APPENDIX J

Botanical Specialist Report

PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL ASSESSMENT

WITH BIODIVERSITY INPUTS

FELDSPAR PROSPECTING & MINING, FARM ROZYNEN BOSCH 104, KAKAMAS

THE PROPOSED PROSPECTING AND MINING ACTIVITIES ON PORTION 5 OF THE FARM ROZYNEN BOSCH NO. 104, KAKAMAS, KHAI !GARIB LOCAL MUNICIPALITY, NORTHERN CAPE PROVINCE.

12 February 2020

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SUMMARY - MAIN CONCLUSIONS

VEGETATION TYPE

Bushmanland Arid Grassland

Bushmanland Arid Grassland is not considered a threatened vegetation type, with more than 99% remaining. However only 4% is formally conserved (Augrabies Falls National Park). Further conservation options must thus be investigated. The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). The NCCBA maps were used to guide the identification of potential significant sites.

VEGETATION ENCOUNTERED

Bushmanland Arid Grassland is generally described as sparsely vegetated (semi-desert) low shrubland dominated by white grasses (*Stipagrostis* species) on gently sloping or irregular plains, which can, in years of abundant rainfall, have rich displays of annual herbs. However, because of the persistent drought experienced in the Northern Cape grasses were almost absent as were annuals and bulbs. According to the owner, the farm had not received any rain during the past 4 years. In general the veld had been reduced to a very sparse low shrubland, with only the hardier and drought resistant species remaining (many of which are also slowly succumbing to the drought). Towering above the low shrubland, Quiver trees (*Aloidendron dichotomum*) can be found scattered throughout the landscape, sometimes forming denser stands. Because of the drought it was sometimes difficult to identify plants to species level.

CONSERVATION PRIORITY AREAS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016).

According to the Northern Cape Critical Biodiversity Areas (2016), only prospecting Site 5 may fall within an ecological support area (although the site itself is located on a small hill away from any watercourse). All the other sites are located outside of any ESA or CBA.

None of the sites will impact on any recognised centre of endemism.

CONNECTIVITY

The footprints will be small (<17 ha) and distributed over a large area of agricultural land. The semi-permanent impact on these small patches of is unlikely to result in any significant impact on connectivity land will have an impact on connectivity.

LAND-USE

Land use is primarily livestock grazing. The area is to dry for cultivation. The possible impact on socio-economic activities is likely to be positive likely to result in job opportunities.

PROTECTED PLANT SPECIES

The following protected or endangered species was encountered / expected:

- Two red-listed species, namely *Hoodia gordonii* & *Aloidendron dichotomum* (Heading 4.6.1).
- One NEM: BA protected plant species observed, namely *Hoodia gordonii* (Heading 4.6.2).
- No NFA protected trees were encountered. (Heading 4.6.3)
- Eight (8) NCNCA protected plant species were encountered, but more can be expected (e.g. annual herbs which only shows after good rains) (Heading 4.6.4).

A number of protected plant species were observed, most notably the potential impact on a number of *Aloidendron dichotomum* and *Boscia foetida* individuals. However, the owner committed (confirmed by previous development practices on this property) to the protection of all significant indigenous trees (wherever possible). Non-the-less, it is expected that a number of smaller *Boscia foetida* species and provincially protected species will be impacted.

WATER COURSES AND WETLANDS

Please note that a freshwater specialist report was commissioned for this development. As a result this report did not address potential impacts on watercourses or wetlands, but only focus on the vegetation within the riparian zone.

MAIN CONCLUSION

The proposed development will result in the semi-permanent transformation of approximately 17 ha of natural veld. According to the impact assessment given in Table 11 and Table 12 the potential impact should be relatively low, even to begin with, but with good environmental control, the impact of the proposed activities should result **very low** impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contributed significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED SINCE IT IS UNLIKELY TO RESULT IN IRREVERSIBLE ENVIRONMENTAL IMPACT.

NO-GO OPTION

The development is likely to result in potential significant beneficial socio-economic gain, while the no-go option will not contribute significantly to national or provincial conservation targets.

INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTR and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity en environmental legal compliance audits.

During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes NEMA EIA applications, environmental management plans for various industries, environmental compliance audits, environmental control work as well as more than 70 biodiversity & botanical specialist studies.

Towards the end of 2017, Mr Botes started his own small environmental consulting business focusing on biodiversity & botanical assessments, biodiversity management plans and environmental compliance audits.

Mr. Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

DECLARATION OF INDEPENDENCE

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Petrus, Jacobus, Johannes Botes, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.

Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

12 February 2020

Date:

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1. INTRODUCTION

Witvlei Boerdery Trust (the owners) would like to apply for prospecting and mining rights on the Farm Rozynen Bosch No. 104/5. Rozynen Bosch is about 37 km south-south-east of Kakamas, in the Northern Cape Province (Kai !Garib Municipality). The farm is just over 5 000 ha in size and used for sheep farming (natural grazing), but evidence of past mining activities were observed on the property.

A Feldspar exploration program report (D Rossouw, no date) identified a number of Feldspar sites on the property. Of the identified sites the owners would like to apply for mining and prospecting rights as follows:

- Mining rights on for two sites (Site 1a & 1b in this report), with a total footprint of about 5 ha; and
- Prospecting rights on a further 4 sites (Site 2 to 5 in this report) with a total footprint of approximately 12 ha.

The proposed development will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed to perform the NEMA EIA application. The new development will be located in veld still supporting natural veld and PB Consult was appointed to conduct a botanical assessment of the various sites.

Only one vegetation type is expected, namely Bushmanland Arid Grassland (considered "Least Threatened" in terms of the National list of ecosystems that are threatened and in need of protection). As with almost all areas in the Northern Cape the site is criss-crossed by the normal ephemeral drainage lines, but some larger water courses were also encountered and the seasonal Hartbees River runs to the west of the farm. In the Northern Cape these watercourses are often associated with slightly larger shrubs and small trees that are only found in the vicinity of these water courses.

1.1. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) in order to determine whether any significant botanical features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species) that should be avoided or that may require "search & rescue" intervention.
- Locate and record sensitive areas from a botanical perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. STUDY AREA

2.1. LOCATION & LAYOUT

The town of Kakamas is located on the banks of the Orange River next to the N14, between Pofadder and Keimoes, about 80 km west of Upington within the Kai !Garib Local Municipality of the Northern Cape Province. The Farm Rozynen Bosch 104/5 is located approximately 37 km south-south-east of Kakamas, just off a secondary gravel road between Kakamas and the R27 (Kenhardt) (Refer to Figure 1).

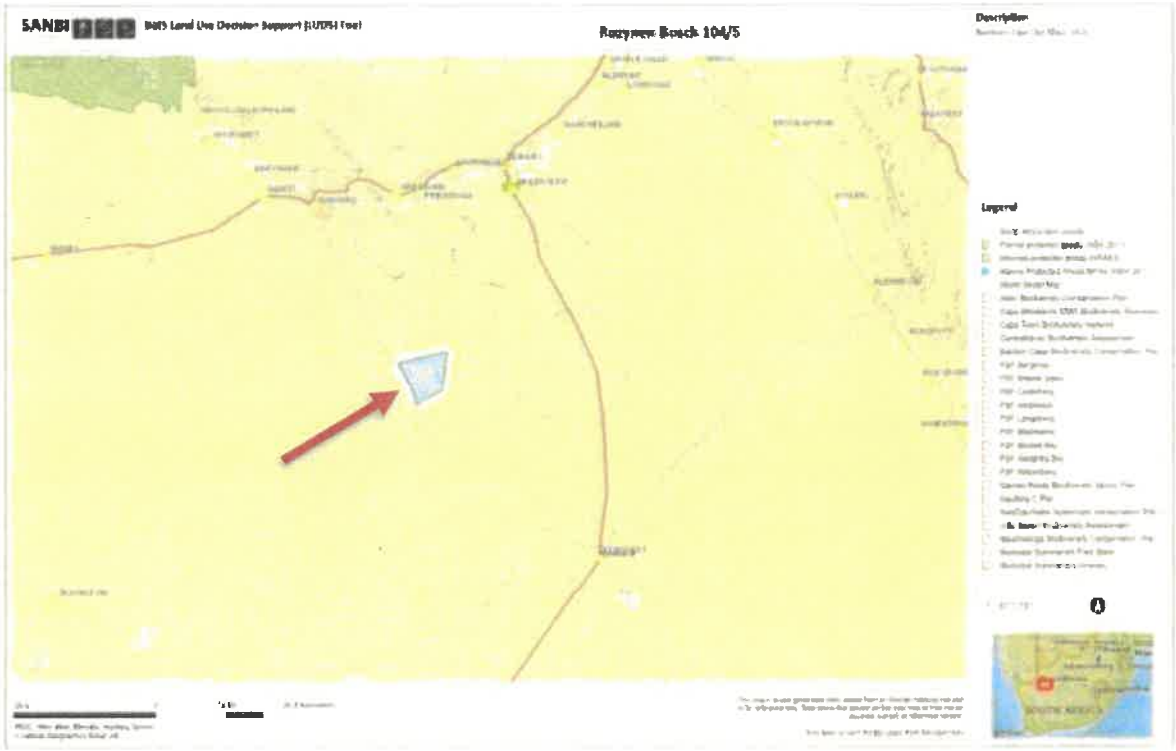


Figure 1: The location of the Farm Rozynen Bosch 104/5 (blue) relative to Kakamas and Kenhardt (Northern Cape)

Figure 2, Table 1 and Table 2 gives an indication of the potential footprints for the proposed new development(s). The red areas (Site 1a & 1b) refer to the mining right application sites, while the yellow areas (Site 2 – 5) refer to the prospecting right application sites.

Table 1: Proposed mining sites (location and footprint)

NAME OF SITE	LOCATION	SIZE	TOTAL
Site 1a	S29° 03' 05.8" E20° 49' 48.2"	± 3.51 ha	4.99 ha
Site 1b	S29° 03' 17.4" E20° 50' 12.1"	± 1.48 ha	

Table 2: Proposed prospecting sites (location and footprint)

NAME OF SITE	LOCATION	SIZE	TOTAL
Site 2	S29° 03' 41.5" E20° 50' 42.2"	± 2.85 ha	11.88 ha
Site 3	S29° 04' 09.5" E20° 51' 23.5"	± 3.11 ha	
Site 4	S29° 04' 09.3" E20° 51' 38.4"	± 3.93 ha	
Site 5	S29° 04' 39.0" E20° 50' 57.6"	± 1.99 ha	

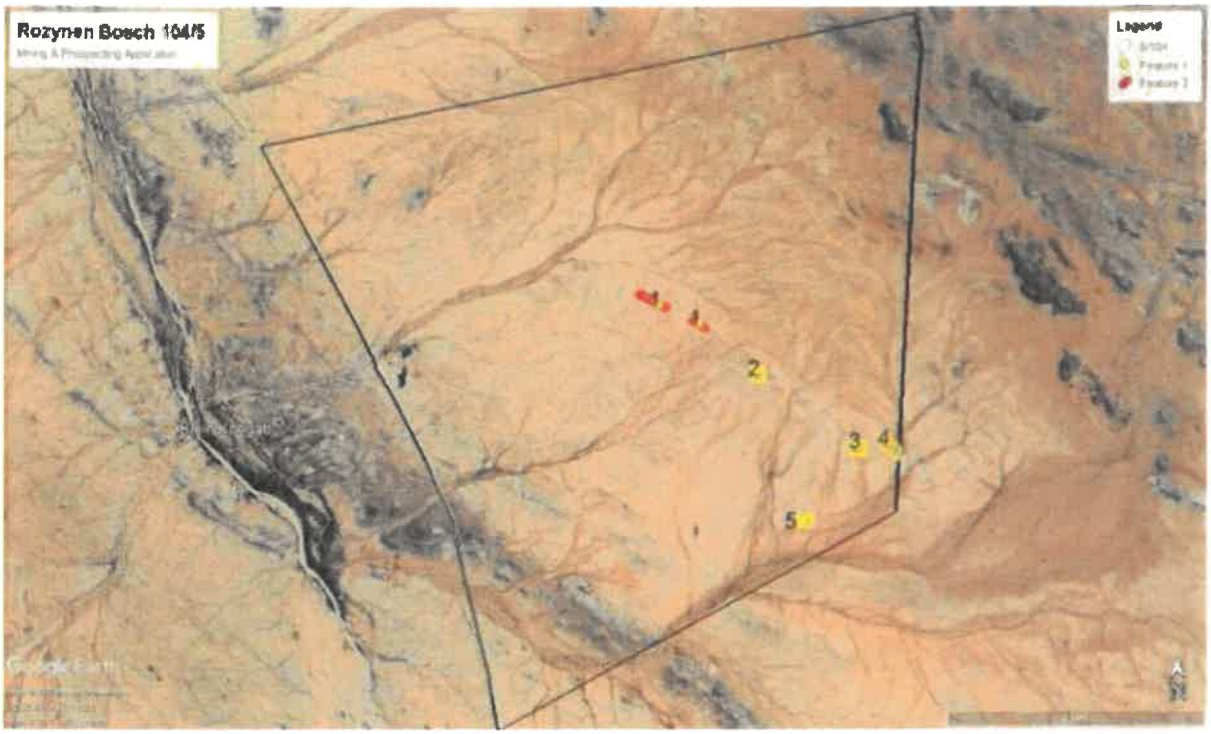
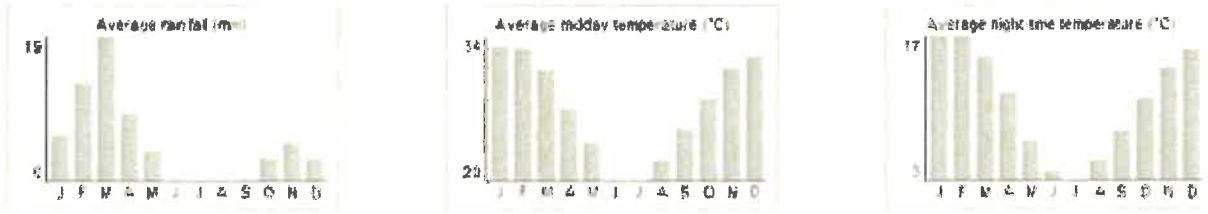


Figure 2: The proposed Mining areas (red) and Prospecting areas (yellow) on Farm Rozynen Bosch 104/5

2.2. CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid and the Kakamas area would be classified as a desert region, receiving on average only about 62 mm of rain per year (mainly during autumn). Table 3 below gives the average rainfall values (left) and average temperatures (centre and right) for Kakamas per month. It receives the lowest rainfall (0 mm) in June and the highest (19 mm) in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Kakamas range from 20°C in July to 33°C in January. On average, the coldest nights can be expected during July with night-time temperatures averaging 3.1°C (www.saexplorer.co.za).

Table 3: Average rainfall and temperatures for Kakamas (www.saexplorer.co.za)



2.3. GEOLOGY AND SOILS

According to Mucina & Rutherford (2006), the geology is dominated by mudstones and shales of the Ecca Group (Prince Albert and Volksrust Formations) and Dwyka tillites, both of the early Karoo age. About 20% of rock outcrops are formed by Jurassic intrusive dolerite sheets and dykes. The soils are described as soils with minimal development, usually shallow on hard or weathering rock, Glenrosa and Mispah forms, with lime generally present in the entire landscape (Fc land type) and, to a lesser extent, red-yellow apedal, freely drained soils with a high base status and usually <15% clay (Ah and Ai land types) are also found. The salt content in these soils is very high.

According to the exploration report done by Rossouw (no date), the area is hosted in the Namaqua-Natal-Province, which hosts numerous pegmatite bodies across a length of approximately of 450 km, striking in a W-E trending, termed the Orange River Pegmatite Belt. The property falls within the Keimoes Suite consisting of gneiss, granites and pegmatites.

2.4. TOPOGRAPHY

The most significant feature of the area, influencing topography is the Hartbees River that runs to the west of the property (from southeast to northwest) as it drains towards the Orange River. As a result the landscape within which the property is located slopes gently from East-North-East to West-South-West (refer to Figure 3). To the east and north-east of the property small hills (koppies) can be observed, but for the most part the landscape can be described as undulating as it slopes (drains) down towards the Hartbees River. The property itself is criss-crossed by a number of small seasonal drainage lines as well as two slightly more significant drainage lines. Elevation drops from approximately 835 m to about 722 m (at the Hartbees River) over a distance of just under 9 km, with a maximum slope of 9.1% and an average slope of only 1.7%.

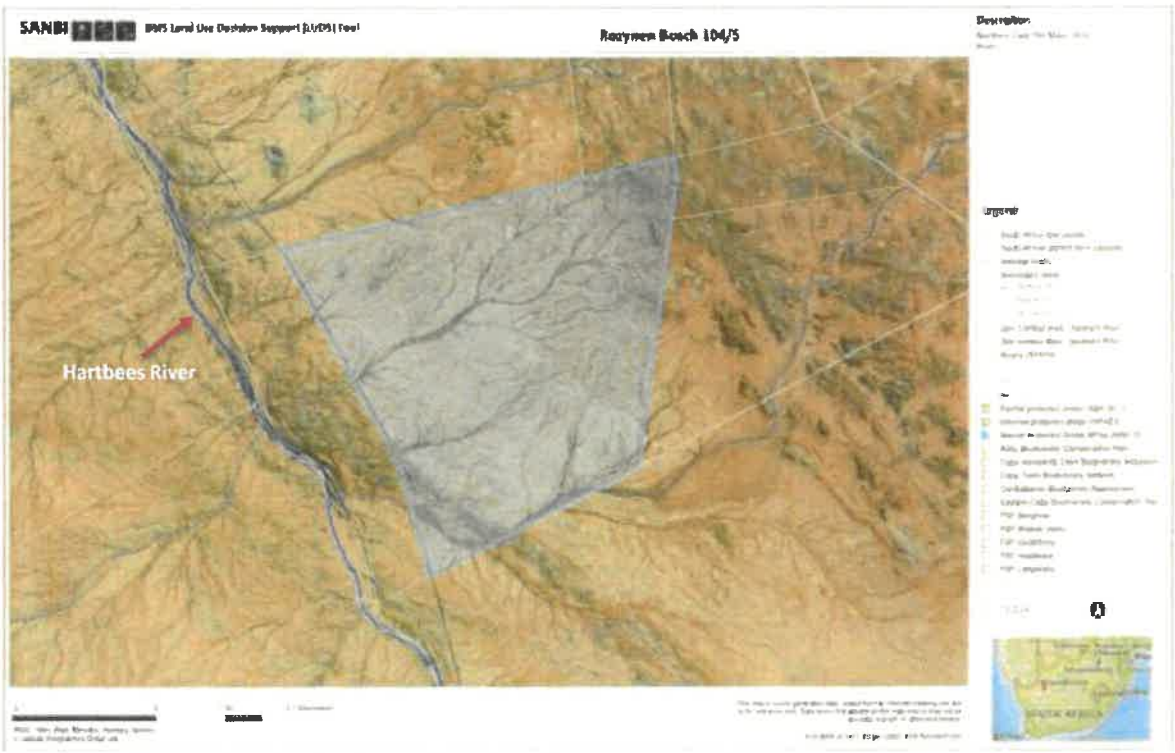


Figure 3: World imagery (SANBI BGIS) showing the property and most significant drainage lines

In general aspect is not expected to have any significant influence on the vegetation. The main environmental feature that might influence vegetation will be geographical features such as the water courses and rocky outcrops. In terms of vegetation, most of these drainage lines are probably not significant, apart from the larger indigenous trees that is often associated with such drainage lines and which in turns can support its own localized ecological habitat. However, the proposed footprints should not have any direct impact on any of these water courses or any of the rocky outcrops that were observed to the east of the site.

3. EVALUATION METHOD

Desktop studies and a site visit were performed to evaluate the proposed sites in terms of potential impacts on biodiversity. Please note that alternative sites were not evaluated as the potential sites were determined by the occurrence of feldspar intrusions. The site visit was conducted during October 2020 and co-in sided with a drought of more than 4 years, which has had a major impact on the economy of the Northern Cape (especially livestock farming). According to the land-owner, the specific property had not received any rains during the past 4 years. As a result the timing of the site visit is as good as it can be, since the impact of the recent droughts in the Northern Cape would have meant that there would have been very little difference in plant species composition throughout the seasons. As a result of the prolonged drought identification of many of the plant species were difficult; especially where only a few dry leaves remain. It was clear that the veld was in desperate need of some good rains. Because of the drought, grasses, bulbs and annual plant species were seldom observed. However, the author has completed a number of botanical assessments in this veld type and is confident that a fairly good understanding of the biodiversity status in the area was obtained (refer to Botes, 2012 to 2019).

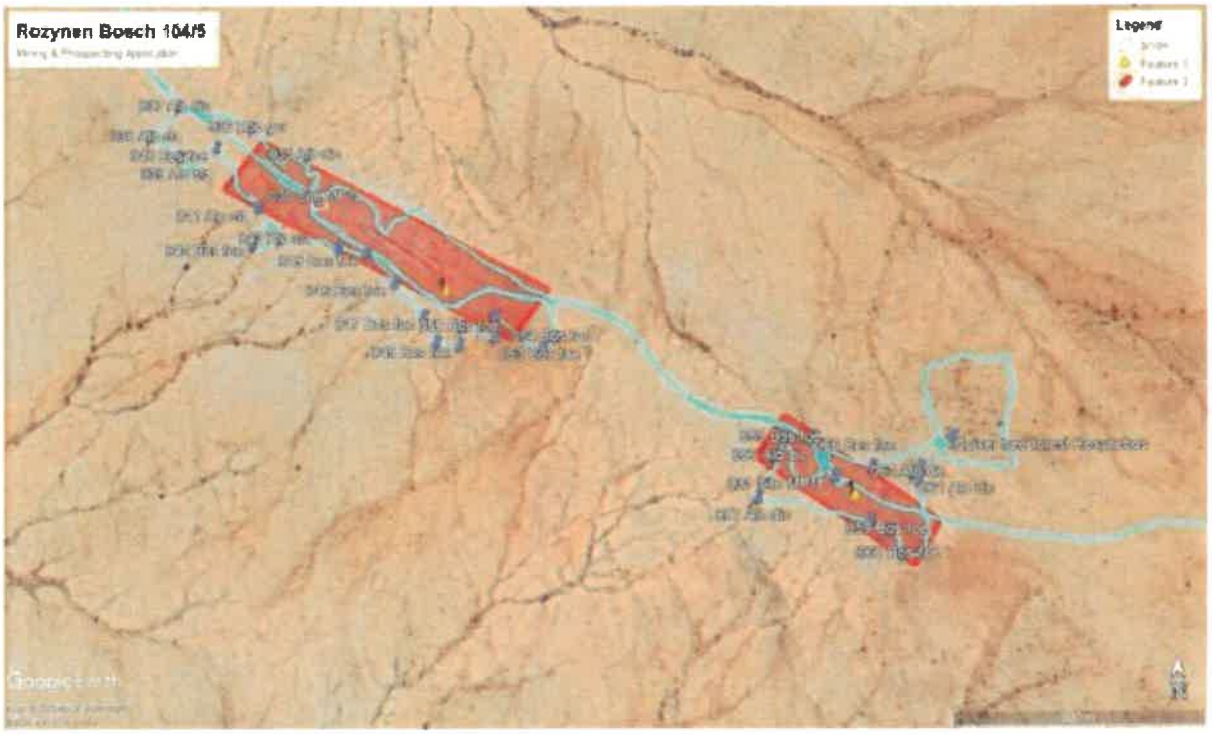


Figure 4: Google image, showing the proposed mining areas, the physical site visit and identified features of significance

The survey was conducted by walking the various sites and examining, marking and photographing any area of interest (refer to Figure 4 and Figure 5). Confidence in the findings is good. During the site visit the author endeavoured to identify and locate all significant biodiversity features, including rivers, streams or wetlands, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

Although no significant physical features were observed a number of protected plant species were identified and marked, including a beautiful "Quiver tree forest" (Refer to Figure 4) to the north-east of Site 1b (the lower site).

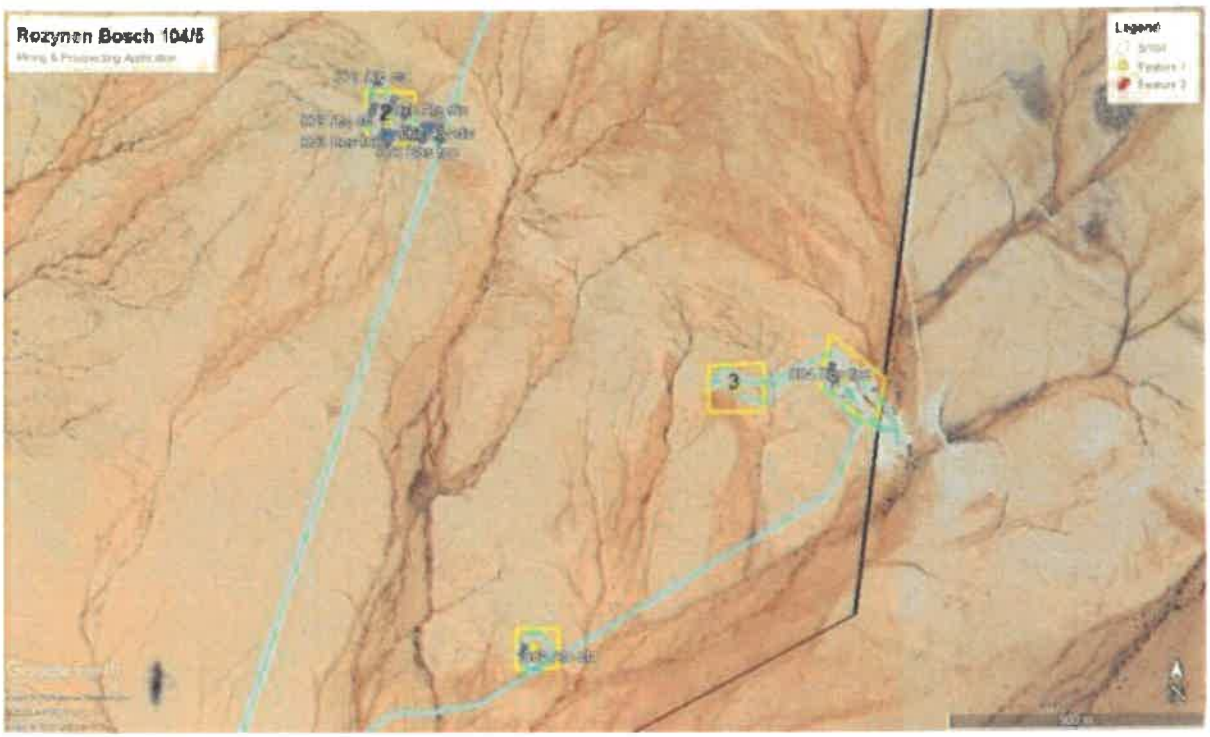


Figure 5: Google image, showing the proposed prospecting areas, the site visit and identified features of significance

4. THE VEGETATION

The Northern Cape contains about 3500 plant species in 135 families and 724 genera, with about 25% of this flora endemic to the region. It is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it must be noted that this remarkable diversity is not distributed evenly throughout the region, but is concentrated in many local centres of endemism.

The Kakamas area would be classified as a desert region. In accordance with the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely **Bushmanland Arid Grassland** (Refer to Figure 6). More than 99% of this vegetation still remains, but only 4% is formally conserved (Augrabies Falls National Park). According to the National list of ecosystems that are threatened and in need of protection (GN 1002, December 2011), Bushmanland Arid Grassland, remains classified as *Least Threatened*.

According to Mucina and Rutherford (20016), Bushmanland Arid Grassland is found in the Northern Cape Province spanning about one degree of latitude from around Aggeneys in the west to Prieska in the east. The southern border of the unit is formed by edges of the Bushmanland Basin while in the north-west this vegetation unit borders on desert vegetation (north-west of Aggeneys and Pofadder). The northern border (in the vicinity of Upington) and the eastern border (between Upington and Prieska) are formed with often intermingling units of Lower Gariep Broken Veld, Kalahari Karroid Shrubland and Gordonia Duneveld. Most of the western border is formed by the edge of the Namaqualand hills. Altitude varies from 600 – 1 200 m.

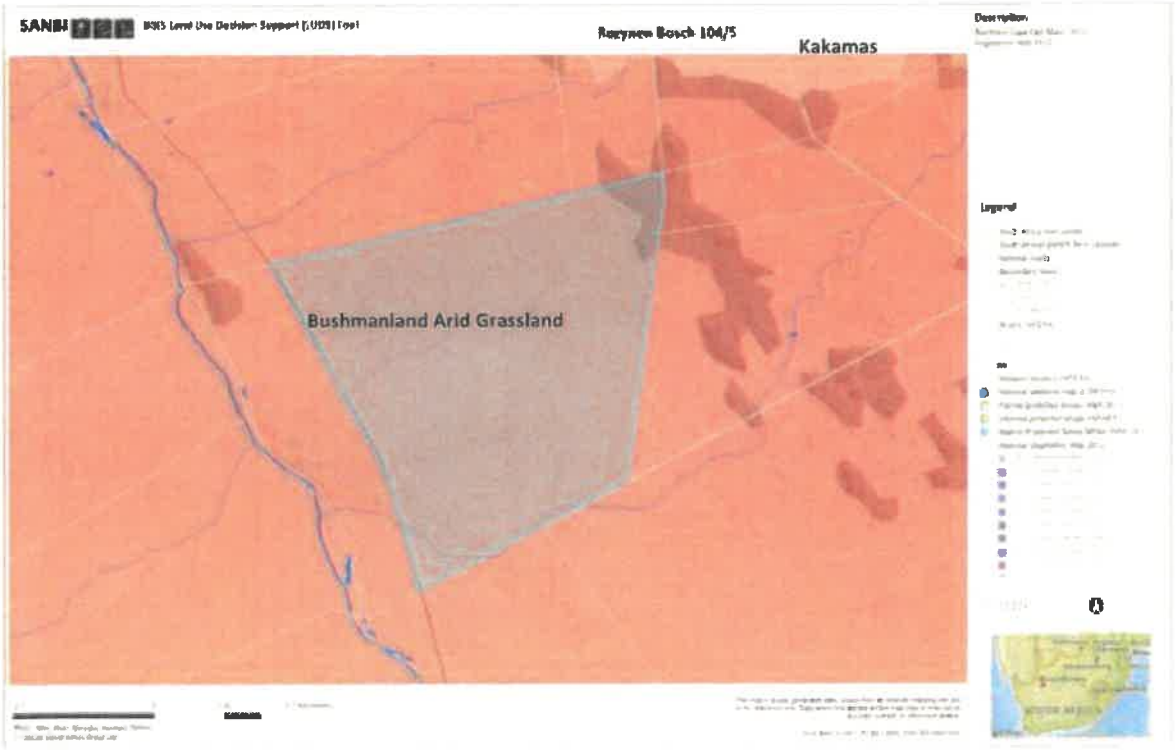


Figure 6: Vegetation map of South Africa (2012 beta 2 version), showing the larger area and expected vegetation type(s)

4.1. THE VEGETATION IN CONTEXT

Bushmanland Arid Grassland is part of the Nama-Karoo Biome, which is a large arid landlocked region on the central plateau of the western half of South Africa, extending into Namibia. It is flanked by the Succulent Karoo to the west and south, desert to the northwest, arid Kalahari Savanna to the north, Grassland to the northeast, Albany Thicket to the southeast and small parts of Fynbos to the south. In South Africa, only the Desert Biome has a higher variability in annual rainfall and only the Kalahari Savanna greater extremes in temperature. The Nama-Karoo receives most of its rainfall in summer, especially in late summer (Mucina *et. al.*, 2006).

Climate is essentially continental and with almost no effect of the ameliorating influences of the oceans. Rainfall is low and unreliable, peaking in March. Droughts are unpredictable and often prolonged. Summers are hot and winters cold with temperature extremes ranging from -5°C in winter to 43°C in summer. However, rainfall intensity can be high (e.g. episodic thunderstorm and hail storm events). This coupled with the generally low vegetation cover associated with aridity and grazing pressure by domestic stock over the last two centuries, raises the potential for soil erosion. In semi-arid environments such as the Nama-Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion (Mucina *et. al.*, 2006).

In contrast with the Succulent Karoo, the Nama-Karoo is not particularly rich in plant species and does not contain any centre of endemism. Local endemism is very low, which might indicate a relative youthful biome linked to the remarkable geological and environmental homogeneity of the Nama-Karoo. Rainfall seasonality and frequency are too unpredictable and winter temperatures too low to enable leaf succulent dominance (as in the Succulent Karoo). It is also too dry in summer for dominance by perennial grasses alone and the soils generally to shallow and rainfall too low for dominance by trees. But soil type, soil depth and local differences in moisture availability can cause abrupt changes in vegetation structure and composition (e.g. small drainage lines support more plant species than surrounding plains) (Mucina *et. al.*, 2006).

4.2. CRITICAL BIODIVERSITY AREAS MAPS

The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). The 2016 Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province (including the Namakwa District Biodiversity Sector Plan, 2008). Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated. Targets for terrestrial ecosystems were based on established national targets, while targets used for other features were aligned with those used in other provincial planning processes.

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans.

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained

in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

From a land-use planning perspective it is useful to think of the difference between CBA's and ESA's in terms of where in the landscape the biodiversity impact of any land-use activity action is most significant:

- For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat).

- For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity).

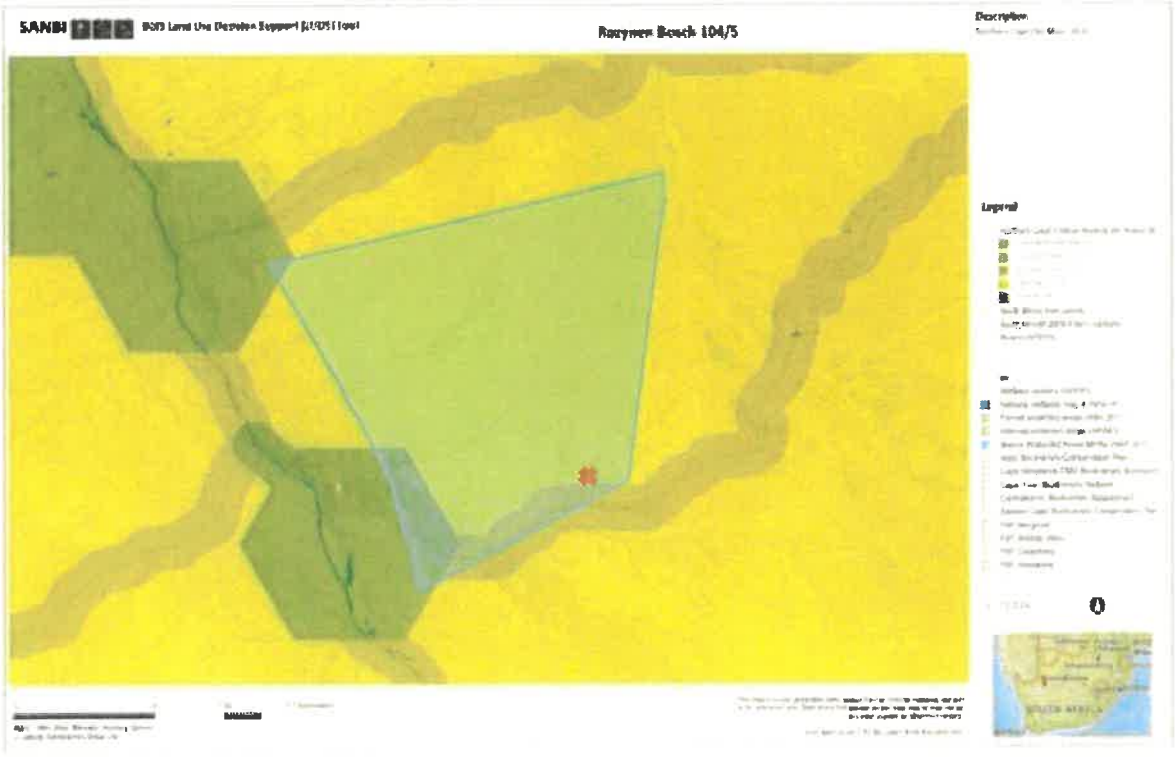


Figure 7: The Northern Cape Critical Biodiversity Areas (2016) showing larger area of the proposed development footprint

The 2016 Northern Cape Critical Biodiversity Areas (NCCBA) gives both aquatic and terrestrial Critical Biodiversity Areas (CBAs) and ecological support areas for the Northern Cape (Refer to Figure 7).

According to the NCCBA both CBA's and ESA's have been identified on Rozynen Bosch, but only Prospecting Site 5 may impact on an ESA. All the other sites are located outside of any ESA or CBA.

4.3. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

The proposed development does not impact on any recognised centre of endemism. The Gariep Centre is located to the north (quite a distance away) associated with Augrabies, Pella and Onseepkans along the border of South Africa and Namibia, while the Griqualand West Centre of Endemism starts to the east of Upington Northern Cape Province (Van Wyk & Smith, 2001).

The property (Farm) does not fall within any recognised centre of endemism.

4.4. VEGETATION ENCOUNTERED

Bushmanland Arid Grassland is generally described as sparsely vegetated (semi-desert) low shrubland dominated by white grasses (*Stipagrostis* species) on gently sloping or irregular plains, which can, in years of abundant rainfall, have rich displays of annual herbs. However, because of the persistent drought experienced in the Northern Cape grasses were almost absent as were annuals and bulbs. According to the owner, the farm had not received any rain during past 4 years. In general the veld had been reduced to a very sparse low shrubland, with only the hardier and drought resistant species remaining (many of which are also slowly succumbing to the drought). Towering above the low shrubland, Quiver trees (*Aloidendron dichotomum*) can be found scattered throughout the landscape, sometimes forming denser stands. Because of the drought it was sometimes difficult to identify plants to species level.

It is important to note that none of the mining or prospecting sites will impact on any significant riparian vegetation (associated with seasonal streams or larger drainage lines), being mostly placed on small outcrops or on top of a small hill. As a result the vegetation was very similar for all of these sites. However, since the mining- and prospecting applications will be two separate applications the vegetation for the mining sites (Site 1a & 1b) and that of the prospecting sites (Site 2 – 5), will be discussed separately.

4.4.1. Vegetation: The mining site(s)

The proposed Feldspar mining sites (Site 1a & 1b) are located about 300m apart (Figure 8), on top of the same small ridge, which is located almost in the centre of Farm 104/5 (Figure 2). Evidence of previous mining activities can be observed at Site 1a, in the form of a deep trench within the site (Figure 8). The soils on the ridge were shallow and dominated by a quarts and feldspar rocky layer. The vegetation was reduced to a very sparsely distributed (less than 10% cover) low shrub layer about 0.4 m in height, with the occasional *Aloidendron dichotomum* (Quiver Tree) scattered through the landscape (Photo 1 to Photo 8).

Photo 1: Looking from west to east over the proposed mining Site 1a. Note the very sparse shrub layer, the absence of grasses and the shallow rocky soils. In the background, a Quiver tree can be observed as well as evidence of previous mining activities.

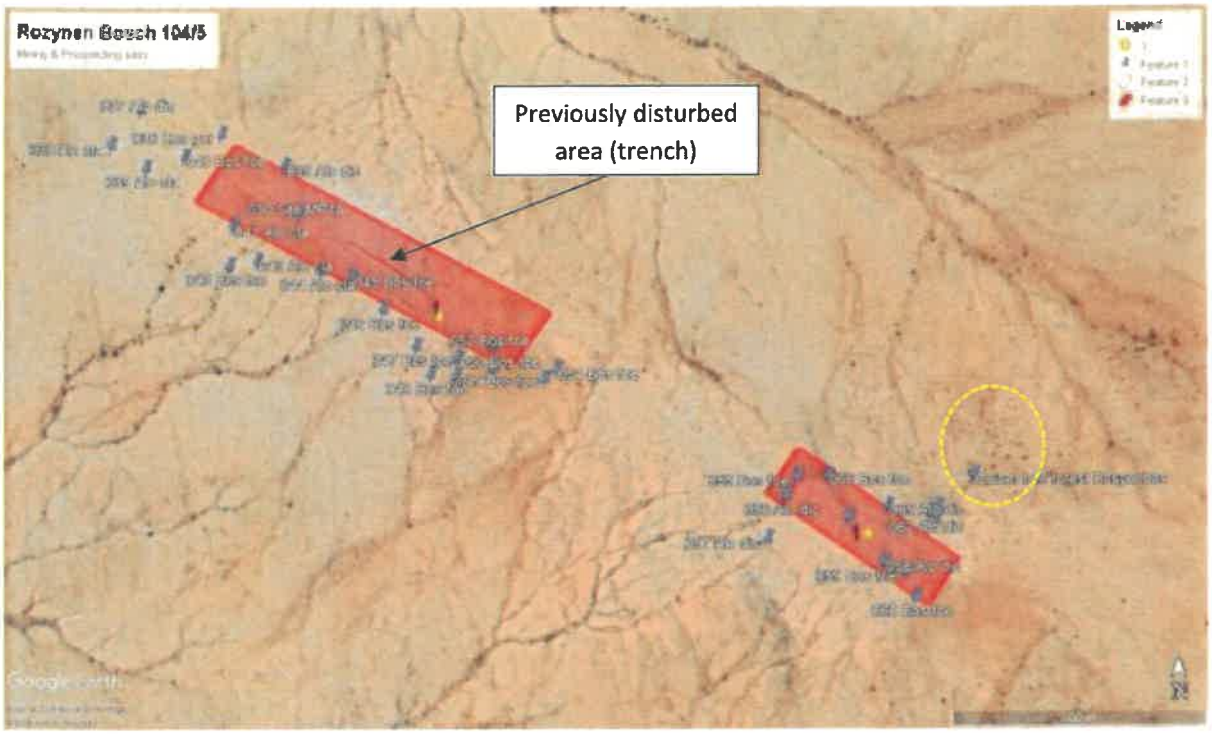


Figure 8: Proposed Site 1a (left) and 1b (right) indicating features of significance; note the "Quiver tree forest" - yellow

Photo 2: Looking back from south east to north west over Site 1a.

The sparse shrub layer was dominated by the small perdebos *Justicia australis (=Monechma genistifolium),* with the *Acanthopsis carduifolia* also prominent.

Sparsely distributed throughout the sites the following species were also encountered, namely: *Acanthopsis disperma* (verneuk-halfmensie), *Aloe claviflora* (Kraalaalwyn), *Aptosimum spinescens*, the occasional *Boscia foetida, Euphorbia spinea,* one individual of *Hoodia gordonii*, *Lycium cinereum, Mesembryanthemum coriarium* (=*Psilocaulon coriarium*), the dried-out stems of one of the *Monsonia* species (boesmanskers), *Parkinsonia africana, Rhigozum trichotomum,* occasionally a *Ruschia intricate* (doringvygie), *Salsola* cf. *tuberculata* (blomkoolganna), *Senegalia mellifera,* with a number of *Aloidendron dichotomum* (Quiver Trees) scattered throughout.

Photo 3: The single individual of *Hoodia gordonii* that was encountered to the northeast and outside of the proposed footprint for Site 1a. Even though it is outside of the footprint, it is likely to be within 30m of the footprint and should be demarcated for protection during construction.

Photo 4: Site 2: Looking from northwest to southwest over the proposed Site 1b. Note the number of Quiver trees to the left of the photo. Fortunately, apart from 2 individuals, all of the Quiver trees will be outside of the proposed footprint.

Photo 5: A dead Quiver tree in front of a *Boscia foetida* to the southwest of Site 1b. About four of the *Boscia foetida* individuals is expected to fall within the two proposed mining footprints

Photo 6: Looking over the Quiver tree "forest" located to the north of Site 1b.

A beautiful Quiver tree "forest" (*Aloidendron dichotomum*) was encountered just north (about 90m away) of the southern portion of Site 1b (refer to Figure 8 and Photo 6 – 7). Fortunately, this beautiful group of trees are well away from the proposed Feldspar mining site and the mining operation should have no impact on these trees.

Photo 7: Some of the Quiver trees (*Aloidendron dichotomum*) within the Quiver tree "forest"

Being on top of a small ridge, the footprint have almost no impact on any significant watercourses, and only impact on one or two smaller drainage lines (to the northwest of Site 1b) (Figure 8 and Photo 8). The proposed sites will thus have very little direct impact on any watercourse (although the run-off patterns from these ridges might be changed slightly as a result from future excavations).

Photo 8: One of the small drainage lines that is likely to be impacted by the proposed footprint of Site 1b (running through the northern part of the footprint).

4.4.1.1. PROTECTED PLANTS ENCOUNTERED

A number of *Aloidendron dichotomum* as well as *Boscia foetida* trees were encountered within or very near to the site (Refer to Figure 8). A number of *Aloe claviflora* individuals were also observed and marked. The location of these plants (in the vicinity of the proposed footprint) is given in Table 4.

Table 4: Location of protected plant species encountered within or near to the proposed Site 1a & 1b

NO.	SPECIES NAME	COORDINATES	COMMENTS	RECOMMENDATIONS
035 Alo dic	*Aloidendron dichotomum*	S29° 03' 04.0" E20° 49' 47.6"	Mature plan. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
036 Hoo gor	*Hoodia gordonii*	S29° 03' 02.7" E20° 49' 44.8"	Single individual. Outside footprint	**Protect:** Mark as a No-Go zone
037 Alo dic	*Aloidendron*	S29° 03' 01.8" E20° 49' 41.2"	Outside footprint	Protect

NO.	SPECIES NAME	COORDINATES	COMMENTS	RECOMMENDATIONS
	dichotomum			
038 Alo cla	*Aloe claviflora*	S29° 03' 03.2" E20° 49' 39.9"	Outside footprint	Protect
039 Alo cla	*Aloe claviflora*	S29° 03' 04.0" E20° 49' 41.5"	Outside footprint	Protect
040 Bos foe	*Boscia foetida*	S29° 03' 03.6" E20° 49' 43.2"	Outside footprint	Protect
041 Alo cla	*Aloe claviflora*	S29° 03' 06.3" E20° 49' 45.3"	Outside Footprint	Protect
042 Bos foe	*Boscia foetida*	S29° 03' 07.8" E20° 49' 45.2"	Outside footprint	Protect
043 Alo cla	*Aloe claviflora*	S29° 03' 07.6" E20° 49' 46.4"	Outside footprint	Protect
044 Alo cla	*Aloe claviflora*	S29° 03' 08.0" E20° 49' 49.2"	Outside footprint	Protect
045 Bos foe	*Boscia foetida*	S29° 03' 08.2" E20° 49' 50.6"	1.2m Shrub. Just inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
046 Bos foe	*Boscia foetida*	S29° 03' 09.5" E20° 49' 51.9"	Outside footprint	Protect
047 Bos foe	*Boscia foetida*	S29° 03' 10.9" E20° 49' 53.4"	Outside footprint	Protect
048 Bos foe	*Boscia foetida*	S29° 03' 12.0" E20° 49' 54.0"	Outside footprint	Protect
049 Bos foe	*Boscia foetida*	S29° 03' 12.1" E20° 49' 55.1"	Outside footprint	Protect
050 Bos foe	*Boscia foetida*	S29° 03' 11.4" E20° 49' 55.2"	Outside footprint	Protect
051 Bos foe	*Boscia foetida*	S29° 03' 11.8" E20° 49' 56.7"	Outside footprint	Protect
052 Bos foe	*Boscia foetida*	S29° 03' 10.9" E20° 49' 56.7"	1.2m Shrub. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
053 Bos foe	*Boscia foetida*	S29° 03' 12.1" E20° 49' 58.9"	Outside footprint	Protect
054 Bos foe	*Boscia foetida*	S29° 03' 11.8" E20° 49' 59.5"	Outside footprint	Protect
055 Bos foe	*Boscia foetida*	S29° 03' 15.9" E20° 50' 09.9"	1.6m Shrub. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
056 Alo dic	*Aloidendron dichotomum*	S29° 03' 16.6" E20° 50' 09.4"	Magnificent individual. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
057 Alo dic	*Aloidendron dichotomum*	S29° 03' 18.2" E20° 50' 08.6"	Outside footprint	Protect
058 Alo dic	*Aloidendron dichotomum*	S29° 03' 19.1" E20° 50' 13.6"	Young individual (<1m). Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
059 Bos foe	*Boscia foetida*	S29° 03' 19.5" E20° 50' 14.5"	2m Shrub. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
060 Bos foe	*Boscia foetida*	S29° 03' 20.4" E20° 50' 15.0"	2m Shrub. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
061 Alo dic	*Aloidendron dichotomum*	S29° 03' 17.5" E20° 50' 15.9"	Outside footprint	Protect
062 Alo dic	*Aloidendron dichotomum*	S29° 03' 17.3" E20° 50' 15.6"	Outside footprint	Protect
063 Alo dic	*Aloidendron dichotomum*	S29° 03' 17.0" E20° 50' 16.0"	Outside footprint	Protect
064 Alo dic	*Aloidendron dichotomum*	S29° 03' 15.8" E20° 50' 17.5"	Outside footprint	Quiver tree forest
065 Alo dic	*Aloidendron dichotomum*	S29° 03' 17.0" E20° 50' 13.8"	Outside footprint	Protect
066 Bos foe	*Boscia foetida*	S29° 03' 15.8" E20° 50' 11.2"	1.8m Shrub. Within footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**

4.4.2. Vegetation: The prospecting sites (Site 2 – 5)

The proposed prospecting sites are scattered in the lower south-eastern corner of the farm located on top of small rocky outcrops (refer to Figure 9). Site 4 is located along the slopes of a small hill, and Site 5 shows signs of previous disturbances (excavations), which had impacted about one quarter of the footprint.

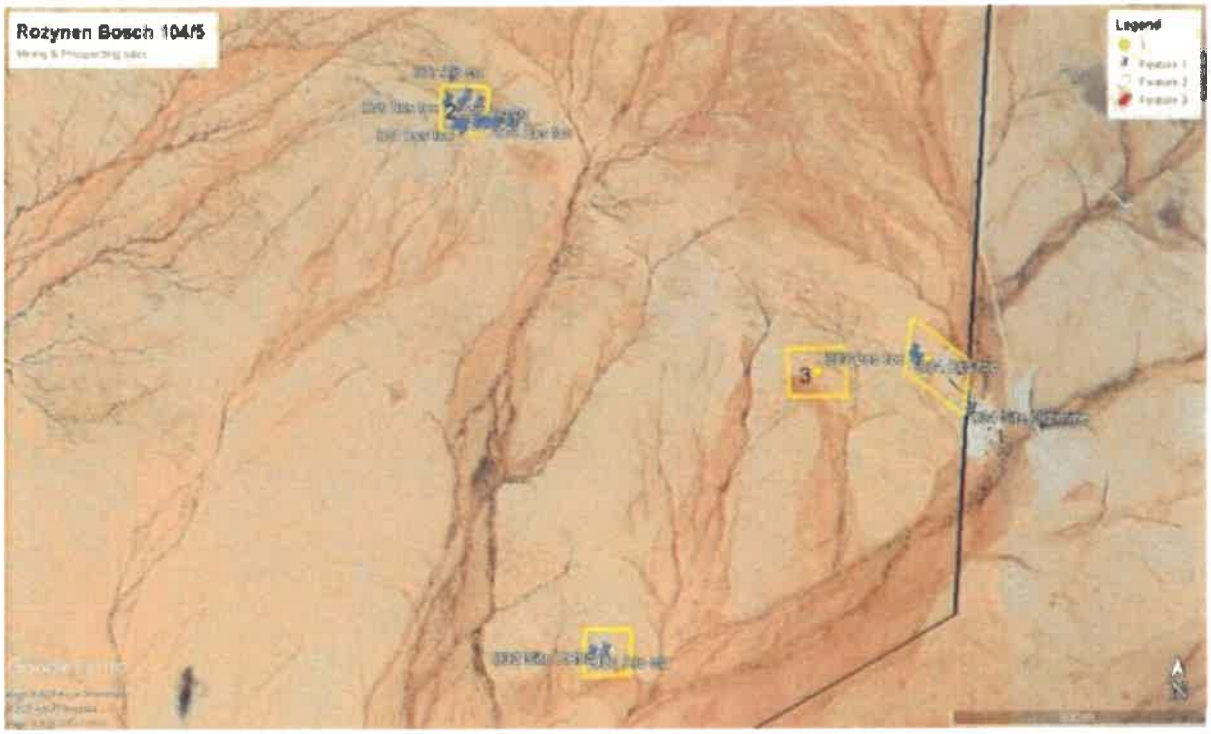


Figure 9: Google image showing the locations of the various prospecting sites and significant features observed

Site 2 overlapped onto slightly deeper soils associated with drainage lines to its north and east (Photo 10). In this area the vegetation was slightly denser, slightly higher and the species composition also changed slightly (slightly more species rich). However, in general the soils of all the other sites were shallow and rocky supporting a very sparse low shrubland (very similar to that encountered at the mining sites – Refer to Heading 4.4.1).

Photo 9: Typical vegetation encountered at Site 2 at the top of the small ridge or hill. Note the shallow rocky soils and the very sparse vegetation cover.

Photo 10: To the north and east of Site 2, slightly deeper soils associated with seasonal drainage lines were encountered. In this area, the shrub layer was slightly more robust (higher and denser). Most of the *Boscia foetida* and the *Aloidendron dichotomum* were located in this area.

In general the vegetation can be described as a low (less than 0.4m in height), very sparse (less than 10% cover) shrubland, showing the impact of the persistent drought currently being experienced throughout the Northern Cape (e.g. Photo 9). The shrub layer was mostly dominated by the small perdebos *Justicia australis (=Monechma genistifolium),* with *Mesembryanthemum coriarium* (=*Psilocaulon coriarium*) and *Acanthopsis carduifolia* also prominent. Sparsely distributed throughout the sites the following species were also encountered, namely: *Acanthopsis disperma* (verneuk-halfmensie), *Aloe claviflora* (Kraalaalwyn), *Aptosimum spinescens*, *Asparagus* species (with not leaves remaining), *Blepharis mitrata*, the occasional *Boscia foetida, Euphorbia spinea,* one individual of *Hoodia gordonii*, *Kleinia longiflora*, *Lycium cinereum,* the dried-out stems of one of the *Monsonia* species (Boesmanskers), *Parkinsonia africana, Rhigozum trichotomum,* occasionally a *Ruschia intricate* (doringvygie), *Salsola* cf. *tuberculata* (blomkoolganna), *Senegalia mellifera, Tetraena retrofracta* (hondepisbos) with individuals of *Aloidendron dichotomum* (Quiver Trees) encountered.

Photo 11: The vegetation encountered at Site 3 (looking from east to west over the site). A small portion of the site also showed previous disturbance (excavation).

Photo 12: Looking from east to west over Site 3. The site is located next to a small drainage line (to its north-east) where the soils are slightly deeper and vegetation slightly more pronounced.

Photo 13: Looking from northwest to southwest over Site 4. Again the very sparse vegetation cover is noteworthy.

Photo 14: Looking from south to north over Site 4. The perdebossie, *Justicia australis* to the left of the picture.

Photo 15: Looking from north to south over Site 5. Note the evidence of previous disturbance at the top of the ridge.

Photo 16: One of the Aloe claviflora encountered at Site 5. Note the poor condition of the plant.

At Site 4 *Tetreana simplex* as well as *Mesembryanthemum barklyi* were observed for the first time. Both of these plants are normally disturbance indicators. At Site 5, a *Pteronia* species as well as one of the Lessertia species was observed for the first time.

4.4.2.1. PROTECTED PLANTS ENCOUNTERED

A number of *Aloidendron dichotomum* as well as *Boscia foetida* trees were encountered within or very near to the various sites (Refer to Figure 9). A number of *Aloe claviflora* individuals were also observed and marked. The location of these plants (in the vicinity of the proposed footprint) is given in Table 5.

Table 5: Location of protected plant species encountered near the proposed prospecting sites (Site 2 – 5)

NO.	SPECIES NAME	COORDINATES	COMMENTS	RECOMMENDATIONS
067 Alo dic	*Aloidendron dichotomum*	S29° 03' 41.7" E20° 50' 45.9"	Outside footprint	Protect
068 Bos foe	*Boscia foetida*	S29° 03' 41.1" E20° 50' 45.4"	Outside footprint	Protect
069 Bos foe	*Boscia foetida*	S29° 03' 40.8" E20° 50' 44.2"	Outside footprint	Protect
070 Bos foe	*Boscia foetida*	S29° 03' 41.8" E20° 50' 43.5"	Outside footprint	Protect
071 Bos foe	*Boscia foetida*	S29° 03' 41.3" E20° 50' 41.6"	<1m Shrub in poor state. Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
072 Alo cla	*Aloe claviflora*	S29° 03' 41.3" E20° 50' 41.0"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
073 Bos foe	*Boscia foetida*	S29° 03' 41.7" E20° 50' 39.6"	1.6m Shrub Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
074 Bos foe	*Boscia foetida*	S29° 03' 42.0" E20° 50' 39.2"	2m Shrub. Just inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
075 Alo cla	*Aloe claviflora*	S29° 03' 41.5" E20° 50' 38.4"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
076 Bos foe	*Boscia foetida*	S29° 03' 38.7" E20° 50' 37.2"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
077 Alo cla	*Aloe claviflora*	S29° 03' 35.4" E20° 50' 37.8"	Outside footprint	Protect
078 Alo cla	*Aloe claviflora*	S29° 03' 38.0" E20° 50' 39.7"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
079 Alo cla	*Aloe claviflora*	S29° 03' 39.3" E20° 50' 38.8"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
080 Bos foe	*Boscia foetida*	S29° 03' 39.0" E20° 50' 41.4"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
081 Alo cla	*Aloe claviflora*	S29° 03' 41.1" E20° 50' 43.5"	Outside footprint	Protect
082 Alo cla	*Aloe claviflora*	S29° 04' 39.2" E20° 50' 56.1"	Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
083 Bos foe	*Boscia foetida*	S29° 04' 07.9" E20° 51' 35.6"	1.8m Shrub Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**
084 Bos foe	*Boscia foetida*	S29° 04' 08.8" E20° 51' 36.1"	1.3m Shrub Inside footprint	**Mark as a No-Go zone or transplant to nearby area (Flora Permit Required).**

4.4.3. Vegetation: The proposed processing plant site

Apart from the mining and prospecting sites, the land owner would also like to establish a site for the processing and handling of the product (Feldspar). It is proposed that the site be located on an existing disturbed / transformed footprint, next to existing outbuildings and storage areas (Photo 17 and Photo 18).

Photo 17: Looking from south to north over the proposed processing plant (indicated in red). Note the existing disturbance footprint on which it will be located.

Photo 18: Looking from north-north-east, to south-south-east over the site. Again the existing disturbance can be easily seen. The *Senegalia mellifera* in the foreground is well away from the footprint.

The only features of botanical significance were the presence of a number of *Vachellia erioloba* trees within the ephemeral water course across the road from the proposed site, and the one *Vachellia erioloba* near the stores. However, none of these trees are within the proposed footprint or will be impacted (Figure 10).

Figure 10: Google image showing the proposed processing plant location (red) at the entrance to the farm

4.5. FLORA ENCOUNTERED

It is expected that because of the timing of the site visit a number of annuals would have been missed, some of whom might be protected in terms of the Northern Cape Nature Conservation Act (NCNCA), Act, 9 of 2009 (especially referring to species of the Aizoaceae family).

Table 6: List of species encountered within or near the proposed footprint

No.	Species name	FAMILY	Status	Alien & invader species (AIS)
1.	*Acanthopsis carduifolia*	ACANTHACEAE	LC	
2.	*Acanthopsis disperma*	ACANTHACEAE	LC	
3.	*Aloe claviflora*	ASPHODELACEAE	NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
4.	*Aloidendron dichotomum*	ASPHODELACEAE	VU NCNCA, Schedule 1 Protected	**Apply for a NCNCA Flora permit (DENC)**
5.	*Aptosimum spinescens*	SCROPHULARIACEAE	LC	
6.	*Asparagus* species	ASPARAGACEAE		
7.	*Blepharis mitrata*	ACANTHACEAE	LC	
8.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC NCNCA, Schedule 2 Protected (all species in this Genus)	**Apply for a NCNCA Flora permit (DENC)**
9.	*Euphorbia spinea*	EUPHORBIACEAE	LC NCNCA, Schedule 2 Protected (all species in this Genus)	**Apply for a NCNCA Flora permit (DENC)**
10.	*Hoodia gordonii*	APOCYNACEAE	DD (Data Deficient) Protected in terms of NEMBA NCNCA, Schedule 1 Protected	**Apply for a permit for transplanting (if required)**
11.	*Justicia australis (=Monechma genistifolium)*	ACANTHACEAE	LC	
12.	*Kleinia longiflora*	ASTERACEAE	LC	
13.	*Lessertia* species	FABACEAE		
14.	*Lycium cinereum*	SOLANACEAE	LC	
15.	*Mesembryanthemum barklyi*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	**Apply for a NCNCA Flora permit (DENC)**
16.	*Mesembryanthemum coriarium (=Psilocaulon coriarium)*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	**Apply for a NCNCA Flora permit (DENC)**
17.	*Monsonia* species	GERANIACEAE	Unsure	
18.	*Parkinsonia africana*	FABACEAE	LC	
19.	*Pteronia* species	ASTERACEAE	LC	
20.	*Rhigozum trichotomum*	BIGONACEAE	LC	
21.	*Ruschia intricate*	AIZOACEAE	Protected in terms of schedule 2 of the NCNCA	
22.	*Salsola* cf. *tuberculata*	AMARANTHACEAE	LC	
23.	*Senegalia mellifera (=Acacia mellifera)*	FABACEAE	LC	
24.	*Tetraena retrofracta (=Zygophyllum retrofractum)*	ZYGOPHYLLACEAE	LC	
25.	*Tetraena simplex (=Zygophyllum simplex)*	ZYGOPHYLLACEAE	LC	

4.6. THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).
- Northern Cape Nature Conservation Act, Act of 2009, provides for the protection of "*specially protected species*" (Schedule 1), "*protected species*" (Schedule 2) and "*common indigenous species*" (Schedule 3).

4.6.1. Red list of South African plant species

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (Foden & Potter, 2005).

- Two red-listed species was observed during the study (Refer to Table 7).

Table 7: Red list plant species encountered

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Aloidendron dichotomum* **Quiver tree**	Commonly found near the mining sites, but only occasionally at the prospecting sites (Refer to Table 4 & Table 5)	All efforts should be made to protect individual plants *in-situ*. However, if this is not possible impacted plants must be transplanted, to a suitable area within the adjacent landscape. Search & rescue must be under supervision of a suitable qualified person and only with the ECO approval. Transplanted plants must have a follow-up maintenance plan for at least one year
2.	*Hoodia gordonii* **Ghaap**	Only one encountered outside of Site 1a	The plant should be demarcated and protected throughout the mining operations.

4.6.2. NEM:BA protected plant species

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007).

- One species (*Hoodia gordonii*) protected in terms of NEM: BA was observed.

4.6.3. NFA Protected plant species

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species (as updated).

- **No species protected in terms of the NFA** was observed (apart from a *Vachellia erioloba* that did not fall within or near to any of the proposed disturbance footprints).

4.6.4. NCNCA protected plant species

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and also provides for the sustainable utilization of wild animals, aquatic biota and plants. Schedule 1 and 2 of the act give extensive lists of specially protected and protected fauna and flora species in accordance with this act. NB. Please note that all indigenous plant species are protected in terms of Schedule 3 of this act (e.g. any work within a road reserve).

- **The following species protected in terms of the NCNCA were encountered**. Recommendations on impact minimisation also included.

Table 8: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Aloe claviflora* **Schedule 2 protected**	Relatively common plant, but only observed within the footprint at Site 2 (4 clumps) and at Site 5 (1 clump)	**Search & rescue**: Individuals within footprint to be transplanted to surrounding area.
2.	*Aloidendron dichotomum* **Schedule 1 protected**	Commonly observe, especially near Site 1a & 1b, but only 3 individuals observed within the footprint of Site 1a & 1b.	All efforts should be made to protect individual plants *in-situ*. However, if this is not possible impacted plants must be transplanted, to a suitable area within the adjacent landscape. Search & rescue must be under supervision of a suitable qualified person and only with the ECO approval. Transplanted plants must have a follow-up maintenance plan for at least one year
3.	*Boscia foetida* **Schedule 2 protected**	Commonly observed throughout the landscape	All efforts should be made to protect individual plants *in-situ*. A permit must be obtained for the removal of any of these plants (because of its deep root system, they are unlikely to transplant successfully).
4.	*Euphorbia spinea* **Schedule 2 protected**	Occasionally observed	**Search & rescue**: Individuals within footprint to be transplanted to surrounding area
5.	*Hoodia gordonii* **Schedule 1 protected**	Only one individual observed, outside of the proposed footprint.	The plant should be demarcated and protected throughout the mining operations.
6.	*Mesembryanthemum barklyi* **Schedule 2 protected**	This plant is weedy a disturbance indicator that should probably not have been on the list of protected species.	No special measures needed, this is a weedy pioneer species.
7.	*Mesembryanthemum coriarium* **Schedule 2 protected**	This plant is weedy a species commonly found throughout.	No special measures needed, this is a weedy pioneer species.
8.	*Ruschia intricata* **Schedule 2 protected**	Only occasionally found and even then seldom within the footprint.	**Search & rescue**: Individuals within footprint to be transplanted to surrounding area

5. FAUNA AND AVI-FAUNA

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region favours free moving herbivores such as ostrich and springbok nomadic birds and invertebrates with variable dormancy cued by

rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, where they would have lingered longer, suggesting the transient nature of herbivores. However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been almost completely replaced by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity. Grazing during and immediately after droughts periods is regarded as a major cause of detrimental change in vegetation composition and were ultimately responsible for the decline of large numbers of palatable plants (Mucina *et. al.*, 2006).

In terms of status, very little of the Nama-Karoo has been transformed and the dominant land use is farming with small stock, cattle and game. Farms are fenced, but they need to be large because of the low grazing capacity. The biggest threat to this vegetation remains domestic livestock grazing pressure. Grazing by livestock particularly during the summer growing season, reduces the perennial grass component, while prolonged droughts kill a high proportion of perennial plants, rapidly changing vegetation composition in favour of short-lived species with soil stored seed banks. Overgrazing after drought periods can delay vegetation recovery, which will worsen the effect of subsequent droughts.

No fauna or avi-fauna screening was done as part of this study and the following notes are just observations with regards to status of the study area and observations made during the site visit. The location of the study area (agricultural land), the current land-use (livestock grazing), and the adjacent farming practices (including wild game hunting) would all have contributed to a disturbance factor. It is considered highly unlikely that a true reflection of potential game species can still be encountered on the property. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal would have been eradicated by farmers in fear of their livestock. Because of the long-term impact of human settlement on the larger areas a comprehensive faunal survey is not deemed necessary.

5.1. MAMMALS

The nearby Augrabies Falls National Park still supports an impressive diversity of larger antelope and other mammal species. However, it is highly unlikely that any of this larger game will still frequent or even visit the proposed footprint or its immediate surroundings (because of its location). Smaller game and other mammal species that may potentially still be found in this area can include the following (deducted from the list of species in the Augrabies Falls National Park: *Orycteropus afer* (Aardvark), *Pedetes capensis* (Springhare), *Phacochoerus africanus* (Common warthog), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Common duiker) *Suricata suricatta* (Suricate), *Xerus inauris* (Southern African ground squirrel) and *Canis mesomelas* (Black-backed jackal). However of all the potential species listed above only the ground squirrel and steenbok droppings was observed on site.

5.2. AVI-FAUNA

This area can potentially attract a great number of bird species like Cape Buntings Cape Wagtail, Cape Southern Masked Weaver, Cinnamon-Breasted Buntings Common Waxbill, Karoo Robin-Chats, Pale Winged Starlings, Pied Wagtail, Red Eyed Bulbuls, Rock Hyraxes, Swallow-Tailed Bee Eaters and White Throated Canaries. Near permanent rivers Alpine Swifts, Bradfield's Swifts, Brown-Throated Martins, Cape Robin-Chats, Common Moorhen Orange-River White-eyes, Rock Martins, Red-Eyed Bulbuls, White-Backed Mousebirds, and Lesser Swamp-Warblers may be observed. However, since the proposed footprints are relatively small and will not impact significantly on watercourses or large trees the impact is unlikely to be significant.

5.3. REPTILE & AMPHIBIANS

No reptile or amphibian species were observed during the site survey. The project footprint may provide habitat for a number of reptile species, but they would most likely be terrestrial species adapted to grassland and preying on avifauna and small mammal species. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

6. IMPACT ASSESSMENT METHOD

The objective of this study was to evaluate the botanical diversity of the property area in order to identify significant environmental features which might have been impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al.*, 2005), were used to evaluate the botanical significance of the property with emphasis on:

- Significant ecosystems
  - Threatened or protected ecosystems
  - Special habitats
  - Corridors and or conservancy networks
- Significant species
  - Threatened or endangered species
  - Protected species

6.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria (Refer to Table 9**Error! Reference source not found.**).

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

Table 9: Categories and criteria used for the evaluation of the significance of a potential impact

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
CONSERVATION VALUE Refers to the intrinsic value of an attribute or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.
LIKELIHOOD Refers to the probability of the specific impact occurring as a result of the proposed activity	Under normal circumstances it is almost certain that the impact will not occur.	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.	It is very likely that the impact will occur under normal circumstances.	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.
DURATION Refers to the length in time during which the activity is expected to impact on the environment.	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require on-going mitigation. Rehabilitation time is expected to be longer (5-15 years).	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require on-going mitigation. Rehabilitation time is expected to be longer (15-50 years).	The impact is expected to be permanent.
EXTENT Refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur.	Under normal circumstances the impact will be contained within the construction footprint.	Under normal circumstances the impact might extent outside of the construction site (e.g. within a 2 km radius), but will not affect surrounding properties.	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding land owners or –users, but still within the local area (e.g. within a 50 km radius).	Under normal circumstances the impact might extent to the surrounding region (e.g. within a 200 km radius), and will regional land owners or –users.	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).
SEVERITY Refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur.	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

6.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. In order to do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact and evaluate the significance of that impact should it occur. Potential significant impacts are evaluated, using the method described above, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 5.

Table 10: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Social, cultural and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. Social, cultural and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts cannot be mitigated and usually result in very severe effects, beyond site boundaries, national or international.

7. DISCUSSING BOTANICAL SENSITIVITY

The aim of impact assessment is to determine the vulnerability of a habitat to a specific impact. In order to do so, the sensitivity of the habitat should be determined by identifying and assessing the most significant environmental aspects of the site against the potential impact(s). For this development the following biodiversity aspects was taken into account.

- **Location**: The proposed sites will be relatively small and distributed over a large area of agricultural land belonging to the applicant. In fact the total footprint for all of the sites will only relate to a direct impact of about 0.34% of this farm property. The sites will have minimum impact on water courses and associated riparian vegetation. On the other hand, the proposed sites will be located within areas still supporting natural veld in relative good condition (although grazing practices and the current drought period have impacted the vegetation composition over time). The vegetation type, however, is not considered vulnerable or endangered and only one of the sites (proposed prospecting Site 5) may impact on an ecological support area.
- **Activity**: The applicant would like to mine Feldspar in 6 locations on his property. This is likely to lead to a semi-permanent transformation of about 17 ha of indigenous vegetation (Bushmanland Arid Grassland). The mining activities will be open excavations that can be quite deep (up to 20 m deep). The proposed development will thus result in the semi-permanent transformation of approximately 17 ha of natural veld and may result in impacts on a number of protected plant species (most notably *Aloidendron dichotomum* and *Boscia foetida*).
- **Geology & Soils**: No special features such as water courses, wetlands, true quarts patches or heuweltjies were observed in or near to any of the proposed footprints that may result in specialised plant habitat (rainfall in this area is too unpredictable to result in true quartz vegetation).
- **Land use and cover**: Land use is primarily livestock grazing. The area is to dry for cultivation. The possible impact on socio-economic activities is likely to be positive likely to result in job opportunities.
- **Vegetation status:** Bushmanland Arid Grassland is not considered a threatened vegetation type, with more than 99% remaining. However only 4% is formally conserved (Augrabies Falls National Park). Further conservation options must thus be investigated. The most significant aspect of this vegetation is the presence of a number of protected tree species in or near to the proposed footprints. The excavated areas will have to be rehabilitated after mining has been completed.
- **Conservation priority areas:** The Northern Cape CBA Map (2016) identifies biodiversity priority areas, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole (Holness & Oosthuysen, 2016). According to the Northern Cape Critical Biodiversity Areas (2016), only prospecting Site 5 may fall within an ecological support area (although the site itself is located on a small hill away from any watercourse). None of the sites will impact on any recognised centre of endemism.
- **Connectivity**: The footprints will be small (<17 ha) and distributed over a large area of agricultural land. The semi-permanent impact on these small patches of is unlikely to result in any significant impact on connectivity land will have an impact on connectivity.
- **Watercourses and wetlands**: Please note that a freshwater specialist report was commissioned for this development. As a result the impacts on watercourses or wetlands have not been evaluated in this report.
- **Protected or endangered plant species**: A number of protected plant species were observed, most notably the potential impact on a number of *Aloidendron dichotomum* and *Boscia foetida* individuals. However, the owner committed (confirmed by previous development practices on this property) to the protection of all significant indigenous trees (wherever possible). Non-the-less, it is expected that a number of smaller *Boscia foetida* species and provincially protected species will be impacted.

- **Invasive alien species**: For most of the property, only the occasional Prosopis trees were observed, but not within or near to any of the proposed footprints
- **Veld fires**: According to the National Veldfire risk classification (March 2010), Bushmanland Arid Grassland falls within an area with a Low fire risk classification. However, veld fire risk must be considered during construction.

7.1. IMPACT ASSESSMENT: THE PROPOSED MINING SITES

Table 11 rates the significance of environmental impacts associated with the proposed mining activities. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 11: Impact assessment: The Mining Sites (Site 1a & 1b)

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	2	1	1	1	1	8	No special habitats observed.
	With mitigation	2	1	1	1	1	8	Ensure good environmental control during the construction phase.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	1	3	1	1	12	Semi-permanent impact on approximately 5 ha of indigenous veld with a very low grazing capacity.
	With mitigation	2	1	2	1	1	10	Potential beneficial socio-economic impact (job opportunities).
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	3	3	1	1	16	Semi-permanent impact on approximately 5 ha of Bushmanland Arid Grassland (Least threatened).
	With mitigation	2	2	2	1	1	12	Minimise the impact on Protected species (search & rescue if not possible to protect *in-situ*).
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	2	1	3	1	1	12	The proposed mining sites have a small footprint area and will not impact on any CBA or ESA.
	With mitigation	2	1	2	1	1	10	Minimise the footprint and the impact on protected plant species wherever possible.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	1	3	1	1	12	The proposed mining sites have a small footprint area and will not impact on any CBA or ESA.
	With mitigation	2	1	2	1	1	10	Minimise the footprint and the impact on protected plant species wherever possible.
Watercourses and wetlands: Potential impact on natural water courses and it's ecological support areas.	Without mitigation	2	4	3	1	2	20	Site 1b might impact on small ephemeral drainage line (and protected species within the riparian zone of the stream).
	With mitigation	2	2	2	1	1	12	Refer to the freshwater specialist report.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	4	4	1	2	33	Three Quiver trees and 6 Boscia foetida shrubs were observed within the proposed footprint of the two sites.
	With mitigation	3	2	2	1	2	21	Minimise the impact on Protected species (search & rescue if not possible to protect *in-situ*).
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation						0	No Alien invasive species were observed within any of the proposed footprints or its immediate vicinity.
	With mitigation						0	
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	2	2	3	2	2	18	Veld fire risk low.
	With mitigation	2	1	1	1	1	8	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	4	4	2	2	36	Semi-permanent impact on approximately 5 ha of Bushmanland Arid Grassland (Least threatened), not within any CBA or ESA, but protected plant species and an ephemeral drainage line is likely to be impacted.
	With mitigation	3	2	2	1	2	21	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	1	1	1	1	12	No direct impact on natural veld or protected plant species, but no potential socio-economic gain.
	With mitigation						0	

7.2. IMPACT ASSESSMENT: THE PROPOSED PROSPECTING SITES

Table 12Table 11 rates the significance of environmental impacts associated with the proposed mining activities. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 12: Impact assessment: The Prospecting Sites (Site 2-5)

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	2	1	1	1	1	8	No special habitats observed.
	With mitigation	2	1	1	1	1	8	Ensure good environmental control during the construction phase.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	1	3	1	1	12	Semi-permanent impact on approximately 12 ha of indigenous veld with a very low grazing capacity.
	With mitigation	2	1	2	1	1	10	Potential beneficial socio-economic impact (job opportunities).

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	3	3	1	1	16	Semi-permanent impact on approximately 12 ha of Bushmanland Arid Grassland (Least threatened).
	With mitigation	2	2	2	1	1	12	Minimise the impact on Protected species (search & rescue if not possible to protect *in-situ*).
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	2	3	3	1	2	18	The proposed mining sites have a small footprint area and will not impact on any CBA or ESA apart from Site 5, which might impact on an ESA.
	With mitigation	2	1	2	1	1	10	Minimise the footprint and the impact on protected plant species wherever possible.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	1	3	1	1	12	The proposed mining sites have a small footprint area and will not impact on any CBA or ESA apart from Site 5, which might impact on an ESA.
	With mitigation	2	1	2	1	1	10	Minimise the footprint and the impact on protected plant species wherever possible.
Watercourses and wetlands: Potential impact on natural water courses and it's ecological support areas.	Without mitigation	2	4	3	1	2	20	None of the footprints from any of the sites will have any direct impact on any watercourse. However, access roads will have to be constructed for Site 3, which might impact a watercourse.
	With mitigation	2	2	2	1	1	12	Refer to the freshwater specialist report.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	3	4	1	2	30	7 *Boscia foetida* shrubs were observed within the proposed footprint of the sites.
	With mitigation	3	2	2	1	2	21	Minimise the impact on Protected species (search & rescue if not possible to protect *in-situ*).
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation						0	No Alien invasive species were observed within any of the proposed footprints or its immediate vicinity.
	With mitigation						0	
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	2	2	3	2	2	18	Veld fire risk low.
	With mitigation	2	1	1	1	1	8	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	4	4	2	2	36	Semi-permanent impact on approximately 5 ha of Bushmanland Arid Grassland (Least threatened), not within any CBA or ESA, but protected plant species and an ephemeral drainage line is likely to be impacted.
	With mitigation	3	2	2	1	2	21	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the	Without mitigation	3	1	1	1	1	12	No direct impact on natural veld or protected plant species, but no potential socio-economic gain.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
No-Go alternative.	With mitigation						0	

As expected both Table 11 and Table 12 gives very similar results (the vegetation and impacts being almost similar).

- The total footprint for the mining sites (approximately 5 ha) is less than half of that of the prospecting sites (12 ha), but even together the total footprint impact is very small (approximately 17 ha), and will only impact on about 0.34% of the total area of this specific property.
- For the mining sites, the potential for impacts on both the protected Quiver tree (*Aloidendron dichotomum*) and *Boscia foetida* (the False Shepherds Tree) is likely, while only *Boscia foetida* will be impacted by the prospecting sites.
- Site 5 of the prospecting sites may potentially fall within an ESA (Ecological Support Area), while none of the mining sites falls within any CBA or ESA.

The cumulative impact in both cases is expected to be **Low** to begin with, but mitigation can reduce the potential environmental impact to a potential **insignificant** rating.

8. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the semi-permanent transformation of approximately 17 ha of natural veld. According to the impact assessment given in Table 11 and Table 12 the potential impact should be relatively low, even to begin with, but with good environmental control, the impact of the proposed activities should result very low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contributed significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

8.1. MITIGATION MEASURES

8.1.1. Before construction commences

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Before any work is done the site and access routes must be clearly demarcated (with the aim at minimal width/smallest footprint). The demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance.
- Access must be limited to routes approved by the ECO.
- Lay-down areas or construction sites must be located within already disturbed areas or areas of low ecological value and must be pre-approved by the ECO.
- An application must be made to DENC for a flora permit in terms of the NCNCA with regards to impacts on species protected in terms of the act.
- Conservation of red-listed and protected plant species:
  - ***Hoodia gordonii***: The plant should be demarcated and protected throughout the mining operation (Refer to Table 4 & Table 7);
  - ***Aloidendron dichotomum***: All efforts should be made to protect individual plants *in-situ*. However, if this is not possible impacted plants must be transplanted, to a suitable area within the adjacent landscape. Search & rescue must be under supervision of a suitable qualified person and only with the ECO approval. Transplanted plants must have a follow-up maintenance (watering) plan for at least one year (Refer to Table 4, Table 5, Table 7 and Table 8);
  - ***Northern Cape Nature Conservation Act protected species***: Please refer to Table 8 for recommendations on the management of the various plants encountered.

8.1.2. During construction

- Topsoil (the top 10 – 15cm layer) should be removed (but only from the area that will actually be mined and spoil storage areas) and stored within the construction footprint (the topsoil contains and protects the seed store of the plants of the site). It must be protected and may not be contaminated by spoil or other excavated material. However, please note the following:

- NB: Topsoil must only be removed from the **areas that will be mined or used for the storage of spoil** (not from the surrounding veld – even if it will be impacted by construction vehicle movement). In other words, the whole footprint, should not be cleared ULESS the whole site will be mined. In dry desert climates like this encountered at Rozynen Bosch the rehabilitation of the veld after disturbance will take many years, and in this case the shallow rocky substrate will protect many of the plant species and or their seeds even if construction vehicles will move over the site.

- Indiscriminate clearing of any area outside of the construction footprint must be avoided.
- An integrated waste management approach must be implemented during construction.
  - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.
  - All rubble and rubbish should be collected and removed from the site to a suitable registered waste disposal site.

8.1.3. Rehabilitation

- The areas impacted by the mining or prospecting activities must be rehabilitated on completion of the project. Since Feldspar mining results in deep trenches, with very steep (stable) sides (Photo 19) the following rehabilitation technique has been discussed with the land-owner (with the aim of minimising the disturbance footprint):
  - Collapse the sidewalls of the trench from the bottom upwards (e.g. using explosives) wherever possible. The aim is to reduce the impact on the topsoil. In this way it is hoped that the topsoil on top of the trenches will remain at the top, while the subsoil shifts to the sides – resulting in infilling and reducing the slope of the sides simultaneously.;
  - Then fill and shape the trench with all surplus spoil, ensuring that slopes approved by the DMR;
  - Lastly, place the topsoil back into the trench on-top of the excavation.

Photo 19: Typical Feldspar mining site. Note the steep side walls and the mining technique (trenching).

9. REFERENCES

Acocks, J.P.H. 1953. Veld types of South Africa. *Mem. Bot. Surv. .S. Afr.* No. 28: 1-192.

Anon, 2008. Guideline regarding the determination of bioregions and the preparation and publication of Bioregional Plans. April 2008. Government Notice No. 291 of 16 March 2009.

Botes, P.J.J. 2012(a). Proposed Kakamas Keren Energy Holdings Solar Facility on Remainder of the Farm 666, Kakamas. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. Unpublished report. 13 March 2012.

Botes, P.J.J. 2012(b). Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. Unpublished report. 9 March 2012

Botes, P.J.J. 2018(a). Kakamas Waste Water Treatment Works Upgrade – Construction of a new WWTW and rising main, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. Unpublished report. 1 August 2018.

Botes, P.J.J. 2018(b). Kakamas Bulk Water Supply – New bulk water supply line for Kakamas, Lutzburg & Cillie, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. Unpublished report. 4 August 2018.

Botes, P.J.J 2018(c). Tripple D farm agricultural development – Development of a further 60 ha of vineyards, Erf 1178, Kakamas, Northern Cape Province. Botanical assessment of the proposed footprint. Unpublished report. 8 October 2018.

Botes, P.J.J. 2019. Verneujkpan Trust agricultural development – The proposed development of an additional ±250 ha of agricultural land on Farms 1763, 2372 & 2363, Kakamas, Northern Cape Province. Unpublished report. 27 June 2019.

De Villiers C.C., Driver, A., Brownlie, S., Clark, B., Day, E.G., Euston-Brown, D.I.W., Helme, N.A., Holmes, P.M., Job, N. & Rebelo, A.B. 2005. Fynbos Forum Ecosystem Guidelines for Environmental Assessment in the Western Cape. Fynbos Forum, c/o Botanical Society of South Africa: Conservation Unit, Kirstenbosch, Cape Town.

DEAT, 2002. Impact significance. Integrated Environmental Management, Information series 5. Department of Environmental Affairs and Tourism (DEAT). Pretoria.

Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria

Driver, A., Maze, K., Rouget, M., Lombard, A.T., Nel, J.L., Turpie, J.K., Cowling, R.M., Desmet, P., Goodman, P., Harris, J., Jonas, Z., Reyers, B., Sink, K. & Strauss, T. 2005. National spatial biodiversity assessment 2004: priorities for biodiversity conservation in South Africa. Strelitzia, 17. South African National Biodiversity Institute, Pretoria.

Edwards, R. 2011. Environmental impact assessment method. Unpublished report for SiVest (Pty) Ltd. Environmental division. 9 May 2011.

Esler, K.J., Milton, S.J., Dean, W.R.J. (eds.) 2010. Karooveld – Ekologie en bestuur. Briza Publications. Pretoria.

Foden, W. & Potter, L. 2005. National Assessment: Red List of South African Plants version 2017.1. Accessed on 2020/02/14

Holness, S. & Oosthuysen, E. 2016. Critical Biodiversity Areas of the Northern Cape: Technical Report. Available from the Biodiversity GIS website at http://bgis.sanbi.org/project.asp

Le Roux, A. 2015. Wild flowers of Namaqualand. A botanical society guide. Fourth revised edition. Struik Nature. Cape Town.

Low, A.B. & Rebelo, A.(T.)G. (eds.) 1996. *Vegetation of South Africa, Lesotho and Swaziland.* Department of Environmental Affairs and Tourism, Pretoria.

Manning, J. 2008. Namaqualand Eco Guide. Briza Publications. Pretoria

Mucina, L. & Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Mucina, L., Rutherford, M.C., Palmer, A.R., Milton, S.J., Scott, L., Lloyd, J.W., Van der Merwe, B., Hoare, D.B., Bezuidenhout, H., Vlok, J.H.J., Euston-Brown, D.I.W., Powrie, L.W. and Dolt, A.P. 2006. Nama-Karoo Biome. In Mucina, L. & Rutherford, M.C. 2006. (eds.) The Vegetation of South Africa. Lesotho & Swaziland. Strelitzia 19. South

African National Biodiversity Institute, Pretoria. Pp. 325 – 347

Rossouw, D. Not dated. Feldspar exploration results for the farm Rozynen Bosch 104. Ref. No. : NC 30/5/1/1/2/?PR. Unpublished Report for the NEMA EIA application.

Rouget, M., Reyers, B., Jonas, Z., Desmet, P., Driver, A., Maze, K., Egoh, B. & Cowling, R.M. 2004. South Africa National Spatial Biodiversity Assessment 2004: Technical report. Volume 1: Terrestrial Component. Pretoria: South African National Biodiversity Institute.

Shearing, D. 1994. Karoo. South African Wild Flower Guide 6. Botanical Society of South Africa. Kirstenbosch.

South African National Biodiversity Institute. Statistics: Red List of South African Plants version (as updated). Downloaded from Redlist.sanbi.org on 2019/06.

South African National Biodiversity Institute. 2006. South African National Botanical Institute: Biodiversity GIS Home. http://bgis.sanbi.org (as updated).

South African National Biodiversity Institute. 2012. Vegetation map of South Africa, Lesotho and Swaziland [vector geospatial dataset] 2012.

Van Rooyen, N. and Van Rooyen, C. 2019. Flowering plants of the southern Kalahari. Novus Print, a division of Novus Holdings.

Van Wyk, A.E., & Smith, G.F. 2001. Regions of floristic endemism in South Africa. A review with emphasis on succulents. Umdaus press. Hatfield.