ESTABLISHMENT OF A NEW ROADWAY TO SERVE KENHARDT PV FACILITIES

Terrestrial BioDiversity Assessment of the proposed road routing serving Kenhardt PV facilities, Kenhardt, Northern Cape Province

S C Bundy BSc MSc (Pr.Sci. Nat.)
SDP Ecological and Environmental Services cc

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CAPE EAPRAC/SCATEC SOLAR

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TERRESTRIAL BIODIVERSITY ASSESSMENT
ROAD ESTABLISHMENT ON FARM ONDER RUGZEER, KENHARDT PV FACILITIES, NEAR KENHARDT NORTHERN CAPE
Rev 01

Contents

Compilation Date	December 2020. January 2021
Client	CapeEAPrac
Compiled by	S C Bundy / LP Maingard
Company	SDP Ecological and Environmental Services
Contact details	P O Box 1016, Ballito, 4420
Telephone	032-586 1218
E mail	simon@ecocoast.co.za
Reviewed by	A M Whitehead (Pr. Sci. Nat.)
Front page image	Image showing portion of proposed road

Acronyms and Abbreviations / Terminologies

BA	Basic Assessment
CSIR	Council for Scientific and Industrial Research
Cape EAPrac	Cape EAPrac – Environmental Assessment Practitioners
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
Mesic	Dry land. Land that is neither aquatic or "wetland"
NEMA	National Environmental Management Act 1998
NFEPA	National Freshwater Ecological Programme
PCA	Principle Component Analysis. Statistical method of identifying variation within data
SANBI	South African National Biodiversity Institute
Transect	A "cut" or length over which sampling of a portion of ground or similar environment is undertaken
TWINSPAN	Two Way Indicator Species Analysis. Statistical method of identifying similarities within data
Veld type	Vegetation or habitat form
Wetland	An area of land intermediate between aquatic and mesic environments

EXECUTIVE SUMMARY

Scatec Solar wish to construct a hard panned roadway to be located on the Rem and Ptn 4 of the Farm OnderRugzeer No. 168, some 10 kilometres northeast of Kenhardt, in the Northern Cape. The roadway will serve 6 photovoltaic facilities on the Farm Onder Rugzeer, which have been approved by the Department of Environmental Affairs between 2017 and 2020. The proposed new roadway will provide improved access to these PV facilities and avoid the present route that traverses the farm. The existing earthen roadway has been identified as having both environmental and engineering constraints. As part of the requisite basic assessment process being undertaken by Cape EAPrac, on behalf of Scatec Solar, a terrestrial biodiversity assessment has been undertaken to inform and guide the basic assessment process. The salient outcomes of this assessment are:

1. The road route and subject area fall within Bushmanland Arid Grassland veld type, a habitat form of low conservation significance, with occasional larger, woody specimens and rocky promontories. As such the road route avoids habitat of ecological significance.

2. The proposed route avoids the traversing of significant drainage features or watercourses and can, through suitable planning avoid any botanical aspects that may be present on the property.

3. Impacts on faunal communities and ethos within the site are considered to be low as a consequence of the establishment of the proposed road, subject to the implementation of suitable mitigation measures.

4. The roadway interfaces with an identified ecological support or ESA (corridor) at its junction with the R383, however the impact of the roadway on the ESA is considered to be of little consequence, as the R 383, an existing public roadway lies to the north of the ESA.

STATEMENT

It is contended that the establishment of the proposed roadway on the Farm Onder Rugzeer, in conjunction with the approved photo voltaic facilities on the site, is unlikely to give rise to any significant, negative ecological impacts and is considered to be a more appropriate route than the existing farm roadway. In addition, the implementation of a number of mitigation measures, including the decommissioning of the existing farm roadway, would ameliorate or redress possible impacts. It follows that there is no reason, based on site specific ecological factors, to preclude the establishment of the proposed road,

PARTICULARS OF AUTHORS/ECOLOGISTS

NAME Simon Colin Bundy. BSc. MSc Dip Proj Man
DATE OF BIRTH 7 September 1966
MEMBERSHIP OF PROFESSIONAL BODIES : South African Council of Natural Scientific Professionals No. 400093/06 – Professional Ecologist ; Southern African Association of Aquatic Scientists

KEY COMPETENCIES AND EXPERIENCE

Simon Bundy has been involved in environmental and development projects and programmes since 1991 at provincial, national and international level, with employment in the municipal, NGO and private sectors, providing a broad overview and understanding of the function of these sectors. From a technical specialist perspective, Bundy focusses on coastal and xeric ecological systems. He is competent in a large number of ecological and analytical methods including multivariate analysis and canonical analysis. Bundy is competent in wetland delineation and has formulated ecological coastal set back methodologies for EKZN Wildlife and Department of Environmental Affairs. Bundy acts as botanical and environmental specialist for Eskom. Based in South Africa, he has engaged in projects in the Seychelles, Mozambique, Mauritius and Tanzania as well as Rwanda, Lesotho and Zambia. Within South Africa , Bundy has been involved in a number of large scale mega power projects as well as the development of residential estates, infrastructure and linear developments in all provinces. In such projects Bundy has provided both technical support, as well as the undertaking of rehabilitation programmes.

SELECTED RELEVANT PROJECT EXPERIENCE

Ecological investigations for numerous renewable energy projects, including “Kalbult”, “Dreunberg”, “jUWI”, “Kenhardt Pv1 - 6”, “Solar Capital 2 and 3” and “Lindes”.

Ecological investigations Tongaat and Illovo Desalination Plants : CSIR – (2013 - 2016)

Ecological investigations and Rehabilitation Planning : Sodwana Bay :iSimanagaliso Wetland Park Authority – (2014 - 2018)

Ecological evaluation and monitoring: Plastic pellet (nurdles) clean-up MSC Susanna Marine Pollution Event : West of England Insurance, United Kingdom (2018 - 2020)

PUBLICATIONS

Over a dozen scientific publications and numerous popular articles and contributions to books and documentaries in local and international journals

NAME Luke Patrick Maingard BSc (Hons)
PROFESSION BSc (Hons) Candidate Ecologist / Environmental Assessment Practitioner
DATE OF BIRTH 15 September 1993
MEMBERSHIP OF PROFESSIONAL BODIES: South African Council of Natural Scientific Professionals– Candidate Ecologist (registration number 116639)

KEY COMPETENCIES AND EXPERIENCE

Luke Maingard is a candidate ecologist with 4 years of experience in the field and undertaking various assessments. Maingard has a core competency in the delineation and assessment of wetland environments as well as a focus on terrestrial environments, particularly coastal habitats.

SELECTED RELEVANT PROJECT EXPERIENCE

Ecological investigations for numerous renewable energy projects, including “West Lunga, Zambia”, Kenhardt PV 4-6

Ecological and wetland delineations for inter alia Seaton Estate, uMzimkhulu offset project, Vryheid roadways

1. INTRODUCTION

Cape EAPrac are the appointed environmental assessment practitioners evaluating the proposed establishment of a new, hardpanned roadway to be located on the Farm Onder Rugzeer No. 168, some 10 kilometres northeast of Kenhardt, in the Northern Cape (Figure 1) (GPS 29°14' 01"E 21°17'52"S). Within the Farm Onder Rugzeer, 6 photovoltaic facilities have been approved by the Department of Environmental Affairs, for establishment by Scatec Solar, the developer.

Scatec Solar have however, identified that existing road infrastructure serving the five southern sites is not adequate for construction and operation purposes and presently lies within or proximal to a watercourse that traverses the property. Scatec Solar therefore wish to establish a new roadway that would serve the PV facilities and effectively traverse the length of the Farm Onder Rugzeer.

The establishment of a roadway at the specifications described below, elicits the requirement for the submission of a basic assessment in terms of R327 of the National Environmental Management Act. This report presents the results of the ecological assessment of the proposed road route, with recommendations on various options to be employed in the planning and construction of the roadway, for consideration and incorporation into the requisite basic assessment.

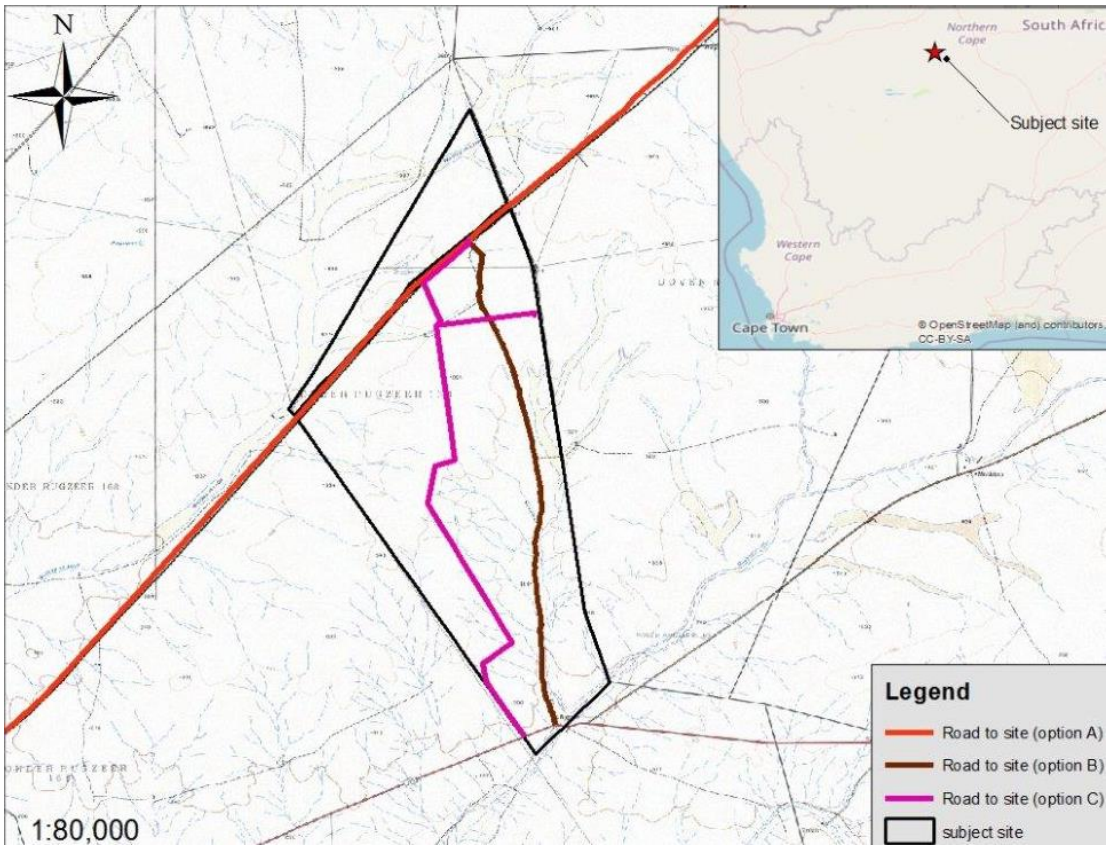

Figure. 1 Topographic map showing Farm Onder Rugzeer and proposed roadways. Option C is the proposed "new roadway".

2. DESCRIPTION OF PROPOSED ACTIVITY

Figure 1, presents the routing of the proposed new roadway (Option C). In addition, two alternative road routes are presented, these being:

1. An existing roadway termed the "Transnet road" (Option A) which would allow access to some of the PV sites but would not effectively serve the balance of the facilities

2. The existing farm road which traverses the farm (Option B). As indicated, this roadway is an earthen route that does not effectively align with the approved PV facilities and lies in part, within a watercourse.

The proposed "new" roadway, is identified below and would be of the following specifications:

- Approximately 10 kms in length, with an additional 1.5km of road that would serve two separate PV facilities namely PV 2 and PV 3.
- A width of 12m
- Comprise of a sub-base, sub-surface and base course of materials that would establish a hardpanned surface

Where required, fordings will be established across drainage features or similar areas.

3. METHODOLOGY

In pursuance of the above, SDP Ecological & Environmental Services undertook the following activities in the compilation of this report.

1. A desktop review of the site using recent aerial imagery (Google Earth).

2. Field reconnaissance of the route and surrounding area was undertaken on 3 and 4 December 2020,whereby the general landscape and landscape features were considered. The assessment was therefore carried out in the early summer. Although rainfall peaks in the period February to March, a significant drought prevails in the region and it is considered that the period of assessment is a suitable and representative period in which to determine issues relating to terrestrial biodiversity (summer).

3. In addition, the proposed route was traversed on foot and specific consideration was given to the presence of specific flora and where relevant, faunal components that may be present proximal to the proposed route.

4. All data relating to the site was logged and recorded using a handheld GPS.

5. As a linear development, the reconnaissance activities related to:
   a. The option of avoiding specific ecological features located proximal to the proposed road routing
   b. The nature and structure of the data / plant communities across site in general.
   c. Any anomalies that may be noted within the information collated

6. From interpretation of the above results and the observations undertaken at site, the nature of the habitat within and adjacent to the route was evaluated from an ecological perspective, which included the suitability of the route for the proposed activity.

7. Consideration was given to the identification of aquatic and wetland systems at a preliminary level during the site reconnaissance. As explained below, the use of geohydromorphic soil indicators, as well as other physical indicators, as per the Guidelines for the Delineation of Wetlands (DWAF 2005) were not considered an effective means of determining such environments.

8. As such, watercourses were determined through the use of primarily geomorphological features such as actively eroding embankments and channels, alluvial deposits and flood terraces. Vegetation was considered a secondary feature for no *de facto* hygrophilous or riparian vegetation was identified on site.

A distinction was made between watercourses and "dendritic drainage", the latter being features that do not necessarily show the geomorphological characteristics of a watercourse as described above, but may possibly channel minor flow during extreme rainfall events. These features are not always the product of flow, but may arise from the passage of livestock, geological controls or anthropogenic interventions. As such, they are not classified as watercourses and are termed "dendritic drainage". Clowes, et al. (1987) recognised "rills" and "gullies" as the initial, "small-scale channels carved out by the flow of water". These features according to these authors are "temporary features" and where they merge, lead to the formation of gullies.

4.REGIONAL ECOLOGICAL PERSPECTIVE OF THE AREA

The Kenhardt region can generally be considered to experience a low annual rainfall of less than 200 mm (SA Weather Services, 2020) although the recorded average rainfall for the period 2000 to 2012 approximates 238 mm within an average of 51 rain days per year (www.worldweatheronline.com). As such the area has been described as a "semi-arid region" (Bailey 1979). Using the Koppen-Geiger climate classification method (www.koeppen-geiger.vu-wien.ac.at), the area is classified "BWh", which refers to an *arid hot environment*. This is supported by Esler *et. al.* (2006) who have defined areas with an annual rainfall of less than 200 mm as being "deserts". This *desert* status may be the case in the Kenhardt region under its lower rainfall periods. Notably, rainfall in the Kenhardt region has remained extremely low for nearly a decade, with the recorded rainfall in 2020 being just under 60mm (Figure 2), which is significantly low, compared to the average annual precipitation of the previous decade. As such, the state of the region at the time of investigation can be considered to be approximating "hyper arid" (www.wad.jrc.ec.europa.eu/patternsaridity)

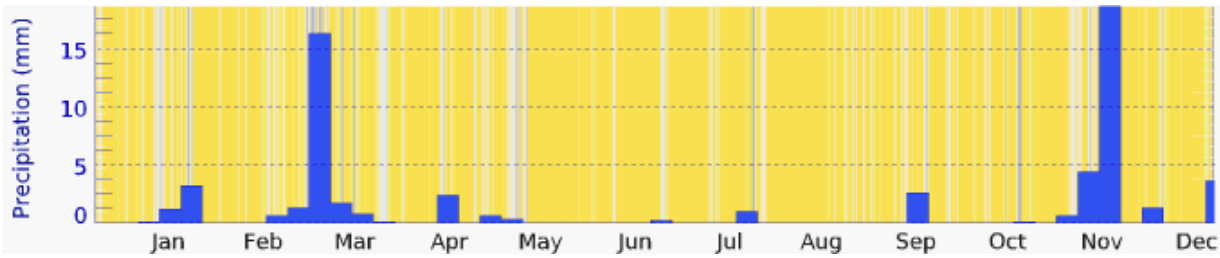

Figure 2. Graph showing rainfall in Kenhardt for the period January 2020 to December 2020. (Source : Meteoblue)

In addition, the highest annual temperatures for the region are recorded between January and February, with average maximum temperatures being 37˚C (www.worldweatheronline.com). Extreme temperatures thus coincide with the peak rainfall period in March. Such correlation may give rise to the low groundwater recharge rates projected for the region, this being estimated at approximately 0.03 mm / annum. (Musekiwa and Majola, 2011). The availability of groundwater in the Kalahari and Karoo of north western South Africa is a significant driver in the regional ecology of these areas and is a major determinant of vegetation communities.

The Farm Onder Rugseer and the study area can be described as a generally level portion of land, with a low gradient, straddling the watershed between two *non perennial* drainage features. To the west of the site, drainage is towards a shallow feature known locally as "Wolfkopse Loop" and to the east, towards the Rugsrivier (Figure 3). Both drainage systems eventually serve the Hartebeest River, which in turn serves

the Sout River and Orange River systems. The proposed roadway and much of the extent of the PV facilities lie along this watershed between the two systems.

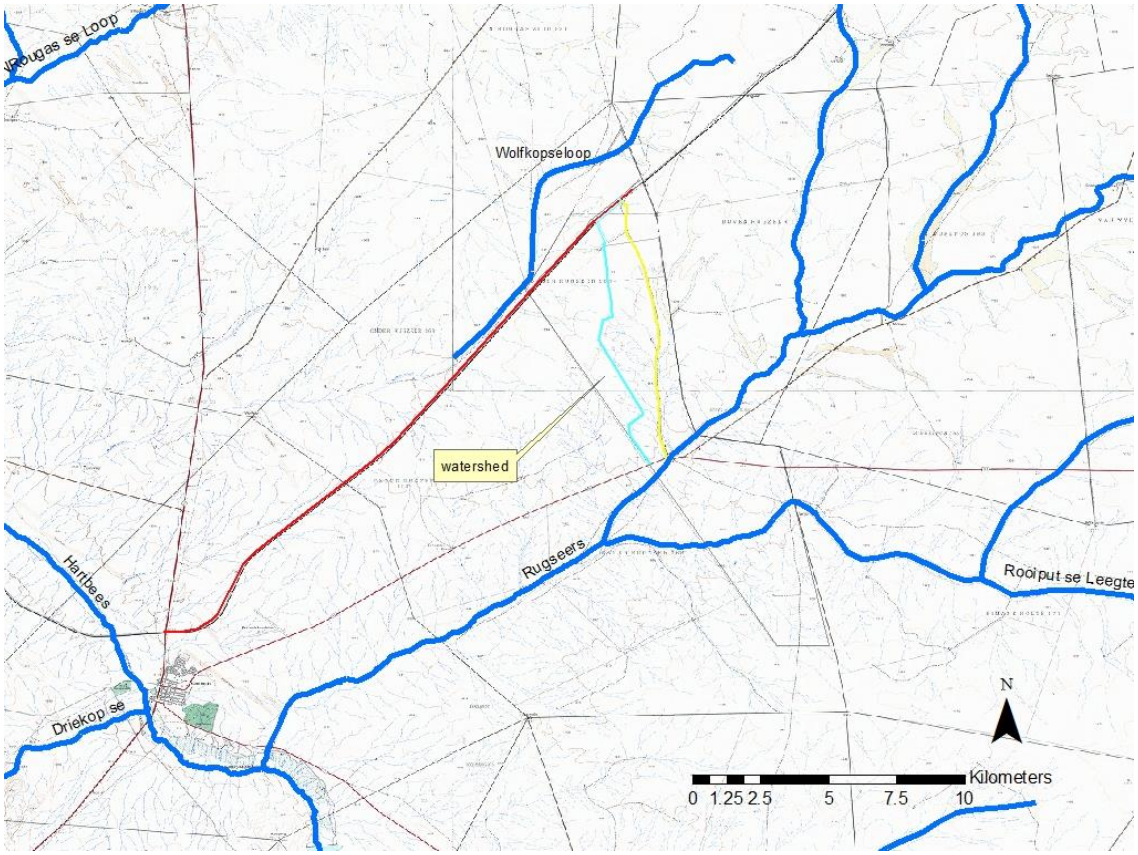

Figure 3: Map indicating drainage lines associated with the Kenhardt PV project area, including the two catchments of Wolfkopseloop and Rugseers River.

According to Mucina and Rutherford's veld type classification of 2006, Kenhardt and surrounding regions fall within the Bushmanland Arid Grassland veld type (NKb3). This veld type is located extensively south of the Orange River, but may include a number of smaller habitat forms, such as lithic outcrops or kopjies comprising of quartz and dolerite, within its broader extent.

With the above in mind, the most definitive physical drivers of the Bushmanland Arid Grassland veld type that lies within the study area, are meteorological in nature and will relate to surface and subsurface hydrology. Other physical drivers will include localised geologies and edaphics, while wind may also play a significant role in more arid portions of the region. Figure 4 below indicates the study area in relation to this veld type.

The Northern Cape Critical Biodiversity Area (CBA) map for the region is presented in Figure 5. This map indicates that much of the Farm Onder Rugseer lies outside of any area deemed to be of conservation value, howsoever, in the south, the farm and road interface with an ecological support area associated with the Rugseers River.

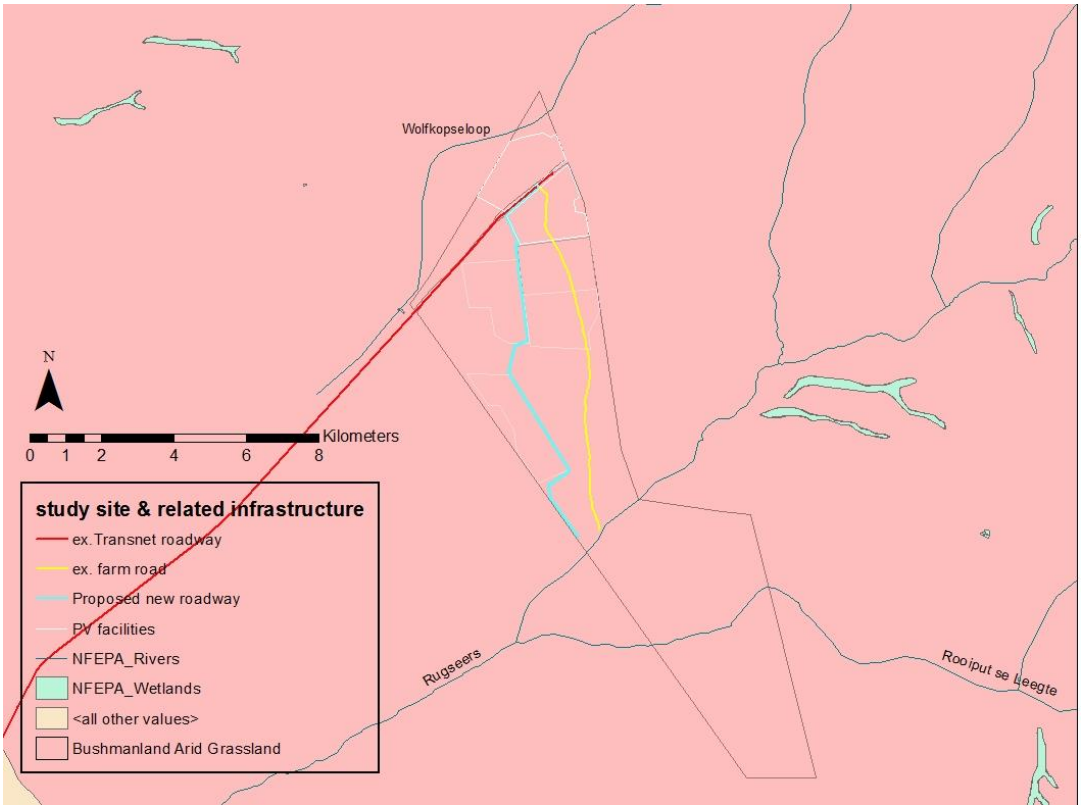

Figure 4 Map image showing roadway and prevalence of Bushmanland Arid Grassland across site, as well as wetlands and river features associated with region.

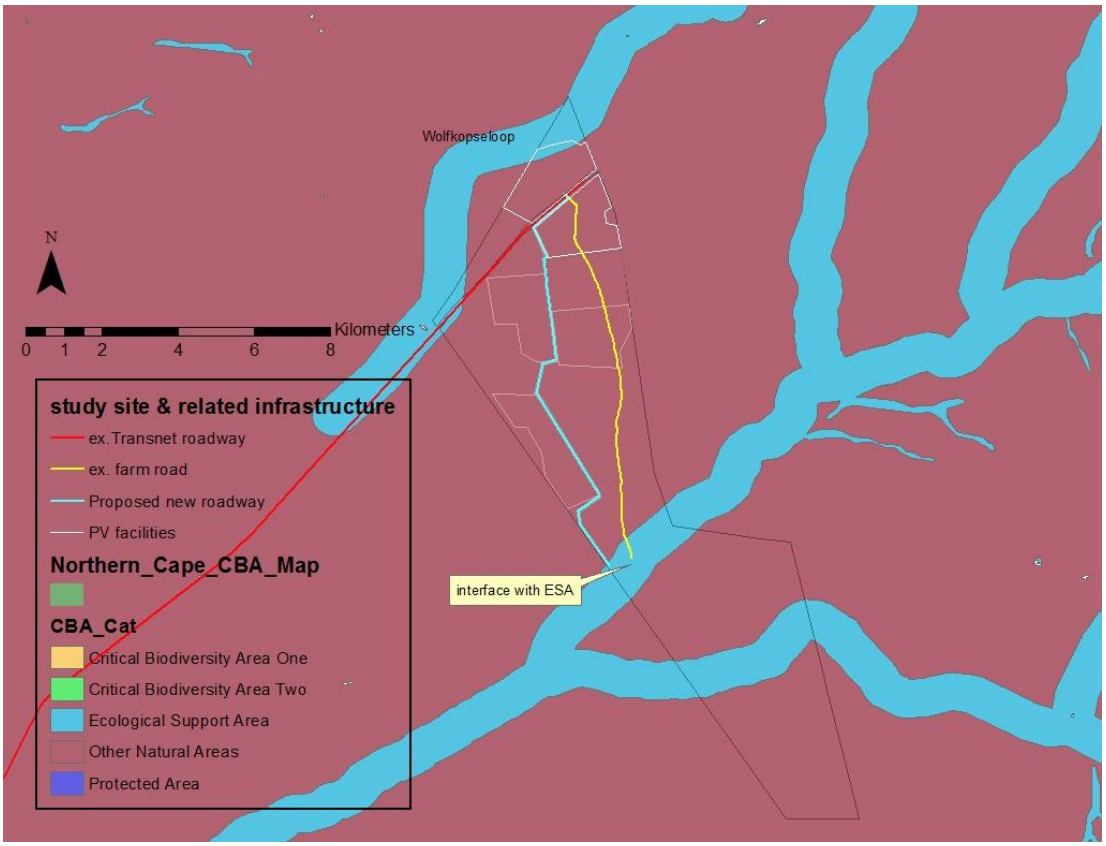

Figure 5 Map image showing Northern Cape CBA data and the interface of the roadway with the identified ecological support area.

5 SITE SPECIFIC EVALUATION

1.3.1 Habitat and Vegetation

The proposed new roadway bisects the Farm Onder Rugseer and extends from the Sishen – Saldanha railway line and its associated support road, located in the north to the R383 in the south. The roadway lies ostensibly upon the watershed that divides the catchment of the Rugseer Rivir, which drains to the south, from that of the northward draining Wolfskopseloop (Figure 6). Figure 6 indicates the proposed route of the roadway and as depicted, little in the way of significant drainage features are associated with the proposed roadway. In this particular region, hydrological flow would be primarily associated with sheet flow scenarios under heavy precipitation events, with drainage being ostensibly overland, before entering into defined watercourses and gullies.

Figure 6 also indicates a number of rills or erosion points that are associated with the area. Together these rills present "dendritic drainage systems" , which as described above, can be temporary in nature and may also be the product of other factors, such as the movement of livestock. Evidently these features have not been considered to be of hydrological significance and are not identified as presenting the features associated with a watercourse. Figure 7 below shows an image of typical dendritic drainage identified on site.

The northern portion of the site can be described as comprising of gently grading quartz dominated lands dissected by three major drainage features which serve the Wolfkopseloop drainage line (Figure 6). The establishment of the Sishen – Saldanha railway and supporting infrastructure has served to transform drainage patterns, relative to the south, where flow into the Rugseerivier is more free-draining only impeded by the P 383. The establishment of the railway line has thus had a minor impact on surface hydrology on site, effectively altering the localized hydrology on the site in this area.

In general, the area Farm Onder Rugseer presents a level terrain, with the proposed roadway aligning along much of the existing fencelines dividing camps within the property, as well as existing roadways. As such, much of the route can be described as "transformed". Existing roadways and fences associated with the operations of the farm have served to alter bio physical states along the proposed road route . Along the central watershed, soils comprise of a compact sand, with occasional calcrete or quartz exposures. As such, much of the route does not exhibit any significant variation in topography, with the exception of the minor points of dendritic drainage. Vegetation cover is sparse across much of the route (Figure 8), with simple monospecific or bispecific communities being evident, a described below.

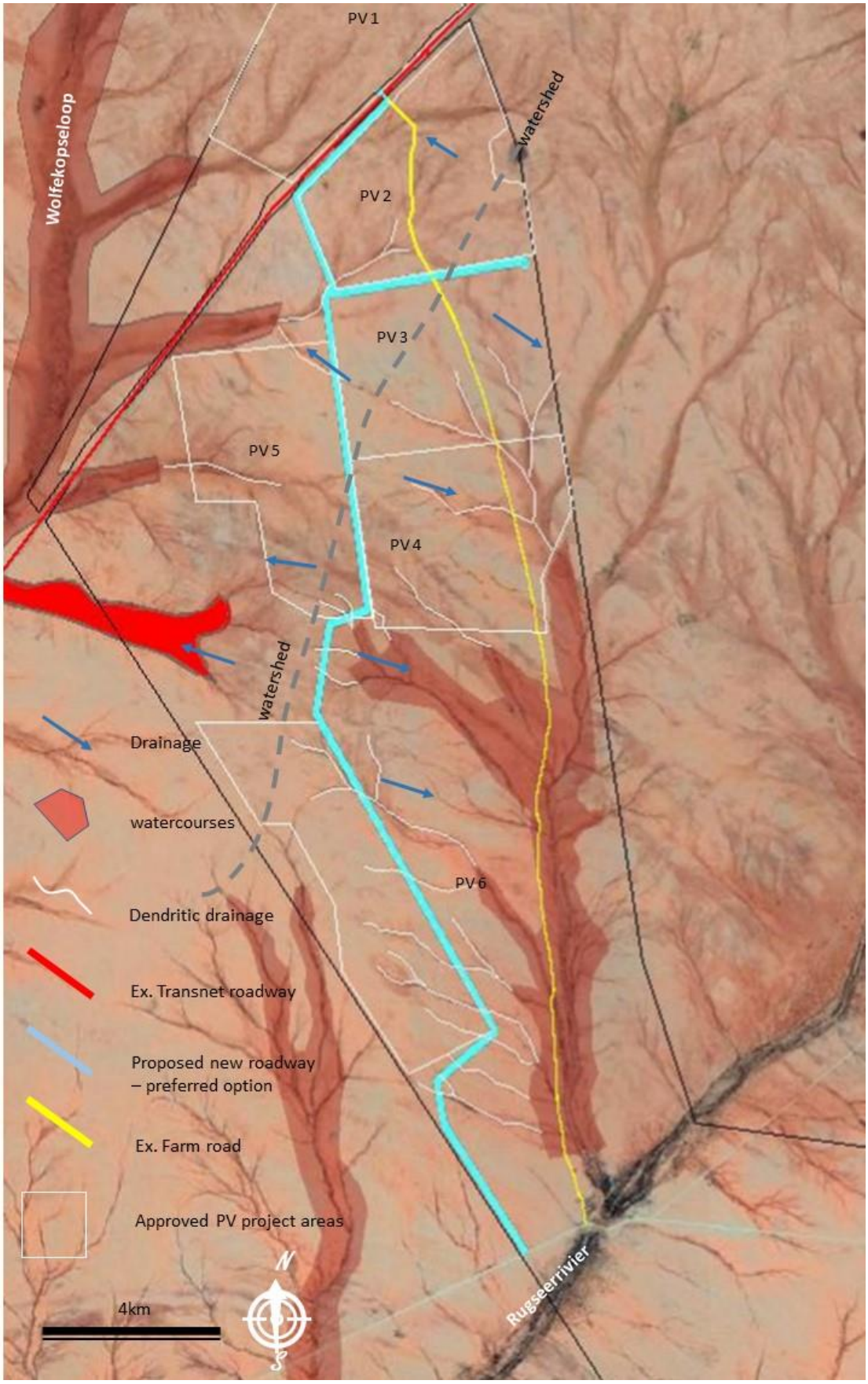

Figure 6 Map image showing preferred road routing across Farm Onder Rugseer and related factors.

Figure 7. Image indicating nature of dendritic drainage or rills within subject site.

Figure 8. Sparse vegetation cover is encountered along the proposed route

Vegetation

On account of the significant drought that has prevailed for some time within the region, as well as the extensive grazing of livestock on the property, much of the proposed route remains ostensibly devoid of vegetation (Figure 8, above). The dominant vegetation form along the route comprises primarily of a *Rhigozum trichotomum* associes, and at points the graminoids *Schmidtia pappophoroides* and *Stipagrostis ciliata.* A list of species located in or proximal to the proposed road route is presented in Table 1, below.

Table 1. List of Observed Species within the Study Site.

Species	Conservation Significance	
	NC NCA *	NFA#
Acacia mellifera		
Aizoon elongatum		
Aloidendron dichotoma	X	
Aptosimum spinescens		
Aristida ascensionis		
Aristida congesta		
Asparagus suaveolens		
Boscia albitrunca		X
Cadaba aphylla		
Chrysocoma ciliata		
Enneapogon scaber		
Datura ferox		
Enneapogon cenchroides		
Eragrostis nindensis		
Eriocephalus encoides		
Euphorbia glanduligera		
Euphorbia stellispina		
Lyceum cinereum		
Mesembryanthemum guerichianum		
Pentzia spinescens		
Prosopis glandulosa		
Rhigozum trichotomum		
Riccia albornata		
Salsola tuberculata		
Schmidtia pappophoroides		
Stipagrostis ciliata		
Tetragonia arbuscular		
Tribulus cristatus		
Tribulus pterophorus		

*NC NCA = Northern Cape Nature Conservation Act (1998)
#NFA = National Forest Act (1998) Protected Trees

Notable is the presence of two listed trees, namely *Aloidendron dichotoma* and *Boscia albitrunca*. These species do not generally form within vegetative associations and are evidently, randomly scattered across the subject properties. They are however, slow growing, and clearly tolerant of extended drought periods, being ecological keystone species within the broader veld type and of conservation importance. These specimens have been mapped along the routing. Figure 9 shows that four specimens of protected species lie proximal to the road route, however they would not generally be disturbed by the roadway, which would pass within 24 to 50 m of the most proximal specimen, dependent upon the final route employed. While

Aloe claviflora, another listed species from the area has been noted to the north of the railway line and proximal to the existing farm road.

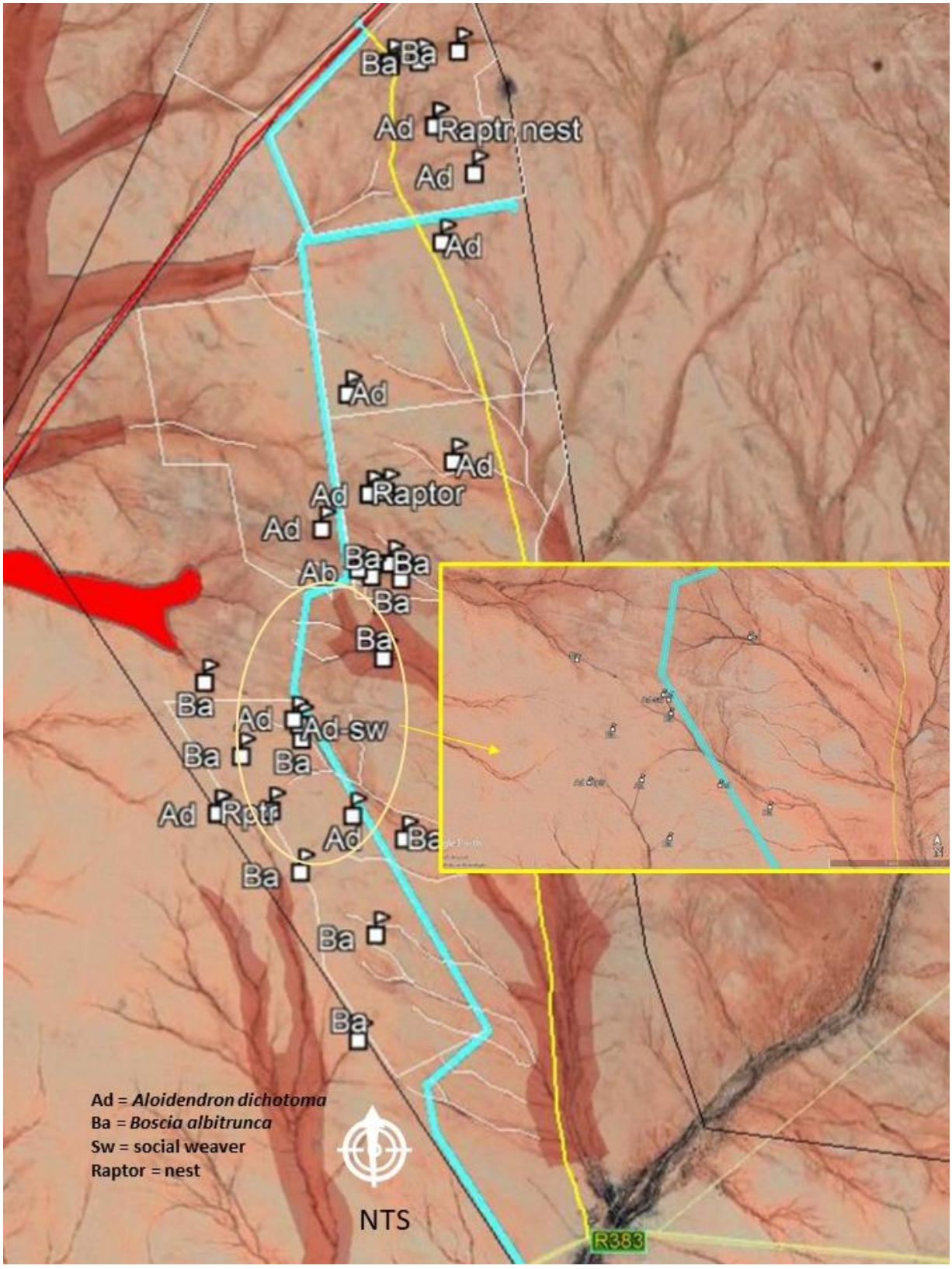

Figure 9. Image showing proximity of *A. dichotoma* (Ad) and *B albitrunca* (Ba) to proposed road route. A social weaver nest (*Philetairus socius*) (sw) is associated with one of the *A. dichotoma* specimens

Figure 10. *A. dichotoma* proximal to road route on PV 2.. Note stick nest within branches.

Fauna

Terrestrial fauna common to the site are considered to be typical of this xeric environment, with limited habitat variation across the study area. Table 2 below indicates species or evidence of their presence observed on the site and surrounds, between 2016 and 2020 and includes other species that are likely to be encountered. The occurrence of such species is likely on account of these animals either utilizing the route as refugia or as part of a wider foraging range or territory. As is typical of the region, a large number of fossorial and burrowing species, including mammals and invertebrates, have been identified across the site in general. Such species included suricates (meerkat) (*Suricata suricata*) and ground squirrel (*Xerus inauris).* These species live in mutual habitation within active burrows. In addition, foraging excavations indicating the presence of Aardvark (*Orycteropus afer*), as well as the porcupine (*Hystrix africaeaustralis*) are evident.

Other larger mammals noted on site include Springbok (*Antidorcas marsupalis),* which are prevalent across the area and may be accompanied by Steenbok (*Raphicerus campestris*), which are also common in the region and open habitat (Estes, 1992).

Most larger mammals located within the subject site are not reliant upon the study area in particular and are likely to forage over extensive ranges that extend well beyond the study area and the Farm Onder Rugseer.

Reptiles common to site are more sedentary and exclusive to particular features (Figure 11), in particular stone outcrops and larger woody specimens, such as *B. albitrunca*. The avoidance of these features in the planning and construction of the roadway would avoid disruption of such refugia. Table 2 presents a list of fauna identified and / or anticipated to be associated with the site.

Figure 11. Bibron's gecko identified around rock outcrops on site (*Chondractylus bibroni).*

As indicated above, nests of larger raptor species were identified in a number of *A dichotoma*. Upon inspection it was found that all nests had been recently abandoned with no fledglings in occupancy. Howsoever, one *A dichotoma* did present a family of Lanner Falcon (*Falco biarmicus*), - two adults and two juveniles. Some of the nests encountered, constructed of stick materials, would be consistent with this species. Other nests identified within *A dichotoma* are probably associated with the Chanting Goshawk (*Melierax canorus*), which also constructs nests of stick, but such nests are larger than that of *F biarmicus*, and the remains of small mammals, essentially prey items at the nest, would be consistent with *M canorus*.

Table 2. List of Terrestrial Species identified within and around Site and likely to be Present within the Region/Site. Species of Conservation Importance identified.

		Observations	**TOPS (2007)**	**Cons. Importance (IUCN) ***
Mammals				
Orycteropus afer	Aardvark	Foraging evidence?		LC
Felis nigripes	Black-footed cat	Observed – roadkill		VU
Atelerix frontalis	South African hedgehog	P.com Orven	Protected	LC
Canis mesomelas	Black back jackal			Not listed
Xerus inauris	Cape ground squirrel	Observed		Not listed
Lepus capensis	Cape hare	Observed		Not listed
Felis caracal ?	Caracal ?	Remains of prey		Not listed
Procavia capensis	Rock dassie	Observed		LC
Suricata suricatta	Meerkat	Observed		LC
Aethomys namaquensis	Namaqua rock mouse			Not listed
Hystrix africaeaustralis	Porcupine	Observed ?		LC
Antidorcas marsupalis	Springbok	Observed		LC
Raphicerus campestris	Steenbok	Observed		LC
Cynictis penicillata	Yellow mongoose	Observed		LC
Reptiles				
Ptenopus spp	Barking gecko			LC
Naja nivea	Cape cobra			Not listed
Chondrodactylus angulifer	Giant ground gecko			LC
C bibronii	Bibrons gecko	Observed		LC
Cordylus spp	Girdled lizard		Protected	*C cataphractus* ; - VU
Psammobates tentorius	Karoo tent tortoise			Not listed
Geochelone pardalis	Leopard tortoise	Observed		Not listed
Bitis arietans	Puff adder			Not listed
Nucras ornata	Ornate sand lizard	Observed		Not listed
Agama makarikarica	Spiny agama	Observed		Not listed
Amphibians				
Tomopterna cryptotis	Tremolo sand frog			LC
Invertebrates				
Locustana pardalina	Brown locust	Observed		Not listed
Pterinochilus spp	Baboon spider		Protected	Not listed
Seothyra spp	Buckspoor spider			Not listed
Family Vespidae	Various wasps	Observed		
Opistophthalmus spp	Burrowing scorpions?	Burrow entrance ?	Protected	Not listed
Parabuthus spp	Parabuthid scorpion		Protected	Not listed
Hodotermitidae	Termite			Not listed

TOPS – Threatened or Protected Species GN R151 of the National Environmental Management: Biodiversity Act (Act 10 of 2004) ; IUCN – International Union of Conservation Networks :*. LC = Least concern; NT = Near threatened; VU = Vulnerable; EN = Endangered CR = Critically Endangered; EW = Extinct in the wild; NE = not evaluated; DD = data deficient

Overview of ecology of route of proposed roadway

As can be determined from the above, much of the Farm Onder Rugseer is typical of the prevailing habitat form associated with the Bushmanland Arid Grassland veld type. Specific anomalies are however, present across the property, these being quartz and to a lesser extent dolerite kopjies or outcrops that form sites of suitable refugia for fauna and may also offer suitable strata for botanical species such as *Lithops sp*. Such areas are of ecological significance. In addition, large, singular specimens of species such as *A. dichotoma* and *B. albitrunca* also play a functional, localized and broader ecological role.

Given the above, these factors have formed the key factors in determining the proposed routing of the roadway. For this reason the route proposed for the new roadway aligns with a number of physical factors that are considered to be appropriate for such infrastructure while avoiding the abovementioned features. Key ecological considerations in determining the route are::

1. The route aligns primarily across the watershed that divides the two catchments of the Rugseerrivier and Wolfekopseloop.

2. The route avoids any significant watercourses associated with the subject property, or beyond.

3. The route aligns with existing fencelines and roadways which can be considered to be primarily transformed portions of the site.

4. The route aligns in general, with the perimeter of approved PV facilities on the farm, where the intention of the roadway is to service such facilities.

The abovementioned features are presented in Figure 12 below and indicate that the road route ostensibly avoids ecologically important features. Notably, a small area has been identified along the proposed route that aligns with an area of deep, sandy soils. While habitat form and structure may remain relatively depauperate in this area, it is recommended that the road alignment be shifted slightly northward (approximately 40m) to avoid these soils.

Further to the above, Figure 5 above, indicates that the road route interfaces with an identified ecological support area (ESA). Evidently, this area has been identified on account of its association with the Rugseer Rivier. As such the impact of the proposed "new" road way on this ESA corridor is considered to be minimal, primarily on account of the fact that the new roadway would intersect with the R 383 which lies to the north of the ESA. As such, the new roadway would not affect the ESA, nor would it reduce its function.

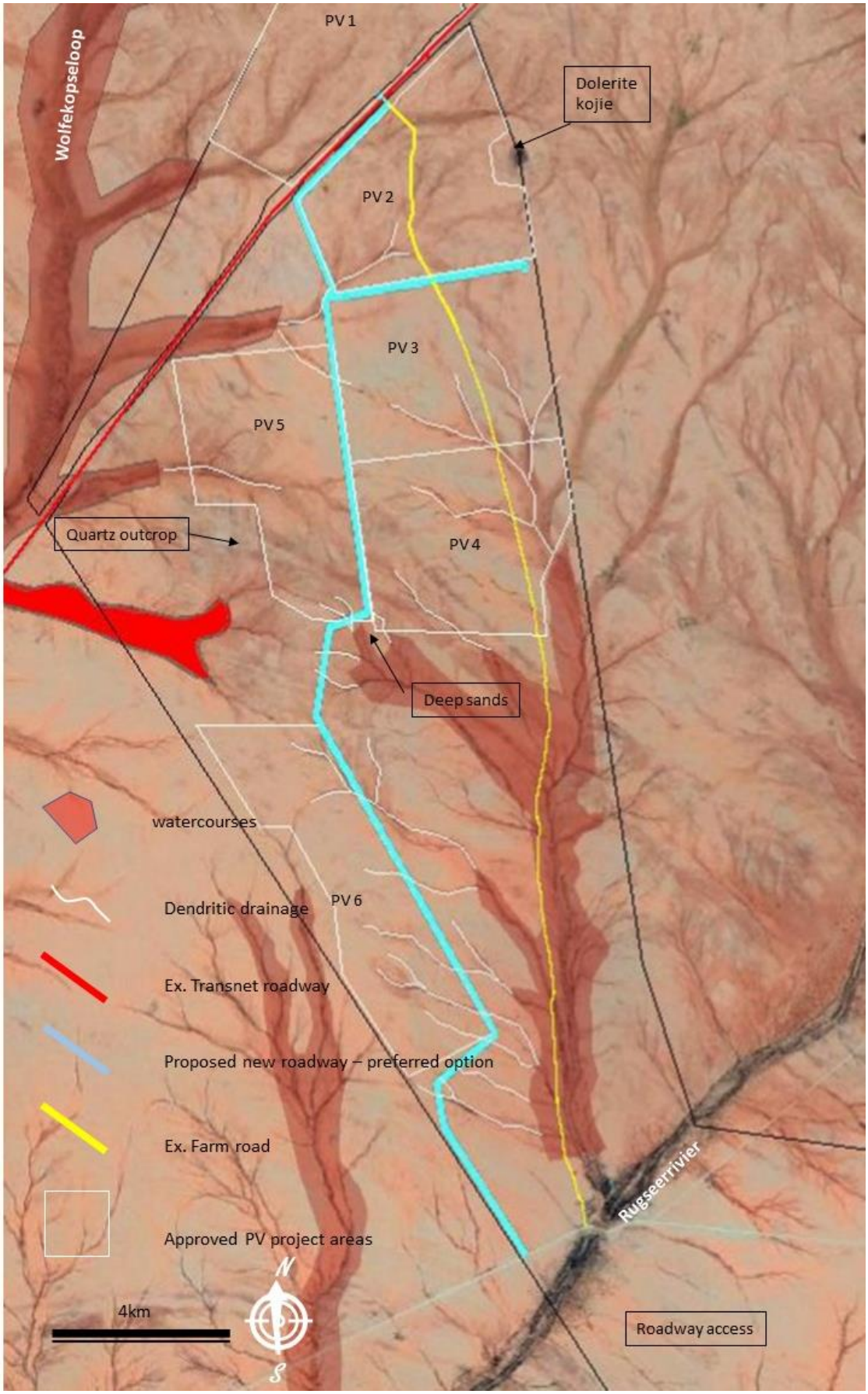

Figure 12 Map showing ecologically important features and areas of deep sands along route.

6. IMPACT EVALUATION

The construction of the proposed roadway lies primarily along a route that encompasses a number of transformed landforms, including existing earthen roads, fencelines and related features; while looking towards the future, the roadway would traverse within lands approved for the establishment of 5 photovoltaic facilities.

The construction of a roadway as envisaged is not expected to elicit significant volumes of traffic, even under the construction phases of the project(s), while due to the level terrain, significant excavation and change in surface topography is unlikely to arise. Therefore with the construction of the roadway the following general ecological impacts can be expected:

1. **Alteration of the local hydrological regime**, associated with factors such as percolation, surface flows and erosion. It can be anticipated that both the construction and operational stages will contribute to changes in the surface hydrology within the road route and on adjacent lands.

2. **Sediment transport**: During construction of the roadway some excavation of materials can be anticipated which would result in variation (expected to generally be an increase) in sediments and related materials accumulating proximal to the roadway. Following construction, some minor and localized variation in aeolian sediment transport can be expected in and around the roadway.

3. **Alteration of habitat**: The construction and post construction stages of the road will alter the physical ecological drivers adjacent to and proximal to the roadway. Such change in these master factors would primarily relate to changes in sediment transport and the concentration of both surface flows in and around the road. More latent change, including 'heat factor's may also give rise to the alteration of habitat. It can be anticipated that the construction and operations of the roadway, will improve plant – water relations in the immediate vicinity of the structure and give rise to a more vegetated habitat along the roadway.

4. **Alteration of faunal ethos:** The roadway will effectively bisect the watershed between the two catchments identified. As a consequence of its establishment localized fauna may be ousted from the immediate vicinity on account of changes in the physical nature of the area (hardpan), increased activity by workers and later movement of traffic, as well as other factors. Alternatively, some species may benefit from the presence of the roadway, particularly if improved vegetation arises along the route or the structure benefits species such as in foraging activities or the establishment of refugia. Such change has broader but more latent ecological effects.

Other factors that may be of consideration but perhaps are of less significance are:

4. **Spillages and general run off**: During construction and at random periods during the operation of the roadway, ostensibly minor spills of materials, in particular hydro carbons or other liquids used in construction and operations of a PV facility may arise along the roadway. Such materials, may on account of their specific chemistry pose an immediate and localized threat to the immediate environment around the roadway.

5. **Road mortalities**. The movement of traffic may, under some circumstances lead to the death or injury of wildlife that moves onto the roadway. Animals with nocturnal and crepuscular behaviour are particularly prone to collisions. Such species in particular Testudinidae or tortoise, are likely candidates for traffic collision across the road route.

6. **Electrical light pollution**. While only smaller portions of the PV facilities may be under illumination at night, traffic along the route may pose an intermittent source of light pollution (ELP).

7. **Noise and related "nuisance" factors**. The general increase in human and vehicular movement along the roadway will serve to possibly discourage fauna from in and along the road route. Such responses are related to the impact 4, discussed above.

Cumulative issues

Determination of "cumulative impacts" would prove to be a difficult issue to factor. Much would depend upon whether the existing roadway remains, however some evaluation is presented below:

- Within the Farm Onder Rugzeer, transformed land as a consequence of the roadway would effectively not constitute more than 0.1%, primarily because the roadway lies within or abuts the approved PV facilities.
- Increased hard-panned area would constitute approximately 16500m^2.

Given the above, it can be stated that the cumulative impacts associated with the roadway construction are negligible at the scale of land use proposed for the Farm Onder Rugzeer.

Impact assessment rating

The impact assessment rating method utilized, below identifies 8 criteria for utilisation in the assessment of the level or degree of impact associated with the activity. These 8 criteria are:

1. **Intensity / severity** – the level of change or disturbance that arises from the activities envisaged. Intensity is determined to arise from "very low" (negligible change) to "high" (prominent change where dysfunctional states arise on the status quo).

2. **Extent/ spatial scale** – the area affected by the activity. This is determined to vary from "local" (impact is confined to the area where the activity is undertaken) to "international" (where the impact extends beyond geopolitical boundaries).

3. **Duration**. The timeframe over which the impact is experienced, varying from "short term" (>5 years) to permanent (where temporal scale will not ameliorate the impact).

4. **Probability** ; The likelihood of the impact arising, which extends from "improbable" to "definite". This is a qualitative determination of probability.

5. **Confidence**: A measure of the level of surety that the impacts or the parameters identified, will occur. (low = <0.35; moderate = 0.35 – 0.75 ; high >0.75).

6. **Reversal** : An indication of the ability to reverse the impact or re-establish the status quo. (irreversible ; partially reversible and fully reversible)

7. **Resource Loss** : The degree to which the impact may cause irreplaceable loss of resources (low, medium and high)

8. **Mitigation** : The level to which a negative impact can be ameliorated (none ; very low ; low ; medium; high)

The consequence of the impacts that have been identified is determined by the "intensity, extent and duration" criteria identified above. These consequences are determined using criteria stated as *very high; high; medium ; low* and *very low*. The significance of the impact is finally determined using a function of "consequence" and "probability".

Table 3. Table identifying impacts and significance associated with proposed roadway.

IMPACT	Intensity	Extent	Duration	Probability	Confidence	Reversibility	Resource Loss	Mitigation	Consequence	Significance
Alteration of the local hydrological regime.	Low	Local	Short term	Definite	High	Partially reversible	Low	Medium	Very low	Very low
Sediment transport	Low	Local	Short term	Definite	High	Partially reversible	Low	Medium	Vert low	Very low
Alteration of habitat	Moderate	Local	Long term	Definite	High	Irreversible	Low	Low	Low	Low
Alteration of faunal ethos	Low	Local	Long term	Definite	High	Reversible	Medium	Low	Very low	Very low
Spillages and general run off	Low	Local	Short term	Definite	Moderate	Reversible	Low	High	Very low	Very low
Road mortalities	Low	Local	Long term	Definite	Moderate	Irreversible	Low	High	Very low	Very low
Electrical light pollution	Low	Local	Long term	Definite	Moderate	Reversible	Low	Low	Very low	Very low
Noise and related "nuisance" factors	Low	Local	Long term	Definite	Moderate	Reversible	Low	Low	Very low	Very low

Mitigation measures

From Table 3, it is clear that much of the impact associated with the roadway can be "mitigated" or "ameliorated" in one way or another. Recommended mitigation measures that should be incorporated into the management regimen to be employed on site are:

Alteration of hydrological regime:

Measures to moderate surface run off from the roadway and control stormwater discharge from the hardpan surface should be employed. This can include dissipation measures and attenuation systems to be employed in an overall stormwater management system.

Sediment transport

Measures to address the transport and accumulation of sediments along the roadway, particularly where surfaces may promote increased run off, should be established. This would include the stabilisation of sands and soils accumulated during the construction phases, as well as addressing the accumulation of aeolian sands during the operational phase.

Alteration of habitat.

Alteration of habitat will arise as a consequence of the establishment of the roadway. Measures to be employed should however be left to the discretion of the environmental control officer depending upon the management outcome desired for the broader area in general. Such measures may include the clearance of vegetation, or alternatively the maintenance and enhancement of vegetation to encourage and promote growth of specific specimens or species.

Alteration of faunal ethos

There are limited measures to be employed in addressing change in faunal behaviours at community or species level.

Spillages and general run off.

Avoidance and redress of spills can best be achieved by ensuring the utilsation of well maintained vehicles, the sound containment of liquids being transported across the route and the redress of spills through appropriate clean up operations if and when spillage arises.

Road mortalities

The reduction in road mortalities is best achieved by ensuring vehicles travel at low speed along the road way and drivers and aware of fauna that may be crossing the road i.e. signage.

Electrical light pollution:

Little mitigation can be offered in redress of ELP.

Noise and Related Nuisance Factors

The presence of persons along the roadway and factors such as noise should be managed as part of the overall environmental management protocols of the farm and site in general. Increased pedestrian and vehicular movement along the route can be expected and with the implementation of the above measures, the overall "nuisance" factor on site should diminish

7. CONCLUSION & STATEMENT

From the above the following summary of the ecological state and significance of the proposed road routing can be provided:

1. The selected road route runs across the watershed of two drainage systems on an active livestock farm.

2. The area falls within Bushmanland Arid Grassland veld type, with occasional larger woody specimens and rocky promontories. As such the road route avoids habitat of ecological significance.

3. The proposed route avoids the traversing of significant drainage features or watercourses and can be "tailored" during final planning to avoid any botanical or other features that may be present. There should be no reason to relocate plant specimens during the establishment of the roadway

4. It is proposed that by minor extensions of the route at its central point, that deeper sandy environments can be avoided.

5. Faunal affiliation with the site is considered to be low, although traverses over or along the route can be expected as movement from larger fauna between the two catchments.

Given the above, it is contended that the establishment of the roadway, in conjunction with the approved photo voltaic facilities on the site, is unlikely to give rise to any significant negative ecological impacts and is considered to be a more appropriate route than the existing farm roadway. In addition, the implementation of a number of mitigation measures will ameliorate or redress possible impacts. An important mitigation measures to be employed should Option C, be approved, would be the decommissioning of existing Option B, the farm roadway. It follows that there is no reason based on ecological principles to preclude the establishment of the proposed road.

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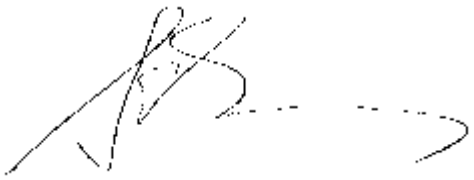
Appendix A

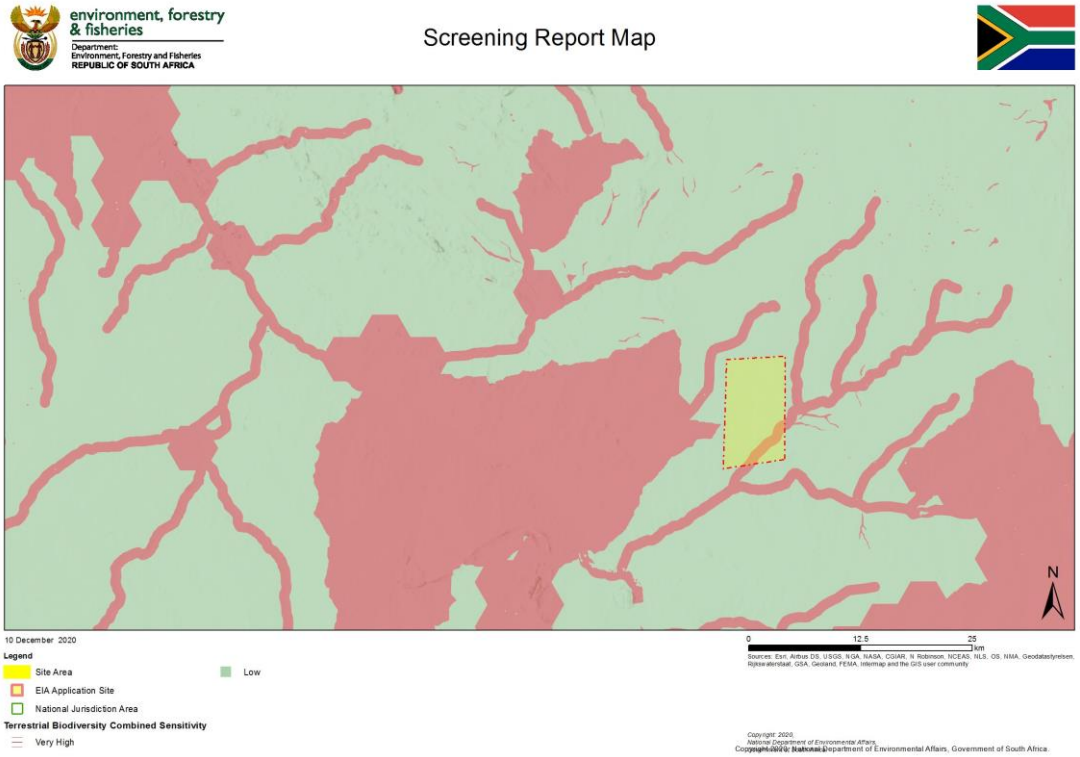
Declaration

I Simon C Bundy (ID No 6609097 5257 081), declare that I have no vested interest in the proposed development of the Kenhardt PV service roadway or any related activities associated with these projects.

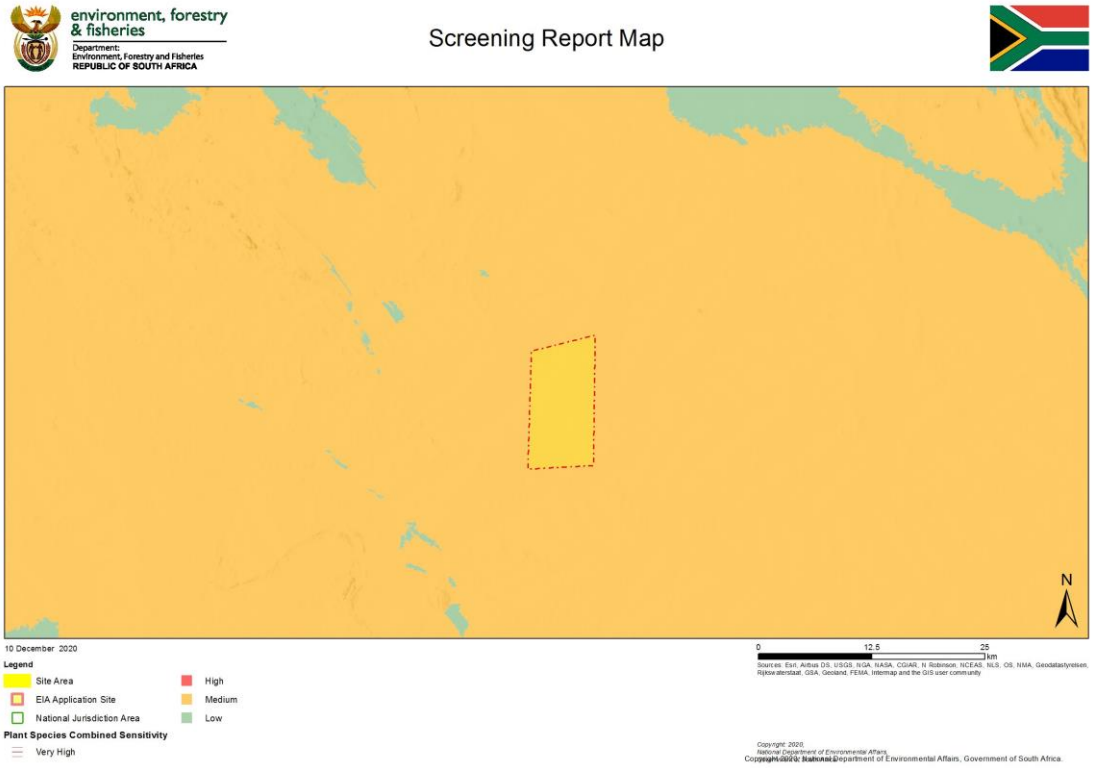
I am a registered ecologist with the South African Council of Natural Scientific Professionals (No.400093/06) with 27 years' experience. A curriculum vitae has been provided within this document.



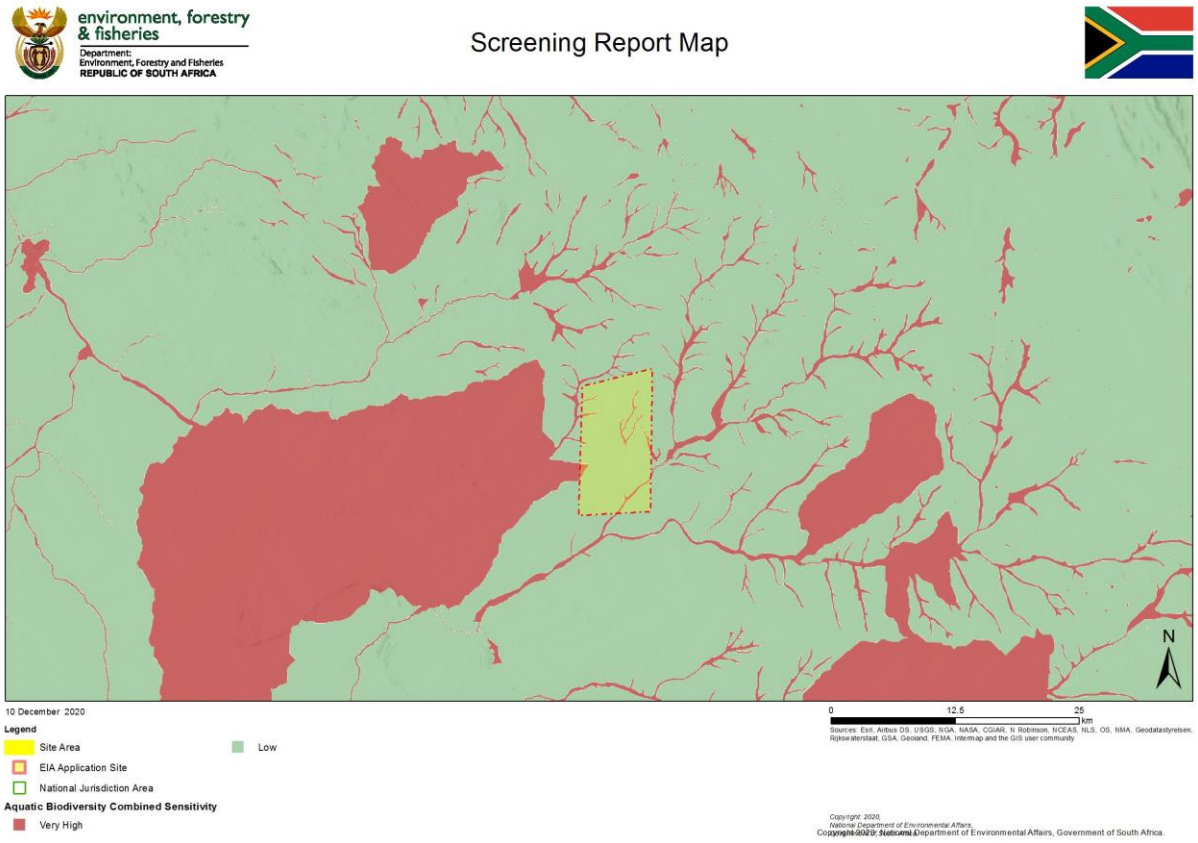
DEA Screening Tool – Spatial results. **Appendix B**



"Terrestrial sensitivity"



"Plant sensitivity".



"Aquatic sensivity"