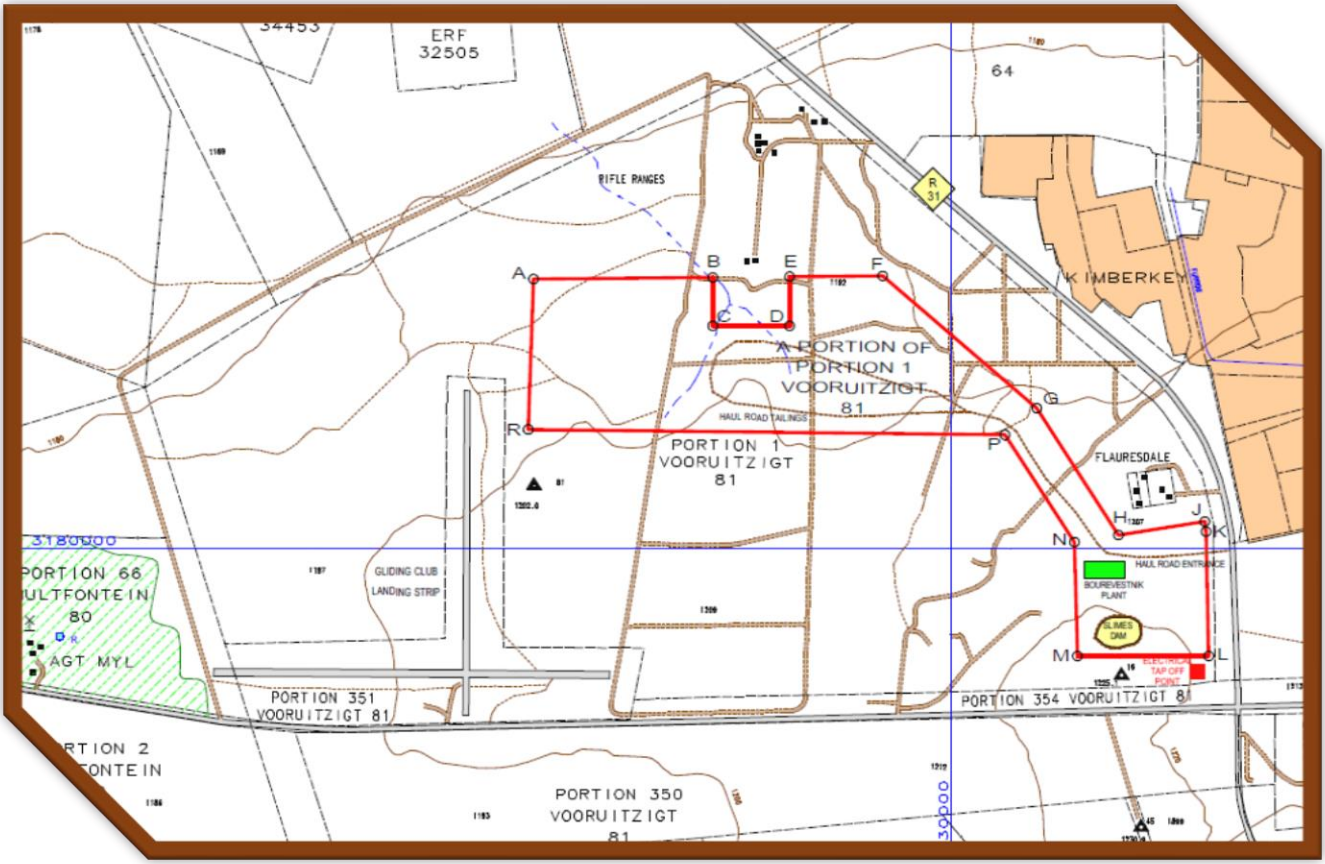
ECOLOGICAL SPECIALIST STUDY FOR THE PROPOSED MYSTIC PEARL 157 (PTY) LTD DIAMOND MINE PROJECT ON PORTION 1 OF FARM VOORUITZIGT 81 & CONCURRENT DEVELOPMENT OF OTTO'S KOPJE DIAMOND MINE, KIMBERLEY DISTRICT, NORTHERN CAPE PROVINCE

Environmental Impact Assessment Report

AUGUST 2017



CLIENT	SPECIALIST
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EXECUTIVE SUMMARY

An ecological specialist study has been undertaken to assess the potential impacts on local ecological aspects associated with the proposed Mystic Pearl 157 (Pty) Ltd diamond mine project on a portion of Portion 1 of the farm Vooruitzigt 81 and the concurrent rehabilitation of the historical Otto's Kopje Mine Dumps in the Kimberley district, Northern Cape Province. A site visit was undertaken on 13 July 2017.

The approach taken for this study was to identify any issues of conservation concern that could potentially occur in the ear-marked and immediately surrounding area that may use the site for some purpose. Literature sources, museum records and databases containing distribution records for all faunal species were consulted to compile a list of species of conservation concern that have a likelihood of occurring on the site. Species with a distribution range that included the site were evaluated to determine whether the site was likely to contain these species. This information was then ground-truthed during a site inspection.

Current literature, conservation assessments, museum records and information from various past surveys in the region by the specialist, together with the site visit indicated an approximate total of 242 bird, 54 mammal, 48 reptile and 13 amphibian and uncalculated arachnid naturally-occurring species to have been recorded in the region. After analysis, an approximate total of 28 bird, four mammal, one reptile, one amphibian and about seven arachnid species of potential conservation significance are thought to potentially occur in the general area. Of these, only 16 species are likely to occur either transiently or permanently in the immediate area because of extensive and ongoing habitat transformation by local urban and mining activities.

Nine potential impacts of the project are identified and discussed. Mitigation measures are suggested for the various phases of the project. Although the factors identified and discussed could negatively impact on faunal species and biodiversity in general, the investigated area is not unique in terms of species diversity and eco-status within the region, and has already been significantly altered to the degree that very little represented natural or original vegetational structure remaining. Development of these specific sites will not have significant impact on the overall distribution, the survival or dynamics of the encountered fauna and flora.

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1. INTRODUCTION

1.1 Background

Mystic Pearl 157 (Pty) Ltd (2007/00634/07) has obtained the prospecting rights in terms of the provisions of Section 2.2 of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) and intends submitting a diamond mining right application to develop a new mine on a portion of Portion 1 of the farm Vooruitzigt 81, whilst and concurrently developing and rehabilitating the historical Otto's Kopje Diamond Mine site in the Kimberley district, Northern Cape Province. Mystic Pearl owns 100% of Otto's Kopje, and the company is 64% owned and driven by Gilmar Corporation. The balance is held by two parties of which 26% is owned by a Black Empowerment group. The faunal Environmental Impact Assessment (EIA) process was initiated by Mr Frank Crossley in July 2017.

As stipulated by Chapter 5 of the National Environmental Management Act, Act No. 107 of 1998, various specialist studies should be conducted. Beryl Wilson, a zoologist and conservation biologist employed by the McGregor Museum in Kimberley, Northern Cape was consulted for an ecological appraisal of the species concerned and a specialist opinion. This consultant has over 30 years of zoological and ecological experience in the region.

The report intends to meet the requirements of Section 32 of Regulation 543 of NEMA. The study investigated the potential impacts that the proposed mining project could have on the birds, mammals, reptiles and amphibians, as well as selected arachnid species in the immediate area and surroundings.

1.2 Scope and limitations

1.2.1 Scope of work

The scope of work was to undertake an ecological specialist study involving the following:

- Baseline assessment of faunal species in and around the project location - includes all bird, mammal, reptile and amphibian species and selected arachnids (scorpions and mygalomorphic or long-lived primitive spiders)
- Identify assumptions made pertaining to the presence of certain species in the area
- Description of the nature of expected effects of the project at the site
- A sensitivity analysis of the habitat and species present
- The identification and quantification of current and future risks if need be
- Suggest possible mitigation measures including a monitoring programme

1.2.2 Approach

Assessing the impacts of a proposed project often requires evaluating the conservation value of the site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site and the species found within it includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?

- Is the protection of biodiversity features on site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach and angle adopted for this type of study is to identify any potential faunal species that may be affected by the proposed mining project at the identified location. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species, the presence of which are most likely to be negatively impacted upon in an ecological sense.

This focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

- Northern Cape Nature and Environmental Conservation Ordinance 19 of 1974
- National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
- National Environmental Management Biodiversity Act, 204 (Act 10 of 2004),
- Threatened or Protected Species Regulations with updated species lists 2007 (ToPS 2007).

1.2.3 Limitations

The designation of Red Data species status reflects the viewpoint mainly from a South African perspective and this data should be viewed with caution because national and international lists vary considerably and are also reviewed on a regular basis.

Red Data List species are, by their nature, usually very rare and difficult to locate. Compiling the list of applicable species that could potentially occur in an area is limited by a paucity of records that make it difficult to predict whether a species may occur in an area or not.

The methodology used in this assessment is aimed at reducing the risks of omitting any species, as well as including others unexpectedly. However, predictions based on experience of these and similar species cannot be expected to hold true under all circumstances, particularly in the instance of highly mobile fauna such as larger mammals, birds and bats. As a result, risk mitigation strategies are generalised to include all fauna unless specific species or taxa have been identified for targeted mitigation.

The Northern Cape region in general, has little long term, verifiable data available on species distribution on a micro-habitat level. Gap analysis data to identify gaps in conservation lands where significant plant and animal species and their habitat or important ecological features occur is limited, unanalysed or currently unpublished.

This report was undertaken at a desktop level scoping report and a winter site visit on 13 July 2017, together with information provided by the client. This is considered adequate for assessing the major issues associated with the impacts of the current project activities and those envisaged for the immediate future on the relevant fauna in the area. The specialist is not able to comment on aspects of the project for which no or limited information were received or indicated.

1.3 Methodology

To specify and describe the specifics at the site satellite imagery from Google Earth and 1:50 000 topocadastral maps and previous specialist reports were examined. A guided site visit was conducted on 13 July 2017.

Only species of conservation importance deemed to be occurring on the sites or immediate surroundings will be discussed in detail. The purpose of listing Red Data species is to provide information on the potential occurrence of species of special conservation concern in the area that may be affected by the proposed mining activities. Species appearing on these lists could then be assessed in terms of their habitat requirements and general ethology (behaviour) to determine whether any of them have a likelihood of being adversely impacted.

Lists of threatened animal species that have geographical ranges that include the project areas were obtained from museum databases and also from literature sources (listed in reference section). The likelihood of any of them occurring was evaluated based on habitat preference, and habitats available at the proposed sites. The three parameters used for each species were as follows:

- Habitat requirements: most Red Data animals have very specific habitat requirements and the presence/absence of these characteristics within the project locations area were assessed
- Habitat status: if available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species
- Habitat linkage: movement between areas used for breeding and feeding purposes forms an essential part of the ecological existence of many species. The connectivity of the proposed project area to these surrounding habitats and adequacy of these linkages was assessed for the ecological functioning of the Red Data species within the project locations.

For all the threatened or conservation-worthy species that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- LOW: no suitable habitats occur on site / habitats on site do not match habitat description for the species
- MEDIUM: habitats on site match general habitat description for species, but detailed microhabitat requirements are absent on the site or are unknown from the descriptions given in the literature or from the relevant authorities
- HIGH: habitats found on site match very strongly to the general and microhabitat description for the species.

1.3.1 Project location sensitivity analysis

The study site was evaluated in terms of the potential for containing habitat for animal species of conservation concern (Table 1). Any habitat considered important for species of concern was considered to be sensitive whereas habitat not important for species of conservation concern was considered to be not sensitive.

Table 1.1. Project location sensitivity analysis

SENSITIVITY LEVEL	DESCRIPTION
LOWER SENSITIVITY	Habitat with no breeding, inhabiting or foraging importance for animal species of conservation concern but adequate or suitable for species of Least Concern.
MEDIUM SENSITIVITY	Habitat with breeding, inhabiting or foraging importance for animal species of low conservation concern (Data Deficient, Near Threatened).
HIGHER SENSITIVITY	Habitat with breeding, inhabiting or foraging importance for animal species of high conservation concern (Critically Endangered, Endangered, Vulnerable or Protected).

1.3.2 Gap analysis

An elementary gap analysis was undertaken to ascertain whether the site falls within an area deemed as having relevant criteria such as irreplaceability of target biodiversity components, minimum effective size and viability requirements, migration requirements, integrity, essential ecological processes and/or ecosystem services for any of the local or regional applicable faunal species.

1.3.3 Assessment criteria for potential environmental impacts

The potential environmental impacts can be identified and evaluated according to their severity, duration, extent and significance. The following sections and tables (Table 2 to Table 7) will describe the various aspects in detail.

The confidence level (the specialist's degree of confidence in the predictions and/or the information on which it is based will be ranked Low, Medium or High.

1.3.3.1 Consequence (C) = $\frac{(\text{Severity} + \text{Duration} + \text{Extent})}{3}$

Table 1.2. Assessment and rating of severity

Rating	Description
1	Negligible / non-harmful / minimal deterioration (0 – 20%)
2	Minor / potentially harmful / measurable deterioration (20 – 40%)
3	Moderate / harmful / moderate deterioration (40 – 60%)
4	Significant / very harmful / substantial deterioration (60 – 80%)
5	Irreversible / permanent / death (80 – 100%)

Table 1.3. Assessment and rating of duration

Rating	Description
1	Less than 1 month / quickly reversible
2	Less than 1 year / quickly reversible
3	More than 1 year / reversible over time
4	More than 10 years / reversible over time / life of project or facility
5	Beyond life of project of facility / permanent

Table 1.4. Assessment and rating of extent

Rating	Description
1	Within immediate area of activity
2	Surrounding area within project boundary
3	Beyond project boundary
4	Regional / provincial
5	National / international

1.3.3.2 Likelihood (L) = $\frac{\text{(Frequency + Probability)}}{2}$

Table 1.5. Assessment and rating of frequency

Rating	Description
1	Less than once a year
2	Once in a year
3	Quarterly
4	Weekly
5	Daily

Table 1.6. Assessment and rating of probability

Rating	Description
1	Almost impossible
2	Unlikely
3	Probable
4	Highly likely
5	Definite

1.3.3.3 Impact significance = Consequence x Likelihood

Table 1.7. Assessment and rating of environmental significance

Environmental Significance	Description
L (1 – 4.9)	Low environmental significance
LM (5 - 9.9)	Low to medium environmental significance
M (10 – 14.9)	Medium environmental significance
MH (15 – 19.9)	Medium to high environmental significance
H (20 – 25)	High environmental significance. Likely to be a fatal flaw.

1.3.4 Biodiversity offset criteria

The need to offset the biodiversity impacts of a development will only be known once all the options and alternatives to prevent, minimise and mitigate the impacts have been identified and evaluated during the environmental impact assessment process and the residual impacts on biodiversity and/or ecosystem services have been found to be of 'medium' to 'high' significance.
There are three main types of offset that could be considered, namely:

- 'Like for like' habitats or ecological proxies: located either on the development site (on-site offset) or at a distance from that site (off-site offset),
- Trading up habitats: the securing and management of an appropriate area of habitat of a more threatened status or higher conservation priority than that impacted by development, or
- Monetary compensation: may include contributions to an accredited biodiversity conservation fund, revolving land trust or dedicated offsets fund, for the purpose of acquiring and managing additional priority habitat, or provision of finance for the expansion or management of public protected areas.

Biodiversity offsets are calculated by multiplying the residual loss by a basic offset ratio linked to the conservation status of the affected ecosystem, namely:

- Offset of **30:1** for residual impacts in Critically Endangered ecosystems
- Offset of **20:1** for residual impacts in Endangered ecosystems
- Offset of **10:1** for residual impacts in Vulnerable ecosystems
- **No offset** in Least Threatened ecosystems.

However, this ratio may need to be adjusted because of factors such as the condition of the affected habitat, the presence of threatened species or special habitats and other general biodiversity aspects of the area.

2. AREA DESCRIPTION

This chapter provides an overview of the general study areas in terms of those elements of the environment around which the desktop study has concentrated. Components that affect the available habitat for faunal species are discussed. Based on these elements, the potential occurrence of conservation-worthy species can be assessed.

2.1 Location and surrounds

The farm Vooruitzigt lies immediately north of the R64 (N8) road just west of Kimberley in the direction of Griekwastad (Figure 2.1). Otto's Kopje lies 3 km north east of this location across the R31 leading in the direction of Barkly West. Both sites fall in the quarter degree square (QDS) 2824 Da. For the purpose of this report, species data from QDS 2824 Db was also included in the assessment due to the proximity and adjacent ecological features that will be discussed later.

Figure 2.1 Google Earth satellite image of the proposed Vooruitzigt project location (shaded in white) and Otto's Kopje (shaded in blue).

2.2 Property size and infrastructure

The Vooruitzigt project site as indicated by the developers (Figure 2.2) will be 254 ha in extent. To the northwest is the SANDF military rifle range and the San community on the farm Platfontein that was relocated from Schmidtsdrift in the 1990s. Directly north is the unoccupied farm Wildebeeskuil. Adjacent to the entire eastern side of the project site is the township area of Galeshewe that forms the western parts of

Kimberley. To the western side are the municipal refuse dumping areas and the John West Airfield.

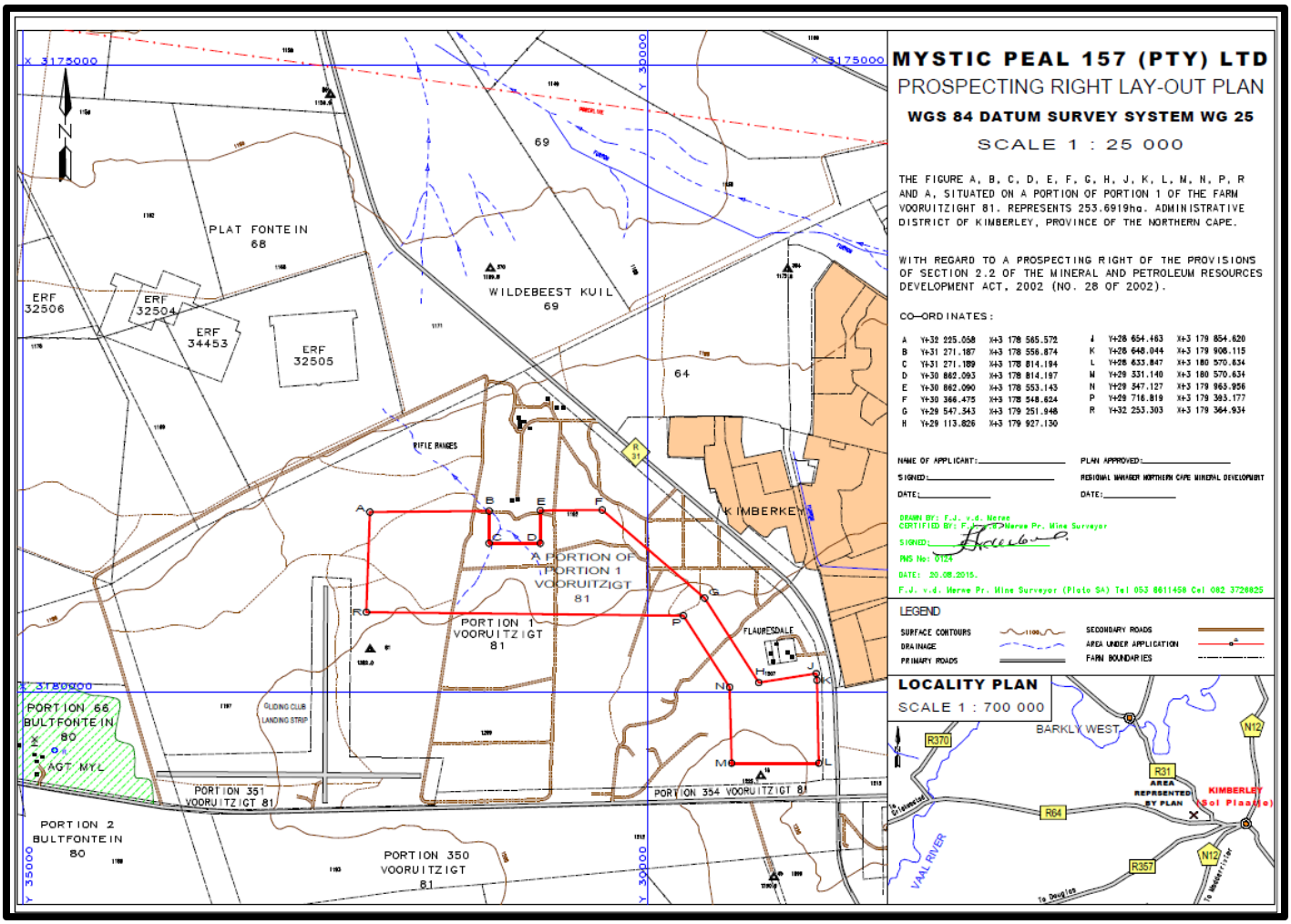

Figure 2.2 Locality map of the proposed Vooruitzigt project location indicated as a red outlined polygon (provided by the client).

Whilst there are no formal public access roads, the area is crisscrossed by unmaintained dirt roads (Figure. 2.3) and pathways.

The area is undeveloped but previously disturbed by large-scale and unrehabilitated mining activities (particularly in the southeastern areas of the proposed area), public fly-tipping and illegal waste dumping (Figure 2.4) as well as poaching, firewood collection and illegal grazing activities by local adjacent communities. There are no fully maintained fencing structures or excluded areas currently.

Figure 2.3 Typical dirt road on the site of the proposed Vooruitzigt project.

Figure 2.4 Much of the Vooruitzigt site is littered by the illegal dumping activities by local residents.

The original area of Otto's Kopje is 22 ha in extent and totally landlocked by urban developments in Galeshewe (Figure 2.5). The area is enclosed by fencing designed to restrict public access but is frequently breached. To the east and north runs the tarred John Daka Road, a main access road in the area. All other access roads surrounding the area are unpaved. The site has been mined historically and periodically from 1880 until 1934 when it was finally abandoned. The site has never been formally rehabilitated and is only partially reclaimed by local vegetation.

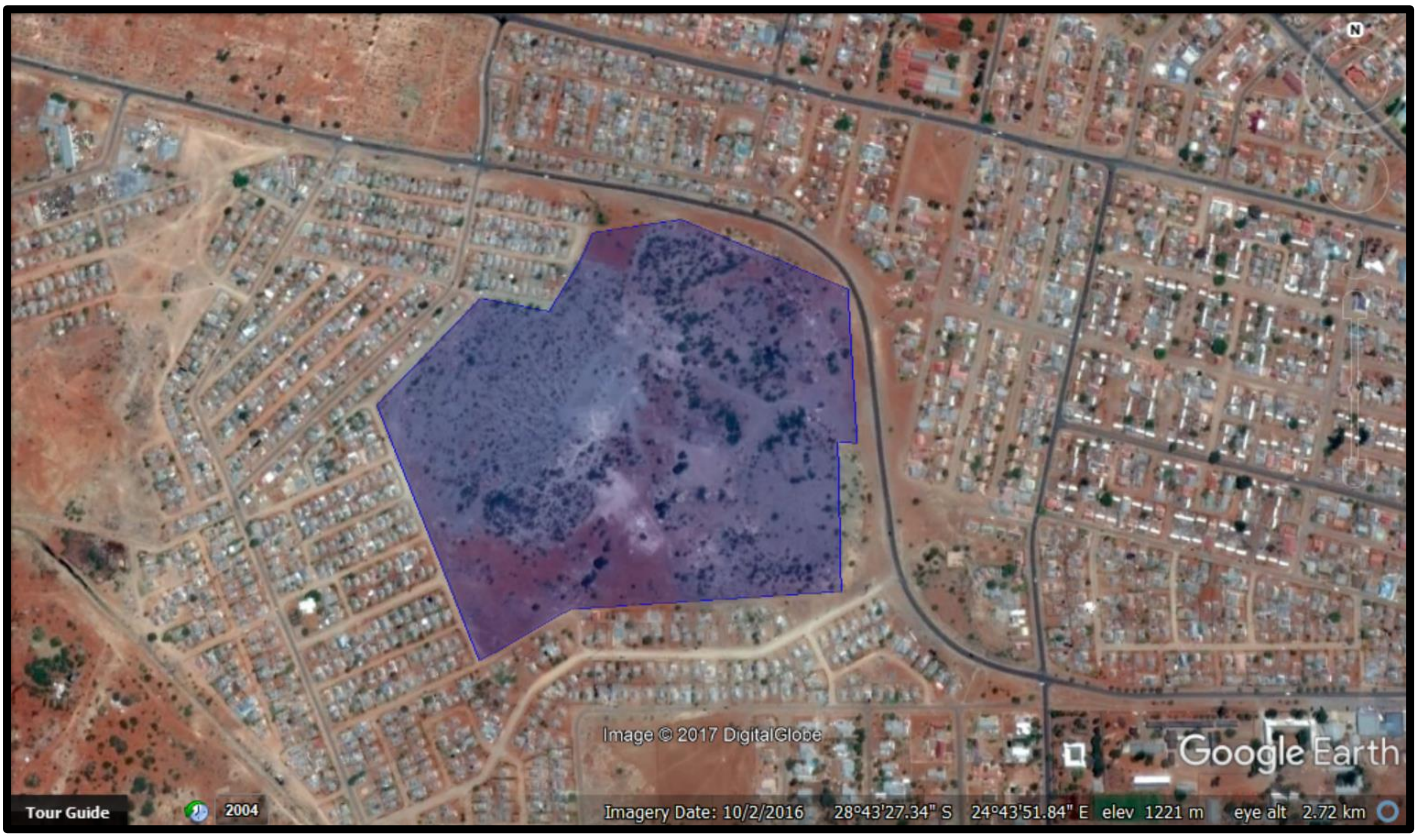

Figure 2.5 Google Earth satellite image of the historic Otto's Kopje mining site.

2.3 Topography

The topography of the project area is relatively flat, with only a few small undulating low hills at an elevation of 1 200 m above sea level. No significant drainage lines were noted but surface drainages in the northwestern area are indicated in the 1 : 700 000 topographical maps provided by the developer. However, as seen in Figure 2.6, the immediately adjacent areas 9 km to the north (Platfontein Pan) and 7 km northeast (Kamfers Dam) have significant water features that are fed by water runoff from this area as well as Kimberley waste water respectively.

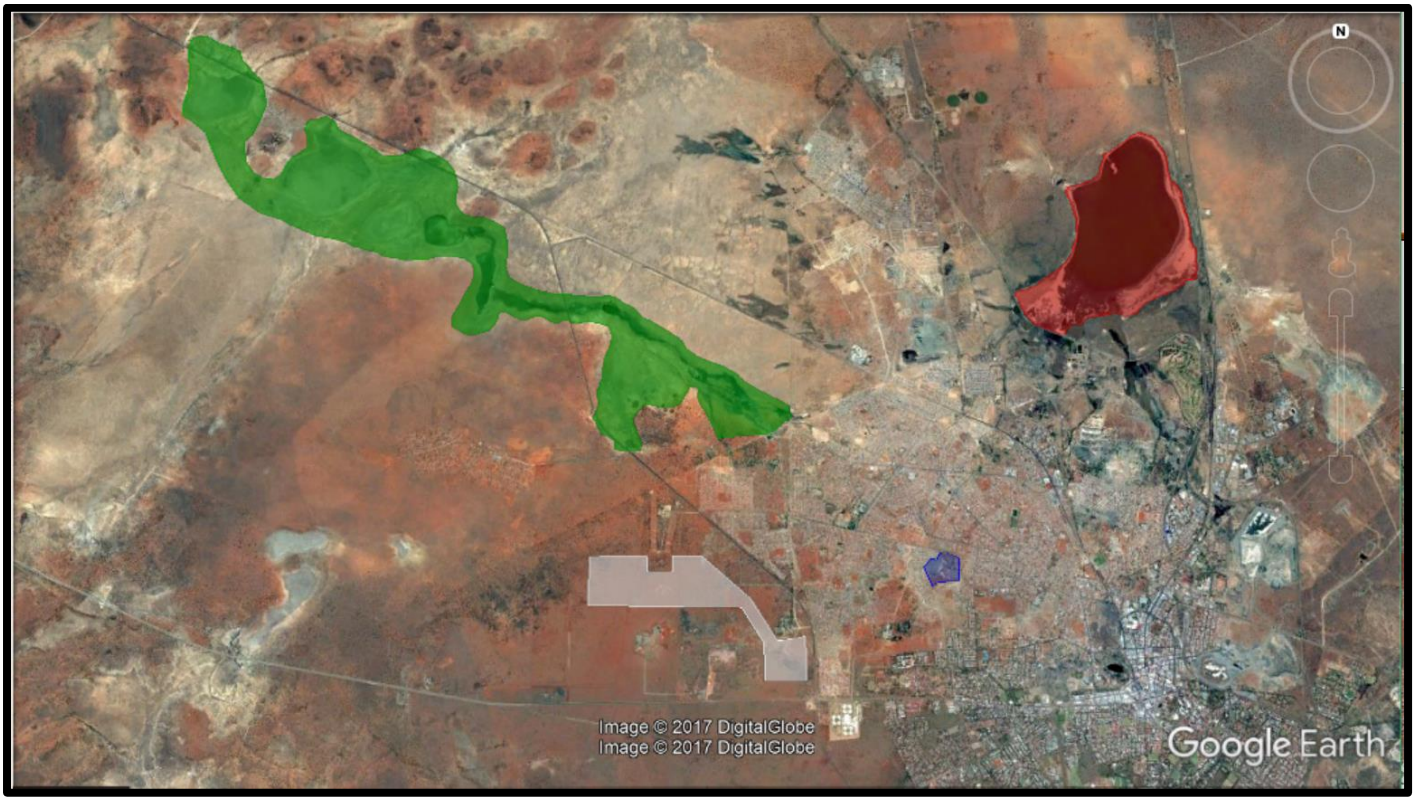

Figure 2.6 Google Earth satellite image of the Vooruitzigt project area (white polygon), historic Otto's Kopje mining site (blue shaded polygon), Platfontein Pan and wetlands (green shaded polygon) and Kamfers Dam and surrounding wetlands (red shaded polygon).

2.4 Geology

The dominate geology (Figure 2.7) in the area is rocky Karoo dolerite interspersed with sandy to loamy red soils are that overlie a shallow calcrete layer. The Kimberley area is synonymous for the multitude of diamond pipes and those associated with this project will the subject of a separate

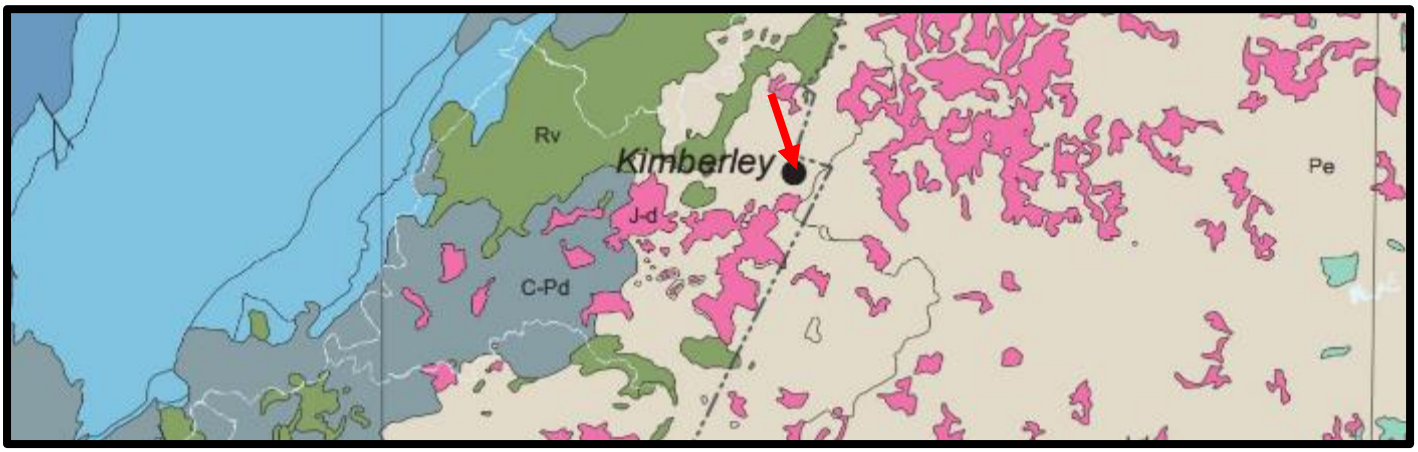

Figure 2.7 Dominant geology map for the proposed Vooruitzigt project area (red arrow) indicating Karoo dolerite (pink) and Ecca shales and sandstone (beige) that are predominantly dominant in the area (Council for Geoscience, 2008).

2.5 Climate

The regional climate in Kimberley is semi-arid and is characterised by low to average rainfall with a mean annual precipitation of around 530 mm per year, although this is highly variable (Figure 2.8). Most rain falls in the late summer months of January, February and March (https://www.worldweatheronline.com/kimberley-weather-averages/northern-cape/za.aspx) usually in the form of thunderstorms, whilst the lowest rainfall records are recorded for the months of June, July and August. Rainfall tends to vary widely over the years as is typical of most arid and semi-arid climates. An average annual precipitation is 283 mm with a high annual deviation. It is also locally highly variable.

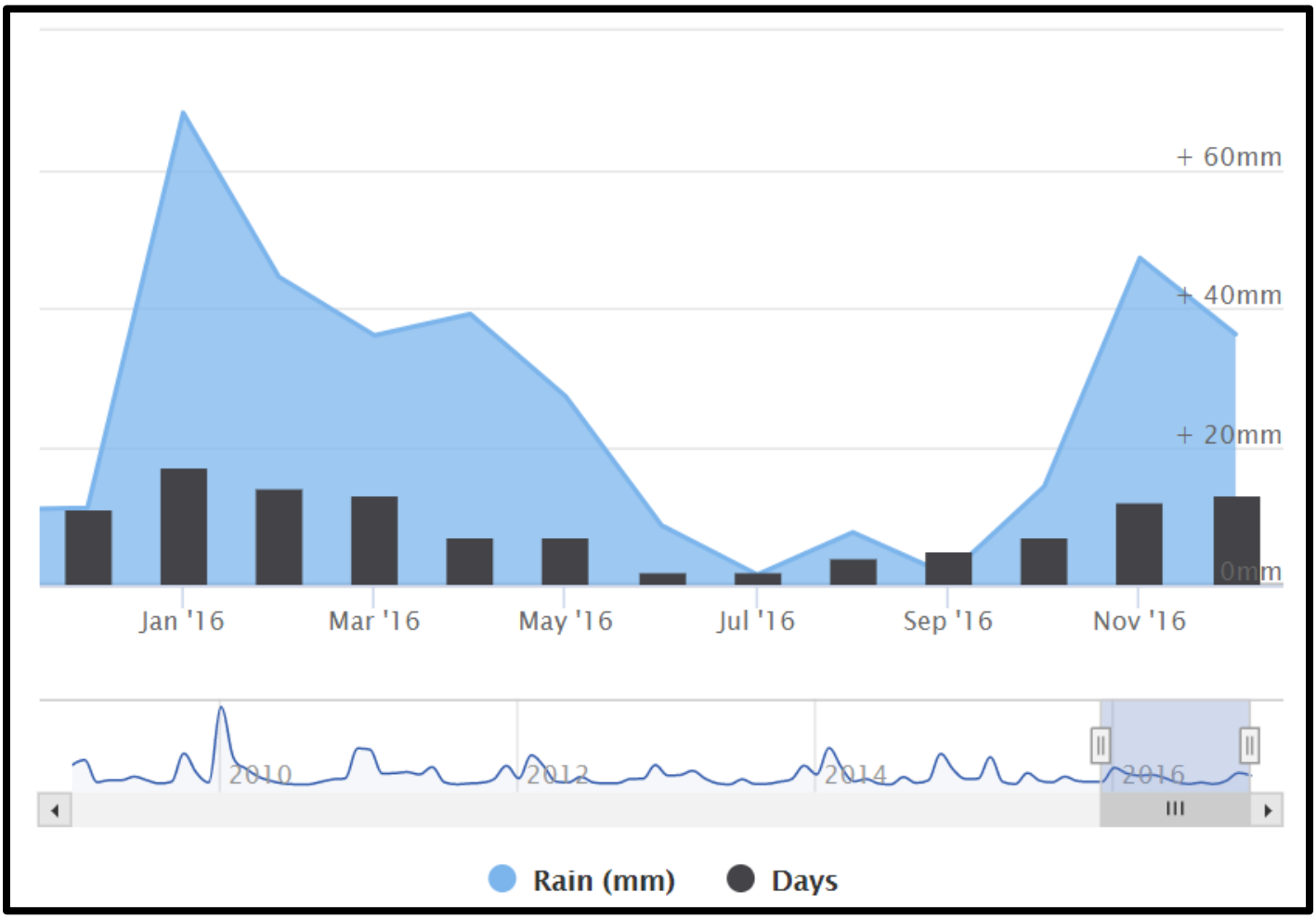

Figure 2.8 Rainfall records for the Kimberley area (https://www.worldweatheronline.com/kimberley-weather-averages/northern-cape/za.aspx).

Temperature plays an important role in the activities of many species, and extreme temperatures may prove a limiting factor for species not accustomed to them. The area can experience temperatures from between –5°C and +38°C (https://www.worldweatheronline.com/kimberley-weather-averages/northern-cape/za.aspx). As indicated in Figure 2.9, January is usually the warmest month in the general area with an average maximum temperature of 33°C and July is the coldest month with an average minimum temperature of 14°C. Frost is frequent in winter.

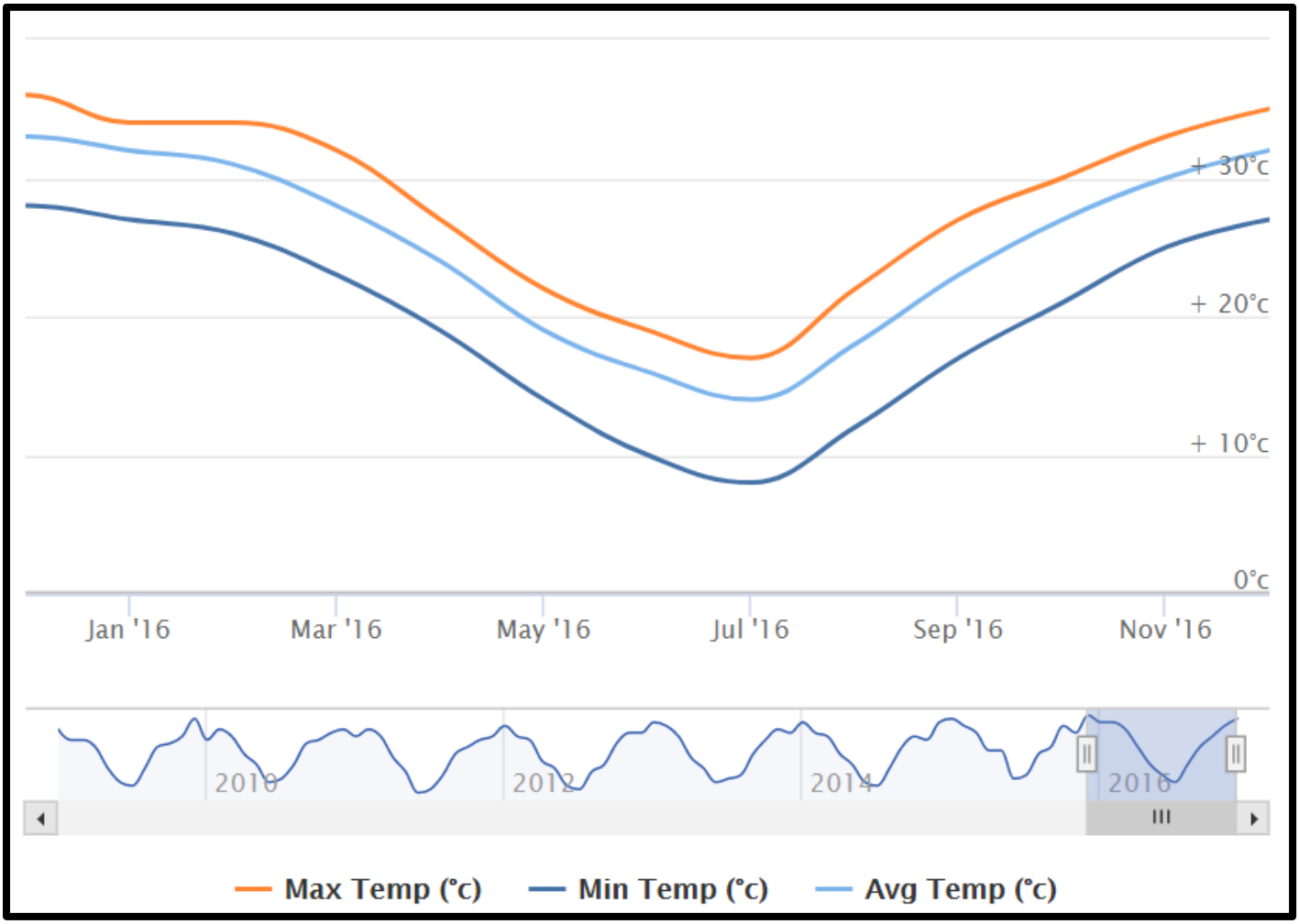

Figure 2.9 Temperature records for the Kimberley area (https://www.worldweatheronline.com/kimberley-weather-averages/northern-cape/za.aspx).

2.6 Bioregion

The Vooruitzigt project falls within the Savanna Biome as classified by Rutherford & Westfall (1994) (Figure 2.10). Although this biome covers some 46% of the southern African, it is highly variable in its geology, climate and soil types, which results in great variation in the vegetation structure as well as in the fauna it supports. More specifically, the area under survey is described as Kimberley Thornveld complex which occurs across three provinces (Northern Cape, Free State and North West) at altitudes between 1 050 to 1 400 m.

This veld type is currently listed in the Least Threatened category indicating that it has no significant conservation threats at present. The vegetation structure typically consists of very well-developed tree layer with *Vachellia (Acacia) erioloba*, *V. (A.) tortilis*, *V. (A.) karroo* and *Boscia albitrunca*, as well as a closed shrub layer and occasional dense stands of *Tarchonantus camphoratus* and *V. (A.) mellifera* where over-utilisation has stimulated bush thickening. *V. (A.) erioloba* is considered a keystone species as it maintains many other flora species which either grow in association with the trees, or faunal species which make use of the trees for food or shelter.

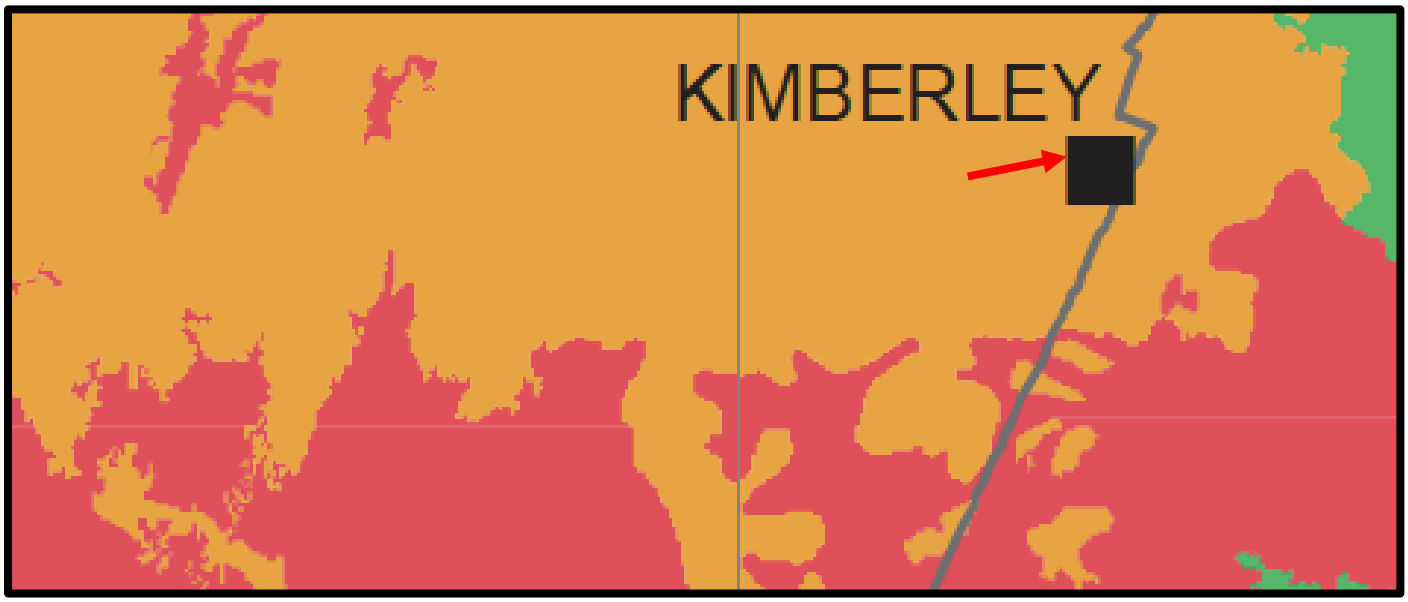

Figure 2.10 Simplified bioregion map with Savanna biome depicted in mustard and Nama-Karoo encroachment in pink with Vooruitzigt project area indicated by a red arrow.

Currently, due to historical disturbances at the Vooruitzigt project site as well as the current illegal wood-gathering activities, the area in general has been denuded of larger tree structures. The browsing and grazing activities of local livestock have also impacted on the vegetational structure and some areas show significant trampling.

In addition, one potentially sensitive site (apart from the already-mentioned water bodies in the area) was also identified near to the Vooruitzigt site. Just to the northeast of the site is a long stand of exotic gum trees *Eucalyptus sp*. (Figures 2.11 & 2.12). These trees that may potentially provide roosting opportunities for protected migrating kestrel species during the summer months.

Figure 2.11 Eucalyptus spp. *trees lining either side of the R31 to Barkly West.*

Figure 2.12 Eucalyptus sp*. trees stand to the northeastern side of the Vooruitzigt project site.*

2.7 Proposed mining project

The full details of this mining venture have not been made available to the specialist at the time of the report compilation process. However, discussions during the guided site visit and some additional maps provided by the clients indicate that there are two aspects to this proposed project, greenfield and brownfield mining, with simultaneous backfilling of the Sol Plaatje Municipality landfill site just west of the processing plant.

2.7.1 Vooruitzigt

Whilst section areas have already been mined previously in and around the proposed areas on Portion 1, much of this project will be greenfield diamond mining. As can be seen in Figure 2.13, much of the planning for excavation, haulage roads and positioning of the slimes dam and sorting plant have been designed around existing dirt roadways and near established power sources.

The Russian-made Bourevestnik X-ray sorter is widely used in the diamond production industry due to its high recovery rate, effective concentration, low operational costs and low environmental impact. They are reported to use 50% less power and water when compared to dense-media separation plants. Maintenance, labour and system downtime are reduced by at least 30% (Odendaal, 2011). In addition, the clients have indicated that they intended establishing a solar plant to meet the operating needs of the processing plant to reduce costs and dependency on the existing electrical structures.

The entire project will be appropriately fenced and secured. Additional infrastructure has not been indicated to the specialist at this point.

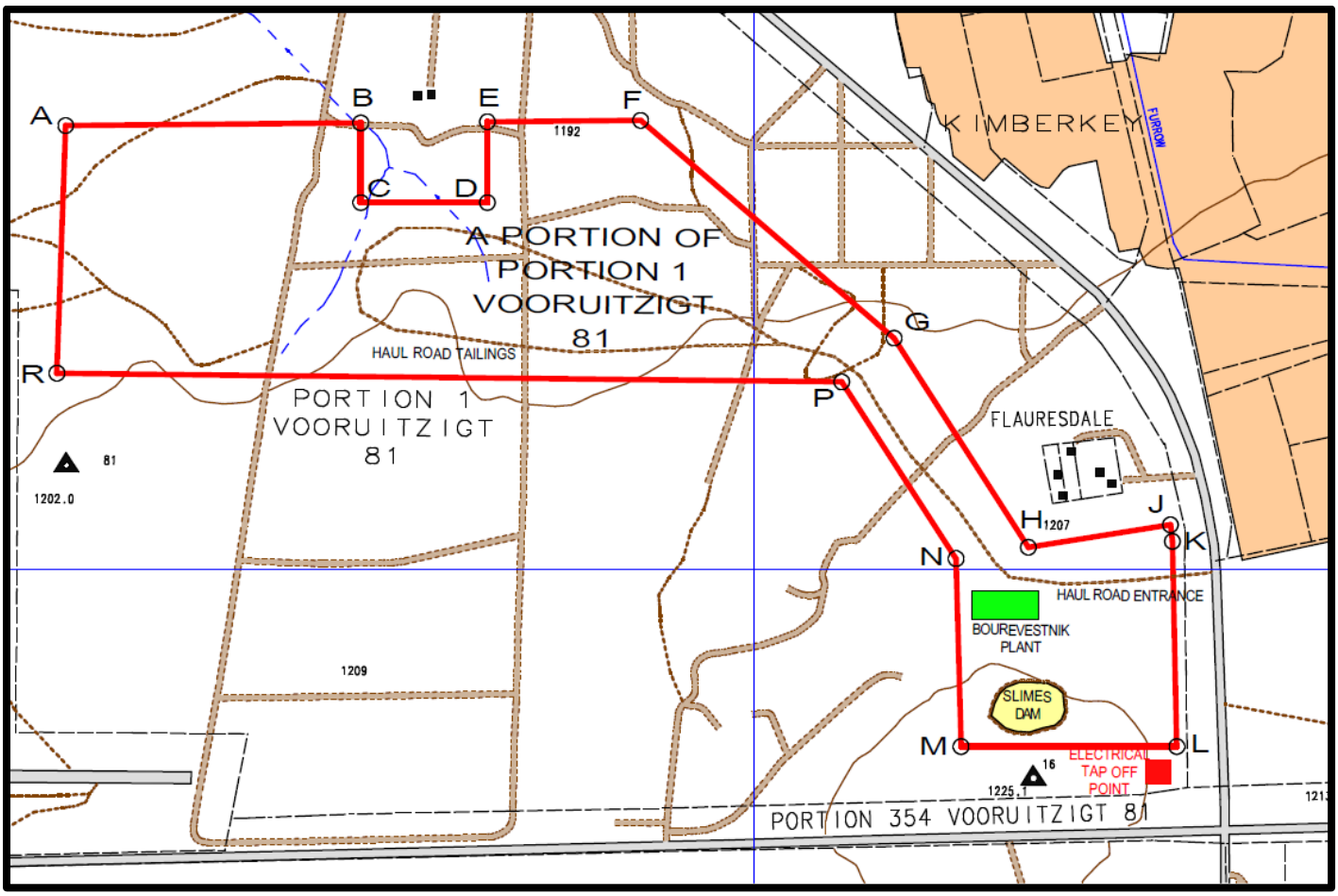

Figure 2.13 Proposed layout of infrastructure at the Vooruitzigt project site (Map provided).

2.7.2 Otto's Kopje

This area in Galeshewe has previously been mined on and off from 1880 until 1914. In 1934, it was officially abandoned and handed back to the local council. From 1970-1980 it was backfilled using historic tailings from the Big Hole. This part of the project will essentially be a brownfields exercise in which all existing dumps on site as well as any additional excavations will be processed through the Bourevestnik sorter at the Vooruitzigt site rather than *in situ*. This will entail haulage routes been established to move the concentrate from source to destination. The preferred routes have been indicated to the specialist as being the most direct and for which municipal permission has been obtained.

The entire project will be appropriately fenced and secured. Additional infrastructure has not been indicated to the specialist at this point.

2.8 Faunal species

Considering the location and habitat in the areas, and with reference to literature and available databases, the Vooruitzigt project area and surrounds contains the following total possible species breakdown as indicated in Table 2.1. A full species list can be seen in Appendix 1.

Table 2.1. Faunal composition in the Vooruitzigt Mine Project areas and surrounds

FAUNAL GROUP	POTENTIAL NUMBER OF SPECIES IN THE GENERAL AREA	NUMBER OF SPECIES OF CONSERVATION CONCERN
Birds	242	**35**
Mammals	54	**5**
Reptiles	48	**1**
Amphibians	14	**1**
Selected Arachnids	~ 11	**~ 7**
TOTAL	***358 (+~ 11)***	**~ 49**

Since all birds, bats and larger mammals and reptiles are mobile, it is naturally assumed that there will be movement in and out of the immediate vicinity of the project locations and this was considered together with the location, vegetation and nearby mining disturbances. The preferred habitat and ethological requirements of each species of concern was then considered, with reference to literature and available databases. It should be noted that certain species are routinely under-reported, particularly those that are nocturnal, secretive, migratory, vagrants, subterranean or hard to identify (e.g. quails, cisticolas, pipits, larks, nightjars, shrews, lacertids, amphisbaenids, arachnids, etc.).

Typically, faunal species diversity in the region is relatively low as is expected in semi-desert and generally widely-disturbed areas. With this in mind, the number of potential naturally-occurring species with similar habitat requirements as those in the project and surrounding areas was calculated. Species that have historical distributions in this region have been included too. Naturally, it is not guaranteed that these species will be present, but the possibility that these species remain in undisturbed or more suitable adjacent areas needs to be considered. From this group, the number of conservation-worthy species was then determined and discussed. It should be noted that only arachnids (spiders and scorpions) with protected statuses have been included for consideration.

2.8.1 Species of conservation concern

There are several species of conservation concern that have geographical distributions that include the proposed project areas.

For the purposes of clarity, the following conservation categories are explained (some of which may not be applicable to species included in this report):

- Critically Endangered (CE): when a species is facing an extremely high risk of extinction in the wild in the immediate future according to ToPS Schedule 2007
- Regionally Extinct (RE): when a species is no longer present in a specific area where it historically occurred, but may well be present elsewhere according to Red Data Books 1988, 2000, 2004 and 2004
- Endangered Species (EN): indigenous species facing a high risk of extinction in the wild in the near future according to ToPS Schedule 2007
- Vulnerable (VU): when a species is facing a high risk of extinction in the wild in the near future according to Red Data books 1988, 2000, 2004 and 2004, ToPS Schedule 2007
- Near Threatened (NT): when a species is close to qualifying for or is likely to qualify for a threatened category in the near future according to Red Data Books 1988, 2000, 2004 and 2004

- Data Deficient (DD): when there is inadequate information to make a direct or indirect assessment of the population status in the wild but for which there is local evidence that the population under discussion may be at risk according to Red Data Books 1988, 2000, 2004 and 2004
- Protected Species (PS): where the species is considered to have high conservation value or national importance according to ToPS Schedule 2007.
- Least Concern (LC): where the species is considered widespread and abundant and currently under no conservation threat according to Red Data Books 1988, 2000, 2004 and 2004.

It should also be noted that the IUCN Red List status (international) may differ from the SA Red Data Book status (national), i.e. a species may be Vulnerable internationally, but locally only considered Least Concern. Some species are also Protected by the ToPS schedule but may not be threatened in the wild (e.g. a common species may be protected to prevent trade in the animal or parts thereof). The status that is most relevant to this situation is the one discussed.

Based on habitat, ethological requirements and investigative evidence, there were 21 species of conservation concern that may be present on or near the project sites. However, it should be noted that additionally, all raptor species are Protected Species (regardless of their Red List Status) under the ToPS. The types of conservation statuses are summarised in Table 2.2. Figures in parenthesis are species that have a dual conservation status and for which this status is considered least important for reasons that will be discussed later.

Table 2.2 Summary of conservation statuses in the faunal groups found at Vooruitzigt project site and surrounding areas

FAUNAL GROUP	CE	EN	VU	NT	(PS)	DD	LC
Birds	1	5	4	7	(28)		225
Mammals			1	2	(4)		51
Reptiles					(1)		48
Amphibians				1	(1)		13
Selected Arachnids					(~ 7)		4
Total	***1***	***5***	***5***	***10***	***~ 41***	***0***	***341***
Habitat Sensitivity	**High**			**Medium**			**Low**

The species of conservation concern include:

- Kori Bustard (Near Threatened)
- Blue Crane (Near Threatened)
- **Western Barn Owl (Protected Species)**
- Southern White-faced Scops Owl (Protected Species)
- Pearl-spotted Owlet (Protected Species)
- **Spotted Eagle-Owl (Protected Species)**
- Verreaux's (Giant) Eagle-Owl (Protected Species)
- **Black-shouldered (Winged) Kite (Protected Species)**
- Yellow-billed Kite (Protected Species)

- White-backed Vulture (Critically Endangered)
- Cape Vulture (Endangered)
- Lappet-faced Vulture (Endangered)
- Black-chested Snake-Eagle (Protected Species)
- African Marsh Harrier (Endangered)
- Black Harrier (Endangered)
- **Southern Pale Chanting Goshawk (Protected Species)**
- Gabar Goshawk (Protected Species)
- Jackal Buzzard (Protected Species)
- **Steppe (Common) Buzzard (Protected Species)**
- Tawny Eagle (Vulnerable)
- Booted Eagle (Protected Species)
- African Fish Eagle (Protected Species)
- Martial Eagle (Endangered)
- **Secretarybird (Vulnerable)**
- Pygmy Falcon (Protected Species)
- **Lesser Kestrel (Vulnerable)**
- Rock Kestrel (Protected Species)
- Greater Kestrel (Protected Species)
- Amur Falcon (Protected Species)
- Lanner Falcon (Vulnerable)
- **Greater Flamingo (Near Threatened)**
- **Lesser Flamingo (Near Threatened)**
- Black Stork (Near Threatened)
- Yellow-billed Stork (Near Threatened)
- Marabou Stork (Near Threatened)
- **Southern African Hedgehog (Near Threatened)**
- **Dent's Horseshoe Bat (Near Threatened)**
- Cape Fox (Least Concern / Protected Species)
- **African Wild Cat (Protected Species)**
- Black-footed Cat (Vulnerable)
- **Southern Rock Monitor (Protected Species)**
- Giant Bullfrog (Near Threatened)
- Horned Baboon Spiders – 2 species (Protected Species)
- Trapdoor Baboon Spider (Protected Species)
- Junodis Golden Baboon Spider (Protected Species)
- **Burrowing Scorpions – 3 species** (Protected Species)

Of these only 16 (sixteen) marked in **bold** are considered to have high possibility of occurring on the site or making use of the habitats available on the sites either permanently, seasonally or transiently. All the species with conservation status' are discussed in more detail in Appendix 2.

3. IMPACTS ON FAUNAL SPECIES

Consideration was given to specific impacts of the project that have documented effects on fauna in general. These aspects have direct and indirect impacts on survival, foraging, breeding activities, quality of life, and movement of species found in the area and surrounds.

The factors considered included the following:

- Clearing of land and habitat fragmentation
- Construction of access roads and vehicular traffic
- Chemical contamination of the soil during the construction and operational phases by vehicles, machinery, etc
- Air, noise and water pollution
- Man-made structures
- The presence of humans and human-related activities

Based on the inputs from the project team, the following impacts on biodiversity are indicated:

- Loss of terrestrial habitat
- Loss of ephemeral habitat
- Disturbance and displacement of fauna
- Faunal interactions with mining activities, servitudes and personnel
- Impact on surrounding habitat and species
- Increase in environmental degradation
- Loss of Red Data / protected species
- Introduction / spread of alien species
- Loss of species diversity

3.1 Loss of terrestrial habitat

Areas larger than 10 hectares are considered to have significant environmental footprint impacts, particularly regarding changes in landforms, drainage patterns, dust generation and conversion of green, undisturbed areas in the local area. In this project, both sites indicated were larger than 10 hectares in extent.

While the development of the Vooruitzigt creates a significant new footprint, neither area is unique in terms of vegetation. Available gap analysis data supports this. In addition, the area is significantly degraded due to historical overutilization and local disturbances. According to Rouget *et al.* (2004) around 98-99 % of this veld type remains fully intact and the goal of protecting 16 % will not be adversely affected by this project. The area is also not under consideration in the National Protected Area Expansion Strategy (2010), as can be seen in Figure 3.1 (grid lines intersecting with green box).

Study area sensitivity analysis suggests that the site has a **MEDIUM-LOW SENSITIVITY** because only Least Concerned and ToPS species are routinely recorded in the area and veld type in general. However, even with both sites combined they form only a very small section of the quarter degree square (QDS Barkly West 2824 Da and Kimberley 2824 Db) and cannot be reasonably expected to hold all the recorded species.

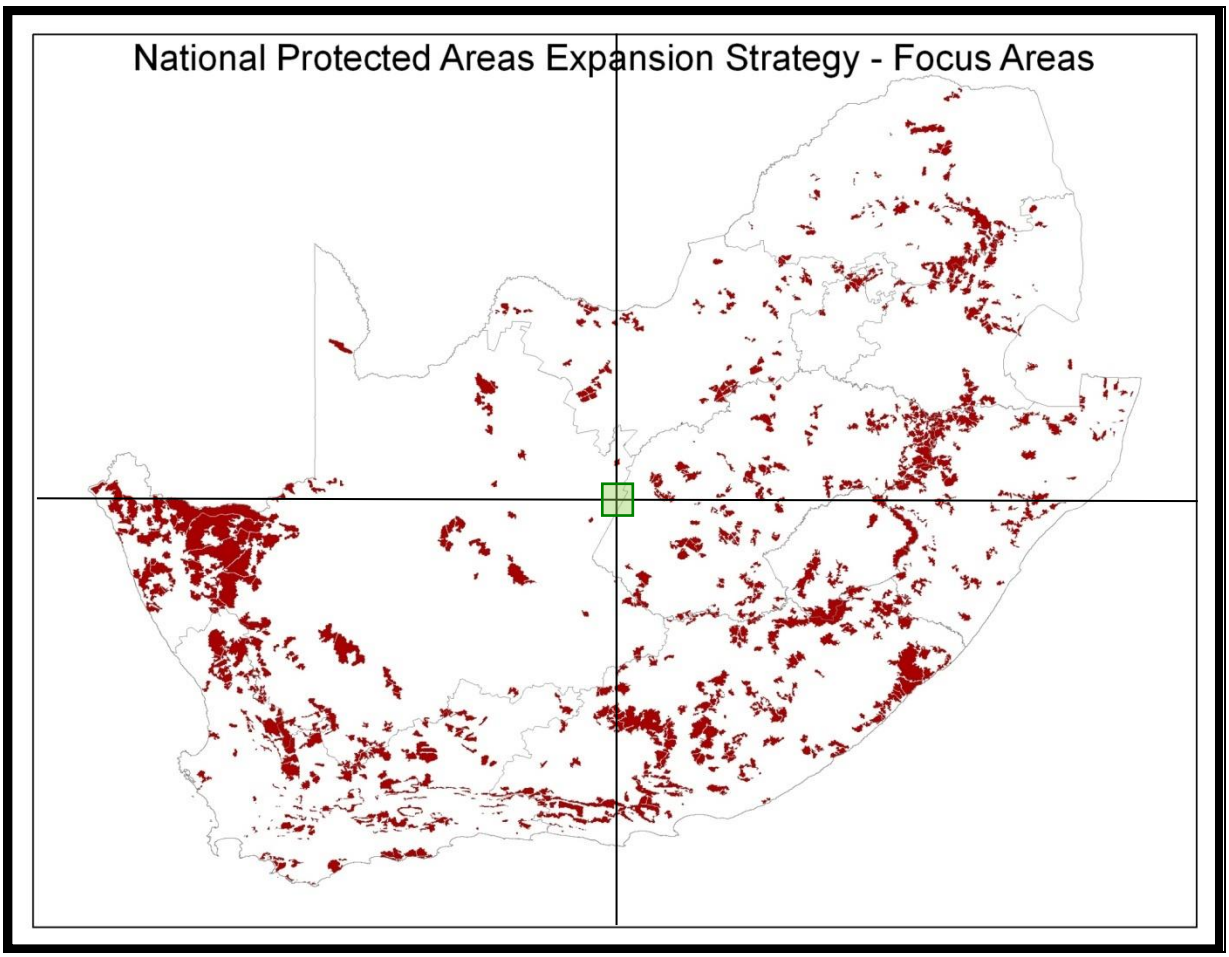

Figure 3.1. Focus areas for land-based protected area expansion (large, intact and unfragmented areas of high importance, suitable for the creation or expansion of large protected areas) indicating the location of Vooruitzigt mine project.

All terrestrial species will be directly affected particularly those that are sedentary such as the amphibian, reptile and all the arachnids including the **Burrowing Scorpions**. The main reason for this is the inability of these species to react in time to disturbance or the inability to relocate. For example, female **Baboon Spiders** are long-lived individuals (up to 18 years) but only make one burrow in their life-time whilst they still have the digging apparatus as a young instar. This burrow is used for shelter and from which prey is ambushed. Some individuals may never range more than several centimetres from their burrow entrances in their entire lives. The loss of this burrow, and the inability to make a new one, results in the individual being vulnerable to predation and the elements. However, this group of arachnids are particularly sensitive to habitat change and usually only occur in climax vegetation.

The area is generally already disturbed and it is unlikely any viable populations have been maintained. However, the Protected Status for the listed scorpions and baboon spiders is only due to concerns regarding the illegal pet trade industry rather than due to habitat loss or a general decline in population numbers.

Note was made of the potential presence of a Near Threatened species of bat. **Dent's Horseshoe Bat** is an endemic breeding species that is widely but sparsely distributed throughout the arid western parts of southern Africa only. This species is associated with caves and mine shafts. Occasional reports of these

species utilising culverts has been recorded, but this would be isolated and rare incidents. Horseshoe bat species are short-winged and are clutter or clutter-edge foragers meaning that they forage for insects in closed habitats within or on the edge of the vegetation canopy. Lack of suitable habitat would make it unlikely for these species to be present in the area. Since all bats are highly mobile, it is possible that occasional or transient bats will be reported in the area but are unlikely to be affected at either site.

3.2 Loss of ephemeral habitat

There were not significant ephemeral pans at either site, whilst there is an ephemeral stream indicated on the topographical maps of Vooruitzigt site. Since there are significant disturbances at this location already, it is unlikely that the stream/s are still intact.

The significance of the pans and wetlands, both natural and artificial, to the north and north east of Vooruitzigt should not be underestimated as most of the smaller streams ultimately drain into these larger water bodies. These water features serve not only to replenish local aquifers and provide water for terrestrial species, but also provide essential habitat links between other water bodies for migratory species such as **Flamingos**, particularly in semi-desert regions (Nash & Endfield, 2002). They are also vital for the resident and sedentary amphibian species such as the **Giant Bullfrogs** that use them for breeding events.

Sub-regionally, **Giant Bullfrogs** populations have declined by as much as 50% over the past century, largely because of urbanisation and industrial activities. This includes the disturbance of wetlands (loss or pollution), and accidental deaths on roads whilst dispersing from breeding sites, as well as being sought after for the native medicinal trade and as food. Whilst bullfrogs are mobile during breeding periods when they travel long distances between suitable breeding sites, they are particularly vulnerable whilst hibernating underground. They can remain underground for significant periods of time and will only emerge after periods of heavy rain to breed, meaning that their presence can go undetected for several seasons. Since **Giant Bullfrogs** are a Near Threatened and a Protected Species any pans or streams that are used by them in the immediate area would normally be considered as **MEDIUM SENSITIVITY**. However, significant habitat changes and disturbances on the site would indicate that it is unlikely that any viable populations remain.

Greater Flamingo and **Lesser Flamingo** have a significant, long-term presence in the nearby Kamfers Dam. They are also known to use other available water bodies, such as the pan on Platfontein, for shorter periods during the wet seasons.

3.3 Disturbance and displacement of fauna

The project activities, particularly more so in the construction than operational phases, will create noise, dust and general disturbances which will cause animals to move away immediately and over time. The species most likely affected will be the larger species and they will react by retreating to less-disturbed neighbouring areas.

Larger mammal species are highly mobile and are quick to respond to disturbances in their habitat. They selectively relocate and movements are usually only restricted by barriers such as fences. Because most small and some medium-sized mammal species as well as most reptile species construct refuges below-ground or on specific localised micro-habitats, their response to the envisaged activities is more likely to

seek refuge in their burrows or nests rather than to escape, and they are thus at significant risk of being killed. Sedentary species and less mobile species with limited ranging capabilities such as tortoises, small rodents and reptiles will suffer more directly, but this is considered inevitable.

Any loss of cover due to the removal of topsoil and vegetation, can also lead to an increase in predation on small mammals, reptiles and amphibians. This also affects thermoregulation in small mammals and reptiles and is likely to hamper access to foraging and breeding sites. However, if only a small area or low percentage of vegetation is removed, then this effect is minimal or non-existent.

While it is likely that most large- and medium-sized mammals living above ground on or around the Vooruitzigt site, as well as most bird species, can flee successfully in response to, or selectively choose to associate with the project activities, the probability of these individuals dying as a direct result of the project is limited. However, evidence suggests that displaced individuals do suffer a much greater mortality rate.

3.4 Faunal interactions with mining activities, servitudes and personnel

The establishment of a human presence or a project in an area always increases the opportunity for interactions between fauna and the associated structures, servitudes and personnel. These interactions may have direct or indirect impacts.

Road systems at the Vooruitzigt site, as well as the haulage routes from Otto's Kopje are expected to be high traffic zones in the operational phase of the project. Incidences of road mortalities because of vehicular traffic especially with respect to terrestrial and slow-moving species such as **Tortoises, Rock Monitors** and **South Africa Hedgehogs** and may occur. Whilst these are expected to isolated events, they should be considered for humane reasons in the former two instances, and for conservation reasons in later species.

With increased human occurrence and movement in an area there is usually an associated risk of poaching, and sometimes of the capture and trade of certain species. A conservation-worthy species particularly at risk here for food and the traditional medicine trade is the **Rock Monitors**. **Tortoises** are also often collected and relocated to urban areas as pets, or in the mistaken belief that their presence at a homestead will increase the egg-laying ability of chickens. However, pressure from the Galeshewe and the adjacent Platfontein community settlements have already had a significant impact on wildlife in this area. During the site inspection, an accompanied pack of hunting dogs was observed. This is likely to be regular occurrence in the area, and that most of the smaller animal species in the area such as steenbok, duiker, hare, springhare etc. have been eradicated at this point.

A slimes dam has been indicated in the development of the Vooruitzigt site. This, like any other open water bodies such as reservoirs prove attractants to animals in a semi-desert environment, and as such, can pose a serious direct threat to fauna by way of accidental drowning. In southern Africa's arid areas, raptor drownings in small farm reservoirs is a significant cause of mortality as these reservoirs are often the only water available to birds. Raptors, all of which are Protected Species, drink and bathe regularly, particularly after feeding. These raptors can fall into open water systems when they are unable to determine the depth of the water. A bird with waterlogged feathers has little chance of getting out since the walls are sheer and offer no purchase for scrambling particularly when the water level drops low.

Staff should also be made aware of certain species of dangerous fauna that are present in the area. Common species include **Cape Cobra**, **Puff Adder, Boomslang** and **Thick-tailed Scorpions**. Many of these species will become locally extinct with the development of the project and operational activities, but certain species such as **Puff Adders** and **Cape Cobras** are often attracted to the presence of humans if this improves their food and shelter opportunities. Mammal species such as **Yellow Mongoose** may carry dangerous zoonotic diseases e.g. rabies.

3.5 Impact on surrounding habitat and species

The footprint of both sites will be limited directly to the said areas. Operational activities will have the most significant impact during the period of the project. This is likely to include some noise pollution, as well as the generation of dust and the discharge of particulate residuals to the atmosphere and hydrosphere with the potential to affect a greater area. Dust emission can cause a decline in the growth vitality, palatability and quality of food plants. This reduction in air and food quality can be detrimental to the long-term survival of localised fauna.

Of more concern is the sourcing of water to meet operational needs. The use of borehole water, even in limited quantities, needs to be carefully monitored in a semi-desert environment. The capacity for annual rainfall to replenish the ground water to the same extent as which it is extracted is usually highly unlikely and normally unsustainable over an extended period. This in turn will ultimately have a long-term effect on the vegetation components and later the associated fauna.

In general, the immediate habitat at neither site is considered critical to the survival in terms of breeding, roosting or foraging for any of the locally occurring conservation-worthy species given the current degradation and disturbance. The effects of habitat fragmentation in this instance will be extremely limited and will have no influence on the distribution or dispersal patterns of any of the species present at any of the locations. However, it should be noted that the nearby *Eucalyptus* spp. trees (indicated as a yellow polygon in Figure 3.2) have the potential to support large roosting populations of **Lesser Kestrels** and **Amur Falcons** during summer. Both species are already present at various sites in and around the Kimberley area in great numbers, with one of these sites in Galeshewe.

Figure 3.2 Proximity of the Eucalyptus spp*. trees (yellow polygon) to the north-eastern side of the Vooruitzigt project site.*

3.6 Increase in environmental degradation

Various forms of pollution and environmental degradation are associated with new projects such as at the Vooruitzigt site. These include air, noise, soil and water pollution. However, long-term monitoring is necessary to identify long-term environmental changes, as well as the cumulative effects.

Diesel for machinery has the potential to increase environmental degradation, especially when it is kept on the site. Soil and ground water contamination are potential risks associated with diesel spills but can be avoided or contained if all installations are SANS 10131 compliant. It is also expected that there may be changes in the topsoil and vegetation characteristics due to the carbon emissions from the diesel. This can result in plants near the sites to be unavailable to herbivorous species as a food resource.

Whenever soil is removed, potential surface erosion is expedited significantly. Surface disturbance and alteration is the most obvious effect of this project. With the removal of the vegetation and prior to the implementation of dust suppression measures, there will be an increase in the discharge of dust particulate residuals into the atmosphere and hydrosphere. This is further exacerbated by the increased vehicular activity in and around the area. Airborne dust, apart from potentially affecting the fauna directly, can also affect them indirectly by causing a decline in the growth vitality, palatability and quality of food plants, all of which are valuable resources to animals.

Noise and vibrations from blasting activity in open pits, operating machinery and passing vehicles will affect all species concerned to a lesser extent.

There is likely to be disturbance of the natural groundwater regime at both sites for different reasons. There is also the potential for ground and surface water pollution as well as soil contamination from the onsite activities. This impacts directly on vegetation and thus forage and should be strictly monitored, particularly the ground water capacity for dewatering purposes at the Vooruitzigt site.

As with any human working environment, there are incidents of small-scale and isolated littering events. Non-biodegradable items of any nature pose a health risk to all faunal species on site.

3.7 Loss of Red Data species

Local extinction of terrestrial sedentary species is anticipated in ground-clearing projects such as these, especially at the Vooruitzigt site. No important conservation worthy species is anticipated to be significantly affected. The main reasons for these losses have already been discussed, but it should be noted that the extent will be limited to the immediate footprint of the combined facilities.

Other conservation-worthy species that may be present such as **African Wild Cats** and all **Raptors** are extremely sensitive to habitat disturbances and will immediately vacate to adjacent areas. Other possible losses, albeit occasional mishaps, may result from the drowning incidents of birds, in particular **Raptors,** in unprotected reservoirs or slimes dams. **Monitors** and **tortoises** are most likely to become road victims.

3.8 Introduction / spread of alien species

The establishment of a human presence in an area always increases the risk of domestic species being brought to the site. Interactions between wild and domestic fauna then become unavoidable. These interactions take on many forms.

Although widely distributed, it is the hybridisation of **African Wild Cats** with domestic or feral cats which occurs readily that is of concern here and the reason why this species has a protected status. It is becoming increasingly difficult to find populations of pure **African Wild Cats** and is therefore desirable to maintain this genetic conservation reservoir.

Whilst certain diseases and parasites are often endemic to an area, the concentration of unvaccinated domestic animals imported from an outside region increases the risk of the introduction of new strains of existing diseases as well as entirely new diseases and parasites to the local faunal populations to which they have no natural resistance. Such examples include canine distemper, parvovirus, rabies virus, coronavirus, herpesvirus, calicivirus, feline immunodeficiency virus, and West Nile virus. By reducing or preventing the introduction of domestic animals to the sites, this risk can be minimised.

The establishment of new structures in the area can also potentially attract unwanted species to the site. **Vervet Monkeys** (and occasionally **Baboons)** are known to travel extensive distances and can create significant damage to structures and equipment. Being water dependent, permanently available water may encourage this highly adaptable and destructive species to take up residence. Whilst the immediate area does not offer sufficient, long-term feeding resources, supplementary feeding by staff or food obtained by deviant means (raiding of waste bins, etc) will worsen the situation and should be discouraged at all costs.

This is already evident in Galeshewe where small numbers of vervet monkeys have already established themselves and are creating problems for the local residents.

3.9 Loss of species diversity

Although the natural species richness, diversity, and endemism is already low in the region, all projects cause available habitat to become fragmented in some way. Together, the total number of mammals, reptiles and amphibians for this area only represents 15 % of the total species richness (Table 3.1) for the country. Since arachnids are not taxonomically complete it is not possible to include this group in the calculation.

Table 3.1 Estimated species richness for the Vooruitzigt area and surrounds

FAUNAL GROUP	SPECIES RICHNESS FOR SOUTHERN AFRICAN TAXA (DEAT, 2007)	POTENTIAL NUMBER OF SPECIES IN THE GENERAL AREA	*% OF SOUTHERN AFRICAN SPECIES*	CONFIRMED NUMBER OF SPECIES IN THE GENERAL AREA	*ADJUSTED % OF SOUTHERN AFRICAN SPECIES*
Birds	**718**	268	*37*	242	*34*
Mammals	**227**	62	*27*	54	*24*
Reptiles	**286**	51	*18*	48	*17*
Amphibians	**84**	14	*17*	14	*17*
Selected Arachnids	**?**	~ 10	*?*	(1)	*?*
TOTAL	**1 315**	***395 (+~ 11)***	***30***	**292**	***29.8***

Mining activities cause available habitat to become fragmented in some way. Open pits, temporary stock piles, haulage roads and other related infrastructure can create so-called 'barrier effects', which involves the restriction of movement by certain species and/or populations across the area. This may be experienced at the Vooruitzigt site. Furthermore, mining activities at worst, can result in localised faunal communities being destroyed.

A range of negative consequences can then arise, such as the reduction of genetic diversity due to the increase of inbreeding within restricted populations, which may lead to genetic bottle-necks, increased risk of local extinction due to population dynamics and catastrophic effects in confined/small areas, a decrease in the ability to recolonise, etc. (Yanes *et al*., 1995).

However, the magnitude of this project at both sites is relatively small regionally and not sufficient enough to be concerned with the creation of a barrier effect. It is also highly unlikely that either site constitutes critically important habitat for any of the conservation-worthy species as listed.

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4. ASSESSMENT OF IMPACTS ON FAUNA

With any proposed project, there are likely to be several direct and indirect ecological impacts on the fauna occurring in the area. While direct impacts include the death of individuals, removal/destruction of refuges and foraging areas etc this will be largely experienced at the construction phase and then later during routine monitoring to remove problem species that may take of residence on structures.

There are likely to be several direct and indirect impacts on the fauna occurring in the area. While direct impacts include the death primarily of mammals, reptiles and amphibians, resulting in significant effects on the populations currently occurring on or near the site, these impacts are usually localised and short-term. However, indirect effects such as changes in habitat structure, fragmentation of habitats and pollution, while less obvious, may be of higher significance, as their effects can be more widespread and long-term.

Most significant impacts are the loss of habit, the disturbance and displacement of individuals, interactions with mining equipment, servitudes and personnel, impact on surrounding habitat and species and the potential increase in environmental degradation. It will remain a relatively low impact given the extent of disturbance but may be attributed to the fact that the area is already degraded and species diversity and richness is naturally low. During the field investigations, it was evident that most of the mining activities will be restricted to a highly concentrated area in each case, but this does not entirely reduce the cumulative effects of the operation nor limit it just to the local area, particularly if further mining projects are considered in the future.

While it is likely that most large- and medium-sized mammals living above-ground on or around the site, as well as most bird species, will have time to flee successfully in response to the disturbance, the probability of these individuals dying as a direct result of the operation is limited. However, evidence suggests that displaced individuals do suffer a much greater mortality rate.

Also, because most small and some medium-sized mammal species as well as most reptile, amphibian and arachnid species construct refuges below-ground or on specific localised micro-habitats, their response to the envisaged activities is more likely to seek refuge in their burrows or nests rather than to escape, and they are thus at significant risk of being killed. Complete localised extinctions of fauna are predicted in these cases.

Regarding sensitivity of species of conservation concern, only a few sedentary species were potentially identified as being highly likely to be permanently resident in the immediate area. Other conservation-worthy species are likely to only be itinerant or occasionally present or in extremely low densities.

4.1 Prediction of impacts before mitigation

The potential ecological impacts on faunal species potentially occurring in the Vooruitzigt greenfield and Otto's Kopje brownfield project areas are assessed and summarised in Table 4-1 below using the assessment criteria listed in Tables 1-2 to 1-7. Since many of these species are not considered to actively present, it is more likely that most of the impacts will only be felt by the common species present.

Table 4.1 Prediction of impacts before mitigation

Impact	Severity (S)	Duration (D)	Extent (E)	Consequence(C) C = (S + D + E) / 3	Frequency (F)	Probability (P)	Likelihood (L) L = (F + P) / 2	Environmental Significance (Impact) C x L	*Confidence*
Loss of terrestrial habitat	1	3	2	2	5	3	4	**8 LM**	*High*
Loss of ephemeral habitat	1	3	1	1.7	5	3	4	**6.8 LM**	*High*
Displacement and disturbance of fauna	3	3	1	2.3	5	3	4	**9.2 LM**	*High*
Faunal interactions with mining activities, servitudes and personnel	4	4	2	3.3	4	4	4	**13.3 M**	*Med*
Impact on surrounding habitat and species	4	4	3	3.7	5	4	4.5	**16.7 MH**	*High*
Increase in environmental degradation	3	4	2	3	5	3	4	**12 M**	*High*
Loss of Red Data species	2	4	1	2.3	5	3	4	**9.3 LM**	*High*
Introduction / spread of alien species	4	4	3	3.7	5	3	4	**14.7 M**	*Med*
Loss of species diversity	2	4	2	2.7	5	3	4	**10.7 M**	*High*

4.2 Mitigation Measures

Management proposals entail the identification of ways in which negative impacts can be avoided or minimised, and ways in which positive impacts can be enhanced to ensure maximum benefit.

The objectives with regards to the ecological integrity of the site and surrounding areas as well as the mitigation to achieve these objectives by negating or minimising negative impacts and enhancing positive impacts are highlighted within this section. The objectives are:

- From the faunal aspect, whilst the relatively low impact significance of this project does not necessitate a biodiversity offset, it may be deemed necessary by the collective conclusions of all the project specialists. If this is case, then the recommendations be that the offset area which is to be left

undisturbed, should be at least the same size and habitat as the project footprint to allow for natural movement of displaced fauna away from the disturbed areas and project activities

- To avoid sensitive areas such as the ephemeral pans and obvious drainage lines where possible
- To minimise and limit the destruction or disturbance of vegetation within the proposed areas of activity, as well as in the surrounding areas
- To limit or prevent further habitat fragmentation by considering the least destructive haul routes, which would include favouring already existing access roads in the area
- To prevent the unnecessary destruction of vegetation in areas prone to soil erosion
- To reduce noise, air, soil and water pollution as far as possible
- To prevent the destruction of wildlife in the area including the abuse to any animal found on the property by educating workers on the best/most sustainable process for construction and by enforcing legislation on the hunting and abuse of animals on site
- To prevent the unnecessary destruction of natural habitat and animal life within the boundaries of the proposed area of development and adjacent areas
- To reduce the impact on the ecology of the area with appropriate management practices as recommended by ecological specialists
- To control and prevent the activities of domestic feral animals (dogs and cats) that may occur in or are brought into the area that could compete with local wildlife for food or resources and spread diseases or foreign parasites.

Mitigation entails the identification of ways in which negative impacts can be avoided or minimised and ways in which positive impacts can be enhanced to ensure maximum benefit. The recommended management practices and mitigatory measures for the various phases of the proposed project are indicated below.

4.3 Preconstruction and construction phases

The preconstruction phase usually involves the removal of topsoil and vegetation as well as the establishment of related infrastructure needed for the mining activities. Unfortunately, the impacts resulting from this phase are difficult to mitigate. However, the impacts are likely to be localised and not widespread. It may be possible to save a significant proportion of animals. Furthermore, the negative effects of this phase can be partially mitigated by:

- Keeping the areas of disturbance to a minimum
- Reducing the amount of soils to be removed from sites
- Staying clear of the drainage areas and sensitive areas and maintaining an appropriate buffer zone (at least 30 m) between these areas and the erected structures
- Construction of culverts, where necessary, to allow for water flow along drainage lines and suitable erosion barriers
- Not disturbing the movements of any animals intending to flee the impacted area by preventing abuse and hunting/chasing of animals by workers and by allowing them passage if they are seen wanting to disperse. This prevents the need for costly trapping and relocation exercises
- Monitoring dust pollution if necessary, and applying reasonable and applicable dust-suppression measures

- Avoiding initial mining activities during spring/summer as animals reproduce and disperse during this period
- Ground water abstraction should be monitored and kept to a minimum
- Raptor-proofing all open water bodies to allow birds to drink and bathe, preventing drowning, and thus contributing to raptor conservation. This can be done by:
    - Keeping reservoirs full
    - Covering reservoirs with shade cloth
    - Attaching a wooden plank, log, ladder or branch to the wall of the reservoir (Figure 4.1) onto which a drowning bird can grasp and lift itself out of the water. These structures can also serve as a platform from which raptors and other birds can drink. However, wooden structures may need to be replaced every few years
    - Providing alternative, more natural drinking places on the ground

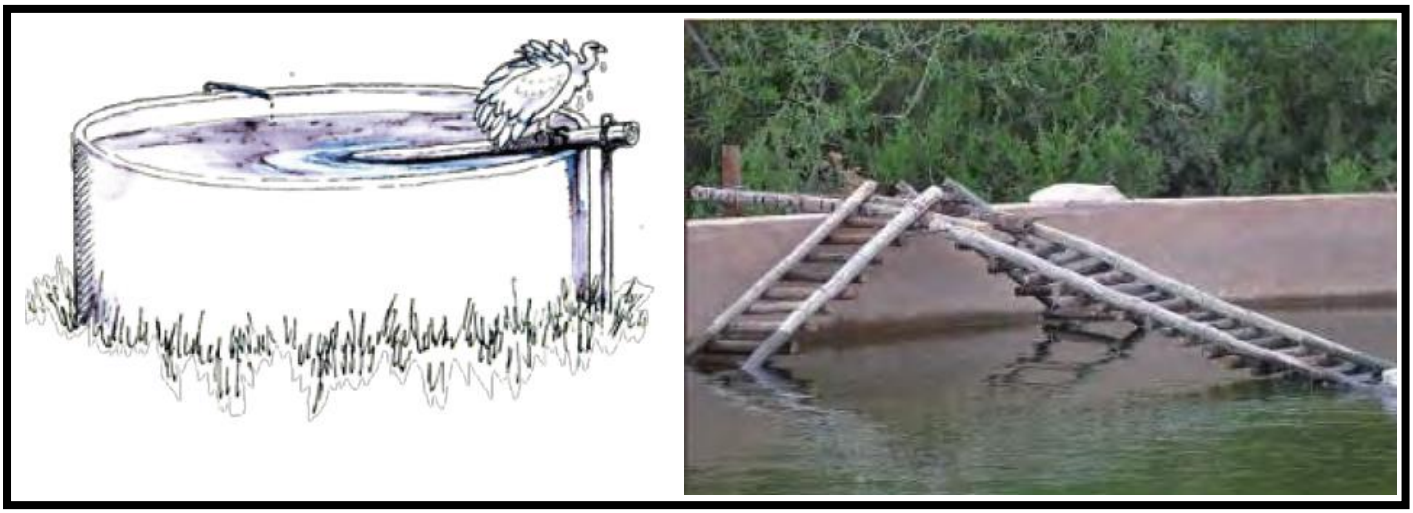

Figure 4.1 Simple methods to make a raptor-friendly reservoir.

- Bird-unsafe electrical structures must be modified to insulate dangerous live components, and to cut a gap in the earth wire – perch deterrents can also be installed to keep birds away from the dangerous areas on the structure.
- Bird collisions on newly constructed electrical features must have anti-collision devices in place
- Soil and water contamination from diesel spills, particularly at the storage tanks, must be prevented by ensuring these areas are adequately constructed on barrier foundations
- Maintaining the integrity of the natural habitat around the facilities, thereby providing the possibility for animals to flee the affected area and re-settle in the undisturbed areas around the area
- Prohibiting the intentional killing of animals through on-site supervision and worksite rules
- Educating employees to minimise accidental killings of animals during the pre-construction phase
- Relocating slow-moving animals like **Tortoises**, found during ground-breaking to nearby suitable, undisturbed areas
- Where necessary and feasible, the construction of landscaped culverts to a depth of 300 mm to allow free movement for small mammals, reptiles and amphibians under roads or other barriers. These will need to be maintained throughout the operational phase and beyond
- Where necessary and feasible, the construction of berms, low walling or fencing guiding animals towards these culverts, thus promoting the use of these passage ways

- Dangerous interactions between personnel and venomous fauna can be reduced through awareness courses, posters, and other forms of education
- The importation of unsterilised and unvaccinated domestic animals, in particular cats, on to site must be banned
- The establishment of a veld fire action policy in the event of a veld fire to prevent unnecessary loss of fauna and habitat.

Mitigation is therefore aimed at preventing the destruction and killing of the animal life in the area, and the maintenance of suitable habitat and resources where possible.

4.4 Operational phase

This phase will primarily affect mobile fauna. These ecological impacts are likely to be more extensive and of longer duration. Most of the impact will occur during the actual mining operations; however, the following steps are required during the operational phase to avoid further negative impact on fauna and the environment:

- The establishment of a basic monitoring programme which considers the key suggestions and concerns of all project specialists, and the familiarisation of terrain staff with these issues so that the area and associated ecosystems can be monitored for significant negative changes and immediate actions taken to rectify these changes
- Preventing any further harassment of animals that remain within the project area and enforcement of disciplinary actions on transgressors
- If constructed, regular assessment of the effectiveness and maintenance of culverts to allow movement of animals and water
- Ensuring dust suppression measures are maintained
- Regular inspection of diesel storage facilities and the implementation of a clean-up operation in the event of an accidental spill
- The continuance of a veld fire action policy in the event of a veld fire resulting from project activities and personal, or from natural causes to prevent unnecessary loss of fauna and habitat
- Interactions between personnel and venomous fauna can be reduced if the presence of humans does not provide food and refuge opportunities for these animals. Rubble, compost heaps, domestic chickens etc are all tremendous attractants to snakes should be avoided
- The training of employees to reduce littering
- A regular refuge removal regime to discourage baboon-raiding activities
- The maintenance of a “no domestic animal” policy.

Mitigation in this phase is aimed at preventing the destruction and killing of the remaining animal life in the area, and the maintenance of the remaining habitat and resources.

4.5 Prediction of impacts after mitigation

It is envisaged that mitigation will reduce but not eliminate negative ecological effects of the mining operations and associated infrastructures (Table 4.2).

Regarding the impacts associated with displacement and disturbance of fauna, strict access control during the construction phase will limit the impact of displacement to some extent, but the construction activities will have some temporary displacement impact. It is also unlikely that large terrestrial species will continue to use the habitat in the general area.

Given the size and scope of this project, no significant ecological effects in the receiving environment are envisaged. However, with similar mining developments taking place in close proximity, the cumulative impact must be considered.

The proposed locations for the facilities and associated infrastructure including transmission lines, access and service roads and slimes dam are deemed suitable unless there are terrain and habitat aspects that have not been brought to the attention of the specialist. Targeted and species-specific relocation and rescue measures of existing avifauna are considered unnecessary.

Despite no significant mitigation measures being advocated for preventing habitat loss to the region, cognisance should be made that this project will be contributing to the long-term cumulative impacts of many similar developments regionally. It is difficult to gauge how severe the cumulative displacement impacts of these developments will be on priority species because inadequate baseline population data exists. Also, the true extent of the actual impacts – local and regional – will only become known once such developments have been made and post-construction monitoring is implemented at all the sites.

Table 4.2 Prediction of impacts after mitigation

Impact	Severity (S)	Duration (D)	Extent (E)	Consequence(C) C = (S + D + E) / 3	Frequency (F)	Probability (P)	Likelihood (L) L = (F + P) / 2	Environmental Significance (Impact) C x L	*Confidence*
Loss of terrestrial habitat	1	3	2	2	5	3	4	**8 LM**	*High*
Loss of ephemeral habitat	1	3	2	1.7	5	2	3.5	**6 LM**	*High*
Displacement and disturbance of fauna	2	3	1	2	5	3	4	**8 LM**	*High*
Faunal interactions with mining activities, servitudes and personnel	3	4	2	3	4	4	4	**12 M**	*Med*
Impact on surrounding habitat and species	3	4	2	3	4	4	4	**12 M**	*High*

Increase in environmental degradation	3	4	1	2.7	4	3	3.5	**9.3 LM**	*High*
Loss of Red Data species	1	4	1	2	4	3	3.5	**7 LM**	*High*
Introduction / spread of alien species	3	4	1	2.7	4	3	3.5	**9.3 LM**	*High*
Loss of species diversity	1	4	1	2	4	3	3.5	**7 LM**	*High*

4.6 Biodiversity offset considerations

Southern Africa boasts a wide spectrum of diversity and endemic species. With the growing international recognition of the importance of biodiversity for the functioning of ecosystems, there is increasing pressure on mining companies to consider biodiversity offsets as part of their developmental plans.

Whilst the National Biodiversity Offsets Policy Framework is still under development to provide guidelines as to what biodiversity offsets are; when they should be considered, and the processes and procedures that will have to be followed when implementing biodiversity offsets, certain considerations can be brought to this developer's attention. The most proactive way to prevent developments from impacting on fauna is to ensure that applicable information is incorporated into development frameworks and plans from the outset.

Habitat loss, which is the primary factor on this project, is recognised as the primary driver of biodiversity loss and biodiversity offsets are becoming a generally accepted tool which can be used to ensure that development is ecologically sustainable by enhancing the conservation and sustainable use of priority or fragile biodiversity areas which do not enjoy formal protection.

The need to offset the biodiversity impacts of these mining activities will only be known once all the options and alternatives to prevent, minimise and mitigate the impacts have been identified and evaluated during the environmental impact assessment process and the residual impacts on biodiversity and/or ecosystem services have been found to be of 'medium' to 'high' significance.

5. CONCLUSIONS AND IMPACT STATEMENT

The proposed Mystic Pearl 157 (Pty) Ltd diamond mine project on Portion 1 of Farm Vooruitzigt and the concurrent development of Otto's Kopje Diamond Mine in the Kimberley district is likely to have the following impacts on local and regional ecology. These are:

- Loss of terrestrial habitat – Impacts associated with this are **LOW-MEDIUM** as the area is already significantly disturbed.
- Loss of ephemeral habitat – Impacts associated with this are **LOW-MEDIUM** as there are no significant water bodies present.
- Disturbance and displacement of fauna – Impacts associated with this are **LOW-MEDIUM** as they are unavoidable but of a limited scale.
- Faunal interactions with mining activities, servitudes and personnel – Impacts associated with this are **MEDIUM** as they will be ongoing and unavoidable.
- Impact on surrounding habitat and species – Impacts associated with this are **MEDIUM** as they will be ongoing and unavoidable and extend to areas outside of the footprints of the mine e.g. transport routes.
- Increase in environmental degradation – Impacts associated with this are **LOW-MEDIUM** as mitigation measures can be successful instituted.
- Loss of Red Data / protected species – Impacts associated with this are **LOW-MEDIUM** as there are not considered to be sizable populations of Red Data or protected species present on the sites.
- Introduction / spread of alien species – Impacts associated with this are **LOW-MEDIUM** as these can be contained with basic mitigation measures.
- Loss of species diversity – Impacts associated with this are **LOW-MEDIUM** as the area is not believed to contain unique species or a high species diversity due to historical disturbances and nearby human settlements.

No biodiversity offset is required for this project.

Impact Statement:

The proposed Mystic Pearl 157 (Pty) Ltd diamond mine project on Portion 1 of Farm Vooruitzigt and the concurrent development of Otto's Kopje Diamond Mine in the Kimberley district, Northern Cape will have a low to moderate ecological impacts on local fauna, which could be reduced to mostly low levels through appropriate mitigation. There will however be residual ecological impacts that cannot be eliminated by the proposed mitigation and these will remain at a moderate level.

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APPENDIX 1: COMPLETE FAUNAL SPECIE LISTS FOR THE VOORUITZIGT MINE PROJECT SITE AND SURROUNDING AREAS

Species marked in **bold** are conservation-worthy species and will be discussed in more detail in Appendix 2.

Birds

Common Name	***Scientific Name***	**Conservation Status**
Common Ostrich	*Struthio camelus*	LC
Orange River Francolin	*Scleroptila levailltoides*	LC
Swainson's Spurfowl	*Pternistis swainsonii*	LC
Helmeted Guineafowl	*Numida meleagris*	LC
Common Quail	*Coturnix coturnix*	LC
Kurrichane Buttonquail	*Turnix sylvaticus*	LC
White-faced Duck	*Dendrocygna viduata*	LC
Fulvous Duck	*Dendrocygna bicolor*	LC
Maccoa Duck	*Oxyura maccoa*	LC
Yellow-billed Duck	*Anas undulata*	LC
Cape Teal	*Anas capensis*	LC
Red-billed Teal	*Anas erythrorhyncha*	LC
Hottentot Teal	*Anas hottentotata*	LC
Egyptian Goose	*Alopochen aegyptiaca*	LC
South African Shelduck	*Tadorna cana*	LC
African Black Duck	*Anas sparsa*	LC
Spur-winged Goose	*Plectropterus gambensis*	LC
Comb (Knob-billed) Duck	*Sarkidiornis melanotos*	LC
Greylag (Domestic) Goose	*Anser anser*	LC / Introduced
Southern Pochard	*Netta erythrophthalma*	LC
Cape Shoveller	*Anas smithii*	LC
Greater Honeyguide	*Indicator indicator*	LC
Lesser Honeyguide	*Indicator minor*	LC
Golden-tailed Woodpecker	*Campethera abingoni*	LC
Cardinal Woodpecker	*Dendropicos fuscescens*	LC
Crested Barbet	*Trachyphonus vaillantii*	LC
Black-collared Barbet	*Lybius torquatus*	LC
Acacia Pied Barbet	*Tricholaeman leucomelas*	LC
Southern Yellow-billed Hornbill	*Tockus leucomelas*	LC
African Grey Hornbill	*Tockus nasutus*	LC
African Hoopoe	*Upupa africana*	LC
Common Scimitarbill	*Rhinopomastus cyanomelas*	LC
Lilac-breasted Roller	*Coracias caudatus*	LC
Malachite Kingfisher	*Alcedo cristata*	LC
Brown-hooded Kingfisher	*Haycyon albiventris*	LC

Pied Kingfisher	*Ceryle rudis*	LC
Giant Kingfisher	*Megaceryle maxima*	LC
Swallow-tailed Bee-eater	*Merops hirundineus*	LC
European Bee-eater	*Merops apiaster*	LC
White-fronted Bee-eater	*Merops bullockoides*	LC
White-backed Mousebird	*Colius colius*	LC
Red-faced Mousebird	*Urocolius indicus*	LC
Jacobin Cuckoo	*Clamator jacobinus*	LC
Red-chested Cuckoo	*Clamator*	LC
Black Cuckoo	*Cuculus clamosus*	LC
Dideric (Diederik) Cuckoo	*Chrysococcyx caprius*	LC
Burchell's Coucal	*Centropus burchellii*	LC
Alpine Swift	*Tachymarptis melba*	LC
Common Swift	*Apus apus*	LC
Bradfield's Swift	*Apus bradfieldi*	LC
African Black Swift	*Apus barbatus*	LC
Little Swift	*Apus affinis*	LC
White-rumped Swift	*Apus caffer*	LC
African Palm Swift	*Cypsiurus parvus*	LC
Western Barn Owl	***Tyto alba***	**LC / PS**
Southern White-faced Scops Owl	***Ptilopsis granti***	**LC / PS**
Pearl-spotted Owlet	***Glaucidium perlatum***	**LC / PS**
Spotted Eagle-Owl	***Bubo africanus***	**LC / PS**
Verreaux's (Giant) Eagle-Owl	***Bubo lacteus***	**LC / PS**
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	LC
Speckled (Rock) Pigeon	*Columba guinea*	LC
Laughing Dove	*Streptopelia senegalensis*	LC
Cape Turtle Dove	*Streptopelia capicola*	LC
Red-eyed Dove	*Streptopelia semitorquata*	LC
Rock Dove (Feral Pigeon)	*Columba livia*	LC / Introduced
Namaqua Dove	*Oena capensis*	LC
Kori Bustard	***Ardeotis kori***	**NT**
Northern Black Korhaan	*Afrotis afraoides*	LC
Red-crested Korhaan	*Lophotis ruficrista*	LC
Blue Crane	***Anthropoides paradiseus***	**NT**
Black Crake	*Amaurornis flavirostra*	LC
Baillon's Crake	*Porzana pusilla*	LC
African Purple Swamphen	*Porphyrio madagascariensis*	LC
Common Moorhen	*Gallinula chloropus*	LC
Red-knobbed Coot	*Fulica cristata*	LC
Namaqua Sandgrouse	*Pterocles namaqua*	LC
African (Ethiopian) Snipe	*Gallinago nigrpennis*	LC
Common Greenshank	*Tringa nebularia*	LC
Ruff/Reeve	*Philomachus pugnax*	LC

Marsh Sandpiper	*Tringa stagnatilis*	LC
Wood Sandpiper	*Tringa glareola*	LC
Common Sandpiper	*Actitis hypoleucos*	LC
Curlew Sandpiper	*Calidris ferruginea*	LC
Little Stint	*Calidris minuta*	LC
Black-winged Stilt	*Himantopushimantopus*	LC
Pied Avocet	*Recurvirostra avosetta*	LC
Spotted Thick-knee	*Burhinus capensis*	LC
Common Ringed Plover	*Charadrius hiaticula*	LC
Kittlitz's Plover	*Charadrius pecuarius*	LC
Three-banded Plover	*Charadrius tricollaris*	LC
Blacksmith Lapwing	*Vanellus armatus*	LC
Crowned Lapwing	*Vanellus coronatus*	LC
Double-banded Courser	*Rhinoptilus africanus*	LC
Grey-headed Gull	*Larus cirrocephalus*	LC
White-winged Tern	*Chlidonias leucopterus*	LC
Black-shouldered (Winged) Kite	***Elanus caeruleus***	**LC / PS**
Yellow-billed Kite	***Milvus aegyptius***	**LC / PS**
White-backed Vulture	***Gyps africanus***	**CE / PS**
Cape Vulture	***Gyps coprotheres***	**EN / PS**
Lappet-faced Vulture	***Aegypius tracheliotus***	**EN / PS**
Black-chested Snake-Eagle	***Circaetus pectoralis***	**LC / PS**
African Marsh Harrier	***Circus ranivorus***	**EN / PS**
Black Harrier	***Circus maurus***	**EN / PS**
Southern Pale Chanting Goshawk	***Melierax canorus***	**LC / PS**
Gabar Goshawk	***Melierax gabar***	**LC / PS**
Jackal Buzzard	***Buteo rufofuscus***	**LC / PS**
Steppe (Common) Buzzard	***Buteo vulpinus***	**LC / PS**
Tawny Eagle	***Aquila rapax***	**VU / PS**
Booted Eagle	***Aquila pennatus***	**LC / PS**
African Fish Eagle	***Haliaeetus vocifer***	**LC / PS**
Martial Eagle	***Polemaetus bellicosus***	**EN / PS**
Secretarybird	***Sagittarius serpentarius***	**VU / PS**
Pygmy Falcon	***Polihierax semitorquatus***	**LC / PS**
Lesser Kestrel	***Falco naumanni***	**VU / PS**
Rock Kestrel	***Falco rupicolus***	**LC / PS**
Greater Kestrel	***Falco rupicoloides***	**LC / PS**
Amur Falcon	***Falco amurensis***	**LC / PS**
Lanner Falcon	***Falco biarmicus***	**VU / PS**
African Darter	*Anhinga rufa*	LC
Reed Cormorant	*Phalacrocorax africanus*	LC
White-breasted Cormorant	*Phalacrocorax lucidus*	LC
Little Grebe	*Tachybaptus ruficollis*	LC
Great-crested Grebe	*Podiceps cristatus*	LC

Black-necked Grebe	*Podiceps nigricollis*	LC
Little Grebe (Dabchick)	*Tachybaptus ruficollis*	LC
Cattle Egret	*Bubulcus ibis*	LC
Little Egret	*Egretta garzetta*	LC
Yellow-billed (Intermediate) Egret	*Egretta intermedia*	LC
Great Egret	*Egretta alba*	LC
Squacco Heron	*Ardeola ralloides*	LC
Grey Heron	*Ardea cinerea*	LC
Black-headed Heron	*Ardea melanocephala*	LC
Goliath Heron	*Ardea goliath*	LC
Purple Heron	*Ardea purpurea*	LC
Green-backed (Striated) Heron	*Butorides striata*	LC
Black-crowned Night-Heron	*Nycticorax nycticorax*	LC
Little Bittern	*Ixobrychus minutes*	LC
Hamerkop	*Scopus umbretta*	LC
Glossy Ibis	*Plegadis falcinellus*	LC
Hadeda Ibis	*Bostrychia hagedash*	LC
African Sacred Ibis	*Threskiornis aethiopicus*	LC
African Spoonbill	*Platalea alba*	LC
Greater Flamingo	***Phoenicopterus ruber***	**NT**
Lesser Flamingo	***Phoenicopterus minor***	**NT**
Black Stork	***Ciconia nigra***	**NT**
Abdim's Stork	*Ciconia abdimii*	LC
Yellow-billed Stork	***Mycteria ibis***	**NT**
White Stork	*Ciconia ciconia*	LC
Marabou Stork	***Leptoptilos crumeniferus***	**NT**
Eurasian Golden Oriole	*Oriolus oriolus*	LC
Fork-tailed Drongo	*Dicrurus adsimilis*	LC
Brubru	*Nilaus afer*	LC
Brown-crowned Tchagra	*Tchagra australlis*	LC
Crimson-breasted Shrike	*Laniarius atrococcineus*	LC
Bokmakierie	*Telophorus zeylonus*	LC
Red-backed Shrike	*Lanius collurio*	LC
Lesser Grey Shrike	*Lanius minor*	LC
Common Fiscal	*Lanius collaris*	LC
Pririt Batis	*Batis pririt*	LC
Cape Penduline Tit	*Anthoscopus minutus*	LC
Ashy Tit	*Parus cinerascens*	LC
Brown-throated Martin	*Riparia paludicola*	LC
Barn (European) Swalllow	*Hirundo rustica*	LC
White-throated Swallow	*Hirundo albigularis*	LC
Pearl-breasted Swallow	*Hirundo dimidiate*	LC
Greater Striped Swallow	*Hirundo cucullata*	LC
Red-breasted Swallow	*Hirundo semirufa*	LC

South African Cliff-swallow	*Hirundo spilodera*	LC
Rock Martin	*Hirundo fuligula*	LC
Pied Crow	*Corvus albus*	LC
African Red-eyed Bulbul	*Pycnonotus nigricans*	LC
Fairy Flycatcher	*Stenostira scita*	LC
Chat Flycatcher	*Bradornis infuscatus*	LC
Marico Flycatcher	*Bradornis mariquensis*	LC
Fiscal Flycatcher	*Sigelus silens*	LC
Spotted Flycatcher	*Muscicapa striata*	LC
Long-billed Crombec	*Sylvietta ruescens*	LC
Yellow-bellied Eremomela	*Eremomela icteropygialis*	LC
African Reed-warbler	*Acrocephalus baeticatus*	LC
Great Reed-warbler	*Arocephalus arundinaceus*	LC
Lesser Swamp-warbler	*Acrocephalus gracilirostris*	LC
Icterine Warbler	*Hippolais icterina*	LC
Willow Warbler	*Phylloscopus trochilus*	LC
Rufous-eared Warbler	*Malcorus pectoralis*	LC
Chestnut-vented Titbabbler	*Parisoma sucaeruleum*	LC
Orange River White-eye	*Zosterops pallidus*	LC
Cape White-eye	*Zosterops virens*	LC
Levaillant's Cisticola	*Cisticola tinniens*	LC
Neddicky	*Cisticola fulvicapilla*	LC
Zitting Cisticola	*Cisticola juncidis*	LC
Desert Cisticola	*Cisticola aridulus*	LC
Black-chested Prinia	*Prinia flavicans*	LC
Rufous-naped Lark	*Mirafra africana*	LC
Eastern Clapper Lark	*Mirafra fasciolata*	LC
Sabota Lark	*Calendulauda sabota*	LC
Fawn-coloured Lark	*Calendulauda africanoides*	LC
Spike-heeled Lark	*Chersomanes albofasciata*	LC
Grey-backed Sparrowlark	*Eremopterix verticalis*	LC
Red-capped Lark	*Calandrella cinerea*	LC
Short-toed Rock Thrush	*Monticola brevipes*	LC
Groundscraper Thrush	*Psophocichla litsitsirupa*	LC
Karoo Thrush	*Turdus smithi*	LC
Cape Robin-Chat	*Cossypha caffra*	LC
Karoo Scrub-Robin	*Cercotrichas coryphoeus*	LC
Kalahari Scrub-Robin	*Cercotrichas paena*	LC
Familiar Chat	*Cercomela familiaris*	LC
Mountain (Chat) Wheatear	*Oenanthe monticola*	LC
Capped Wheatear	*Oenanthe pileata*	LC
Ant-eating Chat	*Myrmecocichla formicivora*	LC
African (Common) Stonechat	*Saxicola torquatus*	LC
Pale-winged Starling	*Onychognathus nabouroup*	LC

Cape Glossy Starling	*Lamprotornis nitens*	LC
Pied Starling	*Spreo bicolor*	LC
Wattled Starling	*Creatophora cinera*	LC
Common Myna	*Acridotheres tristis*	LC / Introduced
Dusky Sunbird	*Cinnyris fuscus*	LC
Scaly-feathered Finch	*Sporopipes squamifrons*	LC
White-browed Sparrow-weaver	*Plocepasser mahali*	LC
Sociable Weaver	*Philetarius socius*	LC
Southern Masked-weaver	*Ploceus velatus*	LC
Red-billed Quelea	*Quelea quelea*	LC
Southern Red Bishop	*Euplectes orix*	LC
Yellow-crowned Bishop	*Euplectes afer*	LC
African Quailfinch	*Ortygospiza atricollis*	LC
Red-headed Finch	*Amadina erythrocephala*	LC
Black-faced Waxbill	*Estrilda erythronotos*	LC
Common Waxbill	*Estrilda astrild*	LC
Violet-eared Waxbill	*Granatina granatina*	LC
Shaft-tailed Whydah	*Vidua regia*	LC
Pin-tailed Whydah	*Vidua macroura*	LC
House Sparrow	*Passer domesticus*	LC
Cape Sparrow	*Passer melanurus*	LC
Southern Grey-headed Sparrow	*Passer diffuses*	LC
Great Sparrow	*Passer motitensis*	LC
Cape Wagtail	*Motacilla capensis*	LC
African Pipit	*Anthus cinnamomeus*	LC
Buffy Pipit	*Anthus vaalensis*	LC
Black-throated Canary	*Crithagra atrogularis*	LC
White-throated Canary	*Crithagra albogularis*	LC
Yellow Canary	*Crithagra flaviventris*	LC
Lark-like Bunting	*Emberiza impetuani*	LC
Cape Bunting	*Emberiza capensis*	LC

Hockey *et al.* 2005, and ToPS Schedule 2007; Harrison *et al*. 1997, Sinclair *et al.* 2002, Taylor 2014, SABAP 2017a & SABAP 2017b

Mammals

Common Name	***Scientific Name***	**Conservation Status**
Karoo Round-eared/Short-eared Elephant Shrew	*Macroscelides proboscideus*	LC
Eastern Rock Elephant Shrew	*Elephantulus myurus*	LC
Southern African Hedgehog	***Atelerix frontalis***	**NT / PS**
Reddish-grey Musk Shrew	*Crocidura cyanea*	LC
African Straw-coloured Fruit Bat	*Eidolon helvum*	LC

Egyptian Slit-faced Bat	*Nycteris thebaica*	LC
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	LC
Dent's Horseshoe Bat	***Rhinolophus denti***	**NT**
Natal Long-fingered Bat	*Miniopterus natalensis*	LC
Cape Serotine Bat	*Neoromicia capensis*	LC
Egyptian Free-tailed Bat	*Tadarida aegyptiaca*	LC
Savanna (Chacma) Baboon	*Papio ursinus*	LC
Vervet Monkey	*Chlorocebus pygerythrus*	LC
Cape Hare	*Lepus capensis*	LC
Scrub Hare	*Lepus saxatilis*	LC
(Cape) Southern African) Ground Squirrel	*Xerus inauris*	LC
Springhare	*Pedetes capensis*	LC
Common (African) Mole-rat	*Cryptomys hottentotus*	LC
Cape Porcupine	*Hystrix africaeaustralis*	LC
Southern African Pouched Mouse	*Saccostomus campestris*	LC
Kreb's Fat Mouse	*Steatomys krebsii*	LC
Grey African Climbing Mouse	*Dendromus melanotis*	LC
Large-eared / Gerbil Mouse	*Malacothrix typica*	LC
Cape Shorted-tailed Gerbil	*Desmodillus auricularis*	LC
Pygmy Hairy-footed Gerbil	*Gerbillurus paeba*	LC
Bushveld Gerbil	*Gerbilliscus leucogaster*	LC
Highveld Gerbil	*Gerbilliscus brantsii*	LC
Namaqua Rock Mouse	*Micaelamys namaquensis*	LC
Xeric Four-striped Grass Mouse	*Rhabdomys pumilio*	LC
Desert Pygmy Mouse	*Mus indutus*	LC
House Mouse	*Mus musculus*	LC / Introduced
Southern African Pygmy Mouse	*Mus minutoides*	LC
Southern African Multimammate Mouse	*Mastomys coucha*	LC
House Rat	*Rattus rattus*	LC / Introduced
Cape Fox	***Vulpes chama***	**LC / PS**
Bat-eared Fox	*Otocyon megalotis*	LC
Black-backed Jackal	*Canis mesomelas*	LC
Striped Polecat	*Ictonyx striatus*	LC
Small (Cape) Grey Mongoose	*Herpestes pulverulenta*	LC
Slender Mongoose	*Herpestes sanguineus*	LC
Marsh (Water) Mongoose	*Atilax paludinosus*	LC
Yellow Mongoose	*Cynictis penicillata*	LC
Suricate	*Suricata suricatta*	LC
Common (Small-spotted) Genet	*Genetta genetta*	LC
Aardwolf	*Proteles cristatus*	LC
African Wild Cat	***Felis silvestris lybica***	**LC / PS**
Black-footed Cat	***Felis nigripes***	**VU / PS**
Caracal	*Caracal caracal*	LC
Aardvark	*Orycteropus afer*	LC

Rock Dassie (Hyrax)	*Procavia capensis*	LC
Common Warthog	*Phacochoerus africanus*	LC
Greater Kudu	*Tragelaphus strepsiceros*	LC
Steenbok	*Raphicerus campestris*	LC
Common/Bush Duiker	*Sylvicapra grimmia*	LC

De Graaf 1981, Smithers 1986, Estes 1991, Erasmus 1998, Skinner & Chimimba 2005, Stuart & Stuart 2007, Monadjem *et al.* 2010, Skead 2011, Apps 2012, Stuart & Stuart 2015, Child *et al*. 2016, ADU 2017.

Reptiles

Common Name	***Scientific Name***	**Conservation Status**
Leopard Tortoise	*Stigmochelys pardalis*	LC
Greater Padloper	*Homopus femoralis*	LC
Serrated (Kalahari Tent) Tortoise	*Psammobates oculifer*	LC
Central Marsh Terrapin	*Pelomedusa subrufa*	LC
Southern (Bibron's) Stiletto Snake	*Atractaspis bibronii*	LC
Common (Brown) House Snake	*Boaedon capensis*	LC
Aurora House Snake	*Lamprophis aurora*	LC
Common (Cape) Wolf Snake	*Lycophhidion capense capense*	LC
Mole Snake	*Pseudaspis cana*	LC
Two-striped Shovel-snout	*Prosymna bivittata*	LC
Sundevall's Shovel-snout	*Prosymna sundevallii*	LC
Short-snouted Whip Snake	*Psammophis brevirostris*	LC
Kalahari (Fork-marked) Sand Snake	*Psammophis trinasalis*	LC
Rhombic (Common) Egg-eater	*Dasypeltis scabra*	LC
Eastern (Common) Tiger Snake	*Telescopus semiannulatus*	LC
Red-lipped Snake	*Crotaphopeltis hotamboeia*	LC
Spotted Bush Snake	*Philothamnus s. semivariegatus*	LC
Black-headed Centipede-eater	*Aparallactus capensis*	LC
Bicoloured Quill-snouted Snake	*Xenocalamus bicolor bicolor*	LC
Northern Boomslang	*Dispholidus typus viridis*	LC
Speckled Shield Cobra	*Aspidelaps scutatus scutatus*	LC
Highveld Garter Snake	*Elapsoidea sundevallii media*	LC
Cape Cobra	*Naja nivea*	LC
Puff Adder	*Bitis arietans arietans*	LC
Delalande's Beaked Blind Snake	*Rhinotyphlops lalandei*	LC
Kalahari Round-headed Worm Lizard	*Zygaspis quadrifrons*	LC
Cape Worm Lizard	*Monopeltis capensis*	LC
Cape Skink	*Trachylepis capensis*	LC
Kalahari Tree Skink	*Trachylepis spilogaster*	LC
Montane (Speckled) Rock Skink	*Trachylepis punctiatissima*	LC
Western Rock Skink	*Trachylepis sulcate sulcata*	LC

Variegated Skink	*Trachylepis variegata*	LC
Spotted Sandveld Lizard	*Nucras intertexta*	LC
Holub's Sandveld Lizard	*Nucras holubi*	LC
Common Rough-scaled Lizard	*Meroles squamulosus*	LC
Spotted Sand Lizard	*Pedioplanis l. lineoocellata*	LC
Namaqua Sand Lizard	*Pedioplanis namaquensis*	LC
Karoo Girdled Lizard	*Karusasaurus polyzonus*	LC
Southern Rock / White-throated Monitor	***Varanus albigularis***	**LC / PS**
Western Ground Agama	*Agama aculeata aculeata*	LC
Eastern Ground Agama	*Agama aculeate distanti*	LC
Southern Rock Agama	*Agama atra atra*	LC
Flap-neck Chameleon	*Chamaeleo dilepis dilepis*	LC
Bibron's Thick-toed Gecko	*Chondrodactylus bibronii*	LC
Common Dwarf Gecko	*Lygodactylus capensis capensis*	LC
Cape Gecko	*Pachydactylus capensis*	LC
Common Banded (Marico) Gecko	*Pachydactylus mariquensis*	LC
Common Barking Gecko	*Ptenopus garrulus garrulus*	LC

Branch 1988, Branch 1998, Wilson 1998, Marais 2004, Alexander & Marais 2007, Branch 2008, Bates 2014, ADU 2017

Amphibians

Common Name	***Scientific Name***	**Conservation Status**
Bushveld Rain Frog	*Breviceps a. adspersus*	LC
Southern Pygmy Toad	*Poyntonophrynus vertebralis*	LC
Raucous Toad	*Sclerophrys capensis*	LC
Guttural Toad	*Sclerophrys (Amietophrynus) gutturalis*	LC
Power's (Western Olive) Toad	*Sclerophrys (Amietophrynus) poweri*	LC
Bubbling Kassina	*Kassina senegalensis*	LC
Snoring Puddle Frog	*Phrynobatrachus natalensis*	LC
Common Platanna	*Xenopus laevis*	LC
Common (Boettger's) Caco	*Cacosternum boettjeri*	LC
Delalande's River Frog	*Amieta delalandii*	LC
Cape River Frog	*Amieta fuscigula*	LC
Giant Bullfrog	***Pyxicephalus adspersus***	**NT / PS**
Tremelo Sand Frog	*Tomopterna cryptotis*	LC
Tandy's Sand Frog	*Tomopterna tandyi*	LC

Passmore & Carruthers 1995, Branch 1988, Carruthers 2001 Minter *et al*. 2004, du Preez & Carruthers 2009, ADU 2017

Selected Arachnids

Common Name	*Scientific Name*	Conservation Status
Thick-tailed Scorpions	*Parabuthus granulatus*	LC
	Parabuthus mossambicensis	LC
Bark Scorpions	*Uroplectes carinatus*	LC
	Uroplectes triangulifer	LC
Burrowing Scorpions	***Opistophthalmus carinatus***	**PS**
	Opistophthalmus wahlbergii	**PS**
	Opistophthalmus pictus	**PS**
Greater Horned Baboon Spider	***Ceratogyrus brachycephalus***	**PS**
South African Horned Baboon Spider	***Ceratogyrus darlingi***	**PS**
"Golden-black" Trapdoor Baboon Spider	***Idiothele nigrofulva***	**PS**
Junodis Golden Baboon Spider	***Augacephalus junodi***	**PS**

Dippenaar-Schoeman & Jocque 1997, Dippenaar-Schoeman 2002, Leeming 2003, Dippenaar-Schoeman & van den Berg 2010, Dippenaar-Schoeman 2014, ADU 2017

APPENDIX 2: THREATENED OR CONSERVATION-WORTHY FAUNAL SPECIES WITH A DISTRIBUTION THAT INCLUDES THE VOORUITZIGT MINE PROJECT SITE AND SURROUNDING AREAS

Species marked in **bold** are considered to have a high likelihood of potentially occurring on or around the project locations.

Birds

Common Name	*Scientific Name*	Habitat	Status[1]	Likelihood of occurrence
Kori Bustard	*Ardeotis kori*	Dry open savanna woodland, dwarf shrublands and occasionally grassland	NT	Medium: Has been seen, and was reported in SABAP to be present in the area but is likely to select natural, undisturbed areas
Blue Crane	*Anthropoides paradiseus*	Mostly natural grassland but also wetlands, cultivated pastures and croplands	VU	Low: Distribution includes this area but has never been recorded or reported in SABAP to present in the general area
Western Barn Owl	***Tyto alba***	**Open habitats avoiding dense forests; roosts in old buildings, caves, hollow trees and mine shafts**	**PS**	**High: Common resident and will readily make use of manmade structures; populations highly responsive to rodent outbreaks**
Southern White-faced Scops Owl	*Ptilopsis granti*	Acacia savanna and dry, broad-leafed woodland	PS	Low: Area is disturbed with much of the preferred natural vegetation removed
Pearl-spotted Owlet	*Glaucidium perlatum*	Acacia savanna and dry, broadleafed woodland	PS	Low: Area is disturbed with much of the preferred natural vegetation removed
Spotted Eagle-Owl	***Bubo africanus***	**All habitats except forest; gardens**	**PS**	**High: Common resident and will readily make use of manmade structures**
Verreaux's Eagle-Owl	*Bubo lacteus*	Broadleaf woodlands, savanna, thornveld and riverine forest; dry riverbeds with large trees	PS	Low: Locally uncommon and area is disturbed with much of the preferred natural vegetation removed

Black-shouldered Kite	***Elanus caeruleus***	**Open savanna, grassland and agricultural areas**	**PS**	**High: Common resident and will readily make use of telephone poles and lines for hunting; populations highly responsive to rodent outbreaks**
Yellow-billed Kite	*Milvus aegyptius*	From forest edges to grassland; rural settlements	PS	Medium: Summer migrant that can often be seen scavenging, including areas with human disturbances
White-backed Vulture	***Gyps africanus***	**Savanna woodland and bushveld**	**CE**	**High: Kimberley supports a large and most southern breeding population of the species. Surrounding areas have annually resident birds that forage frequently over and around this area**
Cape Vulture	*Gyps coprotheres*	Cliff-breeding species but ranges widely in surrounding areas	EN	Medium: Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Uncommon generally
Lappet-faced Vulture	*Torgos tracholiotos*	Favours semi-arid open woodland	EN	None: Distribution includes this area but has never been recorded or reported in SABAP to present in the general area. Uncommon generally
Black-chested Snake-Eagle	*Circaetus pectoralis*	Mesic and semi-arid savanna to desert	PS	Low: Resident in some areas, nomadic or a seasonal visitor in others. Uncommon in the area
African Marsh Harrier	*Circus ranivorus*	Inland wetlands	NT	Low: Has not been recorded as present and normally prefers wetlands so may be present in exceptionally wet periods

Black Harrier	*Circus maurus*	Various habitats including open, dry grassland habitats	VU	Low: Uncommon endemic but generally avoids human presence
Southern Pale Chanting Goshawk	***Melierax canorus***	**Arid savanna, semi-desert and Karoo scrub**	**PS**	**High: Common resident often conspicuously perched on tree tops or telephone poles.**
Gabar Goshawk	*Melierax gabar*	Arid savanna, semi-desert	PS	Medium: Common resident preferring well-treed areas, preferably undisturbed
Jackal Buzzard	*Buteo rufofuscus*	Karoo scrub, grassland and agricultural land; most numerous in hilly and mountainous terrain	PS	Low: Endemic, locally common resident, but in this area will likely to be displaced by human disturbances and Steppe Buzzards
Steppe Buzzard	*Buteo vulpinus*	Open country, avoiding very arid and forested areas	PS	Medium: Abundant Palearctic summer migrant often seen perched on utility or fence poles
Tawny Eagle	*Aquila rapax*	Open savanna woodland	VU	Low: Distribution includes this area but will avoid heavily disturbed areas that lack suitable trees
Booted Eagle	*Aquila pennatus*	Occurs in a wide range of habitats	PS	Low: Locally common where it breeds, rare elsewhere. Favours areas with cliffs and tall trees. Has been known to make use of the deep pit mines in the Kimberley area
African Fish Eagle	*Haliaeetus vocifer*	Associated with large rivers, lakes, pans, estuaries and lagoons	PS	Medium: Common resident in suitable wetland habitats with the area known to have a few pairs present
Martial Eagle	*Polemaetus bellicosus*	Mostly open savanna and woodland on plains, also semi-arid shrublands	VU	Low: Sightings close to human settlements and disturbed areas are rare.

Secretarybird	*Sagittarius serpentarius*	Favours open grassland with scattered trees or shrubs	NT	Medium: Uncommon to locally common breeding resident which is highly nomadic and likely to be present in adjacent natural areas. Was recorded in SABAP
Pygmy Falcon	*Polihierax semitorquatus*	Arid savanna with Sociable Weaver nests	PS	Low: Locally common where Sociable Weaver nests occur but unlikely in areas where large trees have been removed
Lesser Kestrel	***Falco naumanni***	**Open savanna, shrublands, grassland and verges of agricultural lands**	**VU**	**Low: Locally common non-breeding Palearctic migrant that forms large flocks. Present if sufficient roosting sites are available of which nearby Eucalyptus spp. offer suitable opportunity**
Rock Kestrel	*Falco rupicolus*	Grassland and semi-arid scrub usually in hilly country with cliffs for breeding	PS	Low: Common resident in parts of its range and a winter visitor or nomad in other areas. May utilise large, open mine pits
Greater Kestrel	*Falco rupicoloides*	Open, semi-arid and arid country	PS	Low: Common resident, often seen on roadside telephone poles or electrical structures. Avoids heavily disturbed areas
Amur Falcon	*Falco amurensis*	Open country, especially grasslands and agricultural areas	PS	Medium: Summer visitor, often associated with flocks of Lesser Kestrel with which is communally roosts in tall trees such as *Eucalyptus* spp. that are locally present
Lanner Falcon	*Falco biarmicus*	Open grassland or woodland near cliff or electricity pylon breeding sites	VU	Medium: Was recorded in SABAP. Fairly common resident and with migratory populations but generally avoids disturbed areas

Greater Flamingo	*Phoenicopterus ruber*	Favours saline or brackish shallow water bodies such as saltpans, large dams and coastal mudflats	NT	Low: Common species at the nearby Kamfers Dam. Highly nomadic and partially migrant which may use temporary pans in the area if disturbed or moving about
Lesser Flamingo	*Phoenicopterus minor*	Primary eutrophic shallow wetlands, especially saltpans	NT	Low: Common species at the nearby Kamfers Dam. Highly nomadic and partially migrant which may use temporary pans in the area if disturbed or moving about
Black Stork	*Ciconia nigra*	Associated with mountainous regions, but not restricted to them	NT	Low: Uncommon resident. Nomadic in non-breeding season and may use temporary pans
Yellow-billed Stork	*Mycteria ibis*	Shoreline of most inland freshwater bodies	NT	Low: Uncommon but nomadic in response to water levels and fish availability.
Marabou Stork	*Leptoptilos crumenifera*	Favours semi-arid areas	NT	Low: Uncommon resident but with most populations concentrated in game reserves and ranches only

[1] Status Hockey *et al* 2005, and ToPS Schedule 2007; Harrison et al 1997, Sinclair et al 2002, SABAP 2013, ADU 2017.

Mammals

Common Name	*Scientific Name*	Habitat	Status[2]	Likelihood of occurrence
South African Hedgehog	*Atelerix frontatlis*	Variety of dry habitats	NT / PS	Medium: Often locally common but will vacate heavily disturbed areas
Dent's Horseshoe Bat	*Rhinolophus darlingi*	Roost in caves, mine shafts, road culverts	NT	Low: Roosting only in small numbers at a few sites
Cape Fox	*Vulpes chama*	Open areas as grassland and arid scrub	PS	Medium: Fairly common resident but will vacate heavily disturbed areas

African Wild Cat	***Felis silvestris lybica***	**Wide habitat tolerance but with some cover**	**PS**	**High: Common with conservation status due to the interbreeding risk with domestic and feral cats**
Black-footed Cat	*Felis nigripes*	Open dry panveld and short grass areas	VU / PS	Low: Habitat is unsuitable locally and species is highly sensitive to disturbance

[2] De Graaf 1981, Smithers 1986, Erasmus 1998, Status according to Friedman & Daly 2004, Skinner & Chimimba 2005, ToPS Schedule 2007, Monadjem *et al.* 2010, Stuart & Stuart 2015, Child *et al*. 2016, ADU 2017

Reptiles

Common Name	*Scientific Name*	Habitat	Status[3]	Likelihood of occurrence
Rock / White-throated Monitor	***Varanus albigularis***	**Savanna and moister karroid areas**	**LC / PS**	**High: Common species but exploited for bush meat and traditional medicinal trade outside protected areas**

[3] Status according to Branch 1988, Branch 1998, Wilson 1998, Alexander & Marais 2007, Marais 2004, ToPS Schedule 2007, Branch 2008, Bates *et al.* 2014, ADU 2017

Amphibians

Common Name	*Scientific Name*	Habitat	Status[4]	Likelihood of occurrence
Giant Bullfrog	*Pyxicephalus adspersus*	Seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna with sandy substrates	NT / PS	Medium: Fairly common but seldom seen as they spend much of the year buried up 1m below ground awaiting heavy rainfall periods. Threatened by habit loss. Have been recorded in water bodies in the general area

[4] Status according Passmore & Carruthers 1995, Branch 1988, Carruthers 2001, Minter *et al.* 2004, ToPS Schedule 2007, du Preez & Carruthers 2009, ADU 2017

Arachnids

Common Name	*Scientific Name*	Habitat	Status[5]	Likelihood of occurrence
Horned Baboon Spider spp.	*Ceratogyrus brachycephalus*	Ground-dwelling species that prefers sandy soils	PS	Low: Common and widespread in undisturbed habitat
	Ceratogyrus darlingi	Ground-dwelling species that prefers sandy soils	PS	Low: Common and widespread in undisturbed habitat
Trapdoor Baboon Spider	*Idiothele nigrofulva*	Ground-dwelling species that prefers sandy soils	PS	Low: Common and widespread in undisturbed habitat
Junodis Golden Baboon Spider	*Augacephalus junodi*	Ground-dwelling species that prefers sandy soils	PS	Low: Common and widespread in undisturbed habitat
Burrowing Scorpion spp.	***Opistophthalmus carinatus***	**Found under large calcrete stones or dead vegetation, also under loose bark of fallen trees**	**PS**	**High: Common and widespread**
	Opistophthalmus wahlbergii	**Found in consolidated sandy soils**	**PS**	**High: Common and widespread**
	Opistophthalmus pictus	**Open areas in hard substrate**	**PS**	**High: Very common and widespread**

[5] Status according to Dippenaar-Schoeman & Jocque 1997, Dippenaar-Schoeman 2002, Leeming 2003, ToPS Schedule 2007; Dippenaar-Schoeman & van den Berg 2010, ADU 2017

SPECIALIST INFORMATION

Beryl Wilson, author of this report, is a Production Scientist (Grade B) appointed as the Zoology Head of Department at the McGregor Museum, Kimberley. She was appointed as an OSD scientist in terms of the PSCBC Resolution 1 of 2007 and following related Resolutions in 2009 and thus exception of registration of a professional body is addressed. She has 30 years of experience in the field on mammals, birds, reptiles, amphibian and arachnids of the Northern Cape and southern Africa. She has previously complied authored and co-authored 39 other similar environmental assessments (as listed below) in the Northern Cape region during the past 16 years.

DECLARATION OF INDEPENDENCE

I, Beryl Wilson, hereby confirm my independence as a specialist and declare that I have no interests, be it business, financial, personal or other, in any proposed activity other than fair remuneration for work performed, specifically about Mystic Pearl 157 (Pty) Ltd's permit applications or mining rights in the Kimberley district, Northern Cape, or to the appointee, Mr Frank Crossley.

In addition, I declare that I worked independently of the organization or environmental consultants commissioning this specialist input. The opinions expressed within the report are based on my understanding of the project as they have been presented to me, as well as the observations made during field surveys.

_____

Full Name: Beryl Yvonne Wilson

PAST SPECIALIST REPORTS

Anderson, P.C., Wilson, B.Y & Oliphant, J.M. 2000. *The possible ecological impact of the proposed zinc mining activities on the mammalian fauna of Gamsberg, Northern Cape Province.* An Ecological Impact Assessment. 73 pp.

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PROFESSIONAL PROFILE

Beryl Yvonne Wilson

PROFESSIONAL SCIENTIST (PRODUCTION) GRADE B: ZOOLOGIST
Curator, Conservation Biologist & Zoology Head of Department, McGregor Museum

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PERSONAL DATA

Identity Number	690218 0364 086
Date of Birth & Place	18 February - Salisbury (Harare, Zimbabwe)
Sex	Female
Marital Status	Single
Nationality	South African
Languages	English, Afrikaans, basic German

EMPLOYMENT HISTORY

March 1987 – June 2008	Zoology Collections Manager (Chief Industrial Technician) Zoology Department, McGregor Museum, Department of Sport, Arts & Culture (Northern Cape)
1 May 2007 – June 2008	Acting Zoologist, Zoology Department, McGregor Museum, Department of Sport, Arts & Culture (Northern Cape)
1 July 2008 – Present	Professional Scientist (Production) Grade A, Field Biologist & Zoology Departmental Head (Museum Natural Scientist), Zoology Department, McGregor Museum, Department of Sport, Arts & Culture (Northern Cape)

ACADEMIC QUALIFICATIONS

National Diploma	Nature Conservation, Technikon SA (1989 - 1992)
BA Degree	Criminal Psychology, Unisa (1998-2001) – Majors in Criminology and Psychology (distinction)
Hons BA	Psychology (with Forensic Criminology), Unisa (2002 – 2004) with the following papers: Research Methodology (distinction); Psychopathology; Psychological Assessment; Physiological Psychology (distinction); Forensic Criminology, Social Psychology (distinction)
BTech Degree	Nature Conservation, Technikon SA (1994-1997)
MTech Degree	Nature Conservation: Dissertation only, Tshwane University of Technology (2015)
PhD	*Nature Conservation Tshwane University of Technology (2017-)*
Additional Certificates	Freelance Journalism, Intec (1993-94); ArcView GIS, Gims (2008); Capture, Care and Management of Wildlife, Wildlife Campus (2009); Human-Wildlife Conflict, Wildlife Campus (2009); Survival, Wildlife Campus (2009); Medically Important Spiders, Wildlife Campus (2010); Predator Management on Livestock Farms, Wildlife Campus (2011); Georeferencing, SANBI (2013), Mapping and Geospatial Referencing, Coursera - Pennsylvania State University (2013), Introduction to Forensic Science – with distinction - Nanyang Technological University, Singapore

FIELDS OF INTEREST

- ☑ The distribution patterns (historical and current) of all the zoological fauna of the Northern Cape
- ☑ Phylogenetic ground-truthing
- ☑ Human-wildlife conflict situations
- ☑ Ethology (wildlife behaviour) with emphasis on problem behaviour
- ☑ Wildlife journalism
- ☑ Herpetology
- ☑ Wildlife monitoring

CORE FUNCTIONS

- ☑ The curation, maintenance and development of three major zoological collections namely, mammalogy, ornithology and herpetology (reptiles and amphibians), as well as five minor collections.
- ☑ Supervision of the zoology departmental staff, volunteers and field assistants
- ☑ Veld and game management of Magersfontein Battlefield Museum
- ☑ Research
- ☑ Environmental Impact Assessments
- ☑ Outreach
- ☑ Publications

SPECIALITIES

- ☑ The fauna (mammal, ornithological, herpetological and arachnological fields) of the arid areas of southern Africa.
- ☑ The only provincially-based and employed expert curator of general fauna and comparative archaeozoloogy
- ☑ Black-footed Cat (*Felis nigripes*) specialist – the only one in the country

- ☑ An overall broad-based field biology expert
- ☑ Wildlife journalism
- ☑ Specialist Consultant for Green Scorpions Unit, NC Department of Environment and Nature Conservation
- ☑ Specialist Consultant for Directorate: Biodiversity Enforcement, National Department of Environmental Affairs
- ☑ Specialist Consultant for Airports Company South Africa (ACSA) for inland airports
- ☑ FS, NW and NC specialist for NALEH and Interpol
- ☑ Patron of the Cat Conservation Trust

FIELDS OF EXPERTISE

- ☑ Fieldwork
- ☑ Specialised taxidermy material preparation
- ☑ Outreach - University level and above
- ☑ Research (phylogenetical, ethological, distributional and ecological)
- ☑ Environmental Impact Assessments
- ☑ Pollution evaluation
- ☑ Population censusing
- ☑ Capture, care, translocation and management of wildlife
- ☑ Fire fighting
- ☑ Veld evaluation and assessment
- ☑ Hunting and culling (diurnal and nocturnal)
- ☑ Game counting and aerial census (helicopter and fixed wing)
- ☑ Determination of sex ratios, age ratios and cropping rates
- ☑ Global Positioning System usage and GIS
- ☑ Aerial game darting; mark and recapture programmes
- ☑ Radio tracking (capture, fitting of equipment and tracking)
- ☑ Biological data collection
- ☑ Necropsies
- ☑ Anti-poaching
- ☑ Field habituation for film and documentary purposes
- ☑ Human-Wildlife interaction/situations
- ☑ Wildlife photography
- ☑ Wildlife journalism
- ☑ Camera trap monitoring techniques

CURRENT PROJECTS

- ☑ Black-footed Cat research
- ☑ Sympatric Carnivore Disease investigation
- ☑ White-backed Vulture population monitoring using current technology to aid conservation efforts (PhD)
- ☑ Vulture re-sighting monitoring programme
- ☑ *Monopeltis* DNA and distribution
- ☑ Western Barn Owl diet analysis at the Kimberley Airport as part of human-wildlife conflict mitigation
- ☑ Reptiles and Arachnids of the Northern Cape and surrounding districts
- ☑ Secretarybird Monitoring Project
- ☑ Departmental outreach programmes
- ☑ Tortoise mortality rates with reference to electric fences and road victims
- ☑ Road kill monitoring
- ☑ Various environmental assessment projects