PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

BOTANICAL & TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

KTE BRANDVLEI BWS

The proposed development of a bulk water supply (BWS) pipeline from the Soafskolk turn-off (about 72km north of Brandvlei) to Brandvlei.

KAI !GARIB & HANTAM MUNICIPALITIES, NORTHERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA.

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22 August 2024

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DOCUMENT ISSUE STATUS

TITLE	KTE Brandvlei BWS.
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REPORT VERSION	**Initial Report** (22 August 2024).

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EXECUTIVE SUMMARY

The Kutulo Tsatsi Energy Pty Ltd (KTE) plans, amongst others, to develop a large green hydrogen based green ammonia production next to the Sishen-Saldana railway line, between Kenhardt and Brandvlei in the Bushmanland of the Northern Cape Province. Water for the project will be sourced from the Orange River near Keimoes (Neilersdrif), from where it will be pumped/gravitate to a reservoir on the farm Uitkyk 889/1 (a distance of just over 200 km).

As part of their **socio-economic commitment**, the KTE project plans to **supply potable water** to the towns of **Kenhardt** and **Brandvlei**. In order to supply water to Brandvlei a connecting pipeline will have to be installed from Soafskolk (about 72 km north of Brandvlei), along the R27 southwards, to the Brandvlei storage reservoir. The proposed pipeline route will be **located** within the **already disturbed road reserve** of the R27 to **minimise the impact** on the more **pristine vegetation** next to the roads.

VEGETATION TYPE & STATUS

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006, updated), the pipeline will impact mainly on Bushmanland Basin Shrubland but will also go through an area supporting Bushmanland Vloere vegetation just south of Soafskolk (Figure 3). Both these vegetation types are classified as of "**Least Concern**", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022).

WATER COURSES AND WETLANDS

Within the road reserve the proposed pipeline will have to cross numerous watercourses and even salt pan wetlands (Bushmanland Vloere). As a result, the **DFFE Screening Tool** report (Appendix 2) considers or rate the relative Aquatic biodiversity theme sensitivity as of **Very High sensitivity**.

Note that a Freshwater Specialist has been appointed to evaluate and discuss the aquatic biodiversity theme in a separate report. The impacts associated with wetlands and watercourses were not evaluated in detail in this report.

LAND-USE

According to the 2020 (9-Class) National Land Cover Map of South Africa, most of the properties along the route still support natural veld (which is consistent with the findings of the site visit – albeit mostly a disturbed version of the original vegetation).

CONSERVATION PRIORITY AREAS

According to the 2016, Northern Cape critical biodiversity areas maps (Figure 4), the pipeline will impact on critical biodiversity areas (CBA's) and ecological support areas (ESA's). In this case the CBA areas seems to be associated with the protection of the salt pans of the Bushmanland Vloere and wide ecological corridor along the Sak River. Smaller episodic watercourses are protected as ecological support areas.

As mentioned, the pipeline route was specifically chosen to fall within the (already disturbed) road reserve of the R27 to minimise the impact on natural vegetation in better condition.

The proposed pipeline will not impact on any recognised centre of endemism.

VEGETATION ENCOUNTERED

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, meaning that the vegetation type is fairly similar over extended areas, and it would be unlikely that localised impacts will have any significant impact on any specific species or the vegetation type as a whole. Along the R27 the road reserve is subject to regular brush-cutting (to reduce the risk posed by larger animals and fire), which impacted on the vegetation composition.

From the Soafskolk to the reservoir at Brandvlei the pipeline will be located in the eastern road reserve of the R27 and will mainly impact on Bushmanland Basin Shrubland. The vegetation cover was sparse, almost desert-like, often showing only a sparse grassy cover

dominated by "white" grasses (*Stipagrostis* species) (Photo 1), or a sparse shrub layer (Photo 2) consisting of hardy (often spiny) shrubs scattered within the landscape. The larger hardy shrubs were usually *Rhigozum trichotomum* (driedoring), *Lycium cinereum* (kriedoring) or *Phaeoptilum spinosum* (brosdoring).

Along the way, the pipeline route will run through a relatively large salt pan area associated with Bushmanland Vloere and cross various intermittent watercourses. The vegetation on the edges of these pans are often dominated by alien invasive *Prosopis* trees in combination with *Salsola aphylla* (Photo 3 & Photo 4).

Apart from the watercourses and wetland areas, no special habitats or major differences in vegetation were observed.

SPECIES OF CONSERVATION CONCERN (SOCC)

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme sensitivity is considered Medium Sensitive**, because of the potential for or encountering the following species:

- ***Dregeochloa calviniensis* (Poaceae):** This plant normally occurs on limestone outcrops in arid succulent karoo shrubland.
- In addition, five (5) species protected in terms of the NCNCA were also observed (Table 10).

The reason for the DFFE plant sensitivity rating is because of the potential impact on the grass, *Dregeochloa calviniensis*. However, neither the plant nor suitable habitat were observed within the study area. The five (5) NCNCA protected species are all of them common and widespread species, protected by default as part of the Aizoaceae family. None of them are regarded as species of conservation concern (SoCC). Lastly, by placing the pipeline within already disturbed road reserves, the impact on (more) intact vegetation is also significantly reduced.

As a result, the **plant species theme sensitivity** for this project should be **Low Sensitivity** (not medium sensitive).

MAIN CONCLUSION

According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because:

- The proposed project footprint overlaps CBA 1, CBA 2 and ESA areas.
- The proposed project footprint overlaps a FEPA (Freshwater Ecosystem Priority Area) Subcatchment.
- Portion of the footprint overlaps areas that has been included in the National Protected Area Expansion Strategy (NPAES).

The impact assessment method (Refer to Table 12) suggests that the main impacts associated with this project is likely to be:

- The potential impact on special habitats (watercourses and wetlands);
- The potential impact on conservation priority areas (CBA's & ESA's);

However, in both cases the expected impacts will be **Low Negative** because of the location of the pipeline (within a disturbed road reserve). As a result, even the cumulative impact is considered **Low Negative** (although it will impact on CBA and ESA areas). In addition:

- The plant species theme sensitivity is considered of **Low Sensitivity** (Heading 6.2).
- The animal species theme sensitivity is considered of **Low Sensitivity** (Heading 7.3).

No fatal flaws or any other obstacles were found with respect to the flora, vegetation, fauna, and terrestrial biodiversity.

If the proposed mitigation recommendations are implemented it is considered highly 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.

Because of the placement of the proposed pipeline (within a disturbed road reserve) and the temporary nature of the impact, the findings of this assessment suggests that the relative overall **terrestrial biodiversity theme sensitivity** should be **Low Sensitive** (not Very High Sensitive as suggested in the DFFE screening report).

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

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:

22 August 2024

Date:

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ABBREVIATIONS

BAR	Basic Assessment Report
BWS	Bulk Water Supply
CBA	Critical biodiversity area
DENC	Department of Environment and Nature Conservation
DFFE	Department of Fisheries, Forestry and Environment
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
KTE	Kutulo Tsatsi Energy Pty Ltd
LT	Least Threatened
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
NFA	National Forest Act, Act 84 of 1998
SoCC	Species of Conservation Concern
VU	Vulnerable
WTW	Water Treatment Works

1. INTRODUCTION

The Kutulo Tsatsi Energy Pty Ltd (KTE) plans, amongst others, to develop a large green hydrogen based green ammonia production next to the Sishen-Saldana railway line, between Kenhardt and Brandvlei in the Bushmanland of the Northern Cape Province. KTE proposes to become the African Hub for Green Hydrogen/Oxygen/Ammonia/Fertilizer/Synfuels in both the South African and International Export markets. Depending on further rollout the total investment value of the larger project may in time exceed USD 10bn, with a potential to create more than 6 000 jobs. Social, Economic- and Enterprise Development, Job Creation and Socio-Economic Upliftment, especially for local communities, are prominent goals of the project. Water for the project will be sourced from the Orange River near Keimoes (Neilersdrif), from where it will be pumped/gravitate to a reservoir on the farm Uitkyk 889/1 (a distance of just over 200 km).

As part of their socio-economic commitment, the KTE project plans to **supply potable water** to the storage reservoirs in the towns of **Kenhardt and Brandvlei**. In order to supply water to Brandvlei a connecting pipeline will have to be installed from Soafskolk (about 72 km north of Brandvlei), along the R27 southwards, to the Brandvlei storage reservoir.

Along its route, the pipeline will impact mainly on Bushmanland Basin Shrubland but will also go through an area supporting Bushmanland Vloere vegetation just south of Soafskolk (SA Vegetation map, 2018). Along the R27 the road reserve is subject to regular brush-cutting (to reduce the risk posed by larger animals and fire), which impacted on the vegetation composition. Along the way a few larger indigenous trees were occasionally observed, while the pans associated with Bushmanland Vloere was most often heavily infested with alien invasive Prosopis trees where the road reserve runs through these pans. The proposed footprint overlaps critical biodiversity area and ecological support areas as identified in the 2016 Northern Cape critical biodiversity areas maps (Holness & Oosthuysen, 2016).

The DFFE screening report for the proposed site, compiled by PB Consult on the 19th of August 2024, identified various areas of potential environmental sensitivity, of which the following will be discussed in this report:

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

The relative Aquatic Biodiversity Theme (**Very High Sensitivity**) will be discussed in a separate freshwater specialist report.

1.1. LEGISLATION GOVERNING THIS REPORT

EnviroAfrica was appointed by KTE to facilitate the NEMA EIA application for this project. PB Consult was appointed by EnviroAfrica to conduct a botanical and terrestrial biodiversity assessment of the proposed footprint area. This report will form part of NEMA EIA environmental application.

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 perform a site visit and to 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);
- Species of conservation concern (SoCC);
- 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

Brandvlei is a small town in the in the Northern Cape Province (Hantam Local Municipalities), on the R27 between Calvinia and Kenhardt (Figure 1). The proposed pipeline will be about 72 km in length and will be located within the road reserves of the R27 from the Soafskolk turn-off (about 72 km north of Brandvlei) to Brandvlei storage Reservoir and within the urban edge in Brandvlei.

The Brandvlei pipeline will connect to the KTE BWS pipeline at the Soafskolk turn-off. From Soafskolk the pipeline that will supply Brandvlei will run within the eastern road reserve of the R27 all the way to the town of Brandvlei. It will then be located just north of existing town roads (just north of the urban edge of Brandvlei) towards the existing Brandvlei water treatment works (WTW) connecting with the existing Brandvlei storage reservoir. This water will augment the existing Brandvlei bulk water supply system, which depends on borehole water.

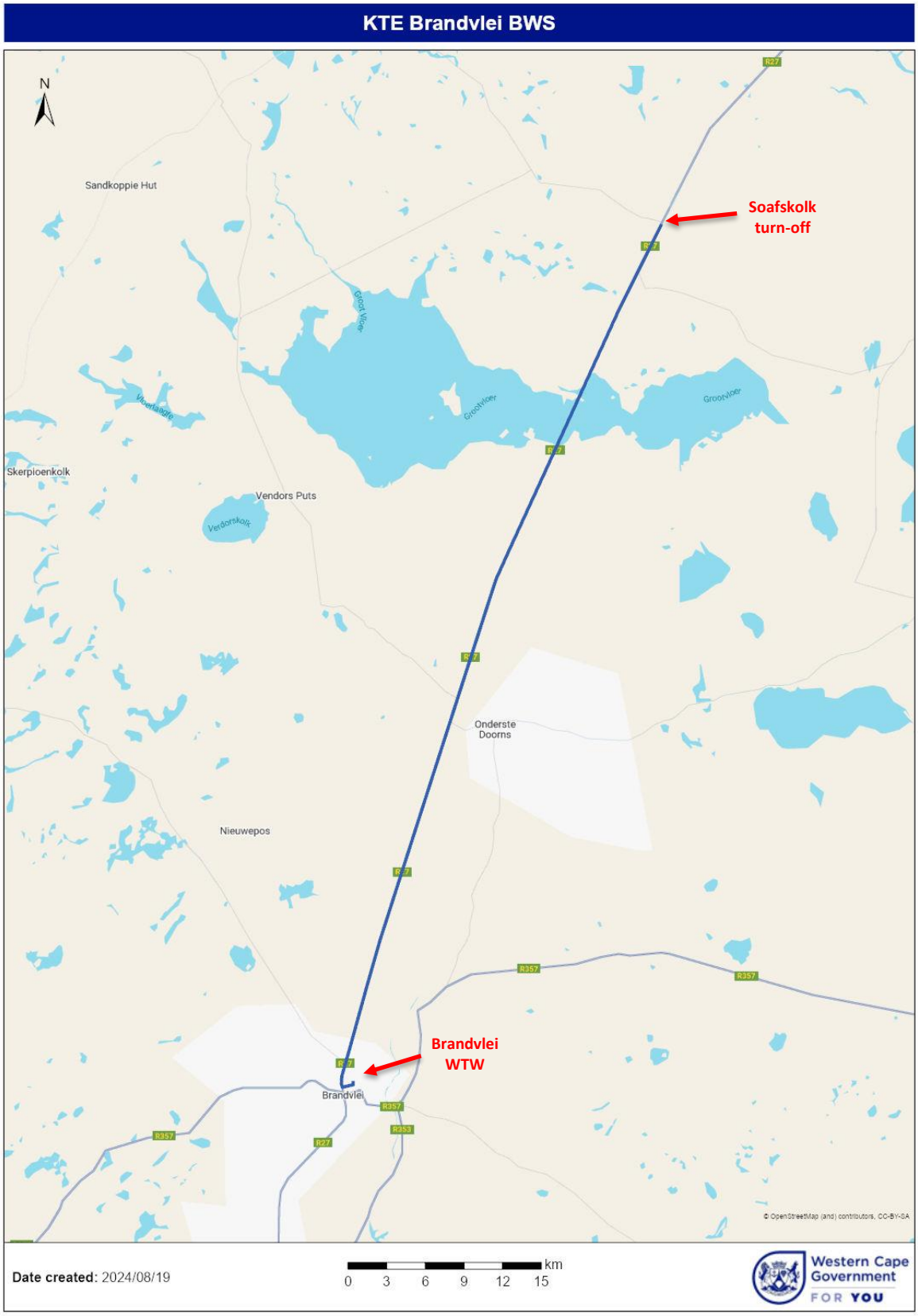


Figure 1: A map showing the proposed pipeline route (blue), from the Soafskolk turn-off to the Brandvlei WTW.

Table 1: GPS Co-ordinates for the locations of main infrastructure along the pipeline route (WGS 84 format)

DESCRIPTION	CO-ORDINATE
Soafskolk Turn-off	29°51'34.25"S 20°44'9.33"E
Brandvlei Water treatment works (WTW)	30°27'23.92"S 20°29'13.28"E

2.2. PROJECT DESCRIPTION

The Kutulo Tsatsi Energy Pty Ltd (KTE) is planning the development of a USD 7–10 bn Green Hydrogen based Green Ammonia Production Plant on a 55 000ha (plus a further up to 30 000ha under option) site in the Northern Cape Province of South Africa with water extraction from the Orange river as well as on a 2 700 ha with a 4,7 km seafront site in the Western Cape at Velddrift for the purpose of Seawater Desalination as sustainability together with a Green Hydrogen powered Power Plant in the Western Cape Province of South Africa. The total investment value in time may exceed USD 10bn, with up to 6000 jobs to be created. Social, Economic- and Enterprise Development, Job Creation and Socio-Economic Upliftment, especially for local communities, are prominent goals of the project.

The Project will be Base Load Powered by a 3-6 GW Hybridisation of Renewable Energy based on Solar PV, Solar CSP and Wind Power. The Production Plants, at 6GW Baseload Power Capacity, utilised for the Electrolysis of water, will be able to produce up to 1 (one) million metric tons of Electrolytic Green Hydrogen per annum and up to 6 (six) million metric tons of Green Ammonia per annum. Up to 5 (five) million tons of Nitrogen will be produced per annum for use in the Production of Green Ammonia. The up to 8 (eight) million tonnes of Oxygen produced as a by-product may be used in the production of Synthetic fuels, Chemical Production Processes and other Gases, the excess Oxygen as well as the Carbon Credits earned (including by Direct Air Capture/ DAC) to be marketed and sold. The KTE International Consortium proposes to become the African Hub for Green Hydrogen/Oxygen/Ammonia/Fertilizer/Synfuels (Synfuels, for example Green Methanol, via the utilization of carbon via Direct Air Capture/DAC) in both the South African and International Export markets.

Water for the project will be sourced from the Orange River near Keimoes (Neilersdrif), from where it will be pumped/gravitate to a reservoir on the farm Uitkyk 889/1 (a distance of just over 200 km). Water extraction will occur at the same location as the existing Kenhardt bulk water supply (BWS) pump station. The proposed pipeline will be located within the western road reserve of the R27 from Neilersdrif to Kenhardt with a water treatment works (WTW) just south of Neilersdrif (east of the R27). At Kenhardt the pipeline will run to the west and south of town, crossing the Hartbees River, towards the east of the R27. It will then run in the eastern road reserve of the R27 to a booster pump station on the Farm De Bakke (±22km south of Kenhardt) from where it will be pumped (still in the eastern road reserve) to the Soafskolk gravel road (about 50 km further south). The proposed pipeline will then follow minor gravel roads (located within the road reserve of these roads) to the farm Styns Vley and on the farm Uitkyk (about 60 km from the Soafskolk turn-off).

As part of their investment into the local communities it is planned to provide potable water to both the towns of Kenhardt and Brandvlei. This water will be delivered in bulk to the existing Kenhardt and Brandvlei storage reservoirs. Provisions were made to provide Kenhardt with a maximum of 2 500 m^3/day and Brandvlei with 500 m^3/day. Distribution will remain the responsibility of the local municipalities.

2.3. GEOLOGY AND SOILS

The Bushmanland is part of the Nama-Karoo, which is underlaid by a thick succession of sedimentary rocks. This includes the Cape Supergroup (marine origin), followed by Dwyka tillites and then as southern Africa drifted away from the south pole, by other fossil-rich sediments of the Karoo Supergroup (including Ecca and Beaufort Groups) deposited in a great inland sea (300 – 180 million years ago). Igneous activity after this period, resulted in voluminous outpourings of basaltic lava intrusions of dolerite sills and dykes into Karoo sediments (Figure 2).

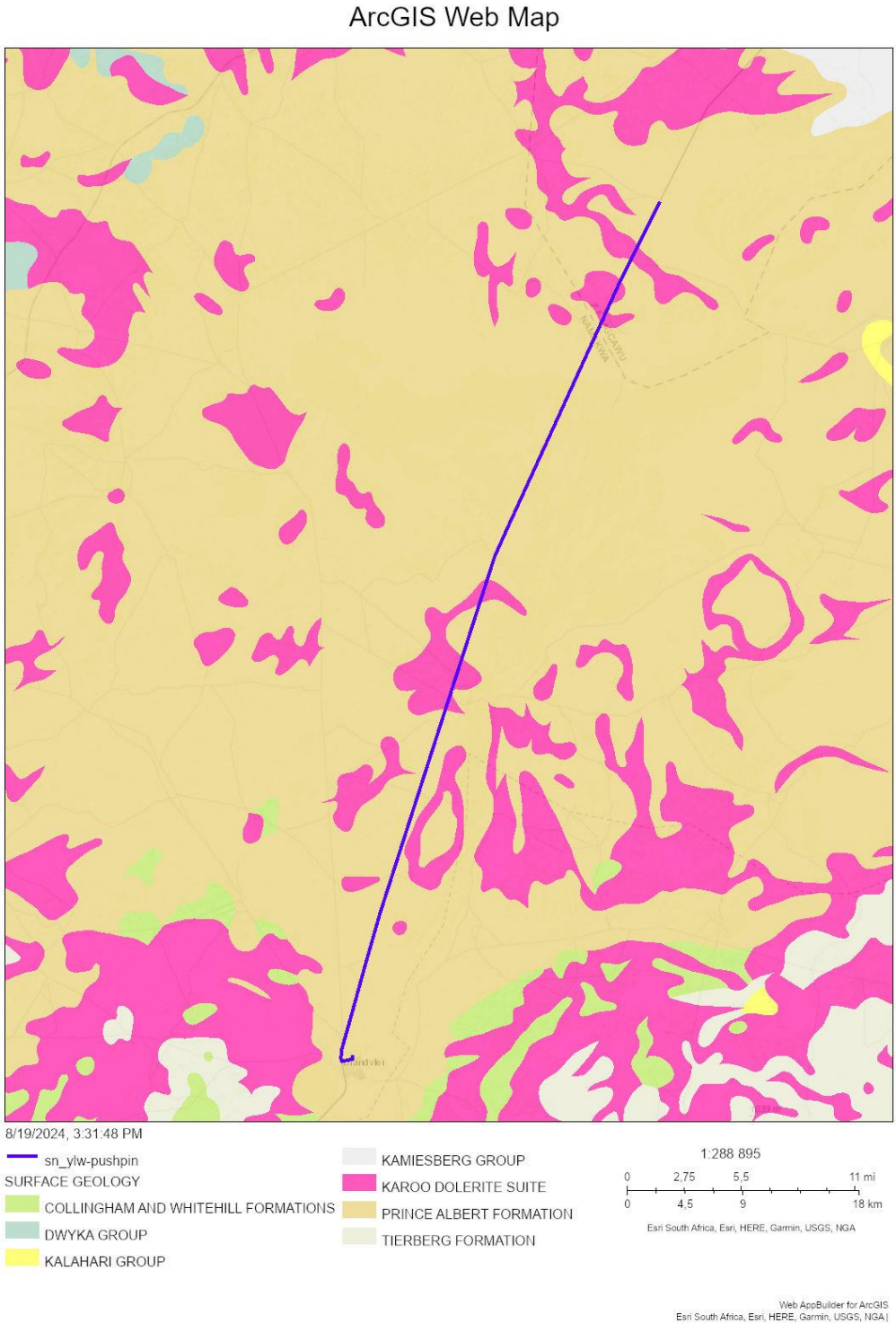


Figure 2: The Geology map of South Africa, showing the geology associated with the study area (Council for Geoscience).

Mostly undisturbed by the intense folding in the south that formed the mountains and valleys of the Fynbos and Succulent Karoo Biome, the strata of the Nama-Karoo remained horizontal, giving rise to flat to gentle undulating rocky or sandy plains, interrupted by boulder outcrops of igneous origin and flat-topped mesas sculpted by wind and rain, with much of the northwest interspersed by with pans with no outlets. The soils are generally base-rich, weakly structured and skeletal. In the north from Bushmanland to around Prieska the most common soils are red and yellow sand to non-swelling clays, generally freely drained with an orthic A-horizon, typical of arid areas in South Africa. In the interdune areas of the Bushmanland, shallow, coarse sand to sandy loam soils with high nutrient status are associated with dorbank and hardpan calcretes. Dolerite outcrops develop shallow to moderately deep, calcareous, sandy-clay loams with contain calcrete and calcareous horizons (Mucina *et al*., 2006).

Soils in most of the area associated with Bushmanland Arid Grassland are red-yellow apedal soils, freely drained, with a high base-status and less than 300 mm deep. Bushmanland Basin Shrubland is dominated by mudstones and shales of the Ecca Group and Dwyka tillites, both of early Karoo age with about 20% of rock outcrops formed by Jurassic intrusive dolerite sheets and dykes. Soils are shallow Glenrosa and Mispah forms, with lime generally present in the entire landscape, and to a lesser degree red-yellow apedal, freely drained soils with a high base status (usually less than 15% clay). The salt content in these soils is very high.

2.4. CLIMATE

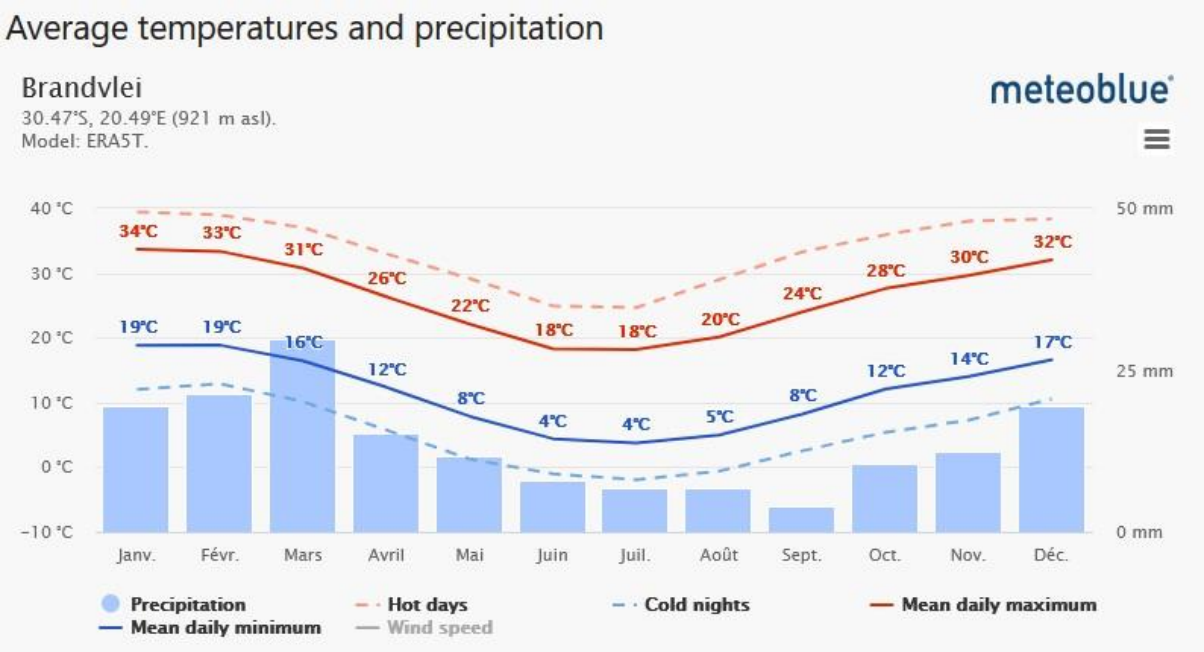
The climate of Nama-Karoo is essentially continental and is little affected by the ameliorating influences of the oceans. It is an arid biome where most of rivers are nonperennial (apart from the Orange River in this area). Shallow lakes (Bushmanland Vloere) may store water after heavy rainfall events, but this is unpredictable and will dry up during the dry season (Mucina *et. al.,* 2006).

Rainfall is unreliable and droughts are unpredictable and sometimes prolonged. In the southwest of the Nama-Karoo, rain comes in the form of unpredictable summer thunderstorms and occasional inland intrusions of winter high-pressure systems from the west. Summers are hot (mean January maximum >30^{o}C) and winters are cold (with the mean July minimum close to zero). Temperature extremes ranges from -5^{o}C in winter to 43^{o}C in summer and winter frost occurs in all areas except in the extreme southeast of the biome (Albany Broken Veld). Dust devils and small whirlwinds are common in summer, but dust storms are uncommon (Mucina *et. al.,* 2006).

In all the vegetation types of the Nama-Karoo, rainfall peaks in March, while the onset of winter frost is soon afterwards, which means a very short growth season for frost sensitive species. This is further exacerbated in some years when the rains are later than usual or frost earlier than usual, or more seriously, when both occur in the same year (Mucina *et. al.,* 2006).

For this study the climate recorded for Brandvlei was taken as an example of the expected climate for the study area. Table 2 shows the average temperatures and precipitation recorded for the last 30 years. The solid red line gives the maximum temperature of an average day, while the solid blue line shows the average minimum temperature per month. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years (Source: www.meteoblue.com).

Table 2: : Average temperature and precipitation for Brandvlei (Source: www.meteoblue.com).



3. APPROACH & METHODOLOGY

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 over a 3-day period during March 2024. The site survey was conducted, by driving the route, stopping at 10 km intervals (or where differenced in vegetation or

SoCC were observed). At each stop the immediate area was walked and while 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. 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.

3.3. LIMITATIONS, ASSUMPTIONS AND UNCERTAINTIES

The findings are based on a 3-day site visits, but does not constitute long-term repetitive sampling, which means that it is likely that some plant species might have been missed. In certain areas the veld was still very dry and probably still suffering from the recent long term drought period (experienced throughout the Northern Cape and Karoo). On the other hand, the author knows this area and its vegetation relatively well, and the timing of the site visit was reasonable. Essentially all perennial plants were identifiable and a good understanding of the status of the vegetation and plant species along the route was 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 3 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 4, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 5).

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 6).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 7).

Table 3: 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 4: 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 5: 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 6: 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 7: 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 8. 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 8: 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.
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

This section discuss the results of the desktop analysis.

4.1. BROAD-SCALE VEGETATION EXPECTED

According to the South African vegetation map (2018) (Mucina & Rutherford, 2006, updated), the proposed pipeline route will impact mainly on **Bushmanland Basin Shrubland (LC)**, but will also cross pans which might still support **Bushmanland Vloere (LC)** within the road reserve of the R27. Both these vegetation types are classified as of "**Least Concern**", in terms of the "*Revised National list of ecosystems that are threatened and in need of protection*" (GN. No. 2747 of 18 November 2022).

Mucina *et al.* (2006), describe the various vegetation types as follows:

- **Bushmanland Basin Shrubland** is described as occurring on slightly irregular plains covered by a dwarf shrubland, which are dominated by a mixture of low sturdy and spiny (and sometimes also succulent) shrubs such as *Rhigozum*, *Salsola*, *Pentzia*, *Eriocephalus* and 'white' grasses (*Stipagrostis*). In years of high rainfall annuals such as *Gazania* and *Leysera* can become abundant.
- **Bushmanland Vloere** occurs on flat and very even surfaces of pans and broad bottoms of intermittent rivers. The center of a pan (or the river drainage channel itself) is usually devoid of vegetation; loosely patterned scrub dominated by *Rhigozum trichotomum* and various species of *Salsola* and *Lycium*, with a mixture of non-succulent dwarf shrubs of Nama-Karoo relationship. In places loose thickets of *Parkinsonia africana*, *Lebeckia linearifolia* and *Acacia karroo* can be found.

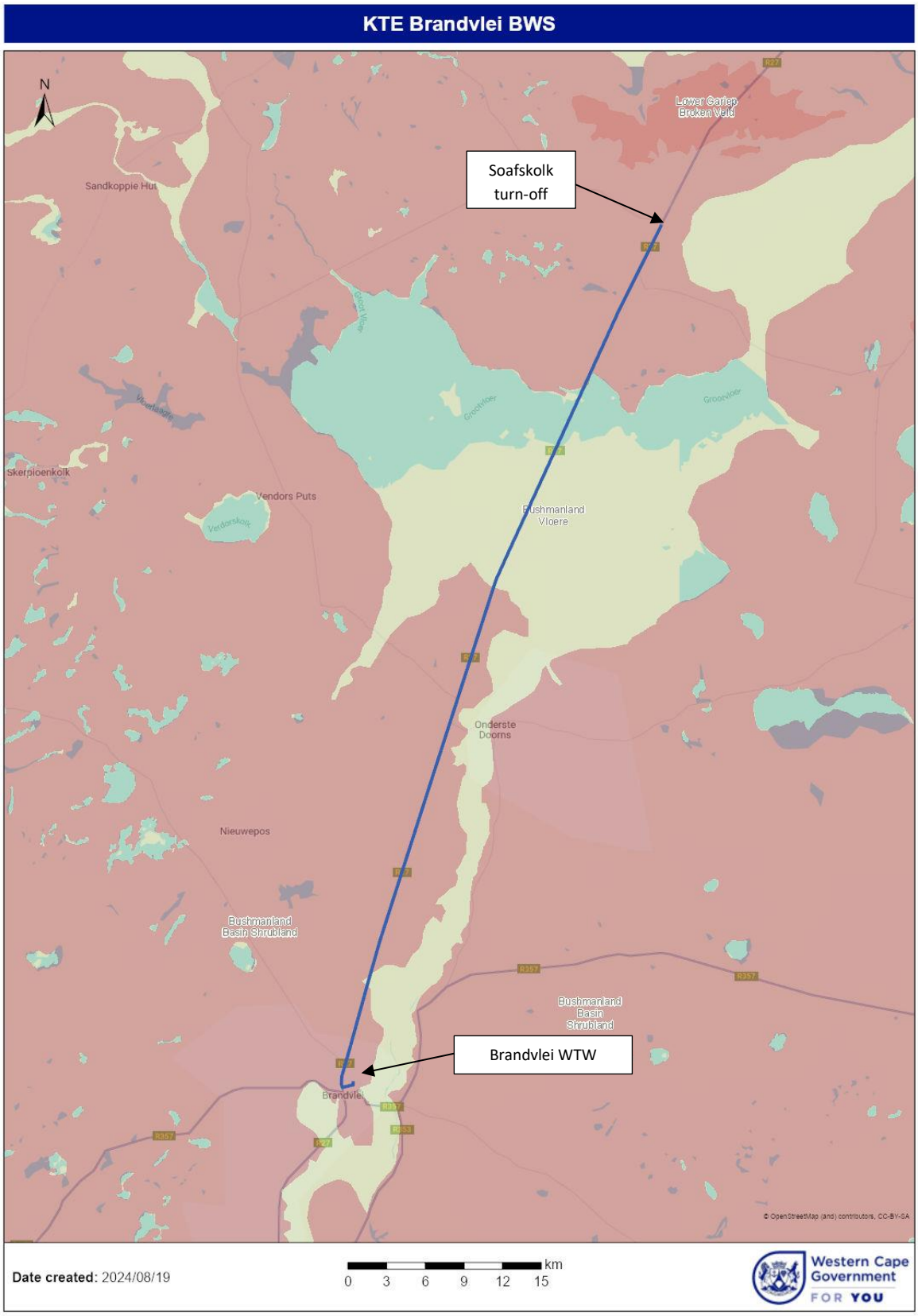


Figure 3: Vegetation map of South Africa (2018), showing the expected vegetation types along the pipeline route (CapeFarmMapper).

4.2. ECOLOGICAL DRIVERS & FUNCTIONING

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

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

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.

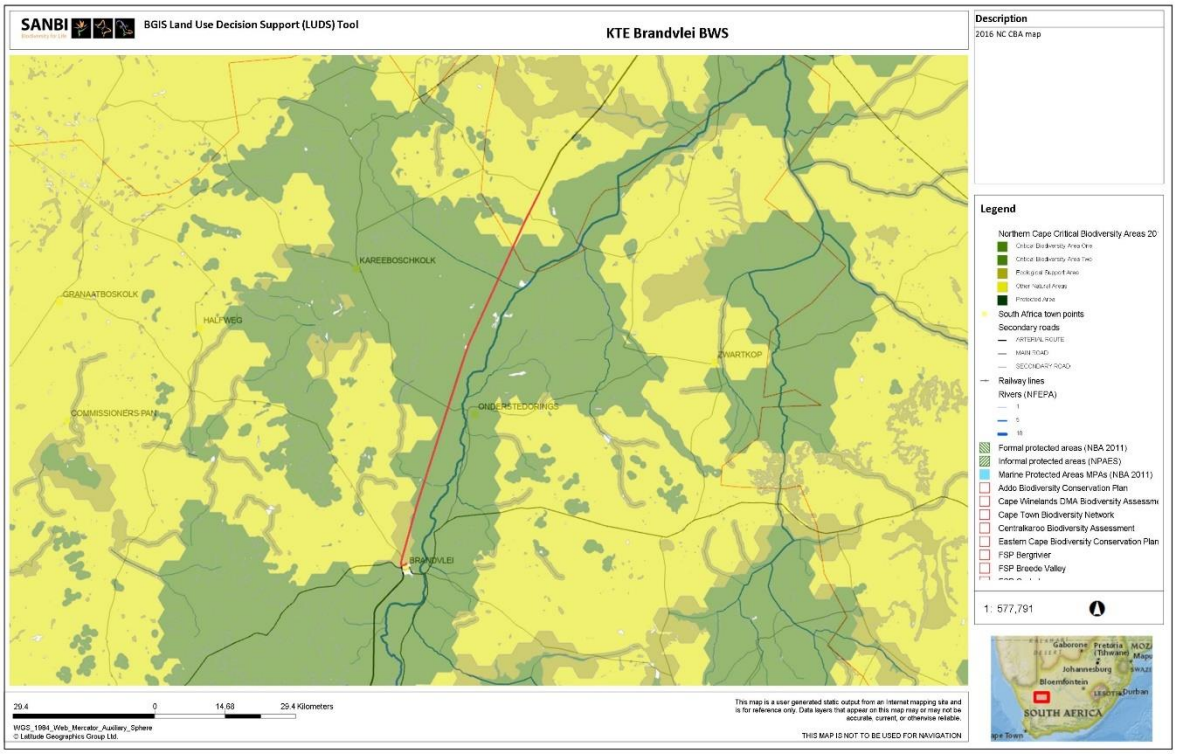


Figure 4: Northern Cape CBA map (2016) showing the proposed Brandvlei BWS pipeline.

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 (Figure 4), the proposed pipeline and its associated infrastructure is likely to impact on critical biodiversity areas (CBA's) and ecological support areas (ESA's). The reasons for assigning this CBA, and ESA are not clearly explained in the GIS layers, but according to information given in Critical Biodiversity Areas of the Northern Cape: Technical Report (Holness & Oosthuysen, 2016) all areas in close proximity of larger rivers were prioritized and all NFEPA (National Freshwater Ecosystem Priority Areas) rivers were given a minimum category of CBA as were areas of specific important bird areas (IBA). Areas of special habitats (e.g. rocky outcrops, koppies, dolerite dykes, boulder fields, woody vegetation on outwash plains etc.) were included with a 50% target and ESA status as minimum.

In this case the CBA areas seems to be associated with the protection of the salt pans of the Bushmanland Vloere and wide ecological corridor along the Sak River. Smaller episodic watercourses are protected as ecological support areas.

It must be noted that the pipeline route was specifically chosen to fall within the (already disturbed) road reserve of the R27 to minimise the impact on natural vegetation in better condition.

4.4. WATERCOURSES AND WETLANDS

According to the **DFFE Screening Tool** report for the footprint area (Appendix 2), the relative Aquatic biodiversity theme sensitivity is considered of **Very High sensitivity**. The pipeline route and associated infrastructure will cross various watercourses salt pans along its route.

A Freshwater Specialist has been appointed to evaluate and discuss the aquatic biodiversity theme.

4.5. LANDUSE AND COVER

The proposed pipeline route will be located within the already disturbed road reserve of the R27 to minimise the impact on the more pristine vegetation next to the roads. According to the 2020 (9-Class) National Land Cover Map of South Africa, most of the road reserve still support natural veld, albeit a disturbed version of the expected natural veld (which is consistent with the findings of the site visit).

4.6. POTENTIAL IMPACT ON CENTERS OF ENDEMISM

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 (Mucina & Rutherford, 2006).

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

5. VEGETATION ASSESSMENT

From the Soafskolk connecting point (about 72 km north of Brandvlei) to the reservoir at Brandvlei the pipeline route will be located in the eastern road reserve of the R27 and will mainly impact on Bushmanland Basin Shrubland. Like the rest of the R27, the road reserve was also brush-cut from time-to-time, but because of the already low vegetation cover probably require much less maintenance. Along the way, the pipeline route will run through a relatively large salt pan area associated with Bushmanland Vloere and cross various intermittent watercourses.

For the first 20 – 30 km from the Soafskolk turn-off southwards the road reserve is quite wide and also very dry. The vegetation cover was sparse, almost desert-like, often showing only a sparse grassy cover dominated by “white” grasses (*Stipagrostis* species) (Photo 1), or a sparse shrub layer (Photo 2) consisting of hardy (often spiny) shrubs scattered within the landscape. The larger hardy shrubs were usually *Rhigozum trichotomum* (driedoring), *Lycium cinereum* (kriedoring) or *Phaeoptilum spinosum* (brosdoring).

Photo 1: Looking from south to north along the eastern road reserve, just south of Soafskolk. Note the sparse vegetation cover and the aridity of the site.

Photo 2: Looking from south to north, about 10km further south along the R27. Note the sparse low shrub layer.

About 20-25km south of Soafskolk the road reserve runs through the Grootvloer or Brandvlei pan. In these areas the vegetation on the edges of the pan (within the road reserve) is often dominated by the alien invasive *Prosopis* tree in combination with *Salsola aphylla* (Photo 3 & Photo 4). Other species observed on the edge of these pans includes *Vachellia karroo*, *Augea capensis*, *Mesembryanthemum vaginatum* (=*Brownanthus*), *Salsola kali*, and *Galenia africana* (kraalbos).

Photo 3: Dense stands of *Prosopis* trees within the road reserve, where it runs through the Bushmanland Vloere area.

Photo 4: Looking from north to south (towards the edge of the Bushmanland Vloere area). *Prosopis* & *Vachellia karroo* individuals showing in this picture.

South of the Bushmanland Vloere area, the road reserve itself narrows down (Photo 5) and as one moves towards Brandvlei the shrub layer becomes slightly more pronounced (Photo 6), but stil

dominated by the same shrubs such as *Rhigozum trichotomum* (driedoring), *Lycium cinereum* (kriedoring) or *Phaeoptilum spinosum* (brosdoring). Other species observed includes species like *Augea capensis*, *Atriplex vestita, Mesembryanthemum dinteri (=Psilocaulon),* the weedy *M. crystallinum, M. coriarium (=Psilocaulon), M. noctiflorum* (vleisbos), *M. vaginatum*, *Salsola tuberculata*, *Osteospermum sinuatum (=Tripteris)* and *Tetraena chrysopteros.*

Photo 5: Looking from north to south, along the R27 about 30 km north of Brandvlei. Note the sparse vegetation cover.

Photo 6: Looking from north to south just north of Brandvlei. Note the slightly denser shrub layer.

The intermittent or episodic drainage lines (watercourses) was often associated or marked by *Parkinsonia africana* and/or *Vachellia karroo* and larger shrubs like *Cadaba aphylla* (swartstorm) and *Gomphocarpus filiformis* (lammerlat). *Stipagrostis namaquensis* (river bushman grass).

Photo 7: Looking from west to east along the proposed pipeline route, just north of the Brandvlei urban edge.

In the vicinity of the Brandvlei water treatment works (WTW) the shrub layer was slightly higher and

denser, but still dominated by hardy shrubs such as *Rhigozum trichotomum*, *Lycium cinereum* and *Phaeoptilum spinosum* but with *Eriocephalus cf. microphyllus* also present (Photo 7 & Photo 8).

Photo 8: Typical vegetation in the vicinity of the Brandvlei WTW. Note the *Prosopis* trees and larger shrubs (mostly *Lycium* or *Phaeoptilum* species) in the foreground.

Although not observed, several other species is expected in this vegetation, such as *Aptosimum spinescens, Blepharis mitrata, Kewa salsoloides, Kleinia longiflora, Rogeria longiflora, Tetraena simplex,* with *Searsia lancea* and *Ziziphus mucronata* expected near watercourses or wetlands.

Although a few of these plant species (e.g. the *Mesembryanthemum* species) are protected in terms of the NCNCA, but al of these species are widespread hardy pioneer species (some of them considered disturbance indicator species) protected by default as part of the Aizoaceae family.

6. FLORA ENCOUNTERED

Table 9 gives a list of the plant species encountered along the route. It is important to note that the species list is not based on long term repetitive sampling, and it is likely that species 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.

Table 9: List of plant species observed within the proposed development footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Aptosimum spinescens*	SCROPHULARIACEAE	LC	Doringviooltjie – a very hardy plant occasionally observed.
2.	*Atriplex vestita*	AMARANTHACEAE	LC	Vaalbrak. Occasional in salt pans and floodplain areas.
3.	*Augea capensis*	ZYGPHYLLACEAE	LC	Occasionally observed, often forming patches.
4.	*Blepharis mitrata*	ACANTHACEAE	LC	Occasionally throughout.
5.	*Cadaba aphylla*	CAPPARACEAE	LC	Bloustorm – occasional near watercourses.
6.	*Eriocephalus* cf. *microphyllus*	ASTERACEAE	LC	Kapokbos: Observed in Bushmanland Basin Shrubland
7.	*Fingerhuthia africana*	POACEAE	LC	Fingerhoedgrass.
8.	*Galenia africana*	AIZOACEAE	LC	Kraalbos: often associated with

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
			NCNCA, Schedule 2 Protected	disturbed areas.
9.	*Gomphocarpus filiformis*	APOCYNACEAE	LC	Lammerlat – occasionally near watercourses.
10.	*Kewa salsoloides*	KEWACEAE	LC	Small succulent occasionally observed.
11.	*Kleinia longiflora*	ASTERACEAE	LC	A medium succulent occasionally observed.
12.	*Lycium cinereum*	SOLANACEAE	LC	Kriedoring- Medium large shrub common throughout.
13.	*Mesembryanthemum crystallinum*	AIZOACEAE	LC NCNCA, Schedule 2 Protected	Soutslaai: A weedy species often in disturbed areas.
14.	*Mesembryanthemum dinteri (=Psilocaulon)*	AIZOACEAE	LC NCNCA, Schedule 2 Protected	A widespread and hardy species occasionally observed along the R27.
15.	*Mesembryanthemum noctiflorum*	AICOACEAE	LC NCNCA, Schedule 2 Protected	Vleisbos: Occasional in Bushmanland Basin Shrubland
16.	*Mesembryanthemum vaginatum (=Brownanthus)*	AICOACEAE	LC NCNCA, Schedule 2 Protected	Occasional in Bushmanland Basin Shrubland
17.	*Parkinsonia africana*	FABACEAE	LC	Small tree, observed near or within drainage lines.
18.	*Phaeoptilum spinosum*	NYCTAGINACEAE	LC	Brosdoring – Relatively common throughout.
19.	*Prosopis* species	FABACEAE	**Alien invasive plant species.**	Common near watercourses or wetland areas.
20.	*Rhigozum trichotomum*	BIGNONIACEAE	LC	Driedoring – common throughout.
21.	*Rogeria longiflora*	PEDALIACEAE	LC	Potentially present.
22.	*Salsola* cf. *aphylla*	AMARANTHACEAE	LC	Ganna: medium shrub associated with salt pans and floodplain areas.
23.	*Salsola kali*	AMARANTHACEAE	**Alien invasive plant weed**	Tumbleweed: An annual unpalatable weed in disturbed areas.
24.	*Salsola* tuberculata	AMARANTHACEAE	LC	Blomkoolganna: Bushmanland Basin Shrubland.
25.	*Searsia lancea*	ANACARDIACEAE	LC	Karee – expected near watercourses.
26.	*Stipagrostis ciliata*	POACEAE	LC	Langbeenboesmangrass.
27.	*Stipagrostis namaquensis*	POACEAE	LC	River bushman grass.
28.	*Stipagrostis* obtusa	POACEAE	LC	Kortbeenboesmangrass.
29.	*Tapinanthus oleifolius*	LORANTHACEAE	LC	Stem parasite – occasionally within larger shrubs.
30.	*Tetraena chrysopteros*	ZYGOPHYLACEAE	LC	Kleinskilpadbos – dwarf shrub occasionally observed.
31.	*Tetraena simplex*	ZYGOPHYLACEAE	LC	Vostruisdruiwe: Often on disturbed road verges.
32.	*Vachellia karroo*	FABACEAE	LC	Soetdoring: Near watercourses.
33.	*Ziziphus mucronata*	RHAMNACEAE	LC	Blinkblaar wag-'n-bietjie: expected near watercourses.

6.1. 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).

6.1.1. 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, 2020).

- No red-listed plant species was observed.

6.1.2. 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 species protected in terms of NEM: BA were observed.

6.1.3. 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 NFA protected species were observed.

6.1.4. NCNCA PROTECTED PLANT SPECIES

The Northern Cape Nature Conservation Act 9 of 2009 (NCNCA) came into effect on the 12th of December 2011, and 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).

- **Five (5)** species protected in terms of the NCNCA were observed, but all of them were widespread common species protected by default as part of the Aizoaceae family (Refer to **Error! Reference source not found.**).

6.2. PLANT SPECIES SENSITIVITY THEME

According to the **DFFE Environmental Screening Tool** report for this site (Appendix 2), the **plant species theme** sensitivity is considered **Medium Sensitive**, because of the potential for or encountering the following species:

- ***Dregeochloa calviniensis* (Poaceae):** This plant normally occurs on limestone outcrops in arid succulent karoo shrubland.
- In addition, five **(5)** species protected in terms of the NCNCA were also observed (Table 10).

Table 10: A list of protected species with impact mitigation recommendations.

NO.	SPECIES NAME	STATUS & COMMENTS	IMPACT MITIGATION RECOMMENDATIONS
1.	*Galenia africana* **Schedule 2 protected (All plants in this family)**	A very widespread plant, often found in disturbed areas. It has a red-list status of Least Concern.	No Search & rescue proposed. This is a hardy pioneer species, considered a disturbance indicator species. **A NCNCA Permit application must be submitted.**
2.	*Mesembryanthemum crystallinum* **Schedule 2 protected (All plants in this Family)**	A widespread hardy plant, often found in disturbed areas. It has a red-list status of Least Concern.	No Search & rescue proposed. This is a hardy pioneer species, considered a disturbance indicator species. **A NCNCA Permit application must be submitted.**
3.	*Mesembryanthemum dinteri* **Schedule 2 protected (All plants in this Family)**	A widespread hardy plant with a red-list status of Least Concern.	No Search & rescue proposed. Topsoil conservation and re-use during rehabilitation should result in seed store protection. **A NCNCA Permit application must be submitted.**
4.	*Mesembryanthemum noctiflorum* **Schedule 2 protected (All plants in this Family)**	A widespread hardy plant with a red-list status of Least Concern.	No Search & rescue proposed. Topsoil conservation and re-use during rehabilitation should result in seed store protection. **A NCNCA Permit application must be submitted.**
5.	*Mesembryanthemum vaginatum* **Schedule 2 protected (All plants in this Family)**	A relatively widespread species, endemic to South Africa with a red-list status of Least Concern.	No Search & rescue proposed. Topsoil conservation and re-use during rehabilitation should result in seed store protection. **A NCNCA Permit application must be submitted.**

The reason for the DFFE plant sensitivity rating is because of the potential impact on the grass, *Dregeochloa calviniensis*. However, neither the plant nor suitable habitat were observed within the study area. The five (5) NCNCA protected species are all of them common and widespread species, protected by default as part of the Aizoaceae family. None of them are regarded as true species of conservation concern (SoCC). Lastly, by placing the pipeline within already disturbed road reserves, the impact on (more) intact vegetation is also significantly reduced.

As a result, the **plant species theme sensitivity** for this project should be **Low Sensitivity** (not medium sensitive).

7. FAUNA AND AVI-FAUNA

The Northern Cape is home to an exceptionally high level of insect and reptile endemism, with new species still being discovered. However, this remarkable diversity is not distributed evenly throughout the region but is concentrated in many local centres of endemism. The Bushmanland is an arid area inland of the Namaqualand and is often described as one of the most inhospitable areas in South Africa. Apart from being very arid, the soils are infertile, and the groundwater is mostly saline. Wildlife is sparse but often interesting.

7.1. FAUNA

Historically, because of its aridity and unpredictable rainfall patterns, the Nama-Karoo region would have favoured free moving herbivores such as ostrich and springbok, nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, where they would have lingered longer, suggesting the transient nature of herbivores. However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been 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 and animal diversity. Grazing during and immediately after droughts periods, for instance, is regarded as one of the major causes of detrimental change in vegetation composition and the ultimately decline in palatable plants species (Mucina *et. al*., 2006).

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

For the most part the pipeline footprint will be located in already disturbed road reserves associated with the R27 and the town of Brandvlei and the impact is considered temporary of nature (because the pipeline will be placed underground). It is considered unlikely that any larger game (if present) will frequent the road reserve or urban edge of Brandvlei. However, some of the smaller mammal species such as *Orycteropus afer* (Aardvark), *Raphicerus campestris* (Steenbok), *Sylvicapra grimmia* (Common duiker), *Suricata suricatta* (Suricate), *Otocyon megalotis* (Bat-eared fox), *Vulpes chama* (Cape fox) and *Canis mesomelas* (Black-backed jackal) might occur in the surrounding natural veld. One listed terrestrial mammals may occur in the region namely the Honey Badger, *Mellivora capensis* (Endangered). The Honey Badger may still occur in the surrounding areas, but it has a wide national distribution, and the temporary nature of the development is unlikely to result in significant impact on habitat for these species. Apart from insects, reptiles and a few smaller mammal species that might be impacted, the **project is not expected to have any significant long term impact on any fauna species**. As a result, a formal fauna screening was not considered necessary for this study (although observations were made during the site visit).

7.2. AVI-FAUNA

According to the Southern Africa Bird Atlas Project (SABAP 2) (https://sabap2.birdmap.africa/) data sets about 108 bird species are known from the pentad surrounding Brandvlei (Refer to Appendix 3 for the full list of species). This includes 5 species of conservation concern (IUCN listed species) (refer to Table 11).

Table 11: Species of conservation concern listed in the SABAP2 data set for the Brandvlei Pentad 3025_2025

No.	Common group	Common species	Genus	Species	Regional	Global
11	Bustard	Ludwig's	*Neotis*	*ludwigii*	**EN**	**EN**
34	Eagle	Martial	*Polemaetus*	*bellicosus*	**EN**	**VU**
38	Falcon	Lanner	*Falco*	*biarmicus*	**VU**	**LC**
51	Korhaan	Karoo	*Eupodotis*	*vigorsii*	**NT**	**LC**
56	Lark	Red	*Calendulauda*	*burra*	**VU**	**VU**

Of these species, both the Ludwig's Bustard and the Karoo Korhaan prefers open arid landscapes in search of food and is unlikely to prefer the R27 road reserve because of the continual movement of vehicles along the road. The Martial Eagle is a low density apex predator which normally holds large territories but can also be "floaters" (not holding a territory but moving around). The Martial Eagle had been observed in the Brandvlei-Kenhardt area (resting on telephone poles along the R27) and is likely to hunt over the Brandvlei area as well. The Lanner Falcon is a partial seasonal migrant that occurs widely but sparsely throughout South Africa (and the whole of Africa) with a core breeding area in the sour grasslands of the eastern parts of South Africa, but with apparent movements westwards in the non-breeding season. The Red Lark on the other hand is endemic to the Northern Cape, where it has a restricted and fragmented distribution, mostly following red sand dunes and sandy flats south of the Orange River, feeding on large-seeded grasses.

Although some of these species might hunt or fly over the proposed route, is considered unlikely that the relatively short construction period of the underground pipeline would have any significant additional impact on the habitat and hunting habits of any of these bird species (it being located in already disturbed road reserves). Overhead cables will not be constructed and impact on larger indigenous tree species will be minimised and considered negligible.

7.3. ANIMAL SPECIES THEME SENSITIVITY

According to the **DFFE National Web Based Environmental Screening Tool** the relative Animal species theme sensitivity is considered of **High Sensitivity** because of the potential impact on **three** bird species of conservation concern, namely Ludwig's Bustard, the Martial Eagle and the Red Lark (discussed in the Avi-fauna section above).

For the reasons discussed above, the **animal species theme sensitivity,** for this project, is considered to be of **Low Sensitivity** (not high sensitive).

8. TERRESTRIAL BIODIVERSITY

The Brandvlei Bulk Water Supply pipeline entails the construction of a new pipeline from the Soafskolk turn-off to the Brandvlei Reservoir in the town of Brandvlei, a distance of approximately 72 km. The pipeline will be placed within the existing road reserve. The construction period will be relative short (months), localised and temporary in nature, but will result in potential impacts on natural veld (within the disturbed road reserve corridor), various intermittent watercourses and salt pan wetlands (which will have to be managed during the construction period).

The vegetation types are considered "Least Threatened" and is not particularly rich in plant species and local plant endemism is very low. **Meaning that the vegetation type is fairly similar over extended areas, and it would be unlikely that localised impacts will have any significant impact on any specific species or the vegetation type as a whole.** The vegetation is also not fragmented in any way with extended areas of excellent connectivity remaining throughout the Bushmanland. A few species protected in terms of the Northern Cape Nature Conservation Act (Act. 9 of 2009) were observed, but they are all relatively common and widespread species (not considered species of conservation concern). Along the route alien vegetation (mostly *Prosopis* trees) was encountered and if not handled correctly can lead to further infestation.

However, most of the route overlaps areas identified as critical biodiversity areas (CBA's) or ecological support areas (ESA's) according to the 2016, Northern Cape critical biodiversity areas maps (Figure 4). For impact assessment purposes it was taken into consideration that the pipeline route was specifically chosen to fall within the (already disturbed) road reserve of the R27 to minimise the impact on natural vegetation in better condition (which will minimise the impacts on the CBA's and ESA's and its functioning significantly).

8.1. DIRECT IMPACTS

Direct impacts refers to impacts with a direct impact on the terrestrial biodiversity associated with the proposed footprint area and may include:

- Direct loss of vegetation type and associated habitat due to construction and operational activities.
- 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

In this case the direct impact will result in short to medium term impact on vegetation and habitat as a result of the construction activities (laying of the underground pipeline). However, with good environmental control and rehabilitation the impact should be temporary of nature and rehabilitation should be easy to achieve (but will depend on subsequent rainfall).

8.2. INDIRECT IMPACTS

Indirect impacts are impacts that are not a direct result of the main activity but are impacts associated or resulting from the construction activities. The following possible indirect impacts were associated with the proposed project:

- Impacts on vegetation type, connectivity and ecological functioning;
- Establishment of a temporary construction associated infrastructure or facilities.
- Temporary lay-down or storage areas (e.g. pipe's and fittings and concrete mixing material).
- Waste management.

In this case the indirect impacts might lead to a temporary impact on connectivity (within a CBA or ESA), habitat and NCNCA protected species. However, the pipeline route was chosen specifically to fall within an already disturbed corridor in order to minimize the impacts on remaining natural habitat in good condition.

With good environmental control it is considered unlikely that the indirect impacts, associated with this project, will result in any significant additional impact or load on the on the surrounding natural environment. It is considered that indirect impacts will have a much lower impact than direct impacts with very little cumulative effect on the environment.

8.3. CUMULATIVE IMPACTS

In order to comprehend the cumulative impact, one has to understand to what extent the proposed activity will contribute to the cumulative loss of ecological function and other biodiversity features on a regional basis.

Having discussed the various possible environmental impacts above, it is concluded that:

- The construction period will be relatively short (months) and the footprint will be located within already disturbed road reserves.
- The pipeline will be located underground (with no overhead cables) and will this result in medium to short term impact on natural vegetation (depending on subsequent rains);
- The vegetation types that will be impacted are both considered "Least Threatened" with good remaining connectivity (only broken by the actual road and its road reserve).
- The impact plant species of conservation concern is expected to be low and can be further mitigated through dedicated topsoil management and rehabilitation.
- It is considered unlikely that the project will result any significant additional impact on fauna and avi-fauna during construction or operation.
- However, the proposed development will result in a temporary impact on CBA's and ESA's along its route.

Cumulatively the proposed project will result in an approximate 72 km long, short to medium term temporary disturbance footprint within or along already disturbed road reserves.

8.4. THE NO-GO OPTION

The "No-Go alternative" does not signify significant biodiversity gain or loss especially on a regional basis. However, it will ensure that none of the potential impacts above occur. The current status quo will remain and there will be no immediate additional impact on vegetation type, ecological corridors, fauna or flora and watercourses or wetlands.

However, it is important to note that the water supply system to Brandvlei is considered under stress and reliant on groundwater that have to be pumped over a distance of more than 50 km.

8.5. TERRESTRIAL BIODIVERSITY IMPACT ASSESSMENT

Using the methodology described under Heading 3.4: Impact Assessment Method, the terrestrial biodiversity assessment given in Table 12 aims to evaluate each of the identified impacts associated with the proposed development, taking the discussion(s) relating to each of these aspects, within this report into account. The colour given under the significance column in Table 12 relates to the scores as shown in the picture to the right (as given in Table 8).

Very Low (Insignificant) = 4-22
Low = 23-36
Medium/Low = 37-45
Medium = 46-55
Medium/High = 56-63
High = 64-79
Very High = 80-100

Table 12: Impact assessment associated with the proposed activity

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	3	4	3	1	2	30	The pipeline will be located in the road reserve, but will touch/cross watercourses and salt pan areas associated with Bushmanland Vloere Vegetation (LT).
	With mitigation	3	2	3	1	1	21	The construction footprint through the watercourses and wetlands must be rehabilitated.
Watercourses & Wetlands: Potential impact on natural water resources and it's ecological support areas.	Without mitigation							The pipeline will be located in the road reserve, but will touch/cross watercourses and salt pan areas associated with Bushmanland Vloere Vegetation (LT).
	With mitigation							A freshwater specialist had been appointed to evaluate the impact on these systems.
Landuse and cover: Potential impact on socio-economic activities.	Without mitigation	2	2	3	1	1	14	Road reserves can be important ecological corridors, but in this case the road reserve has been degraded, while the surrounding veld is still natural.
	With mitigation	2	2	3	1	1	14	Refer to the impact minimisation recommendations.
Vegetation status: Loss of vulnerable or endangered vegetation and associated habitat.	Without mitigation	3	2	3	1	1	21	The vegetation Least Threatened and disturbed, but sections overlaps CBA's or ESA's and supports hardy NCNCA protected species.
	With mitigation	3	1	3	1	1	18	Refer to the impact minimisation recommendations (Environmental oversight during planning and construction, protection of larger indigenous trees).

Impact assessment								
Aspect	**Mitigation**	**CV**	**Lik**	**Dur**	**Ext**	**Sev**	**Significance**	Short discussion
Conservation priority: Potential impact on protected areas, CBA's, ESA's or Centre's of Endemism.	Without mitigation	3	4	3	1	2	30	The vegetation Least Threatened and disturbed, but sections overlaps CBA's or ESA's and supports hardy NCNCA protected species.
	With mitigation	3	3	3	1	2	27	Refer to the impact minimisation recommendations (Environmental oversight during planning and construction, protection of larger indigenous trees).
Connectivity: Potential loss of ecological migration corridors.	Without mitigation	3	2	3	1	1	21	The impact will be temporary (short - medium term) with little additional impact on connectivity.
	With mitigation	3	1	3	1	1	18	Refer to the impact minimisation recommendations (Environmental oversight during planning and construction, protection of larger indigenous trees).
Plant SoCC: Potential impact on threatened or protected plant species.	Without mitigation	3	3	3	1	1	24	The potential impact, mainly on a large number of two NFA protected trees and also on several hardy NCNCA protected species.
	With mitigation	3	2	3	1	1	21	Refer to the impact minimisation recommendations in Table 10.
Cumulative impacts: Cumulative impact associated with proposed activity.	Without mitigation	3	4	3	1	2	30	The main impact relates to the potential impact the CBA and ESA areas, wetlands and watercourses (and a few hardy NCNCA protected species).
	With mitigation	3	3	3	1	2	27	Refer to the impact minimisation recommendations.
The "No-Go" option: Potential impact associated with the No-Go alternative.	Without mitigation	3	2	2	1	2	21	No additional impact on a CBA, wetlands or watercourses or on NCNCA protected species. However, the water supply system to Brandvlei will remain under stress.
	With mitigation							

The impact assessment method (Refer to Table 12) suggests that the main impacts associated with this project is likely to be:

- The potential impact on special habitats (watercourses and wetlands);
- The potential impact on conservation priority areas (CBA's & ESA's);

However, in both cases the expected impacts will be **Low Negative** (even before mitigation) because of the location of the pipeline route (within the already disturbed road reserve). As a result, even the cumulative impact is considered **Low Negative** (although it will impact on CBA and ESA areas). In addition:

- The plant species theme sensitivity is considered of **Low Sensitivity** (Refer to Heading 6.2).
- The animal species theme sensitivity is considered of **Low Sensitivity** (Refer to Heading 7.3).

8.6. TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

According to the **DFFE National Web Based Environmental Screening Tool** the relative Terrestrial Biodiversity theme sensitivity is considered of **Very High Sensitivity** because:

- The proposed project footprint overlaps CBA 1, CBA 2 and ESA areas.
- The proposed project footprint overlaps a FEPA (Freshwater Ecosystem Priority Area) Subcatchment.
- Portion of the footprint overlaps areas that has been included in the National Protected Area Expansion Strategy (NPAES).

No fatal flaws or any other obstacles were found with respect to the flora, vegetation, fauna, and terrestrial biodiversity.

If the proposed mitigation recommendations are implemented it is considered highly unlikely that the development will contribute significantly to any of the following:

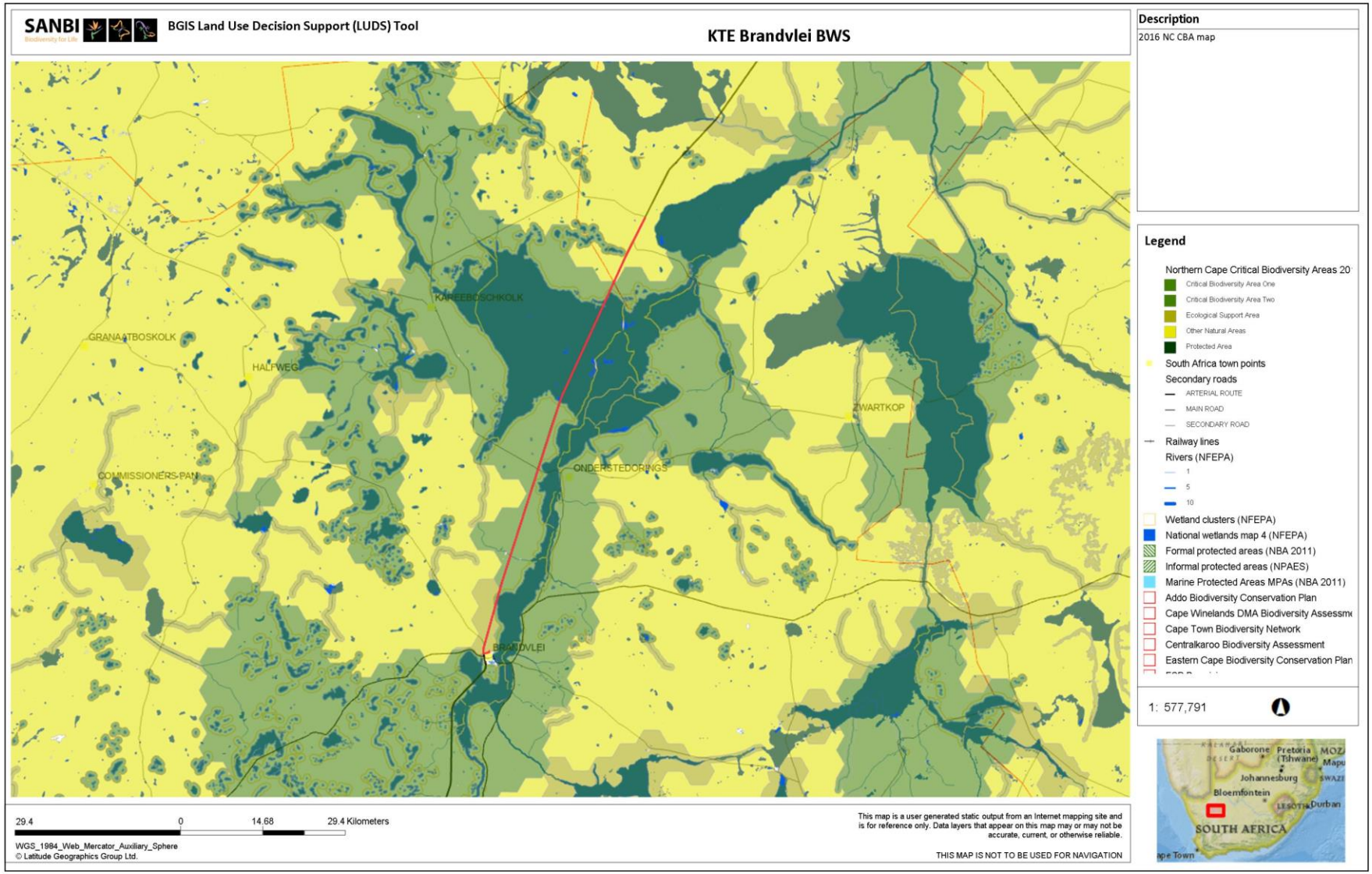
- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened species.
- Loss of ecosystem connectivity.

Because of the placement of the proposed pipeline (within a disturbed road reserve) and the temporary nature of the impact, the findings of this assessment suggests that the relative overall **terrestrial biodiversity theme sensitivity** should be **Low Sensitive** (not Very High Sensitive as suggested in the DFFE screening report).

8.7. TERRESTRIAL SENSITIVITY MAP

The proposed mitigation recommendations focus on the protection of features of special significance such as watercourses and wetlands, which is also the main focus of the Northern Cape CBA maps (2016). As a result, the CBA map or wetlands areas map can be used to indicate the areas of higher environmental importance. The **Sensitivity map (Figure 5)** shows the Northern Cape CBA map combined with the river and wetlands maps along the pipeline route as an indication of terrestrial sensitivity.

Figure 5: The site sensitivity map aims to highlight areas identified as CBA's, ESA's and watercourses and wetlands.



9. MITIGATION RECOMMENDATIONS

Impact minimisation should focus on minimising the construction footprint, good environmental control, topsoil management (seedbed conservation), rehabilitation (especially where watercourses or wetlands will be impacted) an alien plant management.

- 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.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the mitigation recommendations pertaining to specialist studies.
- The pipeline route and disturbance footprint must stay within the road reserve (to control the construction footprint and minimise the impact on the adjacent natural vegetation).
- All larger indigenous trees should be protected wherever possible.
- A Northern Cape Nature Conservation Act permit must be obtained for the impacts on the protected species listed in **Error! Reference source not found.**.
- All alien invasive species within the road reserve 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.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- An integrated waste management approach must be implemented during construction.
    - Construction related spoil, general- and hazardous waste must be disposed to approved waste disposal sites.

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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 i
3.1.2.	a signed statement of independence by the specialist;	Page vi
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 & 3.3
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 8.7
3.1.7.	additional environmental impacts expected from the proposed development;	Heading 7
3.1.8.	any direct, indirect and cumulative impacts of the proposed development;	Heading 7
3.1.9.	the degree to which impacts and risks can be mitigated;	Heading 7
3.1.10.	the degree to which the impacts and risks can be reversed;	Heading 7
3.1.11.	the degree to which the impacts and risks can cause loss of irreplaceable resources;	Heading 7
3.1.12.	proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Heading 9
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 iv
3.1.15.	any conditions to which this statement is subjected.	N/A

APPENDIX 2: DFFE SCREENING REPORT

APPENDIX 3: SABAP2 - BIRD SPECIES LIST

The SABAP2 species list for Pentad 3025_2025. Regional and Global red list categories are from the 2019 BirdLIfe South Africa list categorisation. Red listed species are marked in green.

No.	Common group	Common species	Genus	Species	Regional	Global
1	African Shelduck	South	*Tadorna*	*cana*		
2	Avocet	Pied	*Recurvirostra*	*avosetta*		
3	Barn Owl	Western	*Tyto*	*alba*		
4	Batis	Pririt	*Batis*	*pririt*		
5	Bee-eater	European	*Merops*	*apiaster*		
6	Bee-eater	Swallow-tailed	*Merops*	*hirundineus*		
7	Black Korhaan	Northern	*Afrotis*	*afraoides*		
8	Bokmakierie		*Telophorus*	*zeylonus*		
9	Bunting	Cape	*Emberiza*	*capensis*		
10	Bunting	Lark-like	*Emberiza*	*impetuani*		
11	Bustard	Ludwig's	*Neotis*	*ludwigii*	**EN**	**EN**
12	Canary	Black-headed	*Serinus*	*alario*		
13	Canary	Black-throated	*Crithagra*	*atrogularis*		
14	Canary	White-throated	*Crithagra*	*albogularis*		
15	Canary	Yellow	*Crithagra*	*flaviventris*		
16	Chanting Goshawk	Pale	*Melierax*	*canorus*		
17	Chat	Ant-eating	*Myrmecocichla*	*formicivora*		
18	Chat	Familiar	*Oenanthe*	*familiaris*		
19	Chat	Karoo	*Emarginata*	*schlegelii*		
20	Chat	Sickle-winged	*Emarginata*	*sinuata*		
21	Chat	Tractrac	*Emarginata*	*tractrac*		
22	Cisticola	Desert	*Cisticola*	*aridulus*		
23	Cisticola	Grey-backed	*Cisticola*	*subruficapilla*		
24	Clapper Lark	Eastern	*Mirafra*	*fasciolata*		
25	Courser	Double-banded	*Rhinoptilus*	*africanus*		
26	Crombec	Long-billed	*Sylvietta*	*rufescens*		
27	Crow	Pied	*Corvus*	*albus*		
28	Double-collared Sunbird	Southern	*Cinnyris*	*chalybeus*		
29	Dove	Laughing	*Spilopelia*	*senegalensis*		
30	Dove	Namaqua	*Oena*	*capensis*		
31	Dove	Red-eyed	*Streptopelia*	*semitorquata*		
32	Dove	Ring-necked	*Streptopelia*	*capicola*		
33	Dove	Rock	*Columba*	*livia*		
34	Eagle	Martial	*Polemaetus*	*bellicosus*	**EN**	**VU**
35	Eagle-Owl	Spotted	*Bubo*	*africanus*		
36	Eremomela	Karoo	*Eremomela*	*gregalis*		
37	Eremomela	Yellow-bellied	*Eremomela*	*icteropygialis*		
38	Falcon	Lanner	*Falco*	*biarmicus*	**VU**	**LC**
39	Finch	Red-headed	*Amadina*	*erythrocephala*		

No.	Common group	Common species	Genus	Species	Regional	Global
40	Fiscal	Southern	*Lanius*	*collaris*		
41	Flycatcher	Spotted	*Muscicapa*	*striata*		
42	Flycatcher	infuscatus	*Melaenornis*	*infuscatus*		
43	Goose	Egyptian	*Alopochen*	*aegyptiaca*		
44	Grebe	Little	*Tachybaptus*	*ruficollis*		
45	Grey Shrike	Lesser	*Lanius*	*minor*		
46	Grey-headed Sparrow	Southern	*Passer*	*diffusus*		
47	Heron	Black-headed	*Ardea*	*melanocephala*		
48	Hoopoe	African	*Upupa*	*africana*		
49	Kestrel	Greater	*Falco*	*rupicoloides*		
50	Kestrel	Rock	*Falco*	*rupicolus*		
51	Korhaan	Karoo	*Eupodotis*	*vigorsii*	**NT**	**LC**
52	Lapwing	Blacksmith	*Vanellus*	*armatus*		
53	Lapwing	Crowned	*Vanellus*	*coronatus*		
54	Lark	Fawn-colored	*Calendulauda*	*africanoides*		
55	Lark	Large-billed	*Galerida*	*magnirostris*		
56	Lark	Red	*Calendulauda*	*burra*	**VU**	**VU**
57	Lark	Red-capped	*Calandrella*	*cinerea*		
58	Lark	Sabota	*Calendulauda*	*sabota*		
59	Lark	Spike-heeled	*Chersomanes*	*albofasciata*		
60	Lark	Stark's	*Spizocorys*	*starki*		
61	Long-billed Lark	Karoo	*Certhilauda*	*subcoronata*		
62	Martin	Brown-throated	*Riparia*	*paludicola*		
63	Martin	Rock	*Ptyonoprogne*	*fuligula*		
64	Masked Weaver	Southern	*Ploceus*	*velatus*		
65	Mousebird	Red-faced	*Urocolius*	*indicus*		
66	Mousebird	White-backed	*Colius*	*colius*		
67	Palm Swift	African	*Cypsiurus*	*parvus*		
68	Paradise Flycatcher	African	*Terpsiphone*	*viridis*		
69	Penduline Tit	Cape	*Anthoscopus*	*minutus*		
70	Pied Barbet	Acacia	*Tricholaema*	*leucomelas*		
71	Pigeon	Speckled	*Columba*	*guinea*		
72	Plover	Three-banded	*Charadrius*	*tricollaris*		
73	Prinia	Black-chested	*Prinia*	*flavicans*		
74	Prinia	Karoo	*Prinia*	*maculosa*		
75	Quelea	Red-billed	*Quelea*	*quelea*		
76	Red-eyed Bulbul	African	*Pycnonotus*	*nigricans*		
77	River White-eye	Orange	*Zosterops*	*pallidus*		
78	Robin-Chat	caffra	*Cossypha*	*caffra*		
79	Sandgrouse	Namaqua	*Pterocles*	*namaqua*		
80	Scrub Robin	Karoo	*Cercotrichas*	*coryphoeus*		
81	Sparrow	Cape	*Passer*	*melanurus*		
82	Sparrow	House	*Passer*	*domesticus*		
83	Sparrow-Lark	Black-eared	*Eremopterix*	*australis*		

No.	Common group	Common species	Genus	Species	Regional	Global
84	Sparrow-Lark	Grey-backed	*Eremopterix*	*verticalis*		
85	Sparrow-Weaver	White-browed	*Plocepasser*	*mahali*		
86	Starling	Pale-winged	*Onychognathus*	*nabouroup*		
87	Starling	Pied	*Lamprotornis*	*bicolor*		
88	Starling	Wattled	*Creatophora*	*cinerea*		
89	Stilt	Black-winged	*Himantopus*	*himantopus*		
90	Stonechat	African	*Saxicola*	*torquatus*		
91	Striped Swallow	Greater	*Cecropis*	*cucullata*		
92	Sunbird	Dusky	*Cinnyris*	*fuscus*		
93	Swallow	Barn	*Hirundo*	*rustica*		
94	Swallow	White-throated	*Hirundo*	*albigularis*		
95	Swift	Common	*Apus*	*apus*		
96	Swift	Little	*Apus*	*affinis*		
97	Swift	White-rumped	*Apus*	*caffer*		
98	Teal	Red-billed	*Anas*	*erythrorhyncha*		
99	Thick-knee	Spotted	*Burhinus*	*capensis*		
100	Thrush	Karoo	*Turdus*	*smithi*		
101	Wagtail	Cape	*Motacilla*	*capensis*		
102	Warbler	Chestnut-vented	*Curruca*	*subcoerulea*		
103	Warbler	Layard's	*Curruca*	*layardi*		
104	Warbler	Rufous-eared	*Malcorus*	*pectoralis*		
105	Weaver	Scaly-feathered	*Sporopipes*	*squamifrons*		
106	Wheatear	Capped	*Oenanthe*	*pileata*		
107	Wheatear	Mountain	*Myrmecocichla*	*monticola*		
108	White-eye	Cape	*Zosterops*	*virens*		

APPENDIX 4: 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.

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, 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.

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): 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.

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.