PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL ASSESSMENT

GAMAKOR & NOODKAMP LOW COST HOUSING

Proposed formalisation of the Gamakor and Noodkamp housing development on the Remainder and Portion 128of the Farm Kousas No. 459 and Erven 1470, 1474 and 1480, Gordonia road, Keimoes.
Kai !Garib Local Municipality, Northern Cape Province.

6 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 a 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, the white grasses are usually prominent after recent rains.

In this case the absence of recent rains, as well as grazing by domestic livestock meant that the white grassy layer was mostly absent, and only a sparse low shrubland remained. Because of the arid nature of the region (and the unpredictability of rainfall) the carrying capacity of the veld is very low and overgrazing had an extremely negative effect on many vegetation types (with destruction of natural vegetation quite common near settlements). In addition, a large portion (mostly the eastern section) of the footprint was already transformed as a result of informal settlement and housing (Figure 5).

Within the remainder of the natural veld two plant communities were observed, closely associated with variations in soil type and depth. They were:

- On the shallow quartz rich rocky soils a very sparse (semi-desert) low shrubland were observed, dominated by *Salsola tuberculata* and *Justicia australis*, with *Aloe claviflora* also very common.
- On the deeper sandy soils in the slight depressions associated with the seasonal watercourses a denser and larger shrub and tree layer was encountered, dominated by *Parkinsonia africana* and *Senegalia mellifera*.

CONSERVATION PRIORITY AREAS

According to the 2016 Northern Cape CBA map (Figure 6), the proposed development footprint is located within a terrestrial CBA. Unfortunately, there are no logical alternative sites available to the Keimoes Municipality, which will not impact on the CBA.

The site will not impact on any centre of endemism.

CONNECTIVITY

The proposed activity will result in a permanent footprint enlargement of the existing housing scheme by approximately 100 ha. However, the proposed footprint joins up with the existing urban edge and should not have any significant additional impact on connectivity.

LAND-USE

The footprint is located on municipal land adjacent to an existing urban area. Portions of the footprint is still in relative good conditions (although heavily grazed), but half had already been transformed by illegal structures (settlement). Remaining natural veld is utilised for livestock grazing by the local community.

PROTECTED PLANT SPECIES

Three *Vachellia erioloba* (Camel Thorn) trees (NFA protected) and five NCNCA protected plant was observed. It is recommended that the Camel thorn trees are protected and that *Aloe* and *Boscia* plants are search & rescued.

WATER COURSES AND WETLANDS

The most significant feature of the study area, influencing topography is the seasonal drainage line that runs from northeast to southwest through the northern part of the property, draining towards the Friesdale Spruit, which drains into the Orange River. Please refer to the freshwater specialist report for recommendations (Watsan Africa, 2020).

MAIN CONCLUSION

The terrestrial habitat associated with the project footprint is considered to be of a moderate sensitivity based on the following factors:

- The vegetation type is classified as least threatened;
- However, the project footprint overlaps a CBA;
- The floral habitat and natural systems have been impacted, by grazing and urban related activities, but portions still functions relatively well;
- The floral diversity is very low;
- No special habitats or features were observed within the footprint;
- No red-list species were encountered, but one nationally protected tree and five provincially protected plant species was encountered.

The proposed development will result in the permanent transformation of approximately 100ha of natural veld for human settlement. According to the impact assessment given in Table 7, with good environmental control, the development is likely to result in a **MEDIUM** impact on the environment.

However, with the correct mitigation it is unlikely that the development will contribute 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, WITH THE PROPOSED MITIGATION ACTIONS.

NO-GO OPTION

The development will result in significant 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:

4 February 2020

Date:

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1. INTRODUCTION

The Kai !Garib Local Municipality are in the process of formalizing the Gamakor and Noodkamp low cost housing (LCH) project, which is located to the north-west of Keimoes. The aim is to rezone and subdivide about 1 500 new erven for low cost housing, which will include associated infrastructure such as water, electricity, sewage and solid waste removal. The footprint for this development will be approximately 104 ha. However, it must be noted that many of this area has already been settled by local inhabitants.

The study areas includes (Please refer to Figure 1 – 2):

- The remainder of Farm Kousas No. 459, Keimoes;
- Portion 128 of Farm Kousas No. 459, Keimoes;
- Erven 1470, 1474 & 1480, Keimoes

The proposed development will result in the transformation of a further 50-60 ha of remaining natural veld, which triggers NEMA EIA activities. EnviroAfrica was appointed to perform the NEMA EIA application and PB Consult was appointed to conduct a botanical assessment of the proposed development.

Only one vegetation type is expected to be impacted by the proposed development, namely Bushmanland Arid Grassland (considered "Least Threatened" in terms of the National list of ecosystems that are threatened and in need of protection). Desktop studies indicated that the site is still likely to support natural vegetation including potentially protected tree species.

However, the site also shows signs of being partially transformed already (due to existing housing development), while its proximity to the urban edge would certainly have resulted in some impacts associated with urban development, which were supported by the findings of the site visit.

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.
- 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

Keimoes is located in the Northern Cape Province where the R26 (Brandvlei road) meets the N14 (Springbok-Upington road), Refer to Figure 1). The proposed development is located to the northwest outskirts of Keimoes and overlaps portions of the Remainder and Portion 128 of the Farm Kousas No. 459 as well as Erven 1470, 1474 and 1480 (Keimoes) (Refer to Figure 1 and Figure 2).

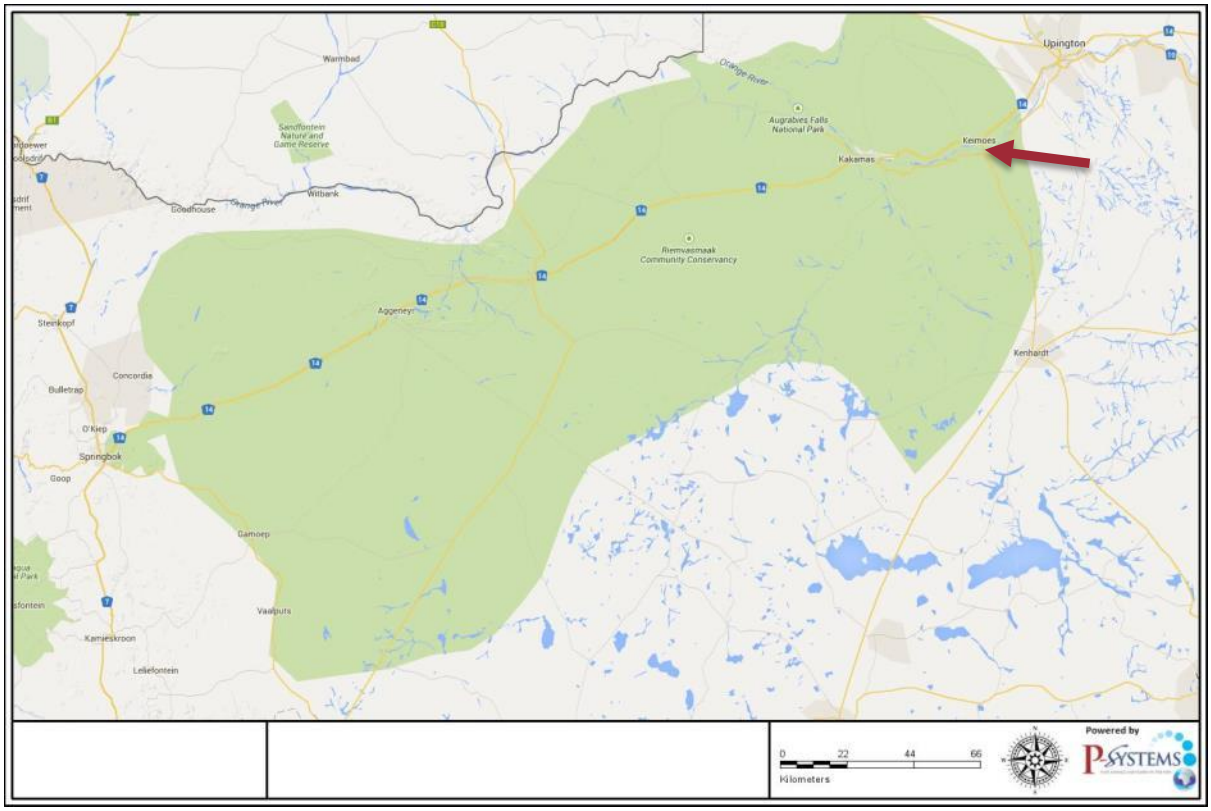


Figure 1: Map showing the location of Keimoes in the Northern Cape Province

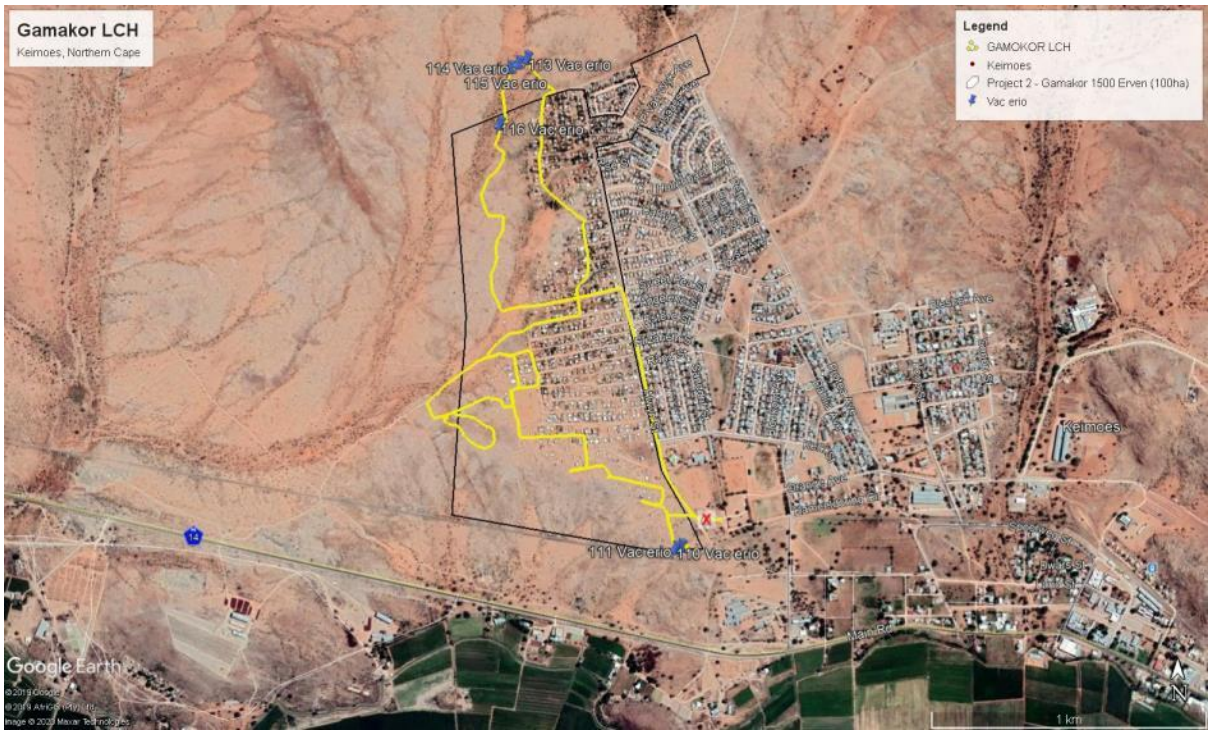


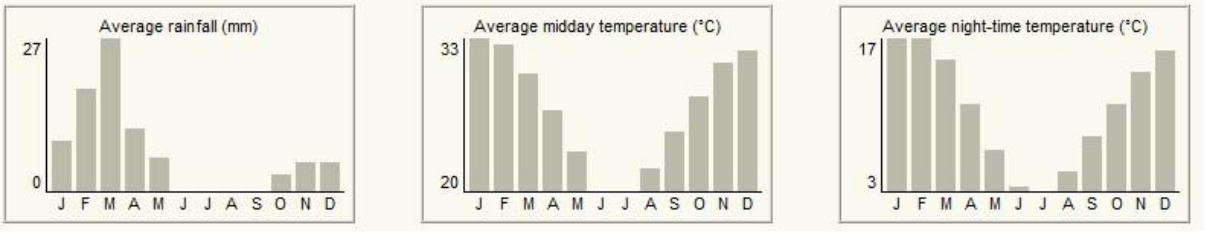
Figure 2: Location of the proposed Gamakor LCH, to the northwest of Keimoes

2.2. CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Keimoes receives on average approximately 84 mm of rain per year (mainly during autumn). Table 1 below gives the average rainfall values

(left) and average temperatures (centre and right) for Keimoes per month. It receives the lowest rainfall (0 mm) in June and the highest (27 mm) in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Keimoes range from 19.8°C in June to 33°C in January. On average, the coldest nights can be expected during July with night-time temperatures averaging 3°C (www.saexplorer.co.za).

Table 1: Average rainfall and temperatures for Keimoes (www.saexplorer.co.za)



2.3. TOPOGRAPHY

The most significant feature of the study area, influencing topography is the seasonal drainage line that runs from northeast to southwest through the northern part of the property, draining towards the Friesdale Spruit, which drains into the Orange River. The study area can be described as flat to slightly undulating (especially the southern portion of the site). However, the site has a slight slope from northeast to southwest (and north to south) as the landscape drains towards the Orange River. Elevation drops from approximately 758 m (northern boundary) to about 738 m (at the southern boundary) over a distance of just more than 1.72 km, with a maximum slope of 1.6% and an average slope of only 0.4%.

In general aspect is not expected to have any significant influence on the vegetation. The main environmental feature that is likely to influence vegetation will be geographical features such as drainage lines and variations in soils. As is typical of this part of the Northern Cape, small seasonal drainage lines were present on the site. 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.

2.4. 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. Lime is generally present in part or most of the landscape.

3. EVALUATION METHOD

Desktop studies coupled with a site visit were performed. The survey was conducted by walking and driving the site and examining, marking and photographing any area of interest. The yellow line in Figure 3 shows the route that was walked and drive during the site visit. The site visit was conducted during February 2019. The

timing of the site visit was reasonable in that, all perennial plants were identifiable, but the site was clearly very dry at the time of the visit. The author is confident that a fairly good understanding of the biodiversity status of the site was obtained (having done a number of studies in the Keimoes / Kakamas areas). Confidence in the findings is high.

The site visit started by driving slowly through the site in order to get an overall "feel" of the landscape and vegetation within the footprint. It also serves to identify differences in the landscape that may result in differences in plant community or species composition. The actual survey was then done, by walking through the sites. A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance, like protected trees (Figure 3). During the survey notes, together with a photographic record, were compiled for the vegetation and landscape.

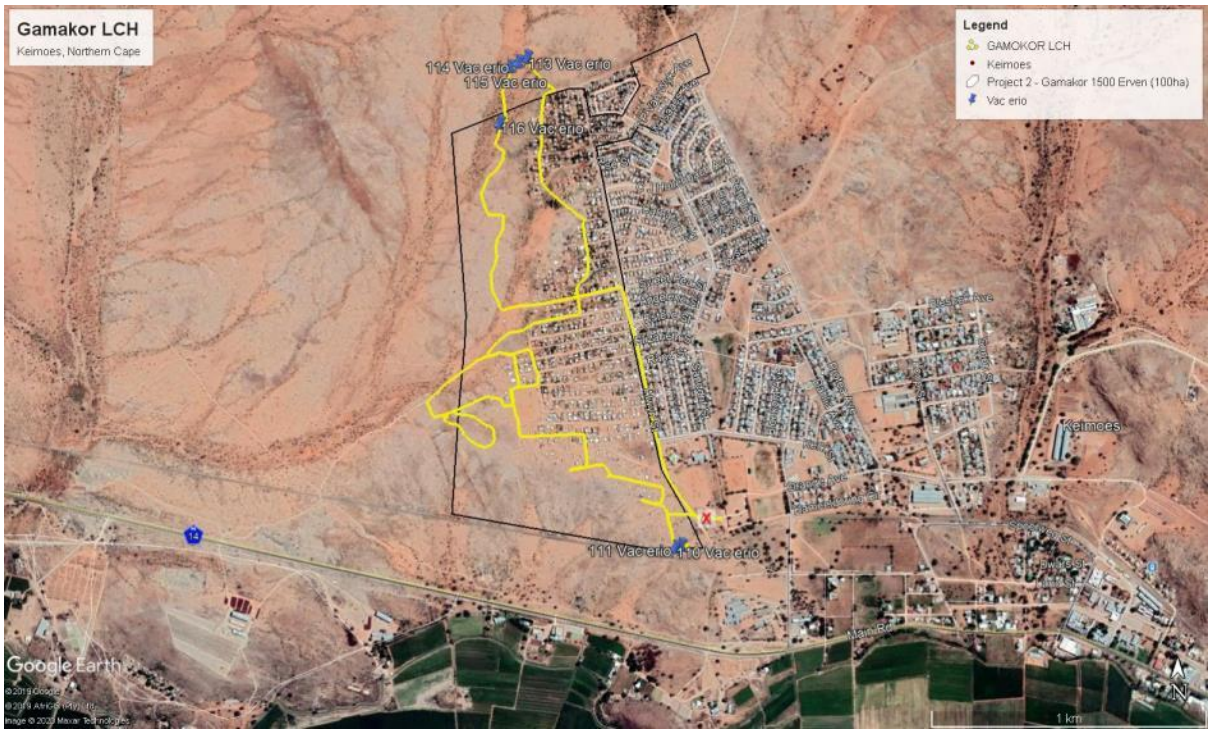


Figure 3: The proposed footprint (black) and the routes followed during the survey (yellow)

During the site visit the author endeavoured to identify and record 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).

The following general observations were made from the desktop studies and the site visit or evaluation:

- The western portion of the proposed footprint still include areas covered in natural land, but most of the eastern half of the proposed footprint are already settled or occupied by informal housing;
- The vegetation type conforms to the expected Bushmanland Arid Grassland, but shows two community variations, as a result of variations in soils;
- According to Van Wyk & Smith (2001) the footprint is not located within centre of endemism.

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 (NDBSP, 2008).

The Keimoes 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** (Figure 4). 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, is classified as *Least Threatened*.

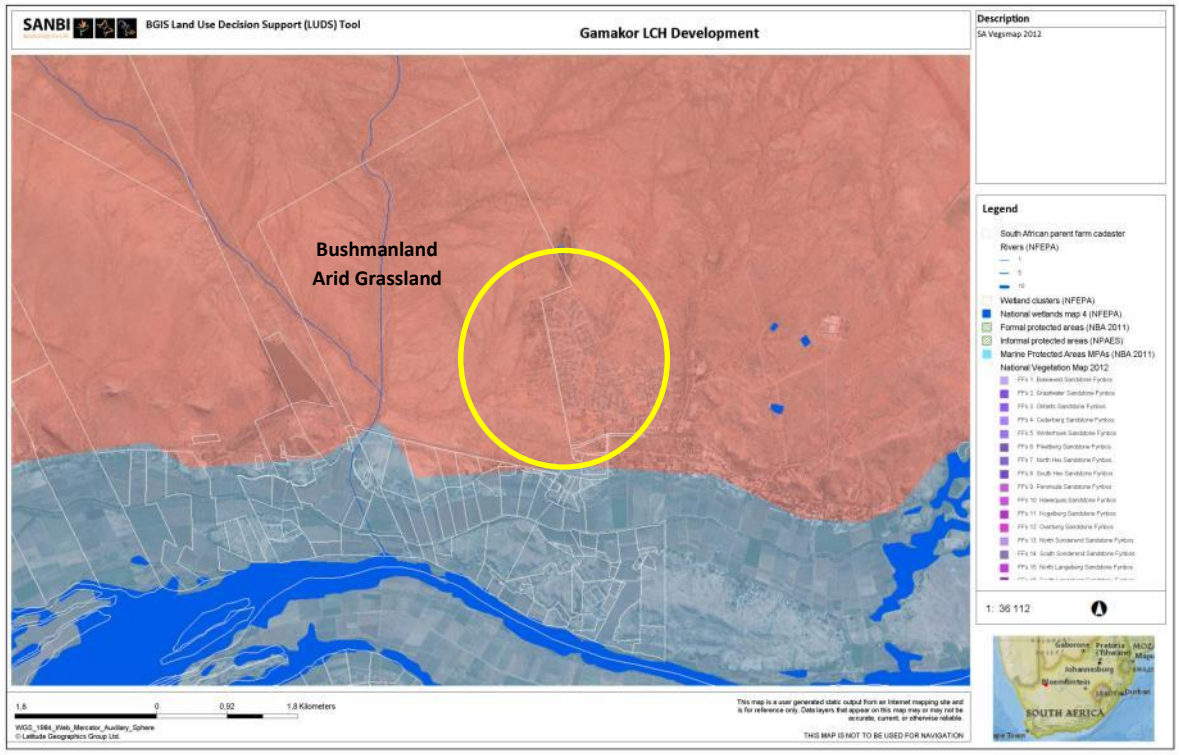


Figure 4: Vegetation map of South Africa (2012 beta 2 version), showing the Keimoes area.

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.

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^{o}C in winter to 43^{o}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. VEGETATION ENCOUNTERED

Bushmanland Arid Grassland is generally described as a 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, the white grasses are usually also only prominent after recent rains.

In this case the absence of recent rains, as well as grazing by domestic livestock meant that the white grassy layer was mostly absent, and only a sparse low shrubland remained. Because of the arid nature of the region (and the unpredictability of rainfall) the carrying capacity of the veld is very low and overgrazing had an extremely negative effect on many vegetation types (with destruction of natural vegetation quite common near settlements). In addition, a large portion (mostly the eastern section) of the footprint was already transformed as a result of informal settlement and housing (Figure 5).

Within the remainder of the natural veld two plant communities were observed, closely associated with variations in soil type and depth. They were:

- On the shallow quartz rich rocky soils a very sparse (semi-desert) low shrubland were observed, dominated by *Salsola tuberculata* and *Justicia australis*, with *Aloe claviflora* also very common.
- On the deeper sandy soils in the slight depressions associated with the seasonal watercourses a denser and larger shrub and tree layer was encountered, dominated by *Parkinsonia africana* and *Senegalia mellifera*.

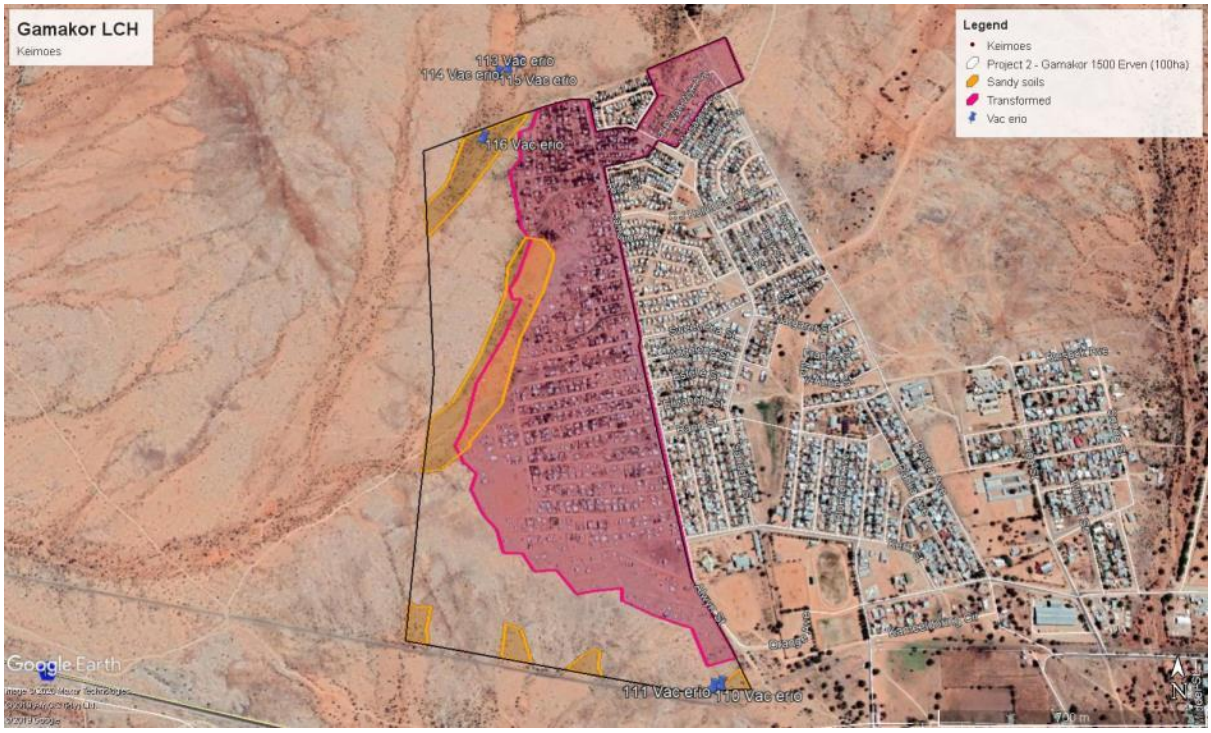


Figure 5: Google image of the footprint, showing the transformed area (purple) and deeper sandy areas (orange)

4.2.1. Vegetation associated with the shallow rocky soils

Most of the remaining natural veld is associated with shallow quartz rich rocky soils. Please note that because of the unpredictability and infrequency of the rainfall the vegetation associated with true quartz fields (e.g. Knersvlakte) will never be able to develop in this area.

The vegetation can be described as a low (<50 cm in height) sparse to very sparse shrubland, low in species composition (not a great variety of species encountered). The shrubland was dominated *Salsola tuberculata* and *Justicia australis* (=*Monechma genistifolium*), with *Aloe claviflora* (Kraalaalwyn), *Mesembryanthemum subnodosum* (often a disturbance indicator) also relatively common.

Photo 1: Typical veld associated with the shallow rocky soils. Note the dominance by *Salsola tuberculata* in this photo. However, this was not always the case and mostly *Justicia australis* or *Mesembryanthemum subnodosum* were also present or common.

Other species in the upper layer included: *Barleria lichtensteiniana, Cynanchum viminale*, *Kleinia longiflora, Parkinsonia africana, Rhigozum trichotomum, Senegalia mellifera* and the aerial hemiparasite *Tapinanthus oleifolius.* In the lower layer (<20 cm) species like *Acanthopsis disperma* (Halfmensie), *Aptosimum spinescens*

(Doringviooltjie), *Blepharis mitrata* and *Tetraena simplex* were observed. Disturbance indicators like *Galenia africana* (Kraalbos) and *Salsola kali* (tumble weed) were also observed in the disturbed or transformed areas.

Photo 2: Looking from west to east over the southern portion of the footprint. Note the dominance by the disturbance indicator, *Mesembryanthemum subnodosum near the disturbance footprint* of the existing houses.

Photo 3: Looking from the middle of the site in a south-westerly direction. Not the dominance by *Justicia australis* in middle of the picture.

Photo 4: One of the rocky outcrops in the south western portion of the footprint. Note the Kraalaalwyn (*Aloe claviflora*) in the foreground and the larger Blackthorn (*Senegalia mellifera*) and *Parkinsonia africana* in the background.

4.2.2. Vegetation associated with the deeper sandy soils

Within the slightly lower lying depressions associated with seasonal drainage lines, deeper sandy soils were encountered, which also supported a denser and larger shrub / small tree layer dominated by *Parkinsonia africana* and *Senegalia mellifera*. Unfortunately, the alien invasive Prosopis tree was also common in some of these areas. The following species were observed: *Asparagus* cf. *cooperi, B. foetida* (occasionally), *Euphorbia braunsii*, *Justicia australis*, *Kleinia longifolia*, *Lycium bosciifolium*, *Rhigozum trichotomum* and *Vachellia erioloba* (3 individuals within the proposed footprint).

Photo 5: A view over the northern portion of the footprint, overlooking the deeper sandy area in the background.

Photo 6: Note the dominance by *Parkinsonia africana* in the deeper sandy area, with the occasional *Senegalia mellifera* also visible.

Photo 7: One of the three *Vachellia erioloba* trees within the footprint. This one to the north of the site. Note the large *Senegalia mellifera* next to the Camel Thorn tree.

Photo 8: One of the two *Vachellia erioloba* encountered in a sandy spot to the south of the footprint.

4.2.3. Transformed area

Most of the eastern portion of the footprint is already transformed as a result of informal settlement. The purpose of this application is to formalise this area into a formal urban development. The following pictures shows portions of this area.

Photo 9: Some of the housing in the north eastern section of the footprint

Photo 10: Some of the housing in the south eastern section of the footprint.

4.3. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study and their status in terms of the Red List of South African plants, National Environmental Management: Biodiversity Act, Act 10 of 2004 (NEM:BA), National Forest Act, Act 84 of 1998 (NFA), the Northern Cape Nature Conservation Act, Act 9 of 2009 (NCNCA) and Conservation of Agricultural Resources Act, Act 43 of 1983 (CARA).

Table 2: List of indigenous species encountered within or near the proposed footprint

No.	Species name	FAMILY	Status	Alien & invader species (AIS)
1.	*Acanthopsis disperma*	ACANTHACEAE	LC	
2.	*Aloe claviflora*	ASPHODELACEAE	LC NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
3.	*Aptosimum spinescens*	SCROPHULARIACEAE	LC	
4.	*Asparagus* cf. *cooperi*	ASPARAGACEAE	LC	
5.	*Barleria lichtensteiniana*	ACANTHACEAE	LC	
6.	*Blepharis mitrata*	ACANTHACEAE	LC	
7.	*Boscia foetida*	BRASSICACEAE (CAPPARACEAE)	LC NCNCA, Schedule 2 Protected (all species in this Genus)	**Apply for a NCNCA Flora permit (DENC)**
8.	*Cynanchum viminale (=Sarcostemma viminale)*	APOCYNACEAE	NCNCA, Schedule 2 Protected (all species in this Family)	**Apply for a NCNCA Flora permit (DENC)**
9.	*Datura innoxia*	BRASSICACEAE	Alien weed	**CARA Cat 1; NEMBA Cat 1b**
10.	*Euphorbia braunsii*	EUPHORBIACEAE		
11.	*Galenia africana*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	**Apply for a NCNCA Flora permit (DENC)**
12.	*Justicia australis (=Monechma genistifolium)*	ACANTHACEAE	LC	
13.	*Kleinia longiflora*	ASTERACEAE	LC	
14.	*Lycium bosciifolium*	SOLANACEAE	LC	
15.	*Mesembryanthemum subnodosum (=Psilocaulon subnodosum)*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	**Apply for a NCNCA Flora permit (DENC)**
16.	*Parkinsonia africana*	FABACEAE	LC	
17.	*Prosopis* species	FABACEAE	**Alien invasive plant species**	**CARA Cat 2; NEMBA Cat 3**
18.	*Rhigozum trichotomum*	BIGONACEAE	LC	
19.	*Salsola kali*	AMARANTHACEAE	Naturalised invader	**NEMBA Cat 1b**
20.	*Salsola tuberculata*	AMARANTHACEAE		
21.	*Senegalia mellifera (=Acacia mellifera)*	FABACEAE	LC	
22.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	
23.	*Tetraena simplex (=Zygophyllum simplex)*	ZYGOPHYLLACEAE	LC	
24.	*Vachellia erioloba*	FABACEAE	LC NFA protected species	**Apply for a NFA Tree permit (DAFF)**

4.4. NORTHERN CAPE CRITICAL BIODIVERSITY 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). 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).

According to the 2016 Northern Cape CBA map (Figure 6), the proposed development footprint is located within a terrestrial CBA. Unfortunately, there are no logical alternative sites available to the Keimoes Municipality, which will not impact on the CBA.

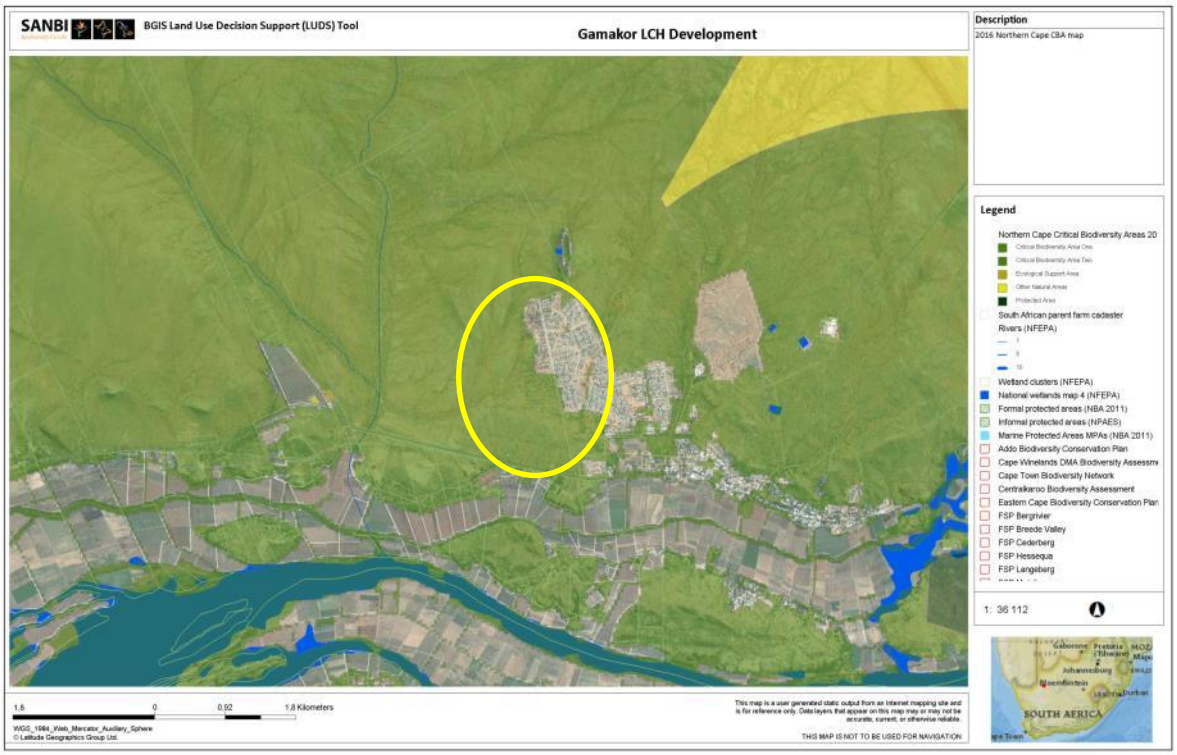


Figure 6: The Northern Cape CBA map showing the location of the proposed development

4.5. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

According to Van Wyk en Smith (2001), the proposed development will not impact on any recognised centre of endemism. The nearest centre of endemism is the Griqualand West Centre which starts west of Delportshoop (approximately 50 km west of the proposed site).

The proposed site does not fall within any recognised centre of endemism.

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 (SANBI, 2015). **No red-listed species** was observed.

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). **No NEM: BA protected species 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).

- **Three *Vachellia erioloba* trees were encountered** within the footprint (Refer to Table 3). There should be no reason to remove these trees.

Table 3: List and location of protected tree species encountered near the proposed site 2, 3 & 9 locations

Waypoint No.	Species name	Coordinates	Comments	Recommendations
110 Vac erio	*Vachellia erioloba*	S28° 42' 14.9" E20° 57' 08.4"	Young tree (4m). Picture 8	**Do not disturb**: Avoid coming nearer than 1 m of the canopy (or drip line).
111 Vac erio	*Vachellia erioloba*	S28° 42' 14.6" E20° 57' 09.1"	Young tree (4m).	**Do not disturb**: Avoid coming nearer than 1 m of the canopy (or drip line).
116 Vac erio	*Vachellia erioloba*	S28° 41' 25.3" E20° 56' 44.9"	Mature tree (5m) Picture 7	**Do not disturb**: Avoid coming nearer than 1 m of the canopy (or drip line).

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 plant protected in terms of the NCNCA was encountered. Recommendations on impact minimisation also included.

Table 4: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Aloe claviflora* **Schedule 2 protected**	All species in the genus protected by default. Locally abundant.	**Search & rescue**: Individuals within footprint to be transplanted to surrounding area.
2.	*Boscia foetida* **Schedule 2 protected**	Occasionally observe, usually in poor condition and subject to grazing	**Search & rescue**: Individuals within footprint to be transplanted to surrounding area.
3.	*Cynanchum viminale* **Schedule 2 protected**	Occasionally observed.	Larger *Cynanchum* plants are expected to transplant poorly. Species protection through topsoil conservation.
4.	*Galenia africana* **Schedule 2 protected**	This plant is weedy a disturbance indicator and commonly found in the Northern Cape.	No special measures needed, this is a weedy pioneer species.
5.	*Mesembryanthemum subnodosum* **Schedule 2 protected**	This plant is weedy a disturbance indicator and commonly found throughout.	No special measures needed, this is a weedy pioneer species.

5. 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

5.1. 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 5).

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

Table 5: 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.

5.2. 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 6: 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.

6. 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 considered:

- **Location**: The proposed development footprint is located on Municipal property, adjacent to existing housing infrastructure on natural veld that shows varying degrees of disturbance as a result of historical land use and more recent urban settlement and current land use (livestock grazing).
- **Activity**: The proposed activity is expected to result in a permanent footprint of approximately 100 ha of veld (showing varying degrees of disturbance), of which almost half had already been transformed.
- **Geology & Soils**: No special features such as true quarts patches or heuweltjies were observed in or near to the larger footprint area that may result in specialised plant habitat.
- **Land use and cover**: The footprint is located on municipal land adjacent to an existing urban area. Portions of the footprint is still in relative good conditions (although heavily grazed), but half had already been transformed by illegal structures (settlement). Remaining natural veld is utilised for livestock grazing by the local community.
- **Vegetation status**: Bushmanland Arid Grassland is not considered to be of conservation concern, but conservation targets have not yet been met. In general the natural systems associated with the proposed footprint have been impacted, but the western portion of the proposed footprint is still largely natural, although it is under constant urban related pressures.
- **Conservation priority areas:** According to the 2016 Northern Cape CBA map (Figure 6), the proposed development footprint is located within a terrestrial CBA. Unfortunately, there are no logical alternative sites available to the Keimoes Municipality, which will not impact on the CBA. The site will not impact on any centre of endemism.
- **Connectivity**: The proposed activity will result in a permanent footprint enlargement of the existing housing scheme by approximately 100 ha. However, the proposed footprint joins up with the existing urban edge and should not have any significant additional impact on connectivity.
- **Watercourses and wetlands**: A number of small seasonal drainage lines run through the property.
- **Protected or endangered plant species**: Three Camel Thorn trees (NFA protected) and five NCNCA protected plant was observed.
- **Alien and Invasive Plant species**: A number of alien and invasive plant species were observed of which the densities and spread of the alien *Prosopis glandulosa* tree is probably the most concerning.

Conservation value or habitat sensitivity is based on the irreplaceability of the habitat unit, on observations of the abundance and diversity of floral and faunal species present at the time of the assessment, on the presence of endangered or protected species within the habitat units, on the presence of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) and on the degree of disturbance encountered as a result of historical and current activities.

The terrestrial habitat associated with the project footprint is considered to be of a moderate sensitivity based on the following factors:

- The vegetation type is classified as least threatened;
- However, the project footprint overlaps a CBA;

- The floral habitat and natural systems have been impacted, by grazing and urban related activities, but portions still functions relatively well;
- The floral diversity is very low;
- No special habitats or features were observed within the footprint;
- No red-list species were encountered, but one nationally protected tree and five provincially protected plant species was encountered.

6.1. IMPACT ASSESSMENT

The following table rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 7: Impact assessment associated with the proposed development

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	3	1	2	3	2	24	No special habitats observed.
	With mitigation	3	1	2	2	1	18	Ensure good environmental control during the construction phase.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	3	3	4	3	2	36	Permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants).
	With mitigation	3	2	4	2	1	27	Potential beneficial socio-economic impact (job opportunities).
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	3	3	4	3	2	36	Permanent transformation of 100ha of partially disturbed Bushmanland Arid Grassland (Least Threatened)
	With mitigation	3	2	4	2	1	27	Incorporate larger trees within the settlement layout where possible and protect all Camel Thorn trees within the development footprint
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	5	5	3	3	48	The development will impact on a proposed CBA. However, there is no alternative that will not impact on the CBA, and this area is probably the most logical choice.
	With mitigation	3	3	4	2	2	33	Incorporate larger trees within the settlement layout where possible and protect all Camel Thorn trees within the development footprint
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	3	3	4	3	3	39	The additional footprint joins the existing urban edge and should not add have any significant additional impact on connectivity.
	With mitigation	3	2	2	2	2	24	Incorporate larger trees within the settlement layout where possible and protect all Camel Thorn trees within the development footprint

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Watercourses and wetlands: Potential impact on natural water courses and its ecological support areas.	Without mitigation	3	3	4	3	2	36	The proposed development will impact on small ephemeral drainage lines and potentially larger water courses with well-established riparian vegetation.
	With mitigation	3	2	3	2	2	27	Refer to the freshwater specialist report.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	4	4	3	4	45	A number of protected species were observed, most notably a number of nationally protected tree species.
	With mitigation	3	2	3	1	2	24	Protect all significant indigenous tree species and search & rescue other potentially significant protected plant species.
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation	3	3	4	3	2	36	Stands of Prosopis trees were observed in certain areas.
	With mitigation	3	1	2	1	1	15	Special care must be taken during their removal (in order to avoid re-sprouting).
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	3	2	3	2	2	27	Veld fire risk low.
	With mitigation	3	1	3	1	1	18	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	5	5	3	4	51	Permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants).
	With mitigation	3	3	4	2	2	33	Refer to all the mitigation recommendations above.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	3	3	2	3	33	No direct impact on natural veld or protected plant species, but slow deterioration through constant grazing and urban creep.
	With mitigation						0	

According Table 7, the main impacts associated with the proposed development will be on:

- The permanent transformation of approximately 100ha of natural veld for human settlement (in an area used for livestock grazing by the local inhabitants);
- The potential impact on critical biodiversity areas;
- The potential impact on protected plant species;

Because of the location and the degraded status of the site, the cumulative impact is expected to be **Medium**, but this can be reduced to **Low** by mitigation.

7. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the permanent transformation of approximately 100ha of natural veld for human settlement. According to the impact assessment given in Table 7, with good environmental control, the development is likely to result in a **MEDIUM** impact on the environment.

However, with the correct mitigation it is unlikely that the development will contribute 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.

7.1. MITIGATION ACTIONS

The following mitigation actions are recommended:

- 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 EA and the construction phase EMP and any other conditions pertaining to specialist studies.
- **Before any work is done** the development footprint and access routes must be clearly demarcated and approved by the ECO. The demarcation must include the total footprint necessary to execute the work, but must aim at minimum disturbance.
- 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.
- No *Vachellia erioloba* (Camel Thorn) trees may be removed or damaged (the three trees within the footprint must be protected).
- An effort should be made to transplant some of the *Aloe claviflora* plants as well as all viable (transplantable) *Boscia foetida* shrubs/trees.
- 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.
- Special attention must be given to alien and invasive control within the construction footprint. All alien invasive species within the footprint and at least 5 m to the side of the footprint must be removed responsibly.
    - Care must be taken with the eradication method to ensure that the removal does not impact or lead to additional impacts (e.g. spreading of the AIP due to incorrect eradication methods);
    - Care must be taken to dispose of alien plant material responsibly.

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