# BIODIVERSITY SURVEY OF THE CAPE LIME PROPERTY, NEARBY VREDENDAL

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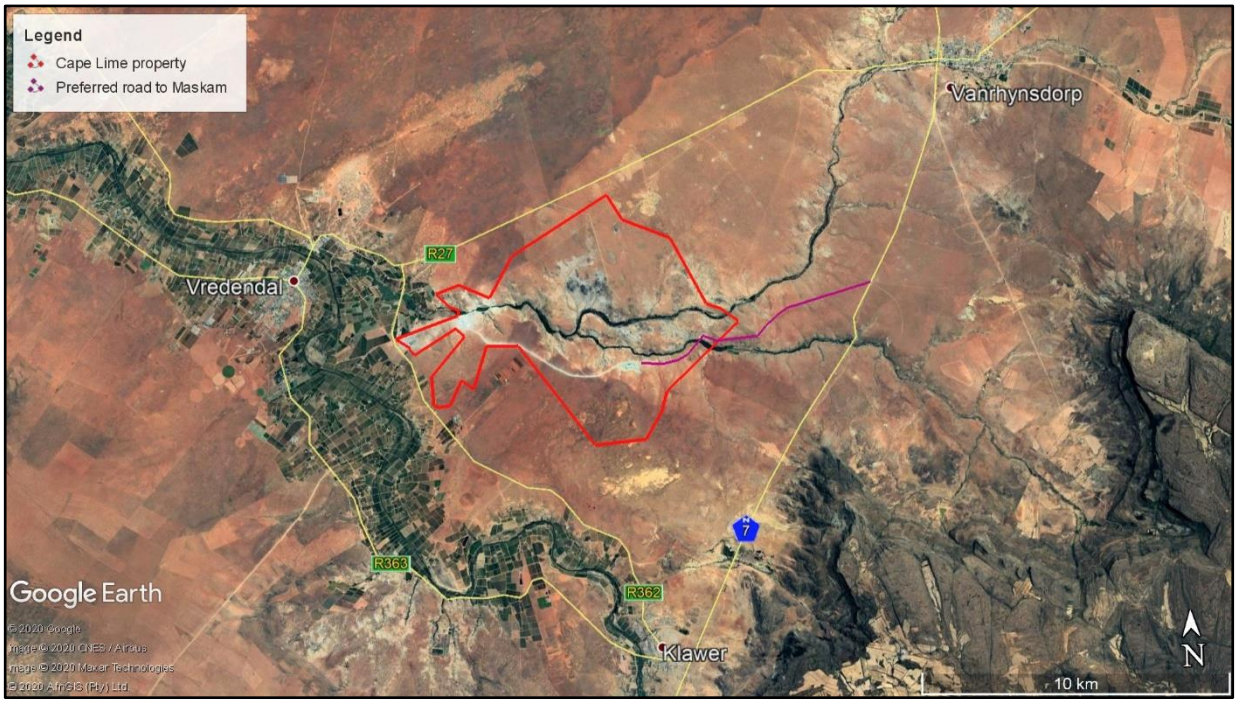
## 1 INTRODUCTION

This report investigates the biodiversity aspects of the Cape Lime property (4 241 ha), nearby Vredendal. The subject property includes Farm Vaderlandsche Rietkuil 308/1 (3677.4 ha), Farm Nuwedrift 450 (89 ha) and Farm Kalkleegte 510 (475 ha) in the Vredendal Magisterial District (see Map 1). It is located on a relatively flat plain about 15 km west of the Matsikamma Mountains. The site includes three open cast mining areas, associated stockpile areas, a crushing area, limited housing for some of the staff, a kiln site and office area. A few smaller open cast mines are also present on the site, but these are inactive or have been abandoned. Gravel access roads provide access to the mining areas. This survey was prompted by the need to update the current environmental management programme for mining activities on the property. Afrimat has approached Mark Berry, an independent biodiversity specialist, to undertake the survey (see CV attached).



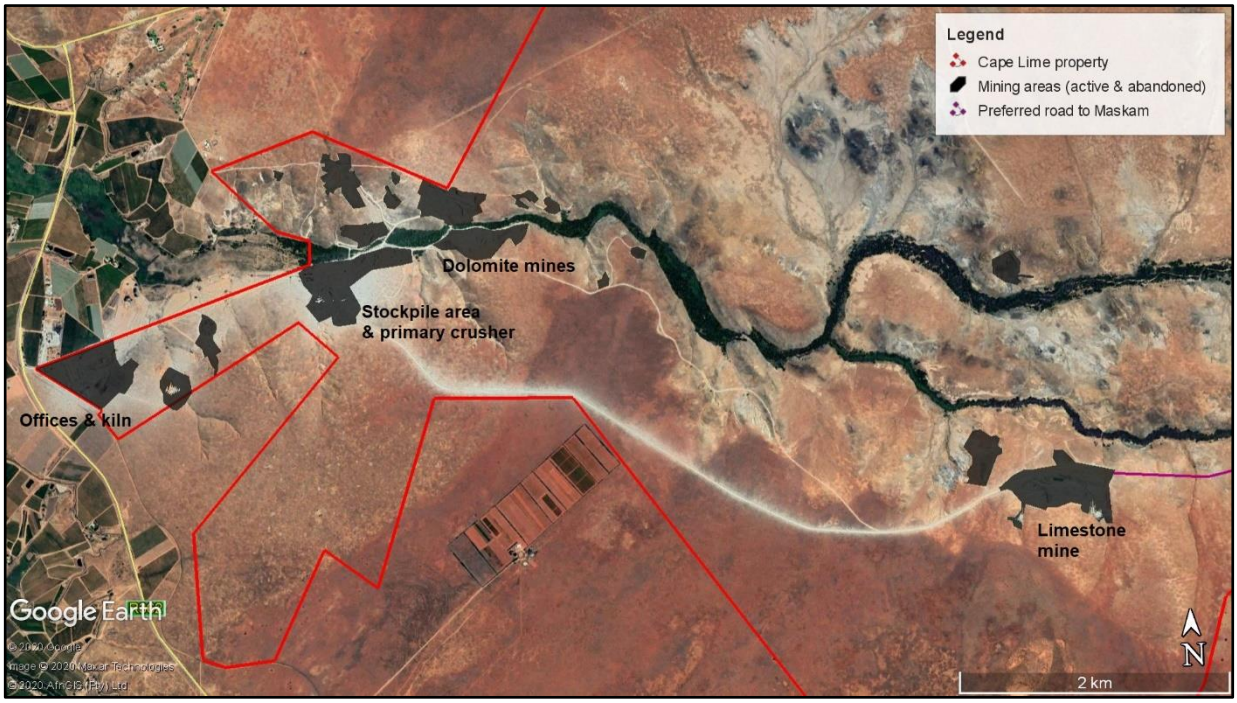

**Map 1** Satellite photo showing the location of the Cape Lime property between Klawer, Vanrhynsdorp and Vredendal.

The general area is covered with low shrubland on the flat areas and taller riparian shrub along the rivers. According to the South African Vegetation Map (2018), the area is covered by a mixture of Vanrhynsdorp Gannabosveld, Namaqualand Spinescent Grassland, Knersvlakte Dolomite Vygieveld, Knersvlakte Quartz Vygieveld and Namaqualand Riviere. Two rivers meet (confluence) in the center of the property, namely the Troe Troe and Widou Rivers. The latter is a tributary of the Troe Troe. According to the National List of Threatened Ecosystems (Dec 2011), none of these vegetation types are considered to be threatened. However, the area

covered by Knersvlakte Dolomite Vygieveld is relatively small compared to the other vegetation types. It accommodates a large diversity of succulents and bulbs, and is therefore considered to be more sensitive (and conservation worthy).

## 2 CURRENT MINING ACTIVITIES

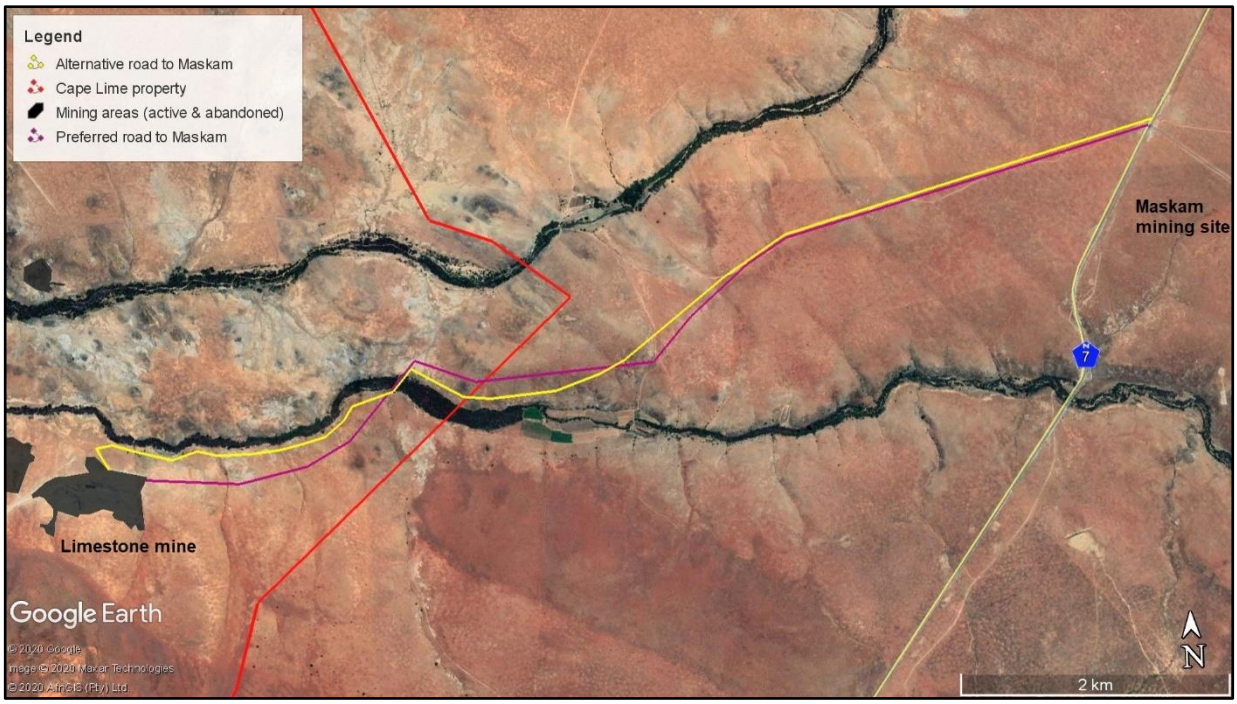
Cape Lime (Pty) Ltd, a subsidiary of Afrimat Ltd, currently mine and process limestone and dolomite on the Farm Vaderlandsche Rietkuil. The current activities entail, apart from mining of limestone and dolomite, crushing and screening of all mined material, as well as calcination of limestone in a fluid bed lime kiln (see Map 2). The markets currently served are water treatment, glass industry, aggregates, mineral fillers, steel making and chemical industries.




**Map 2** Google Earth photo showing the locations of mining activities (past and present) and associated infrastructure (dark grey). The impact of lime dust is clearly visible around the mining areas and along the access road to limestone mine.

Mining is done by removal of overburden to expose the underlying dolomite/limestone. Drilling and blasting are used to break the limestone and dolomite rock. Excavation of blasted limestone and dolomite is done by an excavator and trucks that haul the material to the crushing plant. The primary crushing and screening facility produce feed stock for the fillers, glass dolomite and limestone processing plants. The rest of the material produced at the primary crushing facility is used for the aggregates markets. The limestone processing plant also produces feed for the fluid bed kiln. After calcining of the limestone in the kiln it is further processed and hydrated to service a variety of markets.

It is proposed that a new access road (±8.5 km) from the limestone mine be constructed to the Maskam mine, located 8 km away to the east on the eastern side of the N7 (see Map 3). This road will be a significant shortcut for trucks delivering mined material to the crusher plant on the property. A significant part of this road will follow an existing farm road. However, it will need to be widened (to a 12 m width) to accommodate heavy truck traffic. Two road options are investigated.




**Map 3** Google Earth photo showing the eastern part of study area and proposed access road options to the Maskam mining site.

## 3 TERMS OF REFERENCE

The terms of reference for this study are as follows:

- To map the vegetation types found on the property and highlight sensitive areas or vegetation of high conservation value. Reference will be made to its conservation value and the presence of ecological linkages, CBA's, etc.
- To determine if there are any rare and threatened (Species of Conservation Concern) plant species present on the property.
- To briefly assess the current impacts of mining activities on biodiversity.
- To propose mitigation measures to ensure that the impact on biodiversity is minimised.

## 4 METHODOLOGY

A biodiversity survey of the site was undertaken on 31 July-2 August 2019, and a follow-up survey on 21-22 October 2019. A qualitative assessment of the type and condition of the

vegetation, disturbances, presence of alien species and Species of Conservation Concern (SCC), and any fauna observed was carried out. Plant species not identified in the field, were collected or photographed and identified at the office and Compton (Kirstenbosch) and Bolus (UCT) Herbaria. Staff of the Compton (Kirstenbosch) and Bolus (UCT) Herbaria kindly assisted with the identification of some of the species. The 2018 vegetation map of South Africa (as obtained from Cape Farm Mapper), the 3118 Calvinia 1:250 000 geological map and the latest floristic taxonomic literature and reference books were used for the purpose of this study. Any plants classified as rare or endangered in the Red List of South African Plants online database are highlighted. The assessment follows Brownlie's (2005), CapeNature and other relevant guidelines for biodiversity assessments.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A disturbed or degraded area could range from old/existing agricultural fields (fallow land), or areas previously disturbed by mining activities, to an area that has been severely eroded or degraded as a result of bad land management.
2. The species diversity. This refers to the numbers of different indigenous plant and animal species occurring on site.
3. Species of Conservation Concern occurring on site. This would include rare, vulnerable, endangered or critically endangered plants and animals (where possible).
4. Identification of the vegetation type(s) on the site. This would include trying to establish the known range of a vegetation type and whether or not this vegetation type is vulnerable (VU), endangered (EN) or critically endangered (CR).

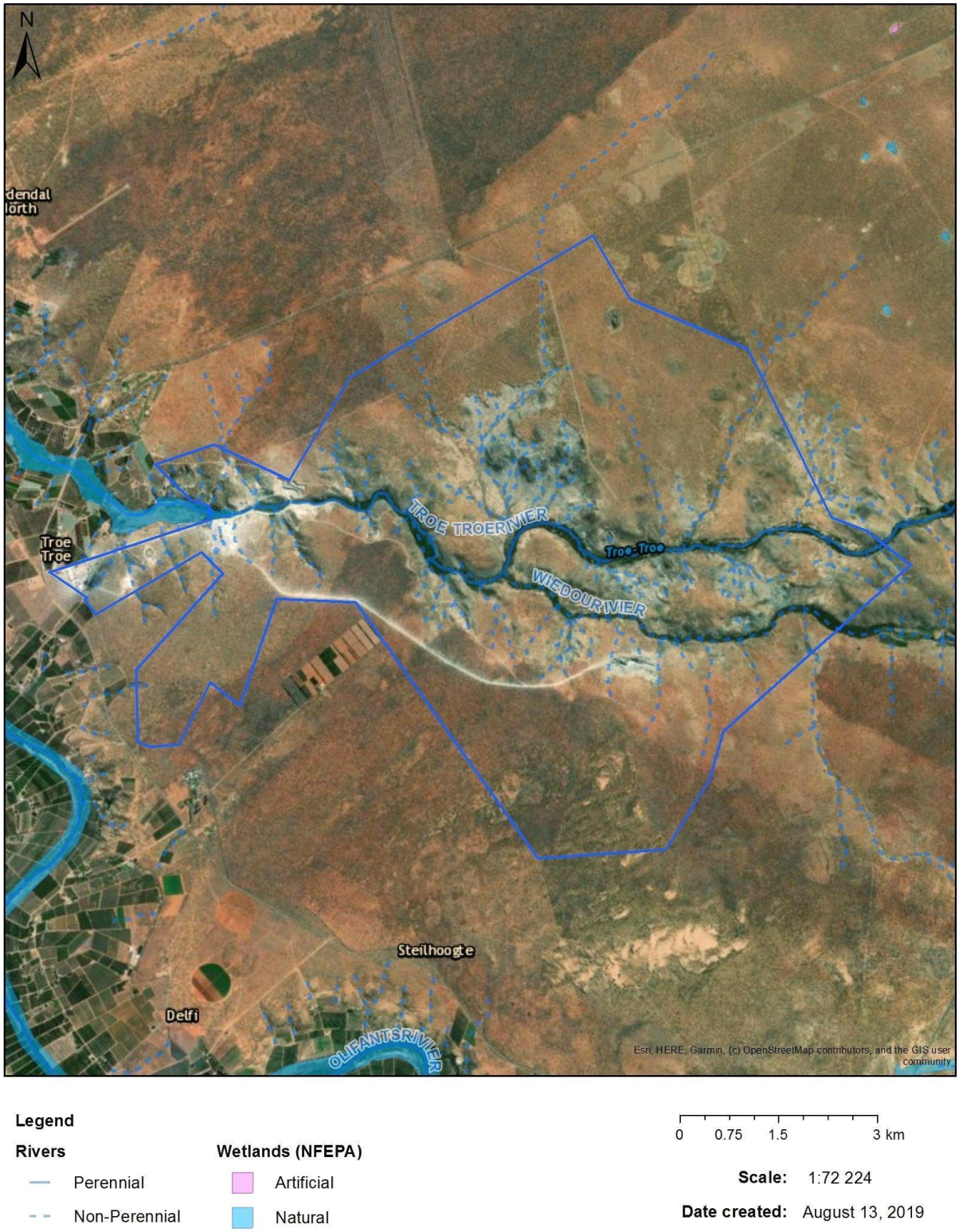
## 5 LIMITATIONS TO THE STUDY

Since fieldwork was carried out during the spring season, flowering plants that only flower at other times of the year (e.g. autumn), such as certain amaryllids, may have been missed. Due to the large extent of study area (>4 000 ha), only a representative area was surveyed. The overall confidence in the completeness and accuracy of the botanical findings is therefore considered to be moderate to good.

## 6 LOCALITY & SITE DESCRIPTION

The study site is located in the Knersvlakte, a topographically uniform area or plain that stretches from Klawer in the south to Kliprand in the north. The surrounding area is relatively flat with a few steep dips down into the Troe Troe and Wiedou Rivers, which cut through the centre of the property. The latter have its source in the Matsikamma Mountains, which form a

dramatic backdrop 15 km to the east. Map 4 illustrates die hydrology of the area. The surrounding area is mostly untransformed and used for grazing (sheep farming). The Olifants River Valley, to the west of the property, supports wine farming as the main agricultural activity in the area.




**Map 4** Hydrology of the study area (outlined in blue). Source: Dept. of Agriculture's Cape Farm Mapper.

The study area lies in a winter-rainfall area with dry, hot summers and mild, rainy winters. Mean annual precipitation is 163 mm as per Mucina & Rutherford's (2006) description of the climate for Vanrhynsdorp Gannabosveld. Nearly all the rainfall occurs between April and August (Mucina & Rutherford 2006). The lowest temperatures in winter 5-10°C; the highest temperatures in summer 30-35°C (Mucina & Rutherford 2006). The winters are mild, with rare occurrence of frost (Mucina & Rutherford 2006).

The underlying geology comprises a mixture of Namibian age Gariep Supergroup metasediments, including limestone, dolomite, marble, greywacke, quartzite, phyllite and schist (see the 3118 Calvinia 1:250 000 geological map). These are the oldest sediments in the area, even older than the sandstone formations associated with Matsikamma (Table Mountain Group). These sediments are overlain by calcareous and gypsiferous soil, red aeolian sand, small deposits of silcrete, and recent alluvium in the riverbeds, which are all of Quaternary and Tertiary age. Limestone and dolomite are exposed on the steeper slopes above the Troe Troe and Wiedou Rivers (see Photo 2). Also found in the area are patches of weathered out quartz and iron oxide (hematite/magnetite!). These appear to originate from quartz/iron veins found in the Gariep metasediments.

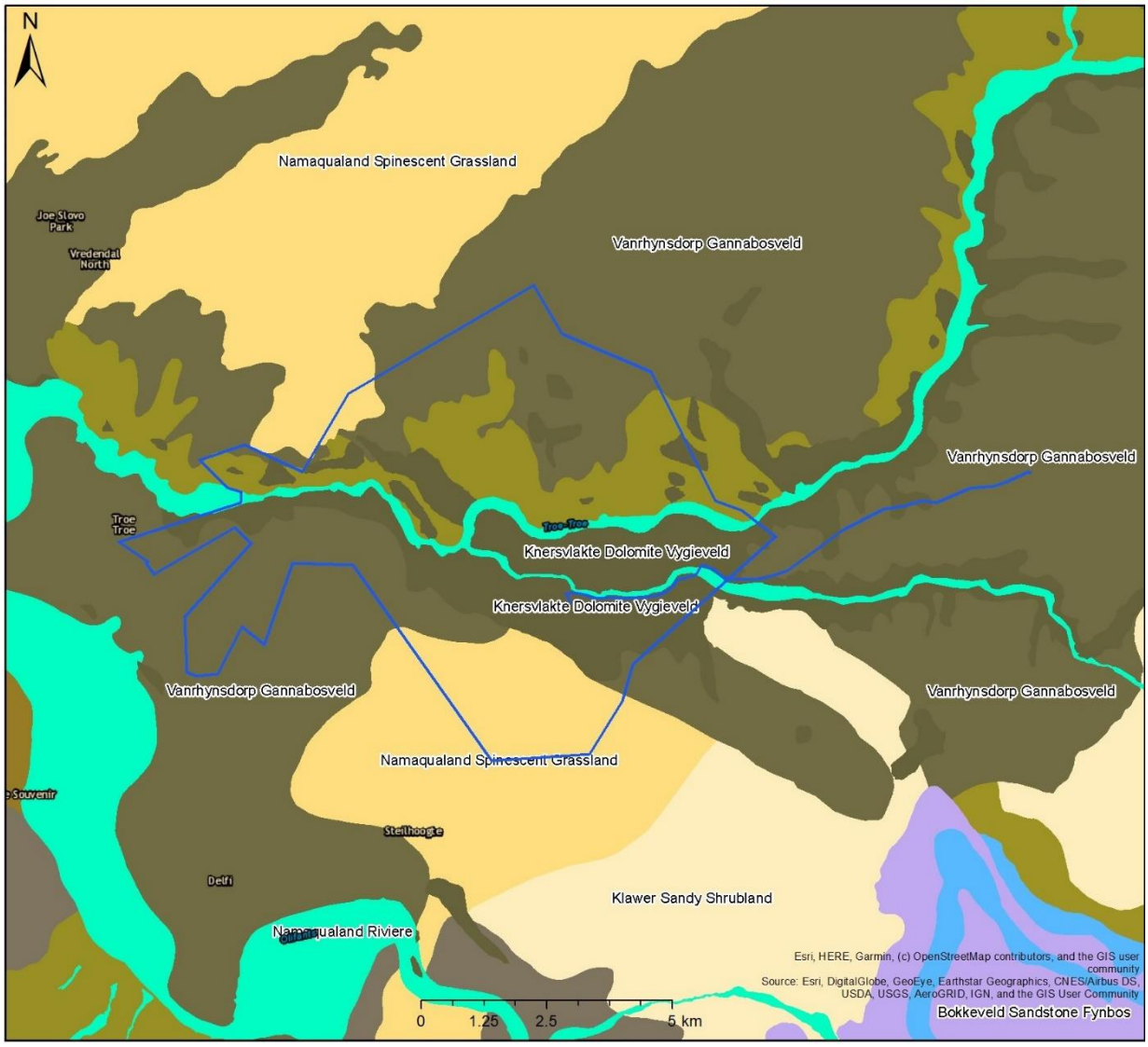
## 7 BIOGEOGRAPHICAL CONTEXT

Being located in the north-western corner of the Western Cape interior, the site lies inside the Succulent Karoo Biome evidenced by a prominence of succulent shrubs, such as mesembs (vygies), *Aloe falcata*, *Tylecodon* species and *Euphorbia* species. Grasses were more prominent in the sandy areas away from the rivers. According to the South African Vegetation Map (2018), the area is covered by a mixture of Vanrhynsdorp Gannabosveld, Namaqualand Spinescent Grassland, Knersvlakte Dolomite Vygieveld, Knersvlakte Quartz Vygieveld and Namaqualand Riviere (see Map 5).

The dominant vegetation type Vanrhynsdorp Gannabosveld is found in the southern Knersvlakte between Vredendal and Vanrhynsdorp at the foot of the Matsikamma and Gifberg Mountains, as well as northeast of Vanrhynsdorp (Mucina & Rutherford 2006). The landscape is mainly flat or slightly undulating, supporting succulent shrubland dominated by *Salsola*, vygies and *Galenia* species (Mucina & Rutherford 2006). In the south, the plains can acquire a grassland appearance through seasonal dominance of certain grass species, such as *Bromus pectinatus* and *Stipa capensis* (Mucina & Rutherford 2006).

Knersvlakte Dolomite Vygieveld, along with Namaqualand Riviere vegetation, follows the main river courses (Troe Troe and Wiedou Rivers) between Vanrhynsdorp and Vredendal. It is

described as a sparse, succulent shrubland dominated by erect shrubs lower than 0.3 m with succulent leaves. It is found on the metasediments of the Namibian Gariep Supergroup, especially on the dolomite units (Mucina & Rutherford 2006). Namaqualand Riviere is characterized by tall shrub species, such as *Vachellia karroo, Tamarix usneoides, Suaeda fruticosa* and *Roepera morgsana* (Mucina & Rutherford 2006). Thickets of *Vachellia karroo* often dominate on alluvial, sandy deposits in the riverbeds.




**Map 5** Extract of the 2018 SA Vegetation Map (Source: Cape Farm Mapper), showing the position of the study site (outlined in blue) and proposed access road (blue). The unlabeled green areas represent Knersvlakte Quartz Vygieveld.

Knersvlakte Quartz Vygieveld, which is found in patches in the deflations, occurs from Bitterfontein southwards to Klawer, with the main area north and northwest of Vanrhynsdorp (Mucina & Rutherford 2006). The landscape is described as slightly undulating with slopes and ridges covered by a prominent, but patchy white layer of quartzite (Mucina & Rutherford 2006). This dwarf succulent shrubland supports a high proportion of compact and subterranean vygies

("living stones"), often imitating its surroundings. *Ruschia* and *Drosanthemum* are the important structure-determining genera (Mucina & Rutherford 2006). Endemic taxa include *Argyroderma fissum, A. congregatum, Monilaria moniliformis, Salicornia xerophila* and *Othonna intermedia*.

Schmiedel & Jürgens (1999), who undertook research in quartz vygieveld, found that the Knersvlakte supports 52 quartz-field specialists of which 39 were endemic to the region. The average canopy cover of the vegetation was found to be less than 10%, and more than half of this comprised dwarf succulents (Schmiedel & Jürgens 1999). In general, the soils of quartz fields were shallower compared to those of adjacent zonal habitats (Schmiedel & Jürgens 1999). The combination of reduced competition from larger/taller shrubs, shallow soils and high soil salinity, represents a regionally unusual selective regime (Schmiedel & Jürgens 1999).

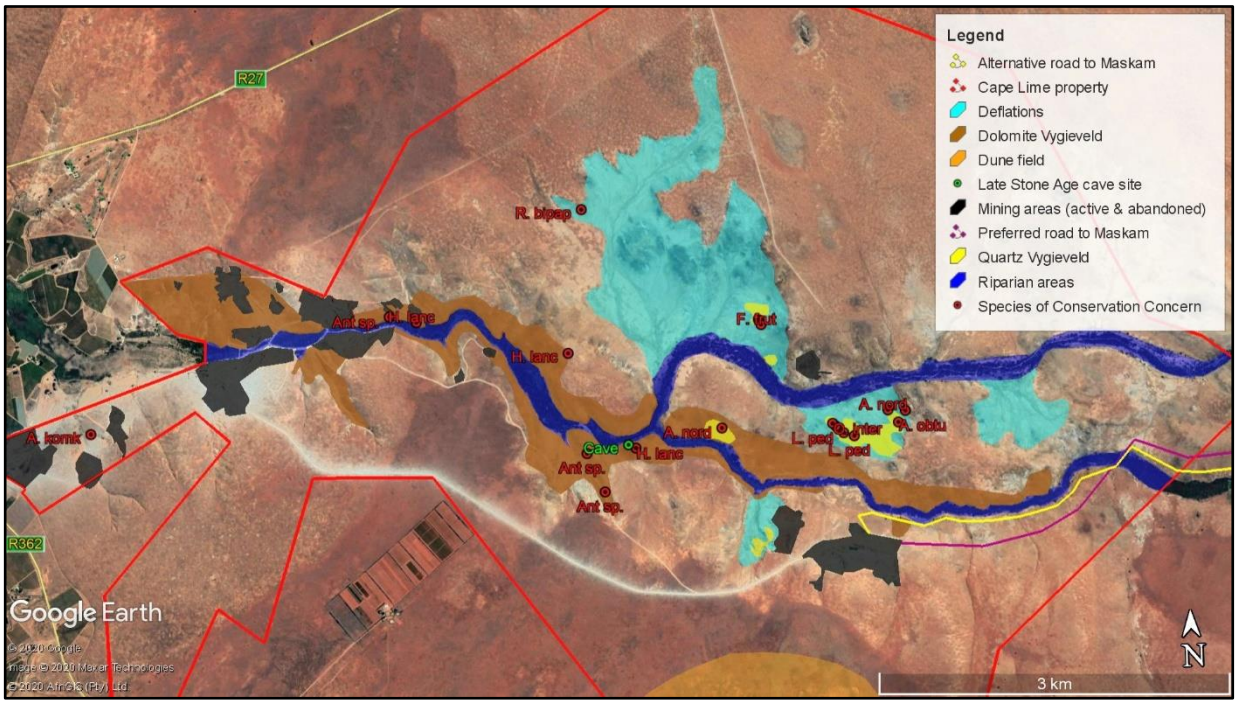
Namaqualand Spinescent Grassland occurs in a strip from Lutzville and Koekenaap eastwards to the north of Vanrhynsdorp (Mucina & Rutherford 2006). It is characterised by a flat landscape covered with a vegetation dominated by spinescent grass (*Cladoraphis spinosa*) and other emergent shrubs, such as *Euphorbia, Ruschia, Othonna, Salsola* and *Roepera* (Mucina & Rutherford 2006). It is associated with Cenozoic aeolian, red sandy soil, which has been transported inland from its source by westerly winds (Mucina & Rutherford 2006).

## 8 VEGETATION & FLORA

The study area is covered by a mixture of Vanrhynsdorp Gannabosveld, Namaqualand Spinescent Grassland, Knersvlakte Dolomite Vygieveld, Knersvlakte Quartz Vygieveld and Namaqualand Riviere (see Photos 1-5). Gannabosveld is arguably the dominant vegetation type, covering the flatter areas away from the Troe Troe and Widou Rivers. Namaqualand Riviere, Dolomite Vygieveld and Quartz Vygieveld are more closely associated with the rivers (see Map 6). Dolomite Vygieveld is typically found on the exposed dolomite/limestone slopes above the rivers, while the riverbeds support Namaqualand Riviere. Adjacent to these, Quartz Vygieveld is found in the quartz and iron oxide (hematite/magnetite!) strewn deflations. Gannabosveld and Spinescent Grassland are associated with the flat sandy areas to the north and south of the rivers away from the mining activities.

Outside the riparian areas, vegetation height varies between 0.3 to 1 m, with emerging species (e.g. *Lycium* and *Prosopis glandulosa*) reaching 2 m or more. Vegetation cover ranges between 30 and 70% (70% for Dolomite Vygieveld). Structurally, the vegetation can be described as a low open to mid-dense succulent shrubland, following Campbell's (1981) classification. Bare soil can be 80% or more depending on the substratum or past disturbances. Quartz Vygieveld has the lowest vegetation cover (<10%), while that of Namaqualand Riviere approaches 100%.

Succulent shrubs are dominant in Gannabosveld and Dolomite Vygieveld, with *Drosanthemum*, *Mesembryanthemum* and *Ruschia* species especially common (see Appendix 1). A characteristic of Quartz Vygieveld is the abundance of dwarf vygies (quartz specialists), such as *Argyroderma cf. congregatum, A. fissum* and *Conophytum uviforme*, most of which are Knersvlakte endemics. Of the 133 indigenous species recorded on site, 23 (17%) are regional/local endemics (see Appendix 1).




**Map 6** Botanical features map, showing the mining areas in relation to significant botanical features and recorded Species of Conservation Concern.

The highest species diversity and number of endemics appear to be associated with Dolomite Vygieveld and Quartz Vygieveld, in other words the more gravelly/stony areas (see Map 6). These areas are therefore regarded as the most sensitive and home to all the recorded Species of Conservation Concern (see Appendix 1). The dominant families are Aizoaceae and Asteraceae, which represent a third of the recorded flora. Current mining activities appear to be concentrated in the areas historically covered by Dolomite Vygieveld.

The Wiedou and Troe Troe Rivers (seasonal), which run through the property, accommodate *Vachellia karroo* thicket (see Photo 3). The latter has been invaded by *Prosopis glandulosa* in places. From a distance it is impossible to distinguish between the *V. karroo* and *P. glandulosa* due to their similar growth form and armed branches. Other indigenous species mixed in with *V. karroo* include *Salicornia cf. pillansii, Suaeda plumosa, Gomphocarpus fruticosus, Tamarix ramosissima, Juncus acutus* and *Phragmites australis*. There are signs of sheet and gully erosion in a few places, although the rainfall is very low.

**Photo 1** Typical Gannabosveld in the northern part of study area. Insert: *Lachenalia splendida*

**Photo 2** Dolomite Vygieveld overlooking the Troe Troe River east of the dolomite mines. Insert: *Haemanthus lanceifolius*

**Photo 3** Quarts Vygieveld north of the Troe Troe River. Insert: *Argyroderma cf. congregatum*

**Photo 4** An existing passage through riverine bush in the vicinity of the proposed river crossing for the new access road to the Maskam mine.

**Photo 5** Dune area south of the limestone mine, with a *Euclea tomentosa* in the foreground.

The Wiedou and Troe Troe Rivers (seasonal) which run through the property accommodate *Vachellia karroo* thicket (see Photo 3). The latter has been invaded by *Prosopis glandulosa* in places. From a distance it is impossible to distinguish between the *V. karroo* and *P. glandulosa* due to their similar growth form and armed branches. Other indigenous species mixed in with the *Vachellia karroo* include *Salicornia cf. pillansii, Suaeda plumosa, Gomphocarpus fruticosus, Tamarix ramosissima, Juncus acutus* and *Phragmites australis*. Erosion does not seem to be a great problem in the area (due to low rainfall), although there are signs of sheet and gully erosion in a few places.

The proposed access road (8.5 km) to the Maskam mining site passes through mainly Gannabosveld, with a ±180 m passage through Namaqualand Riviere. Two route options are presented. The eastern half of both options follows an existing farm road through an area that shows significant degradation from overgrazing (see Photo 6). This is a flat area with 50-60% grass cover and 5% shrub cover. Species recorded here include grasses (*Stipa capensis*), *Mesembryanthemum guerichianum*, *Asparagus capensis* and the invasive shrub *Atriplex nummularia* (1.8 m tall). The latter was planted along the farm road nearby the eastern end.

The western part of the proposed access road options leaves the farm road to skirt the southern slope of a low koppie angling down towards the Widou River, which is crossed at an existing

crossing (see Photo 7). The vegetation height on the koppie is <0.5 m, while vegetation cover ranges from 30 to 40%. Here, grasses (*Stipa capensis*), *Caroxylon zeyheri*, *Mesembryanthemum* species, *Drosanthemum* species, *Didelta carnosa* and *Oncosiphon suffruticosum* dominate.

**Photo 6** Eastern part of proposed access road to the Maskam mine.

The passage through the Widou River comprises dense *Vachellia karroo* thicket, infested with *Prosopis glandulosa*. The remainder of the road will follow a route on compact red sand parallel to the river, but setback from its floodplain. On this side, the vegetation is higher (0.3-1 m) and dominated by *Caroxylon zeyheri,* with *Mesembryanthemum guerichianum* and *M. junceum/dinteri*. A few large erosion dongas were noted here.

The following Species of Conservation Concern were recorded inside Knersvlakte Dolomite Vygieveld and Quartz Vygieveld:

- *Antimima nordenstamii* (rare)
- *Antimima komkansica* (vulnerable)
- *Antimima* sp. (undescribed species!)
- *Ruschia bipapillata* (vulnerable)
- *Haemanthus lanceifolius* (vulnerable)

- *Othonna intermedia* (near threatened)
- *Aspalathus obtusata* (vulnerable)
- *Lasiosiphon pedunculatus* (vulnerable)

**Photo 7** Western part of proposed access road skirting low koppie. Insert: western section of proposed road on southern side of the Widou River.

Nearly all these species were recorded in Dolomite and Quartz Vygieveld, with none of them abundant. *Antimima* sp. is possibly a new species restricted to the gravelly dolomite slopes above the Troe Troe River. No Species of Conservation Concern were recorded along the proposed access road.

New distributions records were made for *Frankenia fruticosa* (a local endemic, previously only known from the Moedverloren Nature Reserve area 14 km northeast of Lutzville) and *Erythrophysa alata* (previously known from Kotzesrus in the Northern Cape northwards to the Richterveld). *Frankenia fruticosa* was recorded on a quartzite patch north of the Troe Troe River, while the latter was recorded nearby the Late Stone Age cave site.

Several alien species were recorded (mostly inside the riverine areas), including *Prosopis glandulosa*, *Nicotiana glauca, Tamarix ramosissima, Nerium oleander* and the naturalised weed *Atriplex lindleyi* subsp. *inflata. Prosopis glandulosa* is a declared alien invader under the

Conservation of Agricultural Resources Act (Act 43 of 1983). It is considered the most important woody invader species in Namaqualand (Mucina & Rutherford 2006). In terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species List (2016), the harbouring of *Atriplex nummularia* on a property requires a permit.

## 9 FAUNA

With regards to mammal and reptile fauna, evidence of aardvark, porcupine, rock hyrax (steep, rocky areas above Troe Troe River), mole/molerat, angulate tortoise and grysbok activity was noted throughout the area (see Photo 8). Several sightings of grysbok were made in the riverine areas. Other mammal species that may frequent the area include the common duiker, steenbok, suricate (meerkat), striped polecat (stinkmuishond), bat-eared fox, black-backed jackal, Cape fox (draaijakkals), caracal (rooikat), African wild cat and hare. Termite (snout harvester termite mounds) nests were also noted. The property was utilised as a sheep farm prior to mining.

**Photo 8** Porcupine spoor in wet river sand. Insert: fresh mole-rat activity

## 10 CONSERVATION STATUS & BIODIVERSITY NETWORK

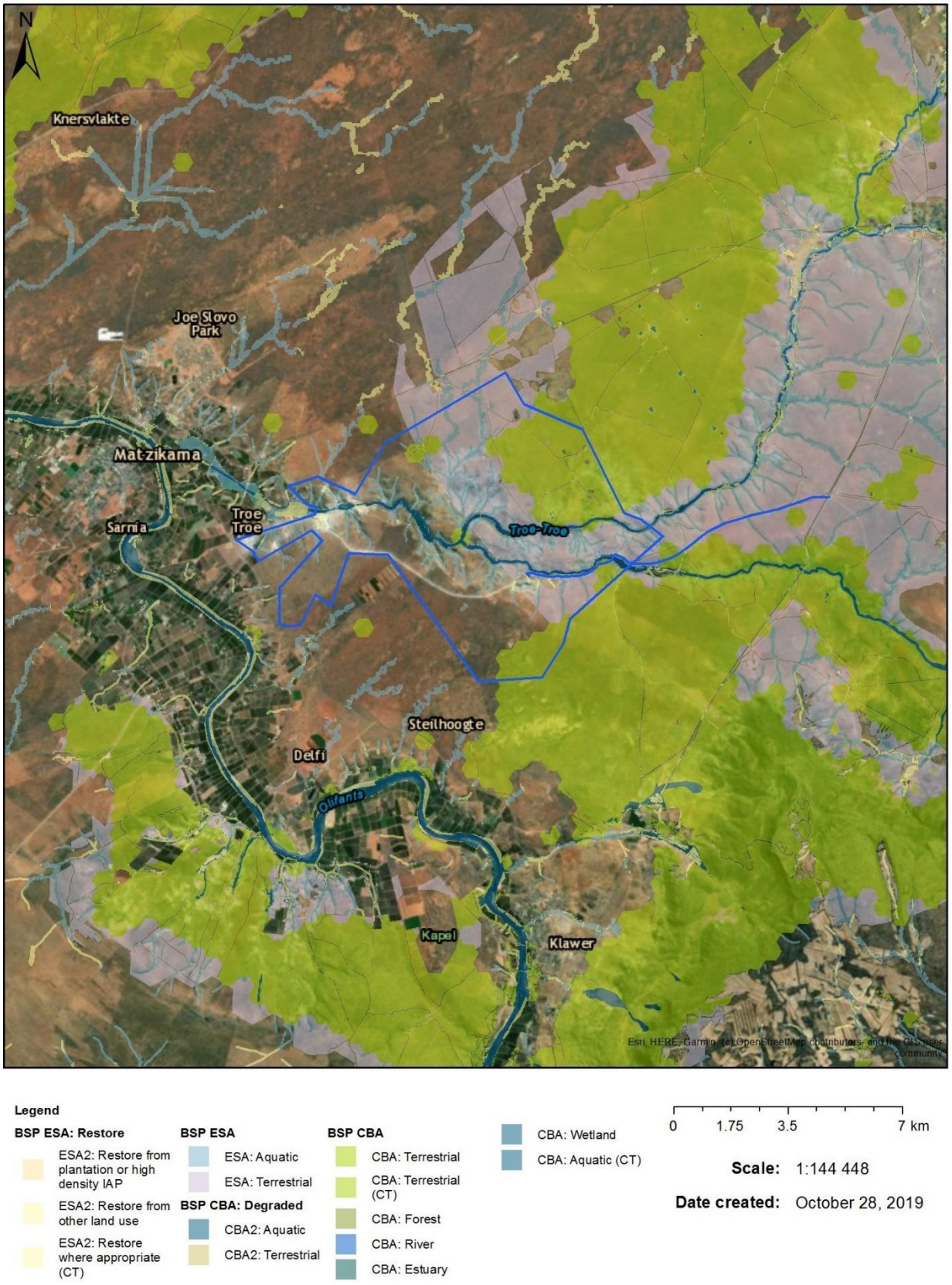
Knersvlakte Dolomite Vygieveld is the best represented vegetation unit, with less than 3%

transformed (Mucina & Rutherford 2006). Knersvlakte Quartz Vygieveld is also well represented, but is one of the largest units in the Knersvlakte. About 5% of the latter is conserved in the Moedverloren Nature Reserve, north-east of Lutzville. The Knersvlakte represents one of the richest succulent plant diversity centres in the world (Pool-Stanvliet *et al.* 2017). Vanrhynsdorp Gannabosveld is the most transformed unit, with 79.5% remaining according to Mucina & Rutherford (2006).

None of the vegetation types appear on the current national list of threatened ecosystems (DEA 2011). However, Vanrhynsdorp Gannabosveld is threatened by agricultural transformation and open-cast gypsum mining (Mucina & Rutherford 2006). It is also not formally protected. Knersvlakte Dolomite Vygieveld has a very limited distribution range (the smallest vegetation unit in the area) with no formal protection. In the larger area, these vegetation types are being threatened by overgrazing, cultivation (limited mainly to the Olifants River valley), mining activities and road construction.

The study area falls within the Matzikama Biodiversity Network. Map 7 below shows the mining area in relation to mapped critical biodiversity areas (CBA's) and ecological support areas (ESA's). The dolomite mines and stockpile areas in the western part of the study area encroach onto an aquatic/river CBA (Troe Troe River) and supporting aquatic ESA's (minor watercourses). The limestone mine are surrounded by both terrestrial and aquatic ESA's. The terrestrial ESA forms part of an extensive ESA that cuts through the property and extends eastwards towards the Matsikamma and Bokkeveld Mountains. It provides support for two large terrestrial CBA's which encroach the property from the northeast and southeast, respectively. Please note that these maps are produced at a small scale and become inaccurate when zooming in.

CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet *et al.* 2017). ESA's, on the other hand, are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of protected areas or CBA's, and are often vital for delivering ecosystem services. These sites are selected for meeting national targets for species, habitats and ecological processes (Pool-Stanvliet *et al.* 2017). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. They should be considered as essential regional priorities for conservation, and must be considered in all land-use planning initiatives (Pool-Stanvliet *et al.* 2017). Loss of designated CBA's is not recommended.




**Map 7** Biodiversity network map (Source: Cape Farm Mapper) with the mining property outlined in blue and the proposed access road to the Maskam mine also indicated in blue.

## 11 IMPACT OF MINING ACTIVITIES

Mining activities are concentrated in areas close to the rivers, presumably where the most viable dolomite and limestone deposits occur. The two dolomite mines in the western part coincide with mapped Knersvlakte Dolomite Vygieveld, but also encroach onto a riparian zone associated with Namaqualand Riviere. Here, mined material has been stockpiled up against the riverine scrub (see Photo 9). The limestone mine further away to the east is setback from the Wiedou River and located inside presumably Vanrhynsdorp Gannabosveld. However, stockpiling/infilling here also encroached onto the river, as well as a small quartzite patch on western side (see Map 6). There are currently no mining activities inside Knersvlakte Quartz Vygieveld and Namaqualand Spinescent Grassland.

**Photo 9** Stockpiled material against riverine scrub.

None of the affected vegetation types are currently listed as threatened. However, as stated earlier, Vanrhynsdorp Gannabosveld is the most transformed vegetation type in the area and threatened by agricultural transformation and open-cast mining. It is also not formally protected. Mucina & Rutherford (2006) noted that “rehabilitation (of Vanrhynsdorp Gannabosveld) after open-cast mining is very limited due to lack of viable topsoil to cover the rehabilitated fields”. Knersvlakte Dolomite Vygieveld, which is probably the most affected vegetation type in the

mining area, has a very limited distribution range (the smallest vegetation unit in the area) with no formal protection.

Although the impact was not quantified or assessed, lime dust on the vegetation around the mining areas, especially the stockpile areas around the primary crusher, and along the access road to the limestone mine is noticeable (see Photo 10). It is expected that it will impact on plant health, recruitment and eventually vegetation cover in these areas. It is recommended that practical and innovative ways be investigated to deal with dust suppression.

**Photo 10** Lime dust on vegetation next to a large stockpile.

As an indirect impact, soil disturbance caused by mining activities provide ideal conditions for the establishment of alien invasive vegetation. However, it is unlikely that woody aliens, such as *Prosopis glandulosa*, will become a serious problem. *Prosopis glandulosa* and *Nerium oleander* are largely confined to the Wiedou and Troe Troe Rivers. Weedy pioneer species, such as *Atriplex* species and *Stipa capensis*, will probably be the first to establish and prevail. These will be difficult to control, but the impact is not considered significant, given the degraded condition of the mining areas.

With regards to the proposed access road to the Maskam mine, there are no great concerns

from a biodiversity perspective, apart from the river crossing and the alignment of the alternative route option too close to the river. No Knersvlakte Dolomite Vygieveld or Quartz Vygieveld will be directly affected. Also, no Species of Conservation Concern were recorded along the route. It is recommended that the river crossing be made where an existing farm road crosses the river. In the preferred option, the route is set back ±200 m from the Widou River. In the alternative option, the route follows an existing farm road directly next to the riverine area from the limestone mine to the river crossing. Impact on the riverine area in terms of dust, noise and traffic is expected to be greater (medium-high significance) for the latter option.

Mammals dwelling inside or visiting the riverine areas (such as grysbok) do so away from the mining areas. Mining currently affects a 1.6 km long section of the Troe Troe in the western part of the study area. The alternative route option will impact on an additional 3.5 km passage along the Widou east of the limestone mine. Faunal movement between the river and the veld to the south of the river will be affected. One can expect that large fauna will move away from this area with the commencement of truck movement and associated dust problems. The preferred route option will only impact on the Widou directly at the river crossing. The surrounding vegetation (irrespective of its condition) should be actively protected during the construction of the access road, especially along the western half where construction will take place in relatively undisturbed vegetation. Table 1 below summarises the impact.

**Table 1** Impact of the access road options on biodiversity.

| Mitigation | Extent | Duration | Intensity | Probability of occurrence | Significance –Preferred option | Significance –Alternative option | Confidence |
|---|---|---|---|---|---|---|---|
| Without mitigation | Limited to site | Long term | High | High | Med (-) | Med-high (-) | Med-high |
| With mitigation | Limited to site | Long term | High | High | Low-med (-) | Med (-) | Med-high |
| **Mitigation measures:**<br>• During the construction of the access road, avoid the unnecessary disturbance of the surrounding vegetation, especially along the western half of the route where it passes through relatively undisturbed areas.<br>• Implement more dust control measures where considered practical. | | | | | | | |

The proposed road, being largely located inside an ecological support area (ESA), is also expected to impact on the local biodiversity network. The impact will be of the same order as described above in Table 1. The impact can be countered to some extent by means of dust control.

## 12 CONCLUSION & MITIGATION MEASURES

The mining area is located in a botanical diverse area with at least five vegetation types (all belonging to the Succulent Karoo Biome) found on the property. Currently three of the five have been affected by mining activities, including Vanrhynsdorp Gannabosveld, Knersvlakte Dolomite Vygieveld and Namaqualand Riviere. Outside the mining areas, lime dust appears to be a problem, settling on the vegetation adjacent to the stockpile areas and roads. The remainder of the property seems to be in a good condition with conservation worthy vegetation. Past overgrazing and erosion in a few places are also evident. None of the vegetation types are currently listed as threatened. However, Vanrhynsdorp Gannabosveld is the most transformed vegetation type in the area, while Dolomite Vygieveld has a very limited distribution range. Currently, none of these vegetation types has any formal protection.

With regards to the access road options to the Maskam mine, consideration should be given to the preferred route option, which is set back furthest away from the Wiedou River. It will result in the least impact on the river and its fauna due to dust, traffic and noise related issues. With mitigation, the impact on the local biodiversity and biodiversity network will be of low-medium significance. The impact will be long term to permanent, depending on rehabilitation success after the completion of mining activities. Consideration should be given to the following mitigation measures to lessen the impact:

- An effort should be made not to stockpile further into the riparian areas. Where practically possible, establish new stockpile areas away from the riparian areas.
- It is recommended that further practical and innovative ways be investigated to deal with dust suppression. Currently, the roads are wetted using water tankers. Certain areas also have irrigation for dust control. Green (shade) netting can also be considered.
- During the construction of the access road, avoid the unnecessary disturbance of the surrounding vegetation through strict control, especially along the western half of the route where it passes through relatively undisturbed areas. The creation of lay-by's along this section should be minimised. Cape Lime noted that there will be "few turning areas for road maintenance vehicles and these will be positioned where there is more dorbank and very little vegetation so as to minimise the impact".
- Care must be taken during the construction of the road through the Widou River to prevent unnecessary damage of the adjacent riverine vegetation. Strict control would be required during the construction phase.

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**PERSONAL COMMUNICATIONS**

Natasha Mouton (mine manager for Cape Lime)

Jompie van Niekerk (mine foreman for Cape Lime)

## Appendix 1 Species list (Species of Conservation Concern = bold; alien species = #)

| Family | Genus & species | Status & habitat |
|---|---|---|
| Acanthaceae | *Justicia cuneata* | |
| Agavaceae | *Chlorophytum undulatum* | |
| Aizoaceae | ***Antimima komkansica*** | Vulnerable; local endemic |
| Aizoaceae | ***Antimima nordenstamii*** | Rare; local endemic |
| Aizoaceae | *Antimima watermeyeri* | Local endemic |
| Aizoaceae | ***Antimima* sp.** | Possibly an undescribed species; restricted to the gravelly dolomite slopes above Troe Troe River |
| Aizoaceae | *Schlechteranthus pungens* | |
| Aizoaceae | *Argyroderma cf. congregatum* | Local endemic; quartzite patches |
| Aizoaceae | *Argyroderma fissum* | Local endemic; quartzite patches |
| Aizoaceae | *Carpobrotus edulis* | |
| Aizoaceae | *Cephalophyllum cf. framesii* | |
| Aizoaceae | *Conophytum uviforme* | Regional endemic; quartzite patches |
| Aizoaceae | *Drosanthemum deciduum* | Regional endemic |
| Aizoaceae | *Drosanthemum diversifolium* (= *Knersia diversifolia*) | Regional endemic |
| Aizoaceae | *Drosanthemum hispidum* (dominant) | |
| Aizoaceae | *Drosanthemum pulverulentum* (6 locular) | Regional endemic |
| Aizoaceae | *Galenia africana* | |
| Aizoaceae | *Galenia sarcophylla* | |
| Aizoaceae | *Mesembryanthemum cf. noctiflorum* (dominant) | |
| Aizoaceae | *Mesembryanthemum corallinum* | Regional endemic; quartzite patches |
| Aizoaceae | *Mesembryanthemum dinteri* | |
| Aizoaceae | *Mesembryanthemum guerichianum* | |
| Aizoaceae | *Mesembryanthemum junceum* | |
| Aizoaceae | *Mesembryanthemum nodiflorum* | |
| Aizoaceae | *Mesembryanthemum rapaceum* | |
| Aizoaceae | *Monilaria moniliformis* | Local endemic; quartzite patches |
| Aizoaceae | ***Ruschia bipapillata*** | Vulnerable; local endemic |
| Aizoaceae | *Ruschia burtoniae* | |
| Aizoaceae | *Schlechteranthus pungens* | |
| Aizoaceae | *Stoeberia frutescens* | |
| Amaranthaceae | *Atriplex lindleyi* subsp. *inflata* # | |
| Amaranthaceae | *Atriplex nummularia* # | |
| Amaranthaceae | *Atriplex vestita* | |
| Amaranthaceae | *Caroxylon* (= *Salsola*) *zeyheri* (dominant) | Dominant in places |
| Amaranthaceae | *Maireana brevifolia* # | |

| Family | Genus & species | Status & habitat |
|---|---|---|
| Amaranthaceae | *Salicornia cf. pillansii* | Riverine areas |
| Amaranthaceae | *Salicornia xerophila* | Regional endemic; quartzite patches |
| Amaranthaceae | *Suaeda plumosa* | Riverine areas |
| Amaryllidaceae | *Ammocharis longifolia* | |
| Amaryllidaceae | *Brunsvigia bosmaniae* | |
| Amaryllidaceae | *Haemanthus coccineus* | |
| Amaryllidaceae | ***Haemanthus lanceifolius*** | Vulnerable; local endemic; exposed dolomite close to rivers |
| Anacardiaceaea | *Searsia pendulina* | |
| Anacardiaceaea | *Searsia undulata* | |
| Apocynaceae | *Gomphocarpus fruticosus* | Riverine areas |
| Apocynaceae | *Microloma sagittatum* | |
| Apocynaceae | *Nerium oleander #* | |
| Asparagaceae | *Asparagus capensis* | |
| Asphodelaceae | *Aloe falcata* | |
| Asphodelaceae | *Bulbine praemorsa* | |
| Asphodelaceae | *Trachyandra falcata* | |
| Asphodelaceae | *Trachyandra muricata* | |
| Asphodelaceae | *Trachyandra paniculata* | |
| Asteraceae | *Arctotis cf. flaccida* | |
| Asteraceae | *Berkheya fruticosa* | |
| Asteraceae | *Cotula microglossa* | |
| Asteraceae | *Crassothonna cylindrica* | |
| Asteraceae | *Crassothonna sedifolia* | |
| Asteraceae | *Didelta carnosa* | |
| Asteraceae | *Dimorphotheca pinnata* | |
| Asteraceae | *Elytropappus rhinocerotis* | |
| Asteraceae | *Felicia hirta* | |
| Asteraceae | *Foveolina tenella* | |
| Asteraceae | *Hoplophyllum spinosum* | |
| Asteraceae | *Oncosiphon suffruticosum* | |
| Asteraceae | *Osteospermum sinuatum* | Dune areas |
| Asteraceae | ***Othonna intermedia*** | Near threatened; regional endemic; quartzite patches |
| Asteraceae | *Othonna leptodactyla* | |
| Asteraceae | *Othonna quercifolia* | |
| Asteraceae | *Pteronia glabrata* | |
| Asteraceae | *Senecio aloides* | |
| Asteraceae | *Senecio arenarius* | |
| Crassulaceae | *Adromischus filicaulis* | |

| Family | Genus & species | Status & habitat |
|---|---|---|
| Crassulaceae | *Crassula cf. cotyledonis* | |
| Crassulaceae | *Crassula expansa* | |
| Crassulaceae | *Crassula muscosa* | |
| Crassulaceae | *Tylecodon paniculatus* | |
| Crassulaceae | *Tylecodon reticulatus* | |
| Crassulaceae | *Tylecodon wallichii* | |
| Ebenaceae | *Euclea tomentosa* | |
| Euphorbiaceae | *Euphorbia burmannii* | |
| Euphorbiaceae | *Euphorbia caput-medusae* | |
| Euphorbiaceae | *Euphorbia mauritanica* | |
| Euphorbiaceae | *Euphorbia rhombifolia* | |
| Fabaceae | ***Aspalathus obtusata*** | Vulnerable; regional endemic |
| Fabaceae | *Calobota angustifolia* | |
| Fabaceae | *Lebeckia ambigua* | Dune areas |
| Fabaceae | *Lessertia frutescens* | |
| Fabaceae | *Prosopis glandulosa #* | Riverine areas |
| Fabaceae | *Vachellia karroo* | Riverine areas |
| Frankeniaceae | *Frankenia fruticosa* | Local endemic |
| Geraniaceae | *Pelargonium cf. carnosum* | |
| Geraniaceae | *Pelargonium karooicum* | |
| Hyacinthaceae | *Albuca canadensis* | |
| Hyacinthaceae | *Drimia elata* | |
| Hyacinthaceae | *Lachenalia splendida* | Regional endemic |
| Hyacinthaceae | *Lachenalia undulata* | |
| Hyacinthaceae | *Massonia depressa* | |
| Iridaceae | *Babiana ambigua* | |
| Iridaceae | *Ferraria variabilis* | |
| Iridaceae | *Lapeirousia jacquinii* | |
| Iridaceae | *Lapeirousia pyramidalis* | |
| Iridaceae | *Moraea miniata* | |
| Juncaceae | *Juncus acutus* | Riverine areas; saline soils |
| Kewaceae | *Kewa salsoloides* | |
| Limeaceae | *Limeum africanum* | |
| Malvaceae | *Hermannia cuneifolia* | |
| Malvaceae | *Hermannia trifurca* | Dune areas |
| Menispermaceae | *Cissampelos capensis* | |
| Montiniaceae | *Montinia caryophyllacea* | |
| Moraceae | *Ficus cordata* | Steep slopes above Troe Troe River |
| Neuradaceae | *Grielum humifusum* | |

| Family | Genus & species | Status & habitat |
|---|---|---|
| Oxalidaceae | *Oxalis flava* var. *fabifolia* | |
| Oxalidaceae | *Oxalis flava* var. *flava* | |
| Oxalidaceae | *Oxalis lichenoides* | Local endemic |
| Oxalidaceae | *Oxalis pes-caprae* | |
| Oxalidaceae | *Oxalis purpurea* | |
| Poaceae | *Cladoraphis spinosa* | |
| Poaceae | *Phragmites australis* | Riverine areas |
| Poaceae | *Stipa capensis* (dominant in places) | |
| Polygalaceae | *Polygala ephedroides* | Dune areas |
| Restionaceae | *Willdenowia incurvata* | Dune areas |
| Rhamnaceae | *Phylica cephalantha* | Dune areas |
| Ruscaceae | *Eriospermum cf. capense* (heart-shaped leaf, not in flower) | |
| Sapindaceae | *Erythrophysa alata* | Southernmost record; previously only known from Northern Cape |
| Scrophulariaceae | *Jamesbrittenia fruticosa* | |
| Scrophulariaceae | *Nemesia cf. anisocarpa* | |
| Scrophulariaceae | *Peliostomum virgatum* | |
| Scrophulariaceae | *Zaluzianskya affinis* | |
| Solanaceae | *Nicotiana glauca* # | |
| Solanaceae | *Lycium amoenum* | |
| Solanaceae | *Lycium horridum* | |
| Tamaricaceae | *Tamarix ramosissima* # | Riverine areas |
| Tecophilaeaceae | *Cyanella orchidiformis* | |
| Thymelaeaceae | ***Lasiosiphon pedunculatus*** | Vulnerable; local endemic |
| Thymelaeaceae | *Struthiola lepthantha* | |
| Zygophyllaceae | *Augea capensis* | |
| Zygophyllaceae | *Roepera cordifolia* | |
| Zygophyllaceae | *Roepera cuneifolia* | Regional endemic |
| Zygophyllaceae | *Roepera morgsana* | Riverine areas |
| Zygophyllaceae | *Roepera teretifolia* | Regional endemic; quartzite patches |

## Appendix 2 Author's abbreviated CV

# CURRICULUM VITAE

**M.G. (Mark) BERRY**
**ENVIRONMENTAL CONSULTANT & BIODIVERSITY SPECIALIST**

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**PROFESSIONAL STATEMENT**

Environmental assessment professional and biodiversity specialist with over 20 years of experience mainly in the Western Cape Province, but also in the Northern Cape and Eastern Cape. Experience in Environmental Impact Assessments (EIA's), biodiversity assessments, Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties and environmental due diligence investigations.

**WORK EXPERIENCE**

**1989-1990** Nature Conservation Officer in the South African Air Force, based at Langebaan Road Air Force Base

**1997-2005** Employed as principal environmental specialist at Planning Partners, a multi-disciplinary consultancy specialising in town and regional planning, environmental planning and landscape architecture. Duties included the conducting of EIA's, compiling EMPr's, ECO duties, biodiversity surveys and status quo environmental assessments for spatial development frameworks.

**2000-2006** Examiner for the Board of Control for Landscape Architects (BOCLA), responsible for the setting up and marking of the Environmental Planning Section of exam paper.

**2005-current** Started Mark Berry Environmental Consultants in June 2005. Responsibilities include office management, seeking tenders, conducting EIA's, compiling EMPr's, construction site environmental audits, biodiversity surveys, etc. A relationship is maintained with previous employer, and, among other, undertook land-use surveys and reporting for the Eskom's site safety reports for three proposed nuclear power plants in the Western and Eastern Cape Provinces.

**QUALIFICATIONS**

- BSc (1988) University of Stellenbosch
- BSc-Hons in Botany (1991) University of Stellenbosch
- MSc in Botany (1993) Nelson Mandela Metropolitan University
- PhD in Botany (2000) Nelson Mandela Metropolitan University.

**PROFESSIONAL MEMBERSHIP**

Professional member (reg. no. 400073/98) of the South African Council for Natural Scientific Professions (SACNASP).

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