APPENDIX F: BIODIVERSITY ASSESSMENT

Ecological Management Services
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BIODIVERSITY ASSESSMENT REPORT FOR MOKALA MANGANESE MINE, IN SUPPORT OF THE EMPr AMENDMENT PROCESS, HOTAZEL NORTHERN CAPE

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EXECUTIVE SUMMARY

Mokala is proposing to amend their approved mine layout to cater for activity/infrastructure changes that have already taken place and proposed changes. These changes are required to optimize their mining operations.

Activity/infrastructure changes to the approved infrastructure that have already taken place but require authorisation include:

- the reconfiguration of plant area, ROM and high-grade product stockpiles to accommodate the expansion of the open pit;
- the relocation of the low-grade product stockpile;
- the relocation of support infrastructure (water storage facilities (potable and process water), workshops and washbay, change houses, sewage treatment plant, water treatment plant, fuel storage, Administrative block (offices, kitchen, canteen, training centre, mustering centre, clinic), stores and waste storage);
- relocation of transportation related facilities/infrastructure (internal haul road, weighbridges, parking areas, truck loading and staging facility);
- the relocation of the approved WRD to accommodate the expansion of the open pit; and
- the relocation of the approved topsoil stockpiles.

Additional activity/infrastructure changes to the approved infrastructure;

- The proposed expansion of the open pit, increase of 57ha for a final area of 150ha
- The proposed increase in the capacity of the current WRD and the establishment of an additional WRD – increase of 111ha (28 ha increase of approved area and 83ha new area)
- Increase in production stockpiles - ROM increase by 4.97ha & product stockpile increase of 23ha
- The proposed establishment of additional topsoil stockpiles – an increase of 7.13ha
- The proposed relocation of stormwater management infrastructure;
- The proposed mining of the barrier pillar between the Kalagadi Mine and Mokala Mine (20ha included in the pit expansion area).
- Sedibeng Pipeline - a clearance area of 5 m for a distance of 3650m. The pipe will be placed at a depth of 1m with dimensions of 4" HDPE PN16 pipe and a throughput of 10.42-20.8l/min

A site visit was conducted in June 2021 and January 2022, data obtain from these surveys was augmented with data obtained from previous field surveys conducted on site over the last 7 years. The project site falls within the Kathu Bushveld and Gordonia Duneveld (Mucina & Rutherford 2006) The Kathu Bushveld which is described as an open savannah with the Camel Thorn, *Vachellia erioloba* (formerly known as *Acacia erioloba*) and Shepards Tree, *Boscia albitrunca* as the prominent trees. The shrub layer is dominated by Black thorn *Senegalia mellifera,* (formerly known as *Acacia mellifera*) Blue bush, *Diospyros lycioides* and River Honey-thorn, *Lycium hirsutum* and the grass layer is described as being vary variable. Gordonia duneveld typically occurs on the undulating dunes. It is an open shrubland with grasslands on the ridges and Grey Camel Thorn, *Vachellia haematoxylon* (formerly known as *Acacia haematoxylon*) on the dunes slopes, *Senegalia mellifera* is prominent on the lowers slopes and Three thorn, *Rhigozum trichotomum* is found in the interdune streets.

The mine does not fall within a NPAES focus area but is located near an area identified as a protected area for the eastern Kalahari bushveld. The study area is not considered a threatened ecosystem in terms of NEM:BA and does not fall within a National Freshwater Ecosystem Priority Area (NFEPA). The study area does not fall within a CBA 1 or CBA 2 but the Ga-Mogara river which runs along the eastern boundary falls within an ecological support area (ESA). An ESA is an area that must retain its ecological processes.

The mining right area does not fall within a River FEPA (Fresh Water Ecosystem Priority Area) but is located in an Upstream Management Area. Upstream Management Areas are sub- quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs. There are no identified NFEPA wetlands within the MRA. The project site and surrounding area does not fall within an Important Bird and Biodiversity Area (IBA).

There are no critically endangered, endangered, vulnerable, near threatened, or critically rare plants within or around the Mining Right Area. There are however two tree species protected in terms of the National Forestry Act and 10 plant species that are protected under the Northern Cape Nature Conservation Act (NCNCA), one of these is also listed under TOPS. A large number of the protected trees occur within the Mining Right Area (MRA) and will be impacted by the proposed expansion of mining operations. Most of the floral species protected under the NCNCA occurred along the eastern section of the property in association within the riverine vegetation. A walk-through survey was conducted for the approved mining area and permits have already been obtained for the removal of all protected species counted within a section of the project area. Most of the infrastructure

layout changes occur within this area and will therefore not significantly alter the impact to these plants.

Seven bird and five mammal species of conservation concern may occur within or adjacent to the mining right area, of these only 4 birds and 3 mammals have a high potential for occurrence within the undisturbed section of the property. The area earmarked for the new waste rock dump and topsoil stockpiles is currently fenced off from the mine and is used as a game area. Animals in this area will be removed from site prior to the commencement of activity.

The project area has been affected by the current mining activity as there are areas where the vegetation layer has been removed or significantly disturbed. The infrastructure layout changes that have already occurred were mostly within an area demarcated as moderately sensitive, owing to the presence of vegetation communities that contained a high number of protected trees. The protected trees occur throughout the area which means that vegetation communities rather than individual trees need to be considered, when determining area sensitivity. The area of the layout changes is quite uniform and is mostly classified as moderately sensitive owing to the presence of the protected trees within the vegetation unit, which was the case for the original infrastructure layout. Most of the infrastructure changes that have occurred fall within the floral removal permit area and thus would not have influenced the clearance of the protected plants significantly in this area, unless the area of clearance was significantly greater than what was proposed in the original layout plan. The area of the waste rock dump and the low grade stockpile does not fall within this application area and protected plants therefore may have been removed without the necessary permits.

The area of the pit extension already contains some areas of disturbance, the natural areas are somewhat fragmented as it is surrounded by mining and mining-related infrastructure. Much of this area as well as the area of the proposed barrier pillar mining falls within the *V. haematoxylon* Savannah and contains a large number of protected trees. There are no recent signs of animal activity in this area which is to be expected owing to the mining activity.

Impacts associated with the proposed expansion of mining operations and infrastructure changes include:

Impact	Significance pre-mitigation	Significance post mitigation
Additional loss of Natural vegetation, Alien invasion and further habitat fragmentation	M	M
Additional loss of Sensitive habitats, Protected Flora and Faunal species of conservation concern	H	M

Anthropogenic Disturbances, Intentional and/or accidental killing of fauna	M	L
Cumulative Impact on the Biodiversity	H	M

Mining of this area has already resulted in the clearing of vegetation and the destruction of the natural habitat. The mine has already had direct and indirect impacts to the surface biodiversity. The proposed amendments will not give rise to different biodiversity impacts from those listed in the original impact assessment but will result in an additional loss of natural vegetation and habitat within and surrounding the mining area. It is anticipated that an additional 10 000 protected trees may be lost with the clearing of the additional 203ha. The continued clearing of *Vachellia erioloba* and *Vachellia haematoxylon* woodlands in the region is a cause for concern as the exact extent of this resource is unknown. Thus, it is unclear as to how much development this vegetation type can sustain without being irreversibly damaged, resulting in a loss of biodiversity within the Northern Cape. The cumulative effects of development in this area exacerbate the potential risk of losing information and/or ecosystem function owing to a lack of basic research information within this area. Although a comprehensive rehabilitation program is planned, there is no guarantee that the protected trees will successfully re-populate the area, or over what time period successful re-growth will occur. It is very difficult to mitigate this impact. Thus, it is likely that there will be residual impacts to the biodiversity in the area as a result of mining. A biodiversity offset should be investigated as an option to offset these residual impacts, not just for this amendment application but for the project as a whole.

From a biodiversity perspective the changes associated with the amendment should only be approved if a biodiversity offset is investigated as a means to offset the residual impacts associated with the continued loss of protected trees and the associated vegetation type from the area.

DECLARATION OF CONSULTANT

I Natalie Birch declare that I –

- act as the independent specialist in this study;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2017;
- do not have and will not have any vested interest in the activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017;
- will provide the competent authority with access to all information at my disposal regarding the study.

Natalie Birch Pr. Sci. Nat 400117/05

January 2022

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ABBREVIATIONS

ADE	Aquifer Dependent Ecosystems
BGIS	Biodiversity Geographical Information System
CBA	Critical Biodiversity Area
CITES	Convention on International Trade in Endangered Species
DAERL	Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
EIA	Environmental Impact Assessment
ESA	Ecological Support Area
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystem Priority Areas
GPS	Global Positioning System
GWC	Griqualand West Centre of Endemism
IUCN	International Union for Conservation of Nature
NCNCA	Northern Cape Nature Conservation Act
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas assessment
NPAES	National Protected Areas Expansion Strategy
MRA	Mining Right Area
PESEIS	Present Ecological State, Ecological Importance & Ecological Sensitivity
QDS	Quarter Degree Squares
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SARCA	Southern African Reptile Conservation Assessment
SIBIS	SANBI's Integrated Biodiversity Information System
TOPS	Threatened or Protected Species
WRD	Waste Rock Dumps

1.1. INTRODUCTION

Mokala has received authorisation to establish the Mokala Mine which is located on the remaining extent and portion 1 of the farm Gloria 266, the farm Kipling 271 and the farm Umtu 281 approximately 4 km north west of the town Hotazel in the Joe Morolong Local Municipality, in the Northern Cape Province. The Mokala Mine is currently in the construction and operational phase of the project.

Mokala is proposing to amend the approved mine layout to cater for activity/infrastructure changes that have already taken place and proposed changes. These changes are required to optimize their mining operations.

SLR has been appointed by the Mokala Manganese (PTY) LTD Mine to conduct a full Scoping and Environmental Impact Assessment (EIA) process in support of an Environmental Management Programme (EMPr) amendment application for the changes to the mining area and infrastructure layout.

Activity/infrastructure changes to the approved infrastructure that have already taken place but require authorisation include:

- the reconfiguration of plant area, ROM and high-grade product stockpiles to accommodate the expansion of the open pit;
- the relocation of the low-grade product stockpile;
- the relocation of support infrastructure (water storage facilities (potable and process water), workshops and washbay, change houses, sewage treatment plant, water treatment plant, fuel storage, Administrative block (offices, kitchen, canteen, training centre, mustering centre, clinic), stores and waste storage);
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- Sedibeng Pipeline - a clearance area of 5 m for a distance of 3650m. The pipe will be placed at a depth of 1m with dimensions of 4" HDPE PN16 pipe and a throughput of 10.42-20.8l/min

The layout changes proposed fall within the approved development footprint. No changes are anticipated to the realignment of the R380, the realignment of the Ga-Mogara drainage channel, or the intersection to the entrance of the mine.

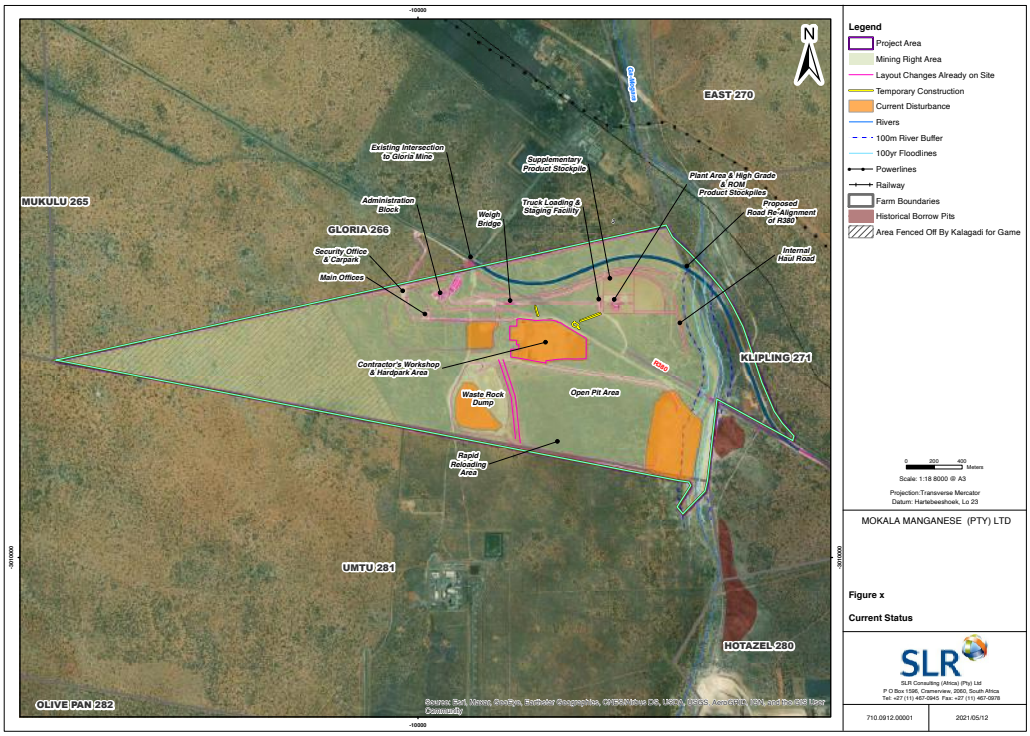

Figure 1 : The current status of the mining area and infrastructure

SLR appointed Ecological Management Services to undertake the Biodiversity specialist study required as part of the impact assessment process for the Environmental Management Programme (EMPr) amendment application.

A preliminary floral report was produced in 2014 and a biodiversity report was completed as part of the original EIA in 2015,. The 2014 report and the 2015 report was compiled by Dr N.V. Birch *Pr. Sci Nat.* (reg no 400117/05). Details of the specialist for this report are attached in Appendix 3

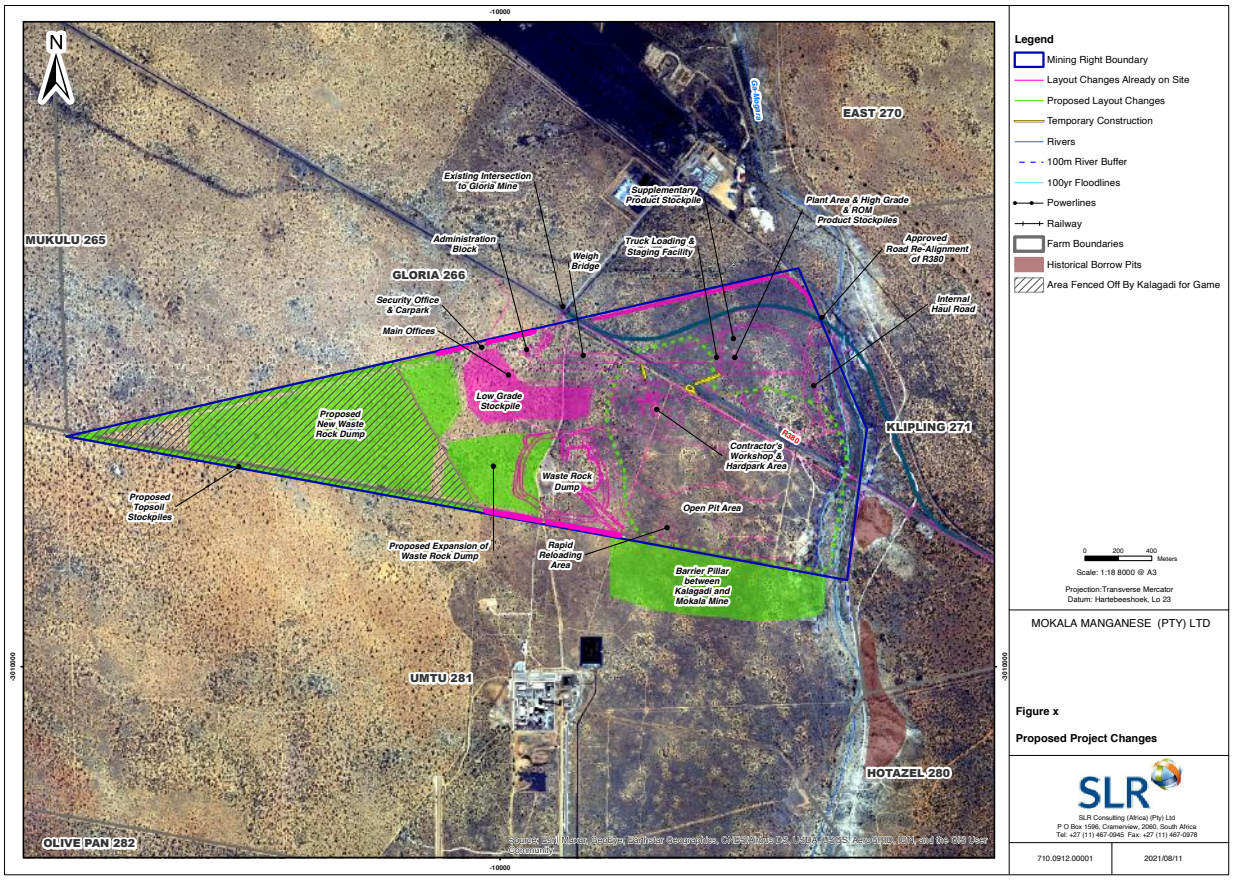

Figure 2 : The proposed layout and infrastructure changes as per the EMPr amendment application.

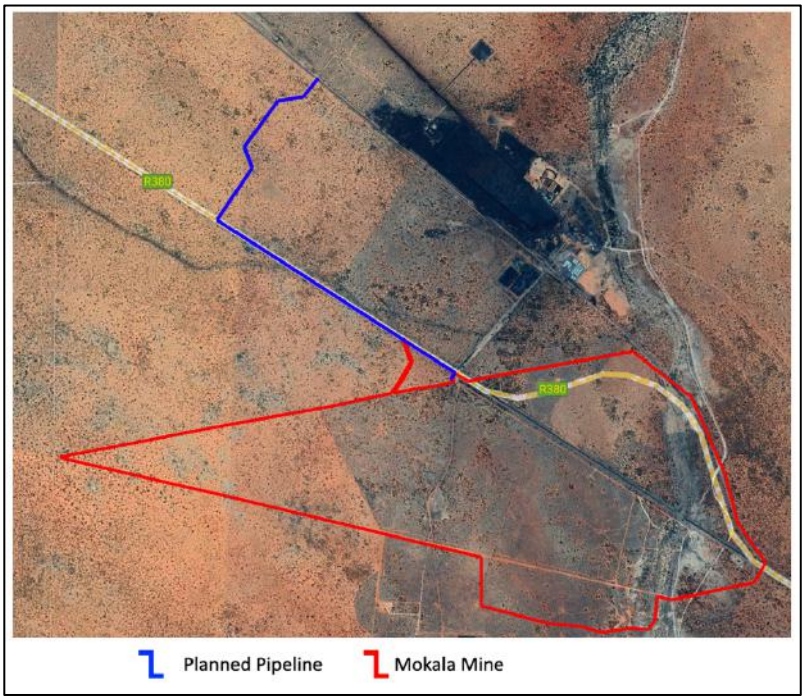

Figure 3 The route for the pipeline in relation to the Mokala MRA

1.1. TERMS OF REFERENCE & SCOPE OF WORK

The scope of work for this study includes

- Review available information and documentation relating to the proposed development;
- A comprehensive investigation will be undertaken to identify potential floral species of special concern, this includes all International Union for Conservation of Nature (IUCN) listed species, Threatened or Protected Species (TOPS) listed species and species listed in schedule 1 and 2 of the Northern Cape Nature Conservation Act (NCNCA). These will be identified through the South African Biodiversity Institute, Plants of Southern Africa (SANBI POSA) database as well as other available literature and confirmed on site.
- A single field survey and literature review of the property to determine vegetation type and distribution. The survey will be undertaken to identify potential floral species of special concern.
- A single field survey and literature review to determine what red data faunal species could potentially occur within the study site. The habitat requirements of each red data species that could potentially occur on-site will be compared with the vegetation description. No onsite trapping of faunal species will be undertaken.
- Once the overall potential for occurrence of each red data species has been identified, each habitat type (based on the vegetation description and any factors identified as relevant to fauna) will be ranked in terms of conservation importance, as well as ecological sensitivity.
- The sites importance in terms of regional sensitivity will also be assessed
- The report and survey will comply with the National Environmental Management Act (NEMA) Appendix 6 requirements.

1.2. DATA SOURCING AND REVIEW

The data sources consulted and used where necessary in the study includes the following;

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (South African National Biodiversity Institute, 2006-2018)).
- Information on plant and animal species recorded for the Quarter Degree Squares (QDS), was extracted from the POSA database hosted by SANBI. This is a much larger extent than the mining right area, but the data was extracted from a larger

area to account for the fact that the area has probably not been well sampled in the past.

- The IUCN conservation status of the species in the list (Table 1) was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2020).
- Threatened Ecosystem data was extracted from the NBA Threat Status and Protection Level list (SANBI 2018).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2016 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI Atlas projects and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) *Bates et al*. (2014) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Bird species lists for the area were extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's Important Bird Areas was also consulted to ascertain if the site falls within the range of any range-restricted or globally threatened species.
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site. For each species, the likelihood that it occurs at the site was rated according to the following scale:
    - **Low:** The available habitat does not appear to be suitable for the species and it is unlikely that the species occurs at the site.
    - **Medium**: The habitat is broadly suitable or marginal and the species may occur at the site.
    - **High:** There is an abundance of suitable habitat at the site and it is highly probable that the species occurs there.
    - **Definite:** Species that were directly or indirectly (scat, characteristic diggings, burrows etc.) observed at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2012) (See Table 1) and where species have not been assessed under these criteria, the CITES status is reported where

possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

Table 1. The IUCN Red List Categories for fauna and flora. Species that fall within the categories in red and orange below are of conservation concern

IUCN Red List Category
Critically Endangered (CR)
Endangered (EN)
Vulnerable (VU)
Near Threatened (NT)
Critically Rare
Rare
Declining
Data Deficient - Insufficient Information (DDD)
Data Deficient - Taxonomically Problematic (DDT)
Least Concern

The following is provided in Accordance with NEMA Appendix 6,

Table 2. NEMBA appendix 6 requirements.

Section	NEMA 2014 Regs – Appendix 6 (1) Requirement	Position 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	Cover page
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix 3
(b)	a declaration that the person is independent in a form as may be specified by the competent authority;	Page 2
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.1

(d)	the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 3
(f)	the specific identified sensitivities of the site related to the activity and its associated structures and infrastructure;	Section 4.3, 4.7 and Section 5
(g)	an identification of any areas to be avoided, including buffers;	Section 5
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitive of the site including areas to be avoided, including buffers;	Section 5
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 6 and 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 6 & 7
(l)	any conditions for inclusion in the environmental authorization;	Section 7
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 6 & 7
(n)	a reasoned opinion- (i) as to whether the proposed activity or portions thereof should be authorized and (ii) if the opinion is that the proposed activity of portion thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7

(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A at this stage,
(q)	any other information requested by the competent authority.	N/A at this stage

1.3. LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due to time and cost constraints and therefore these surveys usually represent a "moment in time" survey. A plant species list was compiled for the site from the site visit as well as previous site visits from the original studies undertaken for the site, this was augmented by a list of species which are known from other studies to occur in the broad vicinity of the site.

The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

Once mining activities commence within an area the biodiversity within the area and its immediate surrounds is impacted. Impacts related to amendments need to consider the impacts to the biodiversity holistically and not just the impacts created by the amendment. An issue with assessing impacts related to biodiversity in terms of a phased approached is that areas become disturbed which results in biodiversity functionality degrading. The loss of biodiversity as a result of the initial phase, alters the perceived sensitivity of the area, hence it is preferable to assess a development in its entirety, and not only the proposed amendments, to ensure that the cumulative impacts as a result of all the phases are adequately assessed.

2. REGULATORY AND LEGISLATIVE OVERVIEW

A summary of the relevant portions of the Acts which govern the activities and potential impacts to the environment associated with the development are listed below. Provided that standard mitigation and impact avoidance measures are implemented, not all the activities listed in the Acts below would actually be triggered.

National Environmental Management Act (NEMA) (Act No 107, 1998):

NEMA requires that measures are taken that "prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." In addition:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimised and remedied:
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

National Environmental Management: Biodiversity Act (NEM:BA) (Act 10 of 2004):

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The Draft National List of Threatened Ecosystems (Notice 1477 of 2009, Government Gazette No 32689, 6 November 2009) has been gazetted for public comment. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the NSBA 2004. In terms of the EIA regulations, a basic assessment report is required for the transformation or removal of indigenous vegetation in a critically endangered or endangered ecosystem regardless of the extent of transformation that will occur. However, all of the vegetation types within and surrounding the study site are classified as Least Threatened.

NEM:BA also deals with endangered, threatened and otherwise controlled species, under the TOPS Regulations (Threatened or Protected Species Regulations). The Act provides for listing of species as threatened or protected, under one of the following categories:

- **Critically Endangered:** any indigenous species facing an extremely high risk of extinction in the wild in the immediate future.
- **Endangered:** any indigenous species facing a high risk of extinction in the wild in the near future, although it is not a critically endangered species.
- **Vulnerable:** any indigenous species facing an extremely high risk of extinction in the wild in the medium-term future; although it is not a critically endangered species or an endangered species.
- **Protected species:** any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

A TOPS permit is required for any activities involving any TOPS listed species.

National Forests Act (No. 84 of 1998):

The National Forests Act provides for the protection of forests as well as specific tree species, quoting directly from the Act: "no *person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated".* A permit is required for the destruction or transplant or transport of any protected tree species.

National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires. The Act provides for a variety of institutions, methods and practices for achieving the purpose such as the formation of fire protection associations. It also places responsibility on landowners to develop and maintain firebreaks as well as be sufficiently prepared to combat veld fires in terms of equipment as well as suitably trained personnel.

Conservation of Agricultural Resources Act (Act 43 of 1983):

The Conservation of Agricultural Resources Act provides for the regulation of control over the utilisation of the natural agricultural resources in order to promote the conservation of soil, water and vegetation and provides for combating weeds and invader plant species. The Conservation of Agricultural Resources Act defines different categories of alien plants and those listed under Category 1 are prohibited and must be controlled while those listed under Category 2 must be grown within a demarcated area under permit. Category 3 plants includes ornamental plants that may no longer be planted but existing plants may remain

provided that all reasonable steps are taken to prevent the spreading thereof, except within the floodline of water courses and wetlands.

Northern Cape Nature Conservation Act, No. 9 of 2009: (NCNCA)

The Northern Cape Nature Conservation Act provides inter alia for the sustainable utilisation of wild animals, aquatic biota and plants as well as permitting and trade regulations regarding wild fauna and flora within the province. In terms of this act the following section may be relevant with regards to any security fencing the development may require.

Manipulation of boundary fences 19. No Person may –

> *(a) erect, alter remove or partly remove or cause to be erected, altered removed or partly removed, any fence, whether on a common boundary or on such person's own property, in such a manner that any wild animal which as a result thereof gains access or may gain access to the property or a camp on the property, cannot escape or is likely not to be able to escape therefrom;*

The Act also lists protected fauna and flora under 3 schedules ranging from Endangered (Schedule 1), protected (schedule 2) to common (schedule 3). The majority of mammals, reptiles and amphibians are listed under Schedule 2, except for listed species which are under Schedule 1. A permit is required for any activities which involve species listed under schedule 1 or 2. A permit obtainable from the DAERL permit office in Kimberly would be required for the site clearing. A permit would also be required to destroy or translocate any nationally or provincially listed species from the site. A single permit, which covers all of these permitting requirements as well as meets TOPS regulations, is used.

3. METHODOLOGY

A number of surveys have been undertaken within the Mokala mining right area (MRA) over the last 7 years. A preliminary vegetation survey was undertaken in November 2014 (EMS 2014) this survey covered the entire project area. An additional vegetation survey was conducted in August 2015 (EMS 2015), this survey included a density survey to determine the number of protected trees that would be affected by the development. This survey was conducted over the mining right area but sampling points were concentrated over the planned, pit, plant stockpile and administration areas. A survey was conducted in order to inform the river diversion rehabilitation plan produced in March 2016. A site survey for this report, was undertaken on the 15 June 2021 and again on 26 January 2022. These surveys included the western section of the mining right area as this area was not included in the original mining right area (this is currently a game area). The uncleared areas within the eastern section of the mining right area (where activity is currently taking place) were

re-visited as well as the areas surrounding the river and road diversion were inspected as part of the 2021 survey. The pipeline area was surveyed in 2022. All the biodiversity information collected over the last 7 years has been included to inform this report.

During the site visit, the different biodiversity features, habitat, vegetation and landscape units present at the site were identified and mapped in the field. Walk-through-surveys were conducted across the site and all plant and animal species observed were recorded. Active searches for reptiles and amphibians were also conducted within habitats likely to harbor or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments such as rocky outcrops or quartz patches were noted in the field if present and recorded on a GPS and mapped onto satellite imagery of the site.

Flora

Satellite images were used to identify homogenous vegetation/habitat units within the study area. These were then sampled on the ground with the aid of a GPS to navigate in order to characterise the species composition. The following quantitative data was collected:

- species composition,
- cover estimation of each species according to the Braun-Blanquet scale,
- vegetation height,
- amount of bare soil and rock cover,
- slope, aspect
- presence of biotic disturbances, e.g. grazing, animal burrows, etc.

Additional checklists of plant species were compiled by traversing a linear route and recording species as they were encountered. Searches for listed and protected plant species at the site were conducted and all listed plant species observed were recorded.

Fauna

The faunal study was undertaken as a desktop / literature survey combined with a field survey. The tasks included in each are given below.

Desktop/literature survey:

A desktop survey was undertaken to determine the red data reptile, amphibian, mammalian and bird species occurring in the quarter degree square in which the study area falls. The likelihood of red data species occurring on-site has been determined using the i) distribution maps in reference books and ii) a comparison of the habitat described from the field survey.

Field survey:

The habitats on-site were assessed to compare with habitat requirements of red data species determined during the literature survey. During the site visit the presence and identification of bird and mammal species was determined using the following methods / techniques:

- Identification by visual observation.
- Identification of bird and mammal calls.
- Identification of spoor.
- Identification of faeces.
- Presence of burrows and / or nests.

Criteria used in the assessment of impacts

The methodology used in the assessment of the identified impacts is provided in Appendix 4.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1. BROAD-SCALE VEGETATION PATTERNS

The study area falls within the Kathu Bushveld and Gordonia Duneveld (Mucina & Rutherford 2006) The Kathu Bushveld which is described as an open savannah with the Camel Thorn[1], *Vachellia erioloba* (formerly known as *Acacia erioloba*) and Shepards Tree, *Boscia albitrunca* as the prominent trees. The shrub layer is dominated by Black thorn *Senegalia mellifera,* (formerly known as *Acacia mellifera*) Blue bush, *Diospyros lycioides* and River Honey-thorn, *Lycium hirsutum* and the grass layer is described as being very variable. Gordonia duneveld typically occurs on the undulating dunes. It is an open shrubland with grasslands on the ridges and Grey Camel Thorn, *Vachellia haematoxylon* (formerly known as *Acacia haematoxylon*) on the dunes slopes, *Senegalia mellifera* is prominent on the lowers slopes and Three thorn, *Rhigozum trichotomum* is found in the interdune streets.

4.2. PLANT COMMUNITY DESCRIPTION

The site consists of a mixture of vegetation that displays various slight structural changes and dominance in woody vegetation. Five distinct vegetation communities could be identified within the study area, these vegetation types are described in more detail below, and are presented on the map (Figure 9). The area is part of an active mine, and there are large areas that have already been disturbed by this mining process, these areas are indicated on the map.

Mixed *Vachellia* Savannah

This vegetation also contains a tree layer which is mainly comprised of tall *Vachellia erioloba* trees but is distinctive from the above vegetation type in that the density of the *V. erioloba* trees is less and the savannah forms a more open unit. Three vegetation strata are evident within this vegetation unit. There is a prominent tree layer between 2.5m – 6m, a shrub layer, between 1.5m – 2.5m and a grass layer with an average height of 70cm. *Vachellia erioloba, V. haematoxylon* (Grey Camel Thorn), and *Senegalia mellifera* (Black Thorn), are prominent within this vegetation type, however *Ziziphus muconata (*Buffalo thorn), *Grewia flava* (velvet raisin), *Terminalia* spp and *S. mellifera* also occur. The grass layer contained species such as *Eragrostis lehmanniana, Stipagrostis uniplumis* (bushman grass), *Setaria verticillata, Aristida stipitata* and *Aristida congesta* were common. Other common species include, *Tribulus zeyheri* (devils thorn), and *Selago geniculata*. The area of the proposed pipeline runs through this vegetation type.

[1] Unlike scientific names, common names are almost always different for speakers of different languages. They may also vary regionally within a language. Some floral species do not have recognized common names. The use of common names is therefore not generally used with respect to plant species.

Figure 4 Mixed *Vachellia* Savannah

Senegalia mellifera Woodland

Senegalia mellifera (Black thorn) constitutes the dominant shrub species within this community. It is characterised by a moderate to high shrub density with a poor to moderate grass coverage (40 –60%) in some areas the *Senegalia mellifera* forms dense thickets. Other common shrub/tree species within this vegetation community include *Grewia flava, Vachellia haematoxylon* and *Ziziphus mucronata.* Common grass species include *Eragrostis lehmanniana, Aristida congesta, Pogonarthria squarrosa, Eragrostis tricophora, Eragrostis echinochloidea, Aristida adscensionis, Schmidtia pappophoroides* and *Tragus racemosus*. Patches of this vegetation type have been over utilised and consequently karroid shrub vegetation has invaded. Stands of *Rhigosum trichotomum* dispersed between the moderate grass cover can be observed within this vegetation community. Other species include, *Salsola patentipilosa, Polygala leptophylla, Chysocomma ciliata* (Bitterkaroo) and *Melolobium candicans* (Honey Bush).

Figure 5 Senegalia mellifera Woodland

Vachellia haematoxylon Savannah

This community has a moderate grass cover (50-60%), the shrub layer is moderately developed. *Vachellia haematoxylon* is the dominant shrub species. The tree layer is poorly developed with individuals of *Vachellia erioloba* occurring within the community. Common grass species include, *Schmidtia pappophoroides (*dominant*), Eragrostis lehmanniana*,, *Eragrostis micrantha*, *Stipagrostis uniplumis, Aristida adscension* and *Aristida vestita.* Other common species within this vegetation type included, *Acanthosicyos naudinianus, Indigofera alternans,* and *Monochema divaricatum.*

Figure 6 : *Vachellia haematoxylon Savannah.* The protected *Vachellia haematoxylon* trees occur with a high density throughout this vegetation type.

Tarchonanthus camphoratus Scrub

This vegetation type occurs on the well drained shallow stony soils which are underlain by calcrete. This vegetation type is characteristically short and has a high percentage occurrence of *Tarchonanthus camphoratus* (Camphor bush). Although *T. camphoratus* is the dominant shrub, *Lycium hirsutum and Senegalia mellifera* are also present within this community. The grass layer consists of species such as, *Schmidtia pappophoroides* (Sand quick), *Eragrostis lehmanniana, Stipagrostis uniplumis Aristida stipitata* and *Aristida congesta*. Dwarf karroid shrubs are prominent within the community and consist of species such as, *Pentzia calcarea Melolobium microphyllum, Salsola patentipilosa,* and *Thesium hystrix.* Other common species included, *Berkheya ferox,* and *Geigeria ornativa.*

Figure 7 Tarchonanthus camphoratus Scrub

Riverine Vegetation

This vegetation type is found within the Ga-Mogara non-perennial stream which runs through the study area. It consists of a grassy layer with scattered trees and shrubs. Species such as *Vachellia erioloba, Ziziphus mucronata, Vachellia karroo, Bosica albitrunca*, *Enneapogon cenchroides, Aristida stipitata, Cynodon spp, Cyperus margaritaceus* and *Eustachys paspaloides* were noted within this vegetation type. In some areas this vegetation type has been heavily invaded by *Prosopis glandulosa* (Mesquite).

Figure 8 : Riverine Vegetation

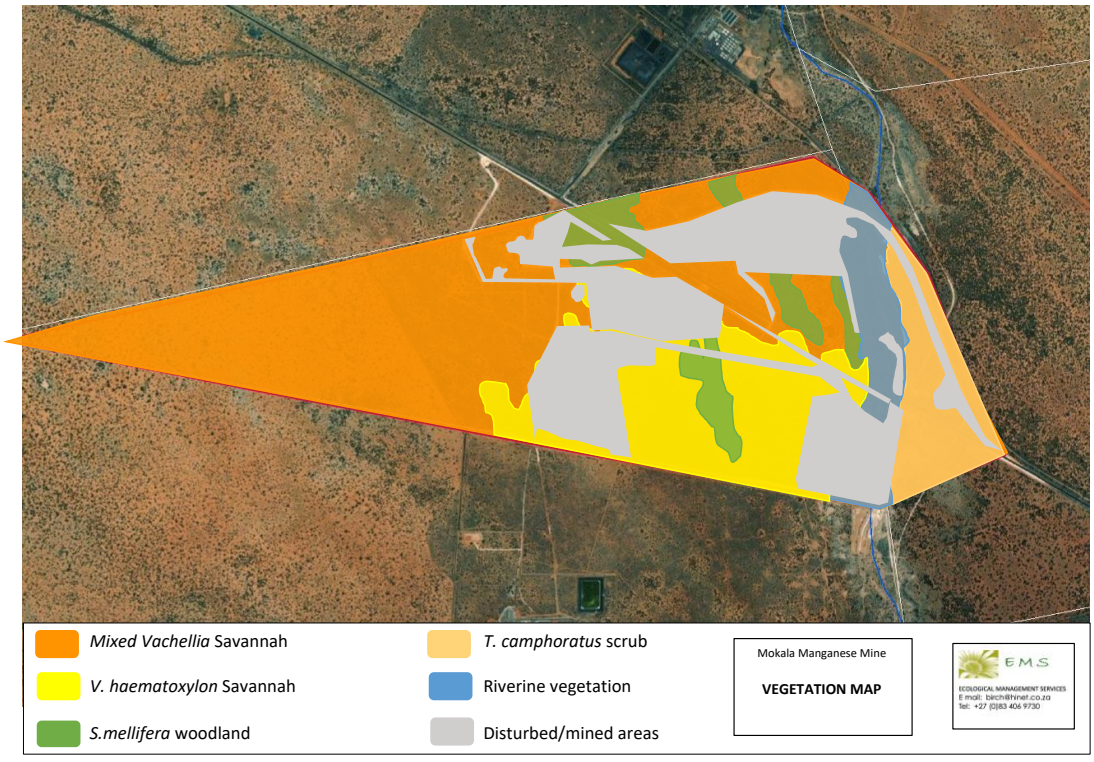

Figure 9 The vegetation distribution map

4.3. CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

Kathu bushveld is classified as least threatened (target 16%), however this vegetation type is not well conserved in statutory conservation areas and more than 1% has already been transformed, threats are from mining and to a lesser extent heavy grazing pressure. The

Gordonia duneveld is listed as Least Concerned (NBA 2018). It is considered to be moderately protected with 14.8% formally conserved, the target is set at 16%.

The study area falls within the Griqualand West Centre of Endemism (GWC) (Van Wyk & Smith, 2001). A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics. Centres of endemism are important because it is these areas, which if conserved, would safeguard the greatest number of plant species. They are extremely vulnerable; relatively small disturbances in a centre of endemism may easily pose a serious threat to its many range-restricted species. The GWC is one of the 84 African centres of endemism and one of 14 centres in southern Africa, and these centres are of global conservation significance. The GWC is considered a priority in the Northern Cape, as the number of threats to the area is increasing rapidly and it has been little researched and is poorly understood. Furthermore, this centre of endemism is extremely poorly conserved, and is a national conservation priority.

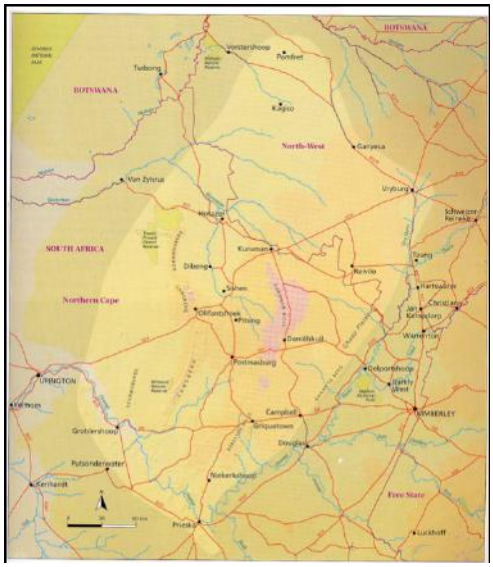

Figure 10 : The extent of the Griqualand West Centre of Endemism (GWC) (Van Wyk & Smith, 2001).

In terms of the mining and biodiversity guideline the study site does not fall into any biodiversity priority areas and is therefore not deemed a risk for mining (Appendix 2).

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets

set in the NPAES, and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems.

The mine does not fall within a NPAES focus area but is located near an area identified as a protected area for the eastern Kalahari bushveld (Appendix 2). The study area is not considered a threatened ecosystem in terms of NEM:BA and does not fall within a National Freshwater Ecosystem Priority Area (NFEPA). The study area does not fall within a critical biodiversity area as identified in the Northern Cape Critical Biodiversity Areas project 2016. The Ga-Mogara river which runs along the eastern boundary falls within an ecological support area (ESA) (appendix 2). An ESA is an area that must retain its ecological processes. A biodiversity sector plan or bioregional plan should provide land-use guidelines for ESAs, generally CBA land-use guidelines propose no mining within ESAs.

The mining right area does not fall within a River FEPA (Fresh Water Ecosystem Priority Area) but is located in an Upstream Management Area (see Appendix 2 for map). Upstream Management Areas are sub- quaternary catchments in which human activities need to be managed to prevent degradation of downstream river FEPAs. There are no identified NFEPA wetlands within the MRA.

The study site and surrounding area does not fall within an Important Bird and Biodiversity Area (IBA). IBAs are sites of international significance for the conservation of the world's birds and other biodiversity.

4.4. ALIEN/INVASIVE SPECIES

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harbouring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture.

The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed IAPs are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016 as listed below:

- Category 1a (PROHIBITED): Listed Invasive Species

  A person in control of a Category 1a Listed Invasive Species must comply with the provisions of section 73(2) of the Act; immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and allow an authorised official from the Department to enter onto land to

monitor, assist with or implement the combatting or eradication of the listed invasive species.

- **Category 1b (PROHIBITED / Exempted if in Possession or Under control): Listed Invasive Species**

  A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act. A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto the land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

- **Category 2 (PERMIT REQUIRED): Listed Invasive Species**

  Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit. Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3. Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

- **Category 3 (PROHIBITED): Listed Invasive Species**

  Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice. Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.

Table 3. Alien invasive species that occur in and around the site

Species		Category
Argemone mexicana	Yellow flowered Mexican Poppy	1b
Prosopis cf. *glandulosa*	Mesquite	3
Prosopis velutina	Mesquite	3
Datura stramonium	Thorn apple	1
Xanthium spinosum	Spiny cocklebur	1b
Argemone ochroleuca	White flowered Mexican poppy	1b
Salsola kali	Tumbleweed	1b

The table above provides a list of alien species that have been recorded on site during the different surveys conducted over the mining right area. The problem species present at the site change over time and as a result, the alien plant management plan for the mine needs to monitor and map these changes as they occur.

4.5. POPULATIONS OF SENSITIVE AND/OR THREATENED SPECIES

A large section of this property has already been disturbed by the mining activity which has resulted in some disturbance to the floral and faunal population on site. Disturbances that alter the natural environment have two effects namely, it may cause the loss of certain species due to the destruction of habitat. It may also cause the influx of other species previously unable to colonise an area owing to lack of suitable habitat or because they have been excluded through competition.

It is important to note that some species that potentially occur on-site may not have been identified thus suitable habitat in included in the assessment in order to determine potential occurrence of species. The potential of occurrence is also assessed for the immediate surrounding area as to establish the possibility of ecological linking corridors for certain species.

Table 4. Floral species of conservation concern that have been recorded on site or have the potential to occur on site

Species	Legislation	Conservation status	Potential of occurrence on site
Vachellia erioloba	National Forests Act 1998	Protected	Recorded across the entire MRA
Vachellia haematoxylon	National Forests Act 1998	Protected	Recorded across the entire MRA
Moraea longistyla	NCNCA	Schedule 2	Recorded on site within the MRA
Moraea pallida	NCNCA	Schedule 2	Not recorded during field surveys, **Low** potential of occurrence within proposed development footprint
Babiana hypogaea	NCNCA	Schedule 2	Previously recorded on site within the current/approved mining footprint

Harpagophytum procumbens Devil's claw	NCNCA TOPS	Schedule 1	Previously recorded on site within the approved/current mining footprint. A sizeable population occurs within the area of the proposed pipeline
Euphorbia wilmaniae	NCNCA	Schedule 2	Not recorded during field surveys, **Low** potential of occurrence within MRA
Euphorbia duseimata	NCNCA	Schedule 2	Not recorded during field surveys, **Low** potential of occurrence within MRA
Euphorbia pseudotuberosa	NCNCA	Schedule 2	Not recorded during field surveys, **Low** potential of occurrence within MRA
Lessertia frutescens	NCNCA	Schedule 1	Previously recorded on site within the approved/current mining area
Nerine laticoma	NCNCA	Schedule 2	Previously recorded on site within approved/ current mining area
Psilocaulon junceum	NCNCA	Schedule 2	Previously recorded on site within the approved/current mining area

Owing to the narrow temporal window of sampling some species may not have been recorded, this however does not preclude them from occurring within the development site. The table above provides a list of all SCC that have been recorded on the property over time. Species that could possibly occur have been included in the species checklist. A walk-through survey was conducted[2] for permits that have already been obtained for the removal of all protected species counted within this area. The protected trees occur throughout the site. Most of the species protected under NCNCA occurred along the eastern section of the property in association within the riverine vegetation and within the area of the pipeline on portion 1 of the farm Gloria 266. The current permit area is shown in Figure 11 below

A large section of the pit extension as well as the changes to the infrastructure are within the area where approval has already been given to remove these plants.

It is recommended that prior to clearing an additional walk through is conducted within the section of property not covered by the removal permit. In order to remove species listed in Schedule 1 & 2 of the NCNCA, during site clearing activities an integrated permit application will have to be made to the DAERL to obtain the required permission to remove and/or translocate these species from site. In order to remove the protected trees a license application will have to be made in terms of the National Forestry Act.

[2] Walk through survey was conducted by Scientific Terrestrial Services CC in November 2019 as part of the permit application.

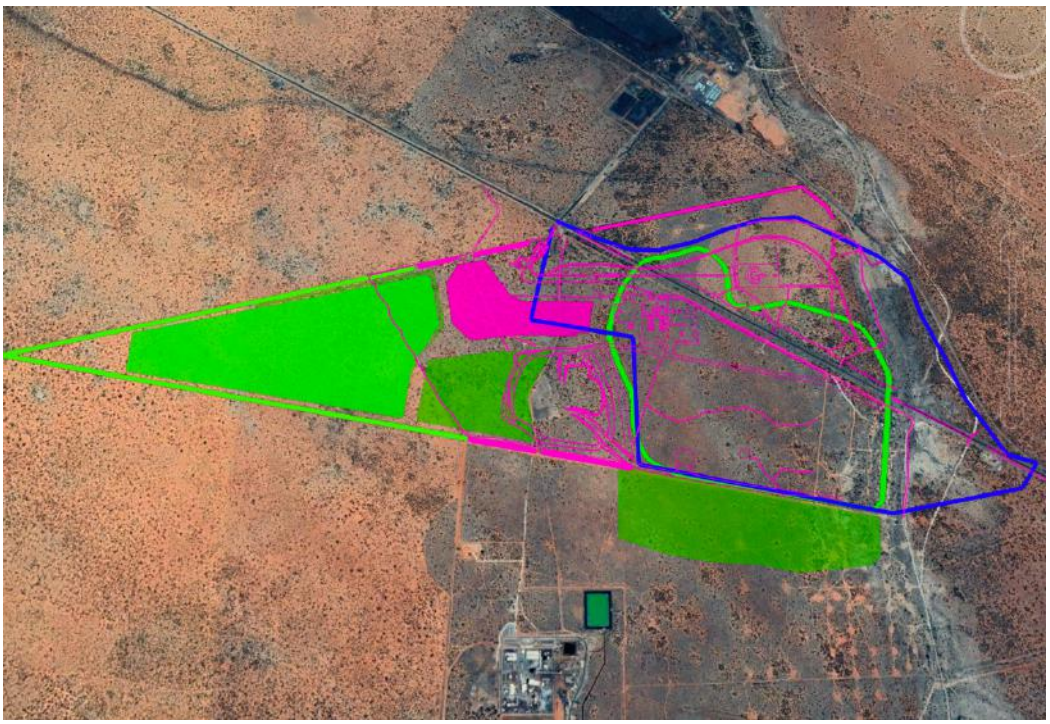

Figure 11 : The blue polygon depicts the area for which the plant removal permit was applied. The pink polygons and lines show the layout changes already on site and the green lines and polygons show the proposed changes.

Reptiles Species of Conservation Concern

No critically endangered, endangered, vulnerable, near threatened, critically rare, rare or declining terrapin, tortoises, snakes or lizards were identified as occurring in the quarter degree square 2722BD, based on the distribution maps available in the South African Red Data Book for reptiles (Bates *et. al*. 2014) and The Southern African Reptile Conservation Assessment (SARCA). The conservation status was cross checked on the IUCN website to determine most recent status listing for these species. Some of the reptiles that occur in the area are protected under the NCNCA schedule 1 & 2, these are listed in appendix 1

Amphibians of Conservation Concern

No critically endangered, endangered, vulnerable, near threatened, critically rare, rare or declining amphibians were identified as occurring in the quarter degree square 2722BD, based on the distribution maps available in the South African Red Data Book for amphibians (Minter *et al*., 2004) Du Preez and Carruthers (2009) and the South African Frog Atlas project. Some of the amphibians that occur in the area are protected under the NCNCA schedule 1 & 2, these are listed in appendix 1

Birds of Conservation Concern

A list of all birds of conservation concern occurring in the quarter degree square 2722BD, was extracted from the SABAP 1 and SABAP 2 databases and Birdlife South Africa's

Important Bird Areas and from the Red Data Book of Birds (Taylor *et al* 2015) with the distribution being confirmed in Roberts – Birds of Southern Africa, 7th edition (Hockey *et al.*, 2005). The IUCN 3.1. status is also presented in the table. Based on an evaluation of the habitat requirements, the potential of these critically endangered, endangered, vulnerable, near threatened, critically rare, rare or declining species to occur either within the MRA or within 500m of the property boundary is provided in Table 5 below.

Table 5. Bird species of conservation concern identified as occurring in the quarter degree squares and the potential for occurrence on the proposed site

Common Name	Scientific Name	Conservation Status (*Regional, Global)	Suitable Habitat requirements[3]	Potential for Occurrence within MRA and surrounding area
Martial Eagle	*Polemaetus bellicosus*	Endangered *Endangered*	Woodland, savannah or grassland with clumps of large trees or power pylons for nest sites	**High** – Nesting habitat in the Mixed Savannah
Secretary bird	*Sagittarius serpentarius*	Vulnerable *Endangered*	Requires open grassland with scattered trees, shrubland, open Mixed Savannah.	**High** – Patches of open savannah will accommodate this species.
African Whitebacked Vulture	*Gyps africanus*	Critically endangered *Critically endangered*	Savannah and bushveld. Nest in tall trees (*Vachellia erioloba*).	**High** -No nest sites were recorded within the planned development area. However the presence of large *Vachellia erioloba* trees presents ideal nesting habitat for these birds.
Kori Bustard	*Ardeotis kori*	Near Threatened *Near Threatened*	Dry thornveld grassland, arid scrub requires the cover of some trees	**Medium** – Moderate to high shrub density throughout the site
Black stork	*Ciconia bigra*	Vulnerable *Least Concern*	Marshes, dams rivers and estuaries breeds in mountainous regions	**Low** – No suitable habitat on site, may occur during periods of high rainfall
Bateleur	*Terathopius ecaudatus*	Endangered *Endangered*	Wide variety of woodland types, savannah and open plains	**Medium** – Some suitable habitat on site
Lappetfaced Vulture	*Torgos tracheliotos*	Endangered *Endangered*	Savannah; semi arid regions closely associated with *Vachellia* spp, *Bosica albitrunca* and *Terminalia pruniode*s	**High** Suitable habitat on site particularly within the Mixed Savannah

Mammals of Conservation Concern

A list of all red data mammal species occurring in the quarter degree squares, was extrapolated from the Red Data Book for Mammals (EWT, 2004) and the MammalMAP, the Mammal Atlas of Africa database. Based on an evaluation of the habitat requirements (EWT, 2004; Skinner and Chimimba, 2005), the potential of these critically endangered, endangered, vulnerable, near threatened, critically rare, rare or declining species to occur either on-site or within 500m of the property boundary is provided in Table 6 below.

[3] Habitat requirements determined using the following reference material: Harrison *et al.*, 1997a; Harrison *et al.*, 1997b; ; Hockey *et al.*, 2005

Table 6. Mammal species of conservation concern identified as occurring in the quarter degree squares and the potential for occurrence on the proposed site

COMMON NAME	SCIENTIFIC NAME	CONSERVATION STATUS	SUITABLE HABITAT ON-SITE[4]	POTENTIAL FOR OCCURRENCE WITHIN MRA
Dent's Horseshoe Bat	*Rhinolophus denti*	Near threatened	**Limited** – Requires *substantial* cover such as caves and rock crevices.	**Very little** –As the landscape in the area is flat sand veld and does not offer suitable roosting habitat for this species, it is unlikely that this species would have colonised the adjacent mining areas.
Honey badger	*Mellivora capensis*	Least Concern (Protected; TOPS)	**High** – As they are catholic in habitat requirements, they are likely to occur on-site.	**High**– Suitable habitat within the area.
South African Hedgehog	*Atelerix frontalis*	Near threatened (protected TOPS)	**High –** Require ample groundcover and dry places for nesting.	**Medium** – Some suitable habitat available.
Pangolin	*Smutsia temminckii*	Vulnerable (protected TOPS)	**High –** Suitable habitat on site in the game camp area	**High –** Has been recorded on site by mine personnel
Brown Hyaena	*Parahyaena brunnea*	Near Threatened (protected TOPS)	**Moderate –** Suitable habitat but a lot of disturbance in the area	**High –** Has been recorded on site by mine personnel

[4] Habitat requirements determined using the following reference material: Skinner and Smithers, 1990; EWT, 2004; Skinner and Chimimba, 2005

5. SITE SENSITIVITY & ADDITIONAL LOSS OF BIODIVERSITY

The classification of areas into different sensitivity classes is based on information collected at various levels. This includes the national conservation status of the vegetation, the presence of species of special concern and the condition of the vegetation

Vegetation types can be categorised according to their conservation status, which is in turn, assessed according to the degree of the transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. Sensitivity of habitats and sites within the area can be assessed using a combination of criteria as follows:

	Criterion	Definition
1	Conservation status of untransformed habitats occurring in the study area	The extent of each vegetation type occurring within the study area that is conserved and/or transformed relative to a targeted amount required for conservation
2	Presence and number of Red Data species and other species of special concern	Presence or potential presence of Red Data species within habitats
3	Within-habitat species richness of flora and the between-habitat (beta) diversity of the site	Presence or potential presence of Red Data Species within habitats.
4	The type or nature of topography of the site, ie presence of ridges koppies etc	Steepness and/or nature of topography in the study area.
5	The type and nature of important ecological processes on site, especially hydrological processes, ie wetlands drainage lines etc.	Habitats and/or terrain features that represent ecological processes such as water-flow migration routes etc.

In order to advise the impact assessment and the proposed mitigation, a sensitivity map has been generated for the property using a number of criteria. In order to quantify and detail the sensitive areas in terms of the criteria used to assess sensitivity, the site was demarcated into a number of manageable blocks. A table was created to list each of the sensitivity criteria and a value assigned to each criteria. Each block was then assessed in terms of its relative sensitivity value. This produced a quantifiable sensitivity map. The criteria used to assess the sensitivity included;

Current state of degradation	1 = (80-100% degraded), Very degraded, highly transformed
	2 = (60 -79% degraded), moderately transformed
	3 = (40 – 59% degraded), some transformation
	4 = (20 -39% degraded), slightly transformed
	5 = (0-19% degraded) Good condition
Slope & drainage	1 = Flat
	2 = Gently undulating
	3 = Slight slope
	4 = Slope less than 5°
	5 = Slope 5° or greater
Potential for erosion	1= Low
	2 = Medium
	3 = High
Presence of Red Data Species	0 = No
	1 = Yes
Suitable habitat for RD species	0 = No
	1 = Yes
Potential habitat fragmentation	1 = Low
	2 = Low – moderate
	3 = Moderate
	4 = Moderate - high
	5 = High
Importance to biodiversity& Ecosystem Functioning	
	1 = Low
	2 = Low – moderate
	3 = Moderate
	4 = Moderate - high
	5 = High

Areas have been classified as follows:

- Low (0-9) sensitivity areas are already highly transformed and/or already contain development. Any development in these areas will not have a significant environmental impact.
- Medium (10-20) sensitivity areas: The vegetation and habitats in these areas have had some disturbance and may include some potential habitat for red data species and/or the presence of some protected/red listed species. Development in these areas, would be subject to strict guidelines and the mitigation measures.
- High (21-25) sensitivity areas included either confirmed occurrence of numerous protected/red listed species and ideal red data species habitat, important ecosystem processes or the presence of CBAs. Any development in these areas would have a significant environmental impact. No development should take place in these areas, but it is recognised that in certain exceptional cases, development may need to take place. Under these conditions very strict development guidelines would be required, and only under guarantee that similar areas within the site would be conserved thus reducing the risk of development.

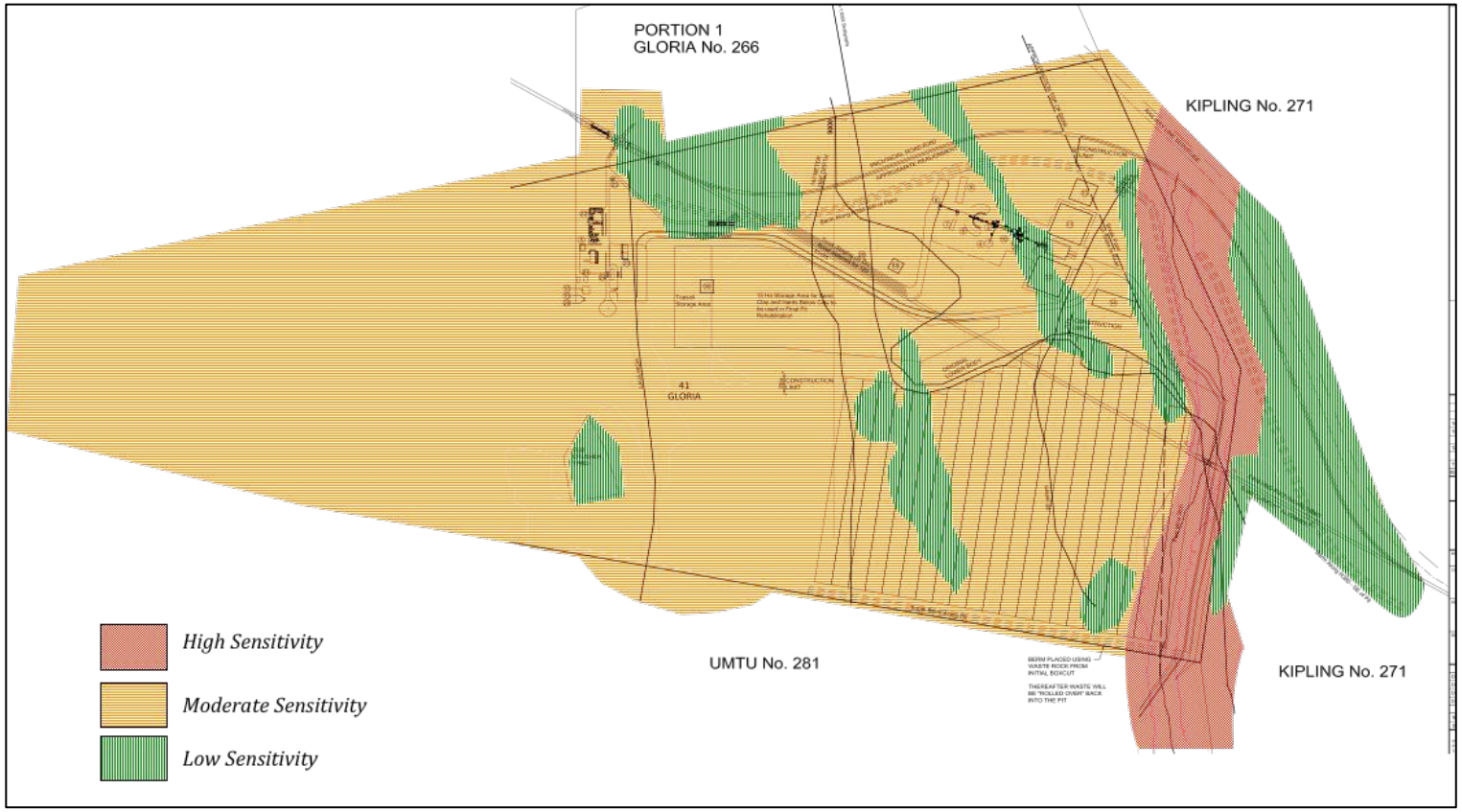

Figure 12 : Site sensitivity map produced for the original mining right application (EMS biodiversity report 2015)

Figure 13 : Aerial image of the property showing the areas that have already been disturbed by mining as at the 18 September 2020.

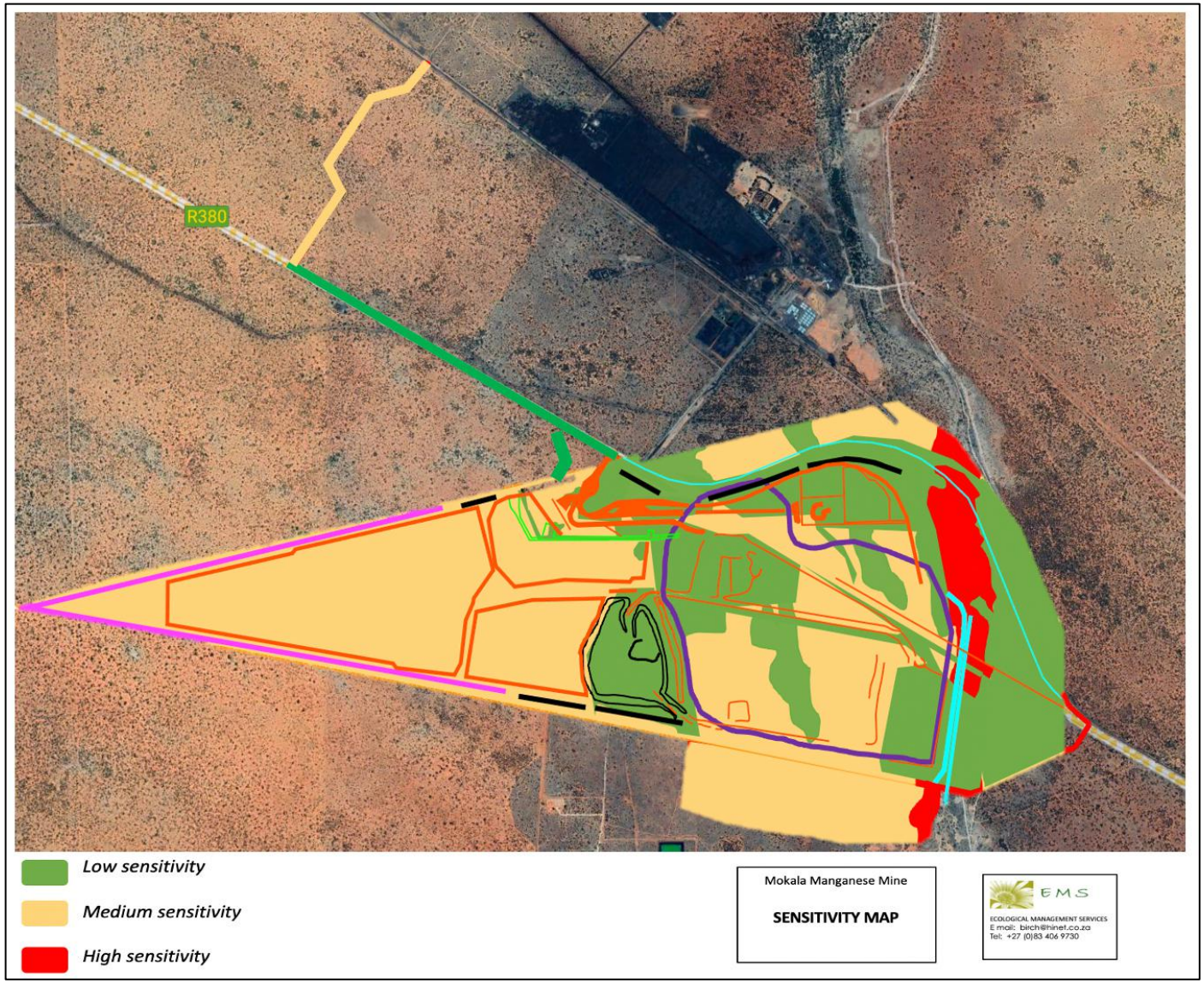

Figure 14 : Sensitivity map of the property with the planned development overlaid.

The project area has been affected by the mining activity as there are areas where the vegetation layer has been removed or significantly disturbed. There have been changes in the sensitivity classification over the site as a result of the activity, this includes areas that were originally classified as high sensitivity areas, now being re-classified as low sensitivity owing to the disturbance of that area. A comparison of the sensitivity map produced in 2015 (Figure 12) with the current sensitivity map (Figure 14) displays these areas.

An area that was classified as highly sensitive is the Ga-Mogara River channel. This area however has been significantly disturbed as the river channel has been diverted and mining has occurred in the original channel path. Although the diversion channel has been created, this has not yet been re-vegetated. This has resulted in the fragmentation of this habitat and some of this area no longer meeting the criteria for a high sensitivity ranking.

Figure 15 : The area of the river channel diversion

The infrastructure layout changes that have already occurred were mostly within an area demarcated as moderately sensitive, owing to the presence of vegetation communities that contained a high number of protected trees. The protected trees occur throughout the area which means that vegetation communities rather than individual trees need to be considered, when determining area sensitivity. The area of the layout changes is quite uniform and is mostly classified as moderately sensitive owing to the presence of the protected trees within the vegetation unit, (which was the case for the original infrastructure layout). Most of the infrastructure changes that have occurred fall within the floral removal permit area and thus would not have influenced the clearance of the protected plants significantly in this area, unless the area of clearance was significantly greater than what was proposed in the original layout plan.

The area of the waste rock dump and the low grade stockpile does not fall within this application area and protected plants therefore may have been removed without the necessary permits.

The area of the pit extension already contains some areas of disturbance, the natural areas are somewhat fragmented as it is surrounded by mining and mining-related infrastructure. Much of this area as well as the area of the proposed barrier pillar mining[5] falls within the *V. haematoxylon* Savannah and contains a large number of protected trees and can be classified as an area with medium sensitivity. The trees still present are currently not showing any substantial signs of stress from mining related impacts such as dust. There are no recent signs of animal activity in this area which is to be expected owing to the mining activity.

The area earmarked for the new topsoil stockpiles and waste rock dump is currently fenced off and used as a game area by Kalagadi Mine. This area has a number of game species, such as Giraffe and Gemsbok which have been translocated onto the property. It is understood that these animals will be removed from this area by Kalagadi Mine prior to the initiation of mining activity. This game area displayed a substantial amount of animal activity including bird life.

The game area has however been very heavily overstocked and consequently the vegetation has been degraded as a result. The grass biomass is very low and there are patches where there is very little grass cover, in other areas grass species such as *Schmidtia kalahariensis* dominates which is very indicative of over utilization. This heavy grazing pressure has resulted in a change in grass structure and composition and the condition ranges from poor to moderate. There are however still a substantial number of protected trees, mostly *Vachellia erioloba* in this area which will be lost as a result of the proposed mining activity.

The although the area of the proposed pipeline that runs along the R380 contains some protected trees, the area is heavily disturbed and is populated by many weedy plants and invasive species, thus it is not considered a sensitive area. The portion from the R380 towards the extraction point, contains protected trees and a significant population of *Harpagophytum procumbens* (Devil's claw), thus this area has a higher sensitivity rating, owing to the presence of these protected species.

[5] Only a portion of the barrier pillar mining area, along the Mokala Mine border has been surveyed, however the vegetation unit is easily extrapolated

Figure 16 : The game area facing the existing waste rock dump

Figure 17 : Jackal spoor noted within the fenced off game area

Figure 18 The pipeline will run along the R380 and cross through the above culvert to reach the extraction point on portion 1 of the farm Gloria 266

6. IMPACTS ASSOCIATED WITH THE EXPANSION OF MINING OPERATIONS AND INFRASTRUCTURE CHANGES

The amendments to the approved EMPr include the expansion of mining operations and infrastructure development, some of which has already taken place. The project area is approximately 468ha in extent, of this about 437ha is designated to the mining right area. Activity has already resulted in the clearing of some vegetation and with the additional proposed clearing and infrastructure changes of ≈ 203ha only about 12%[6] of the total surface area within the project area will remain intact and will not be directly impacted as a result of this mining project.

In order to comprehensively assess the impacts to the biodiversity, the expansion operation should be assessed as part of the whole mining operation and not in isolation. In other words, the amendment needs to be assessed in terms of the original area of clearance as well as the additional area. Assessing the amendment in isolation would not give a true reflection of the cumulative impact of the various phases of the project on the biodiversity as it relates to the project site as well as the greater area in which the site occurs.

Additional loss of Natural vegetation, Alien invasion and further habitat fragmentation

Vegetation clearing will occur as a result of mining and changes to the infrastructure. This will cause additional fragmentation and habitat disturbance in the landscape. This disturbance destroys primary vegetation. As primary vegetation is more functional in an ecosystem, this could irreversibly transform the vegetation characteristics and faunal populations in the area. Clearing of additional surface areas has the effect of creating more unnatural open spaces through the vegetation and the matrix of the landscape. Additional clearance of primary vegetation allows secondary pioneer species or invasive plants to enter and re-colonise disturbed areas, thus increasing the possibility of Alien species invading. Invasive species affect our natural biodiversity in a number of ways. They may compete directly with natural species for food or space, may compete indirectly by changing the food web or physical environment, or hybridize with indigenous species. Rare species with limited ranges and restricted habitat requirements are often particularly vulnerable to the influence of these alien invaders.

Mitigation measures:

A comprehensive rehabilitation plan to revegetate the area post mining will mitigate this impact to some extent if the area is rehabilitated to reflect a re-mined state. Only the

[6] This number is a rough estimation based on screen digitizing, the exact area will require confirmation from the mine engineers

actual development footprint must be disturbed, the surrounding edges must be regarded as no-go areas. The non-mined areas of the mining right site must be well managed to ensure functioning ecological linking corridors of these sites with the surrounding undisturbed properties. These areas should be kept free of disturbance and monitored as part of the biodiversity action plan for the mine. A comprehensive Alien Invasive Plant removal programme must be drawn up and implemented for the property.

All cleared areas should be re-seeded once the topsoil has been replaced with a seed mixture reflecting the natural vegetation as is currently found (harvesting of seed from similar areas within the study area should be undertaken). This may be used in conjunction with a commercially available mix as this will ensure a good vegetation coverage and soil stability. Species such as Stipagrostis are good sand binders and aid in stabilising the substrate and are present within the study area.

Assessment of Impact:

Impact Name	**Additional loss of Natural vegetation, Alien invasion and further habitat fragmentation**					
Alternative	0					
Phase	Construction , Operation, Decommissioning & Closure					
Mitigation	Intensity	Duration	Extent	Consequence	Probability	Significance
Before mitigation	H	H	VL	M	H	M
After mitigation	M	H	VL	M	M	M

Additional loss of Sensitive habitats, Protected Flora and Faunal species of conservation concern

The proposed new mining and infrastructure layout will result in the additional loss of a significant number of protected trees. The preliminary tree removal permit for the currently approved mining right, caters for the removal of ≈20 000 trees. The infrastructure changes that have already occurred were undertaken for the most part within the area already covered by the permit which would not have influenced the clearance of the protected plants significantly, unless the area of clearance was significantly greater than what was proposed in the original layout plan. However protected plants may have been removed without the necessary permits in the areas not covered by the permit. An additional ± 203Ha will be cleared for the proposed amendments this could result in more than 10 000 additional trees being lost. Although a comprehensive rehabilitation program is planned, there is no guarantee that the protected trees will successfully re-populate the area, or over what time period successful re-growth will occur.

This loss will be as a direct result of vegetation clearance but may also result from the indirect impacts of dust generation and ground water draw down associated with the increased area of the pit. The impact could be temporary and reverse on mine closure (e.g.

dust from roads) or could be permanent (e.g. ground-water dewatering, although ground water levels may recover over time after mining, important ecosystems, may have been lost) resulting in permanent changes in the ecosystem. While the activities causing the impacts happen on the site, they could result in offsite impacts and regional effects. Some mining impacts do not result in the immediate loss of natural habitat and important species but are cumulative on the structure and function of individual plants, vegetation communities and ecosystems.

Aquifer dependent ecosystems (ADEs) are ecosystems which depend on groundwater in, or discharging from, an aquifer. They are distinctive because of their connection to the aquifer and would be fundamentally altered in terms of their structure and functions if groundwater was no longer available. ADEs found on Kalahari sands are characterised by the abundance of *Vachellia erioloba*, a species which is sensitive to changes in depth to the water table as well as *Vachellia haematoxylon, Vachellia karroo, Rhus lancea, Tamarix usneoides,* and *Euclea pseudebenus.* There is a growing body of research which has found that these trees - singly, in stands and as gallery forests - are keystone ecosystems. These deep-rooted species are thought to act as nutrient pumps but it is equally likely that they are providing water to shallower-rooted plants via hydraulic lift. ADEs particularly in arid ecosystems provide habitats for an array of species and are considered important in ecological processes by making available resources for the biodiversity in an area that would otherwise not be available.

A high rainfall year is needed to stimulate seed germination and promote seedling recruitment in groundwater dependent phreatophytes such as *Vachellia erioloba*. The rainfall wets the profile down to the water table to the extent that rapid root growth by the seedlings enables them to reach the capillary fringe above the water table before the soil layers above it dry out. The young plants are then no longer vulnerable to variations in rainfall. A seedling only 25 cm high can have roots longer than 320 cm suggesting that a large portion of their growth energy is directed to root development, in order to enable the plants to become drought resistant as soon as possible.

Very little research in the Kalahari has focused on water consumption by the various types of vegetation and on the partitioning of transpired water between water that is extracted from different depths of the unsaturated zone and that which originates from the saturated zone. Thus it is very difficult to predict the extent to which altering the water levels in the aquifers may impact on these ecosystems. A study on the Ga-Mogara River near Kathu to evaluate the effects of dewatering due to mining activities (Institute for Water Research, 2012) shows that along the main tributary, the largest hydrological output from the system is due to riparian evapotranspiration. Such evapotranspiration constitutes approximately

96% of water loss from the system in unaffected areas and 99% in mining-affected areas where water abstraction has taken place (Institute for Water Research, 2012). The difference is small, but indicates that there is very little margin of change that can be tolerated before ecosystem stress will occur. Ecosystem change, i.e. increased mortality rates of trees, would be expected in areas of increased abstraction.

Unfortunately there is very limited research information on how the ADE plants access the water and at what depth they are accessing this water, what the effect of changing the ground water system would have on the plants and vegetation structure within the ADE and how this would affect ecosystem function on a landscape scale.

In terms of dewatering, larger trees will be most at risk because they are less flexible in root growth. Small trees are more flexible because they can grow down to the depths necessary. However, for big trees, a sudden drop in the water table can effectively put them into a situation where they can't reach the water. The effects of dewatering have been studied in Namibia (with a plant ecophysiologist, Prof William Stock from the University of Cape Town). His findings suggests that although trees may sometimes have very deep roots, it does not mean that "adult" trees can lower their roots any more in response to a drop in the water level. Although camel thorns have very deep recorded root depths, extending their roots so deep is not necessarily what they "prefer" to do and that they only extend their roots down as far as necessary.

This would suggest that the dewatering as a result of mining would have the greatest negative impact on large trees within and around the study area and that these negative impacts would be exacerbated during periods of drought which could result in large scale mortalities of large trees in particular and the destruction of the aquifer dependent ecosystem.

The draft ground water study conducted for this project, has determined that the Radius of Influence (ROI) for this project has an elliptical shape with an extent of approximately 5 km to the north and south and approximately 1 to 1.5 km towards the east and west. The simulated drawdown below the proposed overburden/ topsoil stockpile and WRDs ranges between approximately 16 m and 60 m and it is likely that the water level will be drawn down below the sediments of the Kalahari Formation. The highest impact on boreholes is expected in the direct vicinity to the proposed mining infrastructure and only a minor negative impact on borehole yields is expected for boreholes further away from the project site. It is unlikely that an additional water level drawdown will be observed that far from the mine pit, and the impact on ground water is considered to be low (*pers. comm*. M.

Nariansamy SLR). However, there is still the potential that additional protected trees could be lost indirectly through the lowering of the water table.

Dust may cause physical injury to tree leaves and bark, reduced fruit setting and cause a general reduction in growth. Dusting of stigmatic surfaces can completely suppress fruit production and dust may also inhibit pollen germination. Dust can cause blockage and damage to stomata, shading, abrasion of leaf surface or cuticle, and cumulative effects e.g. drought stress on already stressed species as dust can cause a reduction in photosynthesis and diffusive resistance and an increase in leaf temperature, the latter two effects making the tree more likely to be susceptible to drought. These changes in the vegetation may also affect animal communities, from vertebrate grazers to soil invertebrates, which could result in the alteration of cycles of decomposition.

There are also chemical effects of dust, either directly on the plant surface or on the soil. Dust deposited on the ground may produce changes in soil chemistry, which may in the longer-term result in changes in plant chemistry, species competition and community structure. However, the soil type surrounding a mineral site will probably reflect the mineral being worked, so this is unlikely to be a common problem. The effects of dust are not always permanent and relief may occur after periods of rain. However in an area where the rainfall is low and erratic the respite received from rainfall may not be significant.

A dust dispersion model is required to assess the potential for additional protected trees to be lost indirectly because of the negative effects of dust on vegetation and ecology.

These impacts affect the ecological functioning of ecosystems and may result in deterioration of habitats and loss of sensitive species.

Mitigation Measures:
The re-vegetation plan must include the establishment of protected trees within the rehabilitated areas. The progress of tree growth and recruitment must be monitored and actively managed to ensure that the rehabilitated areas reflect the surrounding vegetation in terms of structure and composition.

Pods of Vachellia erioloba, and Vachellia haematoxylon should be collected from the area in order to aid in the re-establishment of these species. These seeds do however require artificial scarring/acid washing in order to aid in germination. The establishment of these trees will form a pivotal part in the rehabilitation of this area post mining as V. erioloba increases habitat heterogeneity. V. erioloba increases species richness by providing habitats and services for a variety of plants, reptiles, birds and mammals. Evidence also

suggests that V. erioloba obtains nitrogen from deep ground water and then cycles nutrients from great depths, making them available above ground. High nutrient levels and shade of the subcanopy microhabitat increase survivorship of shade tolerant fleshy fruited plants. This microhabitat enables a suite of species, not adapted to conditions, to exist in this environment, thus enriching overall biodiversity. These plants provide a valuable food resource for a number of bird and mammal species.

Prior to the clearing of the protected floral species the relevant permits must be obtained from the relevant authorities. With mining it is not usually practical to avoid protected plants owing to the position of the mineral resource. A search and rescue operation is not a feasible or practical option with regard to the protected trees but it is a practical option with respect to species such as the Devils Claw, these plants can be removed and relocated prior to development. The relocation site must be carefully selected to prevent disturbance at the relocation site and the process must be managed to ensure adequate survival rates of relocated plants. Where protected trees occur within the planned infrastructure areas, losses can be lessened by re-designing the infrastructure which will minimize the impact to individual trees.

Engineering measures can sometimes be applied, to minimize the predicted groundwater impacts. The mitigation measures however must be developed on a site-specific basis, but could include measures such as, artificial recharge where groundwater from the pumped discharge can be re-injected back into the ground, either to prevent lowering of groundwater levels and corresponding ground settlement, or to prevent depletion of groundwater resources.

Dust suppression measures can assist with limiting the amount of dust generated. The possibility and practicality of removing dust from protected trees could be investigated as part of an experimentation process for the mine, in an attempt to determine if and how this could be achieved. Should the experimentation process prove successful the techniques developed could assist in minimizing the stresses of the trees, particularly within linking corridors inside the mining area. New innovative techniques to mitigate the effects of mining on biodiversity are continually being sought to lessen the destructive effects of these developments.

Assessment of Impact:

Impact Name	**Additional loss of Sensitive habitats, Protected Flora and Faunal species of conservation concern**					
Alternative	0					
Phase	Construction, Operation Decommissioning & Closure					
Mitigation	Intensity	Duration	Extent	Consequence	Probability	Significance
Before mitigation	H	H	M	H	H	H
After mitigation	M	H	L	M	M	M

Anthropogenic Disturbances, Intentional and/or accidental killing of fauna

Anthropogenic disturbances include aspects such as, vibrations caused by machinery & vehicles. These aspects will impact on invertebrate species more than any other faunal species. These anthropogenic disturbances impact on the way invertebrates forage. For example; some invertebrates use vibrations caused by their prey to locate and catch them. Vibrations caused by construction equipment will make this impossible. Smaller fauna will inevitably be killed during land clearing activities as these activities will destroy their habitat some fauna may also be killed as a result of operational activities. Mining related infrastructure also pose a risk for faunal species in terms of contaminated water or drowning in retention dams. Increase vehicle traffic could result in an increase in road-kill incidences beyond the boundary of the mine. In addition to unintentional killing of fauna, some faunal species, particularly herpetofaunal species, are often intentionally killed as they are thought to be dangerous. Artificial lighting of the mine area has the potential to impact faunal species, particularly invertebrates. Studies have indicated that artificial light can affect trophic levels (altering the predator prey relationship) which then translates to an ecosystem imbalance. This impact will have a greater impact during the operational phase of the mine, as it is assumed that continuous lighting will occur throughout the night of the operational and infrastructure areas.

Mitigation measures

There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. The intentional killing of fauna can be mitigated through education and training and the enforcement of a strict policy against the killing of fauna. A biodiversity Action Plan for the unmined areas of the mining right should be drawn up and monitoring of these sites undertaken. Minimising the number of lights on a development will lower the overall levels of light pollution and reduce the impact that lighting will have on wildlife. An area should not be over-illuminated, it is best to only use as many lights as necessary. The majority of insects and other invertebrates are most visually sensitive to the short wavelength end of the light spectrum.

Therefore lamps with longer wavelengths are likely to have less effect on them (i.e. red, yellow and orange light). Lights that emit a broad spectrum of light with a high UV component should be avoided. If lighting is necessary, then low pressure sodium lamps or narrow spectrum LED lights that incorporate full cut-off shielding are preferable. This is because they produce light at one wavelength, usually in the yellow part of the spectrum, but emit no UV light. Ultraviolet- absorbing filters or glass can also be used on lamps that emit UV light.

Assessment of Impact:

Impact Name	**Anthropogenic Disturbances, Intentional and/or accidental killing of fauna**					
Alternative	0					
Phase	Construction, Operation & Decommissioning					
Mitigation	Intensity	Duration	Extent	Consequence	Probability	Significance
Before mitigation	M	H	VL	M	M	M
After mitigation	M	H	VL	M	L	L

Cumulative impacts on the biodiversity

Cumulative effects are seldom addressed at project-level EIA and therefore developments tend to be approved on a piecemeal basis, without the bigger picture being considered. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. Cumulative impacts are contextual and encompass a broad spectrum of impacts at different spatial and temporal scales. In some cases, cumulative impacts occur because a series of projects of the same type are being developed in close proximity. Cumulative impacts can also occur from the combined effects over a given resource of a mix of different types of projects; for example, the development of a mine site, access roads, transmission lines, and other adjacent land uses.

There are numerous constraints with respect to addressing cumulative impacts, the lack of information available on surrounding developments is one of these limitations. Although looking at satellite images of areas surrounding a proposed development may give a picture of what is currently disturbed it does not address the future land-use planning for an area, and thus it makes it difficult to accurately assess the significance of cumulative impacts on the biodiversity as a result of an additional development.

Figure 19 shows the current level of disturbance surrounding the Mokala MRA, there are numerous mines as well as the town of Hotazel within a 10km radius of the MRA. One can

assume that some of these mines will increase in size over the next 20 years, and that this area will be subject to mining disturbance for at least another 30 years.

Two water courses namely the Ga-Morgara and Witleegte run through the area. These are classified as ecological support areas and, generally CBA land-use guidelines propose no mining within ESAs. However there has already been some mining within these two river courses. The Mokala mine has already undertaken a river diversion along the portion of the Ga-Moraga River, in order to accommodate the pit expansion into the river course. South of this area are two open pits (the Hotazel Pit & the York Pit which are part of Kudumane Mine) that encroach within the ESA of the river. An old pit is located within the Witleegte just before the confluence between the Ga-Morgara and the Witleegte to the south of the Mokala Mine. Between the Vlermuisleegte water course and the Witleegte are two additional large mining areas, UMK and Tshipi Borwa Mine as well as the old Mamatwan Mine. Thus, along a 40km stretch there are already large amounts of disturbances long the water courses which fragments this ESA.

Additional transformation of intact habitat contributes to the fragmentation of the landscape and could potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations.

This greater area contains Kathu Bushveld and Gordonia Duneveld, however most of the development surrounding the Mokala MRA falls within the Kathu Bushveld. Both of these vegetation types are listed as least concerned, however the Kathu Bushveld is regarded as poorly protected. The loss of unprotected/poorly protected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets.

The area surrounding the Mokala MRA contains protected trees which have been impacted as a result of the various developments in the greater area. Resulting in an ever-increasing amount of these protected trees being lost from the area. The biodiversity is degraded by many small impacts that individually do not appear to threaten these species' persistence but could have a significant impact of this system's ability to function.

The ground water survey conducted for this project, estimates the Radius of Influence (ROI) from dewatering will be limited (5 km to the north and south and approximately 1 to 1.5 km east and west) and that the impact to ground water will be low. However one has to consider that there are other mines within a 10km radius of the Mokala MRA mostly with pits that would also have an impact on the ground water. These small individual impacts

however do add stress to the system as a whole which could significantly stress this ecosystem, and in turn it could result in additional tree losses and ecosystem function.

The significance of the impact of dust, is also increased by the cumulative effect of the number of mines and mining activity surrounding the Mokala MRA. Additional clearing of vegetation and mining activity in the area will add to the significance of this already occurring impact.

Mitigation measures:

Mitigating cumulative impacts depends on the success of all the mitigation measures proposed to mitigate the various impacts to the biodiversity. As this will limit the incremental addition of a particular impact on the biodiversity. Project mitigation to minimize cumulative impacts, may include adaptive management approaches to project mitigation as well as participation in regional monitoring programs to assess the realized cumulative impacts and efficacy of management effort. The significance of the cumulative impact on the biodiversity will largely be influenced by the success of the rehabilitation of the area post mining.

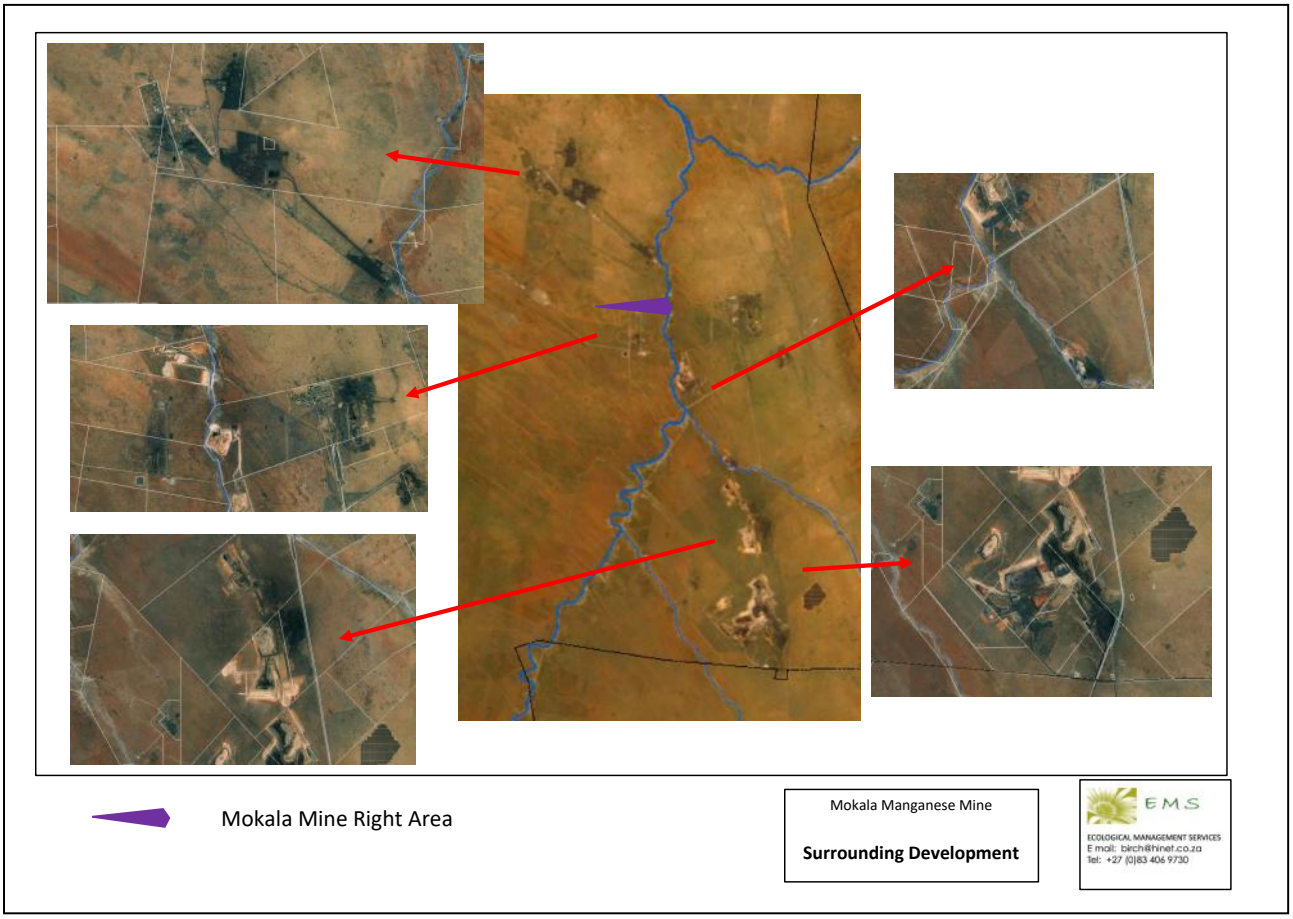

Figure 19 Current development surrounding the Mokala Mining Right Area (MRA)

Assessment of Impact:

Impact Name	**Cumulative impacts on the biodiversity**					
Alternative	0					
Phase	Construction, Operation, Decommissioning & closure					
Mitigation	Intensity	Duration	Extent	Consequence	Probability	Significance
Before mitigation	H	H	M	H	H	H
After mitigation	M	H	L	M	M	M

7. CONCLUSIONS

The site is relatively homogenous, and the protected trees occur throughout. Tree density does change slightly with a change in vegetation community, but they are not restricted to certain areas of the site. Most of the activities that have already taken place without authorisation occurred in areas of similar sensitivity to what was approved, and thus these changes in site layout will not influence the impact to the biodiversity loss as the sensitivity of the impact area did not change. The significant of the impact does however change where larger areas were cleared than what was originally planned and authorised. The successive clearing of larger and large tracts of natural vegetation and protected trees within the project site does influence the significance of the loss of biodiversity from site.

Mining of this area has already resulted in the clearing of vegetation and the destruction of the natural habitat. The mine has already had direct and indirect impacts to the surface biodiversity. These impacts may have a much wider consequence to the surface biodiversity owing to the cumulative effect of increased mining in the area.

Changes to the aquifers on which the surface ecosystem are dependent could potentially impact on individual species as well as entire ADEs, the consequences of which could potentially transcend the boundaries of the immediate mining area. The severity of this impact would depend on the extent of disturbance to the aquifers, the dependence of the ecosystem on the aquifer and other environmental factors such as rainfall.

The proposed amendments will not give rise to different biodiversity impacts from those listed in the original impact assessment but will result in an additional loss of natural vegetation and habitat within and surrounding the mining area. The continued clearing of *Vachellia erioloba* and *Vachellia haematoxylon* woodlands in the region is a cause for concern as the exact extent of this resource is unknown. Thus, it is unclear as to how much development this vegetation type can sustain without being irreversibly damaged, resulting in a loss of biodiversity within the Northern Cape.

The cumulative effects of development in this area exacerbate the potential risk of losing information and/or ecosystem function owing to a lack of basic research information within this area. Although a comprehensive rehabilitation program may be planned, there is no guarantee that the protected trees will successfully re-populate the area, or over what time period successful re-growth will occur. It is very difficult to mitigate this impact. Thus, it is likely that there will be residual impacts to the biodiversity in the area as a result of mining. A biodiversity offset should be investigated as an option to offset these residual impacts, not just for this amendment application but for the project as a whole.

From a biodiversity perspective the changes associated with the amendment should only be approved if a biodiversity offset is investigated as a means to offset the residual impacts associated with the continued loss of protected trees and the associated vegetation type from the area.

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APPENDIX 1

SPECIES LISTS

PLANT SPECIES LIST

FAMILY	SPECIES	IUCN	NCNC
ACANTHACEAE	Monechma genistifolium (Engl.) C.B.Clarke subsp. australe (P.G.Mey.) Munday	LC	
	Barleria irritans Nees	LC	
	Blepharis integrifolia (L.f.) E.Mey. ex Schinz var. integrifolia	LC	
	Monechma divaricatum (Nees) C.B.Clarke	LC	
	Monechma genistifolium subsp. australe	LC	
AMARANTHACEAE	Hermbstaedtia fleckii (Schinz) Baker & C.B.Clarke	LC	
	Pupalia lappacea (L.) A.Juss. var. lappacea	LC	
	Sericorema remotiflora (Hook.f.) Lopr.	LC	
	Sericorema sericea (Schinz) Lopr.	LC	
	Hermbstaedtia fleckii	LC	
ANACARDIACEAE	Searsia dregeana (Sond.) Moffett	LC	
	Searsia erosa (Thunb.) Moffett	LC	
	Searsia tenuinervis (Engl.) Moffett	LC	
	Searsia lancea (L.f.) F.A.Barkley	LC	
ASPARAGACEAE	Asparagus exuvialis Burch. forma exuvialis	LC	
	Asparagus nelsii Schinz	LC	
	Asparagus suaveolens Burch.	LC	
ASTERACEAE	Berkheya ferox O.Hoffm. var. tomentosa Roessler	LC	
	Dimorphotheca zeyheri Sond.	LC	
	Geigeria ornativa O.Hoffm. subsp. ornativa	LC	
	Pentzia calcarea Kies	LC	
	Amellus tridactylus DC. subsp. arenarius (S.Moore) Rommel	LC	
	Aster squamatus (Spreng.) Hieron.	NE Naturalised	
	Dicoma schinzii O.Hoffm.	LC	
	Felicia fascicularis DC.	LC	
	Felicia namaquana (Harv.) Merxm.	LC	
	Geigeria filifolia Mattf.	LC	
	Geigeria ornativa O.Hoffm. subsp. ornativa	LC	
	Kleinia longiflora DC.	LC	
	Osteospermum muricatum E.Mey. ex DC. subsp. muricatum	LC	
	Pseudognaphalium luteo-album (L.) Hilliard & B.L.Burtt	NE naturalised	
	Pulicaria scabra (Thunb.) Druce	LC	
	Berkheya ferox var. tomentosa	LC	
	Chrysocoma ciliata L.	LC	
	Tarchonanthus camphoratus L	Lc	
BIGNONIACEAE	Rhigozum trichotomum Burch	LC	
BORAGINACEAE	Heliotropium strigosum Willd.	LC	

CAMPANULACEAE	Wahlenbergia androsacea A.DC.	LC	
CAPPARACEAE	Cleome angustifolia Forssk. subsp. diandra (Burch.) Kers	LC	
CELASTRACEAE	Gymnosporia buxifolia (L.) Szyszyl.	LC	
	Putterlickia saxatilis (Burch.) M.Jordaan	LC	
CHENOPODIACEAE	Salsola kali L.	NE Naturalised	
	Salsola patentipilosa Botsch.	LC	
	Atriplex semibaccata R.Br. var. appendiculata Aellen	LC	
	Chenopodium ambrosioides L.	NE Naturalised	
	Salsola rabieana I.Verd.	LC	
COMBRETACEAE	Terminalia sericea Burch. ex DC.	LC	
COMMELINACEAE	Commelina livingstonii C.B.Clarke	LC	
CONVOLVULACEAE	Merremia verecunda Rendle	LC	
	Evolvulus alsinoides (L.) L.	LC	
	Seddera capensis (E.Mey. ex Choisy) Hallier f.	LC	
CUCURBITACEAE	Acanthosicyos naudinianus (Sond.) C.Jeffrey	LC	
	Cucumis africanus L.f.	LC	
	Acanthosicyos naudinianus (Sond.) C.Jeffrey	LC	
	Coccinia rehmannii Cogn.	LC	
	Trochomeria debilis (Sond.) Hook.f.	LC	
CYPERACEAE	Cyperus margaritaceus Vahl var. margaritaceus.	LC	
ELATINACEAE	Bergia anagalloides E.Mey. ex Fenzl	LC	
EUPHORBIACEAE	Euphorbia duseimata R.A.Dyer	LC	Schedule 2
	Euphorbia pseudotuberosa Pax	LC	Schedule 2
	Euphorbia wilmaniae Marloth	LC	Schedule 2
	Tragia dioica Sond.	LC	
FABACEAE	Crotalaria virgultalis Burch. ex DC.	LC	
	Cullen tomentosum (Thunb.) J.W.Grimes	LC	
	Melolobium candicans (E.Mey.) Eckl. & Zeyh.	LC	
	Melolobium humile Eckl. & Zeyh.	LC	
	Prosopis glandulosa Torr. var. glandulosa	NE naturalised	
	Prosopis velutina Wooton	NE naturalised	
	Tephrosia burchellii Burtt Davy	LC	
	Vachellia erioloba E.Mey	LC	
	Vachellia haematoxylon Willd.	LC	
	Vachellia karroo Hayne	LC	
	Senegalia mellifera	LC	
	Crotalaria griquensis L.Bolus	LC	
	Indigofera alternans DC. var. alternans	LC	
	Indigofera daleoides Benth. ex Harv. var. daleoides	LC	
	Melolobium microphyllum (L.f.) Eckl. & Zeyh.	LC	
	Otoptera burchellii DC.	LC	
	Pomaria lactea (Schinz) B.B.Simpson & G.P.Lewis	LC	
	Rhynchosia confusa Burtt Davy	LC	
	Rhynchosia totta (Thunb.) DC. var. totta	LC	
	Tephrosia purpurea (L.) Pers. subsp. leptostachya (DC.) Brummitt var. leptostachya	LC	
	Indigastrum argyraeum	LC	

	Indigofera hololeuca	LC	
GISEKIACEAE	Gisekia africana (Lour.) Kuntze var. pedunculata (Oliv.) Brenan	LC	
	Gisekia pharnacioides L. var. pharnacioides	LC	
HYACINTHACEAE	Dipcadi marlothii Engl.	LC	
	Ledebouria apertiflora (Baker) Jessop	LC	
IRIDACEAE	Moraea longistyla (Goldblatt) Goldblatt	LC	Schedule 2
	Moraea pallida (Baker) Goldblatt	LC	Schedule 2
	Babiana hypogaea Burch.	LC	Schedule 2
LAMIACEAE	Stachys spathulata Burch. ex Benth.	LC	
	Salvia verbenaca L.	LC	
	Ocimum americanum L. var. americanum	LC	
	Ocimum filamentosum Forssk.	LC	
LOBELIACEAE	Lobelia thermalis Thunb.	LC	
LOPHIOCARPACEAE	Corbichonia rubriviolacea (Friedrich) C.Jeffrey	LC	
MALVACEAE	Grewia flava DC.	LC	
	Hermannia comosa Burch. ex DC.	LC	
	Hermannia modesta (Ehrenb.) Mast.	LC	
	Hermannia tomentosa (Turcz.) Schinz ex Engl.	LC	
	Hibiscus engleri K.Schum.	LC	
	Hibiscus fleckii GŸrke	LC	
	Hibiscus micranthus L.f. var. micranthus	LC	
	Melhania burchellii DC.	LC	
	Sida ovata Forssk.	LC	
	Grewia flava	LC	
MOLLUGINACEAE	Limeum myosotis H.Walter var. myosotis	LC	
MONTINIACEAE	Montinia caryophyllacea Thunb.	LC	
OROBANCHACEAE	Striga gesnerioides (Willd.) Vatke	LC	
PAPAVERACEAE	Argemone mexicana L.	NE naturalised	
	Argemone ochroleuca	NE naturalised	
PEDALIACEAE	Harpagophytum procumbens		Schedule 1
PHYLLANTHACEAE	Phyllanthus maderaspatensis L.	LC	
	Phyllanthus parvulus Sond. var. garipensis (E.Mey. ex Dr†ge) Radcl.-Sm.	LC	
	Phyllanthus parvulus Sond. var. parvulus	LC	
POACEAE	Aristida adscensionis L.	LC	
	Chrysopogon serrulatus Trin.	LC	
	Enneapogon cenchroides (Licht. ex Roem. & Schult.) C.E.Hubb.	LC	
	Megaloprotachne albescens C.E.Hubb.	LC	
	Schmidtia kalahariensis Stent	LC	
	Schmidtia pappophoroides Steud.	LC	
	Setaria verticillata (L.) P.Beauv.	LC	
	Stipagrostis ciliata (Desf.) De Winter var. capensis (Trin. & Rupr.) De Winter	LC	
	Stipagrostis uniplumis (Licht.) De Winter var. uniplumis	LC	
	Tragus racemosus (L.) All.	LC	
	Tricholaena monachne (Trin.) Stapf & C.E.Hubb.	LC	

	Anthephora argentea Gooss.	LC
	Anthephora pubescens Nees	LC
	Aristida congesta Roem. & Schult. subsp. congesta	LC
	Aristida stipitata Hack. subsp. spicata (De Winter) Melderis	LC
	Aristida vestita Thunb.	LC
	Brachiaria marlothii (Hack.) Stent	LC
	Brachiaria nigropedata (Ficalho & Hiern) Stapf	LC
	Cenchrus ciliaris L.	LC
	Centrapodia glauca Nees) Cope	LC
	Coelachyrum yemenicum (Schweinf.) S.M.Phillips	LC
	Cymbopogon pospischilii (K.Schum.) C.E.Hubb.	NE naturalised
	Cynodon dactylon (L.) Pers.	LC
	Digitaria eriantha Steud.	LC
	Digitaria polyphylla Henrard	LC
	Enneapogon desvauxii P.Beauv.	LC
	Eragrostis echinochloidea Stapf	LC
	Eragrostis lehmanniana Nees var. lehmanniana	LC
	Eragrostis nindensis Ficalho & Hiern	LC
	Eragrostis pallens Hack.	LC
	Eragrostis trichophora Coss. & Durieu	LC
	Eustachys paspaloides (Vahl) Lanza & Mattei	LC
	Fingerhuthia africana Lehm.	LC
	Heteropogon contortus (L.) Roem. & Schult.	LC
	Leptochloa fusca (L.) Kunth	LC
	Melinis repens (Willd.) Zizka subsp. repens	LC
	Oropetium capense Stapf	LC
	Panicum maximum Jacq.	LC
	Pogonarthria squarrosa (Roem. & Schult.) Pilg.	LC
	Schmidtia pappophoroides Steud.	LC
	Sporobolus acinifolius Stapf	LC
	Sporobolus fimbriatus (Trin.) Nees	LC
	Sporobolus ioclados (Trin.) Nees	LC
	Stipagrostis obtusa (Delile) Nees	LC
	Stipagrostis uniplumis (Licht.) De Winter var. uniplumis	LC
	Tragus racemosus (L.) All.	LC
	Triraphis andropogonoides (Steud.) E.Phillips	LC
POLYGALACEAE	Polygala leptophylla Burch. var. leptophylla	LC
	Polygala seminuda Harv.	LC
	Polygala leptophylla Burch. var. armata (Chodat) Paiva	LC
	Oxygonum delagoense Kuntze	LC
	Portulaca hereroensis Schinz	LC
	Portulaca kermesina N.E.Br.	LC
RHAMNACEAE	Ziziphus mucronata Willd. subsp. mucronata	LC
	Helinus spartioides (Engl.) Schinz ex Engl.	LC
RICCIACEAE	Riccia albolimbata S.W.Arnell	LC
SANTALACEAE	Thesium hystricoides A.W.Hill	LC

	Thesium hystrix A.W.Hill	LC
SCROPHULARIACEAE	Selago mixta Hilliard	LC
	Aptosimum elongatum Engl.	LC
	Aptosimum junceum (Hiern) Philcox	LC
	Aptosimum lineare Marloth & Engl. var. lineare	LC
	Peliostomum leucorrhizum E.Mey. ex Benth.	LC
	Selago geniculate L.f.	LC
SOLANACEAE	Datura stramonium L.	NE naturalised
	Lycium cinereum Thunb.	LC
	Lycium hirsutum Dunal	LC
	Lycium pilifolium C.H.Wright	LC
	Solanum burchellii Dunal	LC
	Solanum catombelense Peyr.	LC
VAHLIACEAE	Vahlia capensis (L.f.) Thunb. subsp. vulgaris Bridson var. linearis E.Mey. ex Bridson	LC
VERBENACEAE	Chascanum hederaceum (Sond.) Moldenke var. hederaceum	LC
	Lantana rugosa Thunb.	LC
ZYGOPHYLLACEAE	Tribulus terrestris L.	LC
	Tribulus zeyheri Sond. subsp. zeyheri	LC

FAUNAL SPECIES CHECK LIST

REPTILES			
Family Name	**Species Name**	**Common Name**	
Agamidae	*Agama aculeata subsp. aculeata*	Ground agama	
Lacertidae	*Heliobolus lugubris*	Bushveld Lizard	Schedule 2
Lacertidae	*Pedioplanis lineoocellata*	Spotted Sand lizard	Schedule 2
Gekkonidae	*Chondrodactylus bibronii*	Bibron's Gecko	
Lacertidae	*Pedioplanis namaquensis*	Namaqua Sand Lizard	Schedule 2
AMPHIBIANS			
Family Name	**Species Name**	**Common Name**	
Bufonidae	*Amietophrynus poweri*	Power's Toad	Schedule 2
Hyperoliidae	*Kassina senegalensis*	Senegal kassina	Schedule 2
Pyxicephalidae	*Cacosternum boettgeri*	Common Dainty Frog	Schedule 2
Pyxicephalidae	*Tomopterna cryptotis*	Common Sand Frog	Schedule 2
BIRDS			
Family Name	**Species Name**	**Common Name**	
Accipitridae	*Torgos tracheliotos*	Lappetfaced Vulture	
Accipitridae	*Gyps africanus*	African Whitebacked Vulture	
Accipitridae	*Terathopius ecaudatus*	Bateleur	
Alaudidae	*Calendulauda africanoides*	Fawn-coloured Lark	
Alaudidae	*Calendulauda sabota*	Sabota Lark	
Alaudidae	*Chersomanes albofasciata*	Spike-heeled Lark	
Alaudidae	*Eremopterix verticalis*	Grey-backed Sparrowlark	
Alaudidae	*Mirafra apiata*	Cape Clapper Lark	
Anatidae	*Anas erythrorhyncha*	Red-billed Teal	
Anatidae	*Anas undulata*	Yellow-billed Duck	
Anatidae	*Dendrocygna viduata*	White-faced Duck	

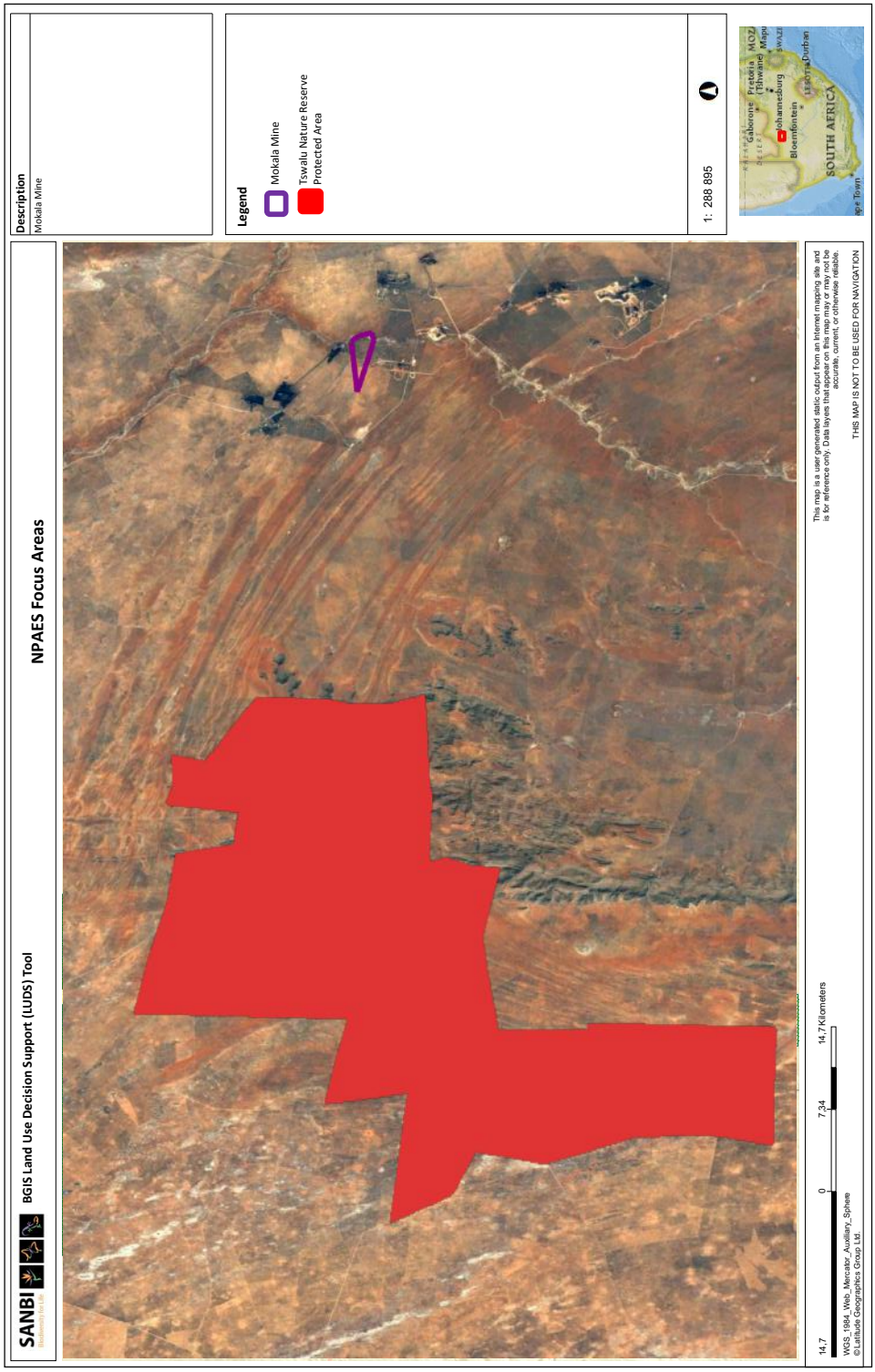
Apodidae	*Apus affinis*	Little Swift
Bucerotidae	*Tockus leucomelas*	Southern Yellow-billed Hornbill
Bucerotidae	*Tockus nasutus*	African Grey Hornbill
Burhinidae	*Burhinus capensis*	Spotted Thick-knee
Capitonidae	*Tricholaema leucomelas*	Acacia Pied Barbet
Charadriidae	*Charadrius tricollaris*	Three-banded Plover
Charadriidae	*Vanellus armatus*	Blacksmith Lapwing
Charadriidae	*Vanellus coronatus*	Crowned Lapwing
Ciconiidae	*Ciconia nigra*	Black Stork
Coliidae	*Colius colius*	White-backed Mousebird
Coliidae	*Urocolius indicus*	Red-faced Mousebird
Coraciidae	*Coracias caudatus*	Lilac-breasted Roller
Coraciidae	*Coracias naevius*	Purple Roller
Cuculidae	*Chrysococcyx caprius*	Diderick Cuckoo
Dicruridae	*Dicrurus adsimilis*	Fork-tailed Drongo
Estrildidae	*Amadina erythrocephala*	Red-headed Finch
Estrildidae	*Estrilda astrild*	Common Waxbill
Estrildidae	*Estrilda erythronotos*	Black-faced Waxbill
Estrildidae	*Granatina granatina*	Violet-eared Waxbill
Estrildidae	*Pytilia melba*	Green-winged Pytilia
Falconidae	*Falco naumanni*	Lesser Kestrel
Falconidae	*Falco rupicoloides*	Greater Kestrel
Fringillidae	*Crithagra atrogularis*	Black-throated Canary
Fringillidae	*Crithagra flaviventris*	Yellow Canary
Fringillidae	*Emberiza flaviventris*	Golden-breasted Bunting
Fringillidae	*Emberiza impetuani*	Lark-like Bunting
Glareolidae	*Cursorius rufus*	Burchell's Courser
Halcyonidae	*Alcedo cristata*	Malachite Kingfisher
Hirundinidae	*Hirundo albigularis*	White-throated Swallow
Hirundinidae	*Hirundo cucullata*	Greater Striped Swallow
Hirundinidae	*Hirundo fuligula*	Rock Martin
Hirundinidae	*Hirundo rustica*	Barn Swallow
Hirundinidae	*Hirundo semirufa*	Red-breasted Swallow
Hirundinidae	*Hirundo spilodera*	South African Cliff-Swallow
Hirundinidae	*Riparia paludicola*	Brown-throated Martin
Laniidae	*Lanius collaris*	Common Fiscal
Laniidae	*Lanius collurio*	Red-backed Shrike
Laniidae	*Lanius minor*	Lesser Grey Shrike
Malaconotidae	*Laniarius atrococcineus*	Crimson-breasted Shrike
Malaconotidae	*Tchagra australis*	Brown-crowned Tchagra
Malaconotidae	*Telophorus zeylonus*	Bokmakierie
Meropidae	*Merops apiaster*	European Bee-eater
Meropidae	*Merops hirundineus*	Swallow-tailed Bee-eater
Motacillidae	*Anthus cinnamomeus*	African Pipit
Motacillidae	*Motacilla capensis*	Cape Wagtail

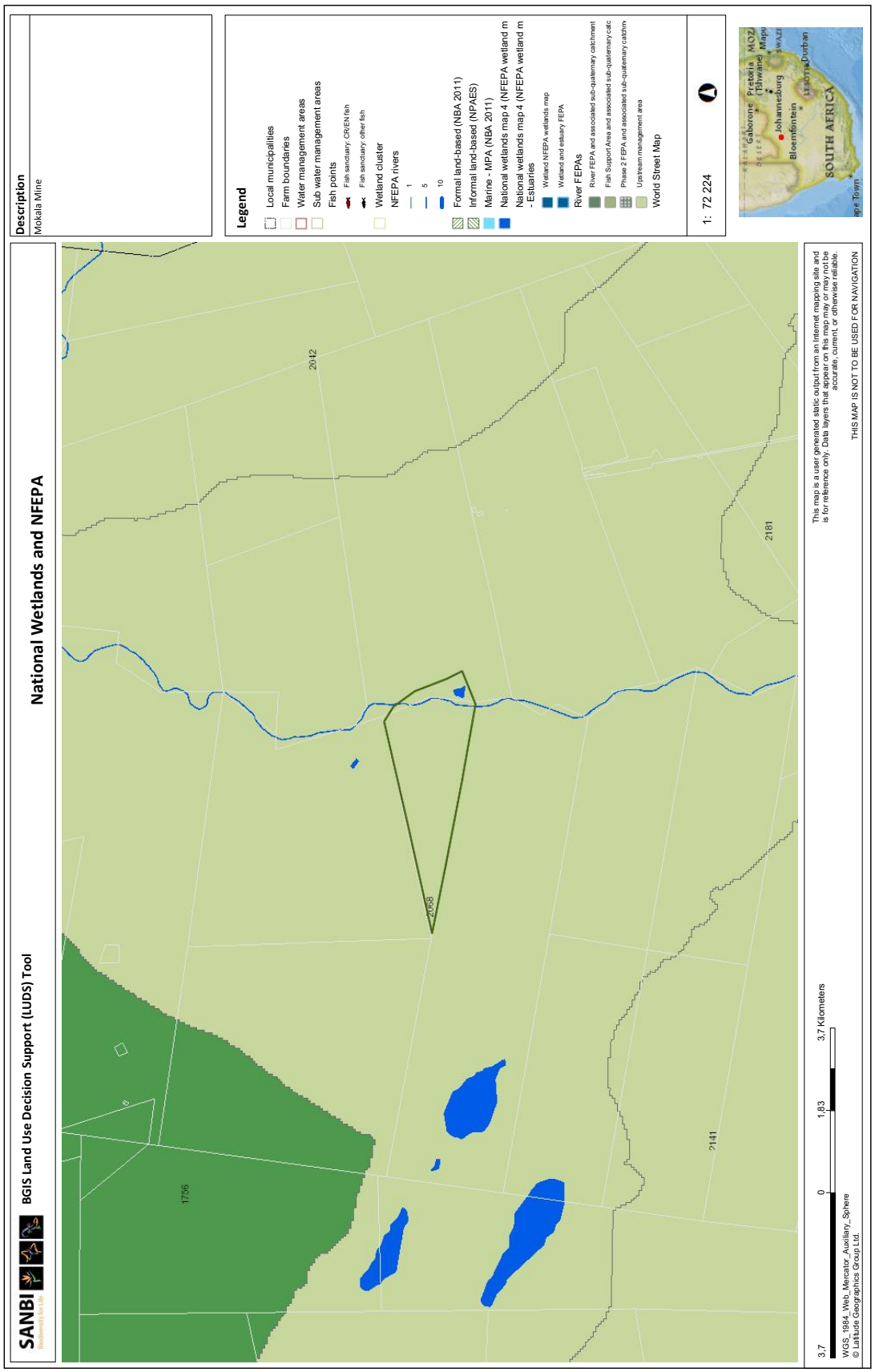
Muscicapidae	*Batis pririt*	Pririt Batis
Muscicapidae	*Bradornis infuscatus*	Chat Flycatcher
Muscicapidae	*Bradornis mariquensis*	Marico Flycatcher
Muscicapidae	*Sigelus silens*	Fiscal Flycatcher
Nectariniidae	*Cinnyris mariquensis*	Marico Sunbird
Numididae	*Numida meleagris*	Helmeted Guineafowl
Otididae	*Eupodotis afra*	Southern Black Korhaan
Otididae	*Lophotis ruficrista*	Red-crested Korhaan
Otididae	*Ardeotis kori*	Kori Bustard
Paridae	*Parus cinerascens*	Ashy Tit
Phalacrocoracidae	*Phalacrocorax africanus*	Reed Cormorant
Phasianidae	*Pternistis adspersus*	Red-billed Spurfowl
Phoeniculidae	*Rhinopomastus cyanomelas*	Common Scimitarbill
Plataleidae	*Platalea alba*	African Spoonbill
Plataleidae	*Plegadis falcinellus*	Glossy Ibis
Plataleidae	*Threskiornis aethiopicus*	African Sacred Ibis
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe
Pteroclididae	*Pterocles bicinctus*	Double-banded Sandgrouse
Pteroclididae	*Pterocles burchelli*	Burchell's Sandgrouse
Pteroclididae	*Pterocles namaqua*	Namaqua Sandgrouse
Pycnonotidae	*Pycnonotus nigricans*	African Red-eyed Bulbul
Rallidae	*Fulica cristata*	Red-knobbed Coot
Rallidae	*Gallinula chloropus*	Common Moorhen
Sagittariidae	*Sagittarius serpentarius*	Secretarybird
Scolopacidae	*Actitis hypoleucos*	Common Sandpiper
Scolopacidae	*Calidris ferruginea*	Curlew Sandpiper
Scolopacidae	*Gallinago nigripennis*	African Snipe
Scopidae	*Scopus umbretta*	Hamerkop
Strigidae	*Bubo lacteus*	Verreaux's Eagle-Owl
Strigidae	*Glaucidium perlatum*	Pearl-spotted Owlet
Struthionidae	*Struthio camelus*	Common Ostrich
Sturnidae	*Creatophora cinerea*	Wattled Starling
Sturnidae	*Lamprotornis nitens*	Cape Glossy Starling
Sturnidae	*Onychognathus nabouroup*	Pale-winged Starling
Timaliidae	*Turdoides bicolor*	Southern Pied Babbler
Viduidae	*Vidua regia*	Shaft-tailed Whydah
Sylviidae	*Acrocephalus baeticatus*	African Reed-Warbler
Turdidae	*Cercomela familiaris*	Familiar Chat
Turdidae	*Cercotrichas paena*	Kalahari Scrub-Robin
Sylviidae	*Cisticola aridulus*	Desert Cisticola
Sylviidae	*Cisticola tinniens*	Levaillant's Cisticola
Columbidae	*Columba guinea*	Speckled Pigeon
Ardeidae	*Egretta garzetta*	Little Egret
Accipitridae	*Elanus caeruleus*	Black-shouldered Kite
Sylviidae	*Eremomela icteropygialis*	Yellow-bellied Eremomela
Falconidae	*Falco rupicolus*	Rock Kestrel
Accipitridae	*Melierax canorus*	Southern Pale Chanting Goshawk

Accipitridae	*Melierax gabar*	Gabar Goshawk	
Turdidae	*Myrmecocichla formicivora*	Ant-eating Chat	
Ardeidae	*Nycticorax nycticorax*	Black-crowned Night-Heron	
Columbidae	*Oena capensis*	Namaqua Dove	
Turdidae	*Oenanthe pileata*	Capped Wheatear	
Sylviidae	*Parisoma subcaeruleum*	Chestnut-vented Tit-Babbler	
Ploceidae	*Passer diffusus*	Southern Grey-headed Sparrow	
Ploceidae	*Passer domesticus*	House Sparrow	
Ploceidae	*Passer melanurus*	Cape Sparrow	
Ploceidae	*Philetairus socius*	Sociable Weaver	
Ploceidae	*Plocepasser mahali*	White-browed Sparrow-Weaver	
Ploceidae	*Ploceus velatus*	Southern Masked-Weaver	
Accipitridae	*Polemaetus bellicosus*	Martial Eagle	
Sylviidae	*Prinia flavicans*	Black-chested Prinia	
Ploceidae	*Quelea quelea*	Red-billed Quelea	
Ploceidae	*Sporopipes squamifrons*	Scaly-feathered Finch	
Columbidae	*Streptopelia capicola*	Cape Turtle-Dove	
Columbidae	*Streptopelia senegalensis*	Laughing Dove	
Sylviidae	*Sylvia borin*	Garden Warbler	
Sylviidae	*Sylvietta rufescens*	Long-billed Crombec	
INVERTEBRATES			
Family Name	**Species Name**	**Common Name**	
Hesperiidae	*Leucochitonea levubu*	White-cloaked Skipper butterfly	
Hesperiidae	*Pelopidas mathias*	Lesser Millets Skipper butterfly	
Lycaenidae	*Azanus jesous jesous*	Topaz spotted blue butterfly	
Lycaenidae	*Cigaritis phanes*	Silver bar butterfly	
Pieridae	*Catopsilia florella*	African Migrant butterfly	
Pieridae	*Colotis agoye bowkeri*	Speckled Sulphur tip butterfly	
Pieridae	*Colotis subfasciatus subfasciatus*	Lemon tip butterfly	
Lycaenidae	*Aloeides gowani*	Gowan's copper butterfly	
Pieridae	*Eurema brigitta subsp. brigitta*	Small grass yellow butterfly	
MAMMALS			
Family Name	**Species Name**	**Common Name**	
Suidae	*Phacochoerus africanus*	Warthog	Schedule 2
Bovidae	*Raphicerus campestris*	Steenbok	Schedule 2
Hespestidae	*Cynictis penicillata*	Yellow Mongoose	Schedule 2
Orycteropdidae	*Orycteropus afer*	Aardvark	Schedule 1
Muridae	*Thallomys nigricauda*	Black tailed tree rat	Schedule 2
Bathyergidae	*Fukomys damarensis*	Damaraland Mole-rat	Schedule 2
Manidae	*Smutsia temminckii*	Pangolin	Schedule 1
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	Schedule 1
Canidae	*Canis mesomelas*	Black-backed Jackal	

APPENDIX 2

REGIONAL CONSERVATION PLANNING - -




SANBI
BGIS Land Use Decision Support (LUDS) Tool
National Wetlands and NFEPA
Description
Mokala Mine
Legend
Local municipalities
Farm boundaries
Water management areas
Sub water management areas
Fish points
Fish sanctuary: CR/EN fish
Fish sanctuary: other fish
Wetland cluster
NFEPA rivers
1
5
10
Formal land-based (NBA 2011)
Informal land-based (NPAES)
Marine - MPA (NBA 2011)
National wetlands map 4 (NFEPA wetland m
National wetlands map 4 (NFEPA wetland m - Estuaries
Wetland NFEPA wetlands map
Wetland and estuary FEPA
River FEPAs
River FEPA and associated sub-quaternary catchment
Fish Support Area and associated sub-quaternary catc
Phase 2 FEPA and associated sub-quaternary catchm
Upstream management area
World Street Map
1: 72 224
Gaborone
Pretoria
Johannesburg
Bloemfontein
Durban
SOUTH AFRICA
2042
2181
2068
2141
1756
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION
3,7
0
1,83
3,7 Kilometers
WGS_1984_Web_Mercator_Auxiliary_Sphere
© Latitude Geographics Group Ltd.


SANBI
BGIS Land Use Decision Support (LUDS) Tool
National Vegetation Map
Description
Mokala Mine
Legend
Local municipalities
Farm boundaries
Vegetation map 2006
FFs 1 Bokkeveld Sandstone Fynbos
FFs 2 Graafwater Sandstone Fynbos
FFs 3 Olifants Sandstone Fynbos
FFs 4 Cederberg Sandstone Fynbos
FFs 5 Winterhoek Sandstone Fynbos
FFs 6 Piketberg Sandstone Fynbos
FFs 7 North Hex Sandstone Fynbos
FFs 8 South Hex Sandstone Fynbos
FFs 9 Peninsula Sandstone Fynbos
FFs 10 Hawequas Sandstone Fynbos
FFs 11 Kogelberg Sandstone Fynbos
FFs 12 Overberg Sandstone Fynbos
FFs 13 North Sonderend Sandstone Fynbos
FFs 14 South Sonderend Sandstone Fynbos
FFs 15 North Langeberg Sandstone Fynbos
FFs 16 South Langeberg Sandstone Fynbos
FFs 17 Potberg Sandstone Fynbos
FFs 18 North Outeniqua Sandstone Fynbos
FFs 19 South Outeniqua Sandstone Fynbos
FFs 20 Tsitsikamma Sandstone Fynbos
FFs 21 North Rooiberg Sandstone Fynbos
FFs 22 South Rooiberg Sandstone Fynbos
FFs 23 North Swartberg Sandstone Fynbos
1: 72 224
Gaborone
Pretoria
Johannesburg
Bloemfontein
Durban
SOUTH AFRICA
Cape Town
3,7
0
1,83
3,7 Kilometers
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
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WGS_1984_Web_Mercator_Auxiliary_Sphere
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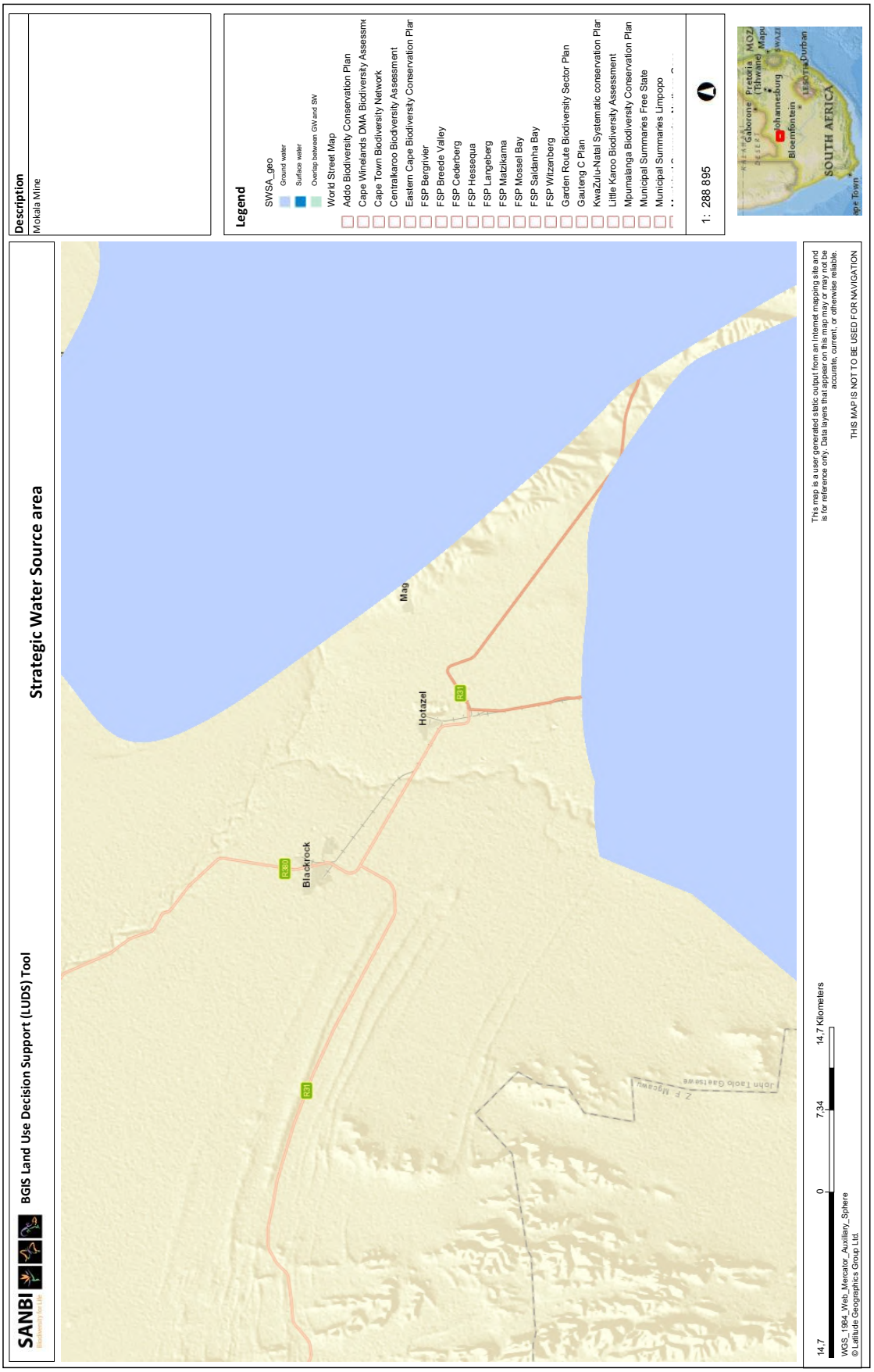
SANBI
BGIS Land Use Decision Support (LUDS) Tool
Strategic Water Source area
Description
Mokala Mine
Legend
SWSA_geo
Ground water
Surface water
Overlap between GW and SW
World Street Map
Addo Biodiversity Conservation Plan
Cape Winelands DMA Biodiversity Assessm
Cape Town Biodiversity Network
Centralkaroo Biodiversity Assessment
Eastern Cape Biodiversity Conservation Plan
FSP Bergrivier
FSP Breede Valley
FSP Cederberg
FSP Hessequa
FSP Langeberg
FSP Matzikama
FSP Mossel Bay
FSP Saldanha Bay
FSP Witzenberg
Garden Route Biodiversity Sector Plan
Gauteng C Plan
KwaZulu-Natal Systematic conservation Plan
Little Karoo Biodiversity Assessment
Mpumalanga Biodiversity Conservation Plan
Municipal Summaries Free State
Municipal Summaries Limpopo
1: 288 895
Blackrock
Hotazel
R380
R31
Map
SOUTH AFRICA
Pretoria
Johannesburg
Bloemfontein
Durban
Cape Town
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION
14.7
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7.34
14.7 Kilometers
WGS_1984_Web_Mercator_Auxiliary_Sphere
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SANBI
BGIS Land Use Decision Support (LUDS) Tool
Northern Cape CBA Map
Description
Mokala Mine
Legend
Northern Cape Critical Biodiversity Areas 20
Critical Biodiversity Area One
Critical Biodiversity Area Two
Ecological Support Area
Other Natural Areas
Protected Area
South African parent farm cadaster
20m Contour lines - northern RSA
20m contour lines - southern RSA
Formal protected areas (NBA 2011)
Informal protected areas (NPAES)
Marine Protected Areas MPAs (NBA 2011)
Addo Biodiversity Conservation Plan
Cape Winelands DMA Biodiversity Assessm
Cape Town Biodiversity Network
Centralkaroo Biodiversity Assessment
Eastern Cape Biodiversity Conservation Plar
FSP Bergrivier
FSP Breede Valley
FSP Cederberg
FSP Hessequa
FSP Langeberg
FSP Matzikama
FSP Mossel Bay
FSP Saldanha Bay
FSP Witzenberg
1: 72 224
Gaborone
Pretoria
(Tshwane)
Johannesburg
Bloemfontein
Durban
SOUTH AFRICA
Cape Town
3,7
0
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3,7 Kilometers
WGS_1984_Web_Mercator_Auxiliary_Sphere
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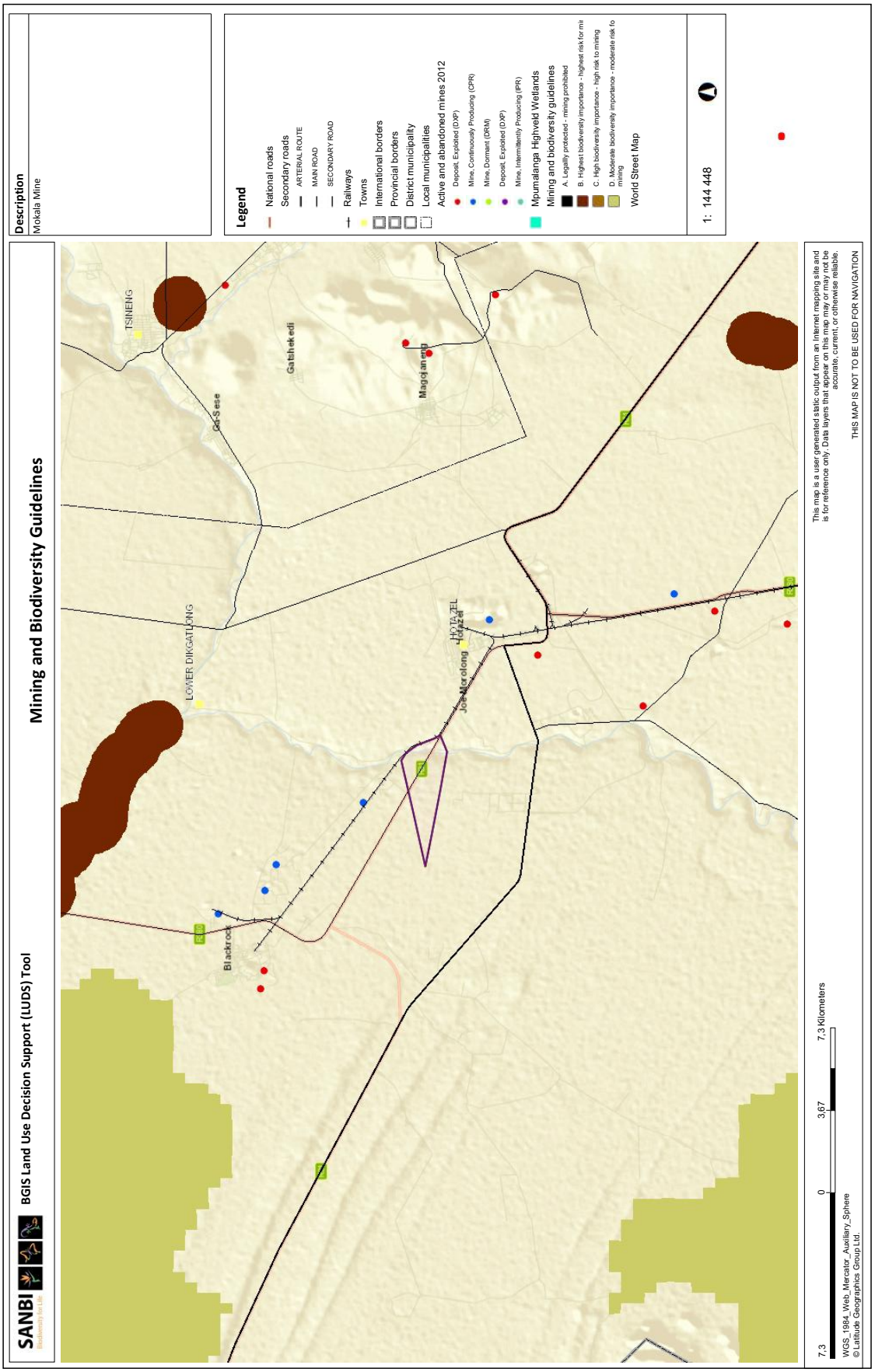
SANBI
BGIS Land Use Decision Support (LUDS) Tool
Mining and Biodiversity Guidelines
Description
Mokala Mine
Legend
National roads
Secondary roads
ARTERIAL ROUTE
MAIN ROAD
SECONDARY ROAD
Railways
Towns
International borders
Provincial borders
District municipality
Local municipalities
Active and abandoned mines 2012
Deposit, Exploited (DXP)
Mine, Continuously Producing (CPR)
Mine, Dormant (DRM)
Deposit, Exploited (DXP)
Mine, Intermittently Producing (IPR)
Mpumalanga Highveld Wetlands
Mining and biodiversity guidelines
A. Legally protected - mining prohibited
B. Highest biodiversity importance - highest risk for min
C. High biodiversity importance - high risk to mining
D. Moderate biodiversity importance - moderate risk fo mining
World Street Map
1: 144 448
TSINENG
Ga-Sese
Gatlhekedi
Maggamen
LOWER DIKGATLONG
Joe Morolong
HOTAZEL
Blackrock
This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
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7,3
0
3,67
7,3 Kilometers
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APPENDIX 3

DETAILS OF SPECIALIST

ABRIDGED CURRICULUM VITA

NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

QUALIFICATIONS

BSc (Rhodes University) – Botany and Zoology

BSc (Hons) Wildlife Management, Pretoria University

PhD (Rhodes University)

PHD DISSERTATION

Vegetation potential of natural rangelands in the mid Fish River Valley. Towards a sustainable and acceptable management system.

RESEARCH INTERESTS

My academic interests cover various areas dealing with ecological functioning, and wildlife management, with a special interest in the functioning and management of arid and semi arid rangelands.

ACADEMIC AWARD

Awarded a medal in 2001 by the Grassland Society of Southern Africa for: Outstanding Student in Range and Forage Science

PROFESSIONAL EXPERIENCE

1999 – 2000	Eastern Cape Parks Board	Ecologist
2000 -2002	Coastal & Environmental Services	Consultant
2003 – present	Ecological Management Services	Owner/Consultant

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. Although we are based in Kimberley we cover most of South Africa and have projects in the Eastern Cape, Free State, North West Province, Northern Cape and Gauteng. We have undertaken impact assessments for various types of developments including urban and rural developments, agricultural developments, as well as

developments within the mining sector. We also provide specialist input to various types of projects and have formulated biodiversity offset studies required to off set impacts from large developments.

A selection of recent work is as follows:

- Department of Agriculture Northern Cape—Hopetown Piggery
- Department of Agriculture Northern Cape—Phillipstown Piggery
- Department of Agriculture Northern Cape—Chikiana Piggery
- Department of Agriculture Northern Cape—De Aar Hydroponics
- Sidi Parani—Fertilizer granulation plant in Christiana
- Tiva Enviro Services - Biodiversity study for De Aar Hospital
- Ghaap Ostrich Abattoir—Biodiversity Study
- Amakhala Nature Reserve—Development of lodge facilities
- IG van der Merwe Trust—Residential development, Douglas
- Valrena Trust—Residential development along Vaal River
- Idstone Pty Ltd—Development of irrigation ground for seed potatoes production
- Tiaan Trust—Development of irrigation ground
- C F Scholtz & Seuns - Development of irrigation ground for growing of crops
- Kosie Smith Trust - Development of irrigation ground for growing seed potatoes
- Bakgat Trust—Development of irrigation ground for growing of crops
- Mount Carmel (pty) Ltd—Development of irrigation ground for growing of crops
- Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production
- Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops
- Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production
- Valrena Trust—Development of irrigation ground for growing of crops
- Middledrift Dairy Trust—Establishment of Dairy
- Eliweni Wildlife (Pty) Ltd - Lodge Development on Amakhala Nature Reserve
- Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes
- Trisa Trust—Development of irrigation ground for the growing of seed potatoes
- GWK Pty Ltd—Development of irrigation pivots and vineyards
- Blair Athol Golf course development
- Rolfontein Nature Reserve lodge development
- SLR—Ecological Specialist survey for Kudumane Mine
- Biodiversity offset plan—UMK mine
- Biodiversity Action Plan for UMK mine
- Biodiversity offset Kudumane Mine
- IDC—Ecological Management & Business Plan: Siyancuma Women in Game Initiative
- Swanvest 123 Pty Ltd—Wolverfontein Breeding Facility
- De Beers—Ecological Evaluation and Management Plan for Kleinsee Game Farm
- Kalahari Oryx Game Reserve—Risk Assessment introduction of Lion
- Department of Land Affairs—Ecological Management and Business plan for Thwane Commonage
- Mauricedale Game Ranch—Paardefontein Specialist Vegetation Survey
- Santrosa Investments Pty Ltd—Olie Rivier Game Farm HA

- Manzi Safaris Habitat Assessment
- Thuru Lodge—Risk Assessment & Habitat Analysis
- Dugmore brothers—Habitat assessment Hartebeesthoek
- Schutte Boerdery Trust—Habitat Assessment Glenfrere
- F G. Taljaard—Habitat Assessment Namakwari Game Reserve
- Rivierfront Wild - Doornfontein Habitat Assessment
- Sjibbolet Trust—Hartsvalley Habitat Assessment
- Raltefontein Habitat Assessment
- Kalahari Oryx Game Reserve—Specialist Vegetation survey

PROFESSIONAL ASSOCIATIONS

Grassland Society of Southern Africa

South African Council for Natural scientific Professions Registration number 400117/05

RESEARCH PUBLICATIONS

Evans, N.V., Avis, A.M. and Palmer, A.R. 1997. Changes to the vegetation of the mid-Fish River valley, Eastern Cape South Africa, in response to land-use, as revealed by a direct gradient analysis. *African Journal of Range & Forage science*, **14**(2): 68-74.

Birch N.V., Avis, A.M. and Palmer, A.R. (1999) The Effect Of Land-Use On The Vegetation Communities Along A Topo-Moisture Gradient In The Mid-Fish River Valley, South Africa. *African Journal of Range & Forage science*, **16**(1): 1-8

Birch, N.V., Avis, A.M. and Palmer, A.R. 1999. Changes to the vegetation communities of natural rangelands in response to land-use in the mid-Fish River valley, South Africa. *People and Rangelands Building the Future* (Eds D. Eldridge & D. Freudenberger) pp.319-320 vol 1. Proceeding of the VI International Rangeland Congress, Townsville, Queensland, Australia

APPENDIX 4

IMPACT ASSESSMENT METHODOLOGY

Criteria used in the assessment of impacts

PART A: DEFNITION AND CRITERIA		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.
	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the Extent of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
			EXTENT				
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			VL	L	M	H	VH
INTENSITY = VL							
DURATION	Very long	VH	Low	Low	Medium	Medium	High
	Long term	H	Low	Low	Low	Medium	Medium
	Medium term	M	Very Low	Low	Low	Low	Medium
	Short term	L	Very low	Very Low	Low	Low	Low
	Very short	VL	Very low	Very Low	Very Low	Low	Low
INTENSITY = L							
DURATION	Very long	VH	Medium	Medium	Medium	High	High
	Long term	H	Low	Medium	Medium	Medium	High
	Medium term	M	Low	Low	Medium	Medium	Medium
	Short term	L	Low	Low	Low	Medium	Medium
	Very short	VL	Very low	Low	Low	Low	Medium
INTENSITY = M							
DURATION	Very long	VH	Medium	High	High	High	Very High
	Long term	H	Medium	Medium	Medium	High	High
	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation
Insignificant	Inconsequential, not requiring any consideration.