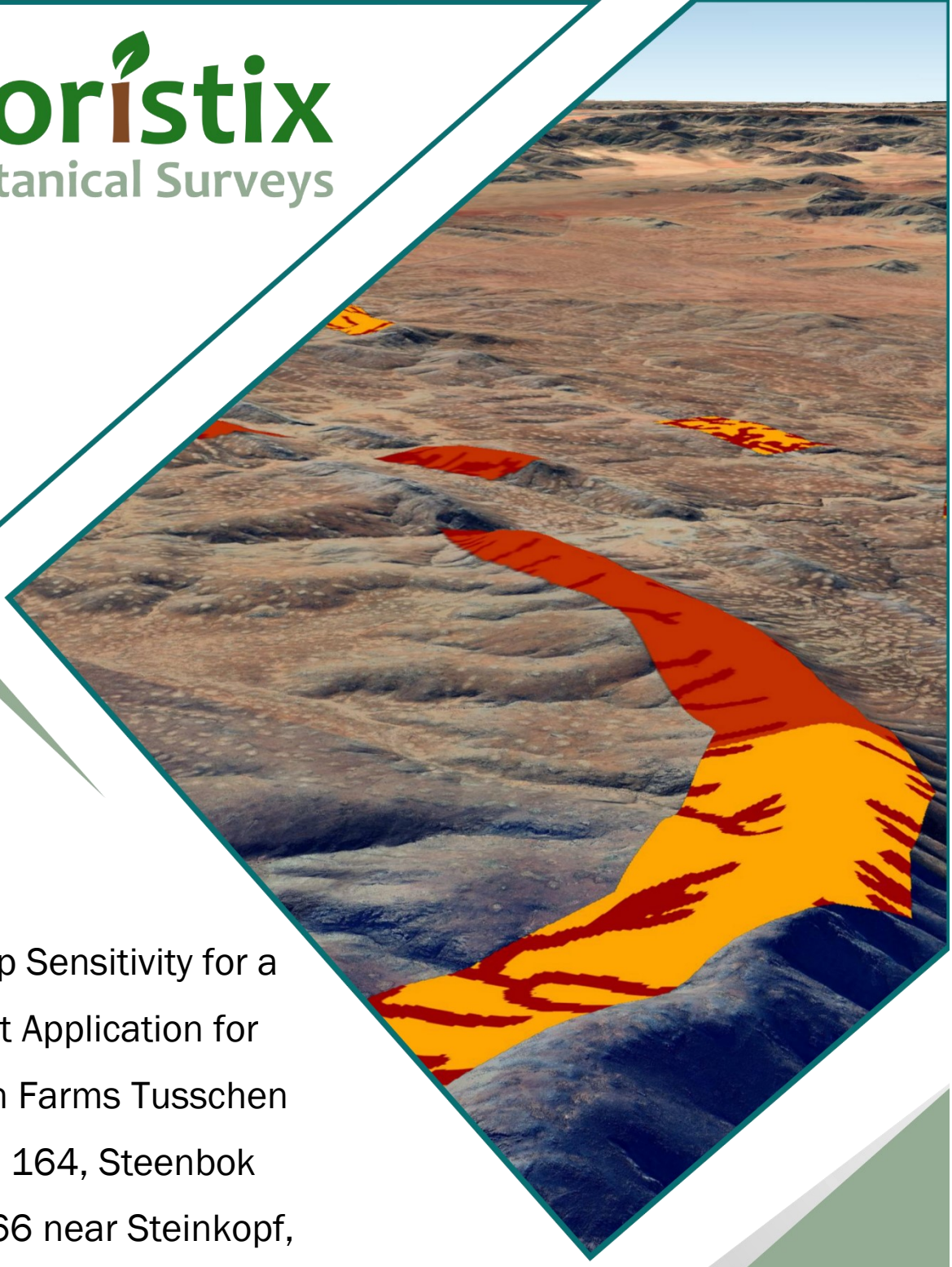
EcoFloristix
Specialist Botanical Surveys



Terrestrial Desktop Sensitivity for a Prospecting Right Application for Targeted Blocks on Farms Tusschen In 143, Aardvark 164, Steenbok 165, and Gifkop 166 near Steinkopf, Northern Cape Province, South Africa

DATE
09 May 2025

PREPARED FOR
Greenmined

info@ecofloristix.co.za
+27 71 451 4853
www.ecofloristix.co.za
Acuity JRK (Pty) Ltd trading as
EcoFloristix Specialist Botanical Surveys

CELEBRATING RESEARCH EXCELLENCE

Internal Document Information

Running Title:	Terrestrial Desktop Sensitivity for a Prospecting Right Application for Targeted Blocks on Farms Tusschen In 143, Aardvark 164, Steenbok 165, and Gifkop 166 near Steinkopf, Northern Cape Province, South Africa
Date:	09 May 2025
Status (Draft/Final):	Final Report
Version:	1.0
Reference:	IA.25.006
Client:	Greenmined
Author Details:	**Dr. Jan-Hendrik Keet** [BSc, BSc Hons, MSc (University of the Free State), PhD (Stellenbosch University); SACNASP Pr.Sci.Nat: 121678 (Botanical Science)] Email: info@ecofloristix.co.za Contact: 071 451 4853
Suggested Citation:	Keet, J-H (2025) Terrestrial Desktop Sensitivity for a Prospecting Right Application for Targeted Blocks on Farms Tusschen In 143, Aardvark 164, Steenbok 165, and Gifkop 166 near Steinkopf, Northern Cape Province, South Africa. Report prepared for Greenmined. Final Report, Version 1.0. Reference: IA.25.006.

CONTENTS

i. List of Abbreviations

BODATSA: Botanical Database of Southern Africa
CARA: Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA: Critical Biodiversity Area
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora
CR: Critically Endangered (threat status)
DD: Data Deficient (threat status)
DDD: Data Deficient – Insufficient Information (threat status)
DDT: Data Deficient – Taxonomically Problematic (threat status)
EIA: Environmental Impact Assessment: EIA regulations promulgated under section 24(5) of NEMA and published in Government Notice R. 543 in Government Gazette 33306 of 18 June 2010
EN: Endangered (threat status)
ESA: Ecological Support Area
EW: Extinct in the Wild (threat status)
EX: Extinct (threat status)
FEPA: Freshwater Ecosystem Priority Area
IAPs: Invasive Alien Plant species
IUCN: International Union for Conservation of Nature
LC: Least Concern (threat status)
MP: Moderately Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
NE: Not Evaluated (threat status)
NEM:BA A&IS: NEM:BA Alien and Invasive Species Regulations, 2020
NEM:BA National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEMA: National Environmental Management Act (Act 107 of 1998)
NFA: National Forest Act 1998 (No. 84 of 1998)
NFEPA: National Freshwater Ecosystem Priority Areas; identified to meet national freshwater conservation targets (CSIR, 2011)
NP: Not Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
NT: Near Threatened (threat status)
NWA: National Water Act 36 of 1998
ONA: Other Natural Area
PA: Protected Area
PAOI: Project Areas of Influence
POSA: Plants of southern Africa (online database)
PP: Poorly Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)
RE: Regionally Extinct (threat status)
RLE: Red List of Ecosystems for South Africa
SANBI: South African National Biodiversity Institute
SCC: Species of Conservation Concern (includes species listed under the IUCN Red List Criteria as Critically Endangered [CR], Endangered [EN], Vulnerable [VU], Near Threatened [NT], or Data Deficient [DD], as well as range-restricted species which are not declining and are nationally listed as Rare or Extremely Rare [sometimes also termed "Critically Rare"])
SSV: Site Sensitivity Verification
SWSA: Strategic Water Source Area
VegMap: National Vegetation Map of Southern Africa, Lesotho, and Swaziland (as per Mucina and Rutherford, 2006, with subsequent updates, e.g., 2018)
VU: Vulnerable (threat status)
WP: Well Protected (according to the National Biodiversity Assessment 2018 Ecosystem Protection Levels)

ii. List of Figures

iii. List of Tables

iv. Details of Specialist

REPORT AUTHOR:

Dr. Jan-Hendrik Keet
Pr.Sci.Nat 121678 (Botanical Science)

Fields of Expertise: Botany; Biogeography; Terrestrial Biodiversity; Vegetation Surveys and Mapping; Invasive Alien Plant Species Identification, Management, and Monitoring; Biological Sciences; Biodiversity Informatics; Experimental Design and Analysis; Geographic Information Systems; and Statistical Computing and Data Analysis.

Summary of Qualifications: BSc (*cum laude*) Chemistry with Physics and Biology; BSc (Hons *cum laude*) Botany (majoring in Plant Taxonomy, Plant Ecology, and Plant Physiology); MSc Botany (Invasive Plant Species and Risk Assessment); PhD Botany (Invasive Plant Species and Impacts); GIS Intermediate (GISB1500S NQF Level 5); SAGIC Invasive Species Consultant; Professional Natural Scientist (Botanical Science: 121678).

May 2025

PART 1: Introduction, Background, and Findings of the Assessment

1. Introduction

1.1. General Information

This project, as well as any and all related areas/sites, will from here on interchangeably be referred to as either the "project", "site", "development site" or "Project Area", "development site and surrounds", "study area", or "study area and surrounds". If the proposed activity(-ies) will impact on Species of Conservation Concern (SCC) beyond the boundary of the preferred site, the "project areas of influence" (PAOI) will be defined and used where relevant. The development footprint in the context of this document means the area on which the proposed activities will take place and includes the area that will be directly disturbed or impacted. The term "property" might also be used to refer to the entire property (that is, the area enclosed within the property boundary), and not just the Project Area.

Greenmined (hereafter referred to as the "client"), on behalf of Strata Energy Minerals & Resources (Pty) Ltd (hereafter referred to as the "applicant"), approached EcoFloristix Specialist Botanical Surveys to conduct a Terrestrial Desktop Sensitivity for a Prospecting Right Application for Targeted Blocks on Farms Tusschen In 143, Aardvark 164, Steenbok 165, and Gifkop 166 near Steinkopf, Northern Cape Province, South Africa.

1.2. Terms of Reference (ToR)

The main aim of this assessment was to provide a professional opinion on botanical and terrestrial biodiversity issues related to the proposed activities within the Project Area. Specifically, this assessment intends to provide the relevant information for guiding and mitigating the risk(s) associated with the proposed activities and their impacts on the local plant communities and associated ecosystems within the Project Area and surrounds by conducting a desktop analysis.

Briefly, the following activities were performed:

- A desktop assessment to identify relevant ecologically important geographical features (for example, unique habitats, Critical Biodiversity Areas (CBAs), and threatened ecosystems);
- A desktop assessment to compile a list of species that might occur in the Project Area and surrounds, with a focus on plant Species of Conservation Concern (SCC); and
- A desktop assessment of the local hydrology (watercourses, wetlands, etc. where present) based on existing environmental layers, as well as project-specific mapping of the local hydrology where features are present that have not yet been captured by existing environmental layers (for example, previously unrecorded watercourses).

1.3. Locality and Details of Proposed Activities

The Project Area consists of 1 Prospecting Right (NC30/5/1/1/2/14344 PR) and covers the farms Tusschen In 143, Aardvark 164 Remainder, Aardvark 164 Portion 1, Steenbok 165, and Gifkop 166 (Figure 1). These farms cover a total area of approximately 21 217 hectares according to the provided professional land surveyor's map.

The farms are situated 565 km north of Cape Town and approximately halfway between the towns of Port Nolloth and Steinkopf (50 km east of Port Nolloth and 32 km west of Steinkopf) in the Northern Cape Province of South Africa.

The R382 tar road between Port Nolloth and Steinkopf gives access to both Aardvark 164 Remainder and Aardvark 164 Portion 1. A tertiary road from the R382 gives access to Tusschen In 143. Finally, Steenbok 165 and Gifkop 166 can be accessed by 2-track roads from the R382.

A literature review and target generation report by Minrom Consulting (Pty) Ltd (hereafter referred to as the "Minrom report") identified a total of 10 target areas for the prospecting of various minerals (Figure 1 to Figure 3). The highest-ranked targets were located on the farms Tusschen In 143 and Steenbok 165. These target areas, as well as the broader region in general, is treated within this report.

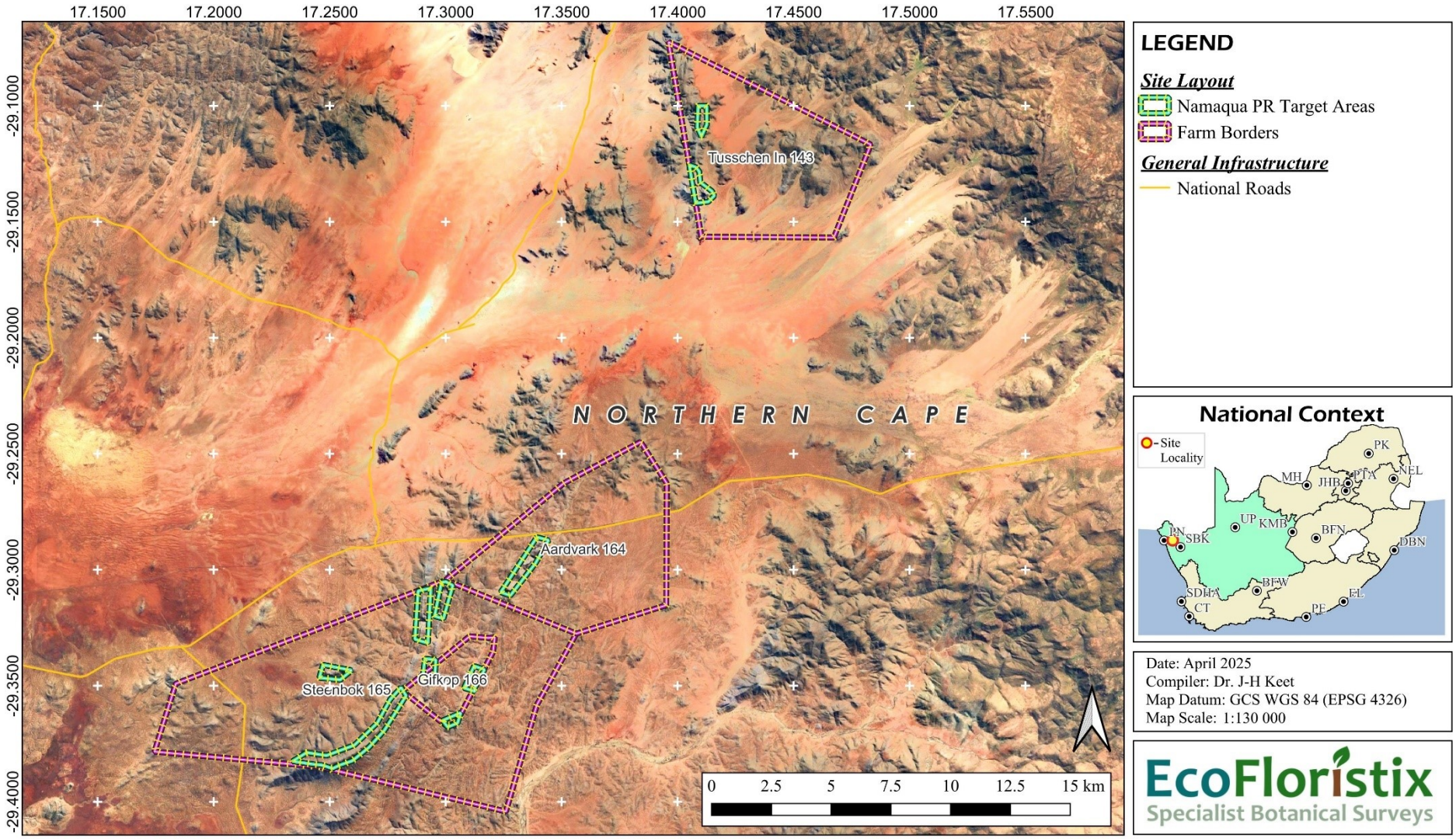


Figure 1: Locality of the Project Area, zoomed out to give a broad context. The inset map shows the main map extent within the broader (national) context of South Africa.

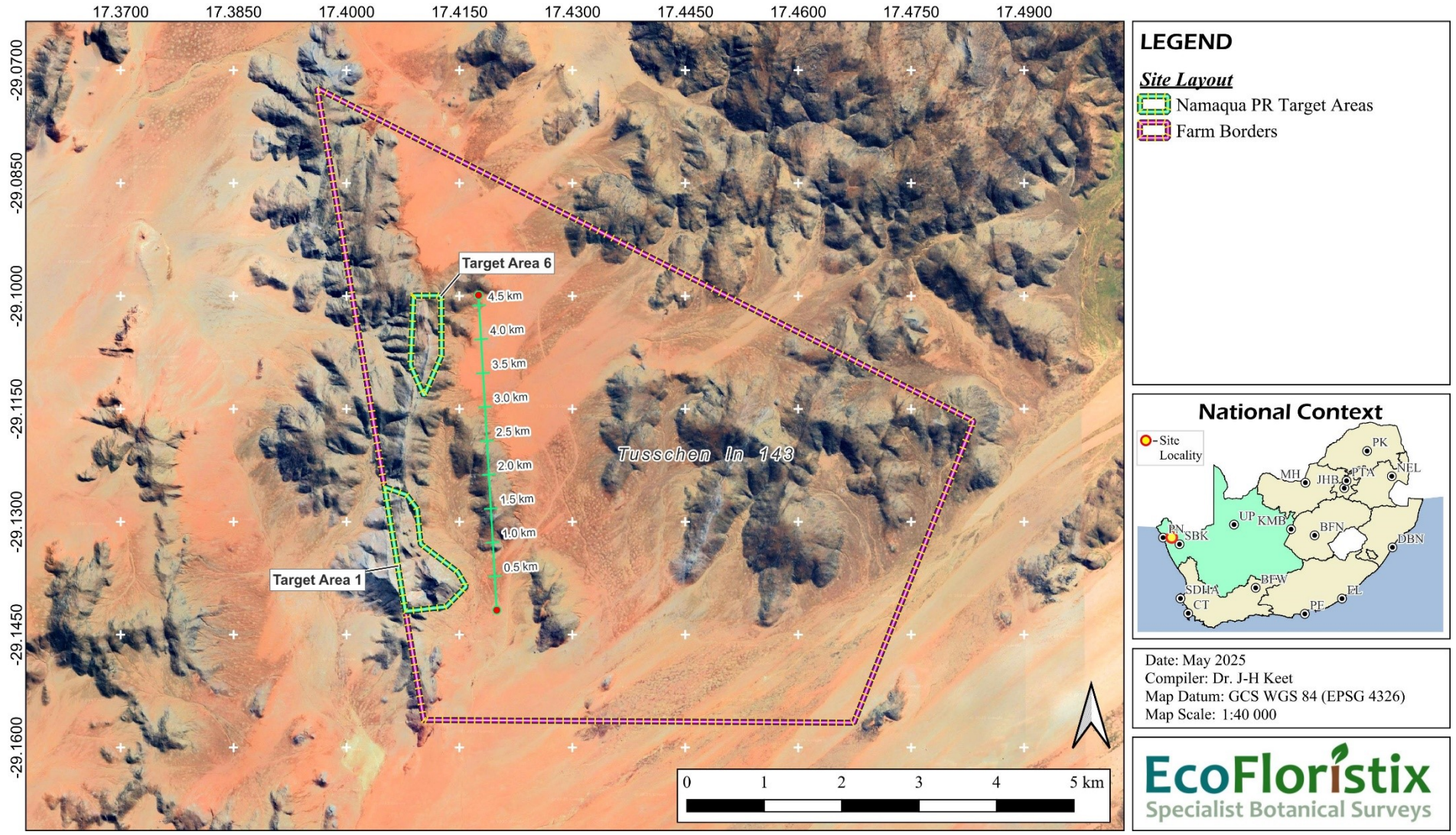


Figure 2: Overview of the Project Area, but with specific focus on the farm Tusschen In 143 (compare with Figure 1).

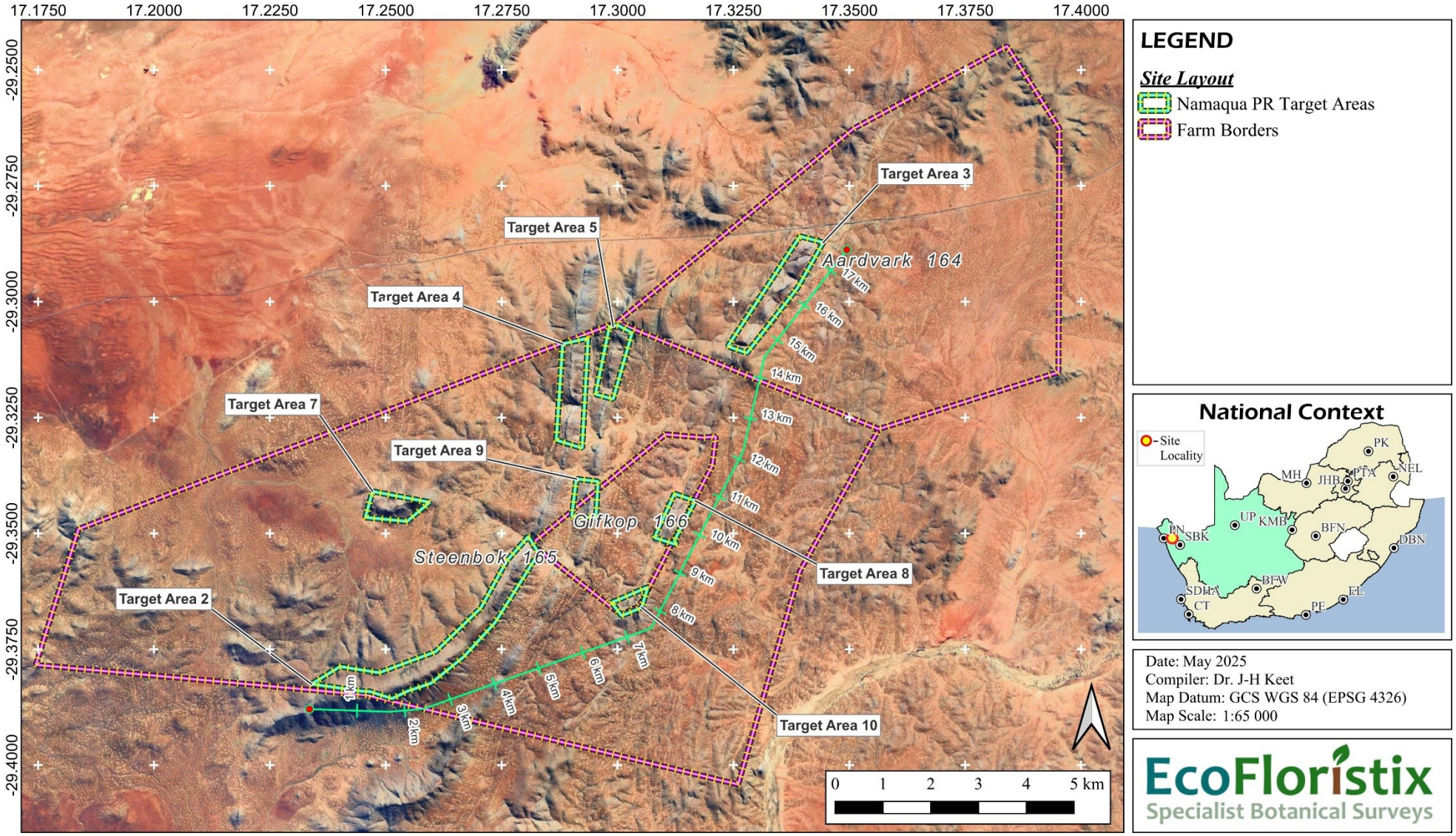


Figure 3: Overview of the Project Area, but with specific focus on the farms Aardvark 164, Steenbok 165, and Gifkop 166 (compare with Figure 1).

1.4. Conditions of This Report

This report deals exclusively with the Project Area as defined in sections 1.1 and 1.3, and the impacts upon plant biodiversity and natural ecosystems in that area, as well as the local hydrology (for example, the occurrence of watercourses, wetlands, etc. where present). Therefore, all relevant project information provided by the applicant and/or the client, as well as any other relevant Environmental Impact Assessment practitioner(s), to the biodiversity specialist was assumed to be correct and valid at the time of its provision. This report is not liable to include and assess any alterations to the Project Area, as provided by the client, if such alterations occurred after the survey date(s).

All findings, recommendations, and conclusions provided in this report are based on the author's best scientific and professional knowledge at the time of compilation, as well as information available at the time of compilation. This report, whether in full or in part, may not be amended or extended in any way whatsoever without the prior explicit written consent of the author. Any recommendations, statements, or conclusions drawn from, or based on, this report must clearly cite or make reference to this report, making sure to include the following reference: IA.25.006. This report must be included in its entirety whenever any recommendations, statements, or conclusions relating to this report form any part of another report.

1.5. General Assumptions and Potential Limitations

Desktop studies rely primarily on existing data, such as literature reviews, reports, and databases. While they can provide a broad overview of a topic, they have several limitations compared to field surveys:

- Lack of Primary Data: Desktop studies cannot collect firsthand information, limiting their ability to capture nuances and unexpected findings.
- Potential for Bias: Existing data may be influenced by biases or limitations in the original research resulting from the specific idiosyncrasies of those who compiled the data.
- Limited Depth: Desktop studies often provide a superficial understanding, lacking the in-depth insights gained from direct observation and interaction on site.
- Difficulty in Verifying Accuracy: It can be challenging to verify the accuracy and reliability of secondary sources.
- Inability to Capture Dynamic Changes: Desktop studies may not reflect recent developments or changing conditions.

This aforementioned presents a gap in knowledge, but can fortunately be mitigated to a great extent by using sufficient data from online databases (see section 7.3 for more details).

In contrast, fieldwork studies involve direct (i.e., firsthand) observation and data collection in the field. This allows for primary information collection, a more in-depth and accurate analysis, and the ability to capture dynamic changes, all of which increase the quality and reliability of conclusions and recommendations.

Therefore, it is it is highly recommended that fieldwork studies — that is, Site Sensitivity Verifications (SSVs) — also be conducted prior to commencement of prospection activities so that desktop findings can either be validated or discredited with more accurate information.

To ensure its relevance, it is strongly advocated that an SSV, in the context of this project, be conducted shortly before prospecting activities commence. A significant delay between the SSV and the commencement of prospecting is not advised, as the verification must be as current as possible. Finally, it is imperative that the SSV be completed prior to the undertaking of any prospecting work.

1.6. Key Legislative Requirements

The lists below provide legislation, policies, and guidelines that are applicable to the current project in terms of biodiversity and ecological support systems. Although these lists are extensive, they are not exhaustive, and other legislation, policies, and guidelines may also apply.

International Legislation:

- Convention on Biological Diversity (CBD, 1993)
- The Convention on Wetlands (RAMSAR Convention, 1971)
- The United Nations Framework Convention on Climate Change (UNFCC,1994)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
- The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)

National Legislation:

- Constitution of the Republic of South Africa (Act No. 108 of 1996)
- The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
- The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
- The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004), Threatened or Protected Species Regulations
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
- Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
- The National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
- The Environment Conservation Act (Act No. 73 of 1989)
- National Protected Areas Expansion Strategy (NPAES)
- Natural Scientific Professions Act (Act No. 27 of 2003)
- National Biodiversity Framework (NBF, 2009)
- National Forest Act (Act No. 84 of 1998)
- National Veld and Forest Fire Act (101 of 1998)
- National Water Act (NWA) (Act No. 36 of 1998)
- National Spatial Biodiversity Assessment (NSBA)

- World Heritage Convention Act (Act No. 49 of 1999)
- Municipal Systems Act (Act No. 32 of 2000)
- Alien and Invasive Species Regulations and, Alien and Invasive Species Lists, published under NEM:BA (NEM:BA A&IS Regulations)
- South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)

Northern Cape:

- Namakwa District Biodiversity Sector Plan 2008
- Northern Cape Nature Conservation Act no. 9 of 2009

2. Summary of the Approach Used in Determining Sensitivities

Although Part 2 of this document details the methodology in full, this section aims to give a concise summary of the approach used in determining sensitivities.

Briefly, various spatial data exists for the terrestrial environment. Chief among these that influence sensitivities are Red List of Ecosystems (RLE; sections 3.1.1 and 3.2.1), Critical Biodiversity Areas (CBAs; section 3.2.2), National Protected Area Expansion Strategy (NPAES) Focus Areas (section 3.2.3), and National Biodiversity Assessment (NBA) Protected Areas (Ecosystem Protection Levels; section 3.2.4). Together with this, the occurrence of threatened plant species also contributes toward sensitivity (section 3.1.2). Finally, watercourses and their associated habitats are generally highly sensitive toward disturbance, and such disturbances can often have far-reaching consequences downstream of where impacts occur. Moreover, water use licenses (WULAs) are required if restricted activities will take place in a watercourse, which is why it is generally recommended that watercourses be avoided wherever possible — they therefore contribute significantly to overall sensitivity ratings.

The method used here combines all of these environmental layers into a single output layer of sensitivities by rasterizing individual layers to the same resolution and combining them. In addition, buffer zones are placed around occurrences of threatened plant species as well as watercourses.

The various combinations are then classified, giving priority to certain layers (for example, Critically Endangered and Endangered ecosystems are always classified as Very High in sensitivity; specifically see section 7.4 for details).

Finally, the occurrence of copper and sulphides can only be determined by ground truthing. Furthermore, soil sampling can only take place once a prospecting right is approved. Thus, it must be noted that the target areas as determined by the Minrom report (i.e., the Remote Sensing report) may differ after ground truthing. To mitigate this, a certain amount of latitude was incorporated in this report by assessing sensitivities beyond the target area boundaries.

3. Results

For detailed methodology, see section 7 at the end of this document. Note that all area calculations, wherever relevant, are based on the planimetric WGS 84 / UTM zone 34S projection (EPSG:32734). However, for ease of reference the majority of maps are displayed in the widely used geographic WGS 84 Latitude/Longitude coordinate reference system (EPSG:4326).

3.1. Desktop Analyses: Botanical Assessment

3.1.1. Vegetation Types of Project Area and Surrounds

According to VegMap, the Project Area overlaps with four vegetation types, namely Namaqualand Heuweltjieveld (SKn4), Kosiesberg Succulent Shrubland (SKr12), Southern Richtersveld Scorpionstailveld (SKr13), and Southern Richtersveld Inselberg Shrubland (SKr14) (Table 1; see Figure 5 for a broad overview, and Figure 6 and Figure 7 for a specific focus on the target areas). However, Kosiesberg Succulent Shrubland does not underly the target areas, and is thus not treated further.

Table 1: Total area sizes (approximately) for vegetation types occurring within, or near, the Project Area, as mapped by the National Vegetation Map 2018.

Vegetation Type	Historic Distribution		Current Distribution			RLE Threat Status
	Total Area (km^2)	Total Area (ha)	Total Area (km^2)	Total Area (ha)	Percentage Remaining (%)	
Namaqualand Heuweltjieveld (SKn4)	5040	504059	4591	459159	91.1	LC
Southern Richtersveld Scorpionstailveld (SKr13)	722	72266	722	72244	100	LC
Southern Richtersveld Inselberg Shrubland (SKr14)	365	36557	365	36540	100	LC

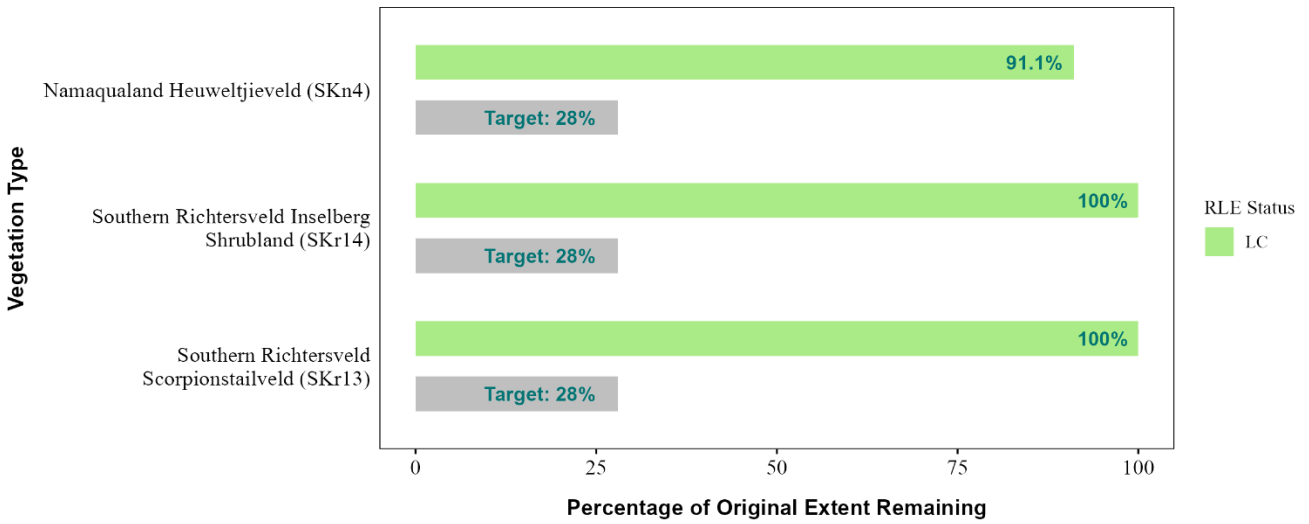


Figure 4: Total area sizes (approximately) for vegetation types occurring within, or near, the Project Area, as mapped by the National Vegetation Map 2018. This is a concise visual depiction of Table 1. Also shown are conservation targets.

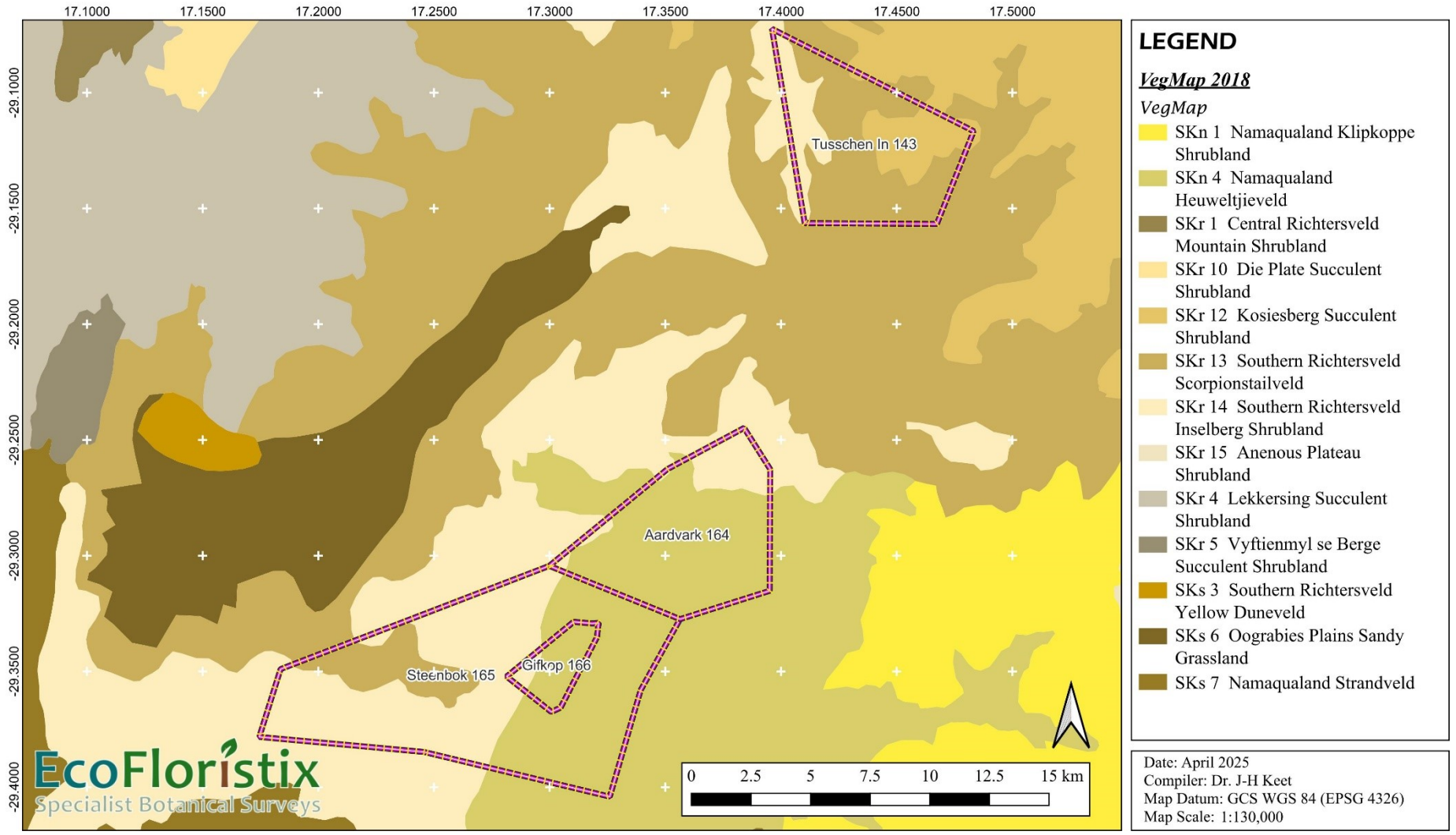


Figure 5: Vegetation types (according to VegMap 2018 and subsequent updates) for the Project Area and surrounds. This map is specifically zoomed out to show the broader extent of vegetation types surrounding the Project Area.

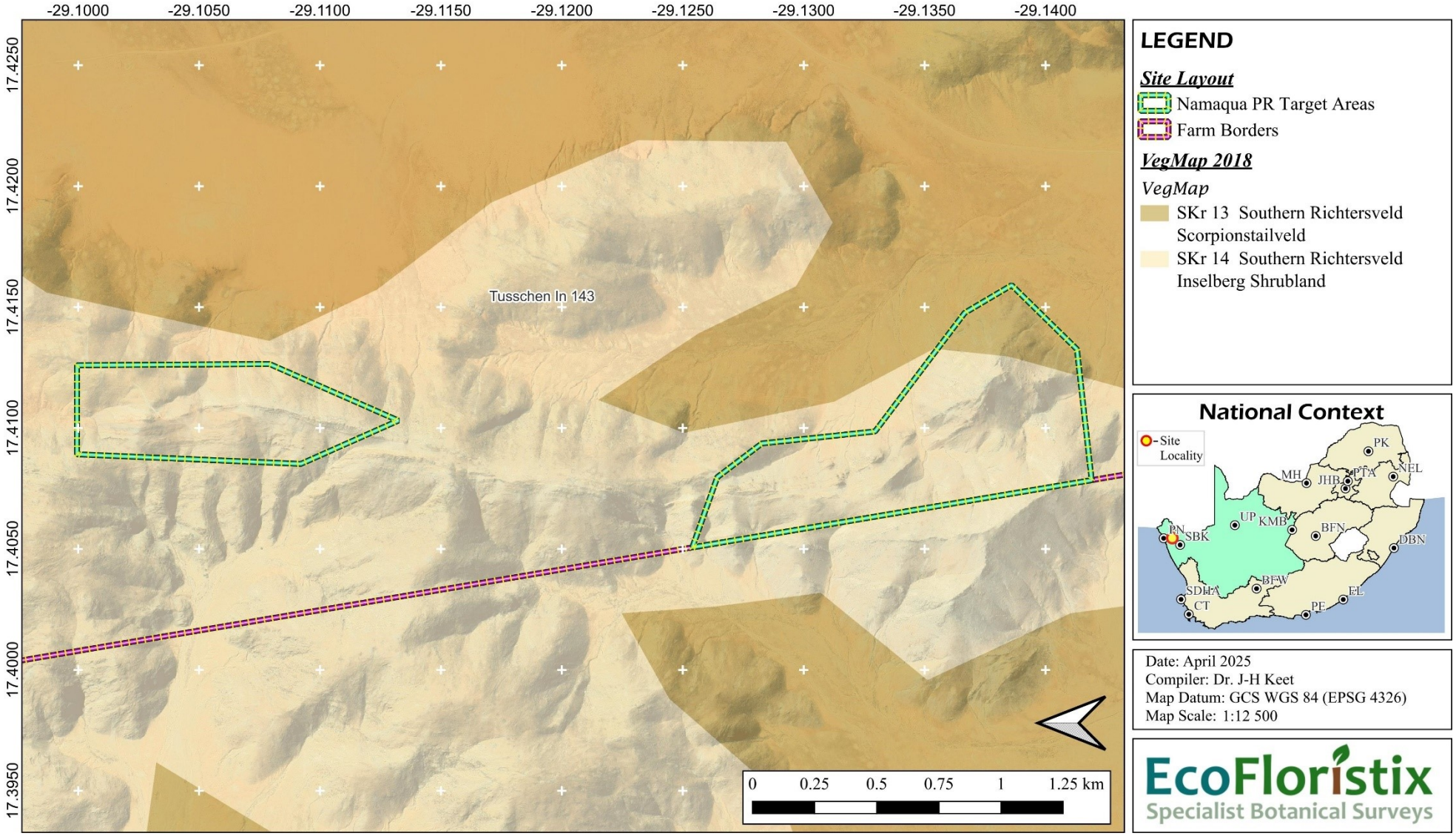


Figure 6: Vegetation types (according to VegMap 2018 and subsequent updates) for the target areas on farm Tuschen In 143. Note: to optimize space, true north is directed to the left.

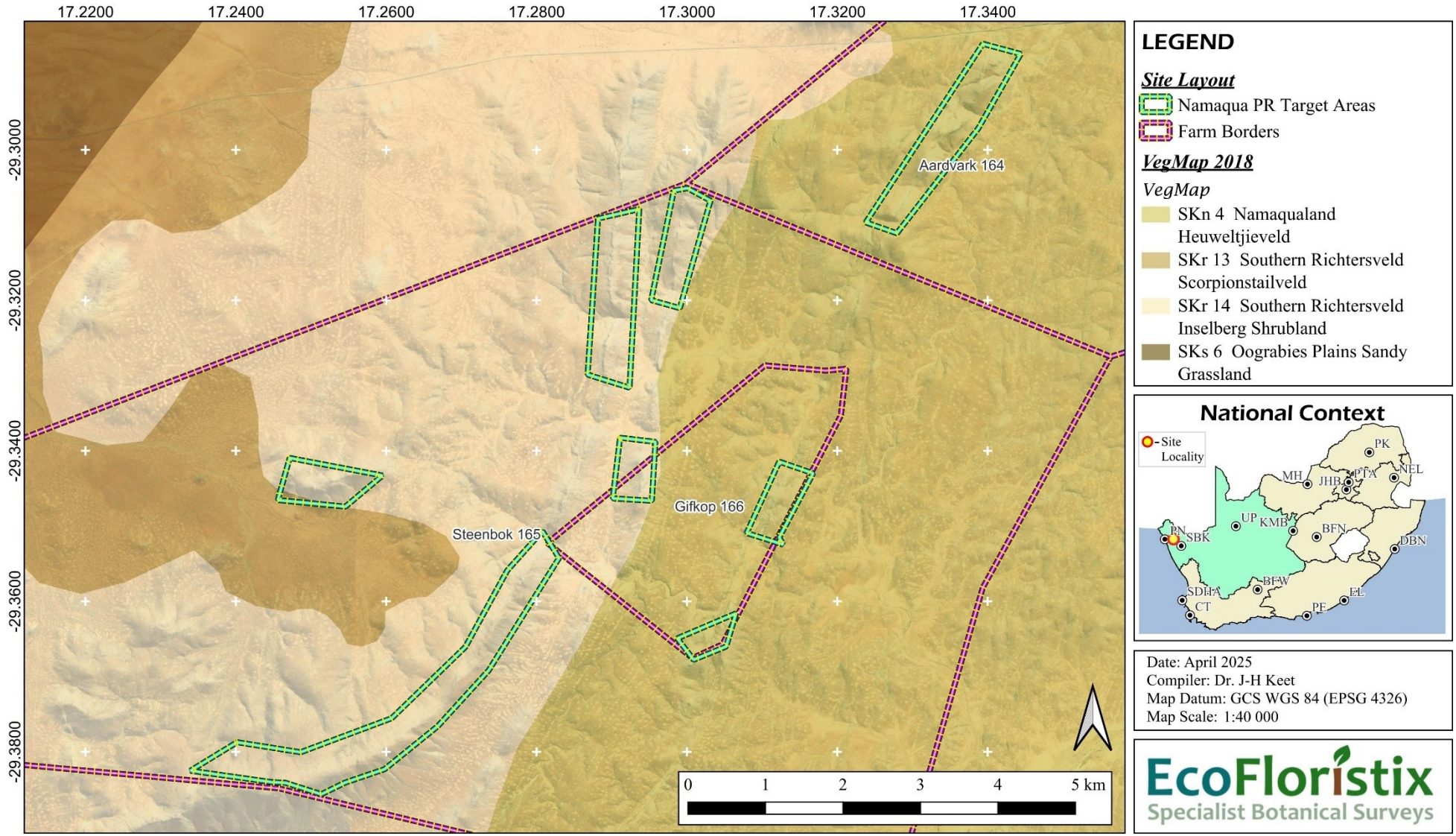


Figure 7: Vegetation types (according to VegMap 2018 and subsequent updates) for the target areas on farms Aardvark 164, Steenbok 165, and Gifkop 166.

3.1.1.a) Namaqualand Heuweltjieveld (SKn 4)

This vegetation type is distributed in the Northern Cape Province at the western foothills of the Namaqualand Escarpment from west of Steinkopf southwards to Soebatsfontein and to Kotzesrust.

It is characterized by undulating plains leading up to the Escarpment with a mosaic of communities on heuweltjies (slightly raised, rounded termite mounds up to 10 m in diameter) and in between the heuweltjies, as well as low shrubland, with a canopy cover 20 – 45%, dominated by leaf-succulent shrubs. Deep red loamy soils occur on granites and gneisses of Mokolian age (most significantly the Kamieskroon Gneiss and Gladkop Suite).

The vegetation types experiences winter rainfall with irregular rain events occurring mostly from May to August and almost always no rain between November and February. Dew is experienced throughout the winter and frosts hardly occur.

Conservation: LC according to RLE2021. Target: 28% according to NBA 2018.

It is not under immediate threat except for local intensive grazing pressure responsible for veld degradation. Some 11% of the unit is statutorily conserved in the Namaqua National Park. Scattered *Acacia cyclops* can be seen as an infestation problem on about 5% of the area in this unit. About 3 – 4% of the area is transformed by cultivation. Erosion remains at very low to low levels.

Heuweltjies are often dominated by *Lampranthus otzenianus* and *Mesembryanthemum neofoliosum*. In other places the heuweltjies are turned into bare circles by overgrazing, often with *Oncosiphon suffruticosum* as the only species occurring here. The heuweltjies are often the home of burrowing animals like erdvark or antbear (*Orycteropus afer*), porcupine (*Hystrix africaeaustralis*) and Brants whistling rat (*Parotomys brantsii*). Species turnover is considerable within this vegetation unit due to its large north-to-south extent. Some of the patches are floristically related to SKr 13 Southern Richtersveld Scorpionstailveld.

Key species associated with Namaqualand Heuweltjieveld (SKn 4).

IMPORTANT SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Drosanthemum hispidum (d), Euphorbia ephedroides var. ephedroides (d), Jordaaniella cuprea (d), Lampranthus otzenianus (d), Ruschia leucosperma (d), R. robusta (d), Salsola namibica (d), Antimima compacta, Mesembryanthemum noctiflorum subsp. noctiflorum, Didelta carnosa var. carnosa, Eberlanzia parvibracteata, Lycium cinereum, Manochlamys albicans, Salsola aellenii, S. aphylla, Monsonia flavescens, Tetragonia fruticosa, T. spicata*
Low Shrubs	*Galenia fruticosa (d), Calobota halenbergensis (d), Anthospermum aethiopicum, Berkheya fruticosa, Galenia africana, Hermannia trifurca, Hirpicium alienatum, Limeum africanum, Pelargonium praemorsum, Pentzia globosa, Pteronia glabrata, Osteospermum oppositifolium, Tetraena retrofracta*

Herbs	*Arctotis fastuosa (d), Dimorphotheca sinuata (d), Leysera tenella (d), Oncosiphon suffruticosum (d), Osteospermum pinnatum (d), Osteospermum microcarpum (d), Amellus microglossus, A. strigosus subsp. pseudoscabridus, Emex australis, Felicia bergeriana, F. tenella subsp. longifolia, Pharnaceum croceum, Plantago cafra, Rhynchopsidium pumilum, Ursinia cakilefolia, Zaluzianskya villosa*
Geophytic Herb	*Oxalis annae (d)*
Succulent Herbs	*Mesembryanthemum guerichianum (d), Mesembryanthemum junceum (d), Tetragonia microptera (d)*
Graminoids	*Ehrharta calycina (d), E. longiflora (d), E. pusilla, Pentameris airoides, Tribolium echinatum, T. utriculosum*
NAMAQUALAND ENDEMIC SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Mesembryanthemum neofoliosum (d), Stoeberia frutescens (d)*
Low Shrub	*Tetragonia namaquensis*

3.1.1.b) Southern Richtersveld Scorpionstailveld (SKr 13)

This vegetation type occurs in the Northern Cape Province, specifically in the Southern Richtersveld for a large portion of the plains west of the Anenous Pass, stretching over some 55 km to Oograbies in the west and from Skimmelberg in the north to just south of the road connecting Steinkopf and Port Nolloth.

It is characterized by a flat basin landscape with a number of inselbergs embedded (mapped as SKr 14 Southern Richtersveld Inselberg Shrubland). Generally, the low vegetation is dominated by the flat cushions of Mesembryanthemum pseudoschlichtianum. Towards the west, a strong admixture of grasses, or mosaic elements of grassland, accompany the (flat) transition to SKs 6 Oograbies Plains Sandy Grassland. Towards the escarpment, increasing rainfall and grazing pressure result in increasing importance of Tetraena retrofracta. In degraded areas *Calobota angustifolia* and/or *Euphorbia ephedroides* are important. Silts and loamy sands occur of partly aeolian origin above migmatite and gneiss of the Namaqualand Metamorphic Complex. Frost is very rare. Fog and a high air humidity often occur. Southerly winds are stronger in the west of the unit.

Conservation: LC according to RLE2021. Target: 28% according to NBA 2018.

In reality this unit is susceptible. None conserved in statutory conservation areas. Evidence of overgrazing and trampling leading to erosion and to disturbance of topsoil occurs. High cover of *Calobota angustifolia* and *Euphorbia ephedroides* in many parts of this unit might be indicative of a shift towards a higher proportion of weeds, when heavily grazed.

Key species associated with Southern Richtersveld Scorpionstailveld (SKr 13).

IMPORTANT SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Euphorbia ephedroides var. ephedroides (d), Aridaria serotina, Cheiridopsis robusta, Drosanthemum inornatum, Eberlanzia dichotoma, Hypertelis salsoloides, Lampranthus otzenianus, Leipoldtia laxa, L. schultzei, L. uniflora, Mesembryanthemum subnodosum, Ruschia goodiae*
Low Shrub	*Calobota angustifolia (d)*
Herbs	*Grielum humifusum, Leysera tenella, Plantago cafra*
Geophytic Herbs	*Ophioglossum polyphyllum, Trachyandra muricata*
Succulent Herb	*Conicosia pugioniformis subsp. alborosea*
BIOGEOGRAPHICALLY IMPORTANT SPECIES (NAMAQUALAND AND GARIEP ENDEMICS)	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Eberlanzia cyathiformis, Mesembryanthemum deciduum*
Geophytic Herb	*Oxalis copiosa*
Succulent Herb	*Mesembryanthemum pseudoschlichtianum (d)*

3.1.1.c) Southern Richtersveld Inselberg Shrubland (SKr 14)

This vegetation type is distributed in the Northern Cape Province from the southern RichtersveId inselbergs scattered over the plains between Anenous Pass and Port Nolloth, partly surrounded by patches of SKr 13 Southern Richtersveld Scorpionstailveld. Includes Klaarkop, Kabies se Berg, Rooidam se Koppe, Steenbok se Berge, and Beesvlei se Berg (but excludes the unique Vyftienmyl se Berge inselbergs).

It is characterized by inselbergs that differ markedly in size, altitude, steepness, rockiness, and spatial aggregation. Habitats vary depending on exposure, altitude, and soil type. Smaller inselbergs are considerably more arid than higher ones, with lower parts covered by sparse chamaephyte vegetation, often dominated by the nanophanerophyte *Tetraena prismatocarpum*. At higher altitudes, especially on southwest facing slopes, dense vegetation of dwarf leaf succulents and lichens occurs. Granite, gneiss, and schist mostly of the Gladkop and Hoogoor Suites (Mokolian) that were affected by the Namaqualand metamorphic event. Shallow soils are of mostly loamy sand. The importance of fog is high in the west and decreases towards the east. Frost is very rare.

Conservation: LC according to RLE2021. Target: 28% according to NBA 2018.

None conserved in statutory conservation areas. The inselbergs house a number of endemic species and should receive protection status. Besides small stock grazing there is no specific threat. Compared to the SKr 5 Vyftienmyl se Berge Succulent Shrubland, these few major inselbergs or ridges at similar altitude lie further inland and are, therefore, less exposed to the coastal fog.

Key species associated with Southern Richtersveld Inselberg Shrubland (SKr 14).

IMPORTANT SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Drosanthemum floribundum (d), D. inornatum (d), Stoeberia frutescens (d), Adromischus mammillaris, A. marianiae var. immaculatus, Cheiridopsis robusta, Cotyledon orbiculata var. orbiculata, Eberlanzia gravida, Euphorbia rhombifolia, E. hamata, E. mauritanica, Hypertelis salsoloides, Kleinia longiflora, Octopoma connatum, Pelargonium crithmifolium, Mesembryanthemum subnodosum, Ruschia intricata, Salsola namibica, S. zeyheri, Monsonia spinosa, Senecio sarcoides, Tetragonia fruticosa, Tylecodon paniculatus*
Tall Shrubs	*Montinia caryophyllacea, Searsia populifolia*
Low Shrubs	*Dyerophytum africanum, Galenia fruticosa, Helichrysum asperum var. albidulum, Calobota sericea, Pteronia glomerata, Osteospermum oppositifolium*
Succulent Herbs	*Conophytum chrisocruxum, C. meyeri, Crassula columnaris subsp. prolifera, C. muscosa, Mesembryanthemum guerichianum, Senecio cicatricosus, Tromotriche aperta*
Graminoids	*Enneapogon scaber (d), Fingerhuthia africana, Stipagrostis zeyheri subsp. macropus*
BIOGEOGRAPHICALLY IMPORTANT SPECIES (NAMAQUALAND, GARIEP, AND RICHTERSVELD)	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Stoeberia frutescens (d), Zygophyllum prismatocarpum (d), Euphorbia dregeana, Hallianthus planus, Schlechteranthus maximilianii, Tetragonia robusta var. psiloptera*
Low Shrub	*Hermbstaedtia glauca*
Herb	*Gorteria corymbosa*
Succulent Herbs	*Conophytum obscurum subsp. obscurum, Crassula grisea, Huernia namaquensis, Larryleachia cactiformis var. cactiformis*
ENDEMIC SPECIES	
Growth Form	**Key Species (d = "Dominant")**
Succulent Shrubs	*Euphorbia ephedroides var. debilis, Namaquanthus vanheerdii, Polymita steenbokensis, Tylecodon cordiformis*
Succulent Herb	*Crassula alstonii*

3.1.2. Species of Conservation Concern and General Species Occurrences

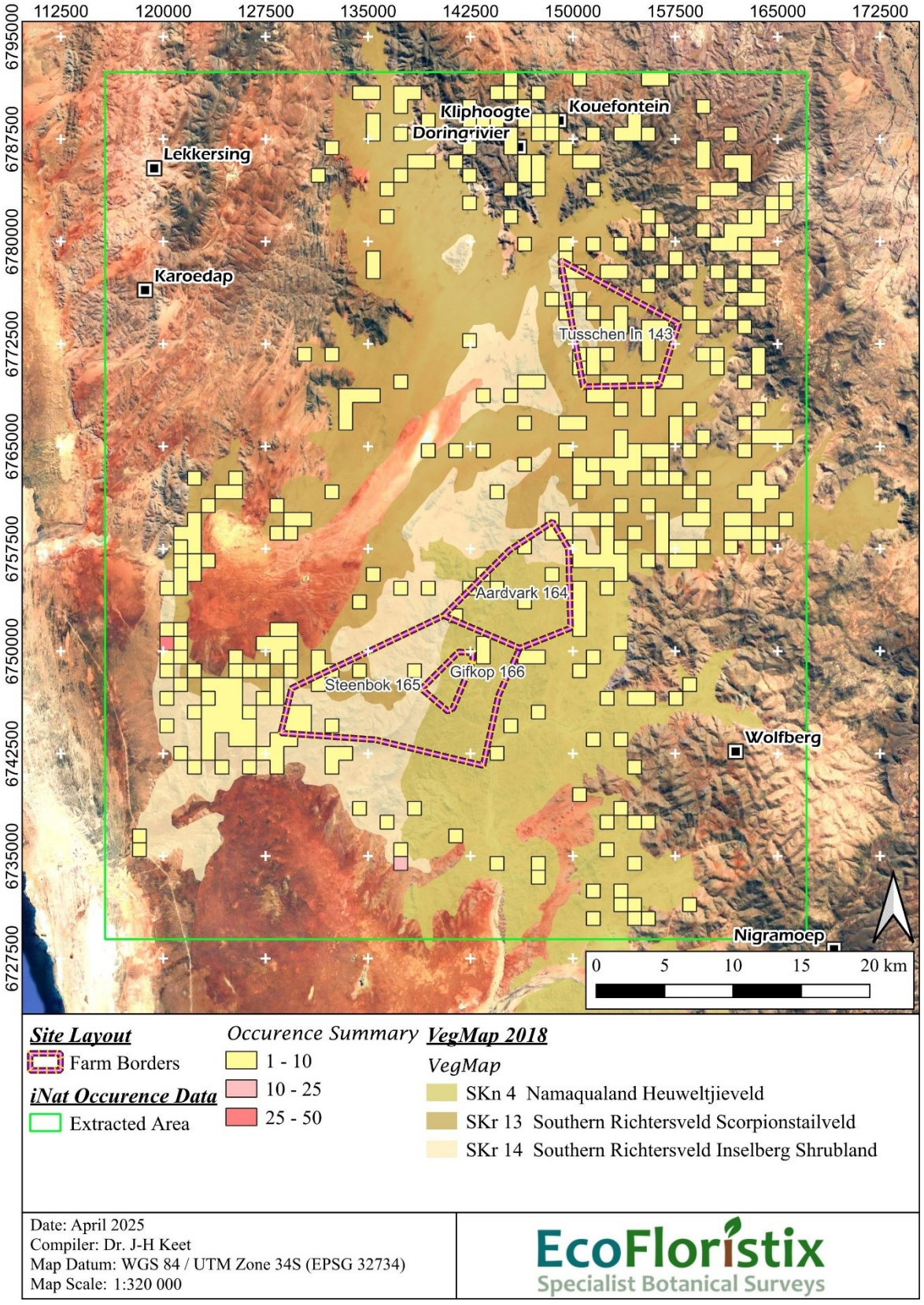
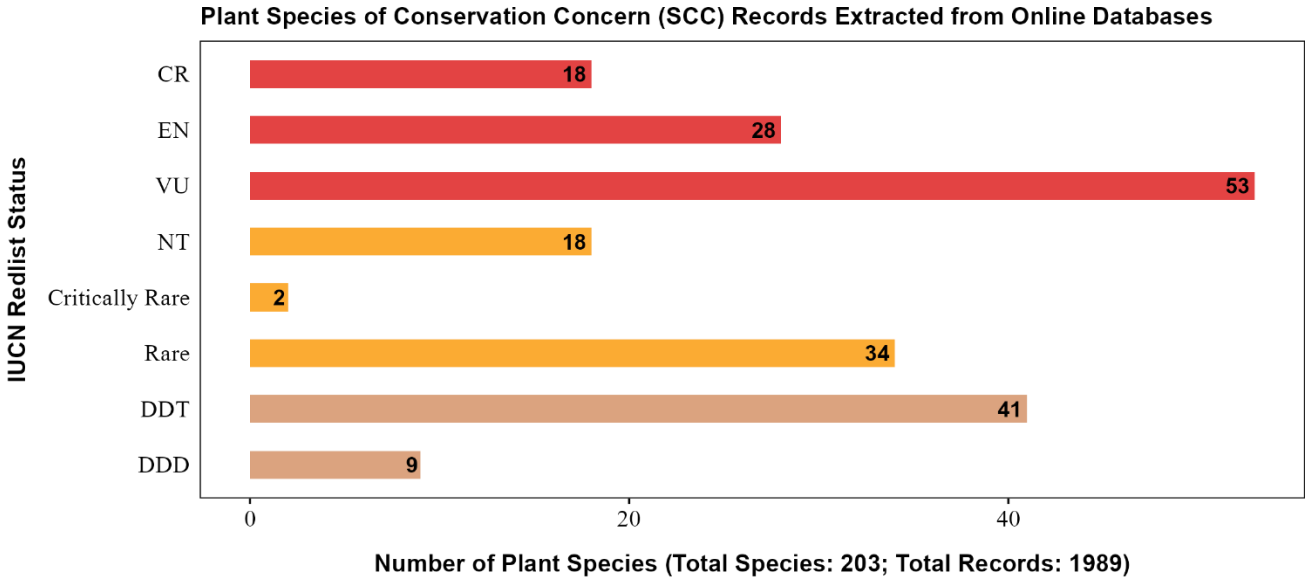


Figure 8: Plant species occurrence data from iNaturalist, displayed as the number of records per each 1 x 1 km grid square (i.e., the small square blocks). Also shown are the mapped vegetation types (from VegMap) underlying the Project Area. Note that the map uses the UTM Zone 34S (EPSG 32734) projection. See section 7.3.1 for more details on methodology.

Only SCC that might potentially occur in the Project Area and surrounds, as predicted by online databases (see section 7.3.1), are listed in this section. Also see section 1.6 for key legislation used to assess SCC and protected plant species. Note that many records that are in the POSA database do not have an IUCN listing, or might have a "Not Evaluated" listing, even though they are indigenous. This is because such records represent older taxonomic groupings that have subsequently been assigned criteria at higher, or lower, taxonomic levels (for example, a subspecies name that is no longer valid and which has been assigned an IUCN value at species level, or a record of a species that has subsequently been divided into subspecies, and therefore assigned IUCN values at subspecies level instead of species level). These records have been included in the analysis for the sake of comprehensiveness since they still represent valuable data.



A combined total of 1989 records were extracted from the online POSA (1551 records) and iNaturalist (438 records) databases. The total area used to extract the records covered approximately 334 956 hectares (3350 km^2), with the records covering a minimum convex hull area of 296 516 hectares (2965 km^2).

Together, these records consisted of a combined total of 1730 plant species that have been recorded within the extracted area (representing a total of 1598 species at an inclusive level, i.e., without considering subspecies, varieties, etc.), with the top three representative families being Aizoaceae (254 spp.), Asteraceae (244 spp.), and Crassulaceae (95 spp.).

This list included a total of 203 SCC, including 99 threatened species (full summary: 18 CR, 28 EN, 53 VU, 18 NT, 2 Critically Rare, 41 DDT, 9 DDD, 1243 LC, and 57 Not Evaluated). It should be noted that the high number of SCC is likely due to the use of an excessively large area for species record collection. Consequently, it is highly improbable that many of these species would be present within the target areas.

A total of 95 of these SCC are protected. Apart from these, a further 387 species are also protected (thus yielding a total of 482 protected plant species, consisting of 479 provincially protected species and 3 nationally protected trees; note that these trees might also be provincially protected).

Finally, the online screening report also revealed the potential presence of 25 Sensitive Species (some of these might have been included in the other online databases). Note that, for their protection, some of the identities of these species will not be made public, and they have therefore been assigned random names.

The following is a full summary of SCC, according to descending threat status:

- *Aloe pearsonii* (CR; Protected [Provincial Schedule 4])
- *Aloidendron pillansii* (CR)
- *Cephalophyllum herrei* (CR; Protected [Provincial Schedule 4])
- *Cheiridopsis peculiaris* (CR; Protected [Provincial Schedule 4])
- *Conophytum bolusiae* (CR; Protected [Provincial Schedule 4])
- *Conophytum bolusiae subsp. bolusiae* (CR; Protected [Provincial Schedule 4])
- *Conophytum crateriforme* (CR; Protected [Provincial Schedule 4])
- *Conophytum ectypum subsp. cruciatum* (CR; Protected [Provincial Schedule 4])
- *Conophytum francoiseae* (CR; Protected [Provincial Schedule 4])
- *Conophytum irmae* (CR; Protected [Provincial Schedule 4])
- *Conophytum jucundum subsp. marlothii* (CR; Protected [Provincial Schedule 4])
- *Conophytum obscurum subsp. barbatum* (CR; Protected [Provincial Schedule 4])
- *Conophytum stephanii subsp. stephanii* (CR; Protected [Provincial Schedule 4])
- *Crassothonna opima* (CR)
- *Drimia barbata* (CR)
- *Lachenalia klinghardtiana* (CR; Protected [Provincial Schedule 4])
- *Lachenalia nordenstamii* (CR; Protected [Provincial Schedule 4])
- *Tylecodon bodleyae* (CR)
- *Acanthopsis glandulopalmata* (EN)
- *Acanthopsis nitida* (EN)
- *Acanthopsis tuba* (EN)
- *Albuca unifoliata* (EN)
- *Aloidendron ramosissimum* (EN)
- *Anacampseros quinaria* (EN; Protected [Provincial Schedule 4])
- *Arenifera pillansii* (EN; Protected [Provincial Schedule 4])
- *Babiana lanata* (EN; Protected [Provincial Schedule 4])
- *Conophytum flavum subsp. novicium* (EN; Protected [Provincial Schedule 4])
- *Conophytum jucundum subsp. jucundum* (EN; Protected [Provincial Schedule 4])
- *Conophytum stephanii subsp. helmutii* (EN; Protected [Provincial Schedule 4])
- *Conophytum stevens-jonesianum* (EN; Protected [Provincial Schedule 4])
- *Empodium veratrifolium* (EN)
- *Enarganthe octonaria* (EN; Protected [Provincial Schedule 4])
- *Eriospermum viscosum* (EN)
- *Lapeirousia barklyi* (EN; Protected [Provincial Schedule 4])
- *Leipoldtia klaverensis* (EN; Protected [Provincial Schedule 4])
- *Leipoldtia lunata* (EN; Protected [Provincial Schedule 4])
- *Leobordea anthylloides* (EN)
- *Leobordea polycephala* (EN)
- *Lessertia argentea* (EN)
- *Oedera nordenstamii* (EN)
- *Pelargonium crassicaule* (EN)
- *Roepera divaricata* (EN)
- *Romulea rupestris* (EN; Protected [Provincial Schedule 4])
- *Sensitive Species X11* (EN)
- *Sensitive Species X23* (EN)
- *Acanthopsis dregeana subsp. longispina* (VU)
- *Acanthopsis glauca* (VU)
- *Acanthopsis spathularis* (VU)
- *Albuca scabrocostata* (VU)
- *Aloe komaggasensis* (VU; Protected [Provincial Schedule 4])
- *Aloidendron dichotomum* (VU)
- *Antimima koekenaapensis* (VU; Protected [Provincial Schedule 4])
- *Babiana horizontalis* (VU; Protected [Provincial Schedule 4])
- *Babiana namaquensis* (VU; Protected [Provincial Schedule 4])
- *Bulbine rhopalophylla* (VU)
- *Bulbine vitrea* (VU)
- *Bulbinella latifolia subsp. doleritica* (VU)
- *Bulbinella nana* (VU)
- *Cheiridopsis pillansii* (VU; Protected [Provincial Schedule 4])
- *Conophytum bilobum* (VU; Protected [Provincial Schedule 4])
- *Conophytum bilobum subsp. altum* (VU; Protected [Provincial Schedule 4])
- *Conophytum bilobum subsp. bilobum* (VU; Protected [Provincial Schedule 4])
- *Conophytum breve* (VU; Protected [Provincial Schedule 4])
- *Conophytum meyeri* (VU; Protected [Provincial Schedule 4])
- *Crotalaria pearsonii* (VU)
- *Drimia nana* (VU)
- *Heliophila namaquensis* (VU)
- *Lachenalia valeriae* (VU; Protected [Provincial Schedule 4])
- *Lampranthus aureus* (VU; Protected [Provincial Schedule 4])
- *Lapeirousia macrospatha* (VU; Protected [Provincial Schedule 4])
- *Leipoldtia frutescens* (VU; Protected [Provincial Schedule 4])
- *Leobordea plicata* (VU)
- *Lithops meyeri* (VU; Protected [Provincial Schedule 4])
- *Manulea corymbosa* (VU)
- *Mesembryanthemum springbokense* (VU; Protected [Provincial Schedule 4])
- *Microloma poicilanthum* (VU; Protected [Provincial Schedule 4])

- *Mitrophyllum abbreviatum* (VU; Protected [Provincial Schedule 4])
- *Monilaria obconica* (VU; Protected [Provincial Schedule 4])
- *Monsonia patersonii* (VU)
- *Namaquanthus vanheerdii* (VU; Protected [Provincial Schedule 4])
- *Nemesia saccata* (VU)
- *Oxalis crocea* (VU)
- *Phylica pauciflora* (VU)
- *Podalyria pearsonii* (VU)
- *Psammophora modesta* (VU; Protected [Provincial Schedule 4])
- *Richtersveldia columnaris* (VU; Protected [Provincial Schedule 4])
- *Schlechteranthus holgatensis* (VU; Protected [Provincial Schedule 4])
- *Schlechteranthus maximilianii* (VU; Protected [Provincial Schedule 4])
- *Selago beaniana* (VU)
- *Sensitive Species X15* (VU; Protected [Provincial Schedule 4])
- *Sensitive Species X16* (VU; Protected [Provincial Schedule 4])
- *Sensitive Species X17* (VU)
- *Sensitive Species X2* (VU)
- *Sensitive Species X20* (VU)
- *Stapeliopsis neronis* (VU; Protected [Provincial Schedule 4])
- *Tritonia marlothii* (VU; Protected [Provincial Schedule 4])
- *Tylecodon pusillus* (VU)
- *Tylecodon torulosus* (VU)
- *Amphibolia succulenta* (NT; Protected [Provincial Schedule 4])
- *Cheiridopsis acuminata* (NT; Protected [Provincial Schedule 4])
- *Conophytum hians* (NT; Protected [Provincial Schedule 4])
- *Crossyne flava* (NT; Protected [Provincial Schedule 4])
- *Cyphia crenata* (NT)
- *Cyphia longiflora* (NT)
- *Cyrtanthus herrei* (NT; Protected [Provincial Schedule 4])
- *Eriocephalus macroglossus* (NT)
- *Helichrysum marmarolepis* (NT)
- *Helichrysum tricostatum* (NT)
- *Hesperantha radiata* (NT; Protected [Provincial Schedule 4])
- *Larryleachia cactiformis var. cactiformis* (NT; Protected [Provincial Schedule 4])
- *Manulea altissima subsp. altissima* (NT)
- *Othonna euphorbioides* (NT)
- *Othonna intermedia* (NT)
- *Oxalis senecta* (NT)
- *Phylica nigrita* (NT)
- *Romulea namaquensis* (NT; Protected [Provincial Schedule 4])
- *Acanthopsis insueta* (Critically Rare)
- *Tylecodon cordiformis* (Critically Rare)
- *Anacampseros mallei* (Rare; Protected [Provincial Schedule 4])
- *Anacampseros scopata* (Rare; Protected [Provincial Schedule 4])
- *Annesorhiza latifolia* (Rare)
- *Brunsvigia pulchra* (Rare; Protected [Provincial Schedule 4])
- *Cheiridopsis purpurea* (Rare; Protected [Provincial Schedule 4])
- *Colchicum vanjaarsveldii* (Rare)
- *Crassula columella* (Rare)
- *Crassula exilis subsp. exilis* (Rare)
- *Crassula rupestris subsp. commutata* (Rare)
- *Cullumia rigida* (Rare)
- *Daubenya namaquensis* (Rare)
- *Eriospermum ratelpoortianum* (Rare)
- *Ferraria ovata* (Rare; Protected [Provincial Schedule 4])
- *Gladiolus salteri* (Rare; Protected [Provincial Schedule 4])
- *Haemanthus namaquensis* (Rare; Protected [Provincial Schedule 4])
- *Heliophila schulzii* (Rare)
- *Hesperantha flava* (Rare; Protected [Provincial Schedule 4])
- *Hessea pilosula* (Rare; Protected [Provincial Schedule 4])
- *Ifloga lerouxiae* (Rare)
- *Limonium namaquanum* (Rare)
- *Lotononis arenicola* (Rare)
- *Mitrophyllum roseum* (Rare; Protected [Provincial Schedule 4])
- *Moraea fenestralis* (Rare; Protected [Provincial Schedule 4])
- *Nelia schlechteri* (Rare; Protected [Provincial Schedule 4])
- *Ornithogalum pendens* (Rare)
- *Phylica pearsonii* (Rare)
- *Restio vilis* (Rare)
- *Sensitive Species X12* (Rare; Protected [Provincial Schedule 4])
- *Sensitive Species X13* (Rare; Protected [Provincial Schedule 4])
- *Sensitive Species X3* (Rare)
- *Sensitive Species X4* (Rare)
- *Sensitive Species X7* (Rare; Protected [Provincial Schedule 4])
- *Sensitive Species X9* (Rare; Protected [Provincial Schedule 4])
- *Tylecodon hirtifolius* (Rare)
- *Albuca arenosa* (DDT)
- *Albuca osmynella* (DDT)
- *Antimima compressa* (DDT; Protected [Provincial Schedule 4])
- *Antimima defecta* (DDT; Protected [Provincial Schedule 4])
- *Antimima longipes* (DDT; Protected [Provincial Schedule 4])
- *Antimima microphylla* (DDT; Protected [Provincial Schedule 4])
- *Antimima oviformis* (DDT; Protected [Provincial Schedule 4])
- *Antimima pilosula* (DDT; Protected [Provincial Schedule 4])
- *Antimima pusilla* (DDT; Protected [Provincial Schedule 4])
- *Arctotis decurrens* (DDT)
- *Bulbine hallii* (DDT)
- *Bulbine lamprophylla* (DDT)
- *Bulbine torsiva* (DDT)
- *Bulbine truncata* (DDT)
- *Curio pinguifolius* (DDT)
- *Curio sulcicalyx* (DDT)
- *Drosanthemum filiforme* (DDT; Protected [Provincial Schedule 4])
- *Euphorbia brakdamensis* (DDT)

- *Felicia annectens* (DDT)
- *Lampranthus roseus* (DDT; Protected [Provincial Schedule 4])
- *Lessertia pauciflora var. schlechteri* (DDT)
- *Lotononis densa subsp. leucoclada* (DDT)
- *Othonna pachypoda* (DDT)
- *Oxalis pulchella var. pulchella* (DDT)
- *Pelargonium grenvilleae* (DDT)
- *Phyllopodium maxii* (DDT)
- *Rhynchosia viscidula* (DDT)
- *Ruschia aggregata* (DDT; Protected [Provincial Schedule 4])
- *Ruschia brevibracteata* (DDT; Protected [Provincial Schedule 4])
- *Ruschia fugitans* (DDT; Protected [Provincial Schedule 4])
- *Ruschia sessilis* (DDT; Protected [Provincial Schedule 4])
- *Ruschia tribracteata* (DDT; Protected [Provincial Schedule 4])
- *Ruschia valida* (DDT; Protected [Provincial Schedule 4])
- *Salsola tuberculata* (DDT)
- *Tetragonia distorta* (DDT; Protected [Provincial Schedule 4])
- *Thesium microcarpum* (DDT)
- *Thesium urceolatum* (DDT)
- *Wahlenbergia buseriana* (DDT)
- *Wahlenbergia costata* (DDT)
- *Wahlenbergia divergens* (DDT)
- *Wahlenbergia sonderi* (DDT)
- *Cephalophyllum numeesense* (DDD; Protected [Provincial Schedule 4])
- *Colchicum bellum* (DDD)
- *Eriospermum attenuatum* (DDD)
- *Eriospermum papilliferum* (DDD)
- *Heliophila affinis* (DDD)
- *Jamesbrittenia major* (DDD)
- *Phylica glabrata* (DDD)
- *Selago tenuis* (DDD)
- *Ursinia laciniata* (DDD)

3.2. Desktop Analyses: Ecologically Important Landscape Features

3.2.1. Ecosystem Threat Status: RLE 2021 and NBA 2018

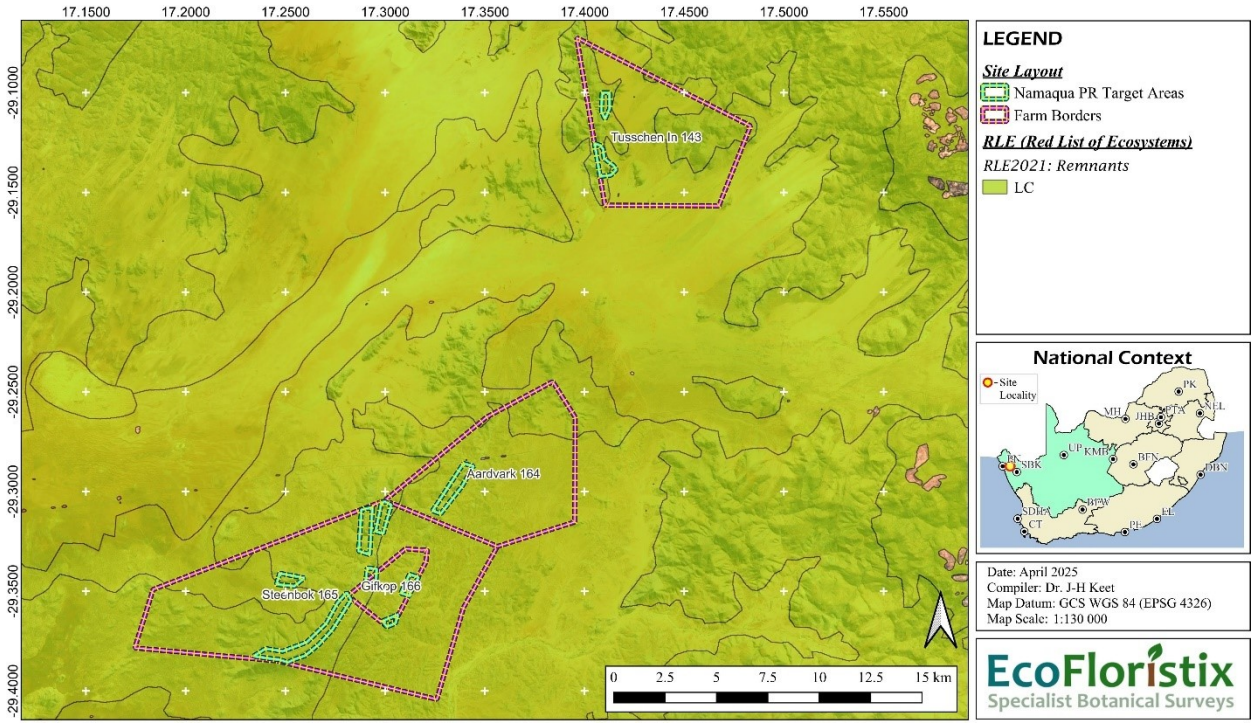


Figure 9: Ecosystem Threat Status, according to the Red List of Ecosystems for South Africa (2021), associated with the Project Area and surrounds.

According to the Red List of Ecosystems for South Africa (2021) spatial dataset the Project Area and all the target areas overlap Least Concern ecosystem types, namely Namaqualand Heuweltjieveld, Southern Richtersveld Scorpionstailveld, and Southern Richtersveld Inselberg Shrubland (Figure 9). The National Biodiversity Assessment 2018 essentially presents the same information.

Given that these areas are listed as Least Concern, and that fact their current extents far surpass proposed conservation targets (specifically see Figure 4 in section 3.1.1), they are unlikely to be impacted to any significant degree by prospecting activities.

See section 7.2.1 for more details and notes on Ecosystem Threat Status categories.

3.2.2. Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA)

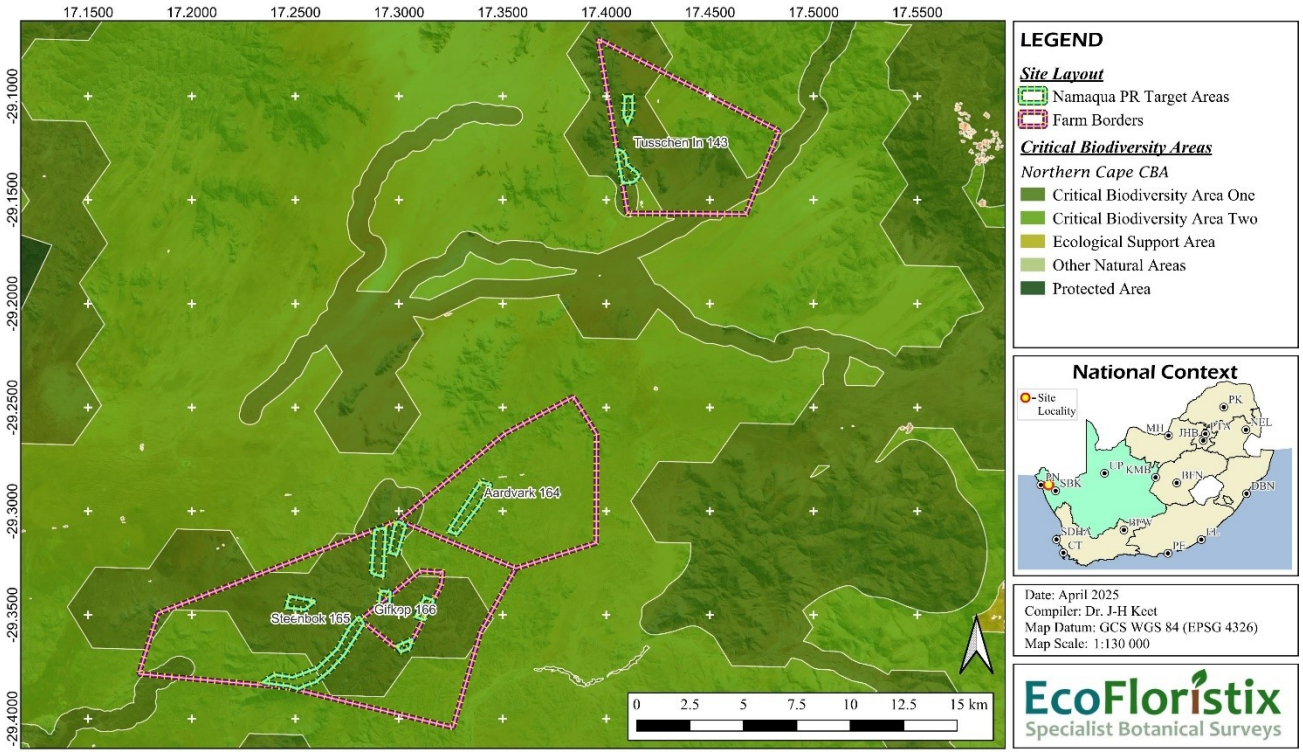


Figure 10: Layout of Critical Biodiversity Areas within the Project Area and surrounds.

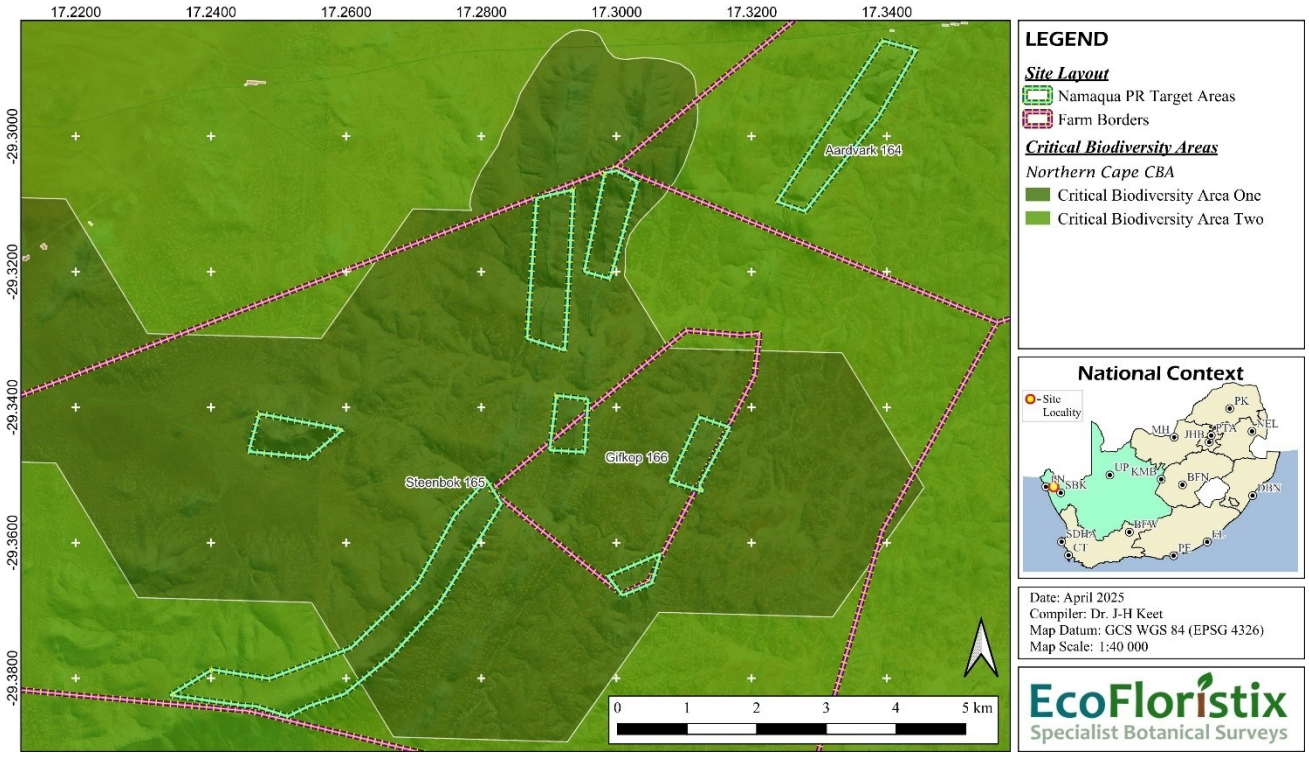


Figure 11: CBAs for the target areas on farms Aardvark 164, Steenbok 165, and Gifkop 166.

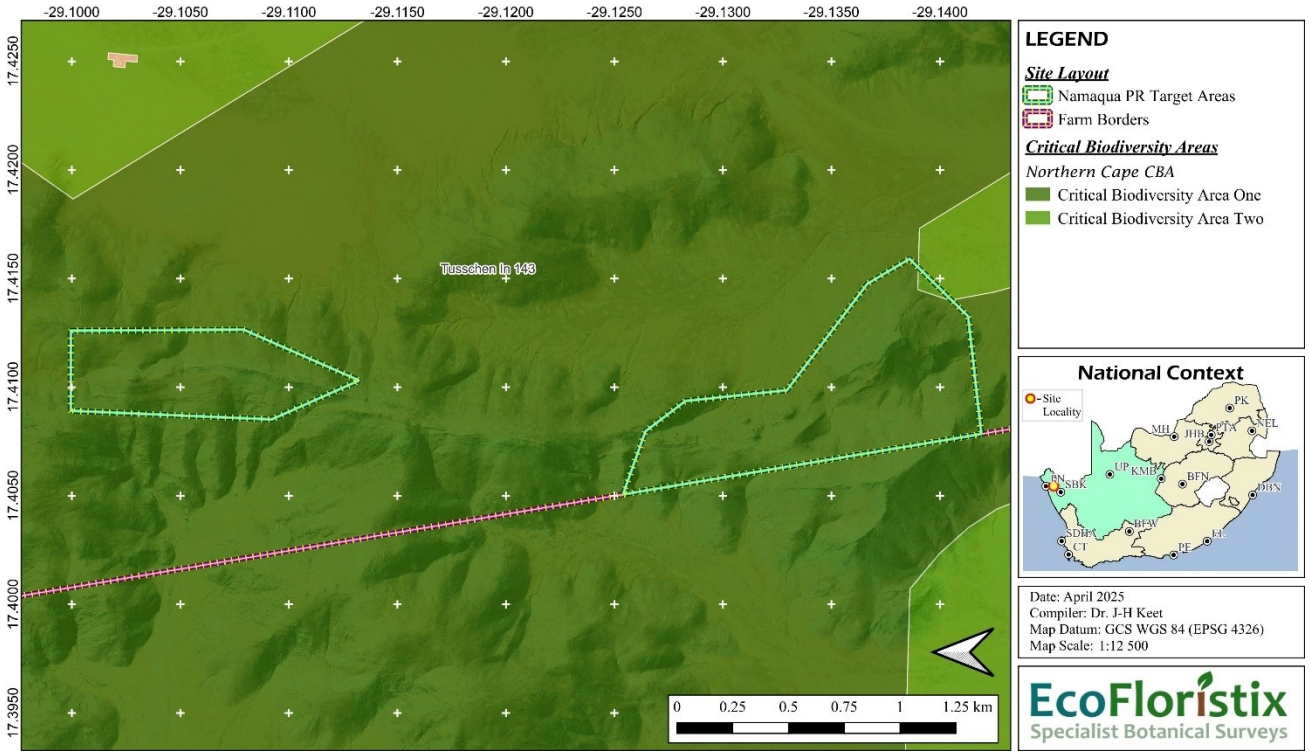


Figure 12: CBAs for the target areas on farm Tuschen In 143. Note: to optimize space, true north is directed to the left.

The target areas are located either in CBA 1 or CBA 2 areas (Figure 10). More specifically, only one target area on farm Aardvark 164 and part of one target area on farm Steenbok 165 (Figure 11), and a small part of one target area on farm Tuschen In 143 (Figure 12) occur in CBA 2 areas; the rest of the target areas all occur in CBA 1 areas.

CBA1 and CBA2 areas are considered critical for meeting biodiversity targets for species, ecosystems, or ecological processes and infrastructure. Thus, they are of high biodiversity and ecological value, and must preferably be kept in a natural or near-natural state, with no further loss of habitat or species. This is, however, more crucial for ecosystems that have suffered great loss in terms of their original extents. Where the majority of specific ecosystems and/or vegetation types are still extant — as is this case here — activities such as prospecting would be considered to have a minimal impact. Large areas of intact ecosystems offer ecological benefits, including acting as reservoirs for species and genetic diversity for potential recolonization and resilience, sustaining vital processes like water regulation, soil stability, and carbon sequestration, providing buffer zones and supporting wildlife movement, and offering essential baseline data for impact assessment and enhancing the potential for natural regeneration and ecosystem recovery.

See section 7.2.4 for more details and notes on CBA and ESA categories.

3.2.3. National Protected Area Expansion Strategy

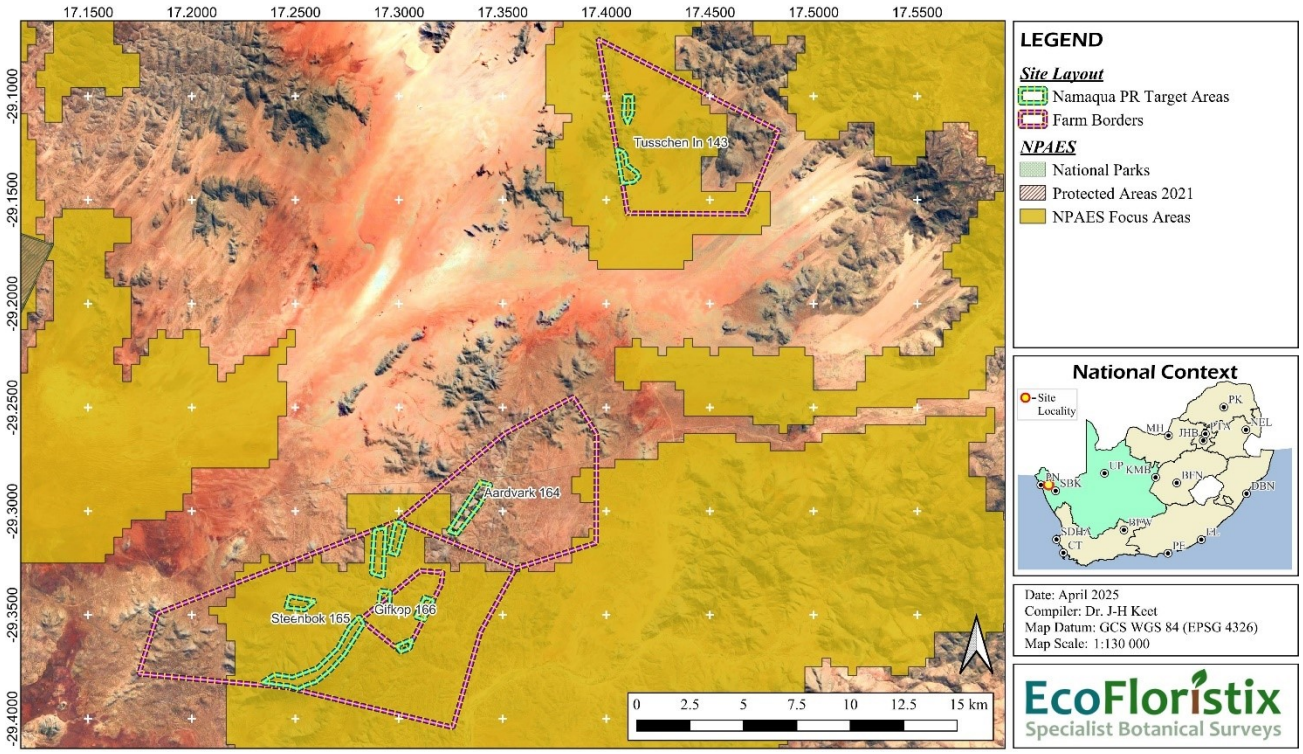


Figure 13: Project Area and target areas in relation to designated areas of the National Protected Area Expansion Strategy (NPAES).

All of the target areas, except for target area 3 on farm Aardvark 164, are located within NPAES Focus Areas, all of which constitute the Richtersveld Focus Area (Figure 13). The target areas do not occur in or near any national parks (the closets of which is ± 18 km northeast of the target areas on farm Steenbok 165, namely the Richtersveld National Park) or protected areas (the closest of which is ± 14 km to the north of the northernmost target area of farm Tuschen In 143, namely the Richtersveld Cultural & Botanical Landscape).

NPAES areas provide the best opportunities for meeting ecosystem-specific protected area targets. Given that the current extents of these areas far surpass proposed conservation targets (specifically see Figure 4 in section 3.1.1), they are unlikely to be impacted to any significant degree by prospecting activities.

See section 7.2.3 for more details and notes on the NPAES.

3.2.4. National Biodiversity Assessment (NBA) Protected Areas (Ecosystem Protection Levels)

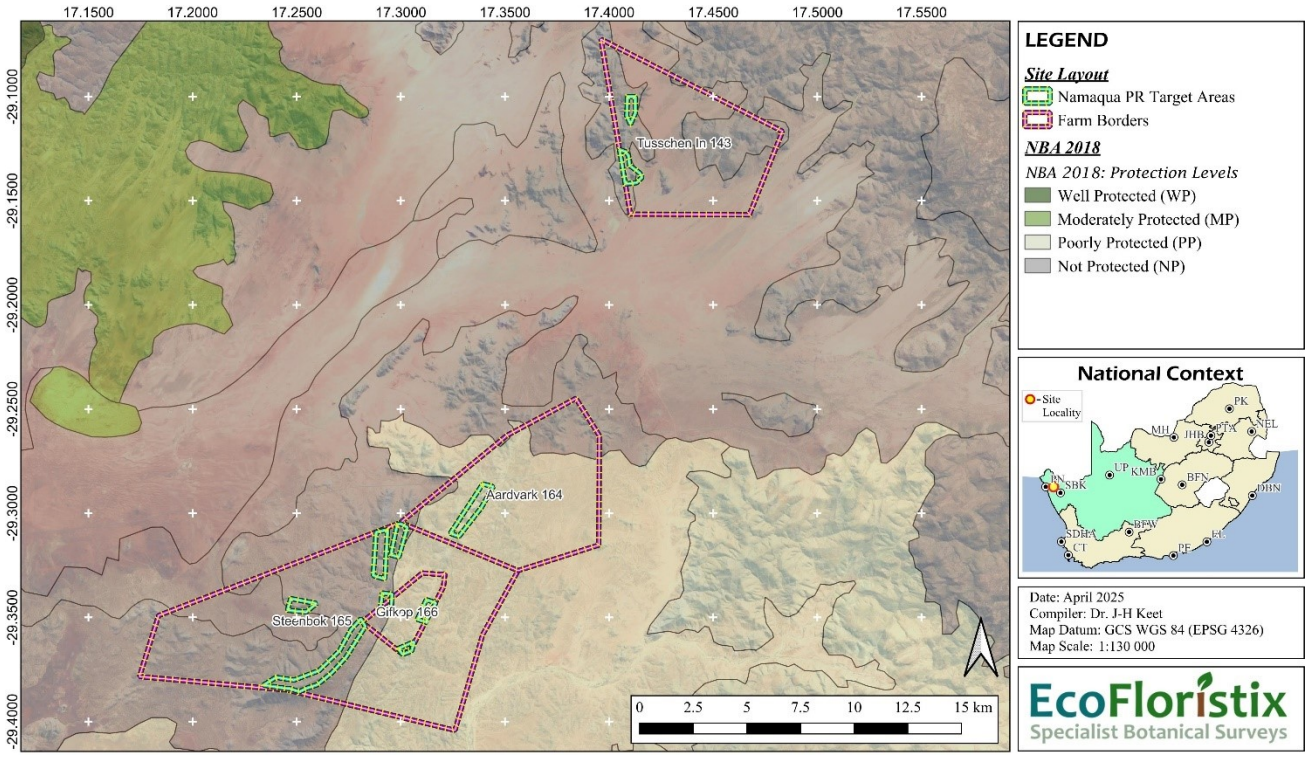


Figure 14: Ecosystem Protection Levels within the Project Area and surrounds.

According to the National Biodiversity Assessment 2018 spatial dataset the target areas are located either within NP (Southern Richtersveld Scorpionstailveld or Southern Richtersveld Inselberg Shrubland) or MP (Namaqualand Heuweltjieveld) ecosystems (Figure 14).

Despite their low levels of ecosystem protection, the current extents these areas (Table 1 and Figure 4) are such that they are unlikely to be impacted to any significant degree by prospecting activities.

See section 7.2.2 for more details and notes on Ecosystem Protection Level categories.

3.2.5. Hydrological Features

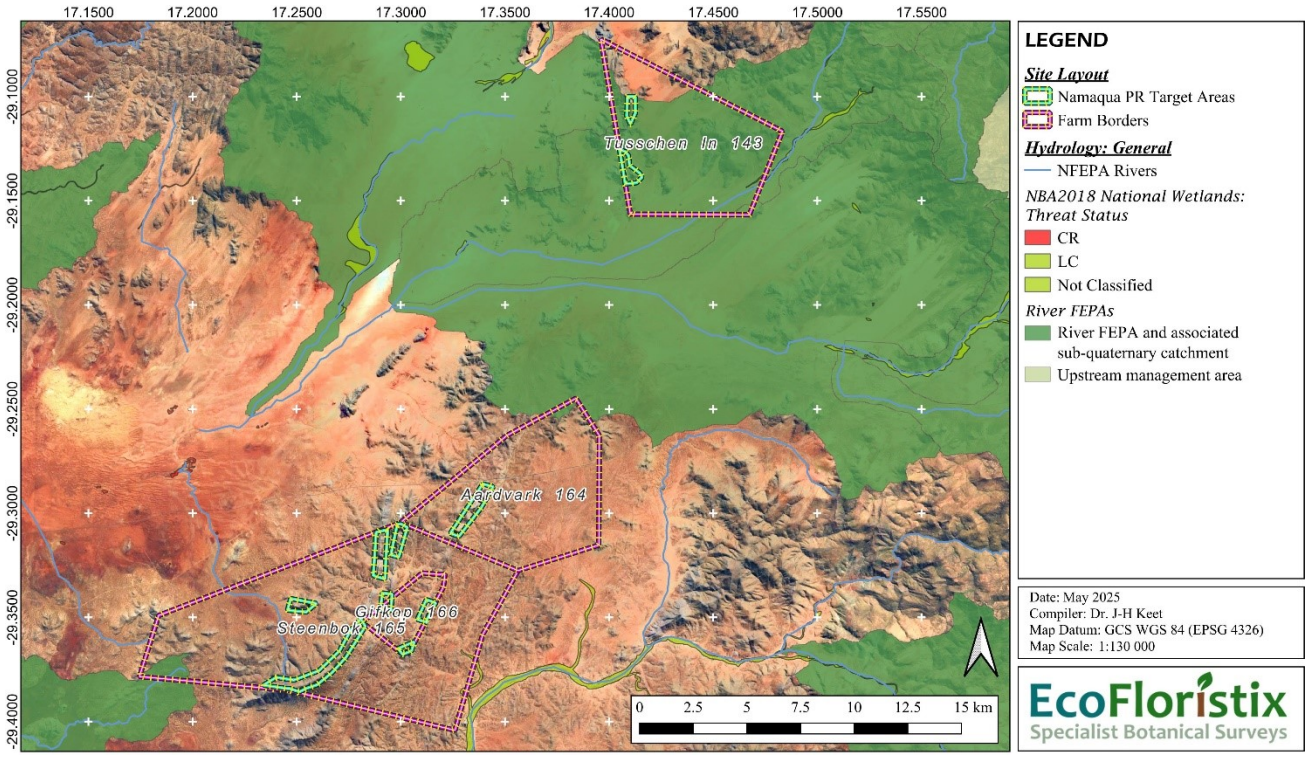


Figure 15: Hydrological setting of the Project Area and surrounds in the context of NFEPA rivers, Strategic Water Source Areas (SWSA), and the South African Inventory of Inland Aquatic Ecosystems (SAIIAE)) as represented by the National Biodiversity Assessment (NBA) 2018.

The target areas are not located within any SWSA areas and do not occur near any threatened rivers as determined by NFEPA (Figure 15). An unnamed NFEPA river originates within the southwest part of target area 2 on farm Steenbok 165.

The National Wetlands Map was also consulted. The target areas do not contain any wetlands (whether natural, artificial, or unclassified), and the target areas also do not occur near any such wetlands.

Finally, the majority of farm Tusschen In 143 (including target areas 1 and 6) and a part of the southwestern corner of the farm Steenbok 165 (excluding any target areas) extends across areas classified as a river FEPA.

Note that NFEPA rivers and river FEPAs differ from each other ‘n a key way: an NFEPA river specifically refers to the river itself (represented by lines in Figure 15), whereas a river FEPA refers to a geographical area — more specifically a sub-quaternary catchment (represented by polygons in Figure 15) — that has been earmarked to achieve biodiversity targets for river ecosystems and threatened/near threatened fish species. Essentially, a river FEPA is a management unit that includes NFEPA rivers (or portions of them) and the surrounding land that drains into them.

Given the highly localized nature prospecting drilling, the proposed activities will not have any major impacts these specific hydrological features.

See sections 7.2.4 and 7.2.5 for more details and notes on hydrological features.

4. Final Sensitivities

All watercourses were buffered by 32 m so that these sensitive habitats can be adequately avoided. Since watercourse buffers were included, raster aggregation was done at a resolution of 10 m. This was deemed an acceptable scale of resolution given the various differing resolutions of the input layers. Although a 32 m buffer was deemed adequate for avoiding sensitive watercourse habitats, it must be noted that any listed activity proposed within a 100 m of a watercourse will require a water use licence (WUL).

All watercourses and their buffered areas are classified as having a Very High sensitivity, and they should be avoided wherever possible.

Although the target areas vary in their sensitivity combinations, none were scored as having areas of Low or Very Low sensitivity. The primary reasons for this include the fact that all of the target areas occur either in CBA1 or CBA2 area, as well as occurring in either Poorly Protected or Not Protected ecosystems (Figure 16). Furthermore, all of the target areas, with the exception of target area 3 on farm Aardvark 164, occur in an NPAES Focus area (Richtersveld Focus Area). Thus, despite the fact that all of the target areas occur in Least Concern ecosystems, the presence of these areas contribute significantly to their higher sensitivities. Nevertheless, the extents of the ecosystems in which the target areas occur currently far surpass their proposed conservation targets, and they are unlikely to be impacted to any significant degree by prospecting activities.

Finally, Endangered (*Aloidendron ramosissimum* and *Albuca unifoliata*) and Vulnerable (*Schlechteranthus maximilianii*) plant species have been recorded on the farm Tusschen In 143 according to online databases, and their buffer zones specifically overlap with target area 1. Firstly, it should be noted that the exact localities of online threatened plant species records (specifically from iNaturalist) are obscured for their protection. Thus, including buffer zones around potential threatened plant species localities applies the precautionary principle since it's preferable to encompass a larger area where these species might be found, rather than risking exclusion by defining a smaller, potentially incomplete, area. Despite the fact that the mentioned threatened plant species have only been recorded in or near target area 1, they are known to occur widely within the region, and especially within habitats that characterize the target areas, all of which comprise arid mountain slopes. It is highly likely that these plant SCC will occur in at least some of the target areas. Fortunately, these plant SCC can likely easily be avoided, which is why Site Sensitivity Verifications are recommended.

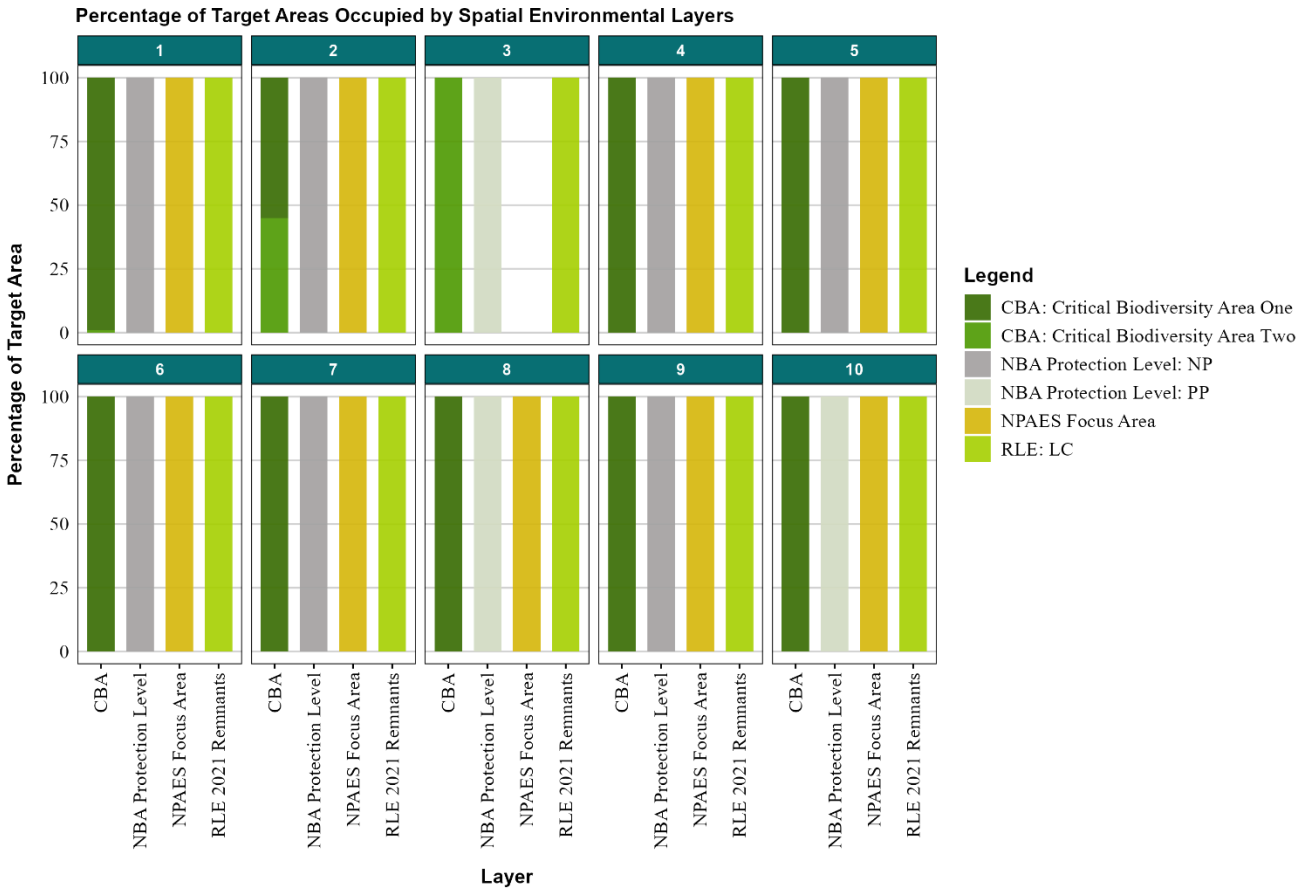


Figure 16: Percentage contribution (in terms of total land area covered) per target area of the various environmental spatial layers used to determine final sensitivities. Compare with

From the final sensitivity ratings, the preferred target areas in order of preference are 3, 8, 10, and 2 (Figure 17; also see Table 2). This is based firstly on having the largest percentage of medium sensitivity area. It is preferable to conduct activities affecting the environmental in areas with the lowest assigned sensitivities.

Thereafter, the remaining target areas were ranked based on having the lowest percentage of Very High sensitivity areas, and their order of preference is 7, 5, 6, 4, 1, and finally target 9. Although these last target areas have a higher percentage of Very High areas compared to some of the preferred target areas (e.g. area 10 has the largest amount of Very High sensitivity), they do not contain any areas of Medium sensitivity (target area 1 does have some Medium sensitivity, but this is negligible — only 1% of its total area).

The Minrom report considered the top 5 target areas, in order of preference, to be areas 1, 2, 3, 4, and 5 (names are based on preferred rank). This Terrestrial Desktop Sensitivity report supports the preference of target areas 2, 3, and 5, since these contain optimum levels of overall sensitivity: target area 3 has a large percentage of Medium sensitivity, while target area 2 has the smallest percentage of Very High sensitivity. Target area 5 has the third lowest percentage of Very High sensitivity, even though it has no Medium sensitivity areas.

Target areas 4 and 1, however, ranked third and second to last given that they have the third and second highest levels of Very High sensitivity (apart from areas with Medium sensitivity), with no or almost no Medium sensitivity areas.

It should be noted that all of the area calculations are based on the target area boundaries, and not added buffered areas surrounding the target areas.

Despite the aforementioned, it must be stressed that these are only based on desktop evaluations and ground truthing of onsite conditions (presence of sensitive micro habits, levels of disturbance, presence of Species of Conservation Concern, etc) might alter sensitivities (see section 1.5). It is thus strongly recommended that field studies (i.e., SSVs) be done prior to commencement of prospecting activities to determine the accuracy of sensitivities presented here.

It is expected that minimal levels of disturbance will be found within the target areas given the nature of the areas in which they occur (inaccessible mountainous terrain) and their localities (in arid areas with a sparse human population). This might alter the sensitivity levels that have been presented here.

Table 2: Sensitivity levels and area sizes of the target areas. Compare with Figure 17 and Figure 18 for graphs, and Figure 19 to Figure 22 for maps.

Target Area ID	Sensitivity	Fragment Size (ha)	Target Area Size (ha)	Percentage of Site
1	Very High	33	89	37%
	High	55.5		62%
	Medium	0.5		1%
2	Very High	68.4	307.6	22%
	High	134.3		44%
	Medium	104.9		34%
3	Very High	58.2	157.1	37%
	Medium	98.9		63%
4	Very High	43.7	133.2	33%
	High	89.4		67%
5	Very High	21.2	74.4	29%
	High	53.2		72%
6	Very High	13.8	46.5	30%
	High	32.7		70%
7	Very High	16.2	61.6	26%
	High	45.4		74%
8	Very High	27.1	50.1	54%
	Medium	23		46%
9	Very High	18.8	42.8	44%
	High	24		56%
10	Very High	14.2	24.9	57%
	Medium	10.7		43%

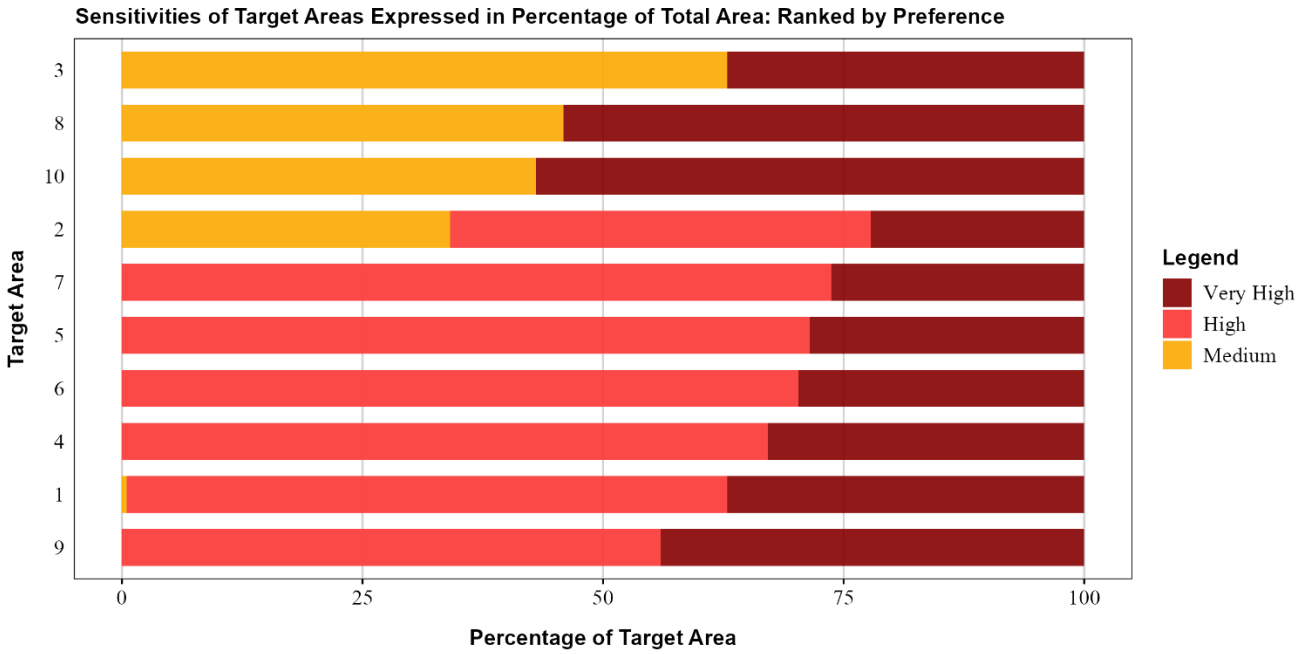


Figure 17. Sensitivity levels and area sizes of the target areas as ranked by preference. The order given of the target areas (from top to bottom on the y-axis) is the preferred order in which sites should be chosen for prospecting. Compare with Table 2 for graphs, and Figure 19 to Figure 22 for maps.

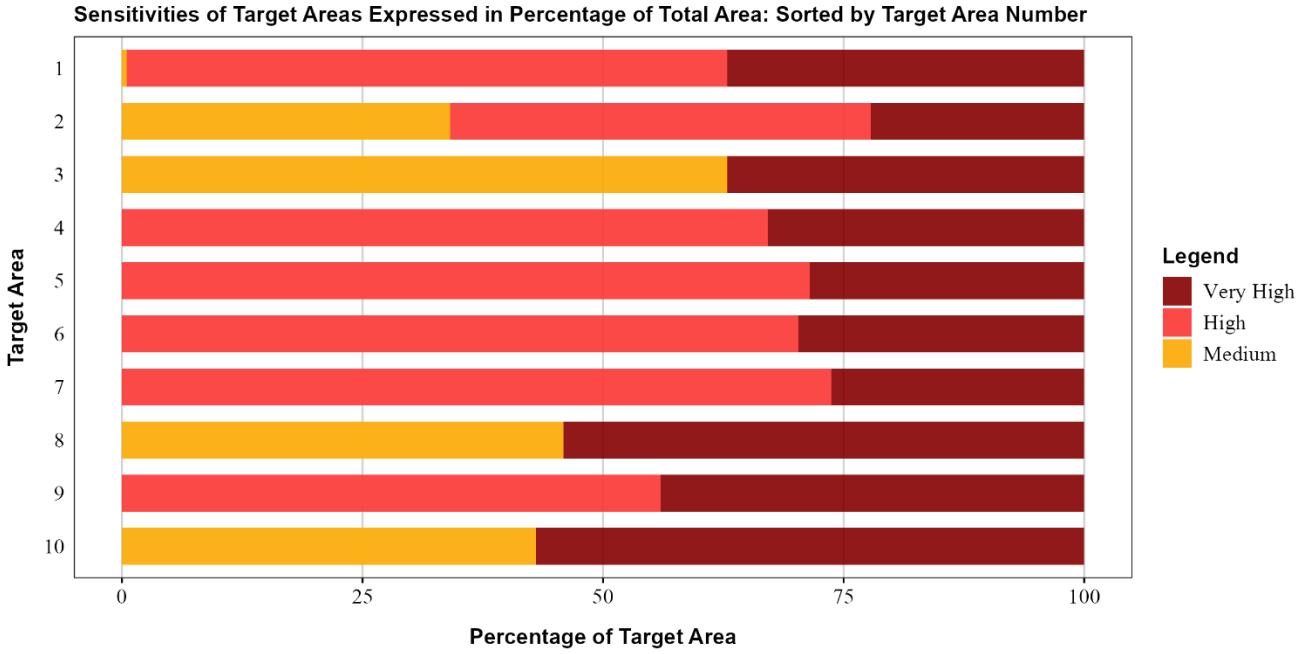


Figure 18: Sensitivity levels and area sizes of the target areas sorted by target area number. Compare with Table 2 for graphs, and Figure 19 to Figure 22 for maps.

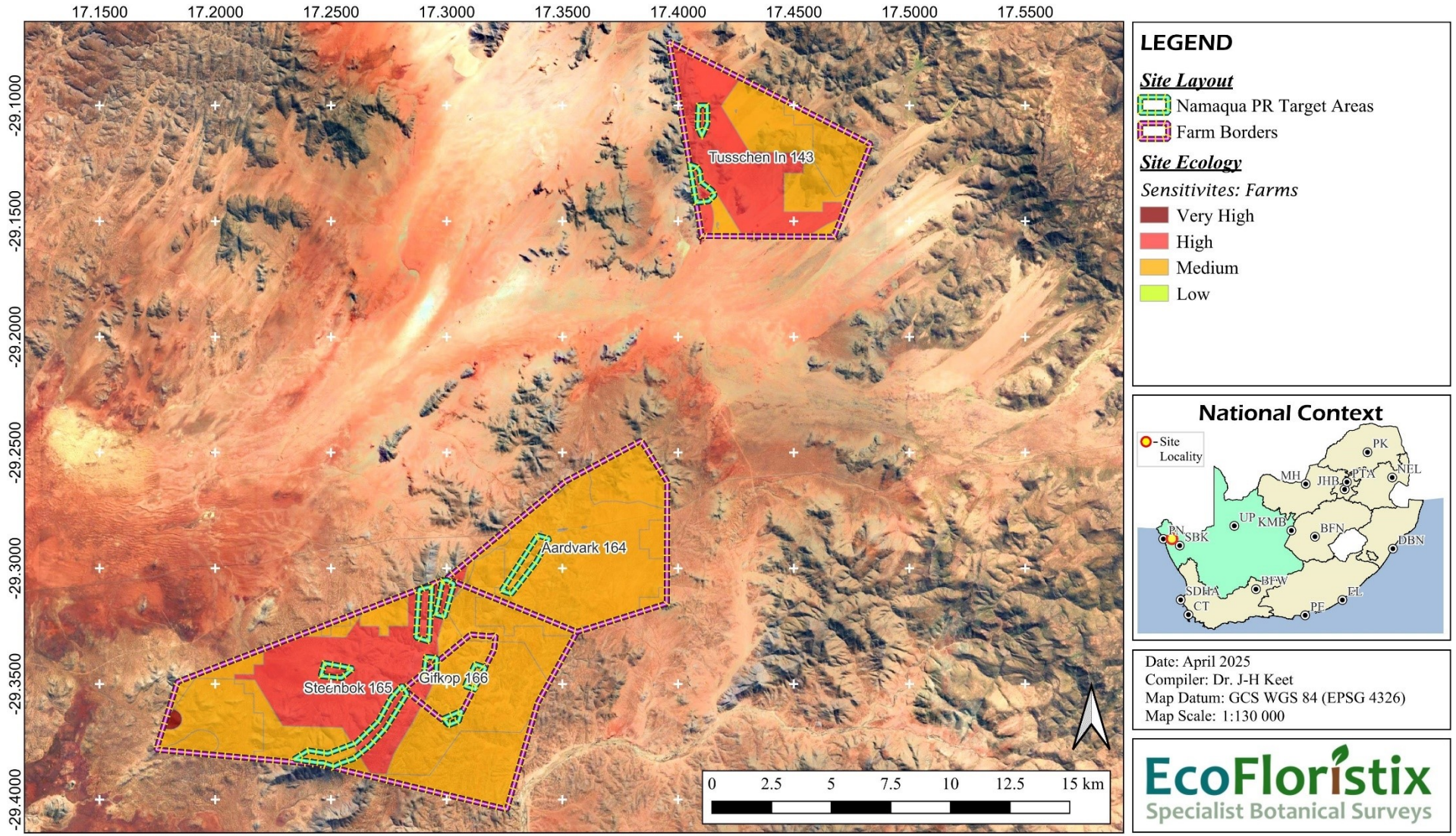


Figure 19: Final sensitivities of the target areas, including farm boundaries. Note that this is intended to give a broad overview, and watercourses are not shown given their fine-scale mapping for the specific target areas.

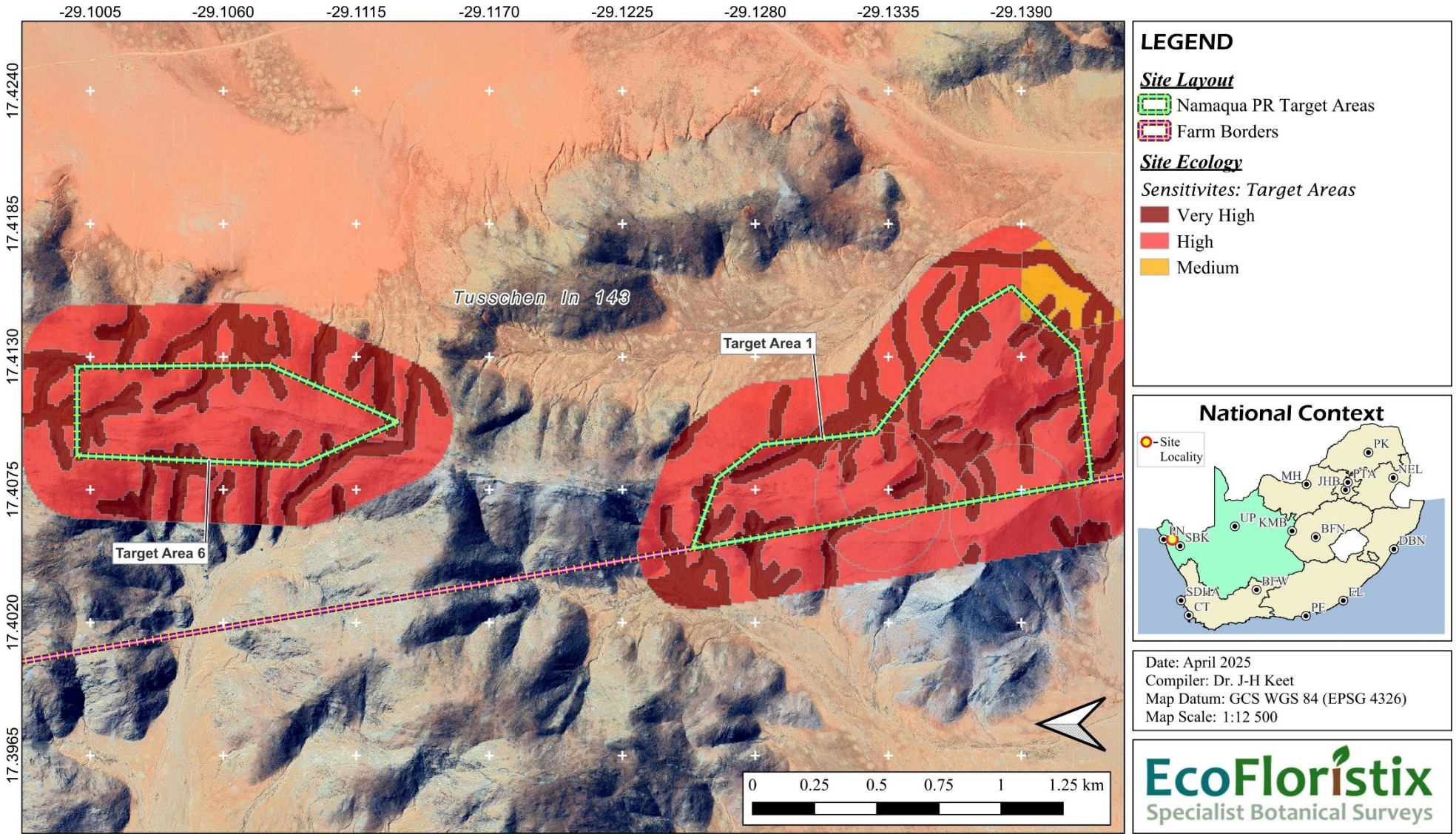


Figure 20: Final sensitivities for the target areas on farm Tuschen In 143. Note: to optimize space, true north is directed to the left.

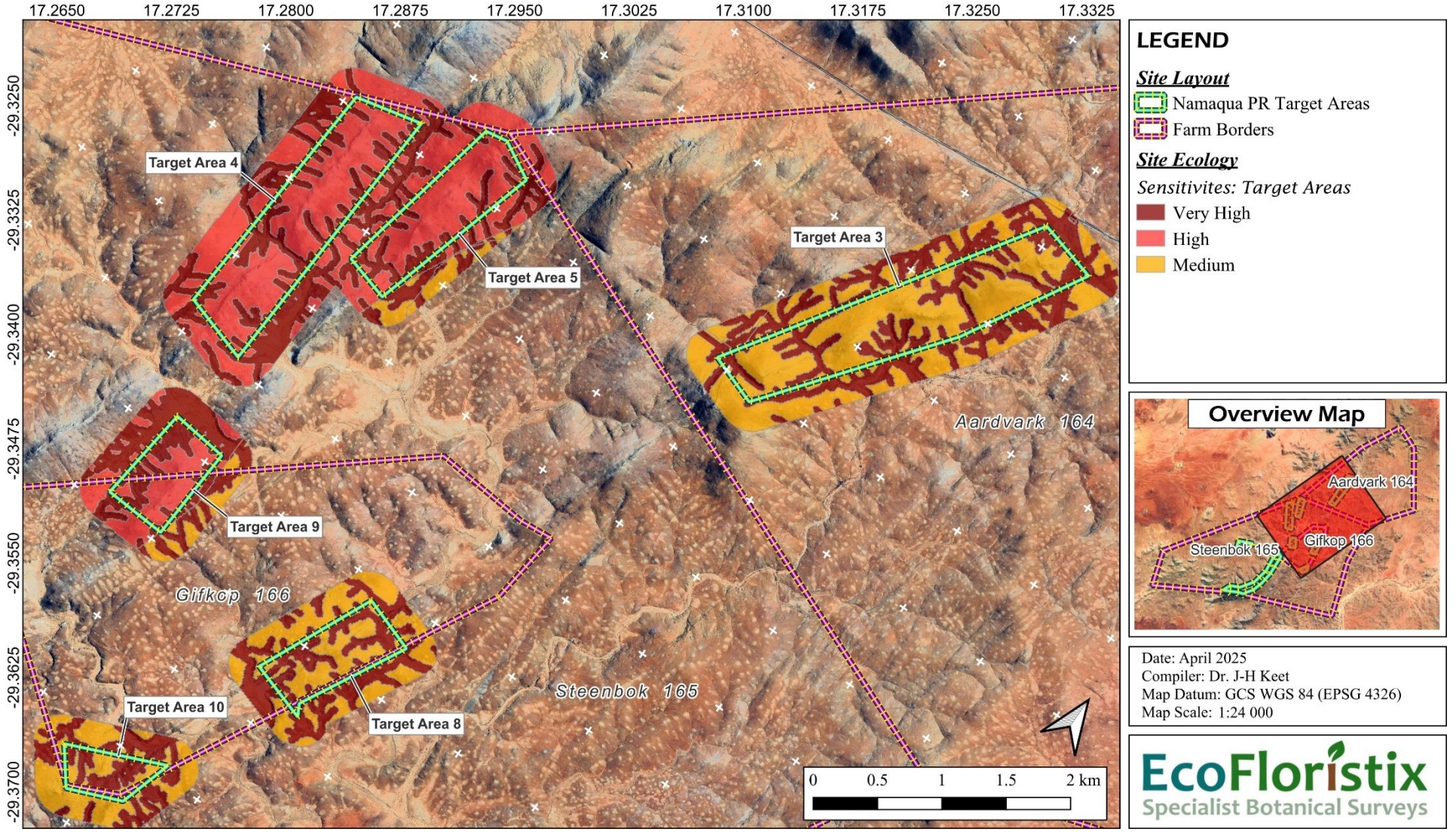


Figure 21: Final sensitivities for the target areas on farms Aardvark 164, Steenbok 165, and Gifkop 166. Note: to optimize space, true north is directed to the top right. This map is continued in Figure 20.

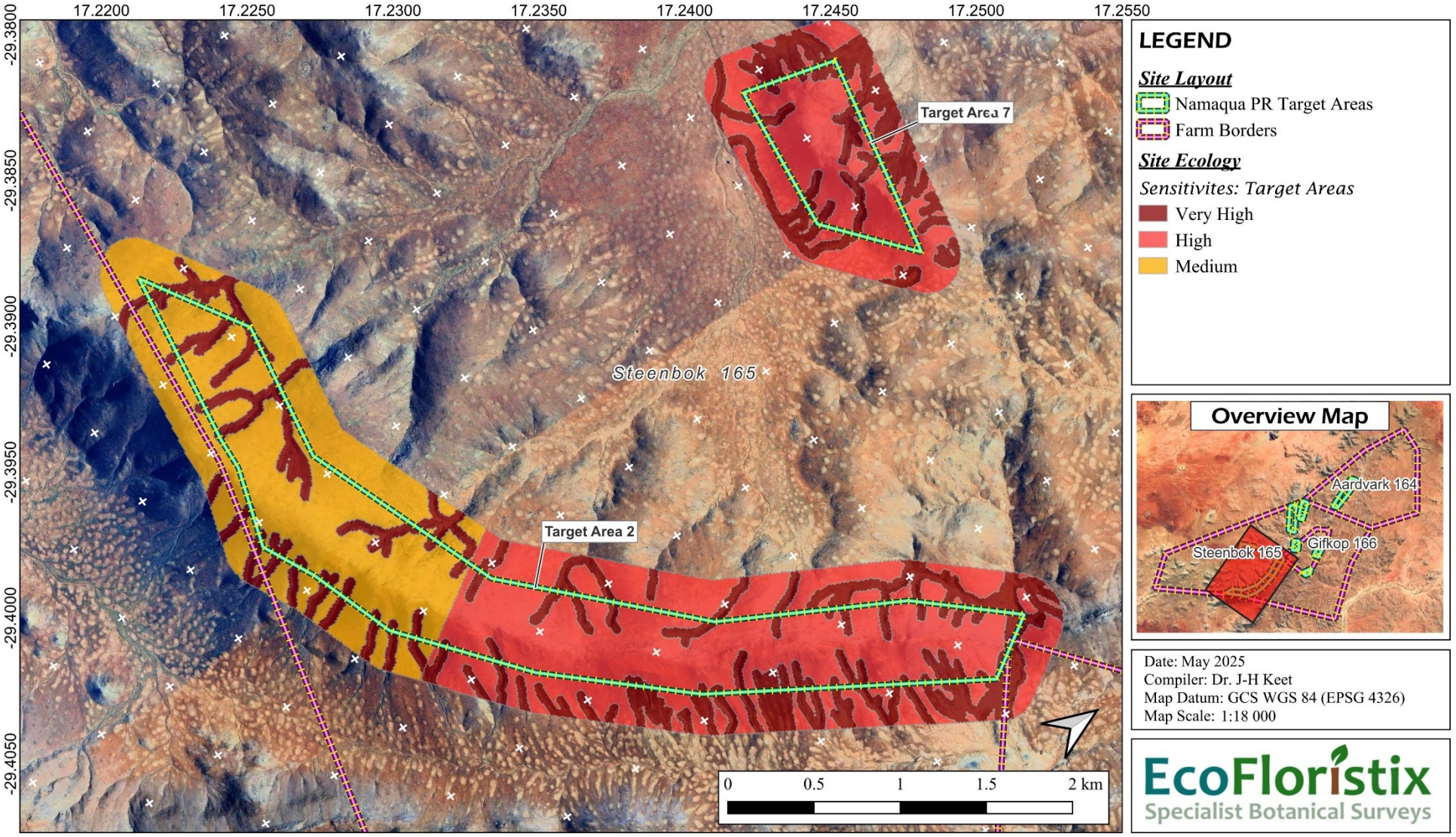


Figure 22: Final sensitivities for the target areas on farms Aardvark 164, Steenbok 165, and Gifkop 166. Note: to optimize space, true north is directed to the right. This map is continued from Figure 21.

5. Conclusion

EcoFloristix Specialist Botanical Surveys was appointed to conduct a Terrestrial Desktop Sensitivity for a Prospecting Right Application for Targeted Blocks on Farms Tusschen In 143, Aardvark 164, Steenbok 165, and Gifkop 166 near Steinkopf, Northern Cape Province, South Africa.

The final sensitivity layer created for the terrestrial ecosystems are crucial for planning purposes. It is imperative to avoid sensitive areas wherever possible, particularly those classified as “Very High” sensitivity, to protect the environment and minimize project risks. These layers should be utilized alongside other informative data, such as geological surveys, to pinpoint potential prospecting locations.

Furthermore, it's anticipated that additional fieldwork will be necessary at selected prospecting sites. This fieldwork will provide essential data for refining ecological sensitivities.

PART 2: References, Methodology, and Supplementary Information

6. References

Dayaram, A., Harris, L., Grobler, B. A., van der Merwe, S., Rebelo, A. G., Powrie, L. W., Vlok, J. H. J., Desmet, P., Qabaqaba, M., Hlahane, K. M., & Skowno, A. L. (2018). Vegetation Map of South Africa, Lesotho and Swaziland 2018: A description of changes since 2006. *Bothalia*, *49*(1), a2452. https://doi.org/10.4102/ abc.v49i1.2452

Mucina, L., & Rutherford, M. C. (Eds.). (2006). *The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19.* South African National Biodiversity Institute.

Nel, J., Maherry, A. M., Peterson, C. P., Roux, D. J., Driver, A., Hill, L., van Deventer, H., Funke, N., Swartz, E. R., Smith-Adao, L. B., Mbona, N., Downsborough, L., & Nienaber, S. (2011). *Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. 1801/2/11.*

Raimondo, D., von Staden, L., Foden, W., Victor, J. E., Helme, N., Turner, R. C., Kamundi, D. A., & Manyama, P. A. (2009). *Red List of South African plants 2009. Strelitzia 25.* South African National Biodiversity Institute.

Skowno, A. L., Poole, C. J., Raimondo, D., Sink, K., van Deventer, H., van Niekerk, L., Harris, L. R., Smith-Adao, L. B., Tolley, K. A., Zengeya, T. A., Foden, W., Midgley, G. F., & Driver, A. (2019). *National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity. Synthesis Report. South African National Biodiversity Institute, an entity of the Department of Environment, Forestry and Fisheries.*

South African National Biodiversity Institute. (2018). *The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Version 2018*. http://bgis.sanbi.org/Projects/Detail/186

South African National Biodiversity Institute. (2020). *Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (Issue 3.1). South African National Biodiversity Institute.

7. Appendix A: Methodology Desktop Phase

A desktop assessment was undertaken using an appropriate Geographic Information System (GIS) and the latest available spatial datasets, as well as relevant online biodiversity databases and/or literature (these are listed where applicable). The aim of this was to develop local digital cartographs and species lists/databases. The various subsections that follow expand upon this desktop assessment.

It must be noted that during the entirety of this project it was assumed that all third-party information used — e.g., GIS software and data, satellite imagery, mapping algorithms, etc. — was correct and accurate at the time of their use. The author of this report accepts no liability for any erroneous data or algorithms produced by any third-parties, or any subsequent products derived from such data.

Finally, use of any maps within this report is entirely at the applicant and/or client's own risk. Acuity JRK (Pty) Ltd (trading as EcoFloristix Specialist Botanical Surveys) shall not be liable for any direct, indirect, incidental, special, or consequential damages arising out of or in connection with the use of or inability to use any or all maps within this report. By using any or all maps within this report, the client and/or applicant agrees to indemnify and hold Acuity JRK (Pty) Ltd (trading as EcoFloristix Specialist Botanical Surveys) harmless from any and all claims, liabilities, damages, and/or expenses, arising out of or in connection with usage of any or all maps within this report.

7.1. Ecologically Important Landscape Features: Custom GIS Mapping

The GIS was used together with the latest Google Earth satellite imagery to delineate and map observable landscape features in the Project Area and surrounds. Specifically, attention was given to homogenous units that could easily be recognized. Some examples of such features include watercourses, plains and floodplains, hill- and mountain tops, and hill- and mountains slopes (if present and if sufficiently large and distinct from surrounding features), as well as areas that have distinctly recognizable vegetation features, such as the presence/absence of large trees and/or shrubs, and vegetation patches of differing colours — these likely represent distinct plant community types. However, while satellite imagery is highly useful, it nevertheless suffers from several issues. For example, these include the generation of areas where image stitching has resulted in different colours for the same features, or imagery that might not have a high enough resolution, among other things. For this reason ground truthing is required to validate and refine the results of such desktop analyses.

7.2. Ecologically Important Landscape Features: Existing Data

Existing ecologically relevant data layers were incorporated into the GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

7.2.1. Red List of Ecosystems for South Africa

The Red List of Ecosystems (RLE; http://bgis.sanbi.org/Projects/Detail/1233/) for South Africa is a dataset containing the historical/potential extent, as well as the remaining remnants, of each ecosystem type. This represents a revision of the "List of terrestrial ecosystems that are threatened or in need of protection" published in December 2011. Ecosystems are categorised into one of four classes representing their risk of collapse, namely Critically Endangered (CR), Endangered

(EN), Vulnerable (VU), or Least Concern (LC). The units of assessment for the RLE are the vegetation types of VegMap (see section 7.3.2).

7.2.2. National Biodiversity Assessment 2018

The National Biodiversity Assessment 2018 (NBA) (Skowno et al., 2019) assessed the state of South Africa's biodiversity based on the best available science to understand temporal trends, and informs policy and decision-making across a range of sectors. The NBA deals with three biodiversity components: 1) genetics, 2) species, and 3) ecosystems. The NBA also assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine, and marine environments. The two headline indicators assessed in the NBA are:

- **Ecosystem Threat Status**: An indicator of ecosystem wellbeing. This concerns the amount of change regarding ecosystem structure, function, and/or composition, based on the proportion of the original extent of each ecosystem type still currently in good ecological condition. Specifically, ecosystem threat levels are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), or Least Concern (LC).
- **Ecosystem Protection Level**: An indicator of how well ecosystems are adequately protected or under-protected. Specifically, ecosystems protection levels are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on biodiversity targets for each ecosystem type included within one or more protected areas. So-called "under-protected ecosystems" include NP, PP, or MP ecosystem types.

7.2.3. National Protected Areas Expansion Strategy (NPAES)

National Protected Areas Expansion Strategy (NPAES; SANBI, 2010): NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These present the best opportunities for meeting ecosystem-specific protected area targets set out in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. NPAES focus areas are large, intact, and unfragmented, and are therefore highly important for biodiversity, climate resilience, and freshwater protection. Note that these areas are not necessarily future protected area boundaries — often times only a portion of a particular focus area would be required to meet protected area targets. Moreover, they do not replace fine scale planning. Such planning might identify many different priority sites based on local requirements, constraints, and opportunities.

7.2.4. Hydrological Features: Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) represent 10% of South Africa's land area that provides a disproportionate 50% of the country's water runoff. The localities of SWSAs are crucial for planning and managing water resources, including the ecosystems that support water quality and quantity (SWSAs extend into Lesotho and eSwatini).

7.2.5. Hydrological Features: National Freshwater Ecosystem Priority Area Status

South African river systems are categorised based on ecological criteria (such as ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to better conserve aquatic ecosystems, and are represented by Freshwater Ecosystem Priority Areas (FEPAs) (Nel et al., 2011). FEPAs are intended to support conservation and are

intended to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's (NEM:BA) biodiversity goals.

7.2.6. Biodiversity Spatial Plan

Biodiversity Spatial Plans classify areas within a province based on their contribution towards provincial conservation targets. Various land use types are classified according to their biodiversity and environmental importance as follows:

- **Critical Biodiversity Areas** (CBAs): areas that are required to meet biodiversity targets for species, ecosystems, or ecological processes and infrastructure. CBAs are of high biodiversity and ecological value and must be kept in a natural or near-natural state, with no further loss of habitat or species. Moreover, degraded areas should be rehabilitated to natural or near-natural conditions, and only low-impact, biodiversity-sensitive land uses are appropriate. Examples are areas required to meet biodiversity pattern (e.g. species and ecosystems) targets, Critically Endangered (CR) ecosystems, all areas required to meet ecological infrastructure targets, and critical corridors that maintain landscape connectivity. Two subtypes are distinguished:
    - CBA Irreplaceable (CBA 1): Areas that are critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable species populations and ecosystem functionality.
    - CBA Optimal (CBA 2): Areas which represent the best localities, from a potentially larger selection of available planning units, that are optimally located to meet conservation targets, as well as other criteria.
- **Ecological Support Areas** (ESAs): the ecological functioning and sustainability of CBAs require support from additional areas, namely ESAs. Although ESAs are not essential for meeting biodiversity targets, they are nevertheless important for supporting PAs or CBAs. ESAs are often crucial for delivering ecosystem services. For terrestrial and aquatic environments, such areas are functional, but not necessarily pristine and natural. However, they are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within CBAs, and also contribute significantly to the maintenance of ecological infrastructure. Two subtypes are distinguished:
    - ESA 1: Areas that might still be functional, and could be natural, near-natural, or moderately degraded.
    - ESA 2: Areas that are severely degraded or have no natural cover remaining and therefore require restoration.
- **Other Natural Areas** (ONAs): Some areas have not been identified as a priority in the current biodiversity spatial plan. However, they retain most of their natural character, and still perform many biodiversity and ecological infrastructure functions. Therefore, they are an important part of the natural ecosystem. It is desirable that ONAs, where possible, are managed or utilized to minimize habitat and species loss, and that ecosystem functionality through strategic landscape planning is ensured.
- **Severely Modified to No Natural Remaining** (NNR): These areas have been severely modified by human activity. They are no longer natural and do not contribute to biodiversity targets. However, these areas may still provide limited biodiversity and ecological infrastructure functions (and could potentially be useful for restoration/rehabilitation endeavours).
- **Protected Areas** (PAs): Areas that are formally protected by law in terms of the NEM:PAA. This includes gazetted private Nature Reserves and Protected Environments.

7.3. Botanical Assessment

The flora of the region was assessed both floristically (species identity) and compositionally (community assembly patterns).

7.3.1. Species Identities

Various reasons exist why the flora of a region cannot be fully catalogued within a limited timeframe (or even an extended timeframe; specifically see section 1.5). Therefore, the following data sources were used to obtain historical distribution records to develop a comprehensive list of plant species potentially occurring within the Project Area and broader region:

- **Botanical Database of Southern Africa** (BODATSA; also often referred to as POSA [Plants of southern Africa]): this is an electronic database hosted by the South African National Biodiversity Institute (SANBI) that provides herbarium records collected in the region (http://posa.sanbi.org/). Records were specifically extracted from a very large area surrounding the actual Project Area.
- **The Red List of South African Plants** (Raimondo et al., 2009): this online database (http://redlist.sanbi.org/) provides the most current national status of South Africa's vascular plant species. This was used to assess SCC[1], which are taxa (in this case plant species) that have a significant conservation importance for preserving South Africa's high biological diversity. SCC have a high conservation importance in terms of preserving South Africa's high floristic diversity, and include threatened species (CR, EN, and VU), as well as NT or DD, and also includes range-restricted species which are not declining and are nationally listed as "Rare" or "Extremely Rare" (also referred to in some Red Lists as Critically Rare; see Figure 23) (South African National Biodiversity Institute, 2020). Note that SANBI divides the IUCN category DD into "Data Deficient: Insufficient Information (DDD)", and "Data Deficient: Taxonomically Problematic (DDT)". When SCC occur in a Project Area or PAOI, the proposed activities could impact them and result in significant biodiversity loss — the loss of SCC populations might either increase the extinction risk of the respective species, or might even contribute toward their extinction. As such, it is very important to note that a permit must be obtained from the relevant local authorities to destroy or relocate any SCC (or even protected species).
- **iNaturalist**: this is a comprehensive online platform (https://www.inaturalist.org/) to which numerous citizen scientists contribute distribution records of biodiversity, mostly in the form of photos. Although many of the users are not professional botanists, various recognized botanical experts from across the globe assist in accurate species identification, and the platform is therefore an invaluable source of information regarding biodiversity. Nevertheless, to ensure a higher data reliability (i.e., only relevant/accurate records), the following parameters were used to extract records for this project: Quality Grade = "Research"; Identifications = "most agree"; Captive / Cultivated = "no". Records were specifically extracted from a very large area surrounding the actual Project Area. However, to minimize redundancy, and to provide the most likely set of plant species that might occur on

[1] Note that all South African plants have been assessed (i.e., assigned a red list category, or "redlisted") by the Red List of South African Plants. Therefore, using the terms "redlist" or "red list" specifically for Threatened or other conservation concern species is not accurate (even though it remains popular). The term "Species of Conservation Concern" (or SCC) is preferable, or "Threatened" where applicable.

site, the retrieved geospatial records were filtered by the vegetation types underlying the Project Area (as mapped by VegMap; see section 7.3.2).

- **National Web Based Environmental Screening Tool**: a geographically based, web-enabled governmental application (https://screening.environment.gov.za/screeningtool/#/pages/welcome) which allows a proponent intending on submitting an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended, to screen their Project Area for environmental sensitivity. Of specific interest for this report are the potential presences of so-called "sensitive plant species" that might occur in the Project Area and surrounds, as well as any terrestrial biodiversity features listed as having a "Very High" sensitivity rating.

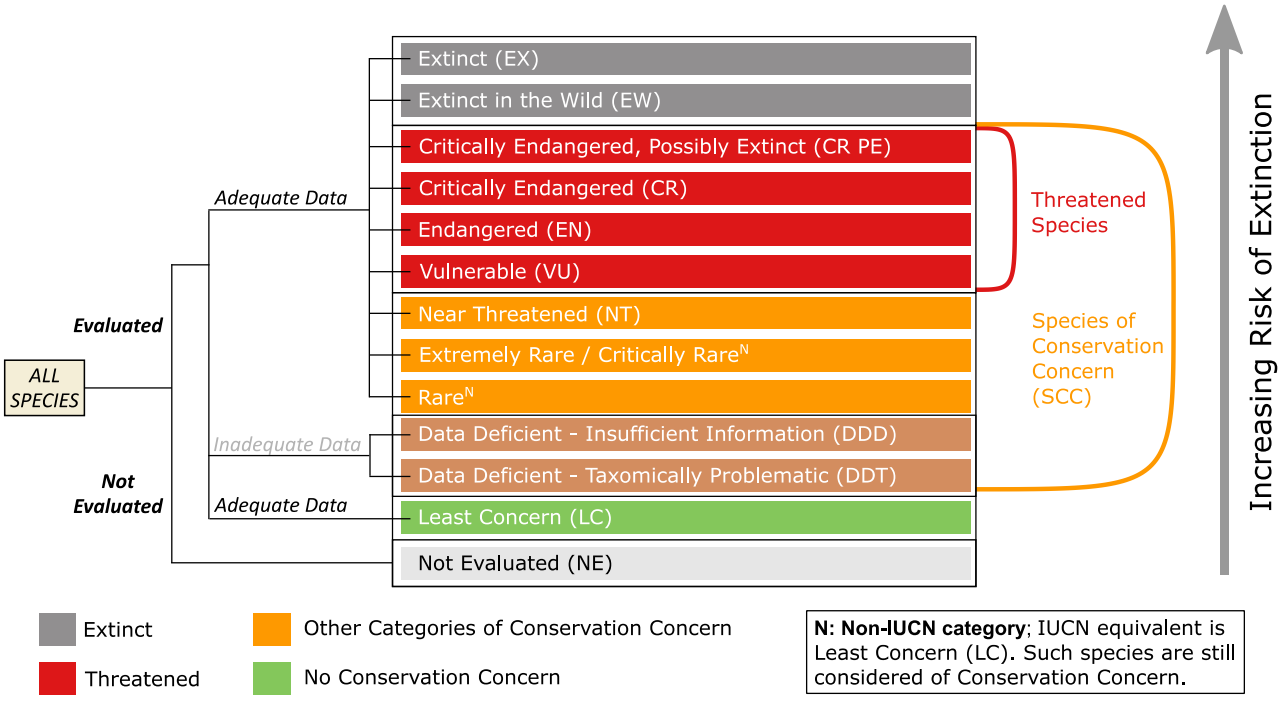


Figure 23: Red List and SCC categories used in this report as originally delineated according to SANBI's Red List of South African Plants (http://redlist.sanbi.org/redcat.php), and recently updated in the *Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa* (South African National Biodiversity Institute, 2020).

Although not explicitly required by the relevant gazetted protocols, protected plant species were also surveyed for and included in this project. The lists obtained from the aforementioned databases were used to identify such protected plant species. These species are protected by NEM:BA, as well as other provincial legislation (see section 1.6). Briefly, no person may sell, buy, transport, destroy, or harvest a protected plant without a permit from the relevant authority.

7.3.2. Community Composition: Vegetation Types

The vegetation types (and their conservation statuses) of the Project Area, as well as the broader regions surrounding the Project Area, were verified using the South African National Vegetation Map, or simply "VegMap" (Dayaram et al., 2018; Mucina & Rutherford, 2006; South African National Biodiversity Institute, 2018) and the Red List of Ecosystems (see section 7.2.1). The latest version of VegMap was consulted for any updates of the respective regions. Although

vegetation descriptions given in this report are as per VegMap 2006, these units were cross-validated with VegMap 2018 to inspect their respective extents.

7.4. Determination of Final Sensitivity Categories

Developing robust and accurate methods for determining site sensitivities remains inherently difficult. A few key factors contribute to this, namely:

- **Ecosystem Complexity:** Numerous interacting factors, context-dependent sensitivities, and the dynamic nature of the environment make the creation of objective measures challenging.
- **Defining "Sensitivity":** Multiple interpretations (resistance, resilience, vulnerability, etc.) and a lack of universal indicators complicate objective measurement.
- **Human Influence:** Value judgments in setting criteria, as well as data gaps requiring expert opinion, introduce subjectivity.
- **Methodological Limits:** Difficulty in establishing clear thresholds, as well as spatial heterogeneity, obstruct purely objective assessments from being carried out.

Despite these challenges, a few guiding principles can nevertheless increase the robustness of sensitivity categories and their practical application. Chief among this is the precautionary principle which assigns the highest possible sensitivity given the data available, especially when faced with uncertainty or potential negative consequences, in order to mitigate against the possibility of accidentally assigning a lower sensitivity to a highly sensitive area. In this context, threatened ecosystems were given priority above the other layers. for example, Critically Endangered and Endangered ecosystems are always treated as being Very High in sensitivity irrespective of whether they occur Well Protected areas. Moreover, given that many of the spatial layers are classified without being ground-truthed in the majority of instances (given the magnitude of the area involved), it is possible that a higher than required sensitivity is assigned to an area. This is in accordance with a risk-averse and cautious approach, until a Site Sensitivity Verification can be done to either validate or discredit the classification.

In assigning sensitivities to the final output, the following guidelines were adopted, similar to Site Ecological Importance (SEI) values prescribed by the *Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for Environmental Impact Assessments in South Africa* (South African National Biodiversity Institute, 2020):

Red List of Ecosystems (RLE):

- CR and EN ecosystems are always classified as Very High.
- VU ecosystems are usually a combination of Medium to Very High depending on context (for example, being Well Protected vs Poorly Protected), but are never classified as Low or Very Low.
- LC ecosystems are generally scored "Low", but classification also depends on context and these can be classified up to High (for example, if occurring in a CBA1 or CBA2 that is also an NPAES focus area and a Poorly Protected or Not Protected ecosystem).

Critical Biodiversity Areas (CBA):

- CBA1 and CBA2 areas are usually a combination of Medium to Very High but never Low or Very Low. For example, a score of Medium would occur when present in an LC ecosystem and/or a Well Protected or Moderately Protected ecosystem.
- ESA areas are usually a combination of Low to Very High but never Very Low. For example, a score of Low would occur when present in an LC ecosystem and/or a Well Protected or Moderately Protected ecosystem (but not when in a NPAES Focus Area).
- ONA areas are usually a combination of Low to Very High but never Very Low. For example, a score of Low would occur when present in an LC ecosystem and/or a Well Protected or Moderately Protected ecosystem, and a score of Very High would occur when present in a CR ecosystem.
- NNR are usually scored Very Low. However, when indicated to occur in an NPAES Focus Area, the risk-averse and cautious approach is applied and it is scored Medium since it's possible that it might have been mapped incorrectly and might be valuable for future conservation purposes.

National Biodiversity Assessment (NBA) Protected Areas

- These areas range from Low to Very High depending on context. A Low score results from occurring in an LC ecosystem that is Well Protected; conversely a Very High score would result when occurring in a CR or VU ecosystem (irrespective of protection level), and possibly in conjunction with CBA1 or CBA2 areas.

National Protected Area Expansion Strategy (NPAES) Focus Areas

- NPAES Focus Areas are by default scored as Medium, but can range from Low to Very High depending on context. They are never scored Very Low.

Threatened Plant Species Occurrences from iNaturalist:

- CR PE and CR species: buffered with a 500 m radius, and by default scored Very High and never lower.
- EN species: buffered with a 300 m radius, and by default scored High and sometimes Very High depending on context.
- VU species: buffered with a 200 m radius, and by default scored Medium, but sometimes Very High or High depending on context.
- A 200 m buffer is the minimum distances recommended by SANBI Guidelines (South African National Biodiversity Institute, 2020)

Presence of Watercourses:

- Watercourses require water use licenses (WULAs) and are generally recommended to be avoided if WULAs will not be obtained. All mapped watercourses are buffered by 32 m and by default classified as Very High.

Finally, the only areas that are scored Very Low by default are areas classified as No Natural Area Remaining.

8. Appendix E: Notes on SCC and Protected Plant Species

This section includes relevant definitions and regulations pertaining to SCC and protected plant species as determined by national legislation. Briefly, a permit is required to perform any restricted activity, as defined by NEM:BA, on specimens of any SCC or protected plant species, whether such specimens are living or dead. Note: this is NOT an exhaustive account of NEM:BA.

8.1. National Environmental Management: Biodiversity Act, 2004 (Act No. 10, 2004, Vol. 467, No. 26436)

NEM:BA Definition of "specimen" (Chapter 1, Definitions):

a) any living or dead animal, plant or other organism;

b) a seed, egg, gamete or propagule or part of an animal, plant or other organism capable of propagation or reproduction or in any way transferring genetic traits;

c) any derivative of any animal, plant or other organism; or any goods which-

   i. contain a derivative of an animal, plant or other organism; or

   ii. from an accompanying document, from the packaging or mark or label, or from any other indications, appear to be or to contain any derivative of an animal, plant or other organism.

NEM:BA Definition of "restricted activity" (Chapter 1, Definitions):

(a) in relation to a specimen of a listed threatened or protected species, means-

i. hunting, catching, capturing or killing any living specimen of a listed threatened or protected species by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, catch, capture or kill any such specimen;
ii. gathering, collecting or plucking any specimen of a listed threatened or protected species;
iii. picking parts of, or cutting, chopping off, uprooting, damaging or destroying, any specimen of a listed threatened or protected species;
iv. importing into the Republic, including introducing from the sea, any specimen of a listed threatened or protected species;
v. exporting from the Republic, including re-exporting from the Republic, any specimen of a listed threatened or protected species;
vi. having in possession or exercising physical control over any specimen of a listed threatened or protected species;
vii. growing, breeding or in any other way propagating any specimen of a listed threatened or protected species, or causing it to multiply;
viii. conveying, moving or otherwise translocating any specimen of a listed threatened or protected species;
ix. selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of any specimen of a listed threatened or protected species; or
x. any other prescribed activity which involves a specimen of a listed threatened or protected species

Restricted activities involving listed threatened or protected species, Part 2, 57:

(1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7 (Permits).

8.2. National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): Threatened or Protected Species Regulations

"**Biodiversity Act**" means the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), including any amendment thereof;

"**protected species**" means any species listed as protected in terms of section 56(1)(d) of the Biodiversity Act;

"**threatened species**" means an indigenous species listed as critically endangered, endangered or vulnerable species in terms of section 56(1)(a), (b) and (c) of the Biodiversity Act;

Chapter 2 (Permit System for Listed Threatened or Protected Species), Part 1 Application for permits: Carrying out a restricted activity

4. (1) A person may carry out a restricted activity involving a specimen of a listed threatened or protected species, only if he or she is the holder of a permit issued-

a) in terms of section 57(1) of the Biodiversity Act;
b) in accordance with Chapter 7 of the Biodiversity Act, and
c) in accordance with these Regulations;

unless the Minister has exempted the carrying out of such restricted activity involving such specimen in terms of section 57(4) of the Biodiversity Act.

9. Appendix F: Abbreviated Curriculum Vitae of the Specialist

Personal Details:

- Name: Dr. Jan-Hendrik Keet
- Address: Somerset West, Western Cape, 7130
- Cell: 071 451 4853
- Email: info@ecofloristix.co.za
- Date of Birth: 07 November 1988
- Website: https://ecofloristix.co.za/

Expertise and Experience:

- Current: Botanical & Terrestrial Biodiversity Specialist Consultant (EcoFloristix Specialist Botanical Surveys)
- Current: Freelance Academic/Technical Editor, Proof-reader, and Dissertation Specialist
- Previous: Post-Doctoral Researcher — Mathematical Biosciences Hub (Department of Mathematics), Stellenbosch University
- Previous: Post-Doctoral Researcher — DST NRF Centre of Excellence for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- Specialization: Botany, Ecology, Biogeography, Invasive Plant Species, and Invasion Biology
- Years of experience: > 10 years
- Published in various, high-impact, national and international scientific journals

Skills and Competencies:

- Botany and Ecology
- Invasive Species Biology (PhD in Botany [Stellenbosch University] with a focus on Invasive Alien Plant Species and their environmental impacts)
- Plant Biogeography
- Plant Identification and Taxonomy
- Vegetation Surveys and Mapping
- Biodiversity Informatics
- Biological Sciences
- Soil Microbiome Composition, Function, and Chemistry
- Geographic Information Systems (*GISB1500S, NQF level 5*)
- Research Data Management and Data Visualization
- Statistical Computing Methods (*R Statistical Computing Expert*)
- Experimental Design and Analysis

Global Scientific Influence:

- Research Interest Score >460
- Citations >630
- Global Publication Reads ~8800
- Scopus h-index 11
- Google Scholar h-index 11
- Google Scholar i10-index 13

Tertiary Education:

- 2015 – 2019: Stellenbosch University, Stellenbosch, South Africa. Doctor of Philosophy (Botany)
- 2013 – 2014: University of the Free State, Bloemfontein, South Africa. Magister Scientiae (Botany)
- 2012: University of the Free State, Bloemfontein, South Africa. Bachelor of Science Honours (Botany) - *cum laude*
- 2009 – 2011: University of the Free State, Bloemfontein, South Africa. Bachelor of Science (Chemistry with Physics and Biology) - *cum laude*

Employment History:

- 2015 – present: Botanical Specialist
- 2021 – present: Freelance Academic/Technical Editor, Proof-reader, and Dissertation Specialist
- 2019 – 2021: Post-Doctoral Researcher – Centre for Invasion Biology (Department of Botany and Zoology), Stellenbosch University
- 2011: Part-time demonstrator. Department of Plant Sciences, University of the Free State, Bloemfontein, South Africa
- 2010: Part-time lab assistant. Department of Chemistry, University of the Free State, Bloemfontein, South Africa
- 2007 – 2009: Shop Manager. Christian Tees, Brandwag Centre, Bloemfontein

Memberships, Certifications, and Short Courses:

- SACNASP: Professional Natural Scientist (No.: 121678)
- South African Association of Botanists (SAAB) Ordinary Member (No.: 821)
- SAGIC Invasive Species Consultant (Cape Town, South Africa), March 2016
- GIS Intermediate (NQF level 5): Hydrological modelling and terrain analysis using digital elevation models (University of the Free State, South Africa), 2014
- Project Management (Stellenbosch University), 2023
- Good Laboratory Practice seminar presented by Merck Millipore South Africa, 2012
- Laboratory Safety seminar presented by Merck Millipore South Africa, 2012
- Golden Key International Honour Society (Membership No.: 7564025), 2012

Selected Peer-reviewed Scientific Publications and Book Chapters (a full list is available on request)**:**

- **Keet J-H** & Hui C (2025) One-hectare fine-scale dataset of a fynbos plant community in the Cape Floristic Region. *Data in Brief*, https://doi.org/10.1016/j.dib.2025.111334
- Yannelli F, **Keet J-H**, Kritzinger-Klopper S, Le Roux JJ (2025) Legacy effects of an invasive legume more strongly impact bacterial than plant communities in a Mediterranean-type ecosystem. *Journal of Environmental Management* 373:123802, https://doi.org/10.1016/j.jenvman.2024.123802
- **Keet J-H**, Ellis AG, Hui C, Le Roux (2023) Responses of soil bacterial communities to invasive Australian *Acacia* species over large spatial scales. In: Richardson DM, Le Roux JJ, & Marchante E (Eds.) *Wattles: Australian Acacia Species Around the World*, CAB International, https://www.cabidigitallibrary.org/doi/10.1079/9781800622197.0000.
- **Keet J-H**, Datta A, Foxcroft LC, Kumschick S, Wilson JRU, Nichols GR, Richardson DM (2022) Assessing the level of compliance with alien plant regulations in a large African protected area. *Biological Invasions* 24: 3831 – 3844, https://doi.org/10.1007/s10530-022-02883-7.
- Warrington S, Ellis AG, **Keet J-H**, Le Roux JJ (2022) How does familiarity in rhizobial interactions impact the performance of invasive and native legumes? *Neobiota* 72: 129 – 156, https://neobiota.pensoft.net/article/79620/.
- **Keet J-H** & Richardson, DM (2022) A rapid survey of naturalized and invasive eucalypt species in southwestern Limpopo, South Africa. *South African Journal of Botany* 144: 339 – 346, https://doi.org/10.1016/j.sajb.2021.09.008.
- Novoa A, Foxcroft LC, **Keet J-H**, Pyšek P, Le Roux JJ (2021) The invasive cactus *Opuntia stricta* creates fertility islands in African savannas and benefits from those created by native trees. Scientific Reports 11: 20748, https://www.nature.com/articles/s41598-021-99857-x.
- **Keet J-H**, Ellis AG, Hui C, Novoa A, Le Roux JJ (2021) Impacts of invasive Australian acacias on soil bacterial community composition, microbial enzymatic activities, and nutrient availability in fynbos soils. *Microbial Ecology* 82: 704 – 721, http://dx.doi.org/10.1007/s00248-021-01683-1.
- **Keet J-H**, Robertson MP, Richardson DM (2020) *Alnus glutinosa* (Betulaceae) in South Africa: invasive potential and management options. *South African Journal of Botany* 135: 280 – 293, https://doi.org/10.1016/j.sajb.2020.09.009.
- Wilson JRU, Datta A, Hirsch H, **Keet J-H**, Mbobo T, Nkuna KV, Nsikani MM, Pyšek P, Richardson DM, Zengeya TA, Kumschick S (2020) Is invasion science moving towards agreed standards? The influence of selected frameworks. *NeoBiota*, 62: 569 – 590, https://doi.org/10.3897/neobiota.62.53243.

- Novoa A, **Keet J-H**, Lechuga-Lago Y, Pyšek P, Le Roux JJ (2020) Urbanization and *Carpobrotus edulis* invasion alter the diversity and composition of soil bacterial communities in coastal areas. FEMS Microbiology Ecology 96(7): fiaa106, https://doi.org/10.1093/femsec/fiaa106.
- Le Roux JJ, Leishman MR, Cinantya AP, Gufu GD, Hirsch H, **Keet J-H**, Manea A, Saul W-C, Tabassum S, Warrington S, Yannelli FA, Ossola A (2020) Plant biodiversity in the face of global change. *Current Biology* 30: R371 – R392, https://doi.org/10.1016/j.cub.2020.02.066.
- Hirsch H, Allsopp MH, Canavan S, Cheek M, Geerts S, Geldenhuys CJ, Harding G, Hurley BP, Jones W, **Keet J-H**, Klein H, Ruwanza S, van Wilgen BW, Wingfield MJ, Richardson DM (2019) *Eucalyptus camaldulensis* in South Africa – past, present, future. *Transactions of the Royal Society of South Africa* 75(1): 1 – 22, https://doi.org/10.1080/0035919X.2019.1669732.
- Le Roux JJ, Hui C, Castillo ML, Iriondo, JM, **Keet J-H**, Khapugin, AA, Médail F, Rejmánek M, Theron G, Yannelli FA, Hirsch H (2019) Recent anthropogenic plant extinctions differ in biodiversity hotspots and coldspots. *Current Biology* 29(17): 2912 – 2918, https://doi.org/10.1016/j.cub.2019.07.063.
- **Keet J-H**, Ellis AG, Hui C, Le Roux JJ (2019) Strong spatial and temporal turnover of soil bacterial communities in South Africa's hyperdiverse fynbos biome. *Soil Biology and Biochemistry* 136: 107541, https://doi.org/10.1016/j.soilbio.2019.107541.
- Le Roux JJ, Ellis AG, Van Zyl L-M, Hosking ND, **Keet J-H**, Yannelli F (2018) Importance of soil legacy effects and successful mutualistic interactions during Australian acacia invasions in nutrient-poor environments. *Journal of Ecology* 106(5): 2071 – 2081, https://doi.org/10.1111/1365-2745.1296.
- **Keet J-H**, Ellis AG, Hui C, Le Roux JJ (2017) Legume–rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness. *Annals of Botany* 119(8): 1319 – 1331, https://doi.org/10.1093/aob/mcx028.
- Le Roux JJ, **Keet J-H**, Mutiti B, Ellis AG (2017) Cultivation may not dramatically alter rhizobial community diversity or structure associated with rooibos tea (*Aspalathus linearis* Burm.f.) in South Africa. *South African Journal of Botany* 110: 87-96, https://doi.org/10.1016/j.sajb.2017.01.014.
- Le Roux JJ, Hui C, **Keet J-H**, Ellis AG (2017) Co-introduction vs ecological fitting as pathways to the establishment of effective mutualisms during biological invasions. *New Phytologist* 215(4): 1354 – 1360, https://doi.org/10.1111/nph.14593.
- Nsikani M, Novoa A, Van Wilgen B, **Keet J-H**, Gaertner M (2017) *Acacia saligna*'s soil legacy effects persist up to ten years after clearing: Implications for ecological restoration. *Austral Ecology* 42(8): 880 – 889, https://doi.org/10.1111/aec.12515.
- **Keet J-H**, Cindi D, Du Preez PJ (2016) Assessing the invasiveness of *Berberis aristata* and *B. julianae* (Berberidaceae) in South Africa: management options and legal recommendations. *South African Journal of Botany* 105: 288 – 298, https://doi.org/10.1016/j.sajb.2016.04.012.

Selected Conferences (a full list is available on request)**:**

- 46th South African Association of Botanists conference (Qwa-Qwa, South Africa), January 2020, ***Alnus glutinosa* (L.) Gaertn. [Black Alder]: *an emerging invader in South Africa***
- International Association for Food Protection (IAFP; Louisville, Kentucky, USA), July 2019.
- Ecological Society of America Conference, (New Orleans, Louisiana, USA), August 2018 **Invasive legumes dramatically impact soil bacterial community structures but not function**
- Legumes for Life Workshop (Stellenbosch, South Africa), May 2018 **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness**
- Fynbos Forum Conference (Swellendam, South Africa), July 2017 **Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot**
- 43rd South African Association of Botanists Conference (Cape Town, South Africa), January 2017, **Legume-rhizobium symbiotic promiscuity and effectiveness do not affect plant invasiveness** *Best PhD presentation*
- 43rd Annual Research Symposium on the Management of Biological Invasions Conference (Worcester, South Africa), May 2016, **Legume-rhizobium symbiotic promiscuity does not determine plant invasiveness**
- Evolutionary dynamics of tree invasions: drivers, dimensions, and implications for management (Stellenbosch, South Africa), November 2015
- Neobiota: 8th International Conference on Biological Invasions (Antalya, Turkey), November 2014, **Assessing the threat and potential for management of Berberis spp. (Berberidaceae) in South Africa**
- 42nd Annual Symposium on the Management of Invasive Alien Plants (Karridene Beach Hotel, Durban, South Africa)

- XXth Association for the Taxonomic Study of the Flora of Tropical Africa International Conference (Stellenbosch, South Africa), January 2014
- 41st Annual Symposium on the Management of Invasive Alien Plants (Cape St. Francis, South Africa), May 2013

Selected EIAs and other works (a full list is available on request)**:**

- Section 24G Botanical Assessment for the construction of two unlawful dams on Farm 497 Portion 3 Weltevreden, Western Cape Province. Report prepared for Doug Jeffery Environmental (November 2024). Report prepared for Doug Jeffrey Environmental. Reference: IA.24.021.
- Invasive Alien Species Risk Analysis Review of the Canetsfontein Wine Farm I&AS Risk Assessment Report (November 2024). Report prepared for Earthguard Consulting.
- N6 Galway City (Ireland) Ring Road Environmental Impact Assessment Report: Assistance with Data Analysis, Modelling, and Validation (July 2024 – Current). In collaboration with Scott Cawley, Ireland.
- Terrestrial Biodiversity and Plant Species Compliance Statement for a mining permit application project on Bonne Esperance Farm 83 near Tulbagh in the Western Cape Province (November 2024). Report prepared for Greenmined Environmental. Reference: IA.24.023.
- Invasive Alien Species Risk Analysis Review of the Canetsfontein Wine Farm I&AS Risk Assessment Report (November 2024). Report prepared for Earthguard Consulting.
- Plant and Terrestrial Biodiversity Assessment for a Mining Permit Extension application for the mining site Norrabees near Henkries, Northern Cape Province (May 2024). Report prepared for Site Plan Consulting. Reference: IA.24.010A.
- Plant and Terrestrial Biodiversity Assessment for a Mining Permit Application for the mining site Spodumene Kop near Henkries, Northern Cape Province (May 2024). Report prepared for Site Plan Consulting. Reference: IA.24.010B
- Terrestrial Biodiversity (Fauna, Flora and Terrestrial Biodiversity) study and impact Report for the Grid Connection Solution for the Proposed Onderstepoort Solar 1 and 2 Facilities Near Boshoek in the North West Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (April 2024). Report prepared for Atlantic Energy Partners.
- Specialist Invasive Alien Plant Species Assessment. (March 2024). Report prepared for Mpact Corrugated. Reference: IA.24.006.
- Terrestrial Biodiversity (Fauna, Flora, and Ecological EIA Phase Assessment) Report for the Proposed Kingston Solar PV Energy Facility Near Bothaville, Free State Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (March 2024). Report prepared for Atlantic Energy Partners.
- Terrestrial Biodiversity (Fauna, Flora, and Ecological EIA Phase Assessment) Report for the Proposed Crecy Photovoltaic Solar 4 Energy Facility and Associated Infrastructure near Mookgopong, Limpopo Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (February 2024). Report prepared for Atlantic Energy Partners.
- Plant and Terrestrial Biodiversity Assessment for a Solar Photovoltaic Facility near Northam, Limpopo. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (November 2023). Report prepared for Atlantic Energy Partners.
- Botanical Impact Assessment for a proposed rerouting of a sewer pipeline on Erf 5076, Khayalethu, Knysna, Western Cape. In collaboration with Keep Rooted (PTY) Ltd. (October 2023). Report prepared for Ohana Environmental. Reference: IA.23.015.
- Screening report for a proposed Solar PV plant near Boshoek, Northwest Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (September 2023). Report prepared for Atlantic Energy Partners.
- Plant and Terrestrial Biodiversity Assessment for a Powerline Corridor near Boshoek, Northwest Province. In collaboration with Nkurenkuru Ecology and Biodiversity (PTY) Ltd. (September 2023). Report prepared for Atlantic Energy Partners.
- Botanical Assessment and Motivation for a Mining Stockpile Area within a non-CBA zone on Farm Steinkopf no. 22 near Steinkopf, Northern Cape. (August 2023). Report prepared for Greenmined Environmental. Reference: IA.23.010.
- Botanical Impact Assessment: Development of portion 223 of Farm 559, Betty's Bay, Western Cape. (July 2023). Report prepared for Ohana Environmental. Reference: IA.23.007.

- Botanical Study and Assessment for a Housing Development, 2023. Proposed development of the development of Erf 397, Suiderstrand, Western Cape. Report prepared for RMS Environmental.
- Botanical Study and Assessment for a Mining Permit Application, 2023. Proposed development of a dolerite mine near Beaufort West, Western Cape. Report prepared for Greenmined Environmental (Pty) Ltd.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2022. Full Botanical Assessment for the proposed development of wind energy facilities south of Bethal, Mpumalanga Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Application (Expansion of mining footprint), and Final Basic Assessment and Environmental Management Plan for the proposed sand mine expansion on Portion 4 of the Farm Zandberg Fontein 97, Western Cape Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Proposed development of wind energy facilities on the farms Brussels, Driepoort (664-1 and 664-2), Kameelfontein, Lisbon, Nazareth, and Zwartkrans, near Vryburg, Northwest Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Botanical Study and Assessment: Proposed development of wind energy facilities on the farm Kluitjieskraal, Loeriesfontein, Northern Cape Province.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2021. Botanical Study and Assessment: Proposed development of an access road to the authorised Sutherland 1 and Rietrug wind energy facilities near Sutherland.
- Specialist Botanical Assessment Report: Assessment of Damage and Rehabilitation Costs for Unauthorised Driving of a 4x4 Vehicle in the Big Bay Open Space System, Cape Town. Prepared for Hannes, Pretorius, Bock & Bryant Attorneys.
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2019. Mining Permit, Final Basic Assessment & Environmental Management Plan for the proposed mining of Sillimanite, Aggregate and Stone Gravel on the Farm Koenabib 43, Northern Cape Province. Botanical Study and Assessment Report. Unpublished report prepared by Nkurenkuru Ecology and Biodiversity for GreenMined Environmental. Version 1.0, 30 January 2020
- In collaboration with Nkurenkuru Ecology and Biodiversity, 2019. Mining Permit, Final Basic Assessment & Environmental Management Plan for the proposed mining of Sillimanite on the Farm Wortel 42, Northern Cape Province. Botanical Study and Assessment Report. Unpublished report prepared by Nkurenkuru Ecology and Biodiversity for GreenMined Environmental. Version 1.0, 30 January 2020
- Specialist Invasive Alien Plant Species Report: Prepared for: Mpact Corrugated, Kuils River (Western Cape), July 2019
- Proposed Township development, Country view, Gauteng: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015
- Colenso Anthracite Coal Mining and Power Station Project: Biodiversity Impact Assessment (Flora) – Specialist Report prepared for Zone Land Solutions (PTY) Ltd, July 2015