PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL ASSESSMENT

KAMIESKROON OXIDATION PONDS

PROPOSED UPGRADES TO THE EXISTING WWTW & CONSTRUCTION OF NEW OXIDATION PONDS KAMIESBERG LOCAL MUNICIPALITY,KAMIESKROON, NORTHERN CAPE PROVINCE

31 August 2020

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EXECUTIVE SUMMARY

VEGETATION TYPE

Namaqualand Klipkoppe Shrubland

Classified as "Least Threatened" (GN 1002, December 2011) although statutory conservation targets have not yet been met.

VEGETATION ENCOUNTERED

The site supported a very dry version of Namaqualand Klipkoppe Shrubland. Because of the on-going drought, the vegetation on the site had been reduced to a few hardy species, most of which had already discarded their leaves in an attempt survive the drought. Although this is not uncommon (as the Namaqualand normally is very dry for three quarters of the year), the absence of even the most common leaf succulents suggest severe stress over a period of time. The veld was generally very uniform in species composition as well as structure and dominated by a low shrub layer (about 0.4 – 0.6 m in height). As to be expected during the dry season, the bottom stratum was mostly absent. Since no recent rains had fallen (and because of the timing) spring flowers and bulbs were almost totally absent and species diversity was even lower than normally expected (even for disturbed veld).

CONSERVATION PRIORITY AREAS

According to the Northern Cape CBA maps the proposed site falls within a CBA area. However, there is no alternative on the property that will not impact on the CBA.

The site will not impact on any recognised centre of endemism.

CONNECTIVITY

The transformation will not add significantly to the existing impact on connectivity and will not add to the impact on the surrounding area, where connectivity will remain the same.

LAND-USE

The footprint is on municipal land which had already been degraded to some extent. It is also the most logical place in terms of existing infrastructure (next to the existing WWTW and the Municipal Landfill site. The remainder of the property is natural veld, grazed by livestock of the local herders.

PROTECTED PLANT SPECIES

The most significant botanical aspect of this site is the presence of a few species protected in terms of the Northern Cape Nature Conservation Act, (Refer to Table 3).

MAIN CONCLUSION

The proposed application is for the much needed upgrades to existing infrastructure in order to be able to meet the sewage demands of Kamieskroon as it expands (the existing sewage does not have the capacity, which had already resulted in sewage pollution). The activity is expected to result in a permanent transformation of a further 3-5 ha of land next to the existing WWTW and near the Municipal waste disposal site. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). A few plants protected in terms of the Northern Cape Nature Conservation Act, were observed within the footprint, of which one is recommended for search & rescue. However, it is expected that a number of other species, some of which might also be protected will show after good rains.

According to the impact assessment given in Table 6 the development is likely to result in a **Low** impact, which can be reduced to a **Very-Low** impact with good environmental control during construction.

With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:

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

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED, WITH THE PROPOSED MITIGATION ACTIONS.

NO-GO OPTION

The No-Go option is not likely to result in a "no-impact" scenario, as constant slow degradation is expected to continue as a result of urban activities and grazing in and around the site.

INDEPENDENCE & CONDITIONS

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

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

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

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

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

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

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

DECLARATION OF INDEPENDENCE

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

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

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

Note: The terms of reference must be attached.

Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

31 August 2020

Date:

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1. INTRODUCTION

Kamieskroon is a small town located within the Namaqua District Municipal area, just off the N7, between Garies and Springbok within the Northern Cape Province. It was founded in 1924, when the Dutch Reformed Church bought the land to relocate from Bowesdorp, 8 km to the north of the current location of the town. The move was forced by a shortage of water and restricted space for the growth of the town. The town, which lies at the foothills of the Kamiesberge, is more or less in the centre of the Namaqualand (about 70 km south of Springbok) and is well known for its spring wild flowers displays.

The increasing demand for proper housing in Kamieskroon has led to an increased demand for water and sanitation services. Many families living on farms are also moving to the town where services and other facilities are available. The oxidation ponds at the existing wastewater treatment works (WWTW) are not lined and do not comply with the Department of Water Affairs (DWA) specifications. These ponds overflow in the winter season when evaporation is low causing effluent overrun into the nearby stream and rivers and may also result in groundwater contamination. Many farmers downstream of the river are dependent on boreholes and wells for drinking water as well as water for their livestock.

BVi Consulting Engineers was appointed by Kamiesberg Municipality as engineering project managers to evaluate the capacity of the existing oxidation pond system and to determine the existing and potential future demand on the WWTW in order to ensure the works are run within its capacity and comply with legal requirements. The results indicates that the existing WWTW will need to be upgraded (to conform to DWS standards) and additional capacity (evaporation ponds) will have to be installed to cater for the increase in load as well as future growth of the town.

The proposed project will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed to perform the NEMA EIA application and PB Consult was appointed to conduct a botanical assessment of the proposed sites, which, although disturbed in some areas, still supports natural vegetation.

The proposed footprint is expected to fall within the vegetation type known as Namaqualand Klipkoppe Shrubland, which although considered “Least Threatened”, is poorly protected and conservation targets have not been met. Desktop studies shows also indicated that the proposed site(s) overlaps a terrestrial critical biodiversity area (CBA2) as identified in the 2017 Northern Cape Biodiversity Spatial Plan.

The vegetation encountered within the proposed footprint was a very dry and degraded version of Namaqualand Klipkoppe Shrubland. The Northern Cape is currently experiencing a prolonged and severe drought spell (which had already lasted more than 5 years). As a result the veld was severely impacted and plant species diversity was very low. Only a few hardy species still had leaves on, which made identification difficult in some cases. However, the author had also done various vegetation studies in the immediate areas and other areas with this vegetation type in the Northern Cape, and have a good understanding of what is expected.

The site is also located next to a small seasonal stream, a tributary to the Haas River (that runs to the north of the proposed site) (please refer to the freshwater study for an evaluation of the water courses in terms of this project).

1.1. TERMS OF REFERENCE

The terms of reference for this appointment were to:

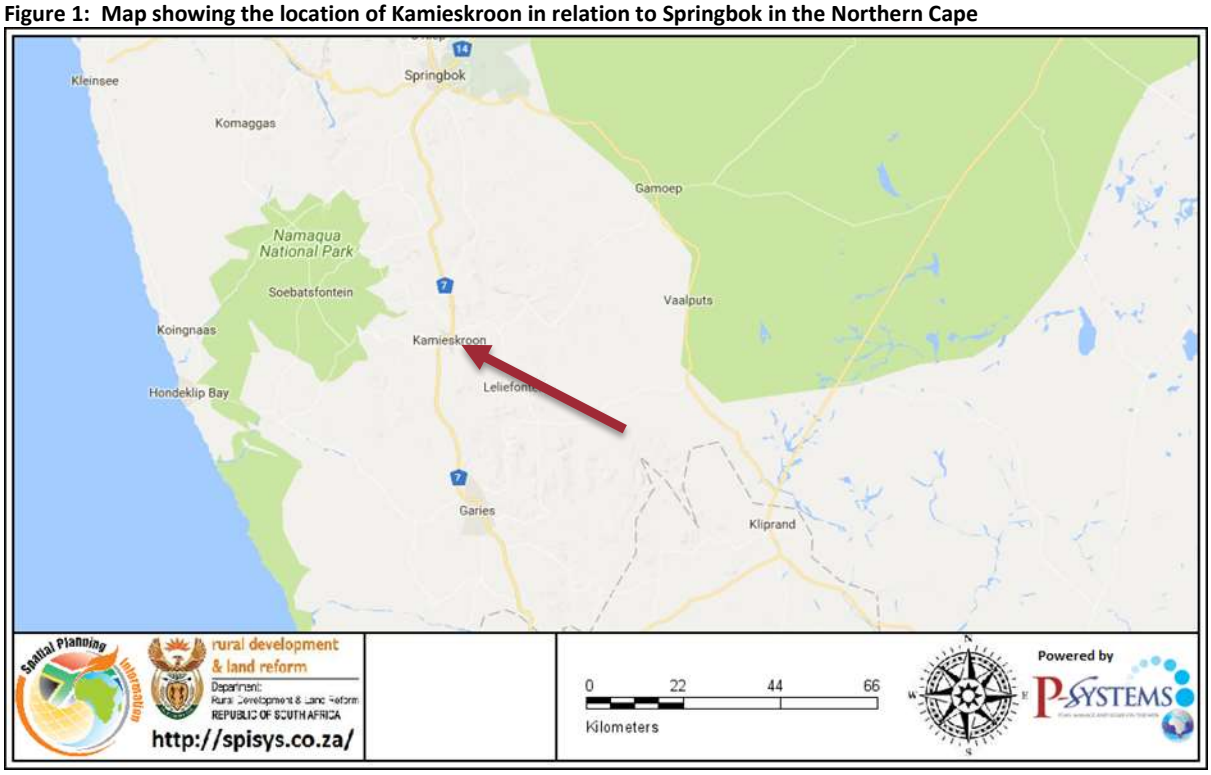
- Evaluate the proposed site(s) in order to determine whether any significant botanical features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g. protected tree species, or rare or endangered plant species)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

2. STUDY AREA

2.1. LOCATION & LAYOUT

The town of Kamieskroon is located just off the N7, between Garies and Springbok, within the Kamiesberg Local Municipality (Namakwa District Municipality) of the Northern Cape Province (Figure 1).

Figure 1: Map showing the location of Kamieskroon in relation to Springbok in the Northern Cape



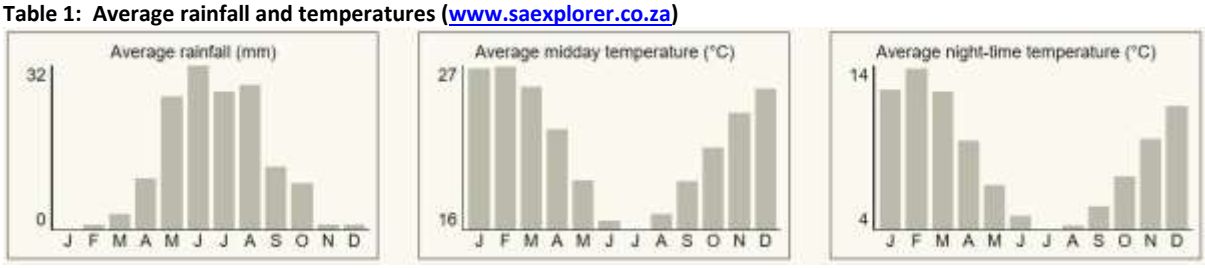
The proposed development will be located on communal land (Remainder of Farm 154), to the north west of Kamieskroon, near the existing wastewater treatment works (Figure 2) and the existing waste disposal site.

Figure 2: The proposed layout plans for the upgrades to the existing WWTW and proposed additions

2.2. CLIMATE

Namaqualand is an arid to semi-arid region with a Mediterranean climate. The Kamiesberg is unusual among desert areas in that although it is arid, it is characterized by relatively reliable rainfall patters, although minimal (50–400 mm/year), with frost being rare. Rain is usually accompanied by heavy dewfall and fog and more than 60% of the rain arrives between May and September. The presence of the cold Atlantic Ocean in the west not only moderates temperatures throughout Namaqualand (mean summer temperature 30°C), but also provides an additional sources of moisture in the form of coastal fog and heavy dew experienced in winter months. Bergwinds during winter can result in temperatures of up to 40 C. After a winter of adequate rainfall, springtime can bring widespread and spectacular flower shows, mainly of the Asteraceae, Brassicaceae Aizoaceae, Scrophulariaceae, Poaceae, Liliaceae and Amaryllidaceae (NDBSP, 2008).

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



Kamieskroon normally receives about 150 mm of rain per year and because it receives most of its rainfall during winter it has a Mediterranean climate. The chart below (lower left) shows the average rainfall values for Kamieskroon per month. It receives the lowest rainfall (0 mm) in January and the highest (32 mm) in June. Average midday temperatures for Kamieskroon range from 16°C in July to 26.9°C in February. The region is the coldest during July with temperatures of 4.3°C on average during the night (www.saexplorer.co.za/south-africa/climate).

2.3. GEOLOGY AND SOILS

The Kamiesberg or Kamiesberge is a mountain range of jumbled granite inselbergs dotted over sandy plains and centred on Kamieskroon in Namaqualand in South Africa. It stretches for about 140 km from Garies in the south to Springbok in the north and forms a plateau between the Sandveld of the Cape West Coast and Bushmanland in the east, with the Hardeveld of the mountainous central Kamiesberg escarpment in the midst (Mucina & Rutherford, 2006).

According to the Mucina & Rutherford (2006), only one major soil type is expected in the study area associated with the Namaqualand Klipkoppe Shrubland (rocky outcrops). The soils can be described as Mokolian granites and gneisses which forms gentle to moderate rocky slopes with rock sizes varying from medium to large with flat to gentle rock sheets as well as rock domes. The soils are described as yellow-brown to brown loamy sand, 0.15 – 0.6 m deep.

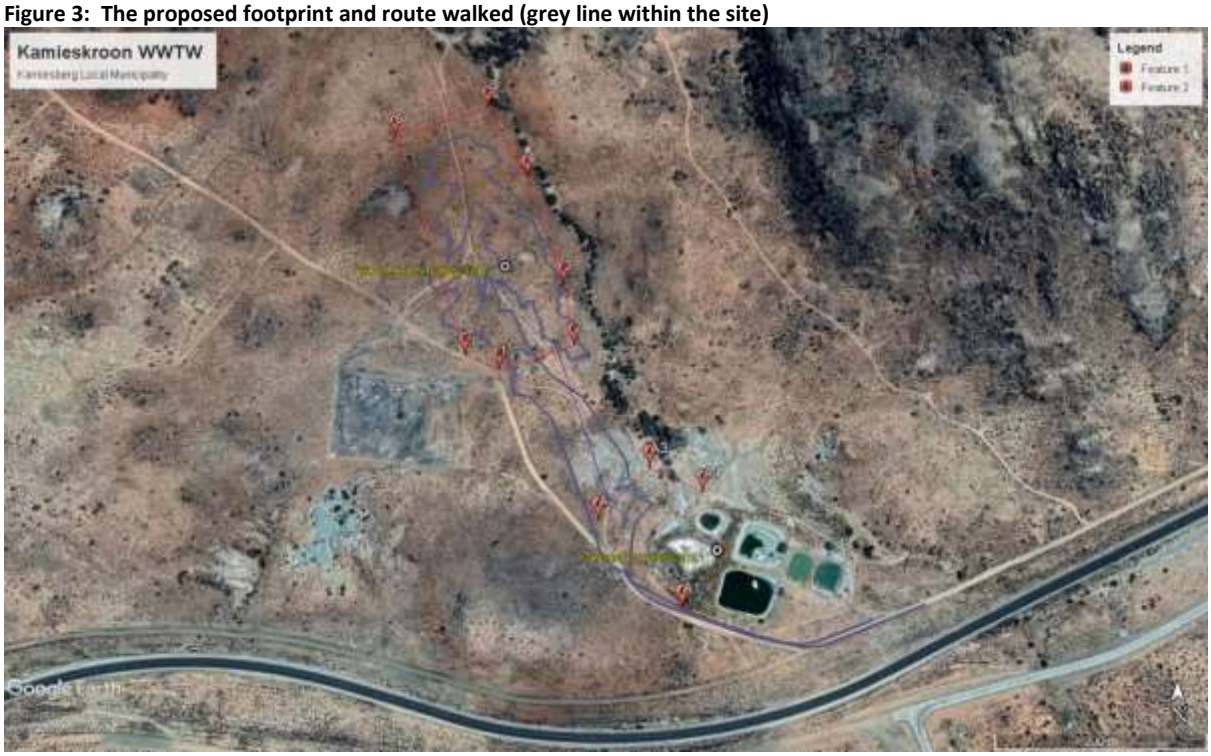
2.4. TOPOGRAPHY

The town of Kamieskroon is located at an elevation of approximately 800 m above mean sea level. The existing WWTW is located in a small valley to the north west of town (just north of the N7). The proposed footprint will be located in this small valley, to the north of the existing WWTW. The areas in which the proposed footprint will be located have an average slope of 0.6% from south to north (along the orientation of the proposed ponds). The site also slopes from west to east (towards the small seasonal stream, which runs in the bottom of the small valley) with an average slope of about 1.9%. Small rocky outcrops had been observed just outside of the proposed footprint, where the vegetation might differ slightly in that slightly larger shrubs and small trees may be associated with these outcrops (however, they will not be impacted). Topography is not expected to play any significant role in vegetation encountered.

3. EVALUATION METHOD

Desktop studies coupled with a site visit were performed. Because of the urgent need for these upgrades the Botanical study had to be done during 2020 lockdown period. The original site visit was conducted on the 18th of April 2020, with a follow-up site visit done on the 28th of May 2020 (unfortunately the site was still very dry). The timing of the site visit was not very good as the Northern Cape was still in the midst of one of a severe drought, and very few grasses, herbs, other annual plants or bulbs were observed. In fact only a few hardy species still had some leaves, which made identification difficult. Even hardy species like Euphorbia mauritanica showed severe signs of drought stress. However, since the author has done a number of botanical studies in the immediate area (on of which were on the same property) a reasonable good understanding of the vegetation could be obtained.

Figure 3: The proposed footprint and route walked (grey line within the site)



The survey was conducted by walking the site and examining, marking and photographing any area of interest (Refer to Figure 3). Because of the on-going drought a number of plant species is sure to have been missed, of which the most obvious would be bulbs and herbaceous and annual plants. However, the vegetation was very similar to that observed on other portions of the property previously evaluated for the upgrades to the Kamieskroon bulk water supply (these sites in fact were just to the south of the N7 from the WWTW site).

During the site visit the author endeavoured to identify and locate all significant biodiversity features, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

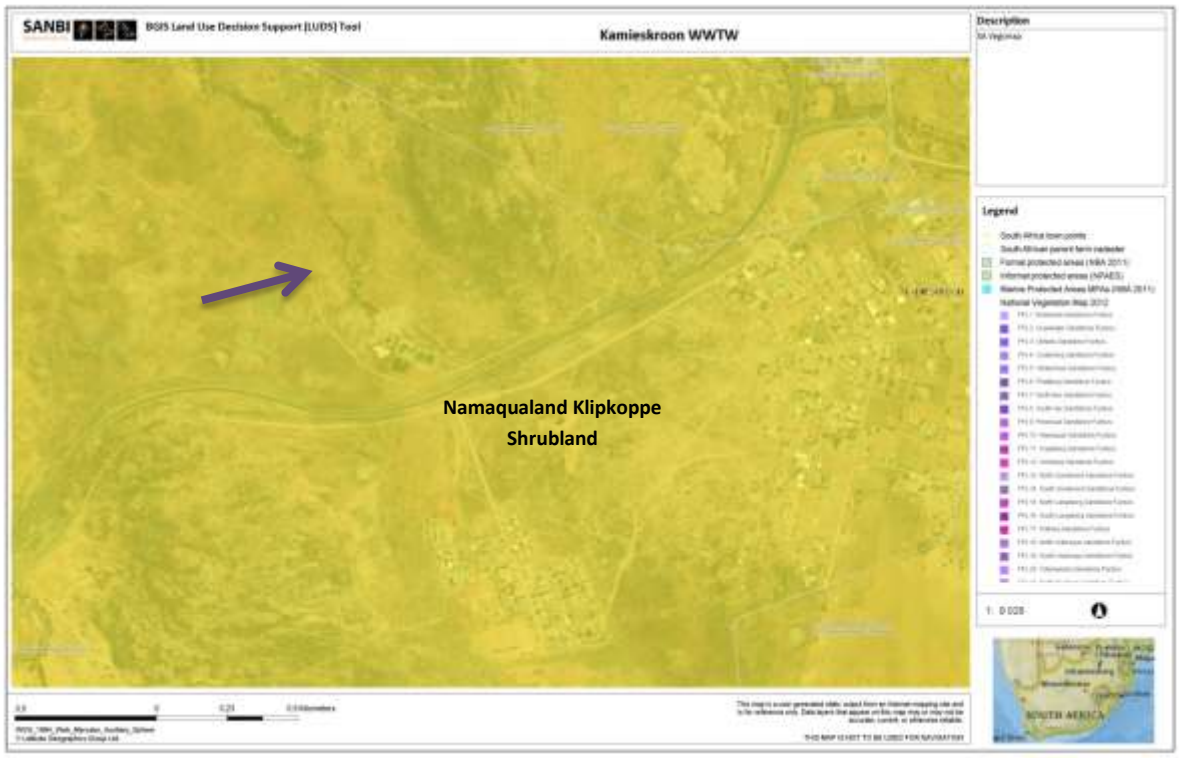
The most noteworthy features observed were a number of protected plant species and the smallish stream to the east of the proposed footprint. Since a freshwater specialist had been appointed to evaluate the stream in terms of this application, it was not evaluated in terms of this botanical assessment.

4. THE VEGETATION

Namaqualand contains about 3500 plant species in 135 families and 724 genera, with about 25% of this flora endemic to the region. It is also home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, it must be noted that this remarkable diversity is not distributed evenly throughout the region, but is concentrated in many local centres of endemism. Namaqualand, (which forms part of the Succulent Karoo) has often been described as a succulent desert enriched by a large bulb flora (Manning, 2008).

The Kamieskroon area would be classified as a desert or semi-desert region. In accordance with the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is to be expected within the proposed footprint, namely **Namaqualand Klipkoppe Shrubland** (Figure 4), a vegetation type classified as "Least Threatened" (GN 1002, December 2011).

Figure 4: Vegetation map of South Africa (2012 beta 2 version), showing the expected vegetation types



4.1. THE VEGETATION IN CONTEXT

4.1.1. Succulent Karoo Biome

The Succulent Karoo Biome covers a flat to gently undulating plain, with some hilly and "broken" veld, mostly situated to the west and south of the escarpment, and north of the Cape Fold Belt. The altitude is mostly below 800 m, but in the east it may reach 1 500 m. A variety of geological units occur in the region. There is little difference between the soils of the Succulent Karoo and Nama Karoo Biomes - both are lime-rich, weakly developed soils on rock. The vegetation is dominated by dwarf, succulent shrubs, of which the Vygies (Mesembryanthemaceae) and Stonecrops (Crassulaceae) are particularly prominent. Mass flowering displays of annuals (mainly Daisies, Asteraceae) occur in spring, often on degraded or fallow lands. Grasses are rare,

except in some sandy areas, and are of the C3 type. The number of plant species (mostly succulents) is very high and unparalleled elsewhere in the world for an arid area of this size (Mucina et al, 2006).

The Karoo used to support millions of antelope, mainly springbuck, but also numerous other larger antelope (and other grazing animal). These animals roamed the vast plains of the Karoo, utilizing different selections of plants and allowing for long "rest" periods as they move around, and as a result preventing overgrazing (Shearing, 1994).

The Succulent Karoo has little agricultural potential due to the lack of water. The scarcity of grasses limits grazing, and the low carrying capacity requires extensive supplementary feeds. However, much soil has been lost from the biome, through sheet erosion, as a consequence of nearly 200 years of grazing. Tourism, on the other hand, is a major industry with the coastal scenery and the spring mass flower displays the main attractions, while mining, although to a lesser degree is also important, especially in the north (Mucina *et al*, 2006).

Lastly it is important to note that less than 0.5% of the Succulent Karoo Biome is formally conserved. The high species richness, high number of rare and Red Data Book species and unique global status of the biome require urgent conservation attention.

4.2. VEGETATION ENCOUNTERED

The area investigated was about 7 ha in size (Figure 5), of which about 3 ha was already disturbed. The existing WWTW covers an area of approximately 1.7 ha (degraded and transformed, Blue area in Figure 5), while previous excavations and spoil dumping resulted in a further approximately 1.1 ha disturbance footprint, just north of the existing WWTW (Orange in Figure 5). The local Municipal Waste Disposal site (approximately 1.3 ha in size) is also located just east of the proposed new oxidation ponds (Pink in Figure 5). The upgrades to the existing WWTW will result in a footprint of approximately 2 ha, while the new oxidation ponds will cover an area of approximately 2.5 ha (which will increase the footprint of the WWTW from ± 1.7 ha to 4.5 ha).

Figure 5: An overview of the site, showing most significant disturbed areas

4.2.1. Existing disturbance footprint

Figure 5 gives an overview of the disturbed areas, which includes;

- Blue area: The existing WWTW (Photo 1 – Photo 2);
- Orange area: Previously disturbed area size (Photo 3);
- Pink area: Existing waste disposal site.

Photo 1: The existing WWTW, looking southwest to northeast over the site.

Photo 2: The existing WWTW, looking from west to east over the site (the N7 in the background).

Photo 3: In the background some of the disturbance footprint can be seen, which had probably resulted from the construction of the original WWTW (Orange in Figure 5).

The location of the waste disposal site, just to the west of the proposed new oxidation ponds has resulted in wind-blown waste (and even some illegal dumping) being encountered within the proposed new footprint.

In fact most of the area, surrounding the waste disposal site is subject to windblown waste. Plastic and metal waste was very common within the proposed footprint.

Photo 4: The existing waste disposal site in the background, looking from east to west up to the site (Pink area in Figure 5).

4.2.2. Remaining natural veld

The site supported a very dry version of Namaqualand Klipkoppe Shrubland. Because of the on-going drought, the vegetation on the site had been reduced to a few hardy species, most of which had already discarded their leaves in an attempt survive the drought. Although this is not uncommon (as the Namaqualand normally is very dry for three quarters of the year), the absence of even the most common leaf succulents suggest severe stress over a period of time. The veld was generally very uniform in species composition as well as structure and dominated by a low shrub layer (about 0.4 – 0.6 m in height). As to be expected during the dry season, the bottom stratum was mostly absent. Since no recent rains had fallen (and because of the timing) spring flowers and bulbs were almost totally absent and species diversity was even lower than normally expected (even for disturbed veld) (Refer to Photo 5 to Photo 7).

Photo 5: A picture of the typical veld encountered with Oom Hoppie Adams in the foreground, on his way to do his daily choirs.

The veld was dominated by a mixture of hardy shrubs like *Eriocephalus* cf. *microphyllus*, *Galenia africana*, *Pteronia* cf. *incana* (with only a few leaves showing on each plant) with *Euphorbia mauritanica* scattered in between. Apart from the drought the site is still regularly grazed by sheep and goats from the local herders and even some of the Euphorbia mauritanica plants seem to have been grazed (probably another result of the drought). The vegetation cover varied from 40-60% with open areas sometimes present. A few small watering holes or dams were also found within the site locations (refer to Photo 8). Other species observed, included: *Asparagus capensis* (occasionally), *Crassula nudicaulis* var. *platyphylla*, *Lycium amoenum* (occasionally), *Pteronia* cf. *glabrata* (with single leaves remaining), *Thesium lineatum* and the poisonous *Tylecodon wallichii* (krimpsiek bossie).

Next to some of the rocky outcrops *Searsia undulata* and *Montinia caryophyllacea* was sometimes observed, with *Searsia undulata* sometimes also present in the veld. The small stream was dominated by *Vachellia karroo*, with *Ozoroa dispar* sometimes observed (Photo 9). Please note that none of these rocky outcrops or the stream was within the footprint itself.

Photo 6: Looking south, back towards the existing WWTW, from about the centre of the new proposed oxidation pond site.

Photo 7: Looking north, away from the existing WWTW towards the lower part of the proposed new oxidation pond site (from about the centre of the site.

Photo 8: One of the small dams encountered in the site.

From previous studies in similar veld (just south of the N7 – on the same property) it was clear that a number of expected species were not encountered. One would have expected at least some of the following plants (and they are very likely to re-appear after the first good rains): *Cheiridopsis denticulata*, *Didelta spinosa, Euphorbia rhombifolia, Leipoldtia* species, *and Ruschia* species. After good rains at least some of the following bulbs and herbs will also be expected, for example: *Babiana* species*, Ballota africana Hermannia amoena, Limonium sinuatum, Melianthus pectinatus* (near streams), *Massonia depressa, Peliostomum* species and an additional number of plants from the Asteraceae and Mesembryanthemum families.

Photo 9: The small seasonal stream (in the background) encountered to the east of the site. Note the larger *Vachellia karroo* trees next the stream and the dominance of *Galenia africana* in the foreground.

4.3. CRITICAL BIODIVERSITY AREAS MAPS

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

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

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.

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

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

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

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

According to the Northern Cape CBA map (Figure 6), the proposed development falls within a terrestrial CBA. However, there is no alternative site on the property or its immediate vicinity that is not located within the CBA.

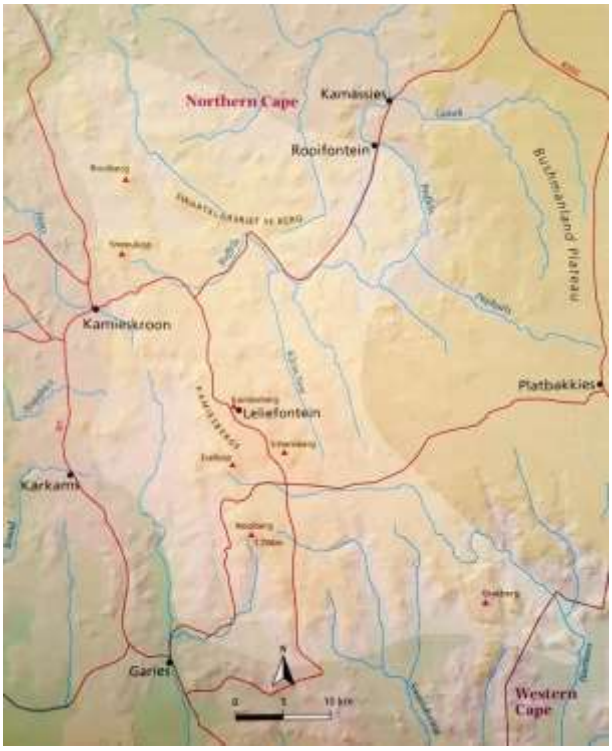
Figure 6: The Northern Cape Critical Biodiversity Areas Map (2016) showing the proposed development

4.4. POTENTIAL IMPACT ON CENTRES OF ENDEMISM

The Kamiesberg centre (KBC) of endemism is named after the Kamiesberg mountain range, just east of Kamieskroon and comprises the entire Kamiesberg Mountain Range (Refer to Figure 6). The vegetation of the Kamiesberg Mountains (especially the high-altitude regions of the Kamiesberg) show remarkable resemblance with that of the Cape Fynbos Region and it is generally regarded as an outlier of the Cape Floristic Region (Van Wyk & Smith, 2001). The KBC is recognized as one of several areas of high endemism within the Succulent Karoo Region, which is one of the globally important sites of plant diversity and endemism recognized by the WWF and one of the world's 25 hotspots (Mittermeier *et. al.* 2000; in Van Wyk & Smith, 2001). The KBC extents from near Garies in the south, to the basin of the Buffels River in the north (about 60km north). Eastwards the region gradually merges, through a series of lower ridges, into the Bushmanland Plateau (not a distinct boundary). The Kamiesberg itself forms the western edge of the extensive interior plateau of the subcontinent and comprises the highest region in the Namaqualand (Van Wyk & Smith, 2001).

Much of the KBC is a broken plateau with an elevation above 1 200 m and is characterized by massive granite domes among granite hills and sandy plains. It receives winter rain of which at least 80% falls between April and September. Because of its higher altitude, the Kamiesberge have a notably higher precipitation (averaging about 400 mm per annum) and lower temperatures than surrounding areas (with typical annual rainfall of between 100 – 200 mm) (Van Wyk & Smith, 2001).

Figure 7: Kamiesberg Centre of endemism (highlighted), taken from Van Wyk & Smith (2001)



Most of the KBC endemics are confined to the Fynbos and Renosterveld. According to Hilton-Taylor (1996) (in Van Wyk & Smith, 2001), about 79 endemic plant species can be found within the Kamiesberg range, with the Family Iridaceae, particularly well represented. Succulent endemism is surprisingly low, especially taken into account that it is surrounded by Succulent Karoo Vegetation. The KBC is the only centre of endemism where, apart from one exception, all the known succulent endemics belong to one family (Mesembryanthemaceae). The affinity of the high-altitude flora of the KBC clearly lies with the Cape Floristic Region (CFR), all three of the characteristic families of the CFR (Restionaceae, Ericaceae and Proteaceae) present in the KBC, as well as several genera that have their present centres of diversity in the Cape (Van Wyk & Smith, 2001).

Much of the KBC is communal land, used mainly for stock farming. By 1938 it was already noted that the vegetation in many parts of the Kamiesberg had been degraded as a result of severe overgrazing by sheep, goats and donkeys. Since then the vegetation had deteriorated further, which was compounded by farmers implementing short interval burns in order to improve grazing. This had an extremely negative effect, especially on the Mountain Fynbos, with complete destruction of natural vegetation quite common around settlements in the region. As a result the KBC is regarded as having among the highest conservation priorities of all centres of endemism in the Succulent Karoo (Van Wyk & Smith, 2001).

Kamieskroon and the proposed location of the proposed development falls just west of the Kamiesberg Centre and is not expected to have any direct impact on the specific centre of endemism.

4.5. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study. Because of the limitations (timing and a single site visit as well as the drought) it is likely that a number of annuals might have been missed.

Table 2: List of plant species observed within or near the proposed footprint

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
1.	*Asparagus capensis*	ASPARAGACEAE	LC	
2.	*Crassula nudicaulis* var. *platyphylla*	CRASSULACEAE	LC Protected in terms of schedule 2 of the NCNCA	

No.	Species name	FAMILY	Status	Alien & invader plant (AIP)
3.	*Eriocephalus microphyllus*	ASTERACEAE	LC	
4.	*Euphorbia mauritanica*	EUPHORBIACEAE	LC Protected in terms of schedule 2 of the NCNCA	
5.	*Galenia africana*	AIZOACEAE	LC Protected in terms of schedule 2 of the NCNCA	
6.	*Lycium amoenum*	SOLANACEAE	LC	
7.	*Montinia caryophyllacea*	MONTINIACEAE	LC	
8.	*Pteronia* cf. *glabrata*	ASTERACEAE	LC	
9.	*Pteronia* cf. *incana*	ASTERACEAE	LC	
10.	*Searsia undulata*	ANACARDIACEAE	LC	
11.	*Thesium lineatum*	SANTALACEAE	LC	
12.	*Tylecodon wallichii*	CRASSULACEAE	LC Protected in terms of schedule 2 of the NCNCA	

4.6. THREATENED AND PROTECTED PLANT SPECIES

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

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

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

4.6.1. Red list of South African plant species

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015).

- **No red-listed species** was observed.

4.6.2. NEM: BA protected plant species

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

- **No NEM: BA protected species was observed.**

4.6.3. NFA Protected plant species

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

- **No species protected in terms of the NFA** was observed.

4.6.4. NCNCA protected plant species

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

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

Table 3: Plant species protected in terms of the NCNCA encountered within the study area

NO.	SPECIES NAME	COMMENTS	RECOMMENDATIONS
1.	*Crassula nudicaulis* var. *platyphylla* **Schedule 2 protected**	Occasionally observed within the footprint	**Search and rescue of these plants is recommended**. Species of the Crassulaceae Family normally transplant quite easily.
2.	*Euphorbia mauritanica* **Schedule 2 protected**	Scattered thoughout the site and quite common in this region.	Previous experience had shown that larger individuals of this species does not transplant very well. Species protection through topsoil conservation and re-used onto disturbed areas in the vicinity.
3.	*Galenia africana* **Schedule 2 protected**	A common plant on site and in this area.	Galenia africana is a common weedy pioneer. No special conservation needed.
4.	*Tylecodon wallichii* **Schedule 2 protected**	A relative common plant in this part of the Northern Cape. The plant is poisonous to livestock.	No special conservation needed.

5. IMPACT ASSESSMENT METHOD

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

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

5.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria (Refer to Table 4).

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

Table 4: Categories and criteria used for the evaluation of the significance of a potential impact

ASPECT / CRITERIA	LOW (1)	MEDIUM/LOW (2)	MEDIUM (3)	MEDIUM/HIGH (4)	HIGH (5)
CONSERVATION VALUE Refers to the intrinsic value of an attribute or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with	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 &	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

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

5.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. In order to do this, the specialist must identify all potentially significant

environmental impacts, predict the nature of the impact and evaluate the significance of that impact should it occur. Potential significant impacts are evaluated, using the method described above, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 5.

Table 5: Categories used to describe significance rating (adjusted from DEAT, 2002)

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

6. DISCUSSING BOTANICAL SENSITIVITY

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

- **Location**: The proposed development footprint is located on Municipal property, degraded to some degree as a result of previous disturbances, dumping of waste and the effect of livestock grazing. In addition, the on-going drought has compounded these impacts, resulting in a veld showing very low species diversity (although good rains, is very likely to restore some diversity in the veld).
- **Activity**: The proposed activity is expected to result in a permanent transformation of a further 3 to 5 ha of natural veld (slightly disturbed).
- **Geology & Soils**: No special features such as true quarts patches or heuweltjies were observed in or near to the larger footprint area that may result in specialised plant habitat.
- **Land use and cover**: The footprint is on municipal land which had already been degraded to some extent. It is also the most logical place in terms of existing infrastructure (next to the existing WWTW and the Municipal Landfill site. The remainder of the property is natural veld, grazed by livestock of the local herders.
- **Vegetation status**: The site supported a very dry version of Namaqualand Klipkoppe Shrubland. Because of the on-going drought, the vegetation on the site had been reduced to a few hardy species, most of which had already discarded their leaves in an attempt survive the drought. Although this is not uncommon (as the Namaqualand normally is very dry for three quarters of the year), the absence of even the most common leaf succulents suggest severe stress over a period of time. The veld was generally very uniform in species composition as well as structure and dominated by a low shrub layer (about 0.4 – 0.6 m in height). As to be expected during the dry season, the bottom stratum was mostly absent. Since no recent rains had fallen (and because of the timing) spring flowers and bulbs were almost totally absent and species diversity was even lower than normally expected (even for disturbed veld). The vegetation is not considered a threatened vegetation type, but conservation targets have not yet been met.
- **Conservation priority areas:** According to the Northern Cape CBA maps the proposed site falls within a CBA area. However, there is no alternative on the property that will not impact on the CBA. The site will not impact on any recognised centre of endemism.
- **Connectivity**: The transformation will not add significantly to the existing impact on connectivity and will not add to the impact on the surrounding area, where connectivity is still very good.
- **Watercourses and wetlands**: Not evaluated in this study as a separate freshwater impact assessment has been commissioned as part of the NEMA EIA process.
- **Protected or endangered plant species**: The most significant botanical aspect of this site is the presence of a few species protected in terms of the Northern Cape Nature Conservation Act, (Refer to Table 3).
- **Alien and Invasive Plant species**: No alien invasive species were observed within the footprint.

6.1. IMPACT ASSESSMENT

Table 6 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 6: Impact assessment associated with the proposed development

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Geology & soils: Potential impact on special habitats (e.g. true quartz or "heuweltjies")	Without mitigation	2	1	5	1	1	16	No special features encountered. The impact on geology and soils is expected to be very low.
	With mitigation	2	1	3	1	1	12	No mitigation required.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	3	5	1	1	20	The development will impact on a small area used for grazing by local herders, but the loss of grazing should be barely perceptible within the larger property.
	With mitigation	2	2	3	1	1	14	Potential beneficial socio-economic impact (infrastructure upgrade and prevention of pollution).
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	2	3	5	1	1	20	Permanent transformation of a further 3-5 ha of slightly disturbed natural veld within a CBA.
	With mitigation	2	2	3	1	1	14	There is no alternative that will not impact on the CBA. At present the WWTW constitutes a pollution risk that should be corrected with the proposed upgrades.
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	3	5	2	1	33	The development will impact on a proposed CBA. However, there is no alternative location on the property that will not impact on the same CBA.
	With mitigation	2	2	3	1	1	14	Refer to recommendations with regards to NCNCA protected plant species (Table 3).
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	2	3	5	1	1	20	Connectivity within the small site will be destroyed, but it will not result in a significant impact on the surrounding area, where connectivity is still excellent
	With mitigation	2	2	3	1	1	14	Refer to recommendations with regards to NCNCA protected plant species (Table 3).
Watercourses and wetlands: Potential impact on natural water courses and its ecological support areas.	Without mitigation						0	N/a (Refer to the Freshwater specialist report).
	With mitigation						0	
Protected & endangered plant species: Potential impact on threatened or protected plant species.	Without mitigation	3	3	5	1	1	30	Only a few NCNCA protected species observed (one to be searched & rescued). However, it is expected that more plants will show after good rains.
	With mitigation	2	2	3	1	1	14	Refer to recommendations with regards to NCNCA protected plant species (Table 3). As well as the mitigation recommendations (Heading 7.1).

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Invasive alien plant species: Potential invasive plant infestation as a result of the activities.	Without mitigation							N/a (no alien invasive species observed within the footprint).
	With mitigation							
Veld fire risk: Potential risk of veld fires as a result of the activities.	Without mitigation	1	2	3	2	2	9	Veld fire risk low.
	With mitigation	1	1	1	1	1	4	Address fire danger throughout construction.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	2	3	5	2	2	24	Permanent transformation of an additional 3-5 ha of natural veld for much needed infrastructure.
	With mitigation	2	2	3	1	1	14	However, the proposed upgrades should prevent future water and groundwater pollution (which is currently the case).
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	2	3	4	1	1	18	Slow degradation of natural veld as a result of illegal dumping, physical disturbances and grazing practices.
	With mitigation						0	

According Table 6, the main impacts associated with the proposed development will be:

- The transformation of 3-5 ha of indigenous vegetation within a proposed CBA; and
- The potential impact on a number of provincially protected plant species.

However, there is no logical alternative site, and the property is already degraded to some degree.

The No-Go option is not likely to result in a “no-impact” scenario, as constant slow degradation is expected to continue as a result of urban activities and grazing in and around the site.

The cumulative impact (even without mitigation) is expected to be **Low**, which can be reduced to **Very Low** through mitigation.

7. IMPACT MINIMISATION RECOMMENDATIONS

The proposed application is for the much needed upgrades to existing infrastructure in order to be able to meet the sewage demands of Kamieskroon as it expands (the existing sewage does not have the capacity, which had already resulted in sewage pollution). The activity is expected to result in a permanent transformation of a further 3-5 ha of land next to the existing WWTW and near the Municipal waste disposal site. The site overlaps an identified critical biodiversity area (according to the 2016, Northern Cape Critical Biodiversity Areas maps). A few plants protected in terms of the Northern Cape Nature Conservation Act, were observed within the footprint, of which one is recommended for search & rescue. However, it is expected that a number of other species, some of which might also be protected will show after good rains.

According to the impact assessment given in Table 6 the development is likely to result in a **Low** impact, which can be reduced to a **Very-Low** impact with good environmental control during construction.

With the correct mitigation it is unlikely that the development will contribute significantly to any of the following:

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

7.1. MITIGATION ACTIONS

The following mitigation actions should be implemented to ensure that the proposed development does not pose a significant threat to the environment:

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must include the recommendations made in this report.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Because of the on-going drought the species diversity at the time of the study was most probably compromised. As a result it is considered imperative that a further botanical scan is done before construction commence in order to ensure that permits are obtained for all protected plants encountered.
- An permit application must be submitted with regards to protected plant species encountered.
- **Before any work is done** protected species must be search & rescued as described in Table 3.
- Lay-down areas or construction sites must be located within the construction footprint.
- No clearing of any area outside of the construction footprint may be allowed.
- All waste that had been illegally dumped within the footprint must be removed to a Municipal approved waste disposal site.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at Municipal approved waste disposal sites.

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APPENDIX 1: COMPLIANCE WITH APPENDIX 6 OF GN. NO. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	**Refer to:**
(i) The specialist who prepared the report; and	Refer to Page ii & Appendix 2
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Appendix 2
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page ii
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.1
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modelling used;	Refer to Heading 3
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructures, inclusive of a site plan identifying site alternatives;	Refer to Headings 4.1, 4.2, 4.3, 4.4, 4.6.
g) An identification of any areas to be avoided, including buffers;	Refer to Figure 5
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Figure 5 & Figure 6
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, [including identified alternatives on the environment] or activities;	Refer to Heading 6
k) Any mitigation measures for inclusion in the EMPr;	Refer to Heading 7.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 7.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the "*Main conclusion*" within the executive summary (Page i)
(iA) regarding the acceptability of the proposed activity or activities; and	
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to Heading 7.1
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

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-, 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): Rietfontein 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.

Botes, P. & McDonald Dr. D. 2014: Loeriesfontein Bulk Water Supply: Proposed construction of a new bulk water supply pipeline and associated infrastructure from the farm Rheeboksfontein to Loeriesfontein Reservoir, Loeriesfontein. Botanical scan of the proposed route to determine the possible impact on vegetation and plant species. 30 May 2014.

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.

Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District 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, Kamieskroon, 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.

Botes, P. 2017: The proposed new Namaqua N7 Truck Stop on Portion 62 of the Farm Biesjesfontein No. 218, Springbok, Northern Cape Province. Botanical scan of the proposed footprint. 10 July 2017.

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

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

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.

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

Botes, P. 2018(i): 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.

Botes, P. 2019(a): Lethabo Park Extension – Proposed extension of Lethabo Park (Housing Development) on the remainder of the Farm Roodepan No. 70, Erf 17725 and Erf 15089, Roodepan Kimberley. Sol Plaaitje Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint (with biodiversity inputs). 15 May 2019.

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.

Botes, P. 2020(h): Topline (Saalskop) housing project – Botanical assessment of the pproposed formalization and development of 248 new erven on Erven 1, 16, 87, Saalskop & Plot 2777, Boegoeberg Settlement, Topline, !Kheis Local Municipality, Northern Cape Province. 18 July 2020.

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.