PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL & TERRESTRIAL BIODIVERSITY SCAN

GROBLERSHOOP RESIDENTIAL DEVELOPMENT

THE PROPOSED HIGHER INCOME RESIDENTIAL DEVELOPMENT ON ERVEN 102 & 141, GROBLERSHOOP, !KHEIS MUNICIPALITY, NORTHERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA.

PREPARED BY:

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3 October 2023

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EXECUTIVE SUMMARY

The landowner would like to extend his agricultural activities by the development of the adjacent Erven 1372 & 1375 (**The study area**), approximately 14 ha in size. The Erven is in the Boegoeberg Settlement area (just north of Groblershoop), within the irrigation zone of agriculture along the Orange River. The study area is surrounded by intensive agriculture but is still covered by natural vegetation.

The proposed development footprint will result in the transformation of 14 ha of natural veld for agricultural.

VEGETATION TYPE & STATUS

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the study area will impact on Bushmanland Arid Grassland (blue in Figure 5), a vegetation type that has been classified as "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022). The red well-drained sandy soils (Refer to Heading 2.3), the dominance by *Senegalia mellifera* and the high number of *Vachellia erioloba* (coupled with the even lower than expected species diversity) would suggest that this is more likely to be an intrusion of deeper dune sands (similar to Duneveld) within the Arid Grassland.

WATER COURSES AND WETLANDS

According to the SANBI BGIS websites, no watercourses or wetlands are expected on the property, and no significant watercourses were observed during the site visit.

According to the **DFFE Screening Tool** report for the footprint area (Appendix 2), the relative Aquatic biodiversity theme sensitivity is considered of low sensitivity, which is supported by the findings of this study.

SPECIAL HABITATS

The landscape is relatively homogenous and does not contain any rocky outcrop or any other significant biophysical feature that might have resulted in special habitats for fauna or flora (apart from the fact that both sites overlap a patch of deeper red well-drained sandy soils).

LAND-USE

Both properties belong to the Municipality and have been earmarked for urban development.

VEGETATION ENCOUNTERED

The vegetation composition coupled with the soils encountered within the study area suggests that this site reflects an intrusion of deeper sandy soils within the Bushmanland Arid Grassland. The species diversity was very low, and the vegetation dominated by *Senegalia mellifera* (swarthaak), the alien invasive *Prosopis* tree and *Vachellia erioloba* (Photo 1 to Photo 6).

CONSERVATION PRIORITY AREAS

According to the 2016, Northern Cape critical biodiversity areas maps, the study area does not overlap any critical biodiversity area or ecological support areas (Figure 6) (Holness & Oosthuysen, 2016).

CONNECTIVITY

The study area borders on the Groblershoop urban edge to the north and part of the west. To the south it borders/overlaps the old golf course. Connectivity to the south, east and west, will be slightly impacted by the enlargement of the urban edge, but overall connectivity to the south, east and west will remain excellent. Because of the existing proximity to the urban edge, animals will naturally stay slightly further south.

THREATENED AND PROTECTED PLANT SPECIES

Table 8 gives a list of the plant species encountered during this study. It is important to note that the species list is only based on a one-day site visit. It is likely that some species (especially annuals and geophytes) might have been missed. However, the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high. No red-listed plant species was observed, and only one (1) species protected in terms of the NFA were observed (namely *Vachellia erioloba*). From a botanical perspective, the presence such a large number of *Vachellia erioloba* trees, scattered throughout the site (more than 60 individual trees were observed, most of them smaller than 5 m, but there were also about 16 trees larger

than 6m in height).

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**. However, the presence of a large number of *Vachellia erioloba* trees, would suggest that the Plant Species Theme should be **Medium** sensitive, which would raise the biodiversity sensitivity also. It is important that conservation of these trees (especially those over 6m in height) are taken into consideration to **lower the plant species theme back to Low Sensitive**.

FAUNA & AVI-FAUNA

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The study is located next to the urban edge (with its associated anthropogenic impacts). The vegetation itself is in fair good conditions, but species diversity is very low and slowly succumbing to alien infestation. Apart from insects, reptiles and a few smaller mammal species, the site itself is not expected to support any significant remaining fauna or even avi-fauna.

However, according to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Medium Sensitive**, because of the potential occurrence of Ludwig's Bustard (*Neotis ludwigii*) (Refer to Table 10). Because of the proximity to the urban edge (and associated anthropogenic activities) it is unlikely that the Ludwig's Bustard will chose to breed within this area. It is also considered highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat.

With regards to the is project the sensitivity rating is **Low sensitive**.

MAIN CONCLUSION

According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Low Sensitivity**. However, because of the presence of so many *Vachellia erioloba* trees (NFA protected species), the impact assessment suggest that the impact on protected species should be **Medium Sensitive**, which raises the overall **Terrestrial Biodiversity Theme** (the accumulated impact) to **Medium Sensitive**.

The impact assessment also suggests that the accumulated impact can be reduced to Low Sensitive through mitigation (Refer to the recommendations under Heading 8).

With proper mitigation, it is thus considered 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 species.
- Loss of ecosystem connectivity.

Based on the data collected and analyzed for the proposed development, no fatal flaws or any other obstacles were found with respect to the flora, vegetation, fauna, and terrestrial biodiversity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT THE PROJECT BE APPROVED WITH THE MITIGATION ACTIONS AS DESCRIBED UNDER HEADING 8.

MAIN MITIGATION RECOMMENDATIONS

Refer Heading 8, for a copy of all recommendations.

1. A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
2. All efforts must be made to protect all healthy *Vachellia erioloba* larger than 6 m in height.
    - Before construction begins, the ECO must mark all such trees for protection. If any of these trees cannot be fitted within the layout plans, a suitable number of smaller trees must be protected in its place.
    - Wherever possible, other large indigenous trees must be protected and incorporated within the design layout.
3. A National Forest Act licence application must be obtained for the removal of any ***Vachellia erioloba*** trees that will be impacted.

DETAILS OF THE AUTHOR

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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 the company have no interest in secondary or downstream development because of the authorization of this 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. The author reserves 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 and environmental legal compliance audits.

During 2010 he joined EnviroAfrica 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.

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:

3 October 2023

Date:

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ABBREVIATIONS

BAR	Basic Assessment Report
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DENC	Department of Environment and Nature Conservation
EA	Environmental Authorization (Record of Decision)
EAP	Environmental assessment practitioner
ECO	Environmental Control Officer
EIA	Environmental impact assessment
EMP	Environmental Management Plan or Program
EMS	Environmental management system
EN	Endangered
ESA	Ecological support area (in terms of the 2017 City of Cape Town Biodiversity Network)
LT	Least Threatened
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
VU	Vulnerable

1. INTRODUCTION

The !Kheis Municipality would like to expand the residential area of Groblershoop in order to add a number of new erven (64 – 70) on a 7 ha piece of land to the northwest of the existing Groblershoop residential area. The new erven will be located on Erf 141 and a portion of Erf 102. Groblershoop falls within the !Kheis Local Municipality of the Northern Cape Province.

The study area (Erven 102 & 141) is about 7.1 ha in size, located on the urban edge of the existing residential development at Groblershoop. Erf 141 still supports natural vegetation, while Erf 102 includes a portion of the old Groblershoop Golf Course (the open areas between the various courses, still supports natural vegetation). According to 2018 Vegetation map of South Africa, the proposed development will impact on one vegetation type, namely **Bushmanland Arid Grassland**, a vegetation type that is considered "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022).

The proposed site (or the study area) does not overlap any critical biodiversity area or ecological support areas, according to the 2016 Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016). According to SANBI BGIS websites there are no watercourses or wetlands expected on either property.

The DFFE screening report for the proposed site, compiled by PB Consult on the 3rd of October 2023, identified various areas of potential environmental sensitivity, of which the following will be discussed in this report:

- The relative Animal species theme sensitivity is considered of **Medium Sensitivity**;
- The relative Plant species theme sensitivity is considered of **Low Sensitivity**;
- The relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity**.

1.1. LEGISLATION GOVERNING THIS REPORT

EnviroAfrica was appointed as the applicant to facilitate the NEMA EIA application for the proposed project. PB Consult was appointed by EnviroAfrica to conduct a botanical and terrestrial biodiversity scan of the proposed footprint area.

This is a 'specialist report', compiled in terms of:

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- The "Protocol for the Specialist Assessment and Minimum report content requirements for environmental impacts on terrestrial biodiversity" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).

1.2. TERMS OF REFERENCE

The Terms of Reference for this study were to undertake a visit to the study area and compile a specialist report that assesses the potential impacts on *Botanical and Terrestrial Biodiversity* features of the proposed development.

Study should address:

- Habitat sensitivity;
- Threatened ecosystems (including critical biodiversity areas and ecological support areas);
- Flora and fauna species of conservation concern;
- Any significant botanical or other terrestrial biodiversity features that might be impacted because of the proposed development as identified in the DFFE Screening Report for the site.
- Potential direct and cumulative impacts resulting from the proposed development on the receiving environment.

2. STUDY AREA

2.1. LOCATION & LAYOUT

Groblershoop is a small town, about 120 km south of Upington on the N10, between Upington and Prieska, within the !Kheis Local Municipality of the Northern Cape Province (Figure 1). Erf 141 & 102 borders on the northwestern urban edge of the town. The study area overlaps Erf 141 and a portion of Erf 102 and is about 7.1 ha in size (Figure 2).

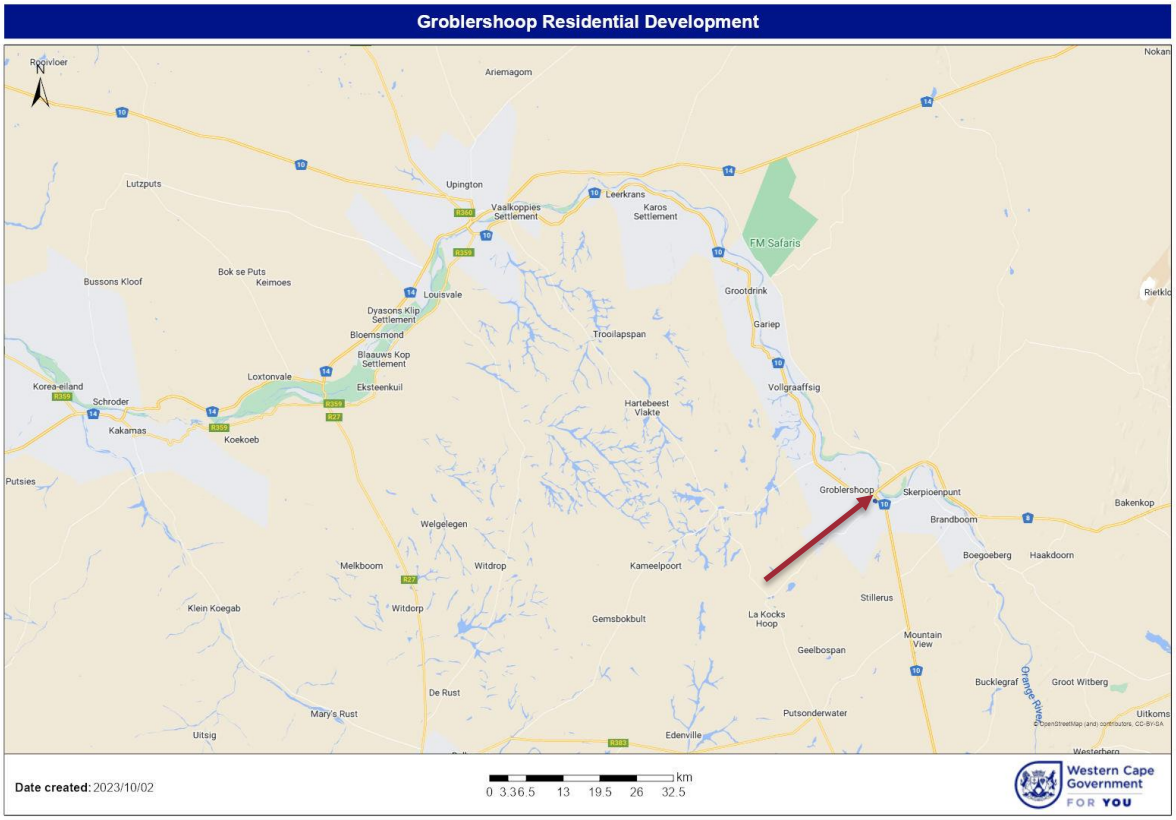

Figure 1: A map showing the location of Groblershoop in the Northern Cape Province.

Table 1: Co-ordinates of the two properties (approximately midpoint) (WGS 84 format)

DESCRIPTION	CO-ORDINATE
Erf 141, Groblershoop (Public Place)	S28°53'48.90" E21°58'46.87"
Erf 102, Groblershoop (Erven)	S28°54'23.08" E21°58'21.54"

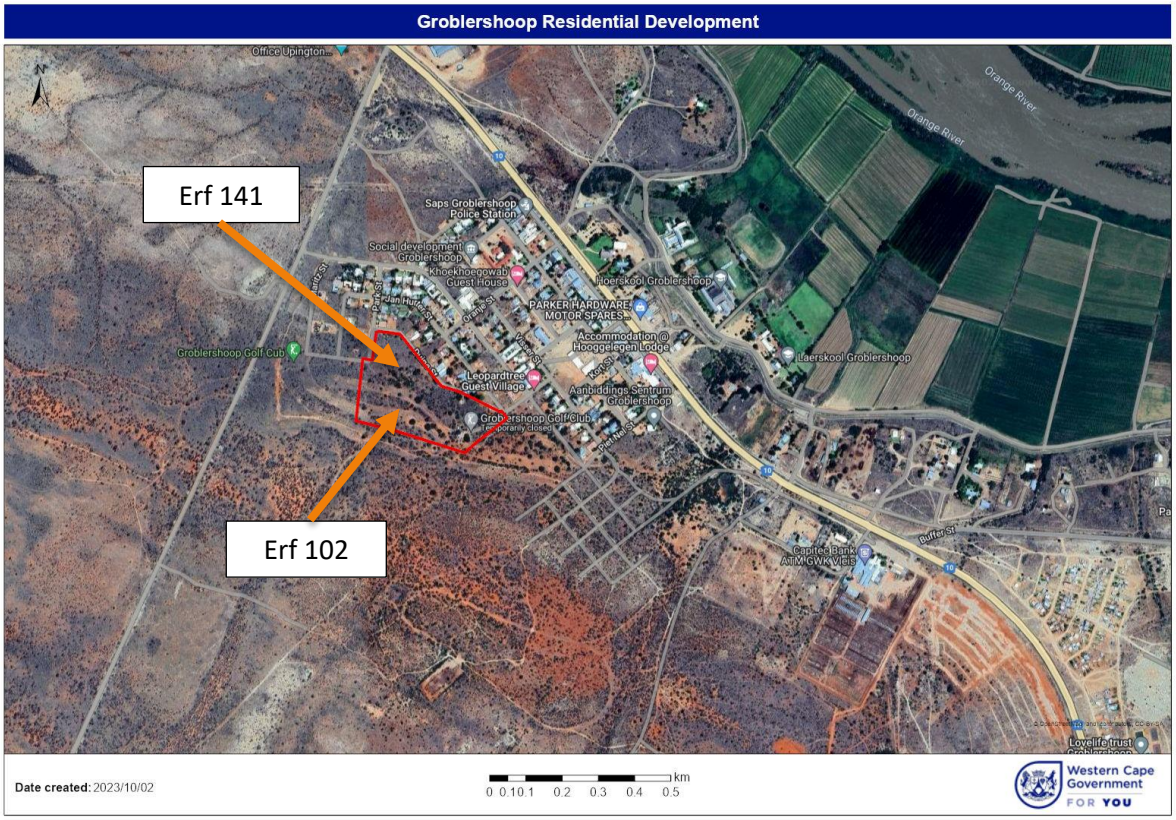

Figure 2: Google Image showing the study area in relation to the town of Groblershoop.

2.2. CLIMATE

The site falls within the Nama Karoo, which is an arid biome (all areas with a rainfall of less than 400 mm/year are regarded as arid). The climate of Nama-Karoo is essentially continental and is little affected by the ameliorating influences of the oceans. Rainfall is unreliable and droughts are unpredictable and sometimes prolonged (Mucina *et. al.,* 2006).

Groblershoop receives less than a 100 mm of rain per year, mainly in mid-summer December to March the highest (40 mm) in February/March, with its lowest rainfall (0 mm)during winter (June to August). It is also important to note that rainfall can be highly erratic and can vary significantly per annum on any specific location. Daily temperatures vary from 23°C – 37°C during the hot summer months (December / January) and drops down to between 8°C - 17°C during the colder winter months (June – July) (www.worldweatheronline.com).

2.3. TOPOGRAPHY, GEOLOGY AND SOILS

The study area is located on almost level terrain with a slight slope (1.6% on average) from the northeast to the southwest. Topography will not play any important role in plant species diversity.

According to Mucina & Rutherford (2006) the soils associated within the study area can be described as freely drained, structureless soils with minimal development, usually shallow, on hard weathering rock, with or without intermittent diverse soils. Lime is generally present in part or most of the landscape (Figure 3).

NB: However, the soils and the vegetation that was encountered on site, is more consistent with that of Duneveld (red well-drained sandy soils). The site also supports many *Vachellia erioloba* (camel thorn) trees, some of them quite large, which suggests deeper sandy soils.

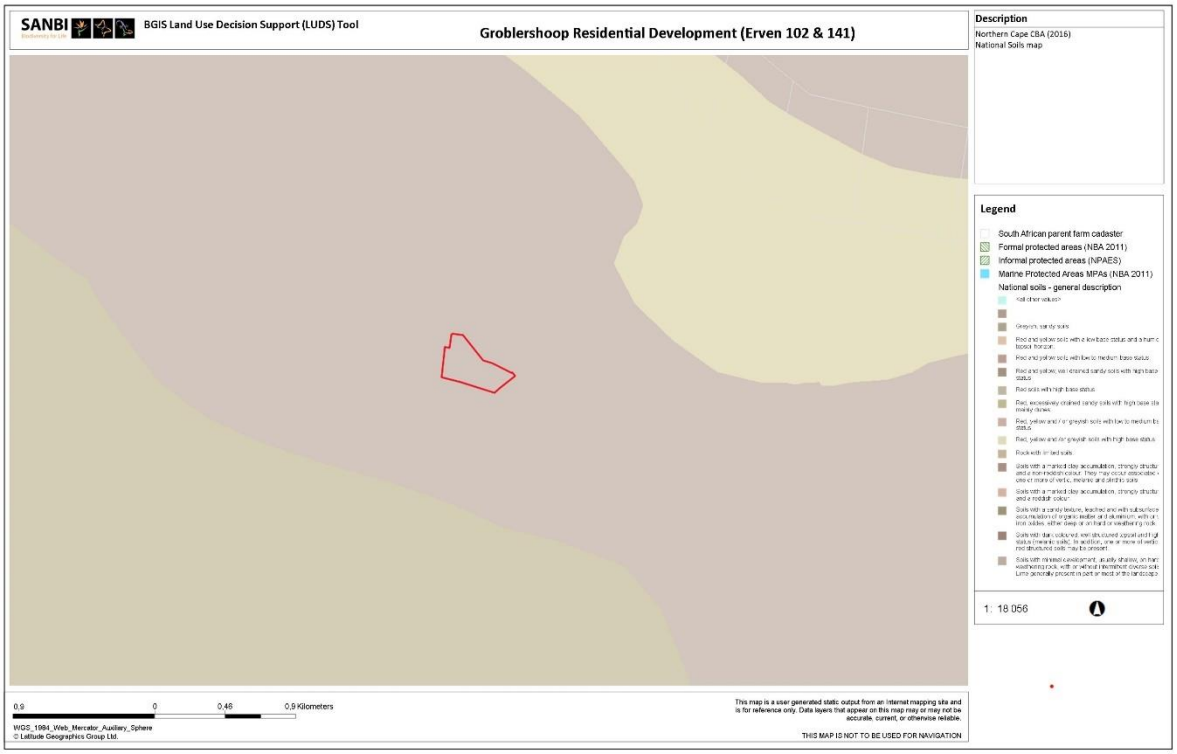

Figure 3: The national soils map, showing the proposed development footprint (study area)

3. METHODS

The protocol for specialist assessment and minimum report content and requirements for environmental impacts on terrestrial biodiversity was published in GN. No. 320 of 20 March 2020. It includes the requirements for a desktop analysis and site verification.

3.1. DESKTOP ANALYSIS

The first step of the study was to conduct a desktop analysis of the study area and its immediate

surroundings. Using the DFFE screening tool report as basis, spatial information from online databases such as SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, obvious differences in landscape (e.g., variations in soil type, rocky outcrops etc.) or vegetation densities , which might indicate differences in plant community or species composition, critical biodiversity areas and other terrestrial biodiversity features as identified in the screening tool.

This information was used to prepare a study area map, which is used as a reference during the physical site visit. Plant species lists were prepared, and species of special significance were flagged.

3.2. SITE SENSITIVITY VERIFICATION

The fieldwork for project was carried out on the 6th of July 2023. The site survey was conducted over a 4-hour period, by walking the site and sampling the vegetation, using a modified approach, based on the Braun-Blanquet vegetation survey method (Werger, 1974).

Protected or other special plants and any terrestrial feature of significance was, marked by waypoints and/or on the study map, and photographed (Figure 4). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints. During the survey notes, and photographic records were collected. All efforts were made to ensure that any variation in vegetation or soil condition, which might indicate special botanical features (e.g., rocky outcrops, watercourses or heuweltjies), were visited. Efforts was also made to ensure that the plant species list was as complete as possible.

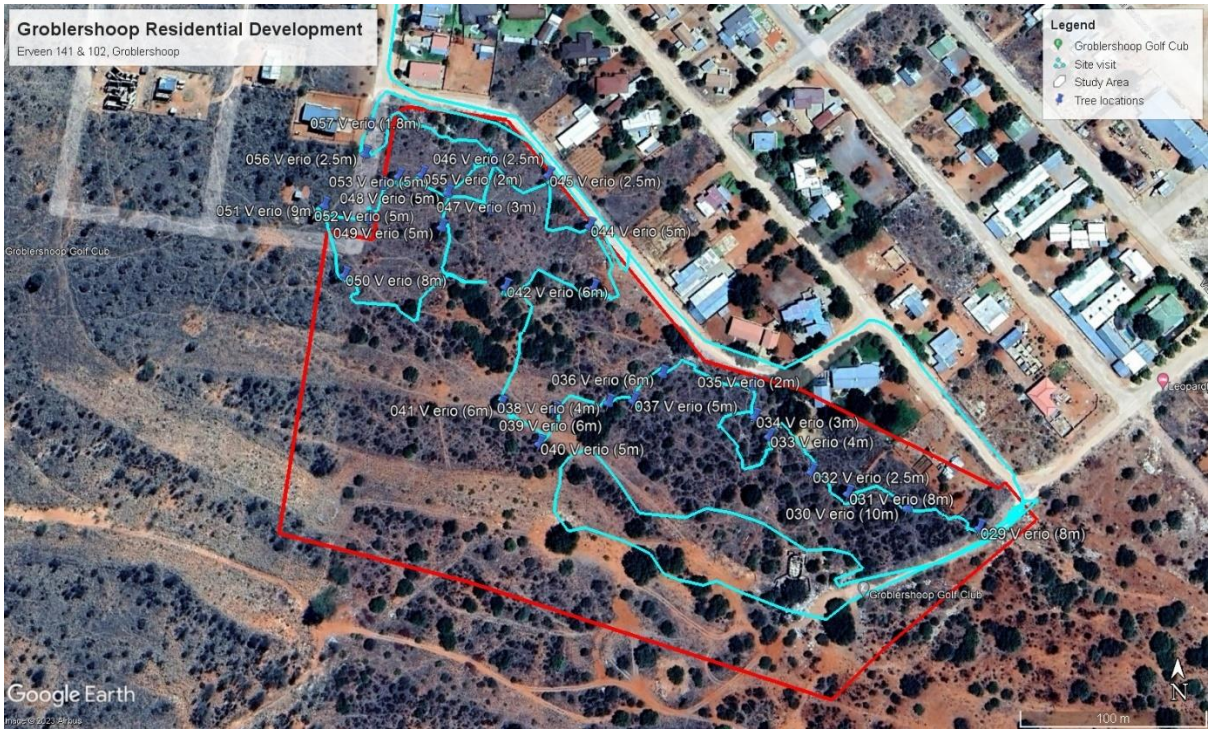

Figure 4: Google overview, showing the study area (red)and the routes walked during the site visit.

3.3. LIMITATIONS, ASSUMPTIONS AND UNCERTAINTIES

The findings are based on a one-day site visit (not long-term repetitive sampling), which means that it is likely that some plant species might have been missed. However, the Nama Karoo vegetation is not high in species diversity, and the author knows this area and vegetation type well. Although, the site visit was not in the main flowering time, the timing of the site visit was reasonable as species diversity on site was particularly low (more typical of Duneveld) and this vegetation type does not support a high number of herbs or geophytes. The relatively dense stands of white grasses, shows that the site had received rains during the summer rainfall period. Essentially all perennial plants were identifiable and a good understanding of the status of the vegetation and plant species in the study areas were obtained and confidence in the findings are high. There should be no limiting factors which could significantly alter the outcome of this study. It is unlikely that a full botanical assessment will result in any additional findings that would have a significant impact on the outcome.

3.4. IMPACT ASSESSMENT METHOD

The concept of environmental impact assessment in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) was developed to identify and evaluate the nature of potential impact to determine whether an activity is likely to cause significant environmental impact on the environment. The concept of significance is at the core of impact identification, evaluation and decision making, but despite this the concept of significance and the method used for determining significance remains largely undefined and open to interpretation (DEAT, 2002).

The objective of this study was to evaluate the status of the veld within the study area to identify special or significant environmental features which might be impacted by the proposed 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.

3.4.1. 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.

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

3.4.2. CRITERIA USED

***Conservation value*:** Conservation value refers to the intrinsic value of an attribute (e.g., an ecosystem, a vegetation type, a natural feature or a species) 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 (Refer to Table 2 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 3, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 4).

Extent refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur (Refer to Table 5).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 6).

Table 2: Categories used for evaluating conservation status.

CONSERVATION VALUE	
Low (1)	The attribute is transformed, degraded not sensitive (e.g., Least threatened), with unlikely possibility of species loss.
Medium/low (2)	The attribute is in good condition but not sensitive (e.g., Least threatened), with unlikely possibility of species loss.
Medium (3)	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.
Medium/high (4)	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.
High (5)	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 3: Categories used for evaluating likelihood.

LIKELHOOD	
Highly Unlikely (1)	Under normal circumstances it is almost certain that the impact will not occur.
Unlikely (2)	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.
Possible (3)	The likelihood of the impact occurring, under normal circumstances is 50/50, it may, or it may not occur.
Probable (4)	It is very likely that the impact will occur under normal circumstances.
Certain (5)	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.

Table 4: Categories used for evaluating duration.

DURATION	
Short (1)	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).
Medium/short (2)	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).
Medium (3)	Impact is medium-term and reversible with mitigation but will last for some time after construction and may require ongoing mitigation. Rehabilitation time is expected to be longer (5-15 years).
Long (4)	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 ongoing mitigation. Rehabilitation time is expected to be longer (15-50 years).
Permanent (5)	The impact is expected to be permanent.

Table 5: Categories used for evaluating extent.

EXTENT	
Site (1)	Under normal circumstances the impact will be contained within the construction footprint.
Property (2)	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.
Surrounding properties (3)	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding landowners or –users, but still within the local area (e.g., within a 50 km radius).
Regional (4)	Under normal circumstances the impact might extent to the surrounding region (e.g., within a 200 km radius), and will impact on landowners in the larger region (not only surrounding the site).
Provincial (5)	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).

Table 6: Categories used for evaluating severity.

SEVERITY	
Low (1)	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.
Medium/low (2)	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.
Medium (3)	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.
Medium/high (4)	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.
High (5)	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.

3.4.3. 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 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. 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, to determine its potential significance. The potential significance is then described in terms of the categories given in Table 7. Mitigation options are evaluated, and comparison is then made (using the same method) of potential significance before mitigation and potential significance after mitigation (to advise the EAP).

Table 7: 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 because 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 because 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.

SIGNIFICANCE	DESCRIPTION
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is 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 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 are un-mitigatable and usually result in very severe effects, beyond site boundaries, national or international.

4. DESKTOP ASSESSMENT

The results of the desktop analysis is given underneath.

4.1. BROAD-SCALE VEGETATION EXPECTED

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the study area will impact on Bushmanland Arid Grassland (blue in Figure 5), a vegetation type that has been classified as "Least Threatened", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022). The red well-drained sandy soils (Refer to Heading 2.3), the dominance by *Senegalia mellifera* and high number of *Vachellia erioloba* (coupled with the even lower than expected species diversity) would suggest that this is more likely to be an intrusion of deeper dune sands (similar to Duneveld).

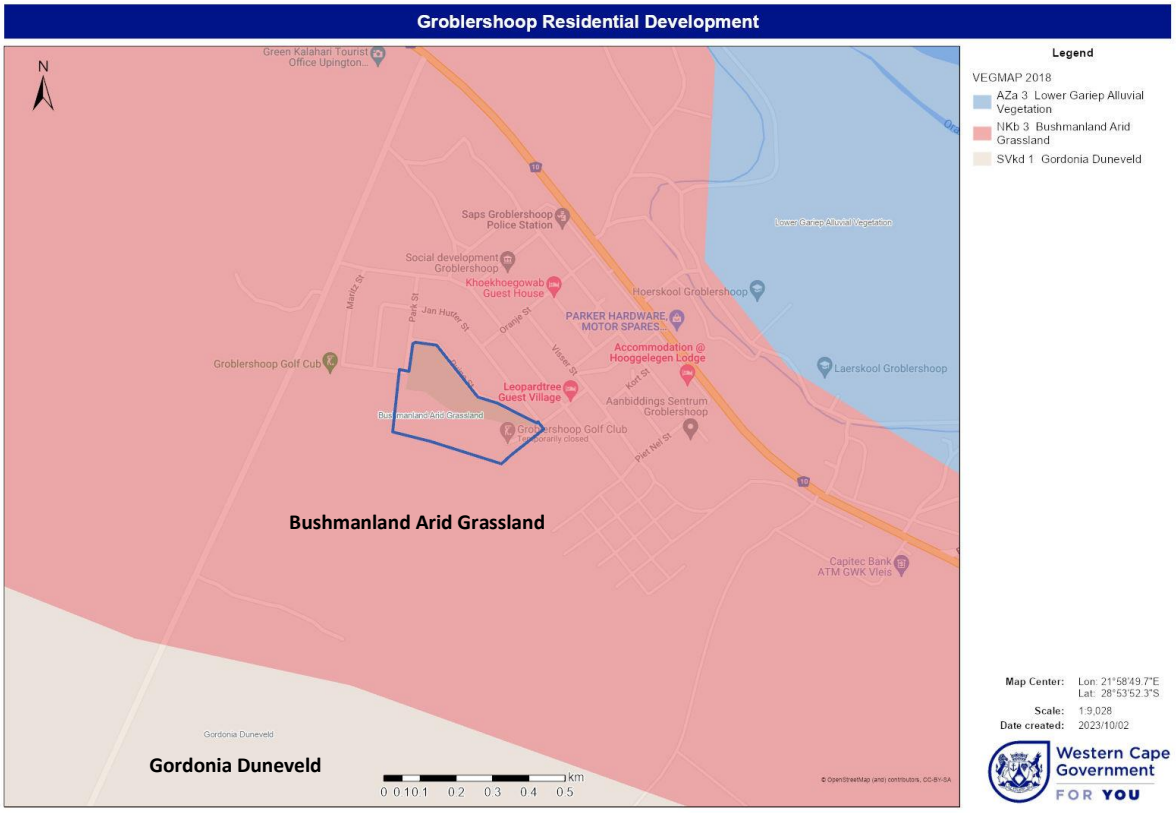

Figure 5: Vegetation map of South Africa (2012), showing the expected vegetation type (SANBI BGIS)

4.2. ECOLOGICAL DRIVERS & FUNCTIONING

The study area falls within the Nama-Karoo Biome, which is a large arid landlocked region on the central plateau of the western half of South Africa, extending into Namibia. It is flanked by the Succulent Karoo to the west and south, desert to the northwest, arid Kalahari Savanna to the north, Grassland to the northeast, Albany Thicket to the southeast and small parts of Fynbos to the south.

In South Africa, only the Desert Biome has a higher variability in annual rainfall and only the Kalahari Savanna greater extremes in temperature. The Nama-Karoo receives most of its rainfall in summer, especially in late summer (Mucina *et. al*., 2006).

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

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region would have favoured free moving herbivores such as gemsbok, ostrich and springbok, nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, suggesting the transient nature of herbivores, except near water where they would have lingered longer. During the 19th century the vast herds of migratory ungulates indigenous to this biome have been replaced (almost completely) by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity. Grazing during and immediately after droughts periods is regarded as a major cause of detrimental change in vegetation composition and were ultimately responsible for the decline of large numbers of palatable plants (Mucina *et. al*., 2006).

In 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).

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

4.3. CRITICAL BIODIVERSITY AREAS & ECOLOGICAL CORRIDORS

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 (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.

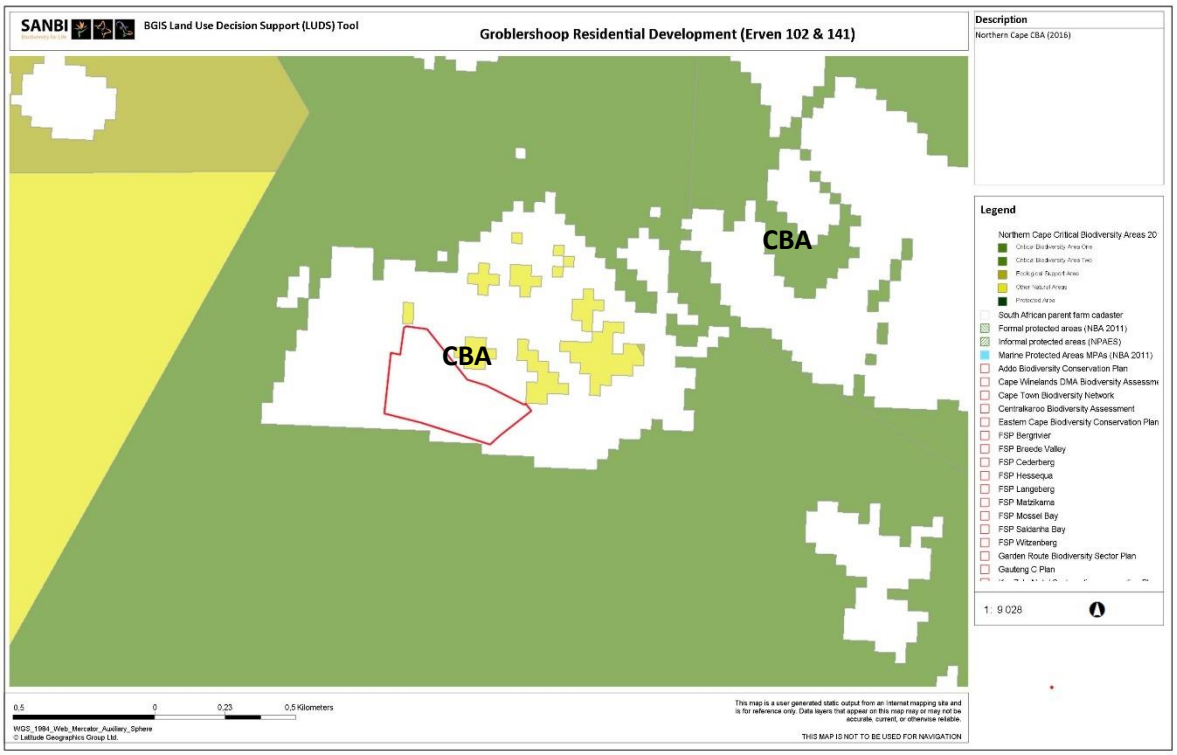

Figure 6: Northern Cape CBA map (2016) showing the study area and associated critical biodiversity areas.

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 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 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.

According to the 2016, Northern Cape critical biodiversity areas maps, the study area does not overlap any critical biodiversity area or ecological support areas (Figure 6) (Holness & Oosthuysen, 2016).

4.4. WATERCOURSES AND WETLANDS

According to the SANBI BGIS websites, no watercourses or wetlands are expected on the property, and no significant watercourses were observed during the site visit.

According to the **DFFE Screening Tool** report for the footprint area (Appendix 2), the relative Aquatic biodiversity theme sensitivity is considered of low sensitivity, which is supported by the findings of this study.

4.5. POTENTIAL IMPACT ON CENTERS OF ENDEMISM

According to Van Wyk & Smith (2001) the study area falls within the larger boundaries of the Griqualand West Centre of Endemism, but it does not overlap any of the geological features required, which is centred on the surface outcrops of the Ghaap Group (notably limestone and dolomite) and the Olifantshoek Supergroup (notably quartzite).

The proposed development is not expected to have any impact on the Griqualand West Centre of Endemism.

5. VEGETATION

Bushmanland Arid Grassland is described as occurring on flat alluvial terraces and riverine islands supporting a complex of riparian thickets (dominated by *Ziziphus mucronata*, *Euclea pseudebenus* and *Tamarix usneoides*), reed beds with *Phragmites australis* as well as flooded grasslands and herblands populating sand banks and terraces within and along the river (Mucina & Rutherford, 2006) (Figure 5).

5.1. THE VEGETATION ENCOUNTERED

The vegetation composition coupled with the soils encountered within the study area suggests that this site reflects an intrusion of deeper sandy soils within the Bushmanland Arid Grassland. The species diversity was very low, and the vegetation dominated by *Senegalia mellifera* (swarthaak), the alien invasive *Prosopis* tree and *Vachellia erioloba* (Photo 1 to Photo 6). Other trees that were observed were *Ziziphus mucronata* (occasionally), while trees such as *Olea* species and the alien tree *Schinus molle* (pepper tree) was probably planted at the golf course and along the outer edge of town. Other shrubs includes *Phaeoptilum spinosum*, *Salsola zeyheri* and *Tetraena* cf. *microcarpa*. The vegetation to the south of the site was much denser and dominated by trees and larger shrubs, while the vegetation to the north and in Erf 102 (the old golf course) was more open with the bottom layer dominated by a variety of white grasses.

Photo 1: Looking from west to east over the southern portion of the site. Note the dense stands of *Senegalia mellifera* with one of the larger *Vachellia erioloba* trees in the background.

Photo 2: Looking from west to east over the middle of the site. In this photo the dense stands of alien invasive *Prosopis* trees are visible (especially in the background).

The bottom stratum or open areas, between the larger shrubs and trees, were dominated by a variety of white grasses (Photo 1 to Photo 4). In the shade of some of the trees, species such as *Asparagus* cf. *pearsonii*, *Justicia divaricata* and *Lycium* cf. *bosciifolium* was occasionally observed. The parasite *Tapinanthus oleifolius* was occasionally observed in larger shrubs such as *Senegalia mellifera*.

Photo 3: Several *Vachellia erioloba* trees can be observed in the southern section of the site photo.

Photo 4: Looking from north to south over the northern portion of the site. Note the more open vegetation.

From a botanical viewpoint the single most important plant species observed was a large number of *Vachellia erioloba* trees, scattered throughout the site. More than 60 individual trees were observed, most of them smaller 6m, but there were also about 16 trees larger than 6m on site.

Photo 5: One several illegal dumping sites observed in Erf 141.

Photo 6: Looking from east to west over the top section of the site. Note the excavations to the left of picture.

Illegal dumping of general household waste was observed in two to three places within the study area, as well as old excavation areas.

Photo 7: A patch of the alien invasive pine cone cactus (*Tephrocactus articulates*) observed in the southern section of Erf 141.

Photo 8: Another alien invasive cactus (*Opuntia ficus-indica*) encountered. This cactus was scattered throughout the site.

The alien invasive *Prosopis* tree, dominated the vegetation in patches, including several large trees (Photo 2, Photo 4 and Photo 5). Two alien invasive cactus species was observed, namely *Trichocereus spachianus* (the torch cactus) and a patch of *Tephrocactus articulatus* (the pine cone cactus) (**Photo 7**), both which is likely garden escapees. Several individuals of the invasive prickly pear (*Opuntia ficus-indica*) was also observed, scattered throughout (Photo 8).

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**. However, the presence of a large number of *Vachellia erioloba* trees, would suggest that the Plant Species Theme should be **Medium** sensitive, which would raise the biodiversity sensitivity also. It is important that conservation of these trees (especially those over 6m in height) are taken into consideration to lower the plant species theme back to Low Sensitive.

5.2. FLORA ENCOUNTERED

Table 8 gives a list of the plant species encountered during this study. It is important to note that the species list is only based on a one-day site visit. It is likely that some species (especially annual herbs) might have been missed. However, the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high. No red-listed plant species was observed, but one (1) species protected in terms of the NFA were observed.

Table 8: List of plant species observed within the proposed development footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Asparagus* cf. *pearsonii* (no flowers)	ASPARAGACEAE	**LC**	Occasionally observed underneath larger trees.
2.	*Justicia divaricata*	ACANTHACEAE	LC	Occasionally observed underneath larger trees.
3.	*Lycium* cf. *bosciifolium* (no flowers)	SOLANACEAE	LC	Occasionally observed underneath larger trees
4.	*Olea* species (wild olive)	OLEACEAE	Probably planted as decorative trees	A few individuals next to the old Golf Club house.
5.	*Opuntia ficus-indica*	CACTACEAE	**Alien invasive plant species: NEMBA Cat. 1b**	Scattered throughout the site. **Must be removed**
6.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	Common to dominant throughout the site.
7.	*Prosopis* species	FABACEAE	**Alien invasive plant species: NEMBA Cat. 3.**	Often observed throughout the site. **Must be removed:**
8.	*Salsola zeyheri*	AMARANTHACEAE	LC	Witkoolganna, occasionally observed.
9.	*Schinus molle*	ANACARDIACEA	**Not indigenous / Probably planted as a decorative tree**	A few individuals observed.
10.	*Senegalia mellifera*	FABACEAE	LC	One of the dominant indigenous species on site.
11.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	Stem parasite, often growing in *Senegalia mellifera*.
12.	*Tephrocactus articulatus*	CACTACEAE	**Alien invasive plant species: NEMBA Cat. 1a**	Pinecone cactus – only one patch observed. **Must be removed:**
13.	*Tetraena* cf. *microcarpa*	ZYGOPHYLACEAE	LC	Occasionally under larger trees.
14.	*Trichocereus spachianus*	CACTACEAE	**Alien invasive plant species: CARA Cat. 1; NEMBA Cat 1b**	Torch cactus - one patch observed. **Must be removed:**
15.	*Vachellia erioloba*	FABACEAE	LC NFA protected species.	More than 60 observed; about 16 more than 6m in height.
16.	*Ziziphus mucronata*	RHAMNACEAE	LC	Occasionally observed.

5.3. 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, SANBI uses an amended system of categories to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

Table 9 gives a summary of threatened and protected species observed within the study area.

Table 9: Threatened or protected plant species observed within the study area.

	SPECIES OBSERVED	STATUS
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, 2020).	No red-listed species observed.	N/a
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 observed.	N/a
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).	1. ***Vachellia erioloba* (Camel thorn tree)**	More than 60 individual trees observed, most of which was young or small trees, but about 16 were more than 6m in height
NCNCA Protected plant species: The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and provides for the sustainable utilization of wild animals, aquatic biota, and plants. Schedule 1 and 2 of the Act gives 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).	No Northern Cape Nature Conservation Act, protected species observed.	N/a

6. FAUNA AND AVI-FAUNA

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The study area borders on the Groblershoop urban edge to the north and part of the west. To the south it borders/overlaps the old golf course. The site is used as a short-cut by local inhabitants as well as for illegal dumping. The golf course is currently not in use. The vegetation is in relatively good condition but is slowly succumbing to infestation by alien invasive species, most notably *Prosopis* trees. Its proximity to the town will mean that it is also subject to typical anthropogenic impacts because of constant human presence. Faunal diversity changes through space and time and are directly influenced by anthropogenic activities, including animal husbandry (i.e., overgrazing by livestock) and human settlements (e.g., transformation of land) (Tilman et al., 1997; Chapin *et al*., 2000).

6.1. HISTORICAL IMPACTS ON ANIMAL POPULATIONS

Because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region is relatively species poor (Vernon, 1999), and favours free moving herbivores such as ostrich and springbok nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, where they would have lingered longer, suggesting the transient nature of herbivores. The Northern Cape is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it is important to note that this remarkable diversity is not distributed evenly throughout the region but is concentrated in many local centres of endemism.

However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been almost completely replaced by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity (Mucina *et. al*., 2006). The major large-scale disturbance to the Nama Karoo ecosystem has been the change in grazing. Previously a variety of indigenous migratory ungulates with a broad range of grazing habits would have migrated through the land, but now domestic sheep and goats with much more selective grazing habits are confined within farm boundaries (Skead, 1982). This change in the grazing regime is thought to be responsible for alterations in both plant species composition and cover, which ultimately influence ecosystem functioning (Roux & Theron, 1986).

Direct impacts are typically associated with urban land expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g., general or sewage) and its management (McDonald *et al.,* 2020). Edge effects have diverse impacts on biodiversity and ecological functioning (Razafindratsima *et al.,* 2018).

6.2. MAMMALS

Although the fauna of the Nama Karoo is not remarkably rich in species or endemism, it is impressively adapted to its climatic extremes. There are few strict endemics, as most animals have extended their

ranges into the Karoo from adjacent biomes. Only the small Visagie's golden mole (Chr*ysochloris visagiei*) is strictly endemic to the eco- region. Five other small mammals are near-endemic, Grant's rock mouse (*Aethomys granti*), Shortridge's rat (*Thallomys shortridgei*), the riverine rabbit (*Bunolagus monticularis*), *Gerbillurus vallinus* and *Petromyscus monticularis* of which riverine rabbit is the most vulnerable (Hilton-Taylor, 2000). The quagga, (*Equus quagga*) a Nama Karoo near-endemic, was hunted to extinction in the 19th Century (Skinner & Smithers, 1990).

The nearby Witsand Nature Reserve still supports an impressive diversity of larger antelope and other mammal species, such *Antidorcas marsupialis* (Springbuck), *Oryx gazelle* (Gemsbok or Oryx), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Grey Duiker), *Alcelaphus buselaphus* (Red hartebeest), *Xerus inauris* (Southern African ground squirrel), *Suricata suricatta* (Meerkat), *Hystrix cristata* (Porcupine), *Proteles cristata* (Aardwolf), *Orycteropus afer* (Aardvark), *Manis temminckii* (Ground Pangolin), *Otocyon megalotis* (Bat-eared fox), *Vulpes chama* (Cape fox), *Genetta tigrina* (Cape genet) and *Pedetes capensis* (Springhare) (Mthombeni, 2019). However, the Witsand Nature Reserve falls within the Savanna Biome (of which elements are found in the study area, although most of the area is covered by Nama-Karoo) and as a result the species occurring at Witsand will not give a true reflection of the expected game for this area. However, it should give an indication of potential fauna for the larger area.

However, the fact that the site is in such close proximity to the urban edge (and its associated anthropogenic activities) would have driven most wild animals away from this area. Smaller game is still expected (albeit in very low numbers) but it is considered highly unlikely that any large game remains in this area. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal are eradicated by local land users and stock farmers in fear of their livestock. Due to long-term impacts associated with human settlements, compounded by the proximity of the proposed development areas to the urban edge, a comprehensive faunal survey is not deemed necessary.

6.3. REPTILES & AMPHIBIANS

The Northern Cape is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it is important to note that this remarkable diversity is not distributed evenly throughout the region but is concentrated in many local centres of endemism.

The Nama-Karoo reptile fauna contains at least 10 species that are regarded as near-endemic, but only a few are potentially confined to this region, which includes the Karoo dwarf chameleon (*Bradypodion karrooicum*) and Boulenger's Padloper (*Homopus boulengeri*). Many of the endemics, and some of the other species present, are relicts of past drier epochs when desert and Savanna biomes expanded to link up with similar biomes in northeast Africa (Werger, 1978). This arid corridor enabled flora and fauna to move between the two regions. Many discontinuous populations of the same species, genera and families with representatives in each region indicate that the corridor formed many times, most recently about 18,000 years ago. Among the fauna to exhibit this interrupted distribution are the bat-eared fox, the olive toad (*Bufo garmani*), and fawn-coloured and sabota larks (*Mirafra africanoides*, *M. sabota*) (Vernon, 1999).

Apart from the occasional lizard no other reptile or amphibian species were observed during the site

survey. The project footprint may provide habitat for several reptile species, but they would most likely be terrestrial species adapted to the dry Nama-Karoo. Most of these species have a wide distribution range and it is unlikely that the proposed development will pose a significant impact on any of these species.

No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

6.4. AVI-FAUNA

Among birds in the Nama-Karoo, the ferruginous lark (*Certhilauda burra*) and Sclater's lark (*Spizocorys sclater*) are strictly endemic, while the following five species are near-endemic: Karoo chat (*Cercomela schlegelii*), tractrac chat (*Cercomela tractrac*), red lark (*Certhilauda burra*), Karoo scrub robin (*Cercotrichas coryphaeus*), red-headed cisticola (*Cisticola subruficapillus*), and the Namaqua prinia (*Phragmacia substriata*). Other characteristic species of the Nama Karoo which are regarded as "Vulnerable" in South Africa are tawny (*Aquila rapax*) and martial (*Polemaetus bellicosus*) eagles, African marsh harrier (*Circus ranivorus*), lesser kestrel (*Falco naumanni*), blue crane (*Anthropoides paradiseus*), kori (*Ardeotis kori*) and Ludwig's (*Neotis ludwigii*) bustards, and the red lark (Dean *et al*., 1991; McCann, 2000; Barnes, 2000).

The nearby Witsand Nature Reserve is regarded as a great birding site, with its dunes and dense woodland and Savanna, offering all the typical arid Savanna birds, as well as species that prefer denser woodland. These include Melba Finch, Black-cheeked and Violet-eared Waxbills, Yellow-billed Hornbill, Lappet-faced Vulture and, in wet years, Monotonous Lark (www.capebirdingroute.org/Kalahari_Witsand_NR). Avi-fauna diversity and numbers is expected to be much higher at Witsand than in the study area, although some elements of Savanna were encountered in the study area. Although Nama-Karroo vegetation can potentially attract several bird species, the proximity to the urban edge is likely to result in much lower avifaunal diversity.

Smaller birds were observed but no larger birds or birds of prey were encountered during the site visit. Because of the location (next to the existing settlement) the proposed footprint enlargement is not expected to have any significant impact on the surrounding bird populations, especially if larger trees next to the seasonal drainage lines are protected.

However, according to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Medium Sensitive**, because of the potential occurrence of Ludwig's Bustard (*Neotis ludwigii*) (Refer to Table 10).

Table 10: Animal species theme according to the NEMA EIA Sensitivity Scan results.

SENSITIVITY	FEATURES	MOTIVATION
Medium	Aves – *Neotis ludwigii*	Ludwig's Bustard is a near endemic and classified as **endangered** because of a projected rapid population decline. It has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of **Angola**, western **Namibia** and in much of **South Africa** (Del Hoyo *et al.* 1996, Anderson 2000).

SENSITIVITY	FEATURES	MOTIVATION
		Today if occurs predominantly in the dry Karoo region of South Africa (Herold, 1988), but historically its distribution is believed to have extended to the eastern and north-eastern portions of the Grassland Biome (Brooke, 1984). This species inhabits open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. The breeding season spans from August-December, with the species nesting on bare ground with a clutch of 2-3 eggs (Del Hoyo *et al.* 1996, Jenkins & Smallie 2009) Because of the proximity to the urban edge (and associated anthropogenic activities) it is unlikely that the Ludwig's Bustard will chose to breed within this area. It is also considered highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat. With regards to the is project the sensitivity rating is **low sensitive**.

7. IMPACT ASSESSMENT

7.1. SITE SENSITIVITY DISCUSSION

The proposed development footprint will result in the transformation of 7 ha of natural veld for residential development (enlarging the existing urban footprint).

Impact on special habitats: The landscape is relatively homogenous and does not contain any rocky outcrop or any other significant biophysical feature that might have resulted in special habitats for fauna or flora.

Impact on watercourses & wetlands: There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary). The Orange River is located more than 170 m to the east of the study area (Figure 6).

Impact on land use: Both properties belong to the Municipality and have been earmarked for urban development.

Impact on vegetation: According to the South African vegetation map (2018) (Mucina & Rutherford, 2006), the study area will impact on Bushmanland Arid Grassland (blue in Figure 5), a vegetation type that has been classified as "Least Threatened". Overall, the veld can be described as in fair condition, but slowly succumbing to alien infestation. The vegetation composition coupled with the soils encountered within the study area suggests that this site reflects an intrusion of deeper sandy soils within the Bushmanland Arid Grassland. The species diversity was very low, and the vegetation dominated by *Senegalia mellifera* (swarthaak), the alien invasive *Prosopis* tree and *Vachellia erioloba* (Photo 1 to Photo 6).

Impact on conservation priority areas: According to the 2016, Northern Cape critical biodiversity areas maps, the study area does not overlap any critical biodiversity area or ecological support areas (Figure 6) (Holness & Oosthuysen, 2016).

Impact on connectivity: The study area borders on the Groblershoop urban edge to the north and part of the west. To the south it borders/overlaps the old golf course. Connectivity to the south, east and west, will be slightly impacted by the enlargement of the urban edge, but overall connectivity to the south, east and west will remain excellent. Because of the existing proximity to the urban edge, animals will naturally stay slightly further south.

Impact on threatened and protected plant species: Table 8 gives a list of the plant species encountered during this study. It is important to note that the species list is only based on a one-day site visit. It is likely that some species (especially annuals and geophytes) might have been missed. However, the author is confident that a good understanding of the vegetation was achieved and confidence in the findings is high. No red-listed plant species was observed, and

only one (1) species protected in terms of the NFA were observed (namely *Vachellia erioloba*). From a botanical perspective, the presence such a large number of *Vachellia erioloba* trees, scattered throughout the site (more than 60 individual trees were observed, most of them smaller than 5 m, but there were also about 16 trees larger than 6m in height).

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Low Sensitive**. However, the presence of a large number of *Vachellia erioloba* trees, would suggest that the Plant Species Theme should be **Medium** sensitive, which would raise the biodiversity sensitivity also. It is important that conservation of these trees (especially those over 6m in height) are taken into consideration to **lower the plant species theme back to Low Sensitive**.

Impact on protected fauna & avi-fauna: No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The study is located next to the urban edge (with its associated anthropogenic impacts). The vegetation itself is in fair good conditions, but species diversity is very low and slowly succumbing to alien infestation. Apart from insects, reptiles and a few smaller mammal species, the site itself is not expected to support any significant remaining fauna or even avi-fauna.

However, according to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **animal species theme sensitivity is considered Medium Sensitive**, because of the potential occurrence of Ludwig's Bustard (*Neotis ludwigii*) (Refer to Table 10). Because of the proximity to the urban edge (and associated anthropogenic activities) it is unlikely that the Ludwig's Bustard will chose to breed within this area. It is also considered highly unlikely that the proposed development will have any significant additional impact on its breeding or feeding habitat.

With regards to the is project the sensitivity rating is **Low sensitive**.

Indirect impacts: Direct impacts are typically associated with urban land expansion, leading to land cover changes (and consequent loss of natural areas) and edge effects, whereas indirect impacts include impacts associated with the generation of waste (e.g., general or sewage) and its management. The indirect impact in this case will be minor loss of connectivity, because of a small loss of natural area (<7 ha). Because of the relatively small size of the development footprint and its location (next to the urban edge), the indirect impact would be Low Significant.

Cumulative impacts: Refer to Table 11. In this impact assessment method, cumulative impacts are calculated by using the worst scenarios for each aspect as input into the impact assessment table.

The "No-Go" alternative: The **"No Go" alternative** means there would be no change to the *status quo*. However, the No-Go alternative will not necessary mean no loss of vegetation or connectivity. Infestation by invasive alien species is likely to proceed, which will have an impact on the remaining natural veld over time and will also impact on the protected plant species in the area. The land would remain in its natural state but might slowly succumb to alien infestation. Other changes might be attributed to external factors such as climate change. The 'No Go'

alternative is included in the impact table below (Table 11).

7.2. TERRESTRIAL BIODIVERSITY 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 11: Terrestrial biodiversity impact associated with the proposed development.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Special habitats: Potential impact on special habitats (e.g., true quartz or "heuweltjies")	Without mitigation	2	1	4	1	1	14	The landscape is relatively homogenous and does not contain any other significant biophysical feature that might have resulted in special habitats for fauna or flora.
	With mitigation	2	1	4	1	1	14	There will be no or very little impact on special habitat.
Watercourses & Wetlands: Potential impact on natural water resources and it's ecological support areas.	Without mitigation						0	There are no rivers or watercourses on the property itself (apart from the manmade concrete irrigation canal that runs on or just east of the property boundary).
	With mitigation						0	
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	2	4	1	1	16	The Erven are both earmarked for residential development (municipal land)
	With mitigation	2	2	4	1	1	16	The impact is expected to have at least a short-medium term positive impact on job creation.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	2	4	1	1	16	The development will impact on 7 ha of Bushmanland Arid Grassland (considered "Least Threatened").
	With mitigation	2	2	4	1	1	16	The impact on loss of vegetation is expected to be negligible.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	2	2	4	1	1	16	The development will NOT impact on any CBA or ESA and will only have a slight impact on connectivity.
	With mitigation	2	2	4	1	1	16	The impact on conservation priority areas is considered to be negligible.
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	3	4	1	1	18	The site is already next to the urban edge but will transfer anthropogenic impact slightly to the south.
	With mitigation	2	3	4	1	1	18	The impact on connectivity is expected to be low to very low.
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	4	5	4	1	3	52	The proposed development might impact on more than 60 *Vachellia erioloba* trees (NFA Protected species).
	With mitigation	3	3	4	1	2	30	Protect as many of the Camel thorn trees as possible, and all healthy trees larger than 6 m in height.

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Fauna & Avi-fauna Potential impact on mammals, reptiles, amphibians & birds.	Without mitigation	2	3	4	1	2	20	The study area is on the urban edge (with its associated anthropogenic impacts), but the veld is still in fair condition.
	With mitigation	2	2	4	1	1	16	Protect all larger indigenous trees (where possible) and all healthy Camel thorn trees larger than 6 m in height.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	4	5	4	1	3	52	The transformation of about 7h of natural veld (Least Concern) and potential impact on a NFA protected tree species.
	With mitigation	3	3	4	1	2	30	Protect all larger indigenous trees (where possible) and all healthy Camel thorn trees larger than 6 m in height.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	4	3	2	1	2	32	The No-Go alternative will not necessary mean no loss of vegetation or connectivity, infestation by invasive alien species and anthropogenic impact is likely to continue and will slowly degrade the natural veld.
	With mitigation							

According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Low Sensitivity**. However, because of the presence of so many *Vachellia erioloba* trees (NFA protected species), the impact assessment suggest that the impact on protected species should be **Medium Sensitive**, which raises the overall **Terrestrial Biodiversity Theme** (the accumulated impact) to **Medium Sensitive**.

The impact assessment also suggests that the accumulated impact can be reduced to Low Sensitive through mitigation (Refer to the recommendations under Heading 8).

With proper mitigation, it is thus considered 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 species.
- Loss of ecosystem connectivity.

7.3. TERRESTRIAL BIODIVERSITY SENSITIVITY MAP

The proposed mitigation recommendations focus on the protection of all healthy *Vachellia erioloba* trees (Camel Thorn trees) 6m or taller. Note that some of the GPS points may indicate more than one tree (Refer to Figure 7, underneath).

Figure 7: Site sensitivity map – showing the location of the *Vachellia erioloba* trees 6m or larger, observed during the site visit (some of the GPS points indicate more than one tree).

8. MITIGATION RECOMMENDATIONS

The proposed development site is considered of Medium sensitivity in terms of terrestrial biodiversity, which can be reduced to Low sensitivity with impact minimisation. Impact minimisation is based on the protection all larger indigenous trees (specifically all healthy *Vachellia erioloba* trees larger than 6m in height).

4. All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
5. A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
6. All efforts must be made to protect all healthy *Vachellia erioloba* larger than 6 m in height.
    - Before construction begins, the ECO must mark all such trees for protection. If any of these trees cannot be fitted within the layout plans, a suitable number of smaller trees must be protected in its place.
    - Wherever possible, other large indigenous trees must be protected and incorporated within the design layout.
7. A National Forest Act licence application must be obtained for the removal of any ***Vachellia erioloba*** trees that will be impacted.
8. All alien invasive species within the footprint and its immediate surroundings 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.
9. An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
    - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.

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APPENDIX 1: REQUIREMENTS FOR SPECIALIST REPORTS

Minimum Content Requirements for Botanical and Terrestrial Biodiversity Specialist Reports as per Protocol for the Specialist Assessment of Environmental Impacts on Terrestrial Biodiversity (GN 320 of 20 March 2020).

Protocol Ref	**Botanical and Terrestrial Biodiversity Specialist Assessment Report Content**	**Section / Page**
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Page iv - v
3.1.2.	a signed statement of independence by the specialist;	Page v
3.1.3.	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Heading 3.2
3.1.4.	a description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant;	Heading 3.1, 3.2 & 3.3.
3.1.5.	a description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;	Heading 3.3
3.1.6.	a location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant);	Heading 7.3
3.1.7.	additional environmental impacts expected from the proposed development;	Heading 7.1
3.1.8.	any direct, indirect and cumulative impacts of the proposed development;	Heading 7.1
3.1.9.	the degree to which impacts and risks can be mitigated;	Table 11 & Heading 8
3.1.10.	the degree to which the impacts and risks can be reversed;	Heading 7.1
3.1.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;	Heading 7 & 7.2
3.1.12.	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Heading 8
3.1.13.	a motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate;	NA
3.1.14.	a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; and	Page iii
3.1.15.	any conditions to which this statement is subjected.	N/A

APPENDIX 2: DFFE SCREENING REPORT

APPENDIX 3: CURRICULUM VITAE – P.J.J. BOTES

Curriculum Vitae: Peet JJ Botes

Address: 22 Buitekant Street, Bredasdorp, 7280; **Cell**: 082 921 5949

Nationality:	South African
ID No.:	670329 5028 081
Language:	Afrikaans / English
Profession:	Environmental Consultant & Auditing
Specializations:	Botanical & Biodiversity Impact Assessments
	Environmental Compliance Audits
	Environmental Impact Assessment
	Environmental Management Systems
Qualifications:	**BSc** (Botany & Zoology), with Nature Conservation III & IV as extra subjects; Dept. of Natural Sciences, Stellenbosch University 1989.
	Hons. BSc (Plant Ecology), Stellenbosch University, 1989
	More than 20 years of experience in the Environmental Management Field (Since 1997 to present).
Professional affiliation:	Registered Professional Botanical, Environmental and Ecological Scientist at SACNASP (South African Council for Natural Scientific Professions) since 2005.
SACNAP Reg. No.:	400184/05

BRIEF RESUME OF RELEVANT EXPERIENCE

1997-2005: Employed by the Overberg Test Range (a Division of Denel), responsible for managing the environmental department of OTB, 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).

2005-2010: Joined Enviroscientific, as an independent environmental consultant 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 and environmental legal compliance audits.

2010-2017: Joined EnviroAfrica, as an independent Environmental Assessment Practitioner and Biodiversity Specialist, responsible for Environmental Impact Assessments, Biodiversity & Botanical specialist reports and Environmental Compliance Audits. During this time Mr Botes compiled more than 70 specialist Biodiversity & Botanical impact assessment reports ranging from agricultural-, infrastructure pipelines- and solar developments.

2017-Present: Establish a small independent consultancy (PB Consult) specialising in Environmental Audits, Biodiversity and Botanical specialist studies as well as Environmental Impact Assessment.

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

Botes. P. 2007:	Botanical assessment. Schaapkraal, Erf 644, Mitchell's Plain. A preliminary assessment of the vegetation in terms of the Fynbos Forum: Ecosystem guidelines. 13 November 2007.
Botes. P. 2008:	Botanical assessment. Schaapkraal Erf 1129, Cape Town. A preliminary assessment of the vegetation using the Fynbos Forum Terms of Reference: Ecosystem guidelines for environmental Assessment in the Northern Cape. 20 July 2008.
Botes, P. 2010(a):	Botanical assessment. Proposed subdivision of Erf 902, 34 Eskom Street, Napier. A Botanical scan and an assessment of the natural vegetation of the site to assess to what degree the site contributes towards conservation targets for the ecosystem. 15 September 2010.
Botes, P. 2010(b):	Botanical assessment. Proposed Loeriesfontein low cost housing project. A preliminary Botanical Assessment of the natural veld with regards to the proposed low cost housing project in/adjacent to Loeriesfontein, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 10 August 2010.
Botes, P. 2010(c):	Botanical assessment: Proposed Sparrenberg dam, on Sparrenberg Farm, Ceres. . A Botanical scan and an assessment of the natural vegetation of the site. 15 September 2010.
Botes, P. 2011:	Botanical scan. Proposed Cathbert development on the Farm Wolfe Kloof, Paarl (Revised). A botanical scan of Portion 2 of the Farm Wolfe Kloof No. 966 (Cathbert) with regards to the proposed Cathbert Development, taking into consideration the National Spatial Biodiversity Assessment of South Africa. 28 September 2011.
Botes, P. 2012(a):	Proposed Danielskuil Keren Energy Holdings Solar Facility on Erf 753, Danielskuil. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 17 March 2012.
Botes, P. 2012(b):	Proposed Disselfontein Keren Energy Holdings Solar Facility on Farm Disselfontein no. 77, Hopetown. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.
Botes, P. 2012(c):	Proposed Kakamas Keren Energy Holdings Solar Facility on Remainder of the Farm 666, Kakamas. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 March 2012.
Botes, P. 2012(d):	Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 9 March 2012.
Botes, P. 2012(e):	Proposed Leeu-Gamka Keren Energy Holdings Solar Facility on Portion 40 of the Farm Kruidfontein no. 33, Prince Albert. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.
Botes, P. 2012(f):	Proposed Mount Roper Keren Energy Holdings Solar Facility on Farm 321, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.
Botes, P. 2012(g):	Proposed Whitebank Keren Energy Holdings Solar Facility on Farm no. 379, Kuruman. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

Botes, P. 2012(h): Proposed Vanrhynsdorp Keren Energy Holdings Solar Facility on Farm Duinen Farm no. 258, Vanrhynsdorp. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 13 April 2012.

Botes, P. 2012(i): Askham (Kameelduin) proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. 1 November 2012.

Botes, P. 2013(a): Groot Mier proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(b): Loubos proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(c): Noenieput proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(d): Paballelo proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(e): Welkom proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

Botes, P. 2013(f): Zypherfontein Dam Biodiversity & Botanical Scan. Proposed construction of a new irrigation dam on Portions 1, 3, 5 & 6 of the Farm Zypherfontein No. 66, Vanrhynsdorp (Northern Cape) and a scan of the proposed associated agricultural enlargement. September 2013.

Botes, P. 2013(g): Onseepkans Canal: Repair and upgrade of the Onseepkans Water Supply and Flood Protection Infrastructure, Northern Cape. A Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). August 2013.

Botes, P. 2013(h): Biodiversity scoping assessment with regards to a Jetty Construction on Erf 327, Malagas (Matjiespoort). 24 October 2013.

Botes, P. 2013(i): Jacobsbaai pump station and rising main (Saldanha Bay Municipality). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 30 October 2013.

Botes, P. 2014(a): Brandvlei Bulk Water Supply: Proposed construction of a 51 km new bulk water supply pipeline (replacing the existing pipeline) from Romanskolk Reservoir to the Brandvlei Reservoir, Brandvlei (Northern Cape Province). A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required). 24 February 2014.

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Botes, P. 2014(b): Kalahari-East Water Supply Scheme Extension: Phase 1. Proposed extension of the Kalahari-East Water Supply Scheme and associated infrastructure to the Mier Municipality, ZF Mgcawu District Municipality, Mier Local Municipality (Northern Cape Province). Biodiversity & Botanical scan of the proposed route to determine the possible impact on biodiversity with emphasis on vegetation and plant species. 1 July 2014.

Botes, P. 2014(c): The proposed Freudenberg Farm Homestead, Farm no. 419/0, Tulbagh (Wolseley Area). A Botanical scan of possible remaining natural veld on the property. 26 August 2014.

Botes, P. 2014(d): Postmasburg WWTW: Proposed relocation of the Postmasburg wastewater treatment works and associated infrastructure, ZF Mgcawu District Municipality, Tsantsabane Local Municipality (Northern Cape Province). Biodiversity and botanical scan of the proposed pipeline route and WWTW site. 30 October 2014.

Botes, P. 2015(a): Jacobsbaai pump station and rising main (Saldanha Bay Municipality) (Revision). A Botanical Scan of the area that will be impacted by the proposed Jacobsbaai pump station and rising main. 21 January 2015.

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Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

Botes, P 2015(c): Proposed Bredasdorp Feedlot, Portion 10 of Farm 159, Bredasdorp, Cape Agulhas Municipality, Northern Cape Province. A Botanical scan of the area that will be impacted. 28 July 2015.

Botes, P. 2016(a): OWK Raisin processing facility, Upington, Erf 151, Kenhardt, Northern Cape Province. A Botanical scan of the proposed footprint. 26 May 2016.

Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.

Botes, P. 2016(c): Henkries Mega-Agripark development. The proposed development of ±150 ha of high potential agricultural land at Henkries, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 28 February 2016.

Botes, P. 2016(d): Proposed Namaqualand Regional Water Supply Scheme high priority bulk water supply infrastructure upgrades from Okiep to Concordia and Corolusberg. Biodiversity Assessment of the proposed footprint. March 2016.

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Botes, P. 2018(a): Kamiesberg Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Kamiesberg, Northern Cape Province. Botanical scan of the proposed footprint. 20 February 2018

Botes, P. 2018(b): Rooifontein Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Rooifontein, Northern Cape Province. Botanical scan of the proposed footprint. 23 February 2018

Botes, P. 2018(c): Paulshoek Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Paulshoek, Northern Cape Province. Botanical scan of the proposed footprint. 27 March 2018.

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

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Botes, P. 2018(f): Wagenboom Weir & Pipeline – Construction of a new pipeline and weir with the Snel River, Breede River Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 7 August 2018.

Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

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

Botes, P. 2020(a): Gamakor & Noodkamp Low cost housing – Botanical Assessment of the proposed formalization of the Gamakor and Noodkamp housing development on the remainder and portion 128 of the Farm Kousas No. 459 and Ervin 1470, 1474 and 1480, Gordonia road, Keimoes. Kai !Gariep Local Municipality, Northern Cape Province. 6 February 2020.

Botes, P. 2020(b): Feldspar Prospecting & Mining, Farm Rozynen Bosch 104, Kakamas. Botanical assessment of the proposed prospecting and mining activities on Portion 5 of The Farm Rozynen Bosch No. 104, Kakamas, Khai !Garib Local Municipality, Northern Cape Province. 12 February 2020.

Botes, P. 2020(c): Boegoeberg housing project – Botanical assessment of the proposed formalization and development of 550 new erven on the remainders of farms 142 & 144 and Plot 1890, Boegoeberg settlement, !Kheis Local Municipality, Northern Cape Province. 1 July 2020.

Botes, P. 2020(d): Komaggas Bulk Water supply upgrade – Botanical assessment of the proposed upgrade of the existing Buffelsrivier to Komaggas BWS system, Rem. of Farm 200, Nama Khoi Local Municipality, Northern Cape Province. 8 July 2020.

Botes, P. 2020(e): Grootdrink housing project – Botanical assessment of the proposed formalization and development of 370 new erven on Erf 131, Grootdrink and Plot 2627, Boegoeberg Settlement, next to Grootdrink, !Kheis Local Municipality, Northern Cape Province. 14 July 2020.

Botes, P. 2020(f): Opwag housing project – Botanical assessment of the proposed formalization and development of 730 new erven on Plot 2642, Boegoeberg Settlement and Farm Boegoeberg Settlement NO.48/16, Opwag, !Kheis Local Municipality, Northern Cape Province. 16 July 2020.

Botes, P. 2020(g): Wegdraai housing project – Botanical assessment of the Proposed formalization and development of 360 new erven on Erven 1, 45 & 47, Wegdraai, !Kheis Local Municipality, Northern Cape Province. 17 July 2020.

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Botes, P. 2020(i): Gariep housing project – Botanical assessment of the proposed formalization and development of 135 new erven on Plot 113, Gariep Settlement, !Kheis Local Municipality, Northern Cape Province. 20 July 2020.