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Environmental Authorisation Process for the Expansion of the Copper Sunset Mining Right Area

Fauna and Flora Specialist Study

Prepared for:

Copper Sunset Sands (Pty) Ltd

Project Number:

COP6679

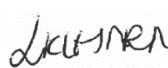

July 2021



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Report Type:	Fauna and Flora Specialist Study
Project Name:	Environmental Authorisation Process for the Expansion of the Copper Sunset Mining Right Area
Project Code:	COP6679

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- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
 - I declare that there are no circumstances that may compromise my objectivity in performing such work;
 - I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



February 2021

Signature of the Specialist

Date

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EXECUTIVE SUMMARY

Copper Sunset Sands (Pty) Ltd (hereinafter Copper Sunset) has an approved Mining Right (DMRE Ref. No. FS30/5/1/1/2/164 MR) and Environmental Management Programme (EMPr), in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), for the mining of sand on the Farm Bankfontein No. 9. The Mining Right was approved in 2008 and amended in 2011, 2016 and 2017 to incorporate additional areas into the Mining Right Area (MRA).

The applicant now intends to expand its MRA to incorporate adjacent properties to extend the Life of Mine (LoM). The proposed extension of the MRA amounts to approximately 1642 ha (Bankfontein) and 1153.6 ha (Zandfontein), for the mining of sand.

The project area is located within the 1:50 000 topographical map Quarter Degree Squares (QDS) 2627 DD. Based on the Mucina and Rutherford (2006) delineation of South Africa's vegetation, the region in which the Project area is located is defined by two main vegetation types, namely Central Free State Grassland and Andesite Mountain Bushveld, which are both listed as vulnerable, see the other Digby Wells specialists studies in this regard and specifically the Wetlands Report.

According to the National List of threatened terrestrial ecosystems, the proposed extension area does not fall within any original or remaining extents of a threatened ecosystem. The proposed area does not fall within or close to any Important Bird Areas (IBA), the nearest, Suikerbosrand Nature Reserve IBA, is about 35 km from the project site. The Suikerbosrand Nature Reserve is a fully protected provincial reserve that is recognised as an IBA on account of the presence of three globally threatened species (i.e. the African Grass Owl, Greater Flamingo and Secretary bird), and several regionally threatened taxa (Marnewick, Retief, Theron, Wright, & Anderson, 2015). A total of five floral species of conservation concern (SCC) (see Table 7-3) as well as two faunal species including *Aonyx capensis* (African Clawless Otter) (NT) and *Pyxicephalus adspersus* (Giant Bullfrog) (NT) could potentially occur in the Project area.

The site visit in January 2021 concluded that the vegetation communities delineated within the Project area include natural and secondary vegetation communities and vegetation which has been largely and completely transformed. The Project area comprises of Secondary Grassland, Wetland and Transformed habitats. Three floral SCC were recorded, namely *Boophone disticha* and *Silene burchellii* var. *burchellii* along the eastern border of the Mining Right Extension Area (MREA) and *Eucomis autumnalis* in the wetland (Channelled Valley Bottom with Depressions) in the central portion of the Project area.

A total of nine (9) mammal species were recorded during the infield assessments. Various mammals of the Herpestidae (Mongoose) family were observed in the Zandfontein Mining Extension Area along the wetland. Tracks of a Water Mongoose were observed in the marshes of the floodplain and associated valley bottom wetland. Mammals observed included Yellow Mongoose, Slender Mongoose, Meerkat, Scrub Hare, Zebra, Fallow Deer (introduced species) Blesbok and Ground Squirrels.

Forty-seven (47) birds have been recorded in the MREA during the survey in January 2021. The identified birds are listed in Table 7-8. No listed or Red Data species were recorded during the field survey.

Two (2) species of herpetofauna were recorded, Boettgers Caco and Montane Speckled Skink, both listed as Least Concern. The amphibian was recorded near the artificial dams in the Channelled Valley Bottom with Depressions and the Skink was recorded in the Transformed habitat.

A total of 33 invertebrates were observed and are listed in Table 7-9. No Red Data invertebrates were recorded during the site assessment in January 2021.

Impacts on the fauna and flora associated with the proposed sand mining activities and associated infrastructure include the loss of vegetation communities, biodiversity (loss of faunal and floral species of conservation concern) and ecosystem functioning (wetlands). If no mitigation is introduced, significance of the impacts ranges from moderately negative to majorly negative. If mitigation measures are adhered to significance of the impacts range from positive to minor negatives (see Section 8 Impact Assessment). Section 9 and Section 10 describes a management plan for the rehabilitation and monitoring during the construction, operational, and decommissioning phase of the project. It is highly recommended to ensure that these management measures be followed to limit the impacts to the fauna and flora of the Project area.

Based on the understanding of the Project while considering the results of the impact assessment, Digby Wells does not object to the Project from a faunal and floral perspective; taken into consideration the provided Environmental Management Plan, Monitoring Program, and Recommendations are adopted



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ACRONYMS, ABBREVIATIONS AND DEFINITION

DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EAP	Environmental Assessment Practitioner
EMPr	Environmental Management Programme Report
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Area
LoM	Life of Mine
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
S&EIR	Scoping and Environmental Impact Reporting



Legal Requirement		Section in Report
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of- (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page iii, iv
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii, iv
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
cA	And indication of the quality and age of the base data used for the specialist report;	Section 6
cB	A description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8
(d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 7
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of the equipment and modelling used;	Section 6
(f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	Section 7
(g)	an identification of any areas to be avoided, including buffers;	Section 7
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 8
(k)	any mitigation measures for inclusion in the EMPr;	Section 9
(l)	any conditions/aspects for inclusion in the environmental authorisation;	Section 9
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10
(n)	a reasoned opinion (Environmental Impact Statement) -	



Legal Requirement		Section in Report
	whether the proposed activity, activities or portions thereof should be authorised; and	Section 13
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMP, and where applicable, the closure plan;	
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Section 11
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Section 11
(q)	any other information requested by the competent authority.	Section 11

1. Introduction

Copper Sunset (Pty) Ltd (Copper Sunset) has an approved Mining Right (DMRE Ref. No. FS30/5/1/1/2/164 MR) and Environmental Management Programme (EMPr), in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), for the mining of sand on the Farm Bankfontein No. 1849. The Mining Right was approved in 2008 and amended in 2011, 2016 and 2017 to incorporate additional areas into the Mining Right Extension Area (MRA).

The existing operations are situated on the Farm Bankfontein No. 1849, the Remaining Extent (RE) of the Farm Zandfontein No. 259, a portion of the RE of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Rietfontein No. 152, situated in the Free State Province.

Copper Sunset currently holds the following Environmental Authorisations (EAs) and Environmental Management Programmes (EMPrs), which are applicable to the Mining Right boundary:

- The original EMPr associated with the application for a MR on the Farm Bankfontein No. 1849, approved in 2008 (DMRE Ref. No. FS30/5/1/1/2/164 MR dated 28/04/2009);
- The 2011 EA and EMPr associated with the construction of a washing plant, a Return Water Dam (RWD), a settling dam and brick building (DMRE Ref. No. FS30/5/1/2/3/2/1 (164) EM dated 19/09/2011);
- The 2015 and 2016 EA and EMPr associated with the incorporation of additional areas into the MRA (DMRE Ref. No. FS30/5/1/2/3/2/1 (164) EM dated 08/03/2016 and 20/12/2016); and
- The 2017 EMPr associated with incorporation of additional areas into the MR (DMRE Ref. No. FS30/5/1/2/2 (164) MR dated 30/05/2018).

The applicant now intends to expand its MRA to incorporate adjacent properties to extend the Life of Mine (LoM). The intent is to expand the current mining operations to include additional portions of the Remaining Extent (RE) of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Zandfontein No. 259. The proposed extension of the MRA amounts to approximately 1642 ha (Bankfontein) and 1153.6 ha (Zandfontein), for the mining of sand.

The extension of the existing MRA triggers activities incorporated in Listing Notice 1 and Listing Notice 2 of the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R982 of 04 December 2014 as amended), promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The Listed Activities require a Scoping and Environmental Impact Reporting (S&EIR) process to be undertaken as part of the authorisation process.

Digby Wells Environmental (Digby Wells) has been appointed by Copper Sunset as the independent Environmental Assessment Practitioner (EAP) to conduct the required environmental authorisation process to expand their existing and approved MR for the mining of sand over the proposed areas. Wetlands have been identified within the expansion areas.

A Water Use Licence Application (WULA) will be submitted to the Department of Water and Sanitation (DWS) to obtain the required permissions to mine the wetland areas.

Additionally, it is recommended that as part of this application all Environmental Authorisations (EAs) and EMPs are consolidated into one EMP that is applicable to the approved MR and the new areas being applied for. Therefore, the following processes will be conducted:

- A Section 102 amendment application process as per the MPRDA to amend the MR boundary;
- A S&EIR process to authorise the new Listed Activities as per the NEMA;
- An IWULA process in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) to mine the wetland areas found within the expansion area; and
- A Regulation 31 amendment process to consolidate the EAs and EMPs into one consolidated report as per the NEMA.

2. Project Locality

The Copper Sunset Project Area is located within Viljoensdrif, a coal-mining village, under the jurisdiction of the Metsimaholo Local Municipality, which is located in the Fezile Dabi District Municipality, Free State Province near the Vaal River and Lethabo Power Station. Table 2-1 provides the location of the mine in relation to the nearest towns.

Table 2-1: Project Locality

Town	Distance from Copper Sunset	Direction from Town
Vereeniging	8km	South
Vanderbijlpark	10km	South-East
Sasolburg	13km	North-East

Figure 2-1 provides the Local Setting map for the Project Area.

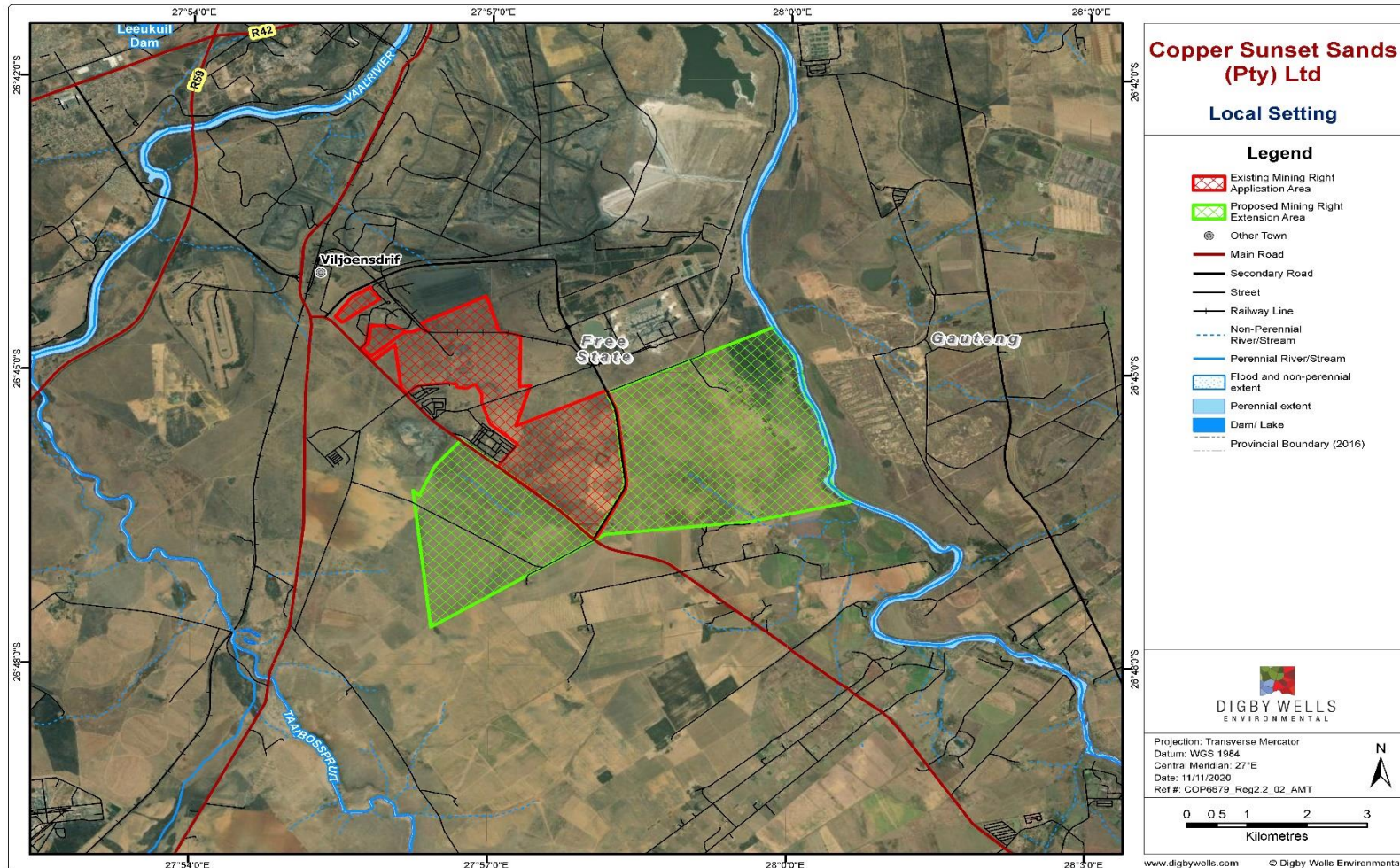


Figure 2-1: Local Setting

3. Description of the Activities to be Undertaken

Copper Sunset began sand mining in 2009. There is currently approximately nine months remaining of the Life of Mine. Therefore, Copper Sunset wishes to expand the MRA to include additional portions of the RE of the Farm Bankfontein No. 9 and a portion of the RE of the Farm Zandfontein No. 259. The properties are located within Seriti's MRA. The intention of the Application is to maximise the mineral resource and to further extend the LoM.

The current mining infrastructure will be utilised for the expansion area., However, mobile offices will be established at the entrance to the new mining areas. Two new mobile offices each approximately 1ha will be established, one and each mining area when mining commences in these areas. The mobile office areas will include the following:

- Mobile offices;
- Hydrocarbon storage tank (14,000 L) with associated bund. Machinery will be refuelled in the area;
- Waste storage area;
- Parking area for the storage of mobile infrastructure; and
- A generator and solar panels to provide electricity.

The sand deposit lies between 0.4 – 5 m below the surface. Strip mining will be utilised to recover the resource, with the sand mined in strips of 30 – 35 m in width and 0.4 - 5 m in depth. The length of the strips is dependent on the area to be mined but approximate lengths are 180 – 600 m. The mining method to be applied includes:

- Stripping and stockpiling of topsoil;
- Construction of a temporary haul road (20 m wide and length will be approximately 10 km);
- Mining of the sand resource including screening;
- Backfilling of the mined excavations with stockpiled topsoil; and
- Concurrent rehabilitation.

Figure 3-1 provides an indication of the proposed office locations and the mining area.

3.1. Resource Deposit

Copper Sunset is applying for an extension to their MREA to include adjacent farms to continue mining general sand (90% plaster and 10% building sand) and clay. Copper Sunset intends to supply several clients with building and plaster sand for use mainly in the construction industry. The deposit extends over an area of 2795.7 ha. The deposit is known to have an average thickness of 5 m. The current mining rate for Copper Sunset is

approximately 2 000 m³ per day. This is expected to continue, and at this rate the proposed extension area will extend the LoM for Copper Sunset by approximately 20 years.

3.2. Establishment Phase

During the establishment phase of the proposed project, the following activities will be undertaken:

- Site Clearance in the form of vegetation and topsoil removal with a bulldozer. Topsoil will be stockpiled along the mined-out strip; and
- Construction of a temporary haul road (20 m width) to gain access to the sand mining area. The haul road will move as mining progresses through life of mine.

No permanent infrastructure will be constructed on site for the sand mining operation. All machinery will be mobile and brought in by Copper Sunset. This will include:

- Placement of mobile office;
- Establishment of parking area;
- Establishment mobile screening plant; and
- Placement of portable toilets, a hydrocarbon storage tank and water bowser.

3.3. Operational Phase

The operation will make use of a fleet of tipper trucks, front-end loaders, excavators, water trucks, tractor and bulldozers. Mining will commence with the removal of vegetation by means of a bulldozer. The topsoil will be removed by a bulldozer to a depth of approximately 0.3 – 0.4 m and stockpiled in a separate area for use during rehabilitation. The commencement of mining in the extension areas will initially be on the sand deposit on the eastern portion of the RE of Bankfontein No. 9 RE (Eastern Block), thereafter on the western portion of the RE of Bankfontein No. 9 RE (Western Block) and lastly on a portion of the RE of Zandfontein No. 259.

During the operational phase of the proposed project, the following activities will be undertaken:

- Strip mining will take place in sequences of 30 – 50 m wide to extract the sand by means of light weight excavators;
- A screening process will be utilised where required should sand become contaminated with unusable particles;
- The customer trucks (100-200 trucks per day) will enter via the haul road into the mining area. The haul road will be constructed as a loop to allow continuous flow of traffic. The mined-out sand / screened sand will be placed directly onto the customers trucks;

- The refuelling of equipment will take place at the mobile office areas within the expanded mining area;
- Water will be abstracted from an authorised borehole, located at the existing Copper Sunset MRA. This borehole is authorised by the Department of Water and Sanitation (DWS) under Water Use Licence (WUL) No. 08/C22F/AG/2315 granted 18 September 2013. It is anticipated that water will only be required for potable water and dust suppression on the expansion area. The amount of water used will remain within the limits of the existing license; and
- No mining will take place within a 100 m buffer from the edge of the Vaal River.

3.4. Rehabilitation Phase

Sand mining will cease once the resource has been extracted. Concurrent rehabilitation will be implemented during the sand mining process.

During the rehabilitation phase of the proposed project, the following activities will be undertaken:

- The areas which have been mined out will be backfilled with waste material from the screening plant which will be covered with topsoil stockpiled during the operational phase;
- The area will be levelled and contoured to mimic pre- mining natural topography to avoid ponding of water. The overall site topography is anticipated to be slightly diminished because of the removal of sand; and
- The area will be allowed to naturally re-vegetate. Where vegetation is not establishing well, an indigenous seed mix will be utilised to improve vegetation establishment.

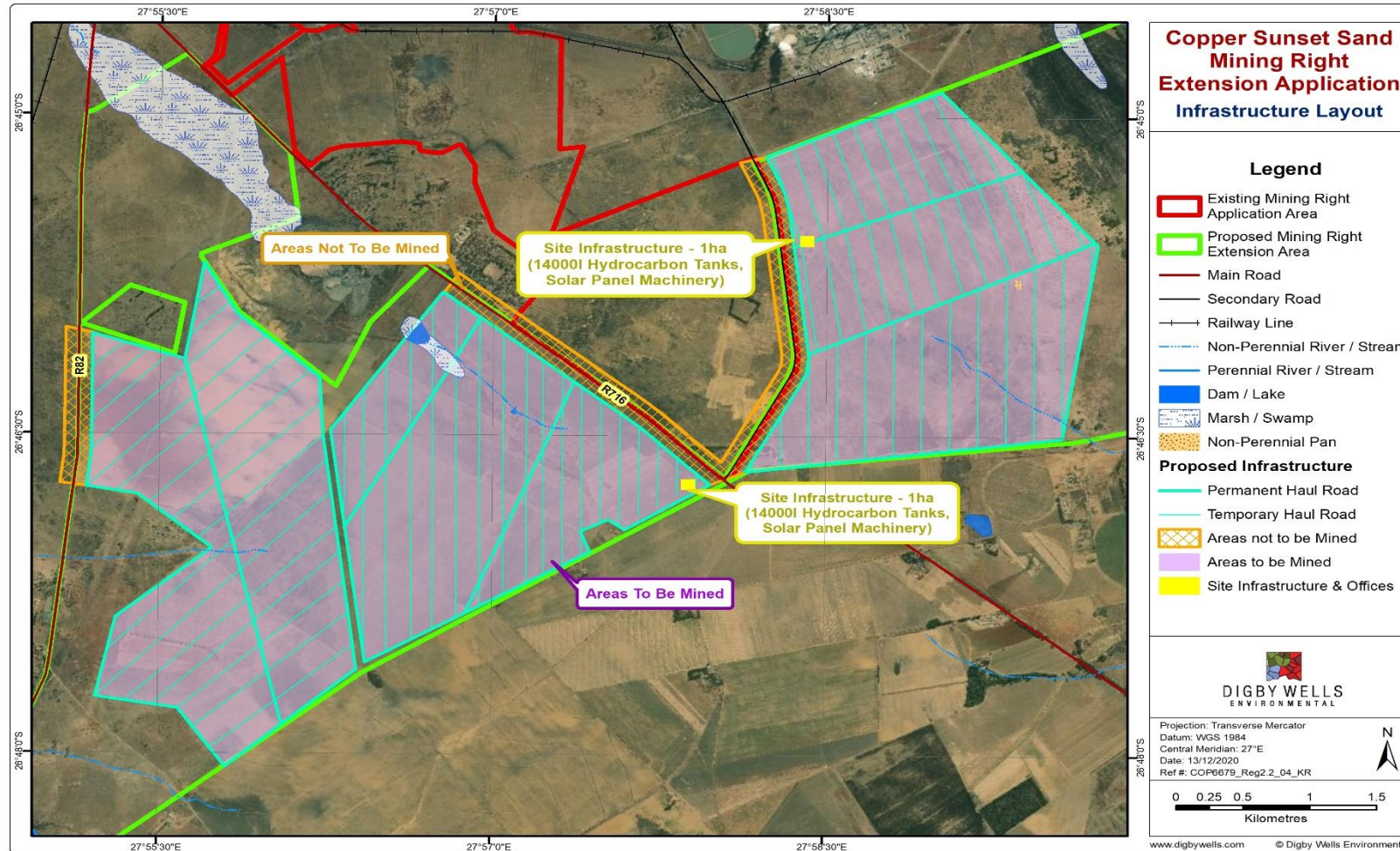


Figure 3-1: Proposed Mine Layout

4. Relevant Legislation, Standards and Guidelines

The Project is required to comply with all the obligations in terms of the provisions of the National legislation, regulations, guidelines and by-laws. The legislation and guidelines guiding the Fauna and Flora Assessment are detailed in Table 4-1 below.

Table 4-1: Applicable Legislation, Regulations, Guidelines and By-Laws

Legislation, Regulation, Guideline or By-Law	Applicability
National Environmental Management Biodiversity Act (NEM: BA) (Act No. 10 of 2004)	<p>This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) A specimen of a listed threatened or protected species; b) Specimens of an alien species; or c) A specimen of a listed invasive species without a permit.</p> <p>Authority – DMRE</p> <p>A specialist fauna and flora assessment has been undertaken for the proposed project and three floral SCC listed species were recorded</p>
Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983)	<p>Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of protected species should take place throughout the establishment and operation, rehabilitation, and closure phases.</p> <p>Authority – Department of Agriculture, Forestry and Fisheries (DAFF).</p>
National Forests Act, 1998 (Act No. 84 of 1998) (NFA)	<p>The National Forests Act (NFA) (Act No. 84 of 1998) provides for the protection of particular trees, a particular group of trees, particular woodland or trees belonging to a particular species by way of a declaration by Minister of the Department of Agriculture, Forestry and Fisheries (“DAFF”) – which is the custodian of all natural forest resources within the borders of the Republic of South Africa. According to section 15 of the NFA, the effect of this declaration means that no individual or persons may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport purchase, sell,</p>

Legislation, Regulation, Guideline or By-Law	Applicability
	<p>donate any protected tree, unless under a license or in terms of an exemption.</p> <p>No protected trees were identified in the Project Area.</p> <p>Authority – DAFF.</p> <p>No protected tree species were observed within or near the proposed expansion area and it is highly unlikely that any protected tree species would be impacted by the development</p>
Forestry Laws Amendment Act (Act No. 35 of 2005)	<p>Refer to the above.</p> <p>Authority – DAFF.</p>
Free State Nature Conservation Ordinance (Ordinance 8 of 1969) (FSNCO)	<p>Conservation in the Free State Province still operates under the Nature Conservation Ordinance (FSNCO). This ordinance provides for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto. Species protected are listed under different schedules within the ordinance</p> <p>Development in the form of the Free State Environmental Conservation Bill (FSECB) will aim to replace the FSNCO. In terms of the FSECB, policies for environmental conservation must further the protection of, amongst others, ecological processes and the preservation of biodiversity in the natural environment. This development will be a shift from a one-sided species conservation approach towards a holistic biodiversity conservation approach.</p> <p>Authorities – Department of Environmental Affairs (DEA) (national), Department of Mineral Resources and Energy (DMRE) and FS State Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) (provincial).</p> <p>Should a permit be required for fauna and flora relocation provincial legislation has been incorporated in this report and will remain applicable throughout the life cycle of the proposed project</p>

Legislation, Regulation, Guideline or By-Law	Applicability
National Environmental Management Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA)	<p>Section 50(5) of NEM: PAA states that no development may be permitted in a nature reserve or world heritage site without the prior written consent and approval of the management authority.</p> <p>Authority – DMRE.</p> <p>The Project Area traverses no protected areas. The Vaaldam Nature Reserve is ca 17 km from the proposed Copper Sunset Mining Right Expansion Area.</p>

5. Assumptions, Limitations and Exclusions

The following assumptions and limitations are applicable to this report:

- Whilst every effort is made to cover as much of the site as possible, representative sampling was completed as per the nature of this type of investigation. The major limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during the different seasons to ensure a comprehensive fauna and flora species list. However, due to time and cost restraints, this is not always possible. It is therefore possible that some plant and animal species that are present on site were not recorded during the field investigations. In order to overcome this limitation, the list of species observed during the site visit is supplemented with species of conservation concern that are known to occur in the area.
- This report lists the findings of an on-site baseline evaluation within the area and is in support of the MREA process. Potential impacts of the proposed mining operations were evaluated based on the layout provided at the time of writing the report, and where necessary, recommendations for the most appropriate mitigation measures have been proposed.

6. Methodology

This section presents the detailed methodology undertaken during the infield assessment and during the assessment of all impacts related to the project in terms of fauna and flora (Terrestrial Biodiversity)

6.1. Desktop Gap Analysis

The desktop review involved compiling relevant information for the greater study area from reliable and recognised resources, including historical studies and assessments. The aim of the desktop study is to identify the current biodiversity and ecosystem status through various databases including the following:

- Mucina and Rutherford (2012), expected vegetation type and community structure:
- South African National Botanical Institute (SANBI), Pretoria Computerised Information System) PRECIS List's, potential species in the proposed development area/site area according to the QDS;
- Potentially occurring avifaunal species through South African Bird Atlas Project (SABAP2), BirdLife South Africa Area (IBA) Directory (Barnes, 1998) and The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor *et al.*, 2015);
- Potentially occurring mammal species through The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005), the Animal Demography Unit Virtual Museum (<http://vmus.adu.org.za/>), and The 2016 Red List of Mammals of South Africa, Lesotho and Swaziland (www.ewt.org.za) (Child, M. F., *et al.*, 2017);
- Potentially occurring herpetofauna species list through the SARCA (sarca.adu.org); A Guide to the Reptiles of Southern Africa (Graham, 2013); Atlas and Red List of Reptiles of South Africa, Lesotho and Swaziland (Bates *et al.*, 2014), A Complete Guide to the Frogs of Southern Africa (Du Preez & Carruthers, 2009); Atlas and Red Data Book of Frogs of South Africa, Lesotho and Swaziland (Minter, 2004); and
- Free State Provincial legislation, potential Red Data Listed species and their current status;

6.2. Field Investigations

Wet season infield fauna assessments took place on the 4th of November 2020 and 12-13 January 2021. Three camera traps were set out in locations where high faunal activity was observed and expected. During the field survey, the area was surveyed for the various fauna assemblages and floral species. The methodology of the fauna and flora assessment is described below.

6.2.1. Flora

A walkthrough of the site was undertaken to assess the vegetation. The survey searched for protected and listed plant species and declared Alien Invasive Plants (AIPs), with the overall aim to produce a full species list of all plant species present.

6.2.2. Mammals

A walkthrough of the site was done during the site survey whereby mammal species were identified by visual sightings as well as using spoor, droppings and roosting sights and available habitat. Camera traps were set up in various locations where high faunal activity was observed and expected. Mammals were identified using the Smithers' Mammals of the Southern African field guide (Smithers, 2000).

6.2.3. Birds (Avifauna)

Data regarding the distribution of bird species was obtained from the Quarter Degree Square (QDS) using the information available from the South African Bird Atlas Project 2 (SABAP2). Concurrently with the mammal survey, the principal ornithological field survey technique was used to record bird species present. Opportunistic sightings were taken during the site survey.

Because the primary purpose of this work was to establish the presence of species, no distance or time limit was set, and hence any species seen or heard anywhere within the general vicinity of the proposed project site was recorded. Visual identification was used to confirm calls of the less common species. Bird species were confirmed using the Sasol photographic field guide (Ryan, 2009)

Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019) and birds listed by NEMBA.

6.2.4. Reptiles and Frogs

Comprehensive amphibian surveys can only be undertaken by nocturnal surveys throughout the wet season. This was beyond the current scope of the assessment and the area was surveyed diurnally for possible habitat for amphibian species. Direct / opportunistic observations were completed along trails or paths within the Project Area. Any herpetofauna species seen or heard along such paths or trails within the Project Area were identified and recorded. Another method used was to examine refuges using visual scanning of terrains to record smaller herpetofauna species which often conceal themselves under rocks and in fallen logs, rotten tree stumps, in leaf litter, rodent burrows, ponds, old termite mounds, etc. Du Preez, *et al.* (2009) was used to confirm identification where necessary. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019) and listed by NEMBA.

6.2.5. Invertebrates (Spiders, Scorpions, Beetles and Butterflies)

A list of visually identified and observed invertebrate species was compiled during the field survey. However, due to their cryptic nature and habits, varied stages of life cycles, seasonal and temporal fluctuations within the environment, it is unlikely that all invertebrate species will have been recorded during the site assessment period. Nevertheless, the data gathered during the general invertebrate assessment along with the habitat analysis provided an accurate indication of which invertebrate species are likely to occur in the study area. A sweep net was used to capture and identify invertebrates. The focus of this assessment was on protected species as this would narrow the field considerably. Assessment of the conservation status of species recorded focused on the various categories of Globally Threatened Species (IUCN 2019) and inverts listed by the NEMBA.

6.2.6. Species of Conservation Concern Assessment

The term Species of Conservation Concern (SCC) in the context of this report refers to all South African National Biodiversity Institute (SANBI) Red Data listed species and species

listed by the International Union for the Conservation of Nature (IUCN) red list of threatened species, as well as provincially protected species. The criterion for the IUCN Red List categories includes:

- Critically Endangered (CR): A taxon is Critically Endangered when it is considered to be facing an extremely high risk of extinction in the wild (IUCN, 2019).
- Endangered (EN): A taxon is Endangered when it is considered to be facing a very high risk of extinction in the wild (IUCN, 2019).
- Vulnerable (VU): A taxon is Vulnerable when the best available evidence indicates it to be facing a high risk of extinction in the wild (IUCN, 2019).
- Near Threatened (NT): A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future (IUCN, 2010).

7. Baseline Environment

The table below (Table 7-1) gives a detailed description of the baseline attributes for the Copper Sunsets MREA. Proceeding the table are the associated maps for conservation aspects of the Project area.

Table 7-1: Baseline Environment of the Copper Sunset Project Area

DETAILS OF THE PROJECT AREA IN TERMS OF MUCINA & RUTHERFORD (2006)		DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE PROJECT AREA ACCORDING TO MUCINA & RUTHERFORD (2006)					
Biome	According to Mucina and Rutherford (2006), the study area falls within a Grassland Biome.	Vegetation Type	Central Free State Grassland and Andesite Mountain Bushveld				
		Altitude (m)	1 280 – 1 660				
Bioregion	The study area is located within the Mesic Highveld Grassland Bioregion .	Climate	Strongly seasonal summer-rainfall region, with very dry winters				
Vegetation Type	The study area falls within the Central Free State Grassland and Andesite Mountain Bushveld Vegetation type (Figure 7-5).		MAP* (mm)	MAT* (°C)	MFD* (Days)	MAPE* (mm)	MASMS* (%)
CONSERVATION DETAILS PERTAINING TO THE PROJECT AREA (VARIOUS DATABASES)			400-1000	16	14	2234	77
Mining and Biodiversity Guideline Category, DEA (2013) (FIGURE 7-2)	No areas within the proposed Copper Sunset MREA were classified according to the guideline. However, in proximity, along the Vaal River and Viljoensdrif, areas were classified as High Biodiversity Importance – High Risk for Mining and Moderate Biodiversity Importance – Moderate Risk for Mining	Distribution	Free State Province				
National Threatened Ecosystems (2011)	According to the National List of threatened terrestrial ecosystems, the Copper Sunset MREA does not fall within any original or remaining extents of a threatened ecosystem.	Geology & Soils	The area falls within the Vryheid formation that consists of cross-bedded sandstone and grit alternating with beds of soft sandy shale. Coal seams and dolerite sheets have intruded the sedimentary rock extensively in the formation.				
SAPAD & SACAD (Q4, 2018); and NPAES (2009)	According to SACAD (Q4, 2018), as depicted in Figure 7-1, several formally protected areas and protected areas have been identified within varying proximities to the Copper Sunset MREA. The Vaaldam Nature Reserve is approximately 17km from the proposed copper sunsets MREA.	Conservation	Both Vulnerable. Target 24%. Only about 3% of this unit is conserved in statutory reserves.				
IBA (2015)	According to the Important Bird and Biodiversity Areas (IBA) database, the Suikerbosrand Nature Reserve IBA is situated 30 km to the northeast of the Copper Sunset MREA. See Figure 7-4.	Vegetation & landscape features	The dominant floral taxa are listed on Table 7-2. Central Free State Grassland is dominated by numerous graminoids and herbs while the Andesite Mountain Bushveld is characterised by considerably less graminoid species and more woody small trees and shrubs.				
FREE STATE BIODIVERSITY PLAN (FIGURE 7-3)							
CBA & ESA (FIGURE 7-3)	The western section of the proposed Copper Sunset MREA is classified as Degraded Land, ESA1 and ESA2 . The eastern section of the MREA is predominantly classified as ESA2 , with smaller areas classified as ESA1 .						

CBA = Critical Biodiversity Areas; ESA = Ecological Support Area; IBA = Important Bird and Biodiversity Areas; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SAPAD = South African Protected Areas Database.

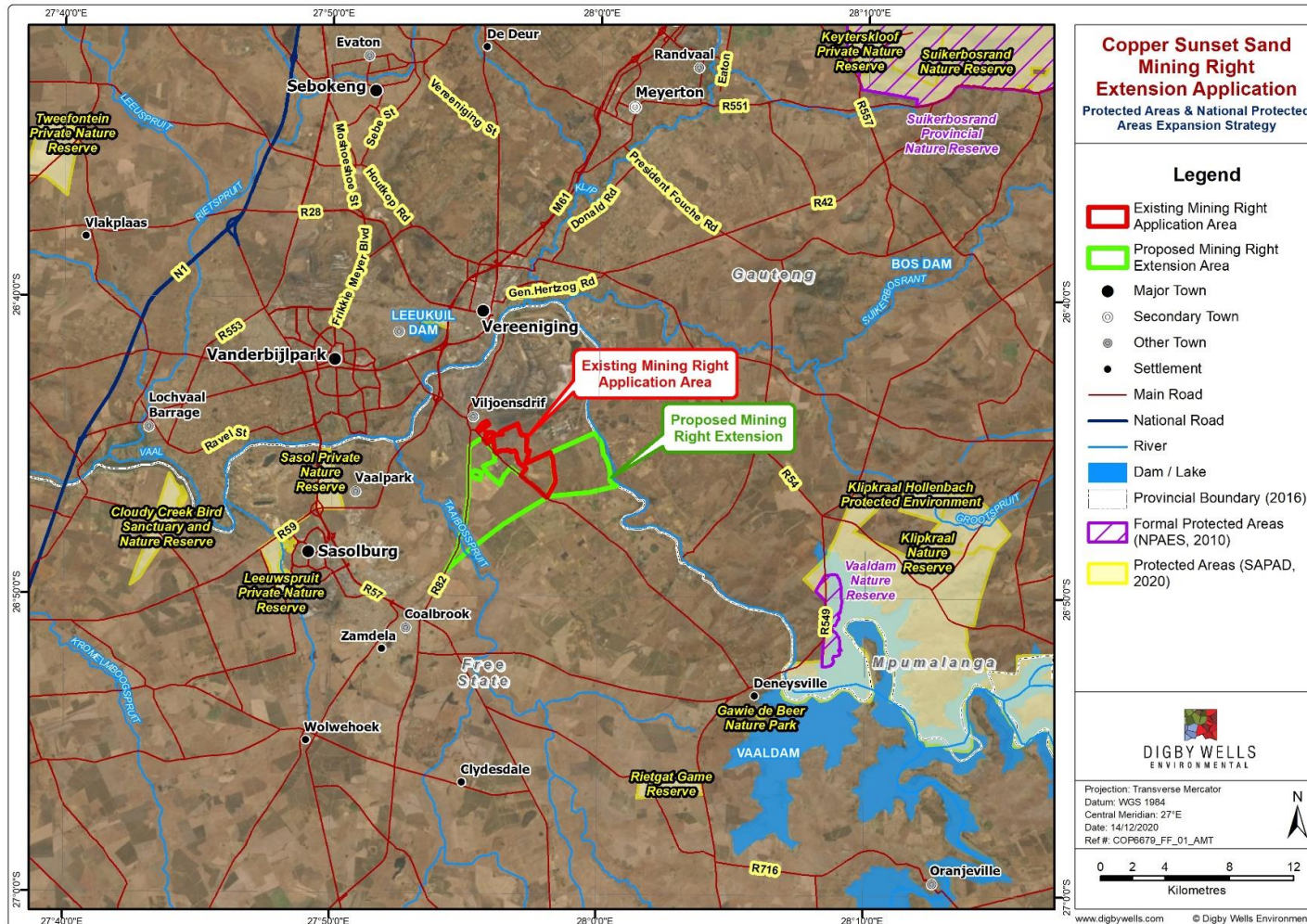


Figure 7-1: Protected Areas and NPAES (2010) in proximity to the Copper Sunset MREA

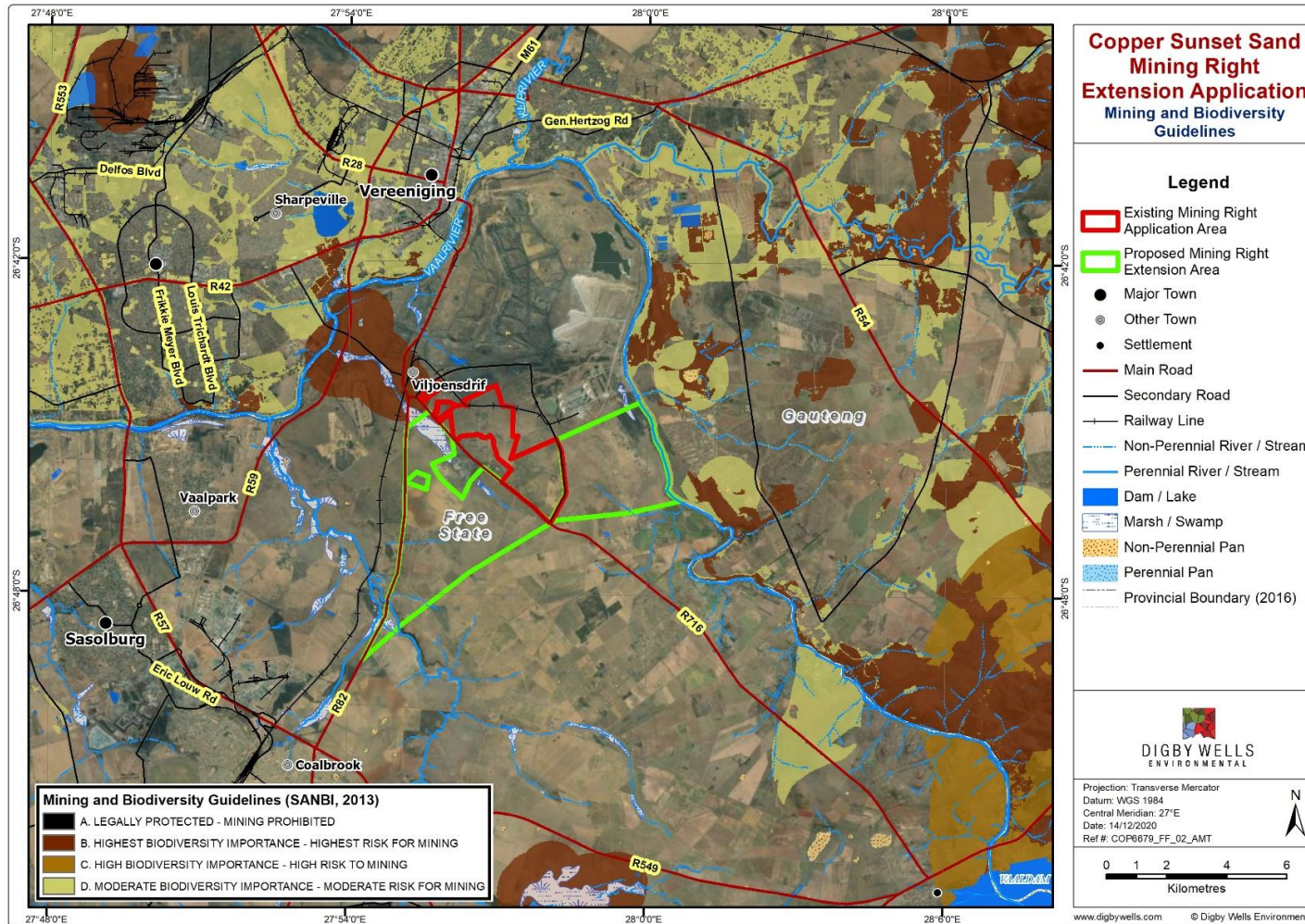


Figure 7-2: Mining and Biodiversity Guidelines of the Copper Sunset MREA

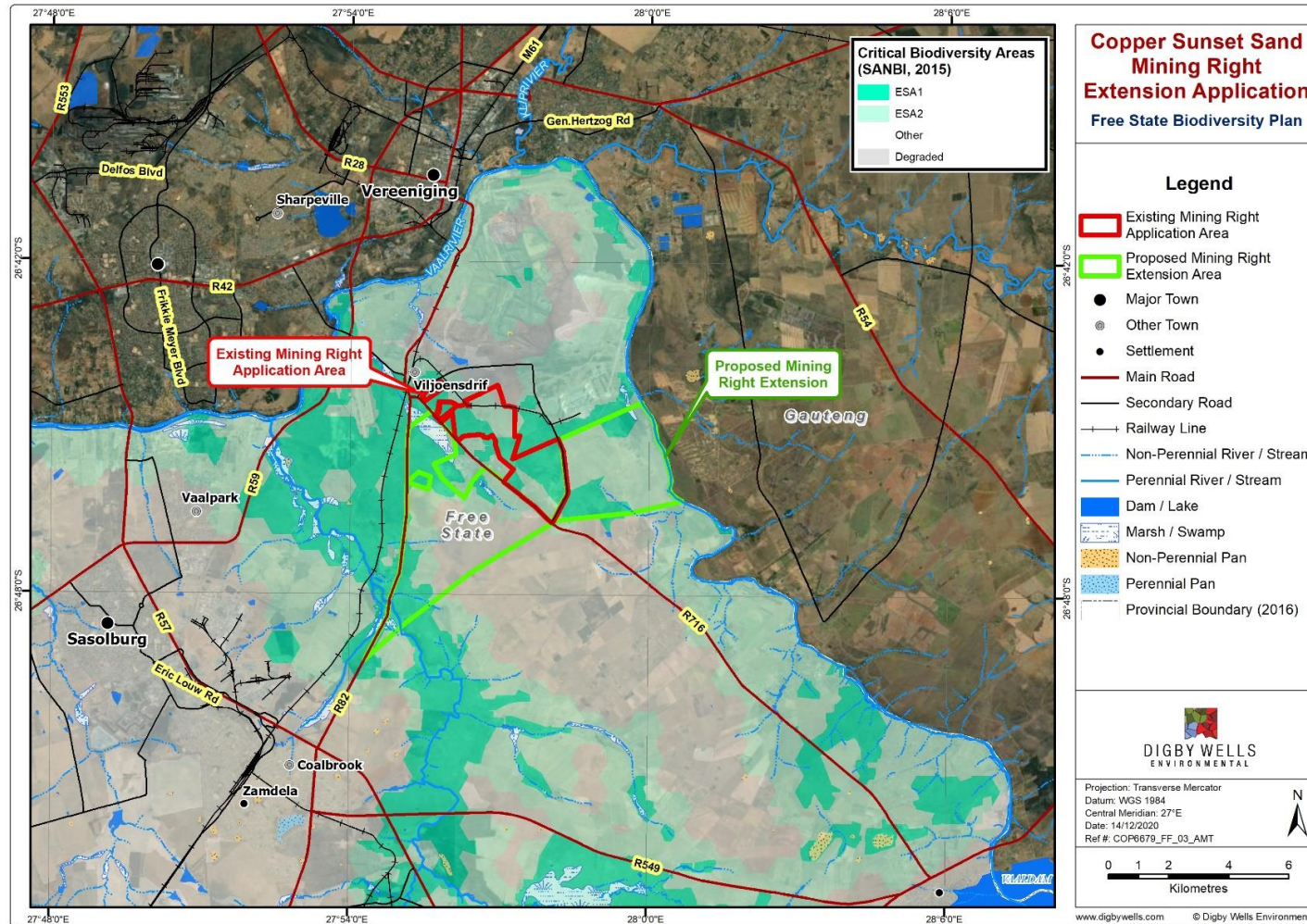


Figure 7-3: Free State Biodiversity Plan of the Copper Sunset MREA

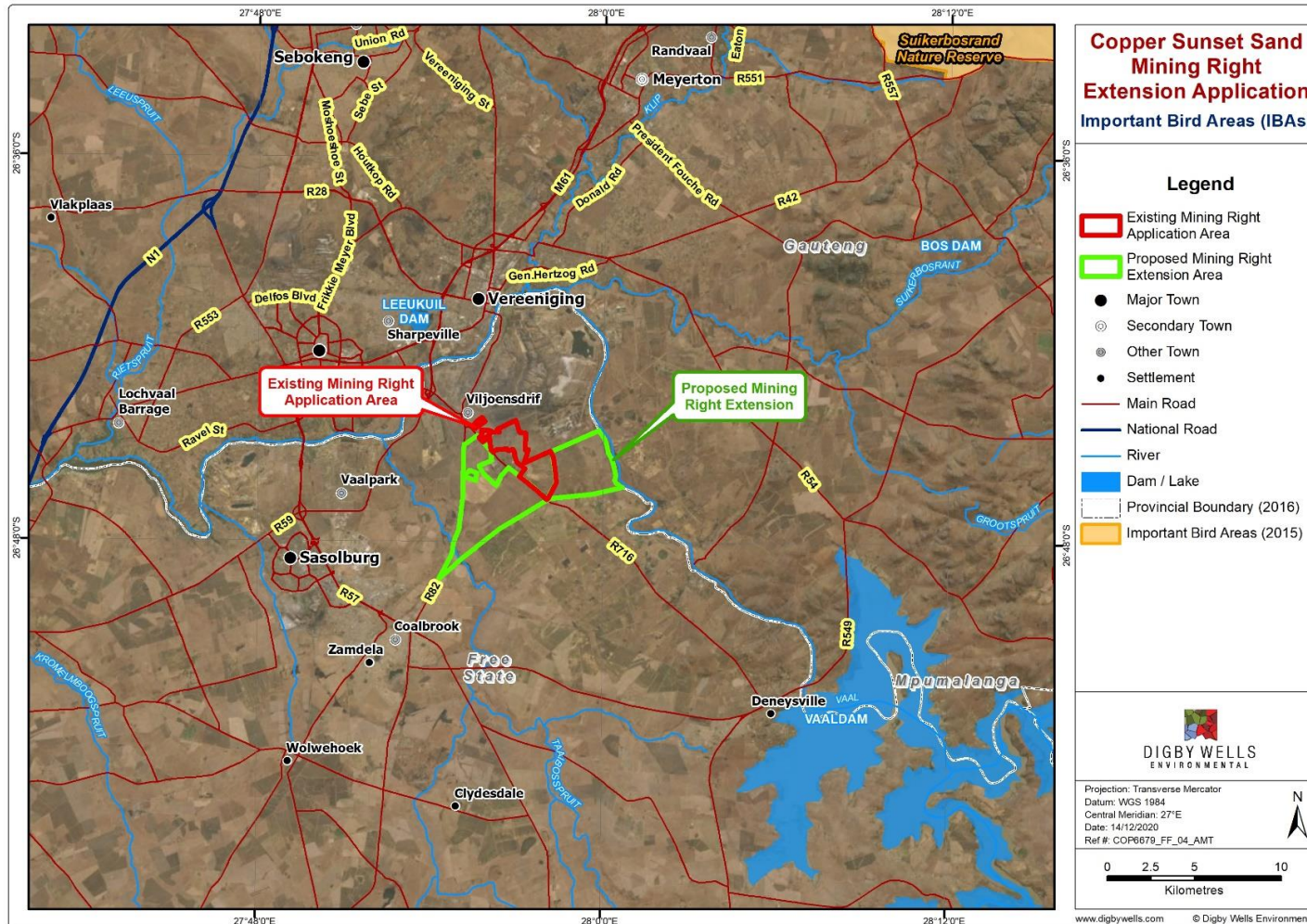


Figure 7-4: Important Bird Areas in proximity to the Copper Sunsets MREA

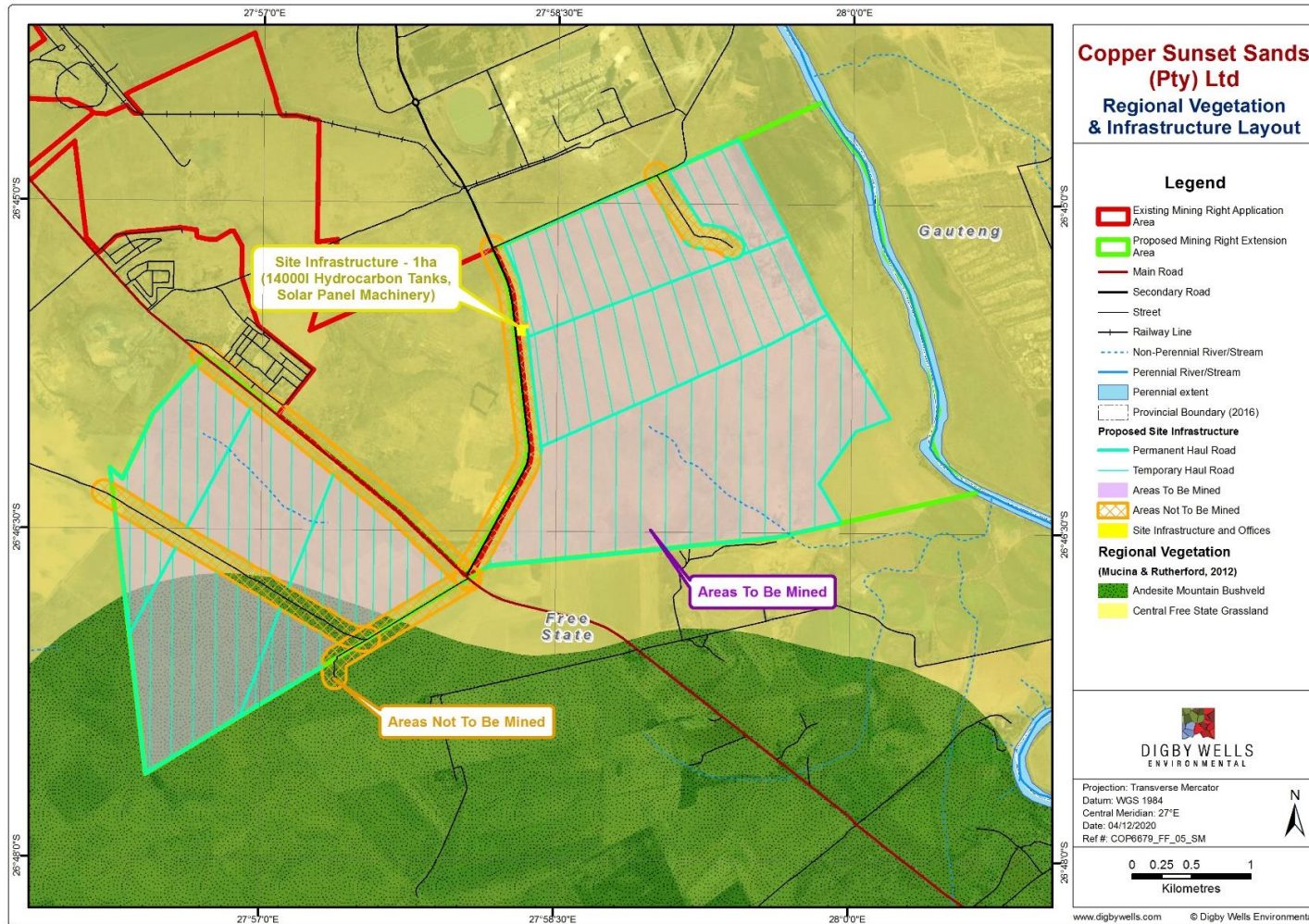


Figure 7-5: Mucina & Rutherford (2012) Regional Vegetation

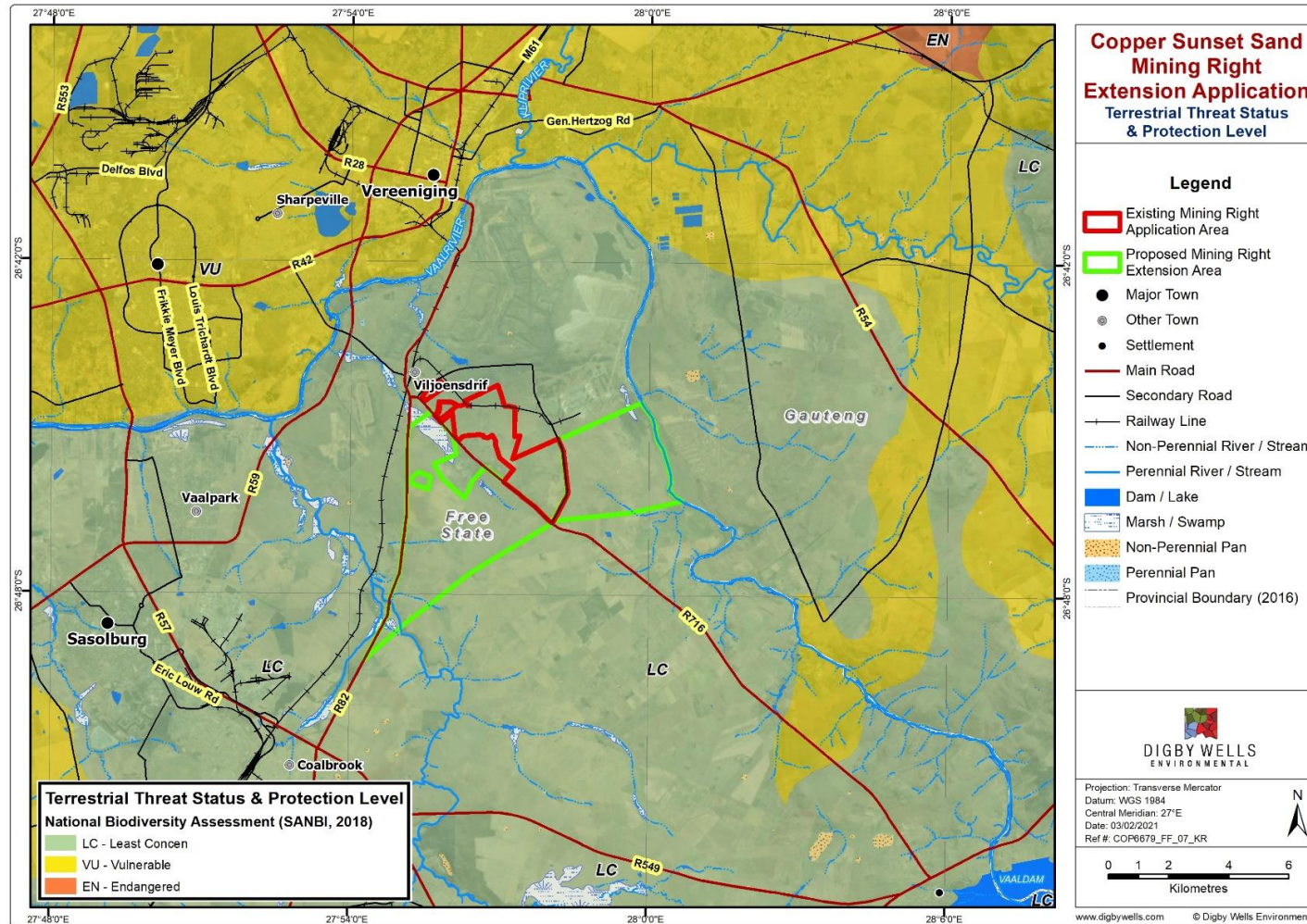


Figure 7-6: National Biodiversity Assessment (SANBI, 2018)

7.1. Regional Vegetation

The Copper Sunsets MREA lies within two vegetation types identified by Mucina & Rutherford (2012), namely the Central Free State Grassland and Andesite Mountain Bushveld. These vegetation types are described in more detail below. Representative flora for each vegetation type are listed in Table 7-2 below.

7.1.1. Central Free State Grassland

This vegetation type consists of undulating plains supporting short grassland, in natural condition dominated by *Themeda triandra* and *Eragrostis chloromelas* became dominant in degraded habitats. Dwarf karoo bushes establish themselves in severely degraded clayey bottomlands. Overgrazed and trampled low lying areas with heavy clayey soils are prone to *Vachellia karoo* encroachment. The conservation status is considered **Vulnerable** with only small portions legally conserved. Almost a quarter of the area has been transformed, either for cultivation or building of dams such as Allemanskraal, Erfenis, Groothoek, Koppies and Kroonstad. Parts of the areas have been subjected to overgrazing with subsequent *Vachellia karoo* encroachment.

7.1.2. Andesite Mountain Bushveld

The Andesite Mountain Bushveld can be observed undulating across Gauteng, North West, Mpumalanga and the Free State provinces within South Africa. The vegetation conforms to a dense, medium-tall thorny bushveld with a well-developed grass layer on the hill slopes with valleys bisecting across the landscape. The conservation status is considered **Vulnerable**, with roughly 7% statutorily conserved, predominantly in the Suikerbosrand Nature Reserve and Magaliesberg area. The vegetation type has succumbed to a staggering transformation of 60% and a conservation target of 24% (Collins, 2016).


Table 7-2: The characteristic plants of the two vegetation types (Mucina & Rutherford, 2006)

Central Free State Grassland		Andesite Mountain Bushveld	
Graminoids	<i>Brachiaria serrata, Cynodon dactylon, Cynodon hirsutus, Digitaria ternata, Elionurus muticus, Eragrostis chloromelas, Eragrostis patentipilosa, Eragrostis plana, Eragrostis racemosa, Heteropogon contortus, Hyparrhenia hirta, Microchloa caffra, Setaria sphacelata, Themeda triandra, Trachypogon spicatus, Abildgaardia ovata, Andropogon schirensis, Cymbopogon caesius, Diheteropogon amplexans, Melinis nerviglumis, Panicum gilvum and Setaria nigrirostris</i>	Graminoids	<i>Cymbopogon pospischilii, Digitaria eriantha subsp. eriantha, Elionurus muticus, Eragrostis racemosa, E. curvula, E. superba, Hyparrhenia hirta, Panicum maximum, Setaria sphacelata, Themeda triandra</i>
Herbs	<i>Acanthospermum australe, Ajuga ophrydis, Eriosema salignum, Euryops transvaalensis, Gerbera viridifolia, Helichrysum nudifolium, Helichrysum rugulosum, Hermannia depressa, Lotononis macrosepala, Nidorella hottentotica, Pentanisia prunelloides, Peucedanum afrum, Rothea hirsuta, Selago paniculata, Senecio coronatus, Senecio inornatus, Sonchus nanus and Hilliardia oligocephala.</i>	Herbs	<i>Commelina africana, Hilliardia galpinii, H. oligocephala.</i> Succulent Herb: <i>Aloe greatheadii var. davyana.</i>
Geophytic Herbs	<i>Oxalis depressa, Raphionacme dyeri.</i>	Woody Climbers	<i>Rhoicissus tridentata.</i>
Succulents	<i>Tripteris aghillana var. integrifolia.</i>	Small Trees	<i>Celtis africana, Protea caffra, Senegalia caffra, S. karroo, Zanthoxylum capense, Ziziphus mucronata</i>
Low Shrubs	<i>Anthospermum rigidum subsp. pumilum, Felicia muricata, Helichrysum dregeanum, Melolobium candicans, Pentzia globosa.</i>	Tall, Low and Soft Shrubs	Tall Shrubs: <i>Asparagus larcinus, Diospyros lycioides subsp. lycioides, Euclea crispa subsp. crispa, Gymnosporia polyacantha, Lippia javanica, Rhamnus prinoides, Searsia pyroides var. pyroides,</i> Low Shrubs: <i>Asparagus suaveolens, Searsia rigida var. margaretae, Teucrium trifidum.</i> Soft Shrubs: <i>Isoglossa grantii.</i>

7.2. Species of Conservation Concern

The Project area is situated within the Quarter Degree Square (QDS) 2627DD. Based on the results of a search of historical records for the QDS on the Botanical Research and Herbarium Management Software (BRAHMS) New Plants of southern Africa website (NEWPOSA), a total of 362 species are indicated to potentially occur in the Project area. Of these potentially occurring species, five are Red Data listed and may potentially occur within the Project area (see Table 7-3). The succeeding headings discuss the Species of Conservation Concern (SCC) (fauna and flora) that occur and are likely to occur within the Project area.

Table 7-3: Red Data flora species occurring in the grid square 2627DD

Family	Species Name	IUCN (2011)	Free Stat Nature Cons. Ordinance (No. 8 of 1969)
Amaryllidaceae	<i>Crinum bulbispermum</i>	Declining	Protected
Amaryllidaceae	<i>Alepidea attenuate</i>	Near Threatened	Protected
Apocynaceae	<i>Brachystelma incanum</i>	Vulnerable	-
Aquifoliaceae	<i>Stenostelma umbelluliferum</i>	Near Threatened	-
Asphodelaceae	<i>Kniphofia typhoides</i>	Near Threatened	Protected

7.2.1. Protected Flora

The Digby Wells Scoping Report (Digby Wells Environmental, 2020) listed a potential 21 floral SCC that may occur within and in close proximity to the Project area. During the recent surveys in 2020 and 2021, three floral SCC were encountered. These species and their respective statutory protection are listed in Table 7-4 below. Two species are listed under Schedule 6 Protected Plants (Section 30) in the Free State Nature Conservation Ordinance (Ordinance 8 of 1969) (FSNCO), and one species is a Red Data listed species under SANBI.

Table 7-4: Floral SCC encountered at Copper Sunsets

Species	Conservation Status
<i>Boophone disticha</i>	Provincially Protected
<i>Silene burchellii</i> var. <i>burchellii</i>	Near Threatened (SANBI)
<i>Eucomis autumnalis</i>	Provincially Protected



Figure 7-7: Left: *Silene burchellii* var. *burchellii*. Middle: *Boophone disticha* and Right: *Eucomis autumnalis*

7.2.2. Protected Fauna

The field work searched for various animal groups including small mammals, large mammals, birds, reptiles, amphibians and invertebrates (specifically butterflies).

7.2.2.1. Mammals

The diverse regional vegetation presents an opportunity to support a variety of mammal species, namely the grassland and wetland habitats. The Virtual Museum of the Animal Demography Unit (ADU) (<http://www.adu.org.za>) was consulted to investigate the recent recordings of mammal SCC. According to this database, the following SCC have been previously recorded within the designated QDS. Expected mammal species are listed in Appendix B. Potential mammal SCC that may be encountered in the Project area are listed in Table 7-5 below.

Table 7-5: Mammal SCC likely to occur within Project area

Family	Species	Common Name	Conservation Status (IUCN)
Bovidae	<i>Hippotragus equinus</i>	Roan Antelope	Endangered
Mustelidae	<i>Aonyx capensis</i>	African Clawless Otter	Near Threatened
Nesomyidae	<i>Mystromys albicaudatus</i>	African White-tailed Rat	Vulnerable
Bovidae	<i>Hippotragus niger niger</i>	Sable	Vulnerable

7.2.2.2. Birds

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological condition are linked to land cover. As the land cover of an area changes, so do

the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the area of interest. The diversity of these habitats should give rise to many different species. According to the South African Bird Atlas Project (SABAP2) database, 160 species of birds have been identified in the area (see Appendix C); the majority of these birds are comprised of Grassland and waterbird species. Of these species, three have been assigned a Red Data status (Taylor MR, 2015). These species are listed in the table below (Table 7-6).

Table 7-6: Bird SCC likely to occur within the Project area

Common Name	Species	Conservation Status*
Greater Flamingo	<i>Phoenicopterus roseus</i>	Near Threatened (NEMBA, 2007)
Secretarybird	<i>Sagittarius serpentarius</i>	Vulnerable (IUCN, 2013)
African Grass Owl	<i>Tyto capensis</i>	Vulnerable (NEMBA, 2007)

7.2.2.3. Herpetofauna

Based on the results of a search of historical records for the 2627 DD QDS, the Animal Demography Unit database and field records from historical studies, a total of 35 herpetofauna species may potentially be present in the Project area. 21 species of reptiles and 14 species of amphibians have previously been recorded in the QDS. These potentially occurring species are listed in Appendix D and E. Of these species, one is listed as a Red Data species, namely the *Pyxicephalus adspersus* (Giant African Bullfrog) listed as Near Threatened.

Numerous wetlands have been identified within the Project Area and thus provide ideal habitat (among others) for the SCC Giant African Bullfrog (*Pyxicephalus adspersus*), thus this species is therefore expected to occur. This is an SCC due to the loss of habitat from negative anthropogenic activities, the Giant African Bullfrog is listed as Near Threatened (NT) in South Africa according to the IUCN.

7.2.2.4. Invertebrates

Butterflies are a good indication of the habitats available in a specific area (Woodhall, 2005). Butterflies are very sensitive to habitat degradation. Although many species are eurytopes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised (Woodhall, 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and to identify. One Red Data species expected to occur in the Project area is the Highveld Giant Cupid (*Lepidochrysops praeterita*), listed as Endangered. This species has a fairly narrow habitat specificity and a large geographic range but has shown a rapid decline in both number of localities as well as numbers of emerging adults in the past 20 years (Henning, 2009). Expected butterfly species are listed in Appendix F.

7.3. Flora

The Project area's floral composition and distribution has been significantly altered due to the historical and current land practises. Upon site inspection, it was apparent that areas are currently utilised for grazing, homestead settlements and agriculture. As a result of these land use practises, large portions of the Project area have been subjected to alterations and have transformed the natural habitat. As a result of the land uses, secondary grasslands have developed and constitute as part of a vegetation community. Patches of secondary grassland were found in conjunction with and adjacent to areas of transformed landscapes. There are numerous wetlands within the Project area and are distinguishable via their composition of wetland indicating species such as Red Cotton Wool Grass (*Imperata cylindrica*), *Cyperus rupestris* and *Schoenoplectus corymbosus* (Sedges). The Project area is surrounded by fields of cultivated Maize and Soya Beans.

7.3.1. Vegetation Communities

The site visit in January 2021 concluded that the vegetation communities delineated within the Project area include natural and secondary vegetation communities and vegetation which has been largely and completely transformed. Three vegetation communities have been delineated and are discussed in further detail below. The Project area comprises of Secondary Grassland, Wetland and Transformed habitats, see Figure 7-13.

7.3.1.1. Secondary Grassland

Secondary grasslands differ from primary grasslands, based on the extent of modification they have undergone. Secondary grasslands have undergone extensive modification and a fundamental shift from their original state, such as cultivated fields, yet they have been allowed to return to their 'grassland' state (SANBI, Grasslands Ecosystems Guidelines: landscape interpretation for planners and managers., 2013). Although secondary grasslands appear as a counterfeit primary grassland, they differ with respect to species composition, vegetation structure, ecological functioning, and the ecosystem services they deliver (SANBI, Grasslands Ecosystems Guidelines: landscape interpretation for planners and managers., 2013). The established secondary grassland in the Copper Sunsets MREA presented a relatively well-developed graminoid and herbaceous component (Figure 7-8).

Within the grassland vegetation community, 97 floral species were recorded. SCC were identified *Boophone disticha* and *Silene burchellii* var. *burchellii* on the eastern boundary of the East Ext area (see Figure 7-13). Numerous graminoids such as *Aristida* sp., *Eragrostis* sp., *Hyparrhenia* sp., *Panicum* sp., *Heteropogon contortus*, *Pennisetum sphaecelatum*, *Digitaria eriantha* and *Themeda triandra* mottled the terrain. Herby forbs such as *Gomphocarpus fruticosus* (seen below in Figure 7-8), *Asparagus laricinus*, *Seriphium vulgare*, *Cleome rubella*, *Commelina africana*, *Bulbine abyssinica*, and *Selago capiltellata* were observed.

Numerous invasive herbs and forbs were observed in the grassland and included *Schkuhria pinnata* (Dwarf Marigold), *Lepidium africanum*, *Pseudognaphalium luteo-album* (Cudweed),

Cirsium vulgare (Thistle, Category 1b), and *Conyza sumatrentis* (Fleabane). The entire floral species list is captured in Appendix A.

Much of the grassland community described is regarded as being moderate to largely modified (secondary grassland); not representing the original grassland vegetation type. The extent of the degradation is illustrated through diminished species richness and the presence of alien invasive vegetation. African grasslands are particularly old, stable, resilient ecosystems. Most plants are perennials, with very few species which are pioneer plants needed to restore disturbance. As a result, grasslands are vulnerable to destruction by cultivation; once ploughed they are invaded by weed pioneer plants that are predominantly alien (Ferrar, 2006).



Figure 7-8: Secondary Grassland

7.3.1.2. Wetland Habitat

According to the 2021 Wetland Report (Digby Wells Environmental, 2021) a total of 6 wetlands (Hydrogeomorphic Units) were delineated and assessed. The wetlands identified consist of:

- Channel Valley Bottom and Seep,
- Channel Valley Bottom,
- Floodplain,

- Floodplain and associated Valley Bottoms,
- Seep, and
- Valley Head Seep and Channel Valley Bottom.

Several of the wetlands were associated with disturbances and impacts resulting from the nearby farming and mining activities (see Figure 7-10). The impacts include alterations in the water quality, quantity, connectivity of the other wetlands, AIP presence and the general biodiversity. Moreover, certain wetland/seep areas have been degraded through ploughing and the establishment of artificial dams/weirs.

The wetland vegetation is distinguishable from the rest of the landscape as dense patches of Cotton Wool Grass (*Imperata cylindrica*), *Schoenoplectus corymbosus*, *Agrostis lacnantha*, various sedges (Cyperaceae spp.) and moisture and clay loving graminoids such as *Berkheya radula*, *Leersia hexandra*, *Setaria sphacelata* can be observed. One floral SCC, *Eucomis autumnalis*, was observed in the central portion of the MREA, in the Slope Seepage Wetland (see Figure 7-13). Two artificial dams were observed within this portion of MREA and served as an ideal habitat for numerous water bird species (see Figure 7-11, discussed in Section 7.4.2). High faunal activity was observed within the Floodplain and associated Valley Bottom (Figure 7-9), further discussions of faunal activity are described in Section 7.4 below.



Figure 7-9: Wetland with high faunal activity



Figure 7-10: Disturbed wetland by cattle



Figure 7-11: Dam

7.3.1.3. Transformed Habitat

The transformed habitats are a direct result from the agricultural activities within the Project area. Natural grasslands have been replaced by fields of Maize (*Zea mays*) and Soya Bean

(*Glycine max*). Alien Invasive Plants (AIPs) can be observed along the peripheries and fence lines along the cultivated fields. Other proliferation of AIPs was observed along the artificial banks of the constructed dams. AIPs such as *Verbena bonariensis*, *Tagetes minuta*, *Flaveria bidentis* (Category 1b), and *Amaranthus viridus* were recorded along the transformed banks. The identified Category 1b species require control by invasive species management programme, according to NEMBA (No. 10 of 2004), as published in August 2014 (GN R5999 in GG 37886 of 1 August 2014). Identified AIPs are listed in the floral species list, Appendix A. The image below, Figure 7-12, depicts the Soya Bean fields and previously cultivated landscape. *Tribulus terrestris* (an invasive creeper) and *Seriphium plumosum* (indigenous encroacher) has pioneered majority of the sandy soils, with soil disturbances from numerous burrows constructed by Ground Squirrels found throughout the Project area.



Figure 7-12: Transformed Habitat

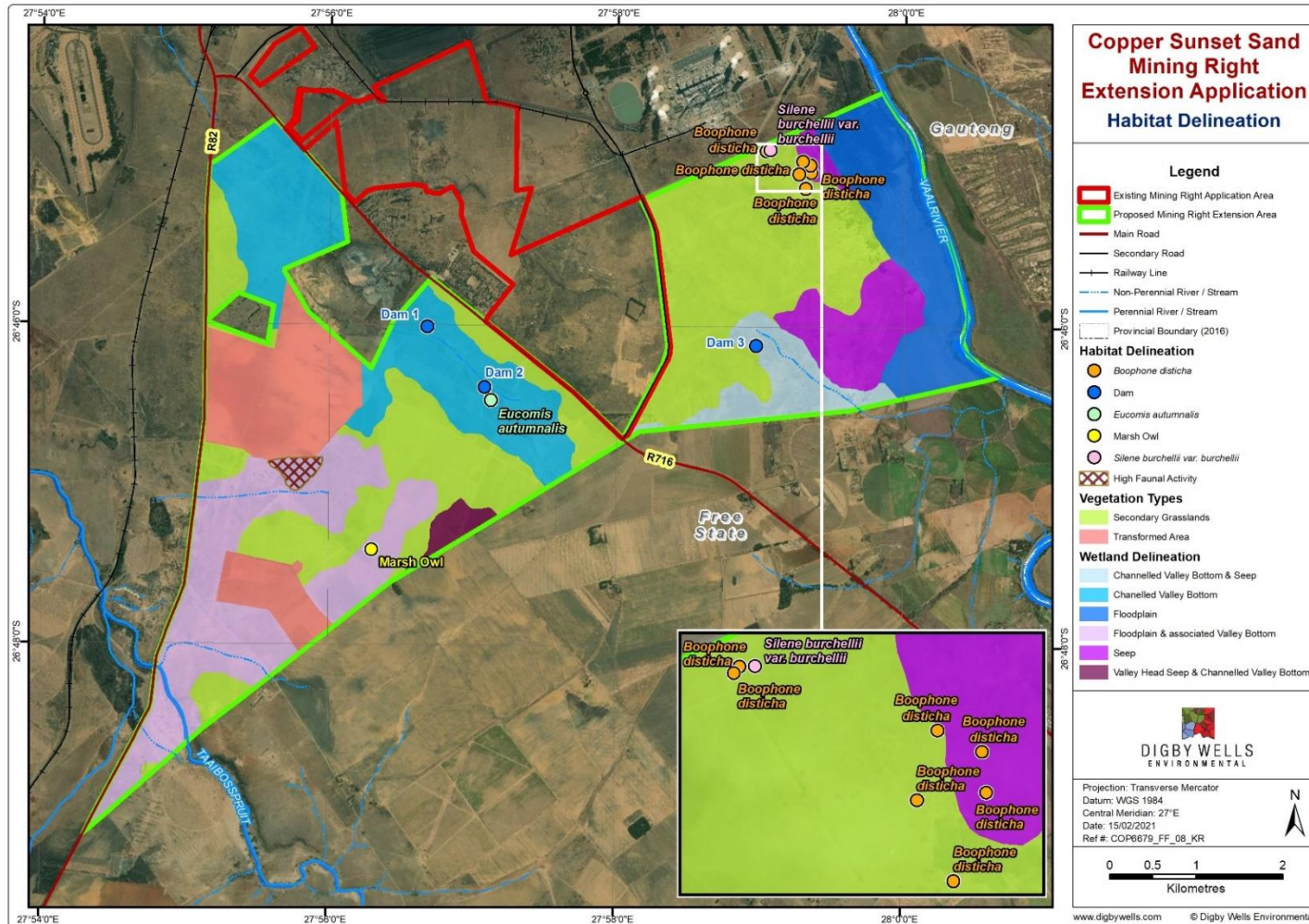


Figure 7-13: Vegetation Communities of Copper Sunsets MREA

7.4. Fauna

This section represents the results from the field survey conducted during January 2021.

7.4.1. Mammals

A total of nine (9) mammal species were recorded during the infield assessments. High faunal activity was observed within the Floodplain and associated Valley Bottom (see Figure 7-13). Various mammals of the Herpestidae (Mongoose) family were observed east of the western boundary within the wetland. Tracks of a Water Mongoose were observed in the marshes of the floodplain and associated valley bottom wetland (Figure 7-13). This particular portion of the Project area appeared less transformed, possibly due to its perennial inundations and inability to traverse or cultivate. It has now provided habitat, as a microclimate refugia, for numerous faunal species and acts as ecological corridor for the movement of various animals. Camera traps were set up in this location and observations of Meerkats and Slender Mongoose were captured on the cameras (see Figure 7-14). Ground Squirrels, Scrub Hares and Yellow Mongoose were observed throughout the Project area and have constructed numerous burrows in the sandy soils. Larger mammals such as Zebra, Fallow Deer (introduced species) and Blesbok were encountered within the Bankfontein Mining Area, they are presumed introduced and monitored by the current landowners possibly for hunting. All encountered and recorded mammals are listed in the table below (Table 7-7), no mammal SCC were recorded.

Table 7-7: Mammals recorded during field investigation

Family	Species	Common Name	Conservation Status
Bovidae	<i>Raphicerus campestris</i>	Steenbok	LC
Cervidae	<i>Dama dama</i>	Fallow Deer	LC
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose	LC
Herpestidae	<i>Atilax paludinosus</i>	Water Mongoose	LC
Herpestidae	<i>Galerella sanguinea</i>	Slender Mongoose	LC
Herpestidae	<i>Suricata suricatta</i>	Meerkat	LC
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	LC
Sciuridae	<i>Xerus inauris</i>	Southern African Ground Squirrel	LC
Bovidae	<i>Damaliscus pygargus phillipsi</i>	Blesbok	LC
Equidae	<i>Equus sp</i>	Zebra	LC



Figure 7-14: Left: Meerkat. Middle: Water Mongoose tracks. Right: Slender Mongoose

7.4.2. Birds

Birds are viewed as good ecological indicators, as their presence or absence tends to represent conditions of a functioning ecosystem. The direct link between bird diversity and land cover portrays a direct indication of the habitats in the area of interest.

According to the South African Bird Atlas Project (SABAP2), 160 species of bird have been identified in the area, majority of these birds are comprised of grassland species. All birds that could be present within the QDS 2627DD are listed in Appendix C. Forty-seven (47) birds have been recorded in the Project area during the survey in January 2021. The identified birds are listed in Table 7-8 below. No listed or Red Data species were recorded during the field survey. The large dam in the central portion of the Project hosts an ideal habitat for a variety of water birds. Species such as Spur-winged Geese, a Dwarf Bittern, Little Grebes, Yellow-billed Ducks, Red Knobbed Coots and Red-billed Teals were observed enjoying the filled dam. It should be noted that a Marsh Owl was observed among the secondary grassland in the Zandfontein Mining Area. January is renowned for their nesting period and it is likely that nests may be situated throughout the grassland. The images below Figure 7-15 depict a few of the birds that were encountered and photographed during the field survey.

Table 7-8: Bird Species Recorded

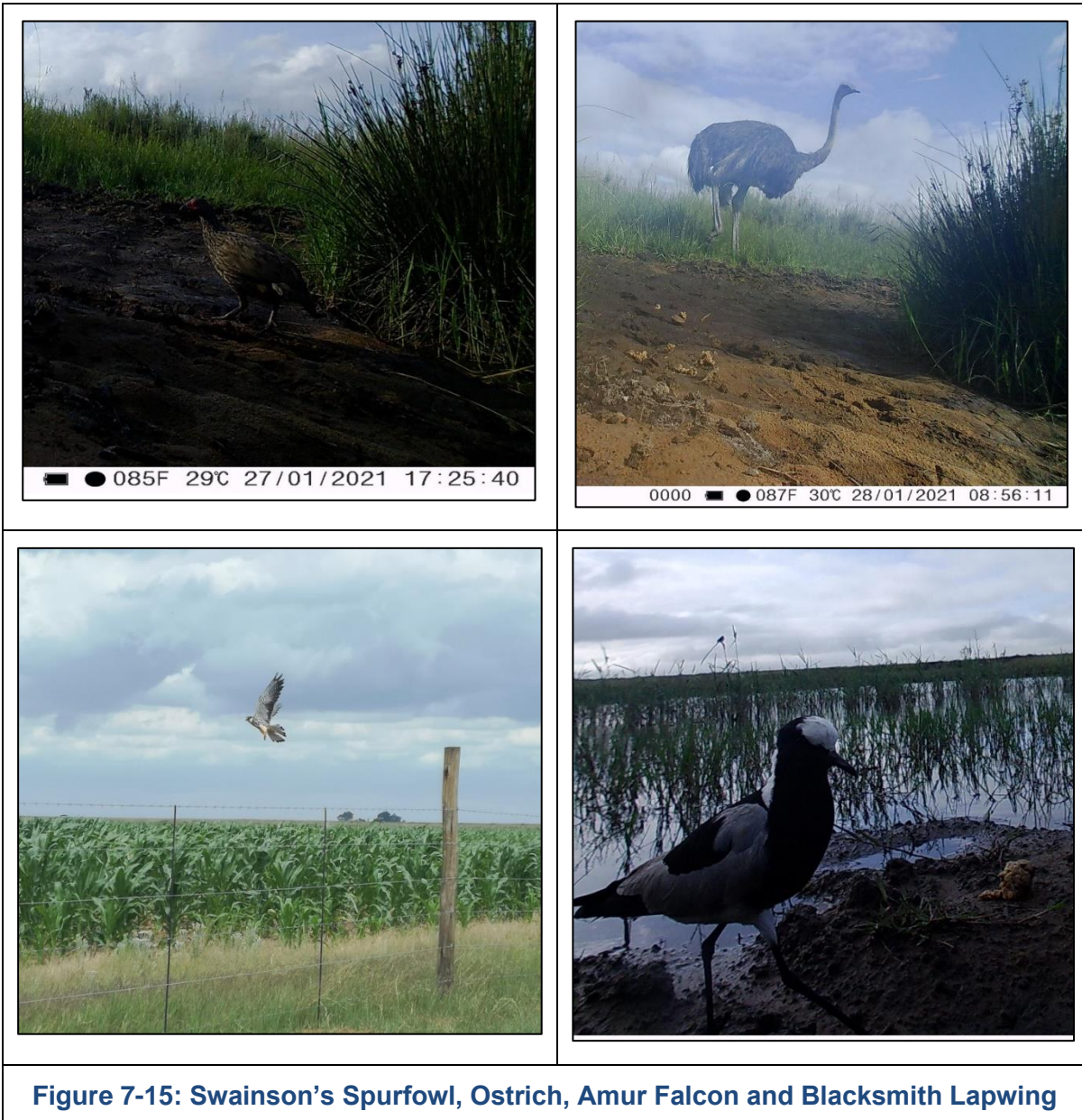
Family	Species	Common Name	Conservation Status
Accipitridae	<i>Buteo vulpinus</i>	Steppe buzzard	LC
Accipitridae	<i>Elanus caeruleus</i>	Black-winged Kite	LC
Accipitridae	<i>Pernis apivorus</i>	European Honey Buzzard	LC
Alaudidae	<i>Mirafra fasciolata</i>	Eastern Clapper Lark	LC
Anatidae	<i>Anas erythrorhyncha</i>	Red-billed Teal	LC
Anatidae	<i>Anas undulata</i>	Yellow-billed Duck	LC
Anatidae	<i>Dendrocygna viduata</i>	White-faced Duck	LC



Family	Species	Common Name	Conservation Status
Anatidae	<i>Plectropterus gambensis</i>	Spur-winged Goose	LC
Apodidae	<i>Apus caffer</i>	White-rumped Swift	LC
Apodidae	<i>Apus horus</i>	Horus Swift	LC
Ardeidae	<i>Ardea intermedia</i>	Yellow-billed Egret	LC
Ardeidae	<i>Bubulcus ibis</i>	Cattle Egret	LC
Ardeidae	<i>Ixobrychus sturmii</i>	Dwarf Bittern	LC
Charadriidae	<i>Vanellus armatus</i>	Blacksmith Lapwing	LC
Charadriidae	<i>Vanellus coronatus</i>	Crowned Lapwing	LC
Cisticolidae	<i>Cisticola fulvicapilla</i>	Neddicky	LC
Cisticolidae	<i>Cisticola juncidis</i>	Zitting Cisticola	LC
Cisticolidae	<i>Cisticola textrix</i>	Cloud Cisticola	LC
Columbidae	<i>Spilopelia senegalensis</i>	Laughing Dove	LC
Columbidae	<i>Streptopelia capicola</i>	Cape Turtle Dove	LC
Cuculidae	<i>Chrysococcyx caprius</i>	Diderick Cuckoo	LC
Falconidae	<i>Falco amurensis</i>	Amur Falcon	LC
Hirundinidae	<i>Cecropis cucullata</i>	Greater Striped Swallow	LC
Hirundinidae	<i>Delichon urbicum</i>	Common House Martin	LC
Hirundinidae	<i>Hirundo dimidiata</i>	Pearl-breasted Swallow	LC
Hirundinidae	<i>Petrochelidon spilodera</i>	South African Cliff Swallow	LC
Meropidae	<i>Merops bullockoides</i>	White-fronted Bee eater	LC
Motacillidae	<i>Macronyx capensis</i>	Cape Longclaw	LC
Muscicapidae	<i>Saxicola torquatus</i>	African Stonechat	LC
Numididae	<i>Numida meleagris</i>	Helmeted Guineafowl	LC
Otididae	<i>Afrotis afraoides</i>	Northern Black Korhaan	LC
Passeridae	<i>Passer melanurus</i>	Cape Sparrow	LC
Phasianidae	<i>Pternistis swainsonii</i>	Swainson's Spurfowl	LC
Ploceidae	<i>Euplectes afer</i>	Yellow-crowned Bishop	LC
Ploceidae	<i>Euplectes orix</i>	Southern Red Bishop	LC
Ploceidae	<i>Euplectes progne</i>	Long-tailed Widowbird	LC



Family	Species	Common Name	Conservation Status
Ploceidae	<i>Plocepasser mahali</i>	White-browed Sparrow Weaver	LC
Ploceidae	<i>Ploceus velatus</i>	Southern Masked Weaver	LC
Podicipedidae	<i>Tachybaptus ruficollis</i>	Little Grebe	LC
Rallidae	<i>Fulica cristata</i>	Red-knobbed Coot	LC
Strigidae	<i>Asio capensis</i>	Marsh Owl	LC
Struthionidae	<i>Struthio camelus</i>	Common Ostrich	LC
Sturnidae	<i>Acridothores tristis</i>	Common Myna	LC
Sturnidae	<i>Lamprotornis bicolor</i>	Pied Starling	LC
Sturnidae	<i>Lamprotornis nitens</i>	Cape Glossy Starling	LC
Threskiornithidae	<i>Bostrychia hagedash</i>	Hadedda Ibis	LC
Viduidae	<i>Vidua macroura</i>	Pin-tailed Whydah	LC



7.4.3. Herpetofauna

Herpetofauna is defined as reptiles and amphibians inhabiting a given area. Reptiles are ectothermic (cold-blooded) meaning they are organisms that control body temperature through external means. As a result, reptiles are dependent on environmental heat sources. Due to this, many reptiles regulate their body temperature by basking in the sun, or in warmer areas. Substrate is an important factor determining which habitats are suitable for which species of reptile.

According to Carruthers (2001), a number of factors influence the distribution of amphibians, but because amphibians have porous skin they generally prosper in warm and damp habitats. The presence of suitable habitat within the Project area (wetland and grassland areas) provides a number of different species of amphibians.

The brevity of the survey meant that relatively few reptiles were observed compared to that of mammals and birds. During the field assessment, one amphibian species was identified within the wetland regions, via its call, the Boettger's Caco (*Cacosternum boettgeri*) (Least Concern). This species is abundant in grassy areas and it can breed in almost any small, temporary water body such as pools in inundated grasslands, culverts and other rain-filled depressions. Its predominant prey is mosquitos, and it is prey to the Yellow-billed Egret (*Ardea intermedia*) and the Giant African Bullfrog (*Pyxicephalus adspersus*) (Scott, 2021).

One species of reptile was identified, namely a Montane Speckled Skink (*Thachylepis punctatissima*) (Least Concern). This species was encountered in the transformed habitat in and amongst old building rubble. The weather during the field survey was cool and overcast, this may have hindered the presence of herpetofauna species within the Project area.

7.4.4. Invertebrates

Invertebrates are the main components of faunal diversity in grasslands, playing substantial roles in ecosystem processes including nutrient cycling and pollination. Grassland invertebrate communities are heavily dependent on plant diversity and production within a given system (Barnett and Facey, 2016). During the field survey in January 2021, a total of 33 invertebrates were observed and are listed in Table 7-9 below. Various images of invertebrates were captured during the field assessment and are presented in Figure 7-16 below.

Table 7-9: Invertebrate Species Recorded

Family	Species	Common Name	Conservation Status (SANBI)
Acrididae	<i>Acrida acuminata</i>	Common Stick Grasshopper	LC
Acrididae	<i>Acrotylus deustus</i>	Burrowing Grasshopper	LC
Acrididae	<i>Kraussaria sp.</i>	Grasshopper	LC
Acrididae	<i>Locustana pardalina</i>	Garden Locust	LC



Family	Species	Common Name	Conservation Status (SANBI)
Calliphoridae	<i>Chrysomya albiceps</i>	Banded Blowfly	LC
Carabidae	<i>Lophyra sp.</i>	Leopard Tiger Beetle	LC
Carabidae	<i>Tefflus sp.</i>	Peaceful Giant Ground Beetles	LC
Chrysomelidae	<i>Platycorynus dejeani</i>	Milkweed Leaf Beetle	LC
Coccinellidae	<i>Cheilomenes lunata</i>	Lunate Ladybeetle	LC
Coreidae	<i>Leptoglossus membranaceus</i>	Twig Wilter	LC
Formicidae	<i>Anoplolepis custodiens</i>	Pugnacious Ant	LC
Formicidae	<i>Linepithema humile</i>	Argentine Ant	LC
Hodotermitidae	<i>Hodotermes mossambicus</i>	Northern Harvester Termite	LC
Lycidae	<i>Lycus melanurus</i>	Hook-winged Net-winged Beetle	LC
Lygaeidae	<i>Spilostethus pandurus</i>	Milkweed Bug	LC
Lygaeidae	<i>Spilostethus rivularis</i>	Rivulet Milkweed Bug	LC
Melittidae	<i>Melitta sp.</i>	Melittidae Bee	LC
Melyridae	<i>Astylus atromaculatus</i>	Spotted Maize Beetle	LC
Miridae	<i>Stenotus sp.</i>	Plant Bug	LC
Muscidae	<i>Musca domestica</i>	House Fly	LC
Myrmeleontidae	<i>Cueta sp.</i>	Pink Pit-building Antlion	LC
Noctuidae	<i>Brithys crini</i>	Lily Borer	LC
Noctuidae	<i>Thysanoplusia orichalcea</i>	Burnished Brass Moth	LC
Nymphalidae	<i>Danaus chrysippus</i>	African Monarch	LC
Nymphalidae	<i>Hypolimnas misippus</i>	Common Diadem	LC
Nymphalidae	<i>Junonia hierta</i>	Yellow Pansy	LC
Nymphalidae	<i>Junonia oenone</i>	Blue Pansy	LC
Nymphalidae	<i>Vanessa cardui</i>	Painted Lady	LC
Pieridae	<i>Belenois aurota</i>	Brown-veined White	LC
Pieridae	<i>Eurema brigitta</i>	Broad-bordered Grass Yellow	LC
Syrphidae	<i>Simoides crassipes</i>	Banded-legged Drone Fly	LC



Family	Species	Common Name	Conservation Status (SANBI)
Tabanidae	<i>Haematopota sp.</i>	Clegs	LC
Tenebrionidae	<i>Lagria vulnerata</i>	Hairy Dark Beetle	LC



Figure 7-16: Top Row: Rivulet Milkweed Bug, Twig Wilter, Garden Locust nymph & Brown-veined White. Bottom Row: Painted Lady, Lily Borer larva, Mellitidae Bee & Northern Harvester Termite.

8. Impact Assessment

This section rates the significance of the potential impacts pre-mitigation and post-mitigation. The impacts below are a result of both the environment in which the activity takes place, as well as the activity itself. The impacts associated with the proposed project include the NEMA EIA Regulations, 2014 (as amended) Listed Activities, as well as the mining and associated activities to take place at the project area. The methodology utilised to assess the significance of the potential impacts is described in Appendix G. The following activities will be assessed as discussed in Table 8-1.

Table 8-1: Summary of Project Activities

Activity No.	Activity
Establishment Phase	<ul style="list-style-type: none"> ● Site clearance and vegetation removal; ● Placement of the Offices and associated mining equipment; ● Construction of the hydrocarbon storage tank and refuelling area; ● Establishment of a haul road / tracks; and ● Stockpiling of topsoil.
Operational Phase	<ul style="list-style-type: none"> ● Mining of sand resources including screening (if required); ● Transportation of sand; ● Refuelling of machinery within the mining area or at the mobile offices; ● Handling of general and hazardous waste.
Closure and Rehabilitation Phase	<ul style="list-style-type: none"> ● Backfilling of the mined excavations with topsoil and waste from the screening plants; ● Concurrent rehabilitation (topsoil cover, ripping and vegetation establishment) and monitoring of vegetation establishment. ● Dismantling and removal of infrastructure; ● Rehabilitation (topsoil cover, ripping and vegetation establishment); and ● Post-closure monitoring

8.1. Establishment Phase

Activities during the Establishment Phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 8-2 below.

Table 8-2: Interactions and Impacts of Activity

Interaction	Impact
Vegetation Clearing	<ul style="list-style-type: none"> • Removal of all vegetation within the development footprint, permits the loss of vegetation communities (including floral SCC), biodiversity and ecosystem services; and • Soil compaction, increased runoff and soil erosion.
Establishment of haul roads / tracks	<ul style="list-style-type: none"> • Removal of vegetation, AIP proliferation and faunal casualties; • Increased vehicle movement; and • Increased dust, compaction and sedimentation.
Hydrocarbon storage tank and refuelling area	<ul style="list-style-type: none"> • Potential spillage of hydrocarbons (diesel/fuel) thus contaminating the soil and ground water.
Stockpiling of topsoil	<ul style="list-style-type: none"> • Vegetation removal, dust pollution, soil erosion, compaction, sedimentation and AIP proliferation.

8.1.1. Impact Description

Large portions of the Copper Sunsets MREA are proposed to be excavated and destroyed as a result of the mining of the sand. Identified vegetation types within the MREA will result in permanent reduction of the natural habitat of all faunal species that reside there. Floral SCC were encountered within the wetland habitat and near the eastern boundary of the Bankfontein 9 farm portion (see Section 7.2.1). The species are expected to occur throughout the Project area and mitigation measures could include obtaining permits and translocating these plants if encountered. The habitats within the proposed area of development will be directly impacted on, as the existing vegetation, the secondary grassland and wetland vegetation will be removed to facilitate the establishment of the mine and its associated activities. Lastly, with the clearing of vegetation, open areas will occur, and indigenous vegetation will be replaced by fast growing AIPs. This impact can be reduced with the correct implementation of alien vegetation management plans.

8.1.1.1. Management Objectives

Management objective for the site clearance activity will include informing the mine where the location of the vegetation communities is, including the location the identified floral SCC, and how to limit impacts to these areas.

The management objectives are to prevent the loss of important landscapes, species of plants and animals (Red Data and Nationally or Provincially listed species). This is achieved by avoiding destruction of areas where these species occur. In the case of plants, if this is not possible, relocation permits are required for the relocation of all protected species. A thorough screening must take place to quantify and locate all protected species. If relocation is not possible than replacing all removed protected species must occur after operation of the mine

and during the commencement of the rehabilitation. In the instance of the Copper Sunsets MREA protected flora have been identified in the proposed development footprint, therefore relocation permits are required. Additionally, destruction of the vegetative cover must be limited, this can be achieved by restricting the removal and disturbance of vegetation to those areas absolutely essential for the infrastructure placement.

8.1.1.2. Management Actions

To avoid or minimise the potential impacts, the management actions and targets discussed below should be implemented:

- An alien plant management strategy to preserve remaining natural habitat and avoid alien plant infestations. Such a strategy will entail the identification of areas where easy propagation of invasive species may occur. Thereafter specific eradication measures can be prescribed for the species present.
- Destruction of natural vegetation should be limited to the areas essential for the mining. Once site clearing and establishment are complete, the environmental officer must ensure that open and steep areas are prone to erosion; these must be marked and attended to before the following wet season starts.
- Floral SCC should be marked prior to establishment and clearing and the necessary permits for relocations of the protected species must be obtained from the relevant government department. The relocation strategy must be approved by relevant authorities. No protected plants can be disturbed without authorisation.
- Unvegetated stockpiles are prone to alien vegetation recruitment. The environmental manager must ensure that no bare patches are left to proliferate with pioneer AIPs and erode due of lack of vegetation cover.

In accordance with the Red List Plant Guidelines (SANBI, Guidelines for Environmental Impact Assessments (EIAs), 2020), it is imperative to adhere to the following conservation techniques regarding Red Listed plant species:

- All populations of Near Threatened and Threatened plant taxa must be conserved *in situ* (locally);
- All populations of Near Threatened and Threatened plant taxa must be protected with a buffer zone in accordance with guidelines; and
- An Ecological Management Plan must be compiled in respect of all actions that affect populations of Red List Plant Species. The Ecological Management Plan must ensure long-term persistence of the SCC, include monitoring programme for the species, facilitate natural ecological processes, minimise artificial edge effects and include an AIP eradication and monitoring plan.

8.1.1.3. Impact Ratings

The impacts associated with the establishment phase are presented in the table below.

Table 8-3: Establishment Phase Interactions, and Impacts of Activity Rating

1. Activity, and Interaction: Site/vegetation clearance			
Impact Description:			
<ul style="list-style-type: none"> • Loss of plant communities including floral SCC; • Loss of biodiversity; • Increased erosion; • Potential for AIP proliferation; • Loss of faunal habitat including faunal SCC; and • Loss of vegetation types. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact of the vegetation clearance will occur during the life of the project, although reduced during the decommissioning phase	Moderate (negative) -91
Extent	3	Vegetation removal will occur within the infrastructure layout and mining area	
Severity	5	Serious loss of the vegetation communities (including grassland and wetlands) limiting ecosystem functioning	
Probability	7	Definite probability of vegetation clearing in the Project area.	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> • Keep site clearing to a minimal, and restrict vehicle movement outside of dedicated areas, specifically close to wetlands; • Keep site clearing and impacts to the Copper Sunset MREA; • Alien plant management strategy should be implemented; • Make use of existing roads to encourage minimal impacts/footprint; • The mining area should be screened for protected species before commencing mining activities. If protected species are identified, permits will be required before the removal and an Ecological Management Plan must be compile; and • Mitigation measures on waste management are discussed in Table 9-1. 			
Post-Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact will occur for the duration of the project life, specifically during the establishment, and operational phases.	Minor (negative)



Extent	3	Vegetation removal is extending only as far as the MREA.	- 66
Intensity	3	Moderate loss, and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning.	
Probability	6	There is a high probability that the impact will occur if mitigation measures are not implemented.	
Nature	Negative		
2. Activity, and Interaction: Access and haul roads construction			
Impact Description:			
<ul style="list-style-type: none"> • Removal of vegetation and basal layer; • Increased proliferation of AIPs • Increased faunal casualties; and • Increased dust pollution. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact of haul roads will exist during the life of the project.	Minor (negative) - 72
Extent	3	Loss of fauna and flora will only occur within the impacted area and its near surroundings.	
Intensity	4	If not mitigated serious loss will occur to the moderately sensitive environment.	
Probability	6	Site clearance has to take place for construction of the access and haul roads, so vegetation removal is inevitable.	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> • Keep site clearing to a minimum; • If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals or after high rainfall events; • Staff of the mine must adhere to policies within the operation of the mine, such as adhering to designated speed limits; • Establishment must be kept within the mining footprint area, to reduce as much fragmentation as possible; • To counteract the negative impacts of dust pollution, see Table 9.1 for details; and • AIPs should be continuously monitored and controlled throughout the life of the mine and thereafter. 			



Post-Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impacts will occur during the life of the project.	Minor (negative) - 66
Extent	3	Loss of fauna and flora is limited only to the footprint of the access and haul roads, exposed areas due to mitigation measures being implemented, such as limit vehicle movement, and restrict movement to specific sites.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or moderately sensitive environments, limiting ecosystem functioning.	
Probability	6	High probability that the impact will continue to occur.	
Nature	Negative		
3. Activity, and Interaction: Stockpiling of topsoil			
Impact Description:			
<ul style="list-style-type: none"> • Heavy machinery utilised increasing vehicle movement in the area, increasing soil compaction, habitat disturbances and vegetation removal; • Natural vegetation will be removed, damaged and fragmented promoting edge effects and AIP proliferation; and • Increased soil compaction and erosion. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact of habitat fragmentation and loss of fauna and flora will occur during the life of the project.	Moderate (negative) - 98
Extent	4	This fragmentation will only occur within the impacted area and its near surroundings.	
Intensity	5	If not mitigated, once the resources have been lost from the landscape it can be difficult to recover and restore.	
Probability	7	Stock piling of the top layer has to take place for the removal of the sand which will encourage the fragmentation and loss of fauna and flora and AIP proliferation.	
Nature	Negative		
Mitigation measures			

- Establishment of effective vegetation around constructed infrastructure for adequate topsoil protection from wind, and water erosion;
- While topsoils are being stockpiled, the soils should be revegetated to limit erosion and loss of organic material;
- Alien invasive plants should be continuously monitored and controlled throughout the life of the mine and thereafter; and
- Corridors (infrastructure and ecological) set aside within the mine area would mitigate fragmentation substantially, especially if this could be managed with the community over an extended period of time.

Post-Mitigation

Dimension	Rating	Motivation	Significance
Duration	5	The impact will occur during the life of the project.	Minor (negative) - 66
Extent	3	Loss of fauna and flora and habitat degradation is extending only as far as the development area.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or moderate sensitive environments, affecting ecosystem functioning.	
Probability	6	High probability that the impact will continue to occur.	
Nature	Negative		

8.2. Operational Phase

Activities during the Operational Phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 8-4.

Table 8-4: Operational Phases Interactions and Impacts

Interaction	Impact
Refuelling of diesel on site	<ul style="list-style-type: none"> • Potential spillage of hydrocarbon thus contaminating the soil, ground water and surrounding areas.
Transportation of sand	<ul style="list-style-type: none"> • Removal of soil, increased faunal casualties (road kill); • Increased erosion and sedimentation decreasing vegetation cover.
Mining of Sand and use of a Screening Machine,	<ul style="list-style-type: none"> • Removal of vegetation, habitats and increased soil erosion and compaction; • Increased dust pollution.

8.2.1. Impact Description

The study site consists of degraded grassland, primarily due to anthropogenic impacts. The general study area (including outside the borders of the Project Area) includes extensive farmland and some mining, with associated houses and buildings. Despite the disturbed

nature of the site, the floral diversity is relatively moderate and serves refuge and habitat for numerous faunal species and the identified floral SCC. During the operational phase the mining of sand, use of screening machine, transport of sand could result in increased dust pollution, removal and degradation of the habitats and vegetation, erosion and compaction of the soil. The movement of sand could result in further vegetation loss and vehicular faunal casualties.

8.2.1.1. Management Objectives

Management objectives during the operational phase will concentrate on preventing the loss of floral SCC and/or habitat and species that surround the operations. A site environmental management plan will manage habitat and species impacts due to machinery activity during operation.

8.2.1.2. Management Actions

- Monitoring of alien invasive sprawl during the operational phase is recommended.
- Ensure no loss of faunal SCC by establishing signage or posters to create awareness of high faunal activity and adhering to speed limit within the Project Area.
- Flag floral SCC to prevent their removal.
- Monitor dust pollution.
- Keep sight clearing to a minimum, and restrict vehicle movement outside of dedicated areas, specifically close to the areas where water collects.

8.2.1.3. Impact Ratings

The impacts associated with screening operation and the associated mitigation measures are detailed in Table 8-5 below.

Table 8-5: Operational Phase Interactions and Impacts of Activity Rating

1. Activity, and Interaction: Sand transportation, vehicle and heavy machinery movement			
Impacts:			
<ul style="list-style-type: none"> • Habitat destruction by removal of vegetation; • Increase in dust production; • AIP spread; • Increased compaction, erosion, and consequently sedimentation potential; • Increased faunal casualties. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance



Duration	5	The impact of habitat destruction will occur during the life of the project, although reduced during the decommissioning phase.	Minor (negative) - 72
Extent	3	Majority of the impacts will occur within the Project Area and access roads.	
Intensity	4	Soil compaction and erosion further degrading the habitat, increased vehicular activity and loss of vegetation due to increased runoff from compacted areas.	
Probability	6	Movement of vehicles and heavy mine machinery will result in habitat degradation.	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> Reduce the footprint of the mine by clearing only the strips and associated access road / tracks that will be mined out; Access should be restricted to already impacted areas (haul roads); To minimise loss of faunal species and floral SCC, posters and signage demarcating sensitive habitats must be incorporated during the mine life cycle. Anti-poaching units should be activated and security patrols enlisted to prevent snaring. Create a sanctuary for faunal species identified within the Project area during the operational phase; Alien invasive plants should be continuously monitored and controlled throughout the life of the mine and thereafter. It is recommended that AIP programme be established to control the spread; and Monitoring of the vegetation communities present must be completed every 2 years to document the impacts of the edge effect and fragmentation. 			
Post-Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact will occur on a Project life, specifically during the operational phases.	Minor (negative) - 50
Extent	3	Habitat degradation is limited only to limited areas, provided that soil management measures are implemented	
Intensity	2	Minor loss, and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning.	
Probability	5	It is likely that the impact will occur	
Nature	Negative		
2. Activity, and Interaction: Transportation of the sand			



Impacts:			
<ul style="list-style-type: none"> Increased potential of faunal casualties through road kill and destruction and removal of vegetation (floral SCC); AIP sprawl; and Increased dust pollution due to erosion and vehicular activity. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact will occur during the life of the project and result in permanent changes to the landscape and habitats.	Moderate negative (-77)
Extent	3	Impacts will extend as far as the development site area.	
Intensity	3	Moderate environmental effects. These activities will result in modification of the landscape and loss of fauna and flora.	
Probability	7	The probability is definite	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> Monitoring of alien invasive sprawl during the operation is recommended as the surrounding vegetation is relatively intact and free from alien invasive plants. Ensure no loss of faunal SCC by activating establishing signage or posters to create awareness of high faunal activity and adhering to speed limits within the Project area. To monitor and mitigate dust pollution please refer to the Digby Wells Air Quality Report 2020. Keep sight clearing to a minimal, and restrict vehicle movement outside of dedicated areas, specifically close to wetlands. 			
Post-Mitigation			
Duration	4	The impact will occur on a long-term basis, specifically during the operational phase.	Minor negative (-40)
Extent	3	Removal of vegetation, soil stripping and stockpiling is limited only to current mine areas, provided that mitigation measures are implemented.	
Intensity	3	Moderate loss and damage to fauna and flora and habitats if mitigation measures are not adhered to.	
Probability	4	There is a probability that the impact will occur.	
Nature	Negative		
3. Activity, and Interaction: Refuelling of diesel on site			



Impacts:			
<ul style="list-style-type: none"> Contamination of soil, water and surrounding areas / habitats (pan vegetation) from Hydrocarbon waste/spills (lubricants, oil, explosives, and fuels). 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact will occur during the life of the project, although reduced during the decommissioning phase	Moderate Negative (- 78)
Extent	3	Most contamination will occur within the mobile office areas within the mining expansion area	
Intensity	5	Serious medium-term environmental effects resulting in limited ecosystem functioning. Damage can be irreparable if not mitigated.	
Probability	6	The probability is very high.	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> All spills should be immediately cleaned up and treated accordingly. Additionally spill kits must be available at the hydrocarbon storage area; Drip trays must be placed beneath stationary vehicles; and Re-fuelling must take place on a sealed surface area away from sensitive habitats such as the pan vegetation to prevent the ingress of hydrocarbons into the topsoil. The hydrocarbon storage area must be bunded and be able to contain a 110% capacity of the largest storage tank. 			
Post-Mitigation			
Duration	5	The impact will occur on a long-term basis, specifically during the operational phases.	Negligible Negative (- 30)
Extent	3	Spillage and contamination is limited only to storage areas, provided that management measures are implemented	
Intensity	2	Minor - term environmental effects due to prevention measures and rehabilitation.	
Probability	3	There is a probability that the impact will occur.	
Nature	Negative		

8.3. Decommissioning Phase

Activities during the decommissioning phase that may have potential impacts on the vegetation communities, biodiversity and ecosystem function are listed in Table 8-6.

Table 8-6: Decommissioning Phase and Impacts

Interaction	Impact
Dismantling and removal of infrastructure	<ul style="list-style-type: none"> ● Disturbance of soils, and subsequent erosion by wind, and water; ● Increased vehicle movement in the area, increasing soil erosion and habitat destruction; ● Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; ● AIP proliferation; and ● Unexpected changes in topography and landscape.
Rehabilitation – re-vegetation and profiling of the land.	<ul style="list-style-type: none"> ● Exposure of soils, and subsequent compaction, erosion, and sedimentation; ● Soil compaction, and increased runoff potential due to vehicle movement during rehabilitation programs; ● Loss of organic material, and vegetation cover; and ● Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of soil.
Post-closure monitoring and rehabilitation.	<ul style="list-style-type: none"> ● Minimal negative impacts on the environment; and ● Environmental Management Plan.

8.3.1. Impact Description

The decommissioning phase will enable the rehabilitation of the removed indigenous vegetation. The demolition of the ancillary infrastructure may also take place, whereby these will be dismantled and trucked away.

8.3.1.1. Management Objectives

The objective for this phase will be to maximise the success of the rehabilitation that will take place after infrastructure is removed, and to furthermore reduce any impacts that may occur during this phase.

8.3.1.2. Management Actions

Decommissioning of the infrastructure will be predominantly a rehabilitation activity of footprint areas. These areas will be sloped and revegetated with indigenous plant species that represent the vegetation types and communities identified.

Thereafter the removal of the infrastructure (ancillary infrastructure) will be completed and the footprints of these areas also rehabilitated. This will be completed so as to not harm or negatively impact surrounding vegetation.

Furthermore, the rehabilitation (of all infrastructure footprints and areas that will be mined) must be conducted in such a manner to achieve positive outcomes. These aims will be to

ensure the mined out areas are vegetated and that potential erosion through runoff and wind does not occur. Efforts will be maximised if rehabilitation is completed before the first rains fall so as to make use of the rainfall to assist in plant recruitment.

8.3.1.3. Impact Ratings

Impacts associated with the rehabilitation of the sand mining area together with the demolition and removal of the infrastructure area are presented in Table 8-7.

Table 8-7: Decommissioning Phase Interactions and Impacts of Activity Ratings

1. Activity, and Interaction: Dismantling of infrastructure and preparation for rehabilitation of affected areas			
Impact Description:			
<ul style="list-style-type: none"> • Disturbance of soils, and subsequent erosion by wind, and water; • Increased vehicle movement in the area, increasing soil erosion and habitat destruction; • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the surrounding grounds; • AIP proliferation; and • Unexpected changes in topography and landscape. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	6	The impacts will remain for some time after the life of a Project.	Minor (negative) - 65
Extent	3	Extending across the MREA and mine infrastructure.	
Intensity	4	Serious medium-term environmental effects.	
Probability	5	The impact may likely occur.	
Nature	Negative		
Mitigation measures			
<ul style="list-style-type: none"> • Continue with Concurrent Rehabilitation, begin with stockpiles, sand mined areas, implement rehabilitation measures; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible to prevent AIP sprawl (please see Digby Wells Rehabilitation Report 2021 for recommended seed mix); • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; and • Only designated access routes are to be used to reduce any unnecessary compaction. 			
Post-Mitigation			



Dimension	Rating	Motivation	Significance
Duration	2	The impact will be less than a year if rehabilitation measures are implemented correctly.	Negligible (negative) - 24
Extent	2	The impact will be limited to the site due to the implementation of mitigation measures.	
Intensity	2	Minor effects on the biological or physical environment. Environmental damage can be rehabilitated internally with/ without the help of external consultants.	
Probability	4	The impact can occur.	
Nature	Negative		
2. Activity, and Interaction: Rehabilitation – re-vegetation and profiling of the land.			
Impact Description:			
<ul style="list-style-type: none"> • Exposure of soils, and subsequent compaction, erosion, and sedimentation; • Soil compaction, and increased runoff potential due to vehicle movement during rehabilitation programs; • AIP proliferation; • Loss of organic material, basal layer and vegetation cover; and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of soil. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	4	The impacts caused during the rehabilitation activities will have a long-lasting effect if not managed.	Minor negative (-65)
Extent	4	The impact could spread beyond the local development boundaries due to the ability of degraded landscape or alien invasive species impacting the area.	
Intensity	5	These impacts have serious implications to the revival of the disturbed areas.	
Probability	5	These are commonly observed impacts for the rehabilitation phase.	
Nature	Negative		
Mitigation measures			



<ul style="list-style-type: none"> • During the decommissioning phase, rehabilitation must start as soon as possible and preferably in the growing season to ensure adequate plant recruitment; • Address eroded and compacted areas by deep ripping to loosen the soil, and revegetate the area as soon as possible; • Inventory of hazardous waste materials stored on-site should be compiled and complete removal arranged; • Only designated access routes are to be used to reduce any unnecessary compaction. 			
Post-Mitigation			
Dimension	Rating	Motivation	Significance
Duration	6	The impact will be less than a year if rehabilitation measures are implemented correctly	Minor Positive 66
Extent	3	The impact will be limited to the site due to the implementation of mitigation measures	
Intensity	2	Minor effects on the biological or physical environment. Environmental damage can be rehabilitated internally with/ without the help of external consultants.	
Probability	6	The impact can occur	
Nature	Positive		
3. Activity, and Interaction: Post-closure monitoring and rehabilitation			
Impact Description:			
<ul style="list-style-type: none"> • Minimal negative impacts on the environment; and • Environmental Monitoring Plan. 			
Prior Mitigation			
Dimension	Rating	Motivation	Significance
Duration	5	The impact will remain for the life of the Project	Minor (negative) -50
Extent	1	Limited to isolated sections of the Project area.	
Intensity	4	Moderate loss, and/or effects to biological or physical resources or low sensitive environments, limiting ecosystem functioning.	
Probability	5	Likely: The impact may occur. <65% probability	
Nature	Negative		

Mitigation measures			
<ul style="list-style-type: none"> • During the decommissioning phase, rehabilitation must start as soon as possible and preferably in the growing season to ensure adequate plant recruitment; • AIP monitoring should be implemented to prevent the sprawl of AIPs; • Ensure sufficient irrigation and fertilizing of newly planted vegetation to facilitate a rapid establishment; and • Replant with species identified within each vegetation community, refer to the Digby Wells Rehabilitation Report 2021 for a recommended seed mix to promote soil stability and the correct climax species. 			
Post-Mitigation			
Dimension	Rating	Motivation	Significance
Duration	6	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Minor Positive 66
Extent	3	Local area will be affected.	
Intensity	2	Low positive impact.	
Probability	6	Almost certain with a high probability that the impact will occur.	
Nature	Positive		

8.4. Cumulative Impacts

It is necessary to consider the impacts that the future development will have from a wide-ranging perspective, by considering land-use and transformation of the natural habitat in surrounding areas. Cumulative impacts are assessed by considering past, present and anticipated changes to the biodiversity.

The Central Free State Grassland and Andesite Mountain Bushveld uphold a Vulnerable conservation status with a conservation target of 24%. These landscapes have been subjected to transformations from overgrazing and damming. The cumulative loss of these vegetation types as well as SCC within it should be considered proactively.

The further removal of habitat/vegetation types to allow establishment will bring about a reduction of natural areas, and the increase of the edge effect. The impacts on the ecology of the area will be significant. It is expected that there will be great losses of vegetation and flora along with associated faunal habitat. The primary impacts will be fragmentation and edge effects with a reduction in movement of remaining naturally occurring wildlife and isolated pockets of vegetation.

Secondary cumulative impacts will include increased accessibility to the site and the resulting increase in development and resource dependence. Ideally, a strategic environmental plan for

the area should be developed and adhered to. This should include the conservation of important areas and make provisions for ecological corridors for the movement of faunal species. The corridor is an area of habitat that connects wildlife populations that are otherwise separated by anthropogenic activities. This allows for the exchange of individuals and genetics between populations to negate inbreeding. Corridors may also facilitate the re-establishment of populations and may mitigate the effects of habitat fragmentation.

8.5. Unplanned and Low Risk Events

Major unplanned risks are associated with infrastructure malfunctioning and contamination of surrounding ground and ground water. Potentially hazardous substances can contaminate the area via accidental spillage or leakage. It is imperative that the requirements of South African legislation are met for minimisation of pollution. Table 8-8 goes into detail of unplanned risks and mitigation measures.

Table 8-8: Unplanned Events and Associated Mitigation Measures

Unplanned Risk	Mitigation Measures
Leaking or spillage of hazardous substances from waste storage	<ul style="list-style-type: none"> • If a spill occurs, it is to be cleaned up immediately (spill kits) and for major spills should be reported to the authorities; • All infrastructure carrying or transporting such substances is to be checked frequently and maintained; and • Ensure all staff are adequately informed and safety measures are in place for instances involving spillage.
Hydrocarbon spillage from vehicles	<ul style="list-style-type: none"> • If leak occurs from vehicle, place drip trays below the leak; • All vehicles are to be serviced on concrete areas and off site; and • Machines must be parked upon hard parking surfaces and checked daily for leaks.
Infrastructure malfunction leading towards dirty water spillage or spontaneous combustion	<ul style="list-style-type: none"> • All infrastructure, machinery and associated setups are to be serviced and checked throughout the project life cycle; • All staff are to be informed about potential hazards and consequently prepared for malfunctioning; • Protocols are to be induced at every phase of the project life cycle; and • If such hazards were to incur, the appropriate authorities are to be notified and the incident recorded.
Excess dust pollution	<ul style="list-style-type: none"> • Excess dust in mining areas is mitigated via various methods and are site specific. The recommended methods for this site would be spraying of water, tackifiers and soil stabilisers that don't harden the soils.

9. Environmental Management Plan

The objective of an Environmental Management Plan (EMP) is to present mitigations (a) to manage undue or reasonably avoidable adverse impacts associated with the development of the project and (b) to enhance potential positives.

Mitigation measures will sometimes be built into the base of a project and should be considered as part of the “pre-mitigation” scenario; additional mitigation must be recommended if the impact assessment indicates it is necessary.

The key objectives are EMPs are to give mitigation measures to:

- Identify the actual environmental, socio-economic and public health impacts of the project and check if the observed impacts are within the levels predicted in the EIA;
- Determine that mitigation measures or other conditions attached to project approval (e.g. by legislation) are properly implemented and work effectively;
- Adapt the measures and conditions attached to project approval in the light of new information or take action to manage unanticipated impacts if necessary; and
- Gauge if predicted benefits of the project are being achieved and maximized; and gain information for improving similar projects.

Table 9-1: Environmental Management Plan

Activities	Potential Impacts	Mitigation Measure	Mitigation Type	The period for implementation
<p style="text-align: center; writing-mode: vertical-rl; transform: rotate(180deg);">Establishment Phase</p> <ul style="list-style-type: none"> • Site clearing, and preparation by the removal of vegetation and associated habitats and removal of soils; • Movement of vehicles, and heavy machinery; • Construction of infrastructure, including access and haul roads; • Stockpiling of soil; and • Waste management activities, including handling of hydrocarbon chemicals, and transportation of sand. 	<ul style="list-style-type: none"> • Removal of vegetation, basal cover, and thus increasing the potential of loss of topsoil, organic material, and increased erosion potential. • Removal of flora SCC and faunal habitat; • Removal of vegetation communities such as grasslands and wetland vegetation; • AIP proliferation; • Increased runoff potential and consequently sedimentation and compaction of the soil; • Potential spillage of hydrocarbons such as oils, fuels (diesel), and grease, thus contamination of the soils and surrounding grounds; and • Increased dust pollution. 	<ul style="list-style-type: none"> • Floral SCC have been located on the eastern boundary of the Project area, hence, site clearing must be kept to an absolute minimum by adhering to the Project area only, and restrict vehicle movement outside of dedicated areas, specifically close to wetlands;. • Floral SCC plants located in areas of development should be marked prior to commencement of Establishment. Necessary permits for relocations of protected species must be obtained from the relative government authorities. The relocation strategy must be approved by relevant authorities prior to relocation to a safe and ideal location. • Make use of existing roads to encourage minimal impacts/footprint to the Project Area; • Whilst the removal of vegetation is underway, key monitoring methods should be focussed on the prevention of AIP proliferation during the Establishment phase. Measures must be in place to prevent the spread of AIPs; • The regulatory speed limit must be communicated to all staff members of the mine to ensure no unnecessary loss of faunal species occur due to speeding; • In support of the Digby Wells Soil Land Use and Land Capability Report 2020, excavated topsoil should be stockpiled separate from the subsoil to enhance the rehabilitation process. Long term stockpiles should be revegetated to minimise loss of soil quality and minimise infestation by AIPs; • Erosion prevention is key thus runoff must be controlled, and managed by use of proper stormwater management measures; • Management of dust may involve the spraying of water and / or covering exposed pits with suitable dust suppressants; • Vehicles should regularly be surveyed and checked that hydrocarbon spill and other contaminants are not exposed to the soils; • Storage and re-fuelling of vehicles must take place on bunded impervious surfaces to prevent seepage of hydrocarbons into the soil; and • Fuel, grease, and oil spills should be remediated using a commercially available emergency clean up kits. However, for major spills (>5L), if soils are contaminated, they must be stripped, and disposed of at a licensed waste disposal site; 	<p style="text-align: center;">Modify, remedy, control, or stop</p> <p>Concurrent rehabilitation through the life of mine</p>	<p style="text-align: center;">Life of Establishment Phase</p>

Activities	Potential Impacts	Mitigation Measure	Mitigation Type	The period for implementation
<p style="text-align: center;">Operational Phase</p> <ul style="list-style-type: none"> • Vehicle, and heavy machinery movement • Waste management activities; • Maintenance and operation pipeline; and • Processing of sand. 	<ul style="list-style-type: none"> • Increased vehicle movement in the area, Increasing the risk of faunal casualties due to road kill; • Increased risk of AIP proliferation without adequate control measures; • Increased dust pollution; • Increase risk of fire during dry season; • Increased erosion, runoff and compaction of soil and consequently sedimentation potential; • Changes to the landscape with subsequent removal of faunal habitats and a decrease in biodiversity and loss of SCC (faunal and floral); and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils and surrounding grounds. 	<ul style="list-style-type: none"> • Make use of existing roads to encourage minimal impacts/footprint to the Project Area; • Monitor AIPs and ensure measures are in place to prevent spread and proliferation; • All bare patches of soil should be vegetated, preferably with pioneer species which will colonise open and disturbed patches quickly. Please refer to recommend seed mix mention in the Digby Wells Financial Provision and Rehabilitation and Closure Plan 2021. • Avoid extensive footprint of sensitive areas such as wetlands as much as possible; • Adhere to recommended protective buffers around the pans as described by the Digby Wells Wetland Report, 2021; • It is recommended that a nursery for indigenous flora that represent the identified vegetation communities be developed as a community-based project; • Management of dust may involve the spraying of water and / or covering exposed mining areas with mulch. Mulch can be sourced from the removed vegetation from the site; • Monitoring must be carried out during the operational phase to ensure no unnecessary impact to the remaining vegetation and associated habitats, and if so that a remediation plan is put in place as soon as possible; • Hydrocarbons should be used in an environmentally safe manner with correct storage as per each chemical's specific storage descriptions; and • Re-fuelling of vehicles and machinery must take place on a sealed surface area away from wetlands to prevent the ingress of hydrocarbons in the surrounding area. 	<p style="text-align: center;">Modify, remedy, control, or stop</p> <p>Concurrent rehabilitation through the life of mine</p>	<p style="text-align: center;">Life of Operational Phase</p>
<p style="text-align: center;">Decommissioning Phase</p> <ul style="list-style-type: none"> • Rehabilitation – rehabilitation mainly consists of reprofiling the landscape via re-vegetation. • Post-closure monitoring, and rehabilitation 	<ul style="list-style-type: none"> • Increased risk of AIP proliferation without adequate control measures; • Increased erosion, runoff and compaction of soil and consequently sedimentation potential; • Changes to the landscape with subsequent removal of faunal habitats and a decrease in biodiversity and loss of SCC (faunal and floral); and • Potential spillage of hydrocarbons such as oils, fuels, and grease, thus contamination of the soils and surrounding grounds. 	<ul style="list-style-type: none"> • Address areas that have been impacted by erosion, compaction, sedimentation by loosening the soil, and revegetate the area as soon as possible; • Begin with the rehabilitation of the vegetation and replant with indigenous flora identified in vegetation communities, particularly pioneer species. • Ensure removal of all AIPs. This can be done manually and if necessary, with a systemic solution; • Ensure designated access routes and roads are used to reduce any unnecessary compaction and degradation; • Inventory of hazardous waste materials stored on-site should be compiled, and complete removal must be arranged; and • Rehabilitation and Monitoring Plan should be implemented. 	<p style="text-align: center;">Modify, remedy, control, or stop</p> <p>Concurrent rehabilitation through the life of mine</p>	<p style="text-align: center;">Life of Decommissioning Phase</p>

10. Monitoring Programme

A monitoring programme is essential as a management tool to detect negative impacts and variations as they arise and ensure that the necessary mitigation measures are implemented together with the effectiveness of the management measures in place. Table 10-1 describes the monitoring plan that is to be implemented from the establishment phase through to monitoring after decommissioning. The program includes each element, frequency of monitoring and the person responsible thereof.

Monitoring should be done in terms of:

- Appendix 6 of the NEMA EIA Regulations, 2014, (as amended);
- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA);
- National Forest Act, 1998 (Act No. 84 of 1998) (NFA); and
- Biodiversity Plan v1.0 Free State Province (2016).

Table 10-1: Monitoring compliance with and performance assessment against the environmental management programme

Monitoring Element	Comment	Frequency	Responsibility
Alien Invasive Management	During the operational phase the presence of AIPs should be detected and monitored. An active programme of weed management, to control the presence and spread of invasive weeds, will need to be instituted so that encroaching weeds (from edge effects and fragmentation) are controlled by means appropriate to the species. This should run for the life of the mine and five years after rehabilitation.	Annually during the wet season for the first three years after rehabilitation.	Environmental Officer
Red Data listed fauna and flora	All protected and SCC must be marked prior to any site clearing.	Monitored every 6 months from rehabilitation	Field Specialist
Flora and Fauna Monitoring	This will be closely linked to the flora monitoring to enable scientific conclusions and comparisons. To successfully monitor faunal and floral biodiversity with a Grassland biome. This needs to be supplemented with	Monitored every 6 months from rehabilitation	Field Specialist

Monitoring Element	Comment	Frequency	Responsibility
	regular site visits to compile a reasonable comparison between the identified faunal communities present and faunal communities found in the same areas during various stages of the operation of the proposed project. It is recommended that this monitoring be carried out through the life of the mine and concurrently during rehabilitation		

11. Stakeholder Engagement Comments Received

The consultation process affords Interested and Affected Parties (I&APs) opportunities to engage in the EIA process. The objectives of the Stakeholder Engagement Process (SEP) include the following:

- To ensure that I&APs are informed about the Project;
- To provide I&APs with an opportunity to engage and provide comment on the Project;
- To draw on local knowledge by identifying environmental and social concerns associated with the Project;
- To involve I&APs in identifying methods in which concerns can be addressed;
- To verify that stakeholder comments have been accurately recorded; and
- To comply with the legal requirements.

The Public Participation Process (PPP) has been completed in part, as a process separate to the Fauna and Flora Environmental Impact Assessment. No formal consultation was undertaken as part of this assessment.

Site surveys can often present an opportunity for informal consultation with specific stakeholders (usually farm owners, managers and employees).

12. Recommendations

The following actions are recommended to reduce adverse effects on the fauna and flora of the Project Area (Table 12-1).

Table 12-1: Possible Impacts Recommendations

Possible Impacts	Recommendations	Person Responsible
Loss of Fauna SCC	<ul style="list-style-type: none"> All identified faunal SCC identified must be located and relocated, if possible, before the establishment phase (please see Table 9-1 for Giant Bullfrog recommendations) 	Field specialist, and PM
Loss of Vegetation cover and Flora SCC	<ul style="list-style-type: none"> All floral SCC must be identified and located. Regional relocation of protected species within development footprint must be instilled to offset the overall loss of floral SCC within the Project Area. As recommended in Section 9, replanting of suitable indigenous flora during the rehabilitation phase as a means to re-vegetate the area after rehabilitation of the mine. 	Field Specialist, and PM
Habitat and landscape fragmentation	<ul style="list-style-type: none"> Restriction of vehicle movement over sensitive areas to reduce degradation of untouched areas. Minimise unnecessary removal of the natural vegetation cover outside the development footprint. After rehabilitation the area must be fenced, and animals should be kept off the area until the vegetation is self-sustaining and established. 	Field Specialist, Communal Nursery and PM

13. Reasoned Opinion Whether Project Should Proceed or Not

Based on the baseline information, and impact assessment significance ratings, it is the opinion of the specialist that this Project is feasible and should be considered. However, it is highly recommended that concurrent rehabilitation, management, and mitigation measures are correctly implemented to minimise all potential impacts (identified in Section 8) on the fauna and flora of the site.

Managing measures to minimise potential negative impacts as set out in Section 9 should form part of the conditions for the environmental authorisation. The vegetation map (Figure 7-13) should be used as a guide in the application of the recommended mitigation measures to ensure a positive outcome for the biodiversity.

14. Conclusion

Based on Mucina & Rutherford (2006) classification of South Africa's vegetation, the proposed Project is located in an area dominated by the vegetation type Central Free State Grassland and Andesite Mountain Bushveld, which according to those authors, is regarded as vulnerable. Much of the study area has been either transformed or degraded largely through intensive crop production and other agricultural activities.

Areas of semi-natural or natural vegetation occur in small, often fragmented patches. These areas have generally been subjected to disturbances such as varying degrees of grazing and therefore cannot be considered pristine habitats. As always, within the surrounding landscape matrix, these areas are important ecologically and serve to provide refuge and habitat for a variety of fauna and flora species.

SCC recorded during the 2021 survey included three floral species, namely *Boophone disticha*, *Eucomis autumnalis* and *Silene burchellii* var. *burchellii*. Moreover, a number of other Red Data/protected species could potentially occur in the area.

The mining activities in the identified vegetation communities will have direct negative ecological impacts, most notably vegetation clearing, habitat loss and fragmentation as well as AIP proliferation. Areas to be mined should be screened for the identified floral SCC and any other Red Data/protected species prior to establishment. If found these species should be relocated to a nearby site of similar habitat.

Recommendations are made for the EIA phase to ensure that the rehabilitation plan, mitigation measures and continuous monitoring measures are in place, and encourage a concurrent rehabilitation and monitoring plan.

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Appendix A: Plant Species List

Family	Common Name	Scientific Name	Conservation Status
Asteraceae		<i>Acrostis venusta</i>	LC
Poaceae		<i>Agrostis lachnantha</i>	LC
Liliaceae		<i>Albuca sp</i>	LC
Amaranthaceae		<i>Amaranthus viridus*</i>	Invasive
Poaceae		<i>Andropogon eucomous</i>	LC
Papaveraceae		<i>Argemone ochroleuca*</i>	Invasive
Poaceae		<i>Aristida congesta</i>	LC
Poaceae		<i>Aristida diffusa</i>	LC
Poaceae		<i>Aristida stipitata</i>	LC
Asparagaceae		<i>Asparagus laricinus</i>	LC
Asteraceae		<i>Berkheya erysithales</i>	LC
Asteraceae		<i>Bidens pilosa*</i>	LC
Amaryllidaceae		<i>Boophone disticha</i>	Provincially protected
Liliaceae		<i>Bulbine abyssinica</i>	LC
Liliaceae		<i>Bulbine angustifolia</i>	LC
Cyperaceae		<i>Bulbostylis hispidula</i>	LC
Fabaceae	Locust Tree	<i>Ceratonia siliqua*</i>	Ornamental/Invasive
Caesalpiniaceae		<i>Chamocrista comosa</i>	LC
Asteraceae	Thistle	<i>Cirsium vulgare*</i>	1b
Capparaceae		<i>Cleome rubella</i>	LC
Commelinaceae		<i>Commelina africana var. krebsiana</i>	LC
Asteraceae		<i>Conyza sumatrensis*</i>	Invasive
Fabaceae	Wild Lucerne	<i>Crotalaria sphaerocarpa*</i>	Invasive
Cucurbitaceae		<i>Cucumis hirsutus</i>	LC
Poaceae		<i>Cynodon dactylon</i>	LC
Cyperaceae		<i>Cyperus congestus</i>	LC
Cyperaceae		<i>Cyperus esculentus</i>	LC
Mesembryanthemaceae	Vygie	<i>Delosperma herbeum</i>	LC
Poaceae		<i>Digitaria eriantha</i>	LC
Liliaceae		<i>Dipcadi viride</i>	LC
Poaceae		<i>Eragrostis gummiflua</i>	LC
Poaceae		<i>Eragrostis plana</i>	LC
Poaceae		<i>Eragrostis racemosa</i>	LC
Poaceae		<i>Eragrostis rigidor</i>	LC
Myrtaceae	Thin-leaved Stringybark	<i>Eucalyptus eugeniodes*</i>	Invasive
Asparagaceae	Pineapple lily	<i>Eucomis autumnalis</i>	Provincially protected
Asteraceae		<i>Felicia muricata</i>	LC
Asteraceae	Smelters Bush	<i>Flaveria bidentis*</i>	1b
Asteraceae		<i>Gazania krebsiana</i>	LC
Asteraceae		<i>Gerbera viridifolia</i>	LC
Fabaceae	Soybean	<i>Glycine max*</i>	Agricultural
Thymelaeaceae		<i>Gnidia caffra</i>	LC
Apocynaceae		<i>Gomphocarpus fruticosus</i>	LC
Amaranthaceae		<i>Gomphrena celosioides*</i>	Invasive
Asteraceae		<i>Helichrysum argyrosphaerum</i>	LC
Asteraceae		<i>Helichrysum caespitium</i>	LC
Sterculiaceae		<i>Hermannia depressa</i>	LC
Malvaceae		<i>Hibiscus trionum*</i>	Invasive

Family	Common Name	Scientific Name	Conservation Status
Poaceae		<i>Hyperthelia dissoluta</i>	Increase I
Hypoxidaceae		<i>Hypoxis hemerocallidae</i>	SCC (not listed)
Poaceae		<i>Hypparrhenia hirta</i>	LC
Poaceae		<i>Hypparrhenia tamba</i>	LC
Poaceae		<i>Imperata cylindrica</i>	LC
Fabaceae		<i>Indigofera filipes</i>	LC
Scrophulariaceae		<i>Jamesbrittenia aurantiaca</i>	LC
Juncaceae		<i>Juncus effusus</i> *	LC
Cyperaceae		<i>Kyllinga alba</i>	LC
Cyperaceae		<i>Kyllinga erecta</i>	LC
Liliaceae		<i>Ledebouria ovatifolia</i>	LC
Poaceae		<i>Leersia hexandra</i>	LC
Brassicaceae		<i>Lepidium africanum</i> *	Invasive
Molluginaceae		<i>Limeum viscosum</i>	LC
Geraniaceae		<i>Mononia angustifolia</i>	LC
Iridaceae	Yellow tulip	<i>Moraea pallida</i>	LC
Scrophulariaceae		<i>Nemesia fruticans</i>	LC
Scrophulariaceae		<i>Nemesia fruticans</i>	LC
Oxalidaceae		<i>Oxalis obliquifolia</i>	LC
Poaceae		<i>Panicum coloratum</i>	LC
Poaceae		<i>Panicum ecklonii</i>	LC
Poaceae		<i>Paspalum notatum</i>	LC
Geraniaceae		<i>Pelargonium luridum</i>	LC
Poaceae		<i>Pennisetum sphacelatum</i>	LC
Poaceae		<i>Perotis patens</i> *	Invasive
Poaceae		<i>Pogonarthria squarrosa</i>	LC
Asteraceae	Cudweed	<i>Pseudognaphalium luteo-album</i> *	Invasive
Juglandaceae	Chinese wingnut	<i>Pterocarya stenoptera</i> *	Ornamental/Invasive
Rosaceae		<i>Pyracantha angustifolia</i> *	Invasive
Apiaceae	Dwarf marigold	<i>Schkuhria pinnata</i> *	Invasive
Anacardiaceae	Common Wild Current	<i>Searsia pyroides</i>	LC
Selaginaceae		<i>Selago capitellata</i>	LC
Scrophulariaceae		<i>Selago densiflora</i>	LC
Asteraceae		<i>Senecia inornatus</i>	LC
Asteraceae		<i>Senecio consanguineus</i>	LC
Asteraceae	Bankrupt bush	<i>Seriphium vulgare</i>	LC
Poaceae		<i>Setaria sphacelata</i>	LC
Caryophyllaceae		<i>Silene burchellii</i> var. <i>burchellii</i>	NT (decreasing) SANBI
Solanaceae		<i>Solanum incanum</i> *	1b
Asteraceae		<i>Tagetes minuta</i> *	Invasive
Poaceae		<i>Themeda triandra</i>	LC
Santalaceae		<i>Thesium cf. costatum</i>	LC
Zygophyllaceae		<i>Tribulus terrestris</i> *	LC
Poaceae		<i>Trichoneura grandiglumis</i>	LC
Poaceae		<i>Urochloa mosambicensis</i>	LC
Verbenaceae		<i>Verbena bonariensis</i> *	Invasive
Fabaceae		<i>Vigna vexillata</i>	LC
Campanulaceae		<i>Wahlenbergia caledonica</i>	LC

Family	Common Name	Scientific Name	Conservation Status
Campanulaceae		<i>Wahlenbergia undulata</i>	LC

1a: Category 1a – Invasive species that require compulsory control.

1b: Category 1b – Invasive species that require control by means of an invasive species management programme.

2: Category 2 – Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.

3: Category 3 – Ornementally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread (**Bromilow, 2010**).



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Appendix B: Potential Mammal Species List

Family	Species	Common Name	Conservation Status
Bathyergidae	<i>Cryptomys hottentotus</i>	Southern African Mole-rat	LC (2016)
Bovidae	<i>Alcelaphus buselaphus</i>	Hartebeest	
	<i>Antidorcas marsupialis</i>	Springbok	LC (2016)
	<i>Connochaetes gnou</i>	Black Wildebeest	LC (2016)
	<i>Connochaetes taurinus taurinus</i>		LC (2016)
	<i>Damaliscus pygargus phillipsi</i>	Blesbok	LC (2016)
	<i>Hippotragus equinus</i>	Roan Antelope	EN (2016)
	<i>Hippotragus niger niger</i>	Sable	VU (2016)
	<i>Kobus ellipsiprymnus ellipsiprymnus</i>		LC (2016)
	<i>Oryx gazella</i>	Gemsbok	LC (2016)
	<i>Raphicerus campestris</i>	Steenbok	LC (2016)
	<i>Sylvicapra grimmia</i>	Bush Duiker	LC (2016)
	<i>Syncerus caffer</i>	African Buffalo	LC (2008)
	<i>Taurotragus oryx</i>	Common Eland	LC (2016)
	<i>Tragelaphus angasii</i>	Nyala	LC (2016)
Canidae	<i>Otocyon megalotis</i>	Bat-eared Fox	LC (2016)
Cervidae	<i>Dama dama</i>	Fallow Deer	Introduced
Emballonuridae	<i>Taphozous (Taphozous) mauritanus</i>	Mauritian Tomb Bat	LC
Herpestidae	<i>Cynictis penicillata</i>	Yellow Mongoose	LC (2016)
Hystriidae	<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC
Leporidae	<i>Lepus saxatilis</i>	Scrub Hare	LC
	<i>Pronolagus randensis</i>	Jameson's Red Rock Hare	LC (2016)
Molossidae	<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC (2016)
Muridae	<i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC (2016)
	<i>Mus (Nannomys) minutoides</i>	Southern African Pygmy Mouse	LC
Mustelidae	<i>Aonyx capensis</i>	African Clawless Otter	NT (2016)
	<i>Ictonyx striatus</i>	Striped Polecat	LC (2016)
	<i>Mellivora capensis</i>	Honey Badger	LC (2016)
Nesomyidae	<i>Malacothrix typica</i>	Large-eared African Desert Mouse	LC (2016)
	<i>Mystromys albicaudatus</i>	African White-tailed Rat	VU (2016)
	<i>Steatomys krebsii</i>	Kreb's African Fat Mouse	LC (2016)
Soricidae	<i>Suncus infinitesimus</i>	Least Dwarf Shrew	LC (2016)
Vespertilionidae	<i>Neoromicia capensis</i>	Cape Serotine	LC (2016)
Viveridae	<i>Genetta maculata</i>	Common Large-spotted Genet	LC



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Appendix C: Potential Bird Species List (SABAP2)

Bird Group	Common Name	Genus	Species	Conservation Status
Apalis	Bar-throated	<i>Apalis</i>	<i>thoracica</i>	LC (BirdLife International)
Barbet	Acacia Pied	<i>Tricholaema</i>	<i>leucomelas</i>	LC (BirdLife International)
Barbet	Black-collared	<i>Lybius</i>	<i>torquatus</i>	LC (BirdLife International)
Barbet	Crested	<i>Trachyphonus</i>	<i>vallantii</i>	LC (BirdLife International)
Bee-eater	European	<i>Merops</i>	<i>apiaster</i>	LC (BirdLife International)
Bishop	Southern Red	<i>Euplectes</i>	<i>orix</i>	LC (BirdLife International)
Bishop	Yellow-crowned	<i>Euplectes</i>	<i>afer</i>	LC (BirdLife International)
Bokmakierie	Bokmakierie	<i>Telophorus</i>	<i>zeylonus</i>	LC (BirdLife International)
Bulbul	African Red-eyed	<i>Pycnonotus</i>	<i>nigricans</i>	LC (BirdLife International)
Bulbul	Dark-capped	<i>Pycnonotus</i>	<i>tricolor</i>	Not Evaluated
Bunting	Cinnamon-breasted	<i>Emberiza</i>	<i>tahapisi</i>	LC (BirdLife International)
Buzzard	Common	<i>Buteo</i>	<i>vulpinus</i>	Not Evaluated
Canary	Black-throated	<i>Crithagra</i>	<i>atrogularis</i>	LC (BirdLife International)
Canary	Yellow	<i>Crithagra</i>	<i>flaviventris</i>	LC (BirdLife International)
Chat	Anteating	<i>Myrmecocichla</i>	<i>formicivora</i>	LC (BirdLife International)
Cisticola	Cloud	<i>Cisticola</i>	<i>textrix</i>	LC (BirdLife International)
Cisticola	Desert	<i>Cisticola</i>	<i>aridulus</i>	LC (BirdLife International)
Cisticola	Lazy	<i>Cisticola</i>	<i>aberrans</i>	LC (BirdLife International)
Cisticola	Levaillant's	<i>Cisticola</i>	<i>tinniens</i>	LC (BirdLife International)
Cisticola	Wailing	<i>Cisticola</i>	<i>lais</i>	LC (BirdLife International)
Cisticola	Wing-snapping	<i>Cisticola</i>	<i>ayresii</i>	LC (BirdLife International)
Cisticola	Zitting	<i>Cisticola</i>	<i>juncidis</i>	LC (BirdLife International)
Cliff-swallow	South African	<i>Hirundo</i>	<i>spilodera</i>	LC (IUCN)
Coot	Red-knobbed	<i>Fulica</i>	<i>cristata</i>	LC (BirdLife International)
Cormorant	Reed	<i>Phalacrocorax</i>	<i>africanus</i>	LC (IUCN)
Courser	Double-banded	<i>Rhinoptilus</i>	<i>africanus</i>	LC (BirdLife International)
Crow	Pied	<i>Corvus</i>	<i>albus</i>	LC (BirdLife International)
Cuckoo	Diderick	<i>Chrysococcyx</i>	<i>caprius</i>	LC (BirdLife International)
Cuckoo	Red-chested	<i>Cuculus</i>	<i>solitarius</i>	LC (BirdLife International)
Darter	African	<i>Anhinga</i>	<i>rufa</i>	LC (BirdLife International)
Dove	Laughing	<i>Streptopelia</i>	<i>senegalensis</i>	LC (BirdLife International)
Dove	Namaqua	<i>Oena</i>	<i>capensis</i>	LC (BirdLife International)
Dove	Red-eyed	<i>Streptopelia</i>	<i>semitorquata</i>	LC (BirdLife International)
Dove	Rock	<i>Columba</i>	<i>livia</i>	LC (BirdLife International)
Duck	African Black	<i>Anas</i>	<i>sparsa</i>	LC (BirdLife International)
Duck	White-faced	<i>Dendrocygna</i>	<i>viduata</i>	LC (BirdLife International)
Duck	Yellow-billed	<i>Anas</i>	<i>undulata</i>	LC (BirdLife International)
Egret	Cattle	<i>Bubulcus</i>	<i>ibis</i>	LC (BirdLife International)
Egret	Little	<i>Egretta</i>	<i>garzetta</i>	LC (BirdLife International)
Egret	Yellow-billed	<i>Egretta</i>	<i>intermedia</i>	LC (BirdLife International)
Falcon	Amur	<i>Falco</i>	<i>amurensis</i>	LC (BirdLife International)
Falcon	Lanner	<i>Falco</i>	<i>biarmicus</i>	LC (BirdLife International)
Falcon	Red-footed	<i>Falco</i>	<i>vespertinus</i>	LC (BirdLife International)
Finch	Red-headed	<i>Amadina</i>	<i>erythrocephala</i>	LC (BirdLife International)
Fiscal	Common (Southern)	<i>Lanius</i>	<i>collaris</i>	LC (BirdLife International)
Flamingo	Greater	Phoenicopterus	ruber	NT
Flycatcher	Fairy	<i>Stenostira</i>	<i>scita</i>	LC (BirdLife International)
Flycatcher	Fiscal	<i>Sigelus</i>	<i>silens</i>	LC (BirdLife International)

Bird Group	Common Name	Genus	Species	Conservation Status
Flycatcher	Spotted	<i>Muscicapa</i>	<i>striata</i>	LC (BirdLife International)
F francolin	Orange River	<i>Scleroptila</i>	<i>levillantoides</i>	LC (BirdLife International)
Goose	Egyptian	<i>Alopochen</i>	<i>aegyptiacus</i>	LC (BirdLife International)
Goose	Spur-winged	<i>Plectropterus</i>	<i>gambensis</i>	LC (BirdLife International)
Goshawk	Gabar	<i>Melierax</i>	<i>gabar</i>	LC (BirdLife International)
Grass-owl	African	<i>Tyto</i>	<i>capensis</i>	LC (BirdLife International)
Grebe	Little	<i>Tachybaptus</i>	<i>ruficollis</i>	LC (BirdLife International)
Guineafowl	Helmeted	<i>Numida</i>	<i>meleagris</i>	LC (BirdLife International)
Gull	Grey-headed	<i>Larus</i>	<i>cirrocephalus</i>	LC (BirdLife International)
Hamerkop	Hamerkop	<i>Scopus</i>	<i>umbretta</i>	LC (BirdLife International)
Heron	Black-headed	<i>Ardea</i>	<i>melanocephala</i>	LC (BirdLife International)
Heron	Goliath	<i>Ardea</i>	<i>goliath</i>	LC (BirdLife International)
Heron	Green-backed	<i>Butorides</i>	<i>striata</i>	LC (BirdLife International)
Heron	Grey	<i>Ardea</i>	<i>cinerea</i>	LC (BirdLife International)
Heron	Purple	<i>Ardea</i>	<i>purpurea</i>	LC (BirdLife International)
Heron	Squacco	<i>Ardeola</i>	<i>ralloides</i>	LC (BirdLife International)
Hoopoe	African	<i>Upupa</i>	<i>africana</i>	LC (BirdLife International)
House-martin	Common	<i>Delichon</i>	<i>urbicum</i>	LC (BirdLife International)
Ibis	African Sacred	<i>Threskiornis</i>	<i>aethiopicus</i>	LC (BirdLife International)
Ibis	Glossy	<i>Plegadis</i>	<i>falcinellus</i>	LC (BirdLife International)
Ibis	Hadeda	<i>Bostrychia</i>	<i>hagedash</i>	LC (BirdLife International)
Kestrel	Greater	<i>Falco</i>	<i>rupicoloides</i>	LC (BirdLife International)
Kestrel	Lesser	<i>Falco</i>	<i>naumanni</i>	LC (BirdLife International)
Kestrel	Rock	<i>Falco</i>	<i>rupicolus</i>	LC (BirdLife International)
Kingfisher	Giant	<i>Megaceryle</i>	<i>maximus</i>	LC (BirdLife International)
Kingfisher	Malachite	<i>Alcedo</i>	<i>crinata</i>	LC (BirdLife International)
Kingfisher	Pied	<i>Ceryle</i>	<i>rudis</i>	LC (BirdLife International)
Kite	Black-winged	<i>Elanus</i>	<i>caeruleus</i>	LC (BirdLife International)
Korhaan	Northern Black	<i>Afrotis</i>	<i>afraoides</i>	LC (BirdLife International)
Lapwing	African Wattled	<i>Vanellus</i>	<i>senegallus</i>	LC (BirdLife International)
Lapwing	Blacksmith	<i>Vanellus</i>	<i>armatus</i>	LC (BirdLife International)
Lapwing	Crowned	<i>Vanellus</i>	<i>coronatus</i>	LC (BirdLife International)
Lark	Eastern Clapper	<i>Mirafra</i>	<i>fasciolata</i>	LC (BirdLife International)
Lark	Eastern Long-billed	<i>Certhilauda</i>	<i>semitorquata</i>	LC (BirdLife International)
Lark	Red-capped	<i>Calandrella</i>	<i>cinerea</i>	LC (BirdLife International)
Lark	Rufous-naped	<i>Mirafra</i>	<i>africana</i>	LC (BirdLife International)
Lark	Spike-heeled	<i>Chersomanes</i>	<i>albofasciata</i>	LC (BirdLife International)
Longclaw	Cape	<i>Macronyx</i>	<i>capensis</i>	LC (BirdLife International)
Martin	Banded	<i>Riparia</i>	<i>cincta</i>	LC (BirdLife International)
Martin	Brown-throated	<i>Riparia</i>	<i>paludicola</i>	LC (BirdLife International)
Martin	Rock	<i>Hirundo</i>	<i>fuligula</i>	LC (BirdLife International)
Martin	Sand	<i>Riparia</i>	<i>riparia</i>	LC (BirdLife International)
Masked-weaver	Southern	<i>Ploceus</i>	<i>velatus</i>	LC (BirdLife International)
Moorhen	Common	<i>Gallinula</i>	<i>chloropus</i>	LC (BirdLife International)
Mousebird	Red-faced	<i>Urocolius</i>	<i>indicus</i>	LC (BirdLife International)
Mousebird	Speckled	<i>Colius</i>	<i>striatus</i>	LC (BirdLife International)
Myna	Common	<i>Acridotheres</i>	<i>tristis</i>	LC (BirdLife International)
Neddicky	Neddicky	<i>Cisticola</i>	<i>fulvicapilla</i>	LC (BirdLife International)

Bird Group	Common Name	Genus	Species	Conservation Status
Ostrich	Common	<i>Struthio</i>	<i>camelus</i>	LC (BirdLife International)
Owl	Barn	<i>Tyto</i>	<i>alba</i>	LC (BirdLife International)
Owl	Marsh	<i>Asio</i>	<i>capensis</i>	LC (BirdLife International)
Palm-swift	African	<i>Cypsiurus</i>	<i>parvus</i>	LC (BirdLife International)
Paradise-whydah	Long-tailed	<i>Vidua</i>	<i>paradisaea</i>	LC (BirdLife International)
Pigeon	Speckled	<i>Columba</i>	<i>guinea</i>	LC (BirdLife International)
Pipit	African	<i>Anthus</i>	<i>cinnamomeus</i>	LC (BirdLife International)
Plover	Three-banded	<i>Charadrius</i>	<i>tricoloris</i>	LC (BirdLife International)
Prinia	Black-chested	<i>Prinia</i>	<i>flavicans</i>	LC (BirdLife International)
Prinia	Tawny-flanked	<i>Prinia</i>	<i>subflava</i>	LC (BirdLife International)
Quail	Common	<i>Coturnix</i>	<i>coturnix</i>	LC (BirdLife International)
Quailfinch	African	<i>Ortygospiza</i>	<i>atricollis</i>	LC (BirdLife International)
Quelea	Red-billed	<i>Quelea</i>	<i>quelea</i>	LC (BirdLife International)
Reed-warbler	African	<i>Acrocephalus</i>	<i>baeticatus</i>	LC (BirdLife International)
Robin-chat	Cape	<i>Cossypha</i>	<i>caffra</i>	LC (BirdLife International)
Scrub-robin	Kalahari	<i>Cercotrichas</i>	<i>paena</i>	LC (BirdLife International)
Secretarybird	Secretarybird	Sagittarius	serpentarius	VU
Seedeater	Streaky-headed	<i>Crithagra</i>	<i>gularis</i>	LC (BirdLife International)
Shelduck	South African	<i>Tadorna</i>	<i>cana</i>	LC (BirdLife International)
Shoveler	Cape	<i>Anas</i>	<i>smithii</i>	LC (BirdLife International)
Shrike	Lesser Grey	<i>Lanius</i>	<i>minor</i>	LC (BirdLife International)
Shrike	Red-backed	<i>Lanius</i>	<i>collurio</i>	LC (BirdLife International)
Sparrow	Cape	<i>Passer</i>	<i>melanurus</i>	LC (BirdLife International)
Sparrow	House	<i>Passer</i>	<i>domesticus</i>	LC (BirdLife International)
Sparrow	Southern Grey-headed	<i>Passer</i>	<i>diffusus</i>	LC (BirdLife International)
Sparrowhawk	Black	<i>Accipiter</i>	<i>melanoleucus</i>	LC (BirdLife International)
Sparrowlark	Chestnut-backed	<i>Eremopterix</i>	<i>leucotis</i>	LC (BirdLife International)
Sparrow-weaver	White-browed	<i>Plocepasser</i>	<i>mahali</i>	LC (BirdLife International)
Spoonbill	African	<i>Platalea</i>	<i>alba</i>	LC (BirdLife International)
Spurfowl	Swainson's	<i>Pternistis</i>	<i>swainsonii</i>	LC (BirdLife International)
Starling	Cape Glossy	<i>Lamprotornis</i>	<i>nitens</i>	LC (BirdLife International)
Starling	Pied	<i>Spreo</i>	<i>bicolor</i>	LC (BirdLife International)
Starling	Wattled	<i>Creatophora</i>	<i>cinerea</i>	LC (BirdLife International)
Stonechat	African	<i>Saxicola</i>	<i>torquatus</i>	LC (BirdLife International)
Stork	White	<i>Ciconia</i>	<i>ciconia</i>	LC (BirdLife International)
Sunbird	White-bellied	<i>Cinnyris</i>	<i>talatala</i>	LC (BirdLife International)
Swallow	Barn	<i>Hirundo</i>	<i>rustica</i>	LC (BirdLife International)
Swallow	Greater Striped	<i>Hirundo</i>	<i>cucullata</i>	LC (BirdLife International)
Swallow	White-throated	<i>Hirundo</i>	<i>albigularis</i>	LC (BirdLife International)
Swamp-warbler	Lesser	<i>Acrocephalus</i>	<i>gracilirostris</i>	LC (BirdLife International)
Swift	Little	<i>Apus</i>	<i>affinis</i>	LC (BirdLife International)
Swift	White-rumped	<i>Apus</i>	<i>caffer</i>	LC (BirdLife International)
Teal	Red-billed	<i>Anas</i>	<i>erythrorhyncha</i>	LC (BirdLife International)
Tern	White-winged	<i>Chlidonias</i>	<i>leucopterus</i>	LC (BirdLife International)
Thick-knee	Spotted	<i>Burhinus</i>	<i>capensis</i>	LC (BirdLife International)
Thrush	Karoo	<i>Turdus</i>	<i>smithi</i>	LC (BirdLife International)
Tit-babbler	Chestnut-vented	<i>Parisoma</i>	<i>subcaeruleum</i>	LC (BirdLife International)
Turtle-dove	Cape	<i>Streptopelia</i>	<i>capicola</i>	LC (BirdLife International)

Bird Group	Common Name	Genus	Species	Conservation Status
Wagtail	Cape	<i>Motacilla</i>	<i>capensis</i>	LC (BirdLife International)
Warbler	Sedge	<i>Acrocephalus</i>	<i>schoenobaenus</i>	LC (BirdLife International)
Warbler	Willow	<i>Phylloscopus</i>	<i>trochilus</i>	LC (BirdLife International)
Waxbill	Common	<i>Estrilda</i>	<i>astrild</i>	LC (BirdLife International)
Waxbill	Orange-breasted	<i>Amandava</i>	<i>subflava</i>	LC (BirdLife International)
Wheatear	Capped	<i>Oenanthe</i>	<i>pileata</i>	LC (BirdLife International)
Wheatear	Mountain	<i>Oenanthe</i>	<i>monticola</i>	LC (BirdLife International)
White-eye	Cape	<i>Zosterops</i>	<i>virens</i>	LC (BirdLife International)
White-eye	Orange River	<i>Zosterops</i>	<i>pallidus</i>	LC (BirdLife International)
Whydah	Pin-tailed	<i>Vidua</i>	<i>macroura</i>	LC (BirdLife International)
Widowbird	Long-tailed	<i>Euplectes</i>	<i>progne</i>	LC (BirdLife International)
Widowbird	Red-collared	<i>Euplectes</i>	<i>ardens</i>	LC (BirdLife International)
Widowbird	White-winged	<i>Euplectes</i>	<i>albonotatus</i>	LC (BirdLife International)
Wood-hoopoe	Green	<i>Phoeniculus</i>	<i>purpureus</i>	LC (BirdLife International)
Woodpecker	Cardinal	<i>Dendropicos</i>	<i>fuscescens</i>	LC (BirdLife International)
Wryneck	Red-throated	<i>Jynx</i>	<i>ruficollis</i>	LC (BirdLife International)



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Appendix D: Potential Reptile Species List



Family	Species Name	Common Name	Conservation Status
Agamidae	<i>Agama aculeata distanti</i>	Distant's Ground Agama	LC (SARCA 2014)
	<i>Agama atra</i>	Southern Rock Agama	LC (SARCA 2014)
Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC (SARCA 2014)
	<i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC (SARCA 2014)
Elapidae	<i>Hemachatus haemachatus</i>	Rinkhals	LC (SARCA 2014)
Gekkonidae	<i>Lygodactylus capensis</i>	Common Dwarf Gecko	LC (SARCA 2014)
	<i>Pachydactylus capensis</i>	Cape Gecko	LC (SARCA 2014)
Lacertidae	<i>Nucras holubi</i>	Holub's Sandveld Lizard	LC (SARCA 2014)
Lamprophiidae	<i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC (SARCA 2014)
	<i>Boaedon capensis</i>	Brown House Snake	LC (SARCA 2014)
	<i>Homoroselaps lacteus</i>	Spotted Harlequin Snake	LC (SARCA 2014)
	<i>Lamprophis aurora</i>	Aurora House Snake	LC (SARCA 2014)
	<i>Lycodonomorphus rufulus</i>	Brown Water Snake	LC (SARCA 2014)
	<i>Psammophis crucifer</i>	Cross-marked Grass Snake	LC (SARCA 2014)
	<i>Psammophylax rhombeatus</i>	Spotted Grass Snake	LC (SARCA 2014)
Leptotyphlopidae	<i>Leptotyphlops sp.</i>		
Pelomedusidae	<i>Pelomedusa galeata</i>	South African Marsh Terrapin	Not evaluated
Scincidae	<i>Acontias gracilicauda</i>	Thin-tailed Legless Skink	LC (SARCA 2014)
	<i>Trachylepis capensis</i>	Cape Skink	LC (SARCA 2014)
	<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC (SARCA 2014)
Typhlopidae	<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	LC (SARCA 2014)



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Appendix E: Potential Frog Species List



Family	Species Name	Common Name	Conservation Status
Brevicipitidae	<i>Breviceps adspersus</i>	Bushveld Rain Frog	LC
Bufonidae	<i>Sclerophrys capensis</i>	Raucous Toad	LC
	<i>Sclerophrys garmani</i>	Olive Toad	LC (IUCN, 2016)
	<i>Sclerophrys gutturalis</i>	Guttural Toad	LC (IUCN, 2016)
	<i>Sclerophrys poweri</i>	Power's Toad	LC
Hyperoliidae	<i>Kassina senegalensis</i>	Bubbling Kassina	LC
Pipidae	<i>Xenopus laevis</i>	Common Platanna	LC
Pyxicephalidae	<i>Amietia fuscigula</i>	Cape River Frog	LC (2017)
	<i>Amietia poyntoni</i>	Poynton's River Frog	LC (2017)
	<i>Afrana angolensis</i>	Common River Frog	LC (2017)
	<i>Cacosternum boettgeri</i>	Common Caco	LC (2013)
	<i>Pyxicephalus adspersus</i>	Giant Bull Frog	NT
	<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC
	<i>Tomopterna sp.</i>		
	<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	LC



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Appendix F: Potential Butterfly Species List

Family	Species Name	Common Name	Conservation Status
Crambidae	<i>Autocharis fessalis</i>		Not listed
	<i>Nausinoe geometralis</i>		Not listed
	<i>Notarcha quaternalis</i>		Not listed
	<i>Spoladea recurvalis</i>		Not listed
Erebidae	<i>Achaea catella</i>		Not listed
	<i>Achaea echo</i>		Not listed
	<i>Dysgonia torrida</i>		Not listed
	<i>Eublemma anachoresis</i>		Not listed
	<i>Grammodes stolidia</i>		Not listed
	<i>Ophiusa tirhaca</i>		
	<i>Siccia caffra</i>		Not listed
	<i>Sphingomorpha chlorea</i>		Not listed
Hesperiidae	<i>Afrogegenes sp.</i>		
	<i>Afrogegenes hottentota</i>	Masked Dodger	LC (SABCA 2013)
	<i>Coeliades forestan forestan</i>	Striped Policeman	LC (SABCA 2013)
	<i>Coeliades pisistratus</i>	Two-pip Policeman	LC (SABCA 2013)
	<i>Kedestes lepenula</i>	Chequered Ranger	LC (SABCA 2013)
	<i>Metisella malgacha malgacha</i>	Grassveld Sylph	LC (SABCA 2013)
	<i>Metisella meninx</i>	Marsh Sylph	LC (SABCA 2013)
	<i>Pelopidas thrax</i>	White-branded Swift	LC (SABCA 2013)
	<i>Spialia asterodia</i>	Star Sandman	LC (SABCA 2013)
	<i>Spialia colotes transvaaliae</i>	Bushveld Sandman	LC (SABCA 2013)
	<i>Spialia ferax</i>	Striped sandman	LC (SABCA 2013)
	<i>Spialia mafa mafa</i>	Mafa Sandman	LC (SABCA 2013)
	<i>Spialia spio</i>	Mountain Sandman	LC (SABCA 2013)
	<i>Tsitana tsita</i>	Dismal Sylph	LC (SABCA 2013)
Lycaenidae	<i>Actizera lucida</i>	Rayed blue	LC (SABCA 2013)
	<i>Aloeides aranda</i>	Yellow Russet	LC (SABCA 2013)
	<i>Aloeides dentatis maseruna</i>	Maluti Toothed Russet	LC (SABCA 2013)
	<i>Aloeides henningi</i>	Hillside Russet	LC (SABCA 2013)
	<i>Aloeides molomo coalescens</i>	Mottled Russet	
	<i>Aloeides molomo molomo</i>	Mottled Russet	LC (SABCA 2013)
	<i>Aloeides trimeni trimeni</i>	Brown Busset	LC (SABCA 2013)
	<i>Anthene amarah amarah</i>	Black-striped Ciliate Blue	LC (SABCA 2013)
	<i>Anthene livida livida</i>	Pale Biliate Blue	LC (SABCA 2013)
	<i>Axiocerses tjoane tjoane</i>	Eastern Scarlet	LC (SABCA 2013)
	<i>Cacyreus marshalli</i>	Common Geranium Bronze	LC (SABCA 2013)
	<i>Chilades trochylus</i>	Grass Jewel Blue	LC (SABCA 2013)
	<i>Crudaria leroma</i>	Silver-spotted Grey	LC (SABCA 2013)
	<i>Cupidopsis jobates jobates</i>	Tailed Meadow Blue	LC (SABCA 2013)
	<i>Deudorix antalus</i>	Brown Playboy	LC (SABCA 2013)
	<i>Eicochrysops messapus mahallakoena</i>	Cupreous Ash Blue	LC (SABCA 2013)
	<i>Lampides boeticus</i>	Pea Blue	LC (SABCA 2013)
	<i>Lepidochrysops ketsi ketsi</i>	Ketsi Giant Cupid	LC (SABCA 2013)
	<i>Lepidochrysops ortygia</i>	Koppie Giant Cupid	LC (SABCA 2013)
	<i>Lepidochrysops patricia</i>	Patrician Giant Cupid	LC (SABCA 2013)
<i>Lepidochrysops plebeia plebeia</i>	Twin-spot Giant Cupid	LC (SABCA 2013)	
	<i>Lepidochrysops praeterita</i>	Highveld Giant Cupid	EN (SABCA 2013)

Family	Species Name	Common Name	Conservation Status
	<i>Leptomyrina henningi henningi</i>	Plain Black-eye	LC (SABCA 2013)
	<i>Leptotes sp.</i>		
	<i>Leptotes pirithous pirithous</i>	Common Zebra Blue	LC (SABCA 2013)
	<i>Lycaena clarki</i>	Eastern Sorrel Copper	LC (SABCA 2013)
	<i>Oraidium barberae</i>	Dwarf Blue	LC (SABCA 2013)
	<i>Tarucus sybaris sybaris</i>	Dotted Pierrot	LC (SABCA 2013)
	<i>Tuxentius melaena melaena</i>	Black Pie	LC (SABCA 2013)
	<i>Zintha hintza hintza</i>	Hintza Pierrot	LC (SABCA 2013)
	<i>Zizeeria knysna knysna</i>	African Grass Blue	LC (SABCA 2013)
	<i>Zizula hylax</i>	Tiny Grass Blue	LC (SABCA 2013)
Noctuidae	<i>Ariathisa abyssinia</i>		Not listed
	<i>Mentaxya albifrons</i>		Not listed
	<i>Spodoptera trituratora</i>		Not listed
	<i>Thysanoplusia orichalcea</i>		
	<i>Trichoplusia orichalcea</i>		Not listed
Nymphalidae	<i>Acraea natalica</i>	Black-based Acraea	LC (SABCA 2013)
	<i>Acraea neobule neobule</i>	Wandering Donkey Acraea	LC (SABCA 2013)
	<i>Acraea oncaea</i>	Window Acraea	LC (SABCA 2013)
	<i>Byblia ilithyia</i>	Spotted Joker	LC (SABCA 2013)
	<i>Catacroptera cloanthe cloanthe</i>	Pirate	LC (SABCA 2013)
	<i>Charaxes jahlusa rex</i>	Pearl-spotted Charaxes	LC (SABCA 2013)
	<i>Charaxes saturnus saturnus</i>	Foxy Charaxes	LC (SABCA 2013)
	<i>Danaus chrysippus orientis</i>	African Plain Tiger	LC (SABCA 2013)
	<i>Hypolimnas misippus</i>	Common Diadem	LC (SABCA 2013)
	<i>Junonia hierta cebrene</i>	Yellow Pansy	LC (SABCA 2013)
	<i>Junonia oenone oenone</i>	Dark blue Pansy	LC (SABCA 2013)
	<i>Junonia orithya madagascariensis</i>	African Blue Pansy	LC (SABCA 2013)
	<i>Melanitis leda</i>	Common Evening Brown	LC (SABCA 2013)
	<i>Neptis saclava marpessa</i>	Spotted Sailer	LC (SABCA 2013)
	<i>Phalanta phalantha aethiopica</i>	African Leopard	LC (SABCA 2013)
	<i>Precis archesia archesia</i>	Garden Inspector	LC (SABCA 2013)
	<i>Telchinia rahira rahira</i>	Marsh Telchinia	LC (SABCA 2013)
<i>Telchinia serena</i>	Dancing Telchinia	LC (SABCA 2013)	
<i>Vanessa cardui</i>	Painted Lady	LC (SABCA 2013)	
Papilionidae	<i>Papilio demodocus demodocus</i>	Citrus Swallowtail	LC (SABCA 2013)
	<i>Papilio nireus lyaeus</i>	Narrow Green-banded Swallowtail	LC (SABCA 2013)
Pieridae	<i>Belenois aurota</i>	Pioneer Caper White	LC (SABCA 2013)
	<i>Belenois creona severina</i>	African Caper White	LC (SABCA 2013)
	<i>Catopsilia florella</i>	African Migrant	LC (SABCA 2013)
	<i>Colias electo electo</i>	African Clouded Yellow	LC (SABCA 2013)
	<i>Colotis evagore antigone</i>	Small Orange Tip	LC (SABCA 2013)
	<i>Eurema brigitta brigitta</i>	Broad-bordered Grass Yellow	LC (SABCA 2013)
	<i>Mylothris agathina agathina</i>	Eastern Dotted Border	LC (SABCA 2013)
	<i>Pinacopteryx eriphia eriphia</i>	Zebra White	LC (SABCA 2013)
	<i>Pontia helice helice</i>	Southern Meadow White	LC (SABCA 2013)
	<i>Teracolus eris eris</i>	Banded Gold Tip	LC (SABCA 2013)
Pyralidae	<i>Loryma basalis</i>		

Family	Species Name	Common Name	Conservation Status
Sphingidae	<i>Hippotion celerio</i>		Not listed
	<i>Nephele comma</i>		Not listed



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Appendix G: Impact Assessment Methodology

Impact Assessment Methodology

Details of the impact assessment methodology used to determine the significance of impacts to fauna and flora is provided below.

The significance rating process follows the established impact/risk assessment formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability} \times \text{Nature}$$

Where

$$\text{Consequence} = \text{Intensity} + \text{Extent} + \text{Duration}$$

And

$$\text{Probability} = \text{Likelihood of an impact occurring}$$

And

$$\text{Nature} = \text{Positive (+1) or negative (-1) impact}$$

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table A. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts. Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this Impact Assessment Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table A, which is extracted from Table B. The description of the significance ratings is discussed in Table C. It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table A: Impact Assessment Parameter Ratings

Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	<u>International</u> The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	<u>National</u> Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	<u>Province/ Region</u> Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	<u>Municipal Area</u> Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	<u>Local</u> Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	<u>Limited</u> Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.



Rating	Intensity/ Replicability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	<u>Very limited/Isolated</u> Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table B: Probability/Consequence Matrix

		Significance																																					
Probability	7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
	6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
	5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
	4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
	3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
	2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
	1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
		Consequence																																					

**Table C: Significance Rating Description**

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a significant and usually a long-term change to the (natural and / or social) environment and result in major changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)