Ecological Management Services

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CONCEPTUAL BIODIVERSITY OFFSET INVESTIGATION FOR UMK MINE, IN SUPPORT OF THE EMPr AMENDMENT PROCESS, HOTAZEL NORTHERN CAPE

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For
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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.

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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
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

1. INTRODUCTION

1.1. BIODIVERSITY OFFSETS

Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and MITIGATION measures have been taken. The goal of biodiversity offsets is to achieve NO NET LOSS and preferably a NET GAIN of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity.

Biodiversity is the total variety of all life. It is the full range of natural variety and variability within and among living organisms, and the ecological and environmental complexes in which they occur. It encompasses multiple levels of organisation, including genes, species, communities, ecosystems and biomes. Its complexity derives from its sheer variety combined with dependencies, feedbacks and variability within and across these different levels

Biodiversity loss is usually observed as one or both of: (1) reduced area occupied by species and community types and (2) reduced abundance of species or condition of communities & ecosystems. The likelihood of any biodiversity component persisting – or surviving – in the long term declines with both lower abundance and reduced habitat area. The relationship is far from linear and is highly variable across different biodiversity components. The loss of a species is the fundamental example of an irreversible loss of biodiversity

Priorities for BIODIVERSITY CONSERVATION are influenced by the concepts of IRREPLACEABILITY and VULNERABILITY. Biodiversity components that are highly irreplaceable and highly vulnerable are a top priority for conservation effort. Irreplaceability (or uniqueness) relates to the existence of additional spatial options available for conservation if the biodiversity at a particular site were irreversibly lost. Vulnerability indicates risk of imminent loss and so reflects the loss of conservation opportunities over time. The scientific concept of vulnerability includes a consideration of loss as the result of past, ongoing or future threats, and with irreplaceability, could be considered equivalent to the concept of 'hazard' used in corporate risk assessment. THREAT STATUS (of a species or community type) is a simple but highly integrated indicator of vulnerability.

The main concepts that arise when designing a biodiversity offset, include, when a biodiversity offset should be considered, how it should be measured, how suitable offset locations and activities can be selected, and how the offset should dovetail with companies' project lifecycles and countries' biodiversity priorities.

The role of biodiversity offsets is effectively as a 'last resort', after all reasonable measures have been taken first to avoid and minimise the impact of a development project and then to restore biodiversity on-site. Consequently, biodiversity offsets should only be applied to the residual adverse impacts of a project. The

application of this mitigation hierarchy, and how far each step should be pursued before turning to the next is one of the key issues for consideration in biodiversity offset design.

When are offsets considered: Offsets tend to be required by a regulator, or considered by a project proponent, when the biodiversity that will be negatively impacted by a project is judged to be 'significant' in terms of its intrinsic or conservation value (e.g. globally threatened or locally endemic species; significant concentrations or source populations; unique ecological communities), or when its loss is likely to have significant consequences in view of its use value (e.g. high level of dependence on that biodiversity for livelihoods). While the significance of impact on an environment is influenced by the sensitivity of the specific environment (and biodiversity offsets are therefore more likely to be considered in more sensitive environments), environmental sensitivity in itself is not the trigger for an offset. The trigger is whether the residual negative impact on biodiversity is of 'medium', 'medium – high' or 'high' significance

Quantified loss and gain: A feature that distinguishes offsets from other forms of ecological compensation is the requirement to demonstrate 'no net loss' or a 'net gain'. What this means and how to measure it lies at the heart of biodiversity offsetting. It is not always easy to determine what should be measured or accounted for in an offset. Biodiversity in its entirety is impossible to measure, so the process of offset design involves decisions about suitable 'metrics' or 'currencies'. As it is impossible to count every individual in every population of every species, and as no two sites are identical in biodiversity terms, the choice of metrics often involves selecting 'surrogates' or 'proxies' which can be quantified and which can be considered representative of 'overall' biodiversity. The extent to which the selected measures are genuinely representative of biodiversity overall may be difficult to demonstrate. It is also important to consider how similar the biodiversity structure, composition and function at an offset site needs to be to that affected by the development project for no net loss to be achieved. Exchange rules may be used to determine what levels of difference might be acceptable and to show how exchange between different sites will be accounted for in the metrics. Loss and gain also encompasses impacts on people's uses and cultural values associated with biodiversity. There are many possible approaches to designing, selecting and applying metrics appropriate for a given situation.

Habitat is a useful concept for loss / gain calculations, because it lends itself to identification of areas of land and uses these as a PROXY for 'carrying capacity' with respect to individual or multiple species. Most offset methods consider the areas of land available to key species, species populations or communities / assemblages and also the capacity of these areas to support them in a viable condition (generally referred to as 'habitat quality'). In this case, measures of area are generally combined with some measure of quality, health or condition of the habitat,

An offset should deliver CONSERVATION GAINS over and above what is already taking place or planned. A fundamental precept of biodiversity offsets is that they deliver results that would not have happened anyway in the absence of the offset. This means that calculations of loss and gain need to take into consideration the biodiversity BASELINE and trends.

1.2. PROJECT BACKGROUND

United Manganese of Kalahari (Pty) Ltd (UMK) Mine have applied to amend their Environmental Management Programme (EMPr). They appointed SLR to conduct a full Scoping and Environmental Impact Assessment (EIA) process in support of the amendment application. UMK is proposing to change the approved surface layout for the mine to optimize their mining operations as follows;

Proposed new surface infrastructure at the mine:

- New parking area (0.52 Ha);
- Solar equipped boreholes and associated storage tanks;
- Tyre fitting bay, workshop/ tyre centre and oil storage (7 Ha);
- Waste rock and sand stockpiles:
    - Central West Waste Rock Dump (WRD)(84Ha)
    - Central West Sand Stockpile (40.9 Ha)
    - J Block West WRD(133Ha)
    - J Block West Sand Stockpile(46.5Ha)
    - J Block East WRD(63.5Ha)
    - J Block East Sand Stockpile(16.5Ha)
    - Powerline West WRD(196ha)
    - Powerline West Sand Stockpile(35,9Ha)
    - A Block West WRD (145 Ha)
- Product stockpile area within the approved sinter plant area (21.4 Ha);
- TUP stockpile area (12.4 Ha);
- Truck staging area (20.4 ha);
- Hard park areas (Phase 1 and 3) (14.3 Ha);
- Barlow's Store (1 Ha);
- Explosive depo and associated service road (13.1 Ha); and
- Engineering salvage yard (temporal and permanent) (2.43 Ha).

Upgrade of existing approved infrastructure:

- Prentec Sewage Plant; and
- Existing weigh bridge and associated access road.

Expansion of existing approved infrastructure

- Product stockpile (53.6 Ha);
- Modular crushing plant (34.6 Ha);
- Fuel storage farm (0.45 Ha);
- EME workshop for major repair and maintenance (3.6 Ha);
- Road truck staging area (1.6 Ha); and
- Offices (19.1 Ha).
- Expansion of the pit (458.54 Ha)

Relocation of the following surface infrastructure at the mine:

- Approved dirty water dams/pollution control ponds; and
- 132 KV powerline from current location to its old location.

UMK received authorisation for the manganese mine in September 2007. This authorisation was subject to a number of conditions which included investigating the need for a biodiversity offset. This investigation was undertaken and the results of this investigation showed that a biodiversity offset was required to offset the residual impacts to the biodiversity as a result of the original mining operation. This was agreed to by the authority and a biodiversity offset was implemented for the project.

As the original extent of the mining and infrastructure area and closure options will change with these amendments, there is now a requirement to investigate whether the biodiversity offset is still relevant for the project.

1.2.1. SCOPE OF THIS REPORT

This report investigates whether the biodiversity offset is still relevant for the project or if there is a need for an additional offset.

The scope of work includes an investigation into:

- Determining residual impacts as a result of the changing project scope
    - Outline what habitat will be impacted
    - Identify of any species of conservation concern that may - or may not - rely on the impacted habitats.
    - Highlight areas of uncertainty, risks and gaps in information
- Identify and evaluate the potential need for an offset, and how this need is affected by the various closure options
- Calculate the offset ratio in terms of
    - Ecosystem status
    - Conservation Target Modifiers for presence of species of special concern, ecological process value and imminent threat
    - Assigning Basic and Final Offset Ratio, using multipliers
- Verifying Offset sufficiency and identifying shortfalls

The scope of this report does not include identifying a specific biodiversity offset option but presents only a conceptualized theory of how/if an increase in impact area affects the biodiversity offset requirements. It has been undertaken in accordance with the Draft National Biodiversity Offset Policy (DEA 2017) and the Business and the Biodiversity Offset Design Handbook (BBOP 2012a).

1.3. OFFSET POLICY FRAMEWORK

1.3.1. INTERNATIONAL GUIDELINES FOR BIODIVERSITY OFFSETS

A biodiversity offset is:
"the measurable conservation outcomes resulting from actions designed to compensate for significant negative residual impacts on biodiversity arising from project development after appropriate prevention and mitigation measures have been taken" (BBOP 2012a)

Biodiversity offsets can encompass spatial patterns of biodiversity and the ecological processes that maintain those patterns, as well as people's use and cultural values associated with that biodiversity (ecosystem services). Our ecosystems create landscapes of aesthetic and natural heritage value; any cultural landscape and associated heritage depends in part on conservation of these natural systems. Impacts on biodiversity and ecosystems affect water resources either in terms of quality or flow, and thus also water users. Likewise, biodiversity offsets – in particular involving riparian and freshwater ecosystems – can be designed to benefit water resources and users in addition to the ecosystem itself.

Offsetting ecosystem service impacts can, however, have undesirable outcomes if the biodiversity or ecological process responsible for the original service is lost due to a development, and the service is effectively replaced with artificial provisions. It is important to ensure that ecosystem service offsets do not compromise or are not traded off for the original biodiversity and/or ecological processes being lost. Moreover, only ecosystem services that flow directly from the biodiversity or ecological process should be considered for offsets, and all ecosystem service offsets should aim to improve those services by enhancing the underlying biodiversity or process.

The most detailed international development of the biodiversity offset concept is outlined in the 2012 Business and Biodiversity Offset Programme (BBOP 2012a). This provides a coherent set of principles, criteria and indicators for offsets, as well as a range of tools and metrics for pursuing defensible offset projects. As far as possible, this study has followed the BBOP approach, except in one or two technical details which flow from the specific regulatory context and biodiversity planning and assessment tools used in South Africa.

1.3.2. LEGAL AND POLICY FRAMEWORK FOR BIODIVERSITY OFFSETS IN SA

Legislation

The Constitution of South Africa requires that development be 'ecologically sustainable'. The principles in the National Environmental Management Act 107 of 1998 (NEMA) state that the environment is held in public trust for the people, and must be protected as the 'people's common heritage'. The principles point to the need to conserve biodiversity and ecological integrity and, where impacts on biodiversity and disturbance to ecosystems cannot be altogether avoided, they must be minimized and remedied. Further, the principles reflect the 'mitigation hierarchy', and state that the party who causes environmental damage

is responsible for 'paying' or remedying that damage. Finally, the NEMA principles advocate a 'risk-averse and cautious approach' where we are uncertain about the consequences of our actions. Environmental management principles in the National Environment Management Act of 1998 (NEMA), which apply to all authorities whose decisions affect the environment and to private and public sector developers, enable the inclusion of biodiversity offsetting as a condition of authorisation. They include the 'polluter pays' principle, and the need to remedy adverse effects on biodiversity and ecosystems after avoidance and minimization. Both NEMA and the National Water Act 36 of 1998 (NWA) provide the competent authority with the discretion to impose any condition necessary for the protection of the environment/water resource, whilst the latter specifically authorises the lodging of financial guarantees for any required mitigation actions. The NEMA Environmental Impact Assessment (EIA) regulations list activities that are subject to environmental assessment. The significance of residual impacts triggers the need for offsets, which are required to address impacts on biodiversity predicted to be of 'medium' to 'high' significance. Impacts of 'very high' significance that may result in loss of irreplaceable biodiversity are considered unacceptable.

In terms of the National Environmental Management Biodiversity Act 10 of 2004 (Biodiversity Act), the State has trusteeship of the country's biodiversity and must 'manage, conserve and sustain' South Africa's biodiversity and its components and genetic resources. The Biodiversity Act provides for the listing of threatened or protected species and ecosystems, and for the publishing of Bioregional Plans, thus identifying our priority biodiversity areas. In addition, this information signals the probable significance of impacts where the species or ecosystems are adversely affected by any proposed development.

The National Environmental Management Protected Areas Act 57 of 2003 (Protected Areas Act) provides for a range of options to protect an area, and point to the most secure statutory options to achieve this. Any of the four categories of protected area can be declared on privately owned land at the request, or with the consent, of the landowner(s). The Act provides for the involvement of parties other than organs of State in the declaration and management of protected areas as the primary tool to safeguard the nation's biodiversity assets, enabling offset management arrangements. Both the National Framework for Sustainable Development in South Africa (2008) and the National Strategy for Sustainable Development (2010) highlight the value of biodiversity to society, its importance in sustaining our life support systems and livelihoods, and the range of benefits to people of healthy, functioning ecosystems.

The National Biodiversity Framework (NBF, 2009) notes that biodiversity offsets are already being implemented to some extent in South Africa, but with little consistency. The Department of Agriculture, Forestry and Fisheries (DAFF, undated) has produced "Principles and Guidelines for control of development affecting natural forests" which includes biodiversity offsets and sets out the steps to be taken and aspects to be addressed. Both the Western Cape and KwaZulu-Natal have issued guidelines for Biodiversity Offsets, and other provinces are developing their own. Biodiversity Offsets are being called for by regulators in all provinces in South Africa.

National Offsets framework

A draft National Biodiversity Offsets Policy Framework has been developed by the Department of Environmental Affairs (DEA) (DEA 2017). This policy encompasses the following principles as a departure point for biodiversity offset development:

1. The Ecosystem Approach

The implementation of biodiversity offsets recognises the ecosystem approach (as opposed to a species approach) to biodiversity management, which promotes the integrated management of land, water and natural capital to affect the conservation and sustainable use of biodiversity, especially the need to safeguard and maintain critical biodiversity areas.

2. Offsets - the last resort in the Mitigation Sequence

Biodiversity offsets should only be considered as a mitigation option once all feasible actions and alternatives, first to avoid or prevent impacts on important biodiversity, then to minimize impacts, and then to repair or restore areas harmed by impacts to the condition before impact or better, have been considered.

3. Limits to what can or should be offset

Biodiversity offsets are to be used in cases where the EIA process identifies negative residual impacts of '**medium**' or '**high**' significance on biodiversity. Activities resulting in impacts of 'low' significance may not require an offset.

Impacts on biodiversity of 'very high' significance may not be able to be fully offset because of the conservation status, irreplaceability, or level of threat to affected biodiversity, or the risk of preventing scientific targets for conserving that biodiversity from being met. In these cases, given that the proposed activity would lead to irreversible impacts and irreplaceable loss of biodiversity, alternatives to the proposal should be sought; i.e. the proposed activity should not be authorized in its current form.

4. Ecosystem protection

Biodiversity offsets should ensure the long-term protection of priority ecosystem on the ground and improve their condition and function, thereby resulting in measurable positive outcomes for biodiversity conservation 'on the ground'. These outcomes could contribute to improved ecosystem integrity and increased use and/ or cultural value of offset areas and the ecosystems of which they are part.

5. No Net Loss up to specified limits of acceptable change

Offsets should not be used to 'soften' a development proposal that would result in unacceptable loss of biodiversity. Biodiversity offsets should be designed in such a way that scientific targets for conserving ecosystems and other biodiversity features in the long term are attainable and not undermined as a consequence of the proposed activity. No biodiversity feature (species or ecosystem) should be at risk of being pushed beyond an Endangered threat status by a development.

6. Locating biodiversity offsets in the landscape

Biodiversity offsets should be located in the landscape in such a way that they help to secure priority areas for conservation, improve connectivity between these priority areas, and/ or consolidate or expand existing protected areas. Where priority ecosystem services are residually affected, biodiversity offsets should preferably be located in the landscape in such a way that they deliver equivalent services to affected parties; that failing, additional compensation measures would be needed for these parties.

7. Equivalence – 'like for like'

Biodiversity offsets should comprise - or benefit - the same biodiversity components as those components that would be negatively affected by development. *In exceptional cases* only, and only with support from the provincial conservation agency, could consideration be given to the biodiversity offset targeting a relatively more threatened ecosystem or habitat.

8. Additionality – new action required

Biodiversity offsets must result in conservation gains above and beyond measures that are already required by law or would have occurred had the offset not taken place.

9. Timing and duration of biodiversity offsets

The design of the biodiversity offset and plans for its implementation should be approved by the provincial biodiversity conservation agency and the CEA before the proposed listed activity starts. Implementation of the biodiversity offset should preferably take place before the impacts of the activity occur, or as soon thereafter as reasonable and feasible.

The biodiversity offset site(s) should endure at least for the duration of the residual impact on biodiversity, but preferably in perpetuity, in order to make a long-term contribution to biodiversity conservation. It should be monitored and managed adaptively to sustain biodiversity outcomes.

10. Defensibility

The measure of residual negative impacts on biodiversity caused by a proposed development, as well as the design and implementation of biodiversity offsets, should be based on the best available biodiversity information and sound science, and should incorporate local traditional or conventional knowledge as appropriate.

Offsets must consider all significant residual impacts on biodiversity: direct, indirect and/ or cumulative impacts. The scope of assessment must include due consideration of impacts on recognized priority areas for biodiversity conservation; impacts on biodiversity pattern (conservation status of ecosystem and species, importance to migratory species) and ecological and evolutionary processes (must look across scales and take into account connectivity, gradients and corridors); and impacts on ecosystems or species on which there is high dependence for health, livelihoods, and/ or wellbeing.

11. Precaution

The biodiversity offset must be designed in a risk-averse and cautious way to take into account uncertainties about the measure of residual negative impacts (including uncertainties about the effectiveness of planned measures to avoid/ prevent, minimize and rehabilitate impacts), and the successful outcome and/ or timing of the biodiversity offset.

12. Fairness and equity

The determination of residual negative impacts, and the design and implementation of biodiversity offsets, should be undertaken in an open and transparent manner, providing for stakeholder engagement, respecting recognised rights, and seeking positive outcomes for affected parties.

Biodiversity offsets should not displace negative impacts on biodiversity to other areas, and/ or cause significant negative effects that in turn would need to be remedied.

13. Non substitutable

A biodiversity offset cannot be exchanged for, or traded off against, compensation for social, cultural heritage or other residual impacts unrelated to biodiversity. Moreover, offsets for residual impacts on use or cultural values of biodiversity cannot be exchanged or substituted for offsets on intrinsic values of biodiversity.

14. Enforceable and auditable

Offsets must be able to be monitored and audited in relation to clear management and performance targets. In addition, they must be able to be enforced through explicitly worded, legally binding conditions, and/or common law contracts.

The desired outcome of biodiversity offsets is to ensure that the cumulative impact of development authorization and land use change does not:

- result in the loss of CBA's or jeopardize the ability to meet South Africa's targets for biodiversity conservation;
- lead to ecosystems becoming more threatened than 'Endangered'; and/or
- cause a decline in the conservation status of species and the presence of 'special habitats

1.4. THE NATURE OF COMPENSATION AND OFFSETS

1.4.1. THE FORM AND NATURE OF ACCEPTABLE BIODIVERSITY OFFSETS

It is useful to clarify the important conceptual differences between **trade-offs, compensation** and **offsets.** These mean different things and have rather different outcomes.

A measure must satisfy the principles above to call itself an 'offset'. In particular, an offset would not undermine conservation targets or lead to irreplaceable loss of biodiversity and would be commensurate with the residual impacts of the proposed activity.[1]

If a measure does not satisfy these principles, and instead offers some form of remedy that is not commensurate with, equivalent in type, or is insufficient to qualify as an offset (although it could contribute to meeting the target of the affected component biodiversity), then it would be termed 'compensation'.

A 'trade-off' is typically made between, rather than within, different categories or 'pillars' of capital (e.g. between socioeconomic benefits and biodiversity loss). A trade-off is not to be confused with 'trading-up' which can be accommodated in the offsets framework and allows impacts on one biodiversity feature to be offset by safeguarding another biodiversity feature of greater value and/or under greater threat.

Ultimately, even if an offset is deemed unacceptable due to, for example, the irreplaceability of the impacted biodiversity, ecological process or the ecosystem service being lost, this would not impede a regulator's ability to require compensation, or even to make a trade-off, provided that such compensation or trade-off is made within our legal framework and is defensible.

[1] In the international context of the IFC PS6 and the BBOP Standard (BBOP 2012b), an offset must achieve NNL or net gain; any measure that does not achieve that outcome would be termed 'compensation'

Biodiversity offsets can be achieved by:

- Increasing a target site's security against land use change, in the long term
- Restoring or repairing degraded areas
- Improved management, and/ or
- Preventing likely transformation or degradation of areas through formal/ legal protection. For protection and restoration to be effective in the offset context, they should endure in perpetuity, and be accompanied by significant land use and allied protection mechanisms to safeguard the biodiversity features for which they initially set aside. While it may be possible to achieve net gain in some critical habitat through successful restoration (of structure, function or condition), it is almost always preferable, in the South African context, to conserve a more pristine expression of the type, habitat of feature first.

1.4.2 OFFSET QUANTUM AND DESIGN

The quantum of biodiversity offsets in South Africa uses a basic ratio derived from a target which is in turn linked to the status[2] of residually affected ecosystems. Multipliers are applied where:

- the area comprises a component of a wider landscape recognized as having high conservation importance;
- the area supports several threatened species or species of special conservation significance;
- the area plays an important role at a landscape level with regard to ecological and/or evolutionary processes that, amongst others, help adapt to climate change;
- the natural systems of the affected area deliver ecosystem services on which there is a high dependency by local or downstream communities, or society as a whole;
- there is either a lack of confidence in impact predictions and/ or a risk of failure of proposed measures to avoid, minimize or rehabilitate/ restore negative impacts within stated time frames, implying that residual impacts would be greater (in extent and severity) than initially estimated; and/ or the delay between the impact and the return to pre-develpment condition is greater than 10 years, or a lifespan of a key component of the rehabilitation system, whichever is longer.

Basic offset ratios are determined using the criteria described in the table below (Table 1.1). The status of a habitat or ecosystem is based on how much of its original area still remains intact relative to various thresholds.

[2] The NEM: Biodiversity Act (Act 10 of 2004) provides for gazetting the threat status of different ecosystems. Notation used is the same as for Threatened species. Endangered = EN, Least Threatened = LT etc. The most recent list was published in 2012 (GN 1002 9 December 2012) the updated list will only be published 2019.

Feature	Basic offset ratio[3]	Adjustments to size and/or number of offsets
Critically Endangered ecosystems, protected areas, Critical Biodiversity 1 (CBA1) areas identified in plans published or adopted by the relevant authorities.	30:1 ratio.	Negative impacts should be avoided as a priority and would be unacceptable unless exceptional circumstances can be demonstrated. Reference must be made to provincial guidance.
Endangered ecosystems, Critical Biodiversity 2 (CBA2) areas identified in plans published or adopted by the relevant authorities.	Minimum 5:1, up to 20:1.	Offset would need to be determined based on exact level of threat and taking into account levels of protection, ecological condition, presence of threatened species**, contribution to important ecological processes and ecosystem services. The minimum size of a viable offset should be determined by provincial guidance.
Vulnerable ecosystems, areas earmarked for Protected Area expansion, Ecological Support Areas (ESAs) identified in plans published or adopted by the relevant authorities.	Minimum 2:1, up to 5:1.	Offset would need to be determined based on exact level of threat and taking into account levels of protection, ecological condition, presence of threatened species**[4], contribution to important ecological processes and ecosystem services. The minimum size of a viable offset should be determined by provincial guidance.
Least threatened, Other Natural Areas (ONAs) identified in plans published or adopted by the relevant authorities.	Generally, no offset required.	Offset may be necessary to cater for residual negative impacts on rare habitats, threatened species**[2], on important ecological processes and ecosystem services. The appropriate size of a viable offset should be determined by provincial guidance.

Table 1.1: Criteria used to determine basic offset ratio based on ecosystem status

The design of the final offset area is dependent on several factors:

- The location and proximity of existing protected areas which may be expanded or consolidated
- The distribution of those biodiversity features and components of the offset across properties in the region
- The availability of specific properties on the market and/or the willingness of the owners to sell them or have them encumbered with offset restrictions
- Consideration of the objectives of the offset area, and its specific management requirements or efficiencies (e.g. having a sensible boundary to secure and avoiding disjointed management units that cross communication and transport lines)

[3] **Note**: The above ratios do not apply to wetland offsets, where restoration of ecological function and services, as well as biodiversity, is the principal offset activity. For guidance on wetland offsets, reference must be made to wetland offset guidelines.

[4] **Note:** biodiversity offsets to accommodate threatened species or local endemic species with restricted distributions are not determined using offset ratios. Specialist advice on the particular affected species must be obtained, to inform an appropriate size and type of offset.

- Capitalising on existing or proposed land use developments that could augment the offset and increase establishment success, and avoidance of current and future land use conflicts.

2. THE AFFECTED AREA

2.1. AMENDMENTS TO MINING FOOTPRINT AND OPERATIONS

UMK received authorisation for the manganese mine in September 2007. The original mining operation/footprint was set to cover approximately 900ha of which 100ha would consist of mining related infrastructure. The 2017 amendment included additional waste rock dumps and an extension of the open pit to the west. The 2021 amendment application includes additional areas for the waste rock dumps, the pit and infrastructure. Thus, the amendment applications have resulted in the disturbance area being increased by approximately 2399 Ha from the original 900ha for which the offset was planned.

PROJECT AREA GROUPINGS	SIZE
Approved disturbance area (including changes in position of and design to the approved infrastructure/ facilities) in 2007	950ha
Additional disturbance are required for already implemented changes (including changes to the layout/ operations already implemented)	97ha
Additional disturbance area required for proposed additional changes (including changes to the layout/ operations still to be implemented) in 2017	898ha
Additional Disturbance from the proposed amendments 2021	1404ha
Total Area of Disturbance	**3349 Ha**

The Original EMPr (Metago, 2007) and EMPr Amendment (SLR, 2017) currently commit UMK Mine at closure to completely backfill the open pit voids and rehabilitate the land to achieve an end use of wilderness and grazing.

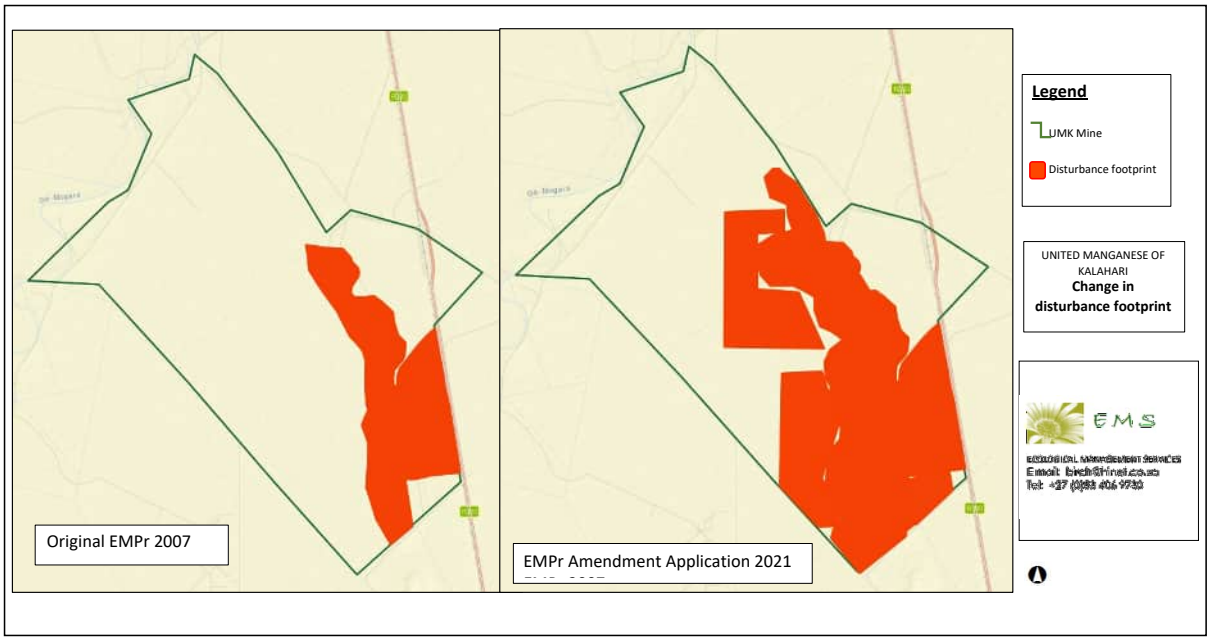

Figure 2.1: A map showing the change in the disturbance footprint of the UMK mine from the original EMPr, approved in 2007 and the proposed changes as set out in the 2021 EMPr amendment application.

2.2. SIGNIFICANCE OF THE BIODIVERSITY IN THE AREA

The study area falls within the Kathu Bushveld (Mucina & Rutherford 2006). The Kathu Bushveld which is described as an open savannah with the Camel Thorn[5], *Vachellia erioloba* (formerly known as *Acacia erioloba*) and Shepards Tree, *Boscia albitrunca* as the prominent trees. The shrub layer contains the Grey Camel Thorn, *Vachellia haematoxylon* (formerly known as *Acacia haematoxylon*) Black thorn *Senegalia mellifera,* (formerly known as *Acacia mellifera*) Blue bush, *Diospyros lycioides* and and *Lycium hirsutum*. The grass layer is very variable.

No Red List (IUCN) plant species have been recorded to occur in the area of the mine, although there are 13 plant species that are listed in Schedule 1 & 2 in terms of the Northern Cape Nature Conservation Act as well as three trees which are protected in terms of the National Forests Act, 1998,.

Species	Legislation	Conservation status	Potential of occurrence on site
Vachellia erioloba	National Forests Act 1998	Protected	Recorded on site
Vachellia haematoxylon	National Forests Act 1998	Protected	Recorded on site
Moraea longistyla	NCNCA	Schedule 2	Not recorded during field survey, **Low** potential of occurrence
Moraea pallida	NCNCA	Schedule 2	Not recorded during field survey, **High** potential of occurrence
Babiana hypogaea	NCNCA	Schedule 2	Not recorded during field survey, **Moderate** potential of occurrence
Harpagophytum procumbens Devil's claw	NCNCA	Schedule 1	Not recorded during field survey, **High** potential of occurrence
Boophone Disticha	NCNCA	Schedule 2	Not recorded during field survey, **High** potential of occurrence
Brunsvigia radula	NCNCA	Schedule 2	Not recorded during field survey, **Low** potential of occurrence
Orthanthera jasminiflora	NCNCA	Schedule 2	Not recorded during field survey, **Low** potential of occurrence
Boscia albitrunca	National Forests Act 1998NCNCA	Protected Schedule 2	Recorded on site
Crassula captella	NCNCA	Schedule 2	Not recorded during field survey, **Low** potential of occurrence
Kalanchoe brachyloba	NCNCA	Schedule 2	Not recorded during field survey, **Moderate** potential of occurrence
Ruschia griquensis	NCNCA	Schedule 2	Not recorded during field survey, **Moderate** potential of occurrence
Olea europaea	NCNCA	Schedule 2	Recorded on site
Oxalis haedulipes	NCNCA	Schedule 2	Not recorded during field survey, **Low** potential of occurrence

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. 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.

[5] 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.

A number of Red listed faunal species have been identified as having a high potential for occurrence in and around the study area, these are:

- Martial Eagle (Endangered)
- Secretarybird (Vulnerable)
- Ludwig's Bustard (Endangered)
- Dent's Horseshoe Bat (Near Threatened)
- Honey badger (Near Threatened)
- South African Hedgehog (Near Threatened)

Both the riparian and instream habitat integrity of the Ga-Mogara water course is described as moderately modified, however the Witleegte is described as largely modified as a large section of the water course has been completely interrupted by a mining pit.

2.3. CONSERVATION VALUE OF AREA TO BE DISTURBED

The National Biodiversity Assessment (NBA) is released every seven years and provides an assessment of South Africa's biodiversity and ecosystems. In 2011, the first National List of Ecosystems that are Threatened and in Need of Protection was published in terms of NEMBA. As part of the development of the NBA 2018 the threat status for all ecosystem types, across all realms in South Africa, was reassessed. In the terrestrial realm the revised assessments were based on an updated national vegetation map and new ecosystem condition data, derived primarily from the National Land Cover dataset provided by the Department of Environmental Affairs. While the 2018 assessment of ecosystem threat status represents the best available science, the 2011 published list of threatened terrestrial ecosystems remains the official National List of Ecosystems that are Threatened and in Need of Protection until such time as the 2011 national list of threatened terrestrial ecosystems is replaced by a new list published in terms of NEMBA based on the updated 2018 assessment.

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level. Ecosystem threat status tells us about the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as critically endangered (CR), endangered (EN), vulnerable (VU) or least threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition relative to a series of thresholds. Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act.

Ecosystem status is based on the percentage of original area remaining untransformed (by croplands, mining, urban development & roads) in relation to the biodiversity target and a threshold for ecosystem functioning. Biodiversity target refers to the percentage of the original areas required to capture 75% of the

species occurring in each vegetation type. The targets are aimed only at species conservation, and ecological processes are not considered. No significant disruption of ecosystem functioning is assumed in *least threatened* vegetation units, which still have more than 80% of their original extent untransformed.

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

The study area falls within the Griqualand West Centre of Endemism. 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 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.

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 north western boundary and the Witleegte water course on the north eastern boundary of the mine area falls within an ecological support area. An ESA is an area that must retain its ecological processes.

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 .

The proposed mining 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 study area.

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.

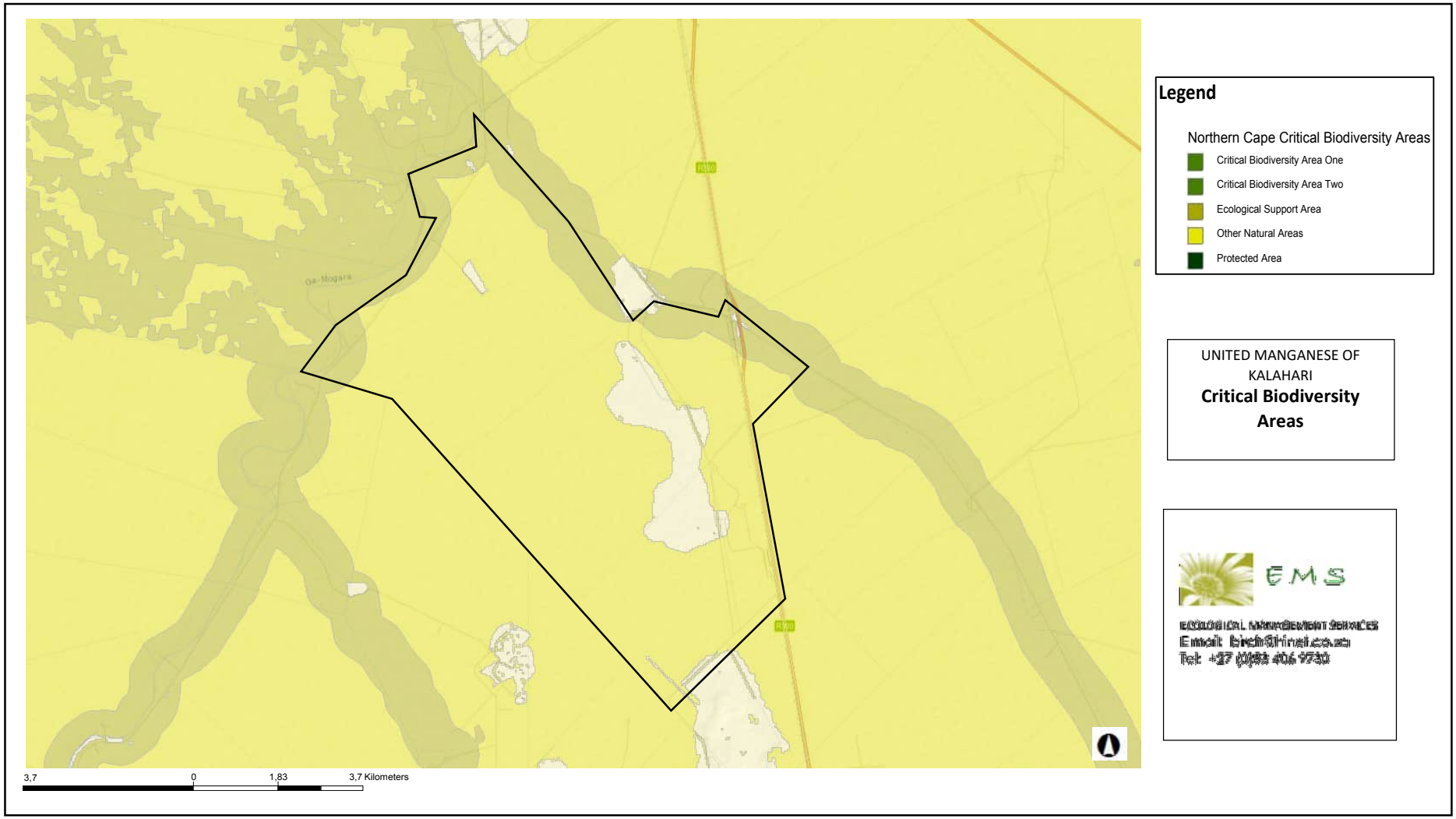

Figure 2.2: Critical Biodiversity area map showing the study area

2.4. THREATS TO THE BIODIVERSITY ON SITE AND IN THE AREA

Threats to the biodiversity within the region include, mining, overgrazing, alien plant infestations, plant collecting for medicinal purposes and firewood, illegal trade in faunal animals and expanding human settlements.

Mining

Possibly the greatest threat in terms of habitat destruction is however mining and its associated developments. Mineral deposits in the area include iron, manganese and base metals.

The area contains one of the largest land-based sedimentary manganese deposits in the world, these deposits are at least 1100 square km in extent and is known as the Kalahari Manganese Field (KMF). South Africa contains 80% of the world's manganese reserves, and most of these are in the Kalahari manganese field (KMF). The KMF hosts 12 000 Mt of high-grade manganese reserves; the field is, already being exploited by a number of mines but significant potential for further exploration and development remains. The manganese ores of the KMF are found in three seams, with an east-west extent of 17 km and a north-south extent of 45 km.

There is a possibility that a long band stretching north of Hotazel down south to Postmasburg could be mined, resulting in a large area being depleted of its biodiversity.

Overgrazing

Vegetation cover must be maintained to prevent soil and veld degradation. Carrying capacity indicates the number of hectares needed to sustain one Large Stock Unit without reducing the potential of the veld to carry livestock in future through degrading the vegetation condition. Overstocking results in vegetation species loss as well as a reduction in vegetation cover which in turn leads to soil erosion and sterilisation of soil resources.

Arid areas typically have sweet veld (veld that does not lose its palatability during the dry/winter season), sweet veld is more prone to overgrazing. The semi-arid to arid climate of the Northern Cape Province limits the vegetation cover and therefore the productivity of agriculture in the province. This lack of productivity results in farmers utilising marginal ground and stocking with higher animal numbers than what should be stocked in order to compete in the market. This pressure however has resulted in most agricultural ground in the Northern Cape being overgrazed. The degree of over utilisation does vary with plant communities and areas but it is a large threat to biodiversity. No detailed information is currently available on the extent of overgrazing and what areas are more overgrazed than others.

Alien infestations and bush encroachment

There are a significant number and types of alien species that have invaded the area, these are at present mostly confined to areas that have been subjected to disturbance, such as mined areas and road reserves

etc, but their presence is a threat to local biodiversity. Not only are alien species a threat to species diversity but the encroachment of indigenous species into an area, that causes a loss of species diversity and results in large patches of single species stands a threat to biodiversity. Of particular concern in the issue of bush encroachment by *Senegalia mellifera* in the area.

Medicinal & firewood plant collections and illegal trade

No comprehensive information on medicinal plant collections is available. Surveys were conducted for the IEMP on what plant species were predominantly used and the results of the survey is listed in the document. However it still remains largely unknown to what extent the plants are being utilised within the area. Illegal trade in faunal species is also taking place although it is difficult to ascertain on what scale but does seem to be less than what occurs in the Namakwa District (pers. comm. B Wilson, McGregor Museum). Animals such as vultures, monitor lizards, snakes and hedgehog are known to be used in traditional healing and are thus being utilised but statistics on numbers are not available.

2.5. CURRENT & FUTURE PROTECTED AREAS

The formal protected areas include land-based and marine protected areas that are recognised in terms of the Protected Areas Act (Act 57 of 2003). In other words these formal protected areas are defined as areas of land or sea that are formally protected by law and managed mainly for biodiversity conservation.

Informal protected areas (eg conservancies) are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation. It is important to differentiate protected areas from conservation areas, because there is no long-term security associated with conservation areas, they are not considered a strong form of protection.

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 2010 (NPAES), these focus area have recently been updated for the Northern Cape (E. Oosthuysen pers. Comm. 2021). 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 (≈ 20km east as the crow flies) an area identified as a protected area for the eastern Kalahari bushveld

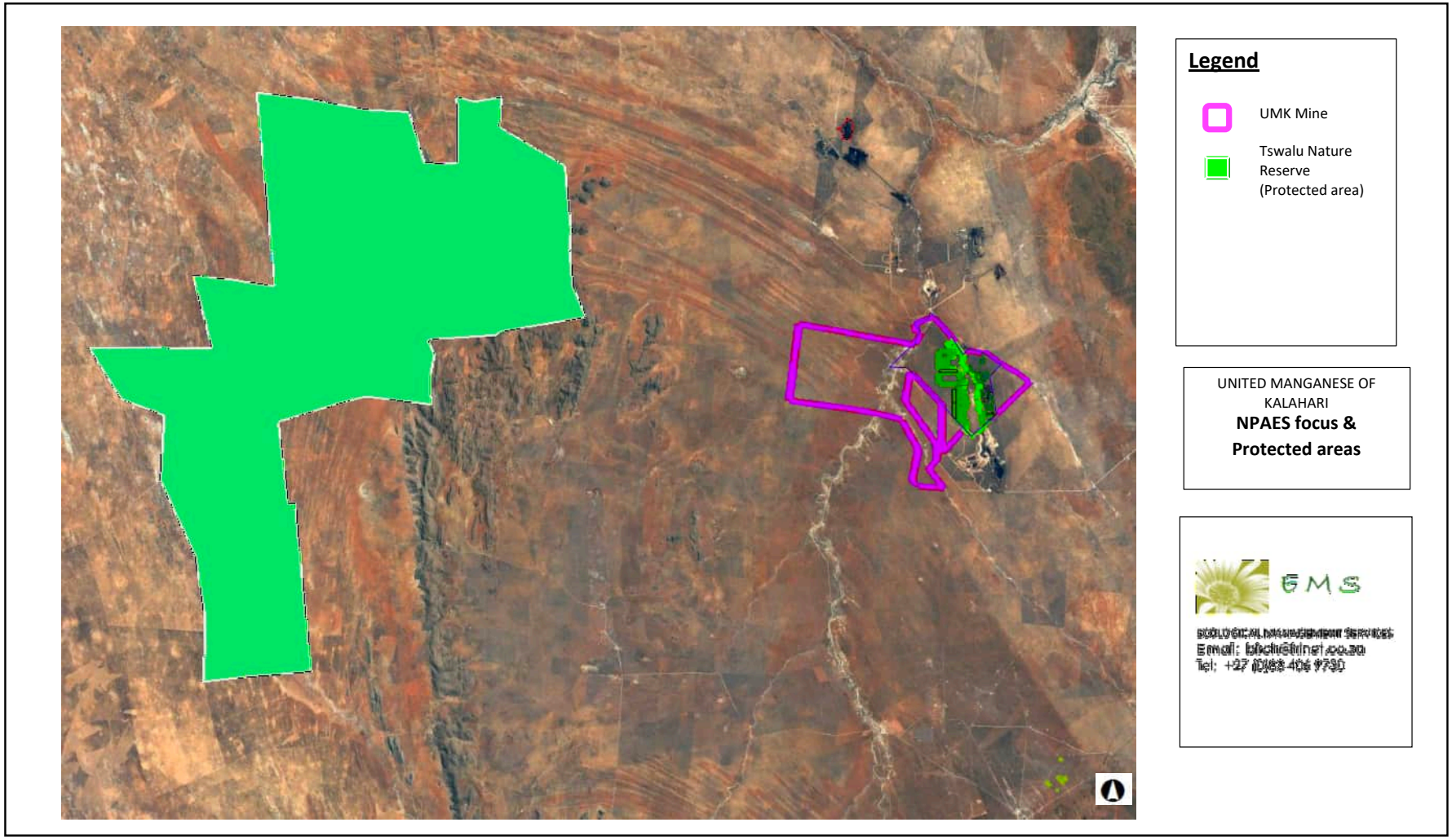

Figure 2.3: Protected areas and focus areas for land-based protected area expansion identified by the National Protected Area Expansion Strategy, in relation to the UMK mine area indicated in blue on the map.

3. DETERMINING THE NEED FOR AN OFFSET

3.1. EVALUATE THE POTENTIAL FOR AN OFFSET.

In order to identify if there is a need for a biodiversity offset one needs to evaluate the occurrence of unavoidable and residual negative impacts of a proposed development, and whether an offset would in fact compensate for these impacts. The actual need to offset the impacts of a development are only known once all the options and alternatives to avoid, minimize or repair/restore the impacts (the so-called 'mitigation hierarchy') have been evaluated during the EIA process. The common school of thought is that if these residual negative impacts on biodiversity have been found to be of 'medium' to 'high' significance then an offset is desirable.

The mitigation hierarchy is defined as:

1. Avoidance: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity.
2. Minimisation: measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
3. Rehabilitation/restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and/ or minimised.
4. Offset: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

The Impact Assessment for this project listed the following impacts to the biodiversity

- Loss of vegetation
- Habitat fragmentation
- Impact on floral & faunal species of special concern
- Establishment of alien vegetation

3.1.1. EXHAUSTING THE MITIGATION HIERARCHY

AVOIDANCE

It is assumed that a suite of alternative activity options was explored in the original EIA process. These are not commented on here as it is deemed that the most feasible option was proposed, given that the activity of mining a specific resource limits the available options.

MANAGEMENT AND MITIGATION

The various potential impacts to the biodiversity as set out in the EIA process were provided with numerous mitigation measures, and these are summarized below;

- Limit mine infrastructure, activities and disturbance in sensitive habitats
- Controlled access & zero tolerance of disturbances in sensitive habitats
- Re-establishment of protected, *Vachellia erioloba* & *Vachellia haematoxylon* trees
- Marking & protection of large established trees
- Management of grazing on the remaining portions of the project area
- Compile a Biodiversity Action Plan
- Alien removal & management programme
- Rehabilitation of all disturbed areas
- Removal of faunal species where possible and/or feasible prior to disturbance.

The significance statement for the impacts on biodiversity for this project was based on the implementation of the above management and mitigation measures.

REHABILIATION/RESTORATION

The original EMPr as well as the 2017 and 2021 amendments stipulates that all disturbed areas including the mine pit will be completely backfilled and rehabilitated to reflect the pre mining environment. The success of the rehabilitation affects the long-term impacts to the biodiversity. Successful rehabilitation to reflect a pre-mined state, will assist in mitigating the significance of impacts to the biodiversity.

3.1.2. CONSIDERING OFFSETS

The need for offsets does not depend on the scale or nature of the particular development, but on the significance of residual negative impacts on biodiversity and ecosystem services predicted as a result of that development. Biodiversity offsets should be considered to remedy residual negative impacts on biodiversity of 'medium' to 'high' significance.

Residual impacts are defined as those impacts that remain following the implementation of the mitigation measures proposed.

The Original EMPr (Metago, 2007) states that the significance of the impact on land related habitats and species is HIGH without Mitigation Measures, reducing to MEDIUM with the management and mitigation actions listed in the specialist reports and EMPr. It further states that the impact on water resource related habitats and species is MEDIUM without management actions, reducing to LOW with the management and mitigation actions listed in the specialist reports and EMPr.

The need for a biodiversity offset is determined by the significance of residual impacts as follows;

- Residual impacts of **'very high' significance** are a fatal flaw for development. Impacts would in all likelihood lead to irreplaceable loss of biodiversity, and/ or irreversible deterioration in valued ecosystem services, and therefore should not be authorised;
- Residual impacts of '**medium' to 'high' significance** should trigger a requirement for a biodiversity offset; and
- Residual biodiversity impacts of **'low' significance** would usually not require offsets, provided that all factors informing the evaluation of impact significance have been considered

Accordingly, as the residual biodiversity impacts are of 'medium' significance the project should trigger a biodiversity offset. Which is why a biodiversity offset was designed and executed for this project at this stage.

Subsequent to this, the mine has applied for an amendment to the original EMPr to extend its mining and infrastructure areas in 2017 and have now applied again (2021) to amend the mining and infrastructure area. The Biodiversity and Freshwater Assessment (EMS 2021) undertaken as part of the impact assessment process for the Environmental Management Programme (EMPr) amendment application lists the impacts to the biodiversity (particularly with respect to the loss of floral SCC) for the amendments after mitigation as being of MEDIUM significance.

3.1.3. ADDITIONAL INFORMATION, ASSUMPTIONS, LIMITATION & UNCERTAINIES

The 2009 offset report states that the mining operation/footprint was set to cover 900ha of which 100ha would consist of mining related infrastructure. The 2017 amendment included additional waste rock dumps and an extension of the open pit to the west. The 2021 amendment application included additional areas for the waste rock dumps and infrastructure. Thus, the amendment applications have resulted in the disturbance area being increased by approximately 1950 Ha from the original 900[6]ha for which the offset was planned.

The term 'No Net Loss' (NNL) is defined as the outcome of an offset where there would be no loss of a vegetation type, habitat or feature beyond the scientifically established conservation target for that feature. For NNL, we assume that provision is made for a budget to ensure that the biodiversity values of that species, or habitat or feature, is maintained in the long term. However, in the absence of regional fine scale mapping, the determination of No Net Loss is not possible at fine scale vegetation community level or species level. No net loss of protected trees cannot be adequately tested as the extent of the resource is not known and has not been mapped or quantified.

The vegetation communities outside the boundary of the mine have not been mapped, therefore the effects of indirect impacts such as dust and water draw down outside the boundary of the mining right application

[6] Although the approved disturbance area for the original EMPr in 2007 was recorded as 950 Ha the 2009 Biodiversity Offset was calculated for a 900 Ha disturbance footprint.

area cannot be accurately offset as the resource beyond the mining area is unknown. The offset is determined based on the direct impacts associated with the mine footprint.

3.2. QUANTIFYING THE OFFSET

The objective of biodiversity offsets in South Africa is to ensure that residual impacts on biodiversity and ecosystem services that are of medium to high significance are duly compensated by developers in such a way that a contribution is made to implementing conservation plans to reach associated targets, and to safeguard valued ecosystem services.

Information used in the calculation of the required offset comprises:

- Determining the residual impacts on biodiversity. The area of individual biodiversity features (both biodiversity pattern and ecological process) predicted to be impacted by the development after mitigation (avoidance, minimization, rehabilitation);
- Determining the size of offset required by:
    - Deciding on the Basic Offset Ratio for each feature using the conservation targets for these features as per national and regional conservation planning exercises
    - Determining a Final Offset Ratio by applying multipliers for Risk and Uncertainty, Condition and Biodiversity Priority to the Basic Offset Ratio.

Offset ratio

The offset investigation in 2009 determined that an offset ratio of 1:1 would be suitable, which meant that as 900ha would be disturbed, 900ha would need to be offset. The offset ratio is re-examined in this document to ensure that all information is still relevant.

At present there is a draft National Biodiversity Offsets Policy Framework that has been developed by the Department of Environmental Affairs which governs the methodology for quantifying offsets in South Africa.

The quantum of biodiversity offsets in South Africa uses a basic ratio derived from a target which is in turn linked to the status of residually affected ecosystems. Multipliers are then applied to this basic ratio dependent on the onsite conditions, the affected biodiversity and the risks associated with the project.

This is calculated using the criteria described in the Table 1.1. Ecosystems or habitats are 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 ecosystem or habitat. The status of a habitat or ecosystem is based on how much of its original area still remains intact relative to various thresholds.

In terms of the criteria in Table 1.1, offsets are considered in terms of ecosystems or habitats as well as threatened species, important ecological processes and ecosystem services. In terms of the UMK Mine Right Area, there are no Critically Endangered, Endangered or Vulnerable Ecosystems. The habitat type within

this area (Kathu Bushveld) is listed as Least Threatened. The area does however contain an ESA and the basic offset ratio for an ESA is set at 5:1. Although only a very small portion of the development footprint actually falls within this ESA, this does still need to be taken into account when determining offset ratios.

Of specific concern within this area is the substantial number of protected trees that will be lost as a result of the mining and associated infrastructure. Offsets related to threatened species are usually not determined using an offset ratio but is guided by specific information on the species to inform an appropriate size and type of offset.

Unfortunately, the extent of the *Vachellia* woodlands within the region has not been adequately mapped. Very little information is available on the extent and distribution of these finer scale vegetation units for the region, which means that there is no information detailing how much of this resource is available and what has been transformed.

Setting targets for species is not a simple task as it depends on many factors including the type of distribution data available as well as the taxa under consideration. Ideally species targets should be population level targets. Setting population level species targets requires information on the distribution and abundance of species. Both *Vachellia erioloba* and *Vachellia haematoxylon* are categorised as Least Concerned on the South Africa Red List of Plants (SANBI 2017), they are however protected under the National Forests Act (Act 84 of 2998) (Protected Tree list of 2014).

The criteria used to select tree species for inclusion in the protected tree list are:

- Red List Status (rare or threatened species);
- Keystone Species Value (whether species play a dominant role in an ecosystem's functioning);
- Sustainability of Use (whether a species is threatened by heavy use of its products such as timber, bark etc);
- Cultural or Spiritual Importance (outstanding landscape value or spiritual meaning attached to certain tree species); and
- Other Legislation (whether a species is already adequately protected by other legislation).

In the absence of conservation targets for the *Vachellia* species, one can revert to the ecosystem data. The Kathu Bushveld is considered least threatened on a national scale. The required percentage of remaining habitat needed to meet the target is set at 16%. It is currently regarded as poorly protected as only 2.5% is formally protected. A revised conservation target for this exercise could include the initial national target plus a buffer to ensure that no habitat becomes endangered. Setting the target at 50% would likely ensure no net loss. A Basic Offset Ratio can then be assigned by reading it off against its corresponding target on the "No-Net- Loss up to a Target" graph. A 50% target would require a ratio of 1X.

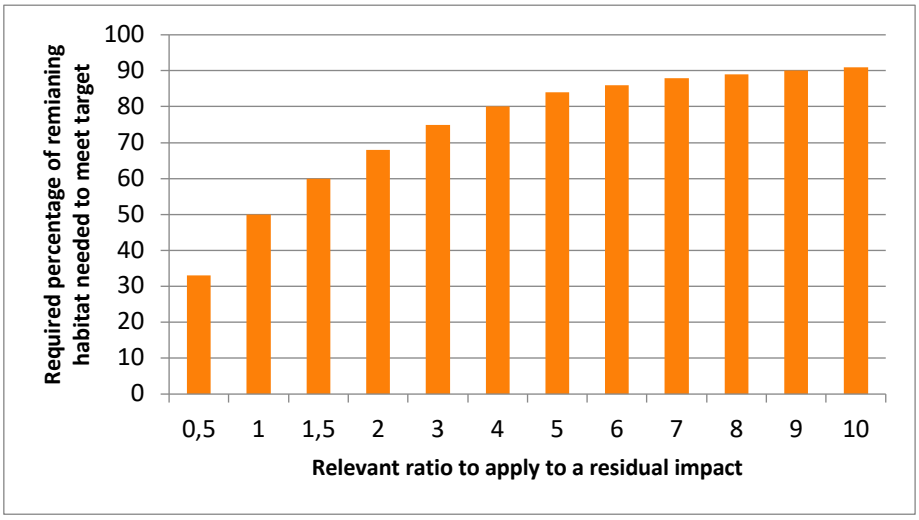

Figure 3.1: The No Net Loss up to a Target graph for determining Basic Offset Ratio

Offset ratios are often subject to other influences which act as additional multipliers to the basic offset ratio. These factors include;

Risks and uncertainties – the basic offset ratio can be multiplied to accommodate uncertainty regarding impacts, this can range from 1 to 2X. With comprehensive rehabilitation, biodiversity and ecosystem function should be restored without any evidence of the mining disturbance. There is always some risk that the area may not return to a pre-mined stated. This is particularly relevant in arid and semi-arid environments where the restorative processes are often very slow, and it can take several decades for a system to be restored. This risk is considerably reduced if active rehabilitation is undertaken, which is what is indicated in the EMPr and rehabilitation plan for the mine.

Condition of habitat – this multiplier caters for differences in condition of the habitat impacted. The condition of the habitat within the project area is very similar to the condition of the habitat in the surrounding area. If the habitat within the development area was significantly better than in the surrounding area then an additional multiplier would be applicable, however this is not relevant in this case and a ratio of 1x can be applied.

Biodiversity priority – This multiplier recognizes the biodiversity priority of certain areas in published bioregional or systematic biodiversity plans. The value can range from 1 to 2X. If a vegetation type fell within a CBA or contained critical habitat for a threatened species it would require an additional multiplier. As the condition of the habitat within the ESA is considered poor/degraded it is not necessary to apply an additional multiplier to the basic ratio for the ESA.

Multiplying the Basic Offset Ratio by the Risk and Uncertainty, Condition of the Habitat and Biodiversity Priority multipliers yields the Final Offset Ratio. The Final Offset Ratio is then multiplied by the size of the impacted area to give the required offset area in hectares.

Table 3.1: Offset Summary Table

Vegetation type	Conservation status	Conservation target NBA 2018	Critical Biodiversity Area	Residual loss (Ha)	Final Offset Ratio	Offset required (Ha)
Kathu Bushveld	Least Concerned	16%	NA	3280,32	1	3280,32
Kathu Bushveld	Least Concerned	16%	ESA	68,68	5	343,4
Total				**3349**		**3623,72**

3.3. VERIFYING THE SUITABILITY FOR AN OFFSET

Biodiversity Offsets is a growing science and mechanism, around which there is draft policy and much theory but limited structure in the implementation in South Africa. The onus therefore rests on all role-players to arrive at an offset that gives effect to the principles set by the policy and are yet also practical and implementable.

The idea of biodiversity offsets is controversial to some in the conservation community; the fear is that the use of offsets could encourage regulators to allow projects with severe impacts on biodiversity to go ahead if they offered offsets to compensate and allow companies to leave significant impacts in areas affected by projects as long as they undertook conservation work elsewhere.

By advocating for strict adherence to the "mitigation hierarchy" this concern can be somewhat addressed. As the role of biodiversity offsets is as a "last resort", after all reasonable measures have been taken first to avoid and minimize the impact of a development project and then to restore biodiversity on-site.

Environmental Authorisation was given for this project with the requirement to fulfil the obligation of an offset. An offset was designed and implemented for the project as presented in 2009. The proposed amendments in 2021 changed the scope of the project and therefore the mine is required to undertake an additional EIA process to ensure that the impacts resulting from the proposed changes are addressed and that suitable management and mitigation measures are implemented for the proposed changes. Similarly, the biodiversity offset requirements should also be investigated to ensure that the offset signed off is still appropriate given the change in project scope.

The increase in the disturbance footprint of the mine significantly alters the number of protected trees that will be removed. The areas for the waste rock dumps falls within medium-high and medium sensitive areas. These areas have a higher conservation priority because of the presence of large numbers of protected tree species. The density of these protected trees varies greatly within the area but can be as high as 25 trees/ha for *Vachellia erioloba* and up to 45 trees/ha for *Vachellia haematoxylon*. Thus, for every additional 100ha that is cleared as part of the extended mining area, an additional loss of 2500 protected *V. erioloba* trees and 4500 protected *V haematoxylon* trees could result. The additional disturbance area should therefore be included in the overall offset area calculation to ensure these additional losses are taken into account.

The proposed amendments affect the offset calculation in terms of area of disturbance as well as offset ratio and this results in an increase in the scope of the required offset from what was calculated for the original mining EMPr.

The introduction of additional offset requirements presents numerous challenges. One of which is that the original offset was a biodiversity study. It is neither practical nor feasible to add to this offset option and therefore a new offset option needs to be implemented. As the original loss of biodiversity has already been offset, the updated offset should offset only the additional biodiversity loss.

	Area of impact	Size of total offset	Area already offset	Size of additional offset
UMK Mine	3349 ha	3623,72Ha	900 Ha	2723,72 Ha

3.4. DESIGNING AN OFFSET

Internationally biodiversity offsets are currently used in reference to both like-for-like exchange for land, trading up to a higher conservation value habitat, and activities such as funding of biodiversity research, provision of financing for protected areas or support for capacity building in government agencies.

Three offset options were presented in the original offset investigation report, namely a biodiversity study, an offsite offset and a like for like onsite offset. These were presented to a variety of stakeholders for comment and it was determined that the most suitable offset for the 900ha of disturbance would be a biodiversity study. The biodiversity study was subsequently approved and was completed in July 2013, thereby satisfying the requirements for an offset for the project as presented in 2009.

As the original offset was in the form of a biodiversity study it is not feasible to add onto the original offset and therefore an additional option should be considered.

Offsets should be located in the landscape to :

- Be in the same bioregion, vegetation or ecosystem type and, preferably, the same quartinary catchment as the impact site;
- Consolidate or buffer existing protected or priority conservation areas and/or minimize fragmentation of habitat;
- Make a maximum contribution to securing, protecting and/or linking biodiversity priority areas, and consolidating ecological corridors in the landscape identified in the provincial biodiversity plan, bioregional or other provincial or municipal biodiversity plans, SDF, EMF, fine scale plans, (etc.);
- Provide habitat for threatened species that would be adversely impacted; and
- Provide comparable ecosystem services specifically to those parties adversely affected by impacts on ‘their’ ecosystem services;

3.3.1 REGIONAL INTEGRATED ENVIRONMENTAL MANAGEMENT PLANNING

The study area falls within the John Taolo Gaetsewe District Municipality (JTGDM). The Integrated Development Plan 2019-2020 has been adopted, the area has a Rural Development Plan 2016, an Integrated Environmental Management Plan (approved 2011) and a Local Economic Development Strategy (2009).

The Spatial Development Framework review (SDF 2017), the Strategic Environmental Assessment SEA) and the Integrated Environmental Management Programme (IEMP) for the area indicate that there is a serious need for environmental awareness and education programmes throughout the District Municipal Area and its municipalities.

The SDF states that the iron and manganese mining in the JTGDM, which is predominantly located in the area between Sishen/Dingleton and Hotazel, impacts directly on the vegetation through

- the sterilisation of soil underneath mine dumps while mines are operational;
- the absence of and low quality of land rehabilitation, should it be undertaken, after mine closure.

The roads and railways associated with the mining activities also cause fragmentation of natural habitats and ecological corridors, while the dust and other hazardous emissions from mining operations and mining trucks, have a severely negative impact on the environment.

The JTG SDF Review (2017) states that apart from the Kathu Forest (2,245 ha) and Tswalu Private Nature Reserve (100,000 ha), no protected areas are present in the District. It does state, however, that it could be argued that game farms are private conservation efforts. It is noted that there were 22 hunting farms and lodges within the JTGDM in 2011. The NPAES have identified a focus area for protected area expansion within the JTGDM.

3.3.2 OFFSET OPTIONS

LIKE FOR LIKE OFFSET

Biodiversity offset policies around the world are often based on the principle of 'LIKE-FOR-LIKE or better'. The outcome is to offset the biodiversity components to be impacted by targeting the same biodiversity components elsewhere (an 'in-kind' offset).

It is assumed that the area adjacent to the proposed mining area contains that same local scale plant communities and habitat that will be lost through the process of mining. Thus conserving an area adjacent to the mining area will ensure that the specific loss to biodiversity through mining will be offset, as the exact same communities and habitats will be conserved rather than conserving areas removed from the impact

site that may be slightly different. There is some uncertainty in the literature whether protecting land that is similar to the land being developed is as ecologically meaningful as creating offsets on the actual site being developed.

In general, the term "offset" is understood to refer to a conservation activity that takes place outside the geographic boundaries of a development site in order to compensate for unavoidable harm, in addition to any mitigation or rehabilitation that may take place on that site. However, some developers may own large plots of land and in some circumstances it is appropriate for biodiversity offsets to be undertaken on land that would not otherwise be conserved within a property, as a way of offsetting development activity on another part of the property.

In theory conserving the area adjacent to the mine results in the exact habitat (in terms of species composition and condition) that will be lost, being conserved. If an on-site offset is considered, the conservation area will be located next to a mine as well as several other active mines in the immediate vicinity. One of the major draw backs of an on-site offset is that they are at risk of edge effects from the activity. Some of the offset area is likely to be impacted by indirect impacts from the mining activity. This presents problems with respect to the long-term sustainability of the offset conservation area, as well as isolating the offset conservation area from linking ecological corridors. However if other mines in the immediate area also develop on-site offset areas, there is an opportunity to create linking corridors between these offset sites, which could result in a meaningful conservation initiative.

TRADING UP –OFFSITE OFFSET

This would entail conserving land within the Kathu Bushveld considered to have a higher conservation value than the Kathu Bushveld within the proposed mining area ie, conserving the Kathu Bushveld in another area that has been less disturbed and degraded. Trading up by conserving Kathu bushveld in better condition elsewhere, if possible, would compensate for biodiversity loss and facilitate in achieving not net loss. It is also best if the offset is a part of an existing conservation area or earmarked for declaration as a protected area.

Existing conservation areas in the Kathu Bushveld include the Kathu Forest and Tswalu Private Reserve. Options for these areas would include buying land to expand their conservation areas, if required. The exact plant communities that will be affected by this development may not be directly offset by this option as these areas are somewhat removed from the project site, but they do contain the protected plant species that require conservation.

As a focus area has been identified adjacent to the mine area, namely Tswalu Private Reserve . This area has already been ear-marked as an area in which to expand the protected areas network for the region, and thus is considered a suitable area for the protection of the Kathu Bushveld and thus a suitable offset area.

Either option (onsite offset or offsetting within a focus area) would require assistance and guidance from the Department of Nature Conservation to ensure it will form part of a greater conservation initiative, to ensure holistic conservation value and sustainability in perpetuity.

3.5. CONCLUSION & WAYFORWARD

The scope of this report is not to present a suitable offset but to investigate the need for an additional offset requirement and conceptualize that offset requirement.

The investigation has established that there is a need for an additional offset given the change in project scope. As Offsets are considered a final step in the mitigation hierarchy the inclusion of an offset design into the EIA process is essential. Reliable, quantified information on residual negative impacts should be required as part of the EIA prior to decision-making to enable inclusion of clearly defined offset conditions into the authorisation.

The next step in the offset process should be the identification of a suitable offset with input from various stakeholders once this has been achieved a management and implementation plan can be produced for the approved offset.

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APPENDIX 1

CURRICULUM VITA

NATALIE VIVIENNE BIRCH

Date of birth: 21 August 1972

QUALIFICATIONS

BSc (Hons) Wildlife Management, Pretoria University
PhD (Rhodes University)

DISSERTATION

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

THE SOUTH AFRICAN COUNCIL FOR NATURAL SCIENTIFIC PROFESSIONS

I am registered as a Professional Natural Scientist Reg No. 400117/05

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

1998 – 2000 Eastern Cape Parks Board (formerly Eastern Cape Tourism Board)

While working for the Eastern Cape Parks Board I produced management plans and condition assessments for their major game reserves. This included, general veld surveys, setting up monitoring systems and undertaking carrying capacity studies. I was solely responsible for designing the surveys including use of the appropriate techniques, field recordings, data capture and analysis, interpretation and report production. I also managed the large Black Rhino Introduction programme in conjunction with KZN Wildlife, this included setting up a long term monitoring programme for the Rhino. I was responsible for co-ordinating and assisting with research programmes undertaken by various universities within Double Drift Game Reserve.

2000 -2002 Coastal & Environmental Services

While working for Coastal & Environmental Services I was involved in undertaking a number of Environmental Impact Assessments and biodiversity specialist studies both Nationally and Internationally.

(2003 – present) Ecological Management Services

I am a founding member of Ecological Management Services, which is based in Kimberley, and we specialise in ecological management and impact assessment. 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 provide specialist ecological input to various types of projects and have formulated biodiversity offset studies required to offset impacts from large developments. We also produce habitat assessments, business plans and risk assessment within the game ranching sector.

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.

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LIST OF CURRENT AND RECENTLY COMPLETED PROJECTS

SLR Consulting- Biodiversity Specialist survey for Kudumane Mine
Biodiversity Offset for Kudumane Mine
Biodiversity Specialist survey for Mokala Mine
River diversion rehabilitation plan for Mokala Mine
Biodiversity Specialist survey for UMK mine
Biodiversity offset for UMK mine

Biodiversity action plan for UMK Mine

Biodiversity Specialist survey for Ntsimbintle Mine

Biodiversity Offset Tshipi É Ntle Manganese Mining (Pty) Ltd

WSP Environmental —Floral survey for Kalahari Solar Power

BHP Billiton World Exploration Inc - The Daniel Project

Damara Lodge Habitat Assessment

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 HA

Sjibbolet Trust—Hartsvalley HA

Raltefontein HA

Kalahari Oryx Game Reserve—Specialist Vegetation survey

BAR - Department of Agriculture Northern Cape—Vaalharts Olive Orchard

BAR - Department of Agriculture Northern Cape—Hopetown Piggery

BAR - Department of Agriculture Northern Cape—Phillipstown Piggery

BAR - Department of Agriculture Northern Cape—Chikiana Piggery

BAR - Department of Agriculture Northern Cape—De Aar Hydroponics

BAR - Sidi Parani—Fertilizer granulation plant - Christiana

BAR - Eggstreme – Egg production facility – Jan Kempdorp

BAR - Tsantsabane Petrol Station - Kuruman

EIA – Development of Irrigation Ground on Openwater

EIA - Tiaan Trust—Development of irrigation ground

EIA - Koppieskraal Plase Rietrivier Beperk—Development of irrigation ground for seed potatoes production

EIA - Genade Boerdery (PTY) Ltd—Development of irrigation ground for growing of crops

EIA - Santarose Investments (Pty) Ltd - Development of irrigation ground for seed potatoes production

EIA - Valrena Trust—Development of irrigation ground for growing of crops

EIA – Wildeklawer - Development of irrigation ground for growing of crops

EIA - Idstone Pty Ltd—Development of irrigation ground for the growing of seed potatoes

EIA - GWK Pty Ltd—Development of irrigation pivots and vineyards