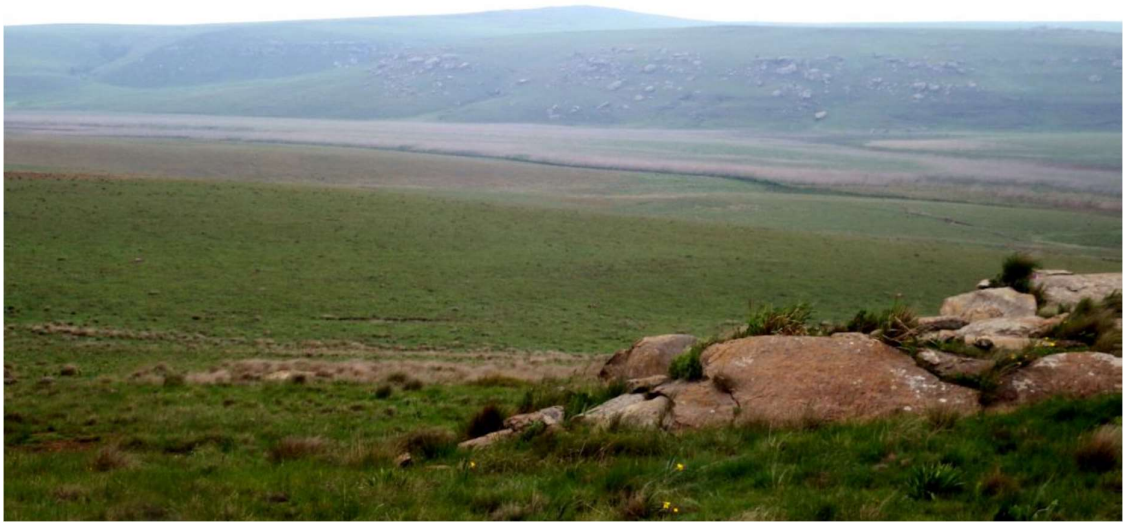
Eskom's biodiversity footprint
Application of the Biological Diversity Protocol to Ingula Pumped Storage Scheme and Sere Wind Farm



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Executive summary

Eskom Hld SOC Ltd (Eskom) has been involved in the development of the Biological Diversity Protocol (BD Protocol) since the launch of the Biodiversity Disclosure Project in early 2018 by the National Biodiversity and Business Network (NNBN), administered by the Endangered Wildlife Trust (EWT). This case study forms part of the pilot testing program managed by EWT and involved undertaking the Biodiversity Footprint assessments of the Ingula Pumped Storage Scheme ("Ingula") and the Sere wind farm ("Sere").

In essence, Eskom holds a Biodiversity Footprint of 14 013,43 ha at Ingula of which 7 223,99 ha eq. constitute its Positive Biodiversity Footprint (or 51,55 % of the total Biodiversity Footprint of Ingula) and 6 784,44 ha eq. its Negative Biodiversity Footprint (or 48,45 % of the total Biodiversity Footprint). At Sere, Eskom holds a Biodiversity Footprint of 7 394,46 ha of which 5650,98 ha eq. constitute its Positive Biodiversity Footprint (or 76,42 % of the total Biodiversity Footprint of Sere) and 1 743,48ha eq. its Negative Biodiversity Footprint (or 23,58 % of the total Biodiversity Footprint). In the end, the consolidated Biodiversity Footprint of Eskom stands 21 407,89 ha, of which 60,14% is its positive Biodiversity Footprint. With active ecosystem management and restoration measures, and no further vegetation clearance, it is expected that the condition of many ecosystem types would improve at both Ingula and Sere, hence potentially improving Eskom's Biodiversity Footprint in the future.

This pilot study has been very successful overall, especially in accounting for impacts on ecosystems. The developed ecosystem impact inventory was comprehensive for both Ingula and Sere and the whole set of accounting journal entries and associated Statements of Ecosystem Performance and Position have been produced. For species, while materiality assessment processes could be completed at both Ingula and Sere, comprehensive sets of information regarding current and target population / habitat sizes were only available for a subset of material species (5 out of 9 at Ingula, 2 out of 7 at Sere).

Beyond helping Eskom with biodiversity performance reporting and disclosure, this pilot study sets a baseline to monitor change in ecosystem extent and condition and the population / habitat size of species over time, in response to management decisions and / or various biodiversity-related activities, thus enabling the integration of evidence-based data in management and budget planning for both sites. It also supports the expansion of biodiversity footprinting to all of Eskom's sites within its direct operations, at very limited costs, especially for impacts on ecosystems.

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1. Introduction and aims

The Biological Diversity Protocol (BD Protocol)[1] aims to enable any organisation, from any sector, to identify, measure, account for and consolidate its impacts on biodiversity for various business applications, from site management and internal reporting to external mandatory and/or voluntary disclosures. For instance, it can be instrumental to companies working on voluntary, biodiversity commitments or targets for the post-2020 Global Biodiversity Framework of the Convention on Biological Diversity (CBD).

Eskom Hld SOC Ltd (Eskom) has been involved in the development of the BD Protocol since the launch of the Biodiversity Disclosure Project in early 2018 by the National Biodiversity and Business Network (NBBN), administered by the Endangered Wildlife Trust (EWT). The BD Protocol has recently been finalised after a year-long international consultation process and its official launch is planned for early 2021. This case study forms part of the pilot testing program managed by EWT.

The intended goals of this pilot case study were two-fold:
(a) to identify the benefits and challenges of applying the BD Protocol and
(b) making recommendations towards expanding net biodiversity impact accounting to all of Eskom's direct operations and, potentially, to some of its key suppliers.

2. Methodology

As per the BD Protocol, assessing the biodiversity footprint of an organisation involves following the following steps:

- Biodiversity impact inventory development:
    - Setting organisational boundaries,
    - Setting value chain boundaries,
    - Identifying the components of the biodiversity impact inventory,
    - Assessing materiality of taxa for inclusion in the biodiversity impact inventory,
    - Choosing appropriate methods for measuring impacts on ecosystems and taxa,
    - Compiling biodiversity impact accounts.
- Accounting for net impacts as per the Biodiversity Accounting Framework:

[1] URL: https://www.nbbnbdp.org/bp-protocol.html

- Accounting for baseline impacts,
- Accounting for gains and losses,
- Compiling the Statements of Biodiversity Position and Performance.

2.1 Setting organisational and value chain boundaries

This pilot study aimed to test the BD Protocol on a limited organisation scope within a single value chain boundary, direct operations. It does not adhere to all the BD Protocol accounting and reporting principles, namely relevance and completeness[2]. Two power generation sites (Generation Division), Ingula pumped storage scheme ("Ingula") and Sere wind farm ("Sere"), and the associated linear infrastructure (Transmission Division) are included in this pilot study. The process thus involved two key Eskom divisions. In addition, only direct impacts were included in this study[3].

2.2 Identifying the components of the biodiversity impact inventory

As per the BD Protocol, compiling the biodiversity impact inventory of Sere and Ingula involves identifying and recording the biodiversity components, or features, which are impacted by Eskom's activities at the sites. The BD Protocol recognises two main types of biodiversity impact accounts:

- Accounts that record impacts on ecosystems,
- Accounts that record impacts on taxa (species and sub-species).

In other words, building Eskom's biodiversity impact inventory meant listing the ecosystem types and taxa (species and sub-species) that the company interacts with at Ingula and Sere.

2.2.1 Ecosystem impact inventory development

Ecosystem impact inventory development involved using desktop analysis, ground-truthing and field surveys at both Ingula and Sere.

[2] See section 2.4 on page 33 of the BD Protocol.

[3] According to the BD Protocol, direct impacts constitute changes in the state of biodiversity which are caused directly by your business activities. In other words, direct impacts involve business impact drivers which can be traced to specific, verifiable biodiversity features, that is direct causal link between your company's actions (e.g. land clearing or ecosystem restoration measures) and a change in the state of ecosystems or taxa (e.g. decrease/increase in ecosystem condition, habitat loss/gain for several species).

Desktop analysis

An initial desktop analysis was done using the three GIS layers[4]. This allowed for the creation of a draft map outlining infrastructure, vegetation types and land modification history within each site.

At Ingula, site-generated shapefiles compiled in the early stages of the Ingula Project by GIS specialists were also used. This included fine-scale mapping of wetland types, tree cover (including whether it is indigenous or alien), roads and tracks, buildings, reservoirs, and powerlines.

Ground-truthing and field surveys

Ingula

BirdLife South Africa has done extensive fieldwork at Ingula since the commencement of the project and has had permanent presence in the form of a Project Manager (PM) and/or Assistant on site since 2003. The PM has extensive knowledge into the reserve management plans and strategies, and implementation thereof. Monthly biodiversity surveys are conducted, including, but not limited to, avifaunal (including breeding) monitoring, mammal and invertebrate monitoring, vegetation condition surveys, etc. This extensive knowledge of the site, as well as continued ecological surveys, has enabled the PM to make informed suggestions during the process of this project, while conducting online analyses. Remote sensing techniques were refined to reflect the situation on site.

Sere

An initial site visit was conducted on the 13th February 2020, to ground-truth the site, hold discussions with the site manager on management plans both past and present, and decide on logistics for the field surveys. It was decided that due to the nature of the vegetation present, surveys would only be completed in Spring when most of the species would be in flower.

[4] **Google Earth**: Openware software that renders a 3D representation of Earth based primarily on satellite imagery. The program maps the Earth by superimposing satellite images, aerial photography, and GIS data onto a 3D globe, allowing users to see cities and landscapes from various angles. The latest iterations include the ability to view historical imagery.
HabModv51_AEA: This is a land cover-based habitat modification layer produced by SANBI for the 2018 National Biodiversity Assessment. It has a resolution of 30m^2 and at the highest level consists of 15 separate land-use categories.
VegMap2018_AEA_V22: This layer produced by SANBI for the 2018 National Biodiversity Assessment and released in June 2019 contains at its finest scale a map of the distribution of 459 vegetation types within South Africa. Vegetation Types are defined as "a complex of plant communities ecologically and historically occupying habitat complexes at the landscape scale".

Vegetation surveys were conducted from 20th August 2020 until 27th August 2020 using methods adapted from the literature[5]. Care was taken to conduct transects across the range of vegetation types, land-use histories and management units identified on site during the desktop analysis. Transects were approximately 1 km long and at every 100 metres a 2 x 4m quadrat was placed down (e.g., 10 quadrat placements per transect). Within each quadrat the total cover and contribution of each species present was estimated and recorded. Although the estimation of cover is subjective, a single experienced observer ensures consistency and accuracy across sample sites. The approach is considered to provide a reliable indication of vegetation composition and diversity within the sampled areas. In total, 25 transects were conducted.

2.2.2 Species impact inventory development

Detailed species lists (mammals, avifauna, herpetofauna, butterflies, plants) have been compiled during past environmental impact assessments for both Ingula and Sere. There are updated regularly through on-site monitoring.

As per the BD Protocol, not all species should be included in the impact inventory, only priority species. To determine the later, a species materiality assessment was carried out. It involved rating the species as per four criteria (Table 10), conservation status[6], population assessment / monitoring (capacity to do both), likelihood of impacts and severity of impacts. The sum of individual species scores determines the importance of the species in the context of each Eskom site. The

[5] Veld Condition Assessment & Restoration Site Evaluation to Inform the Karoo Sustainable Land Management Project - Simon Todd, 3Foxes Biodiversity Solutions, 2018.
Quick Multicriterion Veld Assessment – Sue Milton, Karoo Veld Ecology and Management, 2006
Specialist Scoping Study of Site for Proposed Eskom Wind Energy Facility on the Cape West Coast: Terrestrial Vegetation Component – Nick Helme (prepared for Savanna Environmental), Nick Helme Botanical Surveys, 2007.

[6] Species Red Data lists used:

- Mammals: 2016 Red List of Mammals of South Africa, Lesotho and Swaziland. Endangered Wildlife Trust.
- Avifauna: Taylor et al. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.
- Herpetofauna: IUCN online database. IUCN 2020. The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>
- Butterflies: Henning et al. 2009. SANBI Biodiversity series 13. South African Red Data Book: Butterflies.
- Plants: SANBI Red list of South African Plants. http://redlist.sanbi.org/

threshold for species inclusion in the impact inventory was a minimum of 8 for Ingula and a minimum 10 for Sere.

At Sere, due to the lack of detailed site knowledge, additional field surveys aimed to identify all plant species of conservation concern during the rainy season. Two days were spent walking throughout study site (not performing transects), identifying species not seen during the transects. Over 20kms were covered during this time.

Table 1: Criteria and rating system for the species materiality process. The sum of individual species scores determines the importance of the species in the context of each Eskom site. The threshold for species inclusion in the impact inventory was a minimum of 8 for Ingula and a minimum 10 for Sere.

Conservation status		**Population assessment / monitoring (capacity to do both)**		**Likelihood of impacts**		**Severity of impacts**	
Extinct in the wild (EW) – survives only in captivity, cultivation and/or outside native range, as presumed after exhaustive surveys.	7	Easy / cheap	3	High	3	High	3
Critically endangered (CR) – in a particularly and extremely critical state.	6	Medium / costly	2	Medium	2	Medium	2
Endangered (EN) – very high risk of extinction in the wild, meets any of criteria A to E for Endangered.	5	Difficult / very expansive	1	Low	1	Low	1
Vulnerable (VU) – meets one of the 5 red list criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.	4						
Near threatened (NT) – close to being at high risk of extinction in the near future.	3						
Least concern (LC) – unlikely to become extinct in the near future.	2						
Data deficient (DD)	1						
Not evaluated (NE)	0						

2.3 Measuring net biodiversity impacts

Once the biodiversity impact inventory is established, the BD Protocol prescribes to measure and record the business impacts on all biodiversity features, which involved measuring:

- The extent and condition/integrity of ecosystem types;
- The target population size and actual population size of taxa.

2.3.1Measuring impacts on ecosystems

Different condition rating methodologies were used at Ingula and Sere as very different ecosystem types are present at each site.

Ingula

Grassland and wetland condition scoring

Normalised Difference Vegetation Index (NDVI) was used to assess the moisture content of vegetation and soil to determine over-/under-grazed areas, combined with site knowledge. USGS Landsat 8 Collection 1 Tier 1 TOA Reflectance satellite imagery was used, selecting the greenest pixel (30 m^2 resolution) during the period of 1 January 2020 to 28 February 2020. This enabled the programme to select the vegetation in their prime condition, and therefore give a reflectance of the best grassland and wetland condition during the specified period. Selecting the greenest pixel also eliminates the effect of cloud presence on the dataset. The NDVI was completed and analysed in ArcMap where condition scores were allocated, using vegetation cover as proxy. The grass cover and correlating condition scores are shown in Table 2.

Table 2: Grassland and wetland condition scoring system

Rating		Description	Vegetation cover
0	Transformed	Complete losses of natural ecosystem structure, biota and basic ecosystem functions.	0%-10%
1	Seriously Modified	Extensive losses of natural ecosystem structure, biota and basic ecosystem functions have occurred.	10%-40%
2	Largely Modified	Large losses of natural ecosystem structure, biota and basic ecosystem functions have occurred.	40-55%
3	Moderately Modified	Losses and changes of natural ecosystem structure and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	55%-70%
4	Largely Natural	Small changes in natural ecosystem structure and biota may have taken place, but the ecosystem function is essentially unchanged.	70%-85%
5	Natural	No change in natural ecosystem structure, processes and biota have occurred.	85%+

The "Transformed" class included areas completely lost due to any infrastructure constructed through it, except for powerlines since the vegetation below them are not influenced by the presence of the powerlines. However, powerlines are still regarded as having an influence on the integrity of the habitat due to their impact on avifaunal mortalities.

The NDVI produced a raster dataset with the different condition scores as pixels. The percentage of each condition score was calculated per vegetation type, and then multiplied by the relevant vegetation type's total area to determine the area per vegetation type that falls within each condition score.

Forest and woodland condition scoring

The site-developed shapefile for alien trees was used to identify the areas where alien species currently occur. These were overlaid with the South African Landcover layer of 2018. The landcover classes were further used to identify the vegetation height and composition in the indigenous forests. Based on this information as well as site knowledge (e.g., where fires damaged the forest and regrowth is currently underway, etc.), forests / woodlands were rated according to a condition scoring system (Table 3). Area calculations were done following the same principle as mentioned for grasslands and wetlands.

Table 3: Forest and woodland condition scoring

Rating		Description	2018 Landcover class
0	Transformed	Complete losses of natural ecosystem structure, biota, and basic ecosystem functions.	
1	Severly impacted	Dense stands of alien trees. Heavy to severe impact due to fire, illegal harvesting, or invasive species. No effort to contain or rehabilitate the area has been made.	Dense forest woodland, overlapping with alien plantations
2	Largely impacted	Stands of alien trees. Moderate to heavy impact due to fire, illegal harvesting, or invasive species. Some effort to contain or rehabilitate the area has been made.	Dense forest woodland
3	Moderately impacted	Secondary indigenous forest. Light to moderate impact due to fire, illegal harvesting, or invasive species, but indigenous structure still dominant.	Contiguous low forest thicket
4	Natural	Primary indigenous forest. Very light to light impact due to fire, illegal harvesting or invasive species, but indigenous structure dominant.	Contiguous indigenous forest
5	Pristine	Climax indigenous forest. No human impact on forest.	

Sere

A Vegetation Condition Index (VCI) was created on a scale of 1 – 10, with 1 being vegetation completely cleared (e.g., replaced by infrastructure) and 10 being pristine, untouched vegetation. Because the area has been farmed in the past (even if at very low intensity) and the various ecosystems are very sensitive to disturbance, no vegetation was listed as 10 (Table 4). The VCI considers:

- Taxonomic diversity (species diversity);
- Functional diversity (the number of plant functional types present);
- Non-native species presence (alien species);
- Bare ground vs vegetation cover.

The condition of vegetation with high taxonomic and functional diversity, and low (preferably zero) alien species and minimal bare ground is heathier than vegetation with reduced diversity measures, increased alien species presence and/or substantial bare ground.

Table 4: Ecosystem condition scoring

Unit	Condition Score	Details
Buildings	1	Vegetation removed
Roads	1	Vegetation removed
Thoroughfare road	1	Vegetation removed
Turbines and surrounds	1	Vegetation removed
rehab road verges	4	Vegetation removed during construction phase but since rehabilitated. Very much early successional dominated by annuals and lacking medium/tall shrubs but still of conservation value.
rehab turbines	3	Same as above, but higher presence of alien species and bare ground.
Secondary natural (post-1990)	5	Previously ploughed land, with reduced diversity compared to natural land
Secondary natural (pre-1990)	6	Previously ploughed land but long since abandoned with the legacy much less conspicuous compared to above. Reduced number of geophytes compared to Natural vegetation however
Natural	8	Healthy vegetation, high diversity (both taxonomic and functional) and minimal alien presence
Bare Ground	1	No vegetation
Mines	1	No vegetation
NW Leased Grazing Land	7	Healthy vegetation but slightly reduced diversity due to the continuation of low-intensity grazing which leads to reduction in some palatable species.
East Leased land grazing	7	Healthy vegetation but slightly reduced diversity due to the continuation of low-intensity grazing which leads to reduction in some palatable species.
Eskom Owned Rested Land	8	Healthy vegetation, grazing from sheep removed.

2.3.1Measuring impacts on species

Measuring impacts on material species involves assessing the actual and target population or habitat size of each taxon, with the corresponding GIS data; using the most cost-effective method for the taxonomic group to which the taxon belongs.

Ingula

Determining the actual and target population and / or habitat sizes was feasible for most material species at Ingula. It involved a thorough literature review, more than 5 years' of intensive monitoring data and site-specific knowledge about the conditions of their required habitat.

Sere

The situation was very different at Sere. Very limited knowledge was available for all material species. For instance, many bird species only sporadically used the site while a specific population survey had to be undertaken for angulate tortoises[7].

2.3.2 Net ecosystem impact modelling as per different management scenarios

To better understand how Eskom's potential management practices could impact on ecosystem types, various scenarios were discussed for both Ingula and Sere. However, vegetation condition scores could only be modelled for Sere as per the three scenarios outlined as follows[8]:

Scenario 1: No action, vegetation gradually worsens.

In this scenario, no action is taken but natural succession does not occur. Rather the few alien species currently present in the degraded/rehabilitated site gain a greater foothold with some entering the natural vegetation. Grazing continues on the leased land, reducing diversity as palatable species are removed from the veld.

Scenario 2: No action, vegetation condition passively improves

In this scenario, no action is taken but natural succession does occur. Conditions of the rehabilitated road and turbine verges is improved as later successional species naturally disperse in from the adjacent land. As similar process occurs on bare land and mined areas as early successional species arrive providing ground cover. Previously ploughed land slowly gains species and functional richness and grazing in the leased lands stay at low enough levels to allow for palatable species to recover slowly.

Scenario 3: Active measures are taken to enhance vegetation condition

In this scenario, active measures are taken to enhance natural succession. Rehabilitated sites are monitored and missing vegetation components are reintroduced (e.g., indigenous geophytes and

[7] The detailed methodology is available in Henry, D. (2020). Estimate of abundance and density of the Angulate Tortoise at Sere Wind Farm. EWT, 7 p.

[8] EWT was unable to ascertain the current lease agreement with regards to grazing intensity. This is important with regards to the likelihood of this scenario.

shrubs are planted), notably in the secondary successional (post-1990) areas. In the leased areas, grazing (by sheep) is reduced sufficiently (or entirely) to allow the re-emergence of palatable shrubs, grasses, and geophytes. Ecological drivers such as pollination and seed dispersal are improved.

2.4 Accounting for net biodiversity impacts

Any change, positive or negative, in the biodiversity impact inventory needs to be accounted for. The BD Protocol builds from the foundations of financial accounting through two simple equations, adapted from double entry bookkeeping, which ensures that the total biodiversity impacts of a company are equal to the sum of its accumulated positive and negative impacts[9]. Accounting for net biodiversity impacts thus revolves around the following equations:

- Statement of Biodiversity Position: (A accounts) total impacts on biodiversity features = (B accounts) accumulated positive impacts on biodiversity + (C accounts) accumulated negative impacts on biodiversity (for all periods to date);
- Statement of Biodiversity Performance: (X accounts) net biodiversity impacts on biodiversity features over the accounting period = (Y accounts) periodic positive biodiversity impacts or gains - (Z accounts) periodic biodiversity negative impacts or losses.

The Biodiversity Accounting Framework of the BD Protocol recognises six main biodiversity-related account categories, namely:

- Asset accounts: Accounts in the Statement of Biodiversity Position equation (A), representing the total biodiversity impacts on each feature of the biodiversity impact inventory of your organisation;
- Accumulated positive impact accounts: Accounts in the Statement of Biodiversity Position equation (B), representing the accumulated positive impacts on each feature of the biodiversity impact inventory of your organisation, though not necessarily implying actual conservation measures51. This could be presented as the biodiversity contributions to society of your business;
- Accumulated negative impact accounts: Accounts in the Statement of Biodiversity Position equation (C), representing the accumulated negative impacts on each feature of the biodiversity impact inventory of your organisation, with no financial liability implied;

[9] See theoretical foundations in Houdet, J., Ding H., Quétier F., Addison, P.F.E., Deshmukh, P. (2020). Adapting double-entry bookkeeping to renewable natural capital: an application to corporate net biodiversity impact accounting and disclosure. *Ecosystem Services 45,* 101104, ISSN 2212-0416, https://doi.org/10.1016/j.ecoser.2020.101104

- Net impact accounts: Accounts in the Statement of Biodiversity Performance equation (X), representing the net impacts (gains minus losses) on each feature of the biodiversity impact inventory of your organisation in the reporting period.
- Gain accounts: Accounts in the Statement of Biodiversity Performance equation (Y), representing the gains for each feature of the biodiversity impact inventory of your organisation in the reporting period;
- Loss accounts: Accounts in the Statement of Biodiversity Performance equation (Z), representing the losses for each feature of the biodiversity impact inventory of your organisation in the reporting period.

Key concepts for impacts on ecosystems:

- **Total Biodiversity Footprint** = **sum of surface areas of ecosystems** within impact inventory.
- **Positive Biodiversity Footprint** = sum of surface areas adjusted for condition.
- **Negative Biodiversity Footprint** = difference or gap between the Total Biodiversity Footprint (reference or pristine state of all surface areas) and the Positive Biodiversity Footprint (surface areas adjusted for condition).

Key concepts for impacts on species:

- **Total Biodiversity Footprint =** target population / habitat size within impact inventory.
- **Positive Biodiversity Footprint =** current population / habitat size.
- **Negative Biodiversity Footprint =** the difference or gap between its current population / habitat size and the target / ideal population / habitat size (as determined by science and business context).

  Detailed accounting rules are presented in section 3.3 of the BD Protocol.

3. Results

The results are organised into three sections, one set of accounts for Ingula, one for Sere and a combined set of accounts for both; the latter to show how the BD Protocol enables the consolidation of net ecosystem[10] impacts across sites within a value chain boundary.

3.1 Ingula's net impacts on biodiversity

Ingula's net impacts on biodiversity includes ecosystem and species accounts. Section 3.1.1 presents the Ingula's Biodiversity Impact Inventory, section 3.1.2 the net impacts on biodiversity and section 3.1.3 Ingula's Statements of Biodiversity Performance and Position.

3.1.1 Ingula's Biodiversity Impact Inventory

3.1.1.1 Ecosystems

Ingula's Biodiversity Impact Inventory is composed of ecosystem types and material species. Table 5 presents the eight ecosystem types identified, their surface area (14013,43 Ha in total), condition scores and condition-adjusted surface areas. Figure 1 shows the map of the ecosystem types and key infrastructure (e.g., dams, roads, transmission lines), while Figure 2 highlights ecosystem condition.

[10] While the direct Biodiversity Footprints of Ingula and Sere can be consolidated, individual species accounts need to remain segregated.

Table 5: Ecosystem types identified at Ingula, their surface areas, condition scores and condition-adjusted surface areas

Number	Ecosystem type	Conservation status	Nominal surface area (Ha)	Surface area-adjusted for condition		
				Extent (Ha)	Condition score	Extent adjusted for condition (Ha eq.) (Nominal surface area X condition score / maximum condition score)
1	Northern Afrotemperate Forest	Least Threatened	464,91	0	0	0,00
				53,69	1	10,74
				129,08	2	51,63
				260,86	3	156,51
				21,29	4	17,03
				0	5	0,00
2	Woodland		161,65	0	0	0,00
				101,68	1	20,34
				35,14	2	14,06
				7,04	3	4,22
				17,80	4	14,24
				0	5	0,00
3	Low Escarpment Moist Grassland	Least Threatened	1274,33	47,07	0	0,00
				4,28	1	0,86
				116,89	2	46,76
				733,41	3	440,05
				372,68	4	298,15
				0	5	0,00
4	Eastern Free State Sandy Grassland	Endangered	7833,34	429,62	0	0,00
				77,66	1	15,53
				1940,93	2	776,37
				4848,65	3	2909,19
				536,48	4	429,19

				0	5	0,00
5	Basotho Montane Shrubland	Vulnerable	331,97	8,23	0	0,00
				123,23	1	24,65
				189,60	2	75,84
				10,92	3	6,55
				0	4	0,00
				0	5	0,00
6	Northern KwaZulu-Natal Moist Grassland	Vulnerable	2019,35	478,60	0	0,00
				10,89	1	2,18
				156,60	2	62,64
				1168,35	3	701,01
				204,91	4	163,93
				0	5	0,00
7	Eastern Temperate Freshwater Wetlands	Vulnerable	1418,73	183,31	0	0,00
				0	1	0,00
				40,15	2	16,06
				688,41	3	413,05
				506,86	4	405,49
				0	5	0,00
8	Temperate Grassy Wetlands	Vulnerable	509,15	284,26	0	0,00
				24,44	1	4,89
				13,79	2	5,51
				59,87	3	35,92
				126,79	4	101,43
				0	5	0,00
Total			**14013,43**	**14013,43**		7223,99

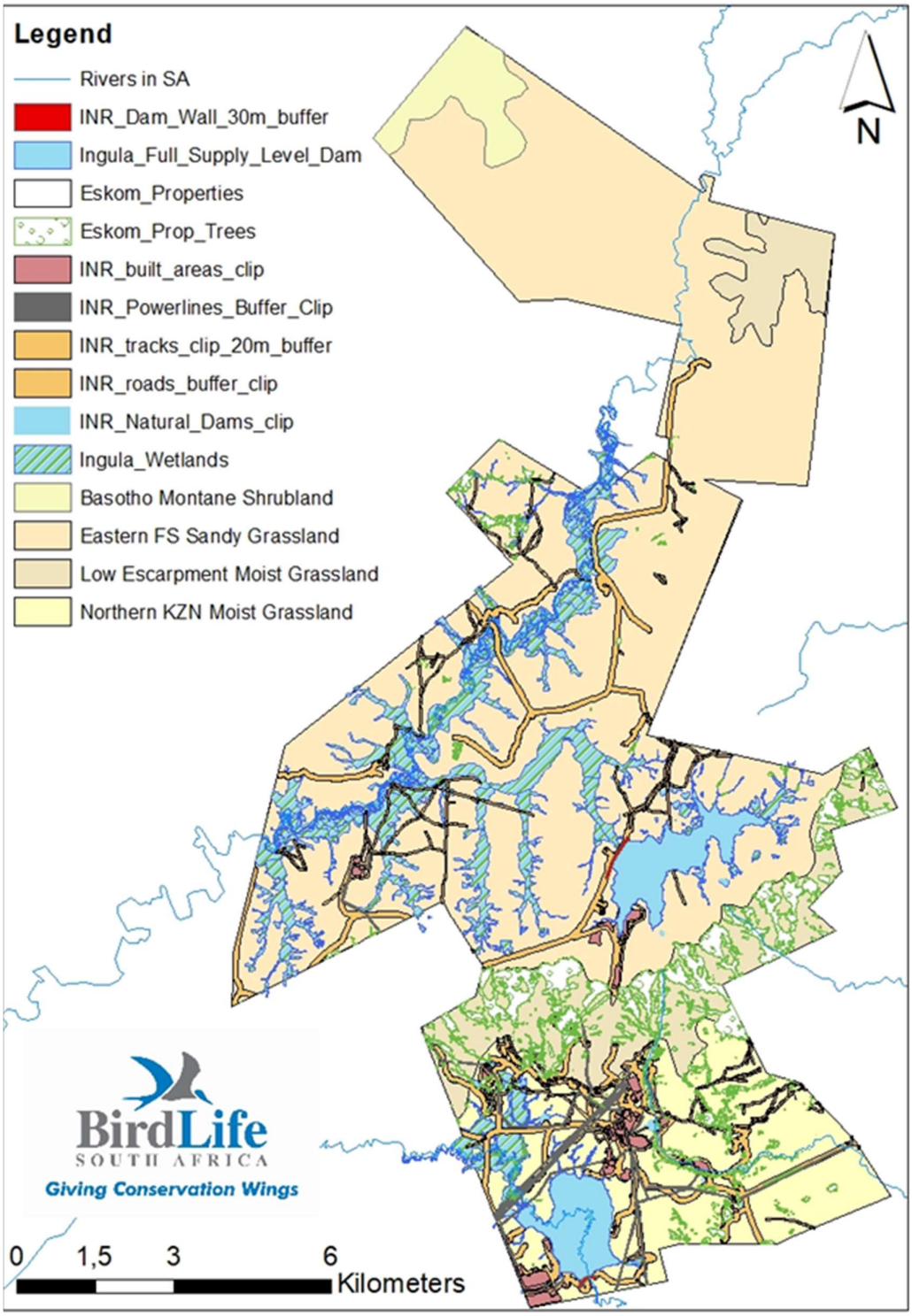

Figure 1: Map of ecosystem types and infrastructure at Ingula

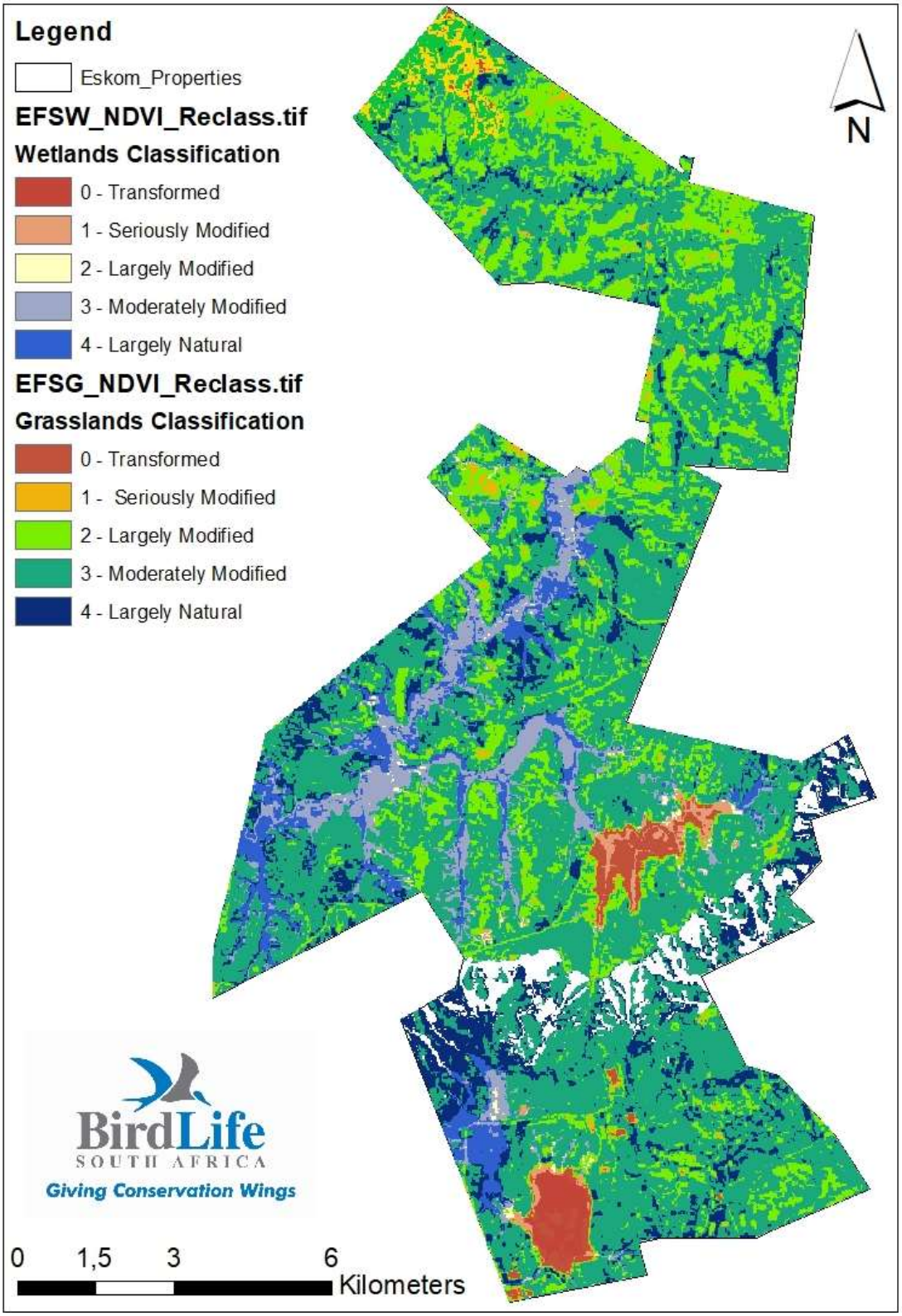

Figure 2: Map of ecosystem condition at Ingula

3.1.1.2 Species

Table 6 presents the results of the species materiality assessment, as per section 2.2.2 and Table 1, with an initial candidate list of more than 20 threatened / rare species. Nine species were eventually included in the net impact assessment process, those with a score of 12 or more: i.e., Grey Crowned Crane, Wattled Crane, African Marsh Harrier, Yellow-breasted Pipit, Secretarybird, Bearded Vulture, Oribi, Mountain Reedbuck and Grey Rhebok.

Table 6: Results of the species materiality assessment at Ingula (species with a score 12 or more were included in the impact assessment)

Conservation status		**Population assessment / monitoring (capacity to do both)**		**Likelihood of impacts**		**Severity of impacts**		**Total score**
Bush Blackcap	4	Forest monitoring	2	Forest destruction (fires)	1	Unknown population size	2	9
Crane Blue	3	Seasonal	3	Confirmed powerline strikes, but management measures put in place	2	Small population, one breeding pair	3	11
Crane Grey Crowned	5	Seasonal	3	Confirmed powerline strikes, but management measures put in place	2	Small population, 2-3 breeding pairs	3	**13**
Crane Wattled	6		3	Poaching of eggs, mismanagement of fires in breeding sites and seasons	2	Only one breeding pair on site.	3	**14**
Eagle Martial	5	Nest moved from site, seen infrequently	1		1	Only one pair in the region	2	9
Falcon Lanner	4		3		1	Only one pair in the region	2	10
Flufftail White-winged	6	Expensive equipment, intensive study needed	1	Loss of habitat through the encroachment of Phragmites into sedge wetland	2	Unknown population size	2	11
Harrier African Marsh-	5		3	Mismanagement of wetland (overgrazing, too frequent/mistimed fires)	2	Only 2 pairs on site.	2	**12**
Ibis Southern Bald	4		3		1		1	9
Kingfisher Half-collared	3	Time/effort required	2	Very dependent on water quality of rivers	1	Only one pair in the region	2	8
Korhaan White Bellied	4	Nest moved from site, breeding off-site - walked transects	2	Numerous powerline strikes	3	Small population	2	11

Lapwing Blackwinged	3	Walked transects	3	One powerline strike recorded in 2010. Mitigation of lines afterward.	1		1	8
Pipit Yellow-breasted	4	Walked transects	3	Mismanagement of grassland (over-/ undergrazing, too frequent fires)	2	Sensitive habitat requirements, small population	3	**12**
Secretarybird	4	Once nest located on site	3	Confirmed powerline/fenceline mortalities	3	~2 pairs in the area, high mate fidelity.	3	**13**
Vulture Bearded	6	Moved breeding site. Breeding in broader region. Not seen since January 2018.	2	Poisonings (not yet recorded in area)	1	Low population, so any impact is severe	3	**12**
Vulture White-backed	6	Only seen rarely	1	Poisonings (not yet recorded in area)	1		3	11
Oribi	5	EWT report, horsemen counts	3	Poaching	3	Small population	3	**14**
Reedbuck Mountain	5	Seen infrequently	2	Poaching	3	Small population	3	**13**
Rhebok Grey	3	Horsemen counts	3	Poaching	3		3	**12**
Serval	3	Very difficult to find. Only recorded by chance - being in the right spot at the right time.	1	Recorded road mortality, but now have lower traffic, and lower speed limits.	2	Small population	3	9
Disa tysonii	2	Expertise required	1	Overgrazing/frequent fires	1	Rare plant	2	6
Fairy Shrimp (Branchiodopsis natalensis)	2	Time/timing essential	2	Climate threats	2	Very rare	2	8

With respect to impacts on the nine material species, the key findings are as follows.

Yellow-breasted Pipit (Anthus chloris):

- Habitat of 217 000 ha globally with an average density across distribution: 0.18 birds/ha (Colyn et al., 2020 in review[11]).
- Current extent of suitable habitat on Ingula (Habitat suitability model values over 0.6): 1 206ha (Figure 3).
- Current population: 11 pairs recorded during the 2019/20 summer breeding season (see Table 7).
- Accordingly, one could model the optimal population on Ingula to be: 1206*0.18 = +/- 217 birds or ≈ Maximum of 100 pairs. If we take immature individuals and chicks into account, the maximum number of pairs should be lower. The team at Ingula feels this maximum population size is unrealistic or unlikely to ever be achieved.

[11] Colyn, R.B., Coetzer, C., Smit-Robinson, H., Chetty, K., Lee, A. & Ryan, P.G. In Prep. The impact of climate, grazing and fire on the breeding activity and density of threatened birds in a highland grassland ecosystem in South Africa.

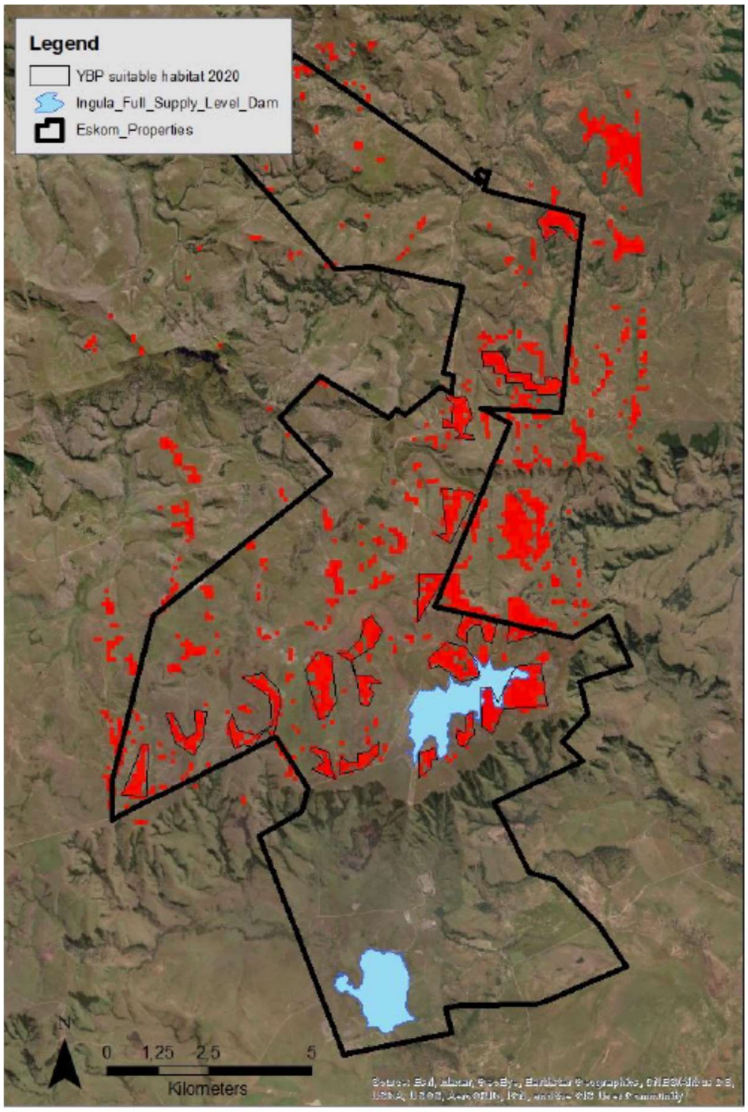

Figure 3: Suitable grassland habitat for Yellow-breasted Pipit within Ingula

Table 7: Yellow-breasted pipit breeding pairs from 2014 until 2019

Yellow-breasted Pipit *Anthus chloris*	
Regional Red List Status: Vulnerable	
	Number of breeding pairs
2014	15
2015	4
2016	14
2017	10
2018	6-10
2019	11

Bearded Vulture (Gypaetus barbatus):

- Breeding pair historically active (last successful fledgling in 2018) 7km from the closest Eskom boundary.
- Home range during breeding season: 600 km^2, during non-breeding season: 4 000 - 7 500 km^2 (Hockey et al., 2005[12]), therefore including Ingula.
- The species prefers foraging in alpine grasslands and rocky mountains/escarpments, so the optimal habitat at Ingula would exclude wetlands and forests / woodlands.
- Area needed for vulture restaurant: one hectare (50x50m to 100x100m).
- Optimal number of Bearded Vultures in the broader region: six
- Current number of Bearded Vultures in the broader region: two (last sighting on Ingula in December 2017).

Grey Crowned Crane (Balearica regulorum):

- Breeds in marshes, pans and dams with fairly tall emergent vegetation, but forages in short to medium-height open grassland, cultivated fields and pastures (Hockey et al., 2005) (Figure 4).
- Up to 13 pairs in marshes > 100ha, 50-250m apart (Hockey et al., 2005).
- Nest locations currently approximately 1,5 to 3km apart. Current known historical nest sites at Ingula: 8 (Figure 5).
- Average number of nests active per year: 2-3. Flocks of >50 individuals seen in 2018.
- Thus, at the very least, optimally Ingula should be able to sustain 5-8 pairs of Grey Crowned Cranes.

[12] Hockey, P.A.R., Dean, W.R.J., & Ryan, P.G. (eds.) (2005). Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.

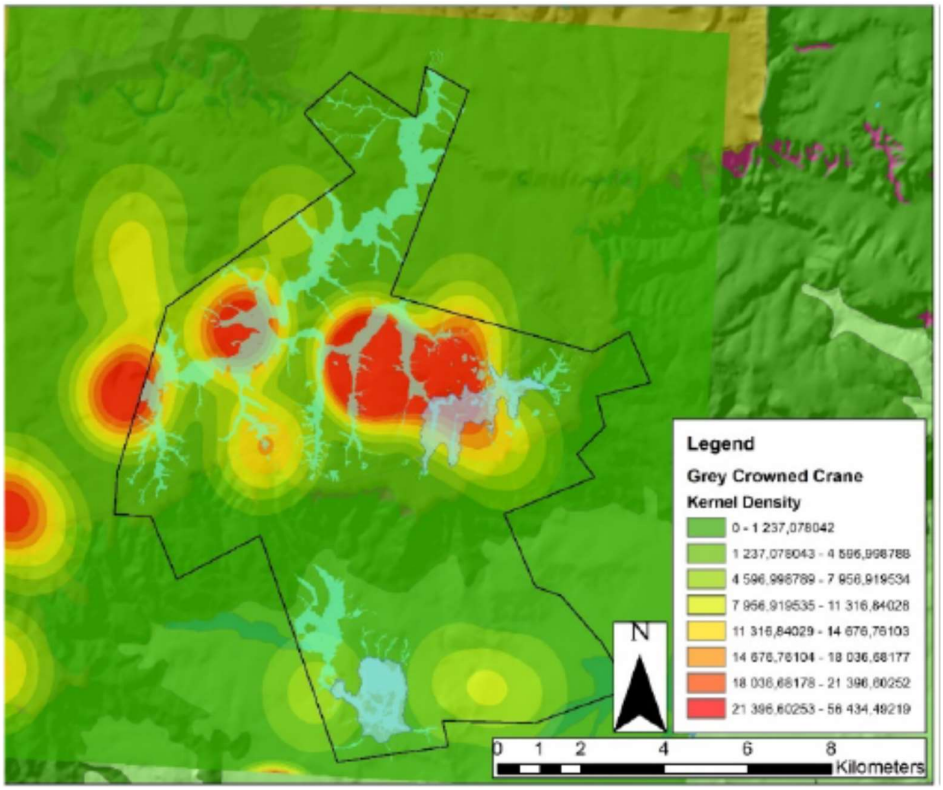

Figure 4: Kernel density analyses showing the area most frequently used by Grey Crowned Crane at Ingula (2016)

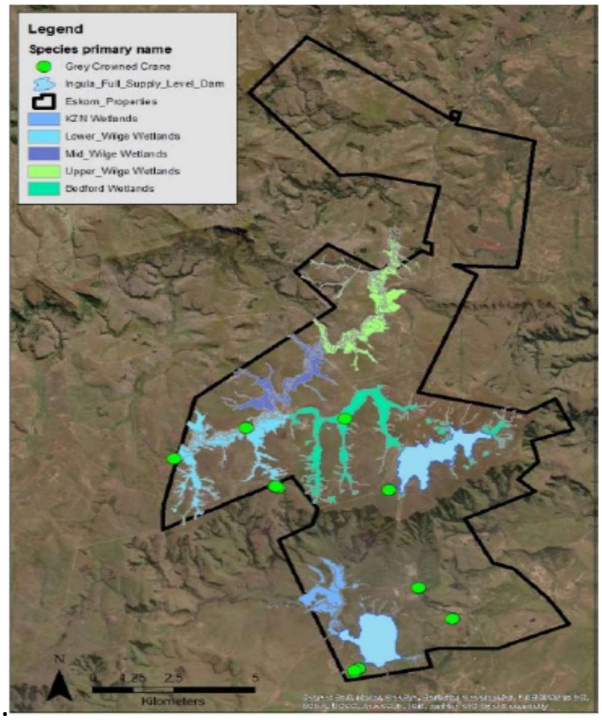

Figure 5: Historical location of Grey Crowned Crane nests within Ingula

African Marsh Harrier (Circus ranivorus):

- Currently two pairs on Ingula (Figure 6). 3 is the highest number of breeding pairs ever recorded, though only two were successful.
- "When provisioning nestlings, flies…covering up to 200km^2… Very territorial, nests could be as close as 80+m apart" (Hockey et al., 2005).
- Based on Kernel density, a maximum of three pairs appears to be reasonable

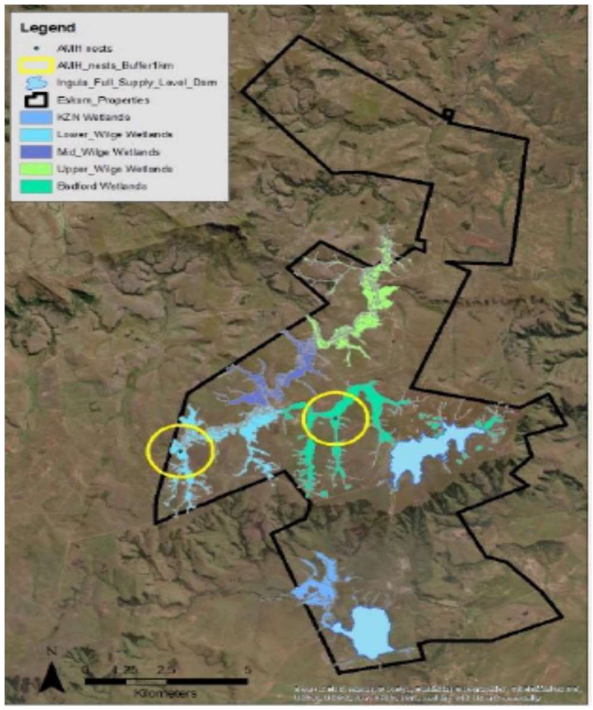

Figure 6: Location of African Marsh Harrier nests within Ingula

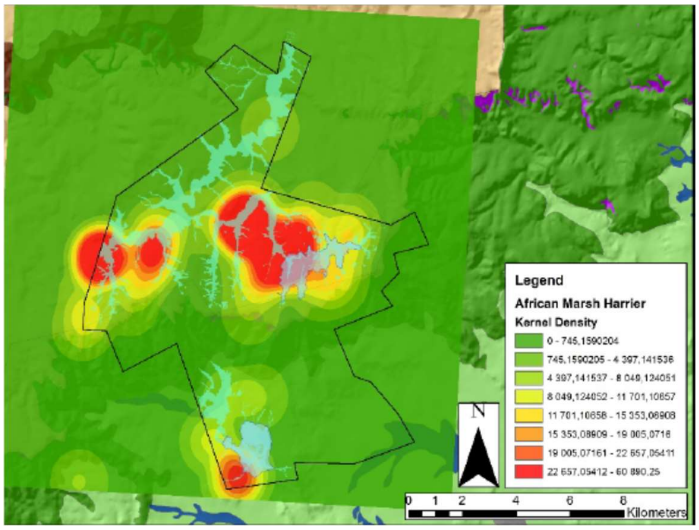

Figure 7: Kernel density analyses showing the area most frequently used by African Marsh Harrier at Ingula

Secretarybird (Sagittarius serpentarius):

- According to Hockey et al., 2005: Hunting territory size = 20km^2 (indicated by the red circles in Figure 8); Home range = 20-230km^2 around the nest, but on average about 50-60km^2 (indicated by the yellow circles in Figure 8).
- Historically on Ingula:
    - Only one pair actively breeding, though a second pair can sometimes be observed foraging. Four breeding attempts, only one successful in 2018.
    - Maximum individuals seen on Ingula in one day: 7 (only one was a juvenile), which indicates that a third pair may be in the broader region.
    - In 2020, four individuals (two pairs) were seen in a territorial dispute on Ingula, where one pair were chased away.
- Based on all this information, it is estimated that only one pair will be able to establish a successful breeding territory on Ingula. The two home range territories on the map are indicative of the lower home range size, which means that one pair would be able to use the whole of Ingula if food availability requires a larger home territory than shown. However, Ingula could assist in providing neighbouring territorial pairs with occasional foraging habitat.

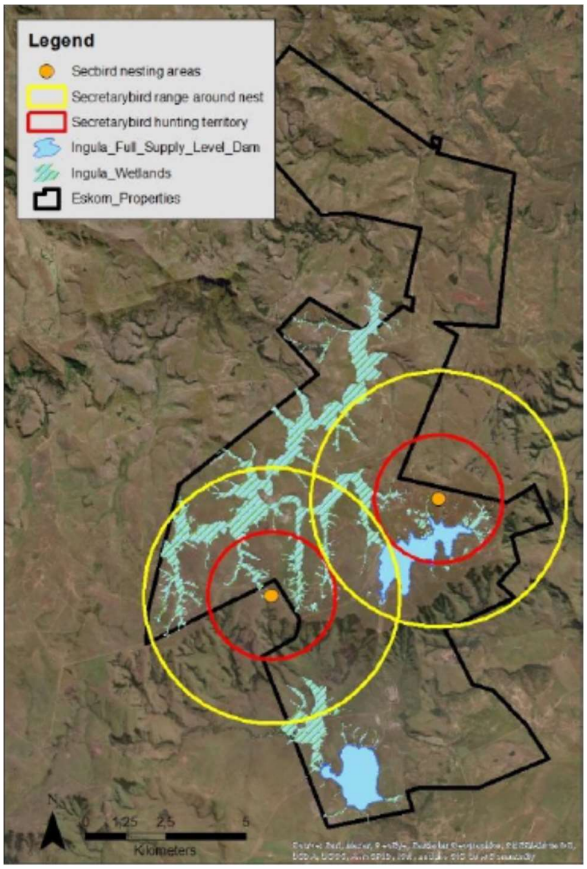

Figure 8: Location of possible Secretary Bird nests, home ranges and hunting territories within Ingula

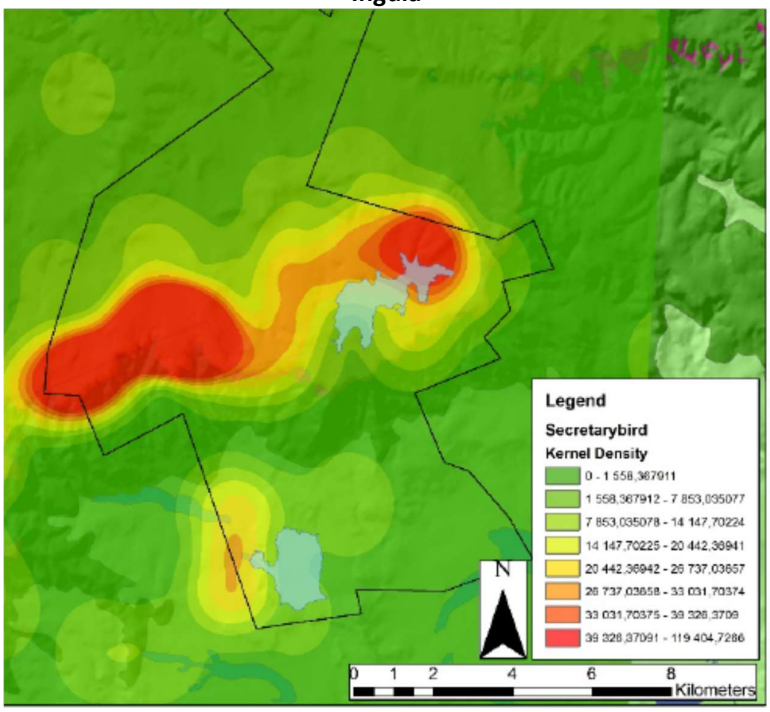

Figure 9: Kernel density analyses showing the area most frequently used by Secretary Birds at Ingula (2016)

Wattled Crane (Bugeranus carunculatus):

According to the "Ingula Nature Reserve Species Action Plan: Wattled Crane Bugeranus carunculatus"[13], the Ingula Wattled Crane population is thought to be predominantly between two and four individuals (1-2 pairs), but a total of six individuals have been confirmed within and surrounding the Ingula boundaries (P. Nelson pers. comm., C. Pienaar pers. obs.). At least one of the two respective pairs have been recorded attempting to breed since 2006, with three known nesting structures being located thus far (Figure 10). Field observations have noted that pairs alternated between the known nesting sites depending on the season. Nesting success has increased during the last five breeding seasons, with successfully fledged chicks recorded in 2008, 2012, 2015, 2016, 2018 and 2019.

[13] Colyn, R. (2015). Ingula Nature Reserve species action plan: Wattled Crane *Bugeranus carunculatus*. BirdLife South Africa, 21p. Reviewed by Pienaar, C. in 2020.

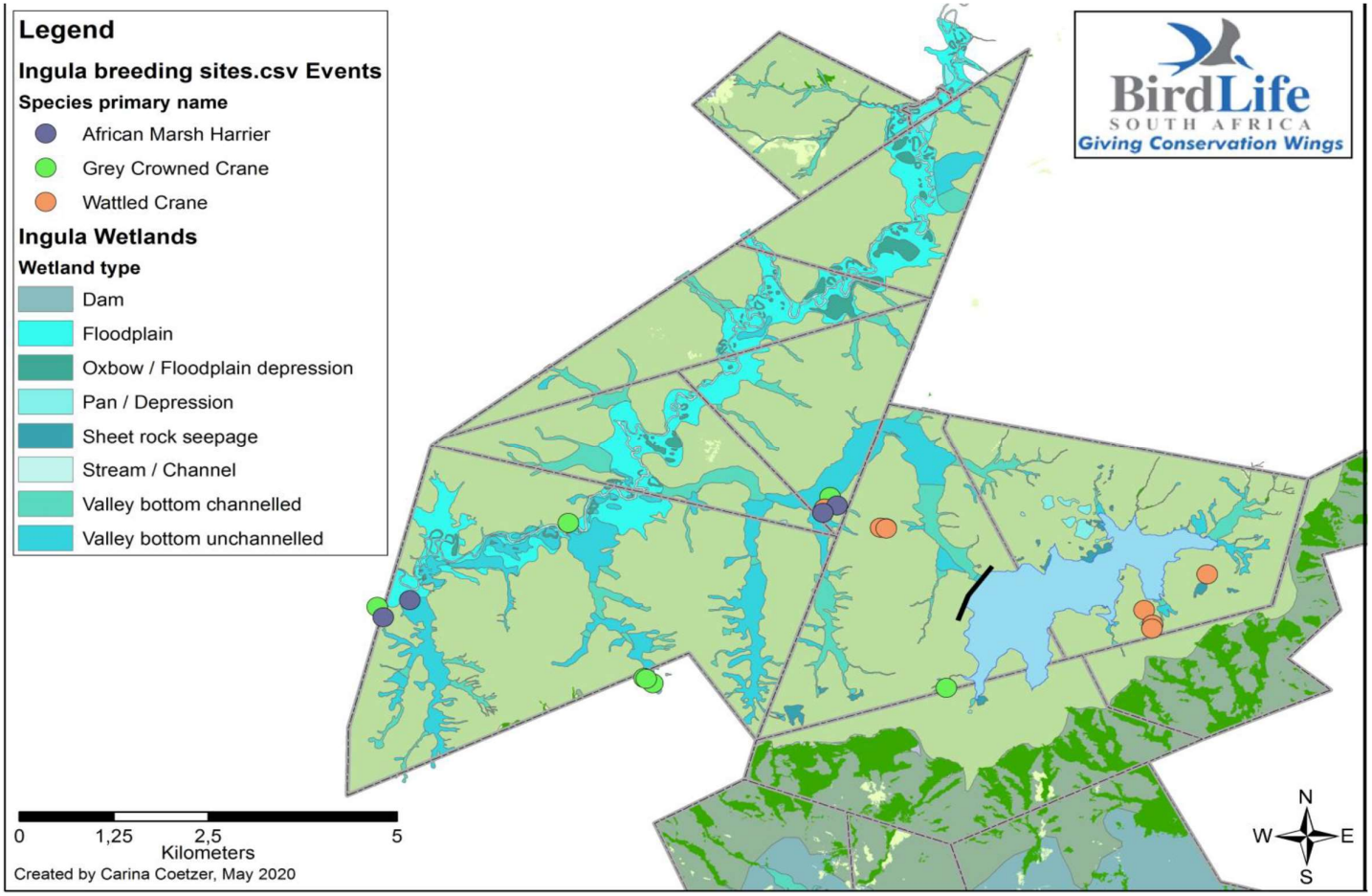

Figure 10: Location of nest for the Wattled Crane, Grey Crowned Crane and African Marsh Harrier[12]

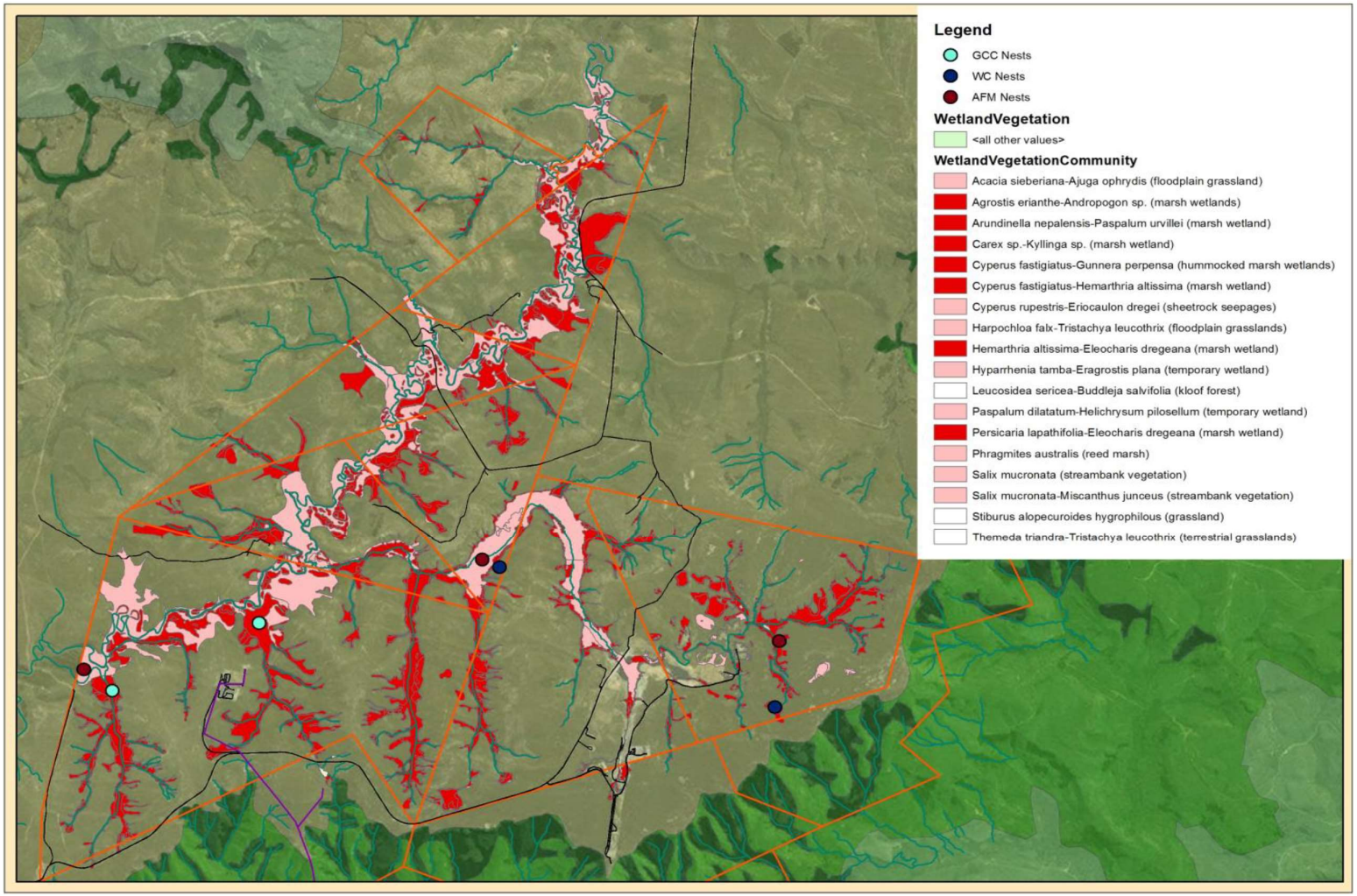

Figure 11: Optimal Wattled Crane breeding (red) and foraging (red and pink) habitat present within Ingula as depicted according to wetland type and respective vegetation community[12]

Furthermore, an additional pair is often observed just outside the Ingula boundary utilising the wetland located on a privately owned property called Strathmorn[12]. This pair is frequently observed in the broader area and subsequently monitored as part of the Ingula Wattled Crane breeding surveys. Since monitoring commenced, one successful breeding event was recorded in 2018 and yielded one fledged chick. Although more than one pair has been observed foraging within the boundaries of INR, only one pair has ever been recorded to breed on the reserve at any given time. Therefore, including the Strathmorn site located on the periphery of the reserve, suggests that the current breeding capacity of the reserve is 1-2 pairs.

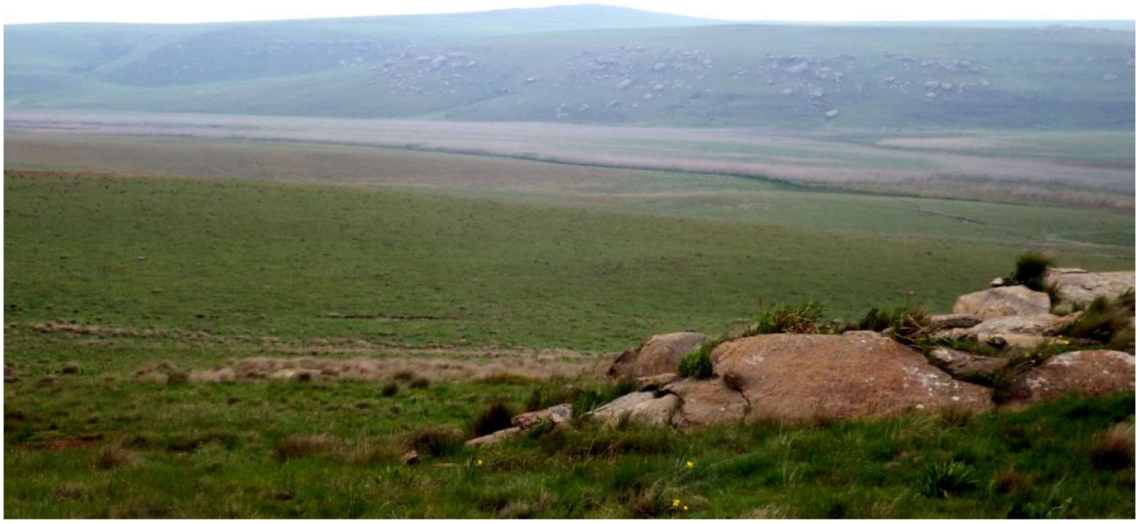

Figure 12: Marsh wetland (background) and grassland (foreground) habitat mosaic within the upper Bedford area at Ingula[12]

As explained by the "Ingula Nature Reserve Species Action Plan: Wattled Crane Bugeranus carunculatus"[12], Wattled Crane habitat suitability was estimated using ArcMAP in 2014 by overlaying numerous key environmental layers including:

- Broad-scale (i.e. National) vegetation and wetland layers cropped for the Ingula area.
- Fine-scale wetland habitats present within Ingula.
- Fine-scale wetland vegetation communities present within Ingula (Figure 11).

The product of overlaid layers was then filtered according to known Wattled Crane habitat preferences as per Burke (1996)[14] and Coverdale (2006)[15]. The result was a digitised map depicting the estimated suitability of wetland habitat for breeding Wattled Crane (Figure 11). This result clearly indicates a relatively large quantity of optimal breeding (red) and foraging (red and pink) habitat for Wattled Crane within the Ingula boundary.

Additionally, average Wattled Crane territory size as determined by McCann and Benn (2006)[16], was buffered and included in the digitisation to provide an estimate of the potential carrying capacity of the Ingula wetlands. These buffers (i.e. 16,6km^2) were focused around two known nesting sites (Figure 13). Buffers (purple circles) were not centred on the respective breeding sites (blue dots) as the majority of habitat east of the Bedford nest site is not suitable for Wattle Crane, that being predominantly Northern Afrotemperate Forest on steep escarpment slopes. The result indicates that according to average territory size estimated by McCann and Ben (2006), Ingula has the definite potential to host two Wattled Crane pairs. Additionally, when combined with the distance between the two respective nests sites, as well as the numerous observed sightings of two pairs within these areas, it further confirms the possible residency of two pairs in these respective wetlands.

Approximately 250 ha (2,5km^2) of the Bedford wetland and grassland habitat (Figure 12) was lost to flooding as the upper Ingula dam became operational (Figure 14). This undoubtedly affected the available foraging habitat for the Bedford Wattled Crane pair and possibly necessitated the need to forage further east into the Chatsworth area since the development of these maps. The remaining wetland conditions have not changed dramatically since 2014, and therefore the exercise was not repeated for the current review.

[14] Burke, A. (1996). Wattled Crane (*Bugeranus carunculatus*). In: Meine, C.D., Archibald, G.W., (eds). *The Cranes: Status, survey and Conservation Action Plan*. Gland: IUCN.
[15] Coverdale, B.M. & McCann, K.I. (2005). Grassland loss in KwaZulu-Natal: Implications for Biodiversity Conservation. *Endangered Wildlife Trust Vision* 13: 80-83.
[16] McCann, K.I. & Benn, G.A. (2006). Land use patterns within Wattled Crane (*Bugeranus carunculatus*) home ranges in an agricultural landscape in the KwaZulu-Natal province, SouthAfrica. *Ostrich* 77, parts 3 & 4.

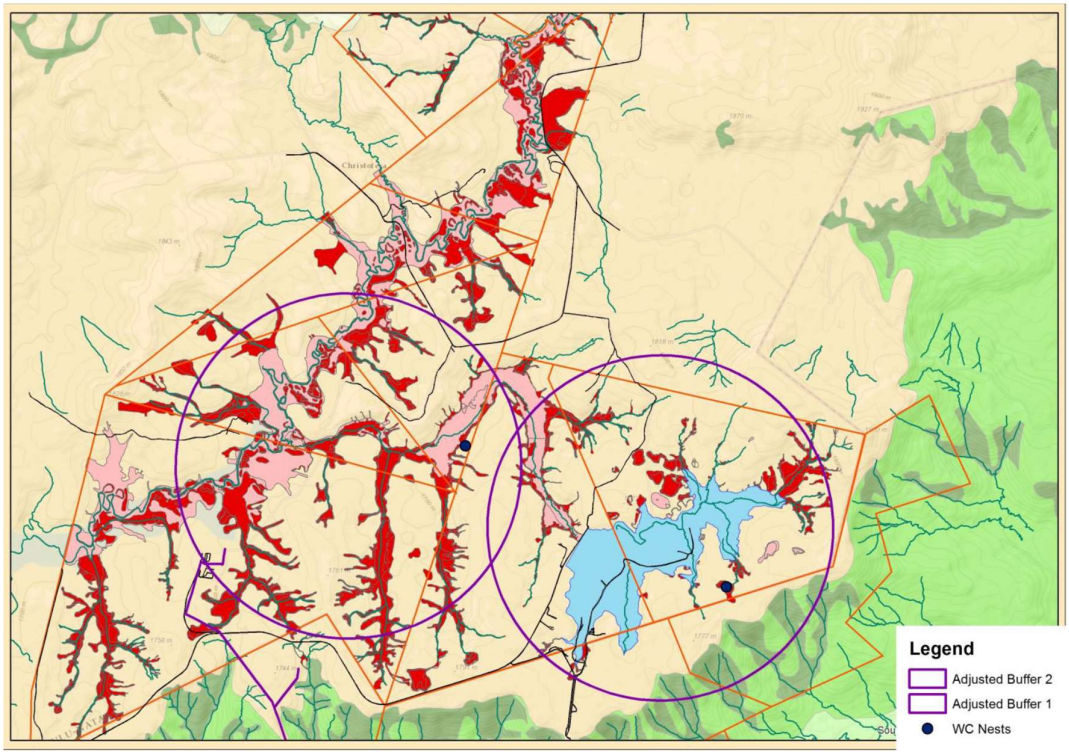

Figure 13: Average Wattled Crane territory size surrounding the Bedford and Chatsworth nest sites (blue dots). Territory buffers (purple circles) were shifted to accommodate suitable habitat[12]

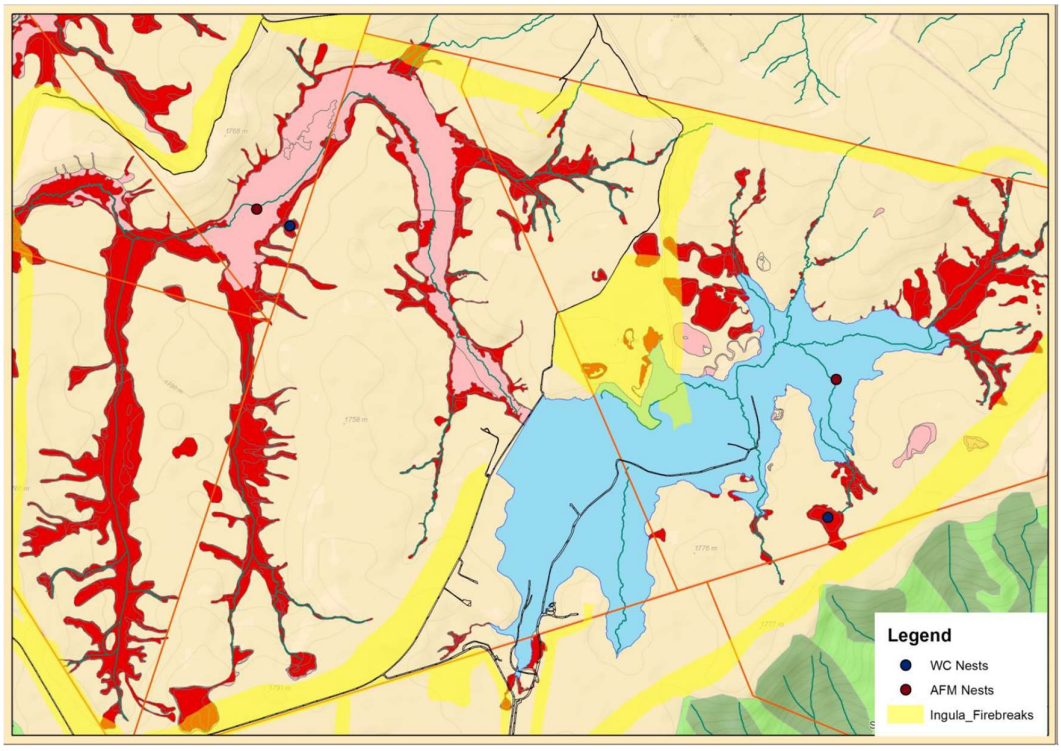

Figure 14: The full supply level of the upper Ingula dam, depicting the resultant habitat loss (250ha) through flooding

Based on the Horsemen's reports for June, July and September 2020 the following numbers of the three key mammal species have been sighted during the respective months[17]:

	June	July	September
Oribi (Average)	2	5	3
Oribi (Max)	2	7	8
Mountain Reedbuck (Average)	8	8	6
Mountain Reedbuck (Max)	23	21	18
Grey Rhebok (Average)	38	33	37
Grey Rhebok (Max)	56	43	47

Oribi (Ourebia ourebi):

- According to Shrader et al. (2016)[18] most subpopulations of Oribi in South Africa are fewer than 50 individuals but are unlikely to be more than maximum 250 individuals. In formally protected areas in KZN (e.g. Ingula Nature Reserve) the average population size per PA is 32 individuals.
- Locally common populations can have densities of between 2-10 individuals per km^2 (Shrader et al., 2016), which can be averaged to 6. In areas where they are uncommon, densities range between 0,1- 0,4 individuals per km^2.
- Currently, Oribi only occur on the lower areas of Ingula:
    - The exact population size is not known.
    - Grassland habitat is a maximum of 1740 ha on lower areas (grassland area minus built-up areas and wetlands and trees).
    - However, not all grasslands are suitable (dependent on fire and grazing regimes, as well as encroachment), thus working with 50% suitability per year, only 870 ha is potentially available.
    - Working on the density of locally common populations means that Ingula can sustain between 17-87 individuals for the available habitat on lower areas (average of 52).

[17] Please note: the numbers indicate the average and maximum individuals seen PER WEEK and not necessarily the size of the population. However, it may be reasonable to deduce that Grey Rhebok are more abundant than Oribi, for example.

[18] Shrader A.M., Little, I., Coverdale, B, Patel, T., 2016. A conservation assessment of Ourebia ourebi ourebi. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

- If upper areas are included (which will not be for the current review), this number could change significantly.

Mountain Reedbuck (Redunca fulvorufula):

- The exact population size within Ingula is not known.
- According to Taylor et al. (2016a)[19], estimated densities in protected areas could be as little as 10 individuals per 100 km^2. Nearby reserves had densities of 300-350 individuals per 100 km^2 (Golden Gate National Park), and 1 150 individuals per 100 km^2 (Sterkfontein Dam Nature Reserve, 18 000 ha) in 2007. In 2013, the average population size in PAs in the Free State were 60 individuals, and in KZN the average population size were 20 individuals. At Sterkfontein Dam Nature reserve the average female territory (larger than the male territory) was >2km^2.
- Accordingly, for all of Eskom owned property (14 268ha) minus the built areas, forests, wetlands etc. (thus a total area of 9 879 ha, or just less than 100 km^2) an estimated total population could vary between 10-350 individuals. However, seeing as the preferred habitat include hillslopes and areas with rocky outcrops (e.g. the escarpment), the available habitat is even less (≈1 285 ha or 13km^2). The estimated optimal population (derived from the nearby and similar habitat type Sterkfontein Dam NR) could therefore be 11 individuals per km^2 * 13km2 = 143 individuals. Working with 50% habitat suitability (fire/grazing dependent), the maximum population would be 72 individuals.

Grey Rhebok (Pelea capreolus):

- The exact population size within Ingula is not known.
- Estimated population densities according to Taylor et al. (2016b)[20] in PAs are between 0,5 – 1,7 individuals per km^2 (1,3 individuals per km^2 in Golden Gate National Park, 6,4 individuals per km^2 at Sterkfontein Dam Nature Reserve). Home range size in the Eastern Free State is estimated at 30 – 100 ha.
- Available habitat size (mostly on Upper site of Ingula): 8 139 ha. Working with the nearby and similar Sterkfontein Dam Nature Reserve density of 6.4 individuals per km^2 (0,064/ha): 8

[19] Taylor, W.A., Avenant, N.L., Schulze, E., Viljoen, P., Child, M.F. (2016). A conservation assessment of *Redunca fulvorufula fulvorufula*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

[20] Taylor, A., Cowell, C., Drouilly, M., Schulze, E., Avenant, N., Birss, C., Child, M.F. (2016). A conservation assessment of *Pelea capreolus*. In Child MF, Roxburgh L, Do Linh San E, Raimondo D, Davies-Mostert HT, editors. The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

139ha * 0.064 individuals = 520 individuals for a maximum population size. Working with 50% habitat suitability (dependent on fire and grazing regime) the maximum population size would be 260 individuals.

3.1.2 Changes in biodiversity and the associated accounting journal entries

3.1.2.1 Ecosystems

Table 5 also shows that changes in ecosystem condition that have occurred at Ingula, with a cumulative condition-adjusted surface area of **7223,99 Ha eq.** out of a total surface area of **14013,43 Ha.** These ecosystem losses can be attributed to several impact drivers (e.g., grazing, wood harvesting, infrastructure development) and can be broken down per ecosystem type as follows:

- Northern Afrotemperate Forest: 229,00 Ha eq. lost (49,26 %) out of a maximum of 464,91 Ha eq. (pristine state);
- Woodland: 108,80 Ha eq. lost (67,31 %) out of a maximum of 161,65 Ha eq. (pristine state);
- Low Escarpment Moist Grassland: 488,52 Ha eq. lost (38,34 %) out of a maximum of 1274,33 Ha eq. (pristine state);
- Eastern Free State Sandy Grassland: 3703,06 Ha eq. lost (47,27 %) out of a maximum of 7833,34 Ha eq. (pristine state);
- Basotho Montane Shrubland: 224,94 Ha eq. lost (67,76 %) out of a maximum of 331,97 Ha eq. (pristine state);
- Northern KwaZulu-Natal Moist Grassland: 1089,60 Ha eq. lost (53,96 %) out of a maximum of 2019,35 Ha eq. (pristine state);
- Eastern Temperate Freshwater Wetlands: 584,13 Ha eq. lost (41,17 %) out of a maximum of 1418,73 Ha eq. (pristine state);
- Temperate Grassy Wetlands: 361,39 Ha eq. lost (70,98 %) out of a maximum of 509,15 Ha eq. (pristine state).

The detailed changes in ecosystem extent and condition are recorded in Table 8 while the associated accounting journal entries are presented in Table 9.

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 1 / 8)

"Northern Afrotemperate Forest" ecosystem		Condition rating of "Northern Afrotemperate Forest" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	464,91	464,91
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	464,91	464,91
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	464,91	464,91
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	464,91	464,91
(b) Current state	Ecosystem account (Ha) (A)	0,00	53,69	129,08	260,86	21,29	0,00	464,91
	Associated positive impacts (Ha Eq.) (B)	0,00	10,74	51,63	156,51	17,03	0,00	235,91
	Associated negative impacts (Ha Eq.) (C)	0,00	42,95	77,45	104,34	4,26	0,00	229,00
	Changes in A accounts (Ha)	0,00	53,69	129,08	260,86	21,29	-464,91	0,00
	Changes in C accounts (Ha Eq.)	0,00	42,95	77,45	104,34	4,26	0,00	229,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	10,74	51,63	156,51	17,03	-464,91	-229,00

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 2 / 8)

"Woodland" ecosystem		Condition rating of "Woodland" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	161,65	161,65
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	161,65	161,65
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	161,65	161,65
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	161,65	161,65
(b) Current state	Ecosystem account (Ha) (A)	0,00	101,68	35,14	7,04	17,80	0,00	161,65
	Associated positive impacts (Ha Eq.) (B)	0,00	20,34	14,06	4,22	14,24	0,00	52,85
	Associated negative impacts (Ha Eq.) (C)	0,00	81,34	21,09	2,81	3,56	0,00	108,80
	Changes in A accounts (Ha)	0,00	101,68	35,14	7,04	17,80	-161,65	0,00
	Changes in C accounts (Ha Eq.)	0,00	81,34	21,09	2,81	3,56	0,00	108,80
	Changes in Y and Z accounts (Ha Eq.)	0,00	20,34	14,06	4,22	14,24	-161,65	-108,80

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 3 / 8

"Low Escarpment Moist Grassland" ecosystem		Condition rating of "Low Escarpment Moist Grassland" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	1274,33	1274,33
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	1274,33	1274,33
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	1274,33	1274,33
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	1274,33	1274,33
(b) Current state	Ecosystem account (Ha) (A)	47,07	4,28	116,89	733,41	372,68	0,00	1274,33
	Associated positive impacts (Ha Eq.) (B)	0,00	0,86	46,76	440,05	298,15	0,00	785,80
	Associated negative impacts (Ha Eq.) (C)	47,07	3,42	70,13	293,36	74,54	0,00	488,52
	Changes in A accounts (Ha)	47,07	4,28	116,89	733,41	372,68	-1274,33	0,00
	Changes in C accounts (Ha Eq.)	47,07	3,42	70,13	293,36	74,54	0,00	488,52
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,86	46,76	440,05	298,15	-1274,33	-488,53

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 4 / 8)

"Eastern Free State Sandy Grassland" ecosystem		Condition rating of "Eastern Free State Sandy Grassland" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	7833,34	7833,34
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	7833,34	7833,34
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	7833,34	7833,34
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	7833,34	7833,34
(b) Current state	Ecosystem account (Ha) (A)	429,62	77,66	1940,93	4848,65	536,48	0,00	7833,34
	Associated positive impacts (Ha Eq.) (B)	0,00	15,53	776,37	2909,19	429,19	0,00	4130,28
	Associated negative impacts (Ha Eq.) (C)	429,62	62,12	1164,56	1939,46	107,30	0,00	3703,06
	Changes in A accounts (Ha)	429,62	77,66	1940,93	4848,65	536,48	-7833,34	0,00
	Changes in C accounts (Ha Eq.)	429,62	62,12	1164,56	1939,46	107,30	0,00	3703,06
	Changes in Y and Z accounts (Ha Eq.)	0,00	15,53	776,37	2909,19	429,19	-7833,34	-3703,06

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 5 / 8)

"Basotho Montane Shrubland" ecosystem		Condition rating of "Basotho Montane Shrubland" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	331,97	331,97
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	331,97	331,97
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	331,97	331,97
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	331,97	331,97
(b) Current state	Ecosystem account (Ha) (A)	8,23	123,23	189,60	10,92	0,00	0,00	331,97
	Associated positive impacts (Ha Eq.) (B)	0,00	24,65	75,84	6,55	0,00	0,00	107,03
	Associated negative impacts (Ha Eq.) (C)	8,23	98,59	113,76	4,37	0,00	0,00	224,94
	Changes in A accounts (Ha)	8,23	123,23	189,60	10,92	0,00	-331,97	0,00
	Changes in C accounts (Ha Eq.)	8,23	98,59	113,76	4,37	0,00	0,00	224,94
	Changes in Y and Z accounts (Ha Eq.)	0,00	24,65	75,84	6,55	0,00	-331,97	-224,94

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 6 / 8)

"Northern KwaZulu-Natal Moist Grassland" ecosystem		Condition rating of "Northern KwaZulu-Natal Moist Grassland" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	2019,35	2019,35
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	2019,35	2019,35
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	2019,35	2019,35
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	2019,35	2019,35
(b) Current state	Ecosystem account (Ha) (A)	478,60	10,89	156,60	1168,35	204,91	0,00	2019,35
	Associated positive impacts (Ha Eq.) (B)	0,00	2,18	62,64	701,01	163,93	0,00	929,75
	Associated negative impacts (Ha Eq.) (C)	478,60	8,71	93,96	467,34	40,98	0,00	1089,60
	Changes in A accounts (Ha)	478,60	10,89	156,60	1168,35	204,91	-2019,35	0,00
	Changes in C accounts (Ha Eq.)	478,60	8,71	93,96	467,34	40,98	0,00	1089,60
	Changes in Y and Z accounts (Ha Eq.)	0,00	2,18	62,64	701,01	163,93	-2019,35	-1089,60

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 7 / 8)

"Eastern Temperate Freshwater Wetlands" ecosystem		Condition rating of "Eastern Temperate Freshwater Wetlands" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	1418,73	1418,73
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	1418,73	1418,73
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	1418,73	1418,73
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	1418,73	1418,73
(b) Current state	Ecosystem account (Ha) (A)	183,31	0,00	40,15	688,41	506,86	0,00	1418,73
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	16,06	413,05	405,49	0,00	834,60
	Associated negative impacts (Ha Eq.) (C)	183,31	0,00	24,09	275,36	101,37	0,00	584,13
	Changes in A accounts (Ha)	183,31	0,00	40,15	688,41	506,86	-1418,73	0,00
	Changes in C accounts (Ha Eq.)	183,31	0,00	24,09	275,36	101,37	0,00	584,13
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	16,06	413,05	405,49	-1418,73	-584,13

Table 8: Detailed changes in the extent and condition of ecosystem types at Ingula (account categories are presented in section 2.4) (part 8 / 8)

"Temperate Grassy Wetlands" ecosystem		Condition rating of "Temperate Grassy Wetlands" ecosystem						
Accounting events	**Accounts**	**0**	**1**	**2**	**3**	**4**	**5**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	509,15	509,15
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	509,15	509,15
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A accounts (Ha)	0,00	0,00	0,00	0,00	0,00	509,15	509,15
	Changes in C accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in Y and Z accounts (Ha Eq.)	0,00	0,00	0,00	0,00	0,00	509,15	509,15
(b) Current state	Ecosystem account (Ha) (A)	284,26	24,44	13,79	59,87	126,79	0,00	509,15
	Associated positive impacts (Ha Eq.) (B)	0,00	4,89	5,51	35,92	101,43	0,00	147,76
	Associated negative impacts (Ha Eq.) (C)	284,26	19,56	8,27	23,95	25,36	0,00	361,39
	Changes in A accounts (Ha)	284,26	24,44	13,79	59,87	126,79	-509,15	0,00
	Changes in C accounts (Ha Eq.)	284,26	19,56	8,27	23,95	25,36	0,00	361,39
	Changes in Y and Z accounts (Ha Eq.)	0,00	4,89	5,51	35,92	101,43	-509,15	-361,39

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 1/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(a) Reference state						
1	Accounting for reference state of ecosystem assets, which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Northern Afrotemperate Forest 5	464,91	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Northern Afrotemperate Forest 5		464,91
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Woodland 5	161,65	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Woodland 5		161,65
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Low Escarpment Moist Grassland 5	1274,33	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Low Escarpment Moist Grassland 5		1274,33
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Eastern Free State Sandy Grassland 5	7833,34	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Eastern Free State Sandy Grassland 5		7833,34
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Basotho Montane Shrubland 5	331,97	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Basotho Montane Shrubland 5		331,97
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Northern KwaZulu-Natal Moist Grassland 5	2019,35	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Northern KwaZulu-Natal Moist Grassland 5		2019,35
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Eastern Temperate Freshwater Wetlands 5	1418,73	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Eastern Temperate Freshwater Wetlands 5		1418,73
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Temperate Grassy Wetlands 5	509,15	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Temperate Grassy Wetlands 5		509,15
(b) At time of assessment						
2	Stock tacking of Northern Afrotemperate Forest assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	53,69	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	129,08	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	260,86	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	21,29	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		464,91

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 2/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
3	Stock tacking of Woodland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	101,68	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	35,14	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	7,04	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	17,80	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		161,65
4	Stock tacking of Low Escarpment Moist Grassland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	47,07	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	4,28	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	116,89	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	733,41	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5	372,68	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		1274,33
5	Stock tacking of Eastern Free State Sandy Grassland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	429,62	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	77,66	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	1940,93	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	4848,65	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	536,48	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		7833,34
6	Stock tacking of Basotho Montane Shrubland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	8,23	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	123,23	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	189,60	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	10,92	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		331,97
7	Stock tacking of Northern KwaZulu-Natal Moist Grassland assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	478,60	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	10,89	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	156,60	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	1168,35	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	204,91	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		2019,35

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 3/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
8	Stock tacking of Eastern Temperate Freshwater Wetlands assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	183,31	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	40,15	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	688,41	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	506,86	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		1418,73
9	Stock tacking of Temperate Grassy Wetlands assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	0	284,26	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	24,44	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	13,79	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	59,87	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	126,79	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		509,15
10	Recording condition-adjusted losses and gains associated to existing condition scores of Northern Afrotemperate Forest assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	464,91	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		42,95
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		77,45
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		104,34
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		4,26
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		10,74
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		51,63
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		156,51
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		17,03

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 4/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
11	Recording condition-adjusted losses and gains associated to existing condition scores of Woodland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	161,65	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		81,34
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		21,09
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		2,81
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		3,56
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		20,34
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		14,06
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		4,22
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		14,24
12	Recording condition-adjusted losses and gains associated to existing condition scores of Low Escarpment Moist Grassland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	1274,33	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		47,07
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		3,42
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		70,13
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		293,36
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		74,54
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		0,86
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		46,76
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		440,05
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		298,15

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 5/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
13	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Free State Sandy Grassland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	7833,34	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		429,62
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		62,12
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		1164,56
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		1939,46
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		107,30
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		15,53
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		776,37
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		2909,19
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		429,19
14	Recording condition-adjusted losses and gains associated to existing condition scores of Basotho Montane Shrubland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	331,97	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		8,23
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		98,59
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		113,76
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		4,37
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		24,65
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		75,84
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		6,55

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 6/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
15	Recording condition-adjusted losses and gains associated to existing condition scores of Northern KwaZulu-Natal Moist Grassland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	2019,35	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		478,60
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		8,71
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		93,96
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		467,34
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		40,98
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		2,18
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		62,64
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		701,01
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		163,93
16	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Temperate Freshwater Wetlands assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	1418,73	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		183,31
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		24,09
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		275,36
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		101,37
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		16,06
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		413,05
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		405,49

Table 9: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Ingula (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 7/ 7)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(b) At time of assessment						
17	Recording condition-adjusted losses and gains associated to existing condition scores of Temperate Grassy Wetlands assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	509,15	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	0		284,26
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		19,56
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		8,27
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		23,95
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		25,36
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	1		4,89
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		5,51
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		35,92
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		101,43

3.1.2.2 Species

Because historical information about the original population / habitat sizes of all nine material species is not available and some actual population / habitat sizes are not known, comprehensive accounting journal entries are not possible at this stage for three species: Oribi, Grey Rhebok and Mountain Reedbuck. However, it is possible to scientifically and / or socially determine the potential maximum population and / or habitat sizes for eight of the material species (apart from the Bearded vulture, which has a huge home range which goes way beyond Ingula's boundaries). Table 10 presents the detailed available data for all nine material species. Table 11 shows the accounting journal entries for five material species: Grey-Crowned Crane, Wattled Crane, African Marsh Harrier, Yellow-Breasted Pipit and Secretarybird.

Table 10: Detailed information about the actual and target population / habitat sizes of the nine material species at Ingula (NA means "not available")

	Asssets (A accounts)		Accumulated positive impacts (B accounts)	Accumulated negative impacts (C accounts)
	Target population size (numbers)	Target population size (breeding pairs)	Actual population size (breeding pairs)	Gap to target population size (breeding pairs)
Grey Crowned Crane	NA	5 - 8	2 - 3	3 - 5
Wattled Crane	NA	2	1 - 2	0 - 1
African Marsh Harrier	NA	3	2	1
Yellow-breasted Pipit	NA	100	11	89
Secretarybird	NA	1	1	0
Bearded Vulture	NA	NA	NA	NA
Oribi	17 - 87	NA	NA	NA
Mountain Reedbuck	72	NA	NA	NA
Grey Rhebok	260	NA	NA	NA

Table 11: Accounting journal entries associated with the changes in the population sizes of material species at Ingula (accounting rules are presented in section 3.3 of the BD Protocol)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(a) Reference state						
1	Accounting for the target population size of species assets	Species asset (Ha)	A (Statement of Biodiversity Position)	Grey-crowned crane - target breeding couples	5 - 8	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Grey-crowned crane - target breeding couples		5 - 8
		Species asset (Ha)	A (Statement of Biodiversity Position)	Wattled crane - target breeding couples	2	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Wattled crane - target breeding couples		2
		Species asset (Ha)	A (Statement of Biodiversity Position)	African marsh harrier - target breeding couples	3	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	African marsh harrier - target breeding couples		3
		Species asset (Ha)	A (Statement of Biodiversity Position)	Yellow-breasted pipit - target breeding couples	100	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Yellow-breasted pipit - target breeding couples		100
		Species asset (Ha)	A (Statement of Biodiversity Position)	Secretary bird - target breeding couples	1	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Secretary bird - target breeding couples		1
(b) At time of assessment						
2	Recording losses associated to existing species assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Grey-crowned crane - gap to target breeding couples	3 - 5	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Grey-crowned crane - gap to target breeding couples		3 - 5
		Periodic losses (Ha eq.)	C (Statement of Biodiversity Position)	Wattled crane - gap to target breeding couples	0 - 1	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Wattled crane - gap to target breeding couples		0 - 1
		Periodic losses (Ha eq.)	C (Statement of Biodiversity Position)	African marsh harrier - gap to target breeding couples	1	
		Accumulated negative Impacts (Ha eq.)	Y (Statement of Biodiversity Performance)	African marsh harrier - gap to target breeding couples		1
		Periodic losses (Ha eq.)	Y (Statement of Biodiversity Performance)	Yellow-breasted pipit - gap to target breeding couples	89	
		Accumulated negative Impacts (Ha eq.)	Y (Statement of Biodiversity Performance)	Yellow-breasted pipit - gap to target breeding couples		89
		Periodic losses (Ha eq.)	Y (Statement of Biodiversity Performance)	Secretary bird - gap to target breeding couples	0	
		Accumulated negative Impacts (Ha eq.)	Y (Statement of Biodiversity Performance)	Secretary bird - gap to target breeding couples		0
3	Closing the Statement of Species Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Grey-crowned crane - current breeding couples	2 - 3	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Grey-crowned crane - current breeding couples		2 - 3
		Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Wattled crane -current breeding couples	1 - 2	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Wattled crane - current breeding couples		1 - 2
		Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	African marsh harrier - current breeding couples	2	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	African marsh harrier - current breeding couples		2
		Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Yellow-breasted pipit - current breeding couples	11	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Yellow-breasted pipit - current breeding couples		11
		Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Secretary bird - current breeding couples	1	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Secretary bird - current breeding couples		1

3.1.3 Ingula's Statements of Biodiversity Performance and Position

3.1.3.1 Ecosystems

Ingula's Statement of Ecosystem Performance is presented in Table 12 while Ingula's Statement of Ecosystem Position is presented in Table 13 (ecosystem accounts can be aggregated as per the BD Protocol). In essence, Eskom holds a Biodiversity Footprint of 14 013,43 Ha at Ingula (i.e., ecosystem assets of 14 013,43 Ha), of which 7 223,99 Ha eq. constitute its Positive Biodiversity Footprint (or 51,55 % of the total Biodiversity Footprint) and 6 784,44 Ha eq. its Negative Biodiversity Footprint (or 48,45 % of the total Biodiversity Footprint). With active ecosystem management and restoration measures, and no further vegetation clearance, it is expected that the condition of many areas would improve at Ingula, thus improving the Biodiversity Footprint of the property. However, uncertainty with regards to future land ownership and use (e.g., for communal areas) prevents us from currently exploring practical scenarios of ecosystem extent and condition change.

Table 12: Ingula's Statement of Ecosystem Performance (ecosystem accounts can be aggregated)

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
1	Accounting for reference state of ecosystem assets, which underpins their subsequent condition scoring	Northern Afrotemperate Forest 5	464,91
		Woodland 5	161,65
		Low Escarpment Moist Grassland 5	1274,33
		Eastern Free State Sandy Grassland 5	7833,34
		Basotho Montane Shrubland 5	331,97
		Northern KwaZulu-Natal Moist Grassland 5	2019,35
		Eastern Temperate Freshwater Wetlands 5	1418,73
		Temperate Grassy Wetlands 5	509,15
10	Recording condition-adjusted losses and gains associated to existing condition scores of Northern Afrotemperate Forest assets	1	10,74
		2	51,63
		3	156,51
		4	17,03
11	Recording condition-adjusted losses and gains associated to existing condition scores of Woodland assets	1	20,34
		2	14,06
		3	4,22
		4	14,24
12	Recording condition-adjusted losses and gains associated to existing condition scores of Low Escarpment Moist Grassland assets	1	0,86
		2	46,76
		3	440,05
		4	298,15
13	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Free State Sandy Grassland assets	1	15,53
		2	776,37
		3	2909,19
		4	429,19
14	Recording condition-adjusted losses and gains associated to existing condition scores of Basotho Montane Shrubland assets	1	24,65
		2	75,84
		3	6,55
15	Recording condition-adjusted losses and gains associated to existing condition scores of Northern KwaZulu-Natal Moist Grassland assets	1	2,18
		2	62,64
		3	701,01
		4	163,93
16	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Temperate Freshwater Wetlands assets	2	16,06
		3	413,05
		4	405,49
17	Recording condition-adjusted losses and gains associated to existing condition scores of Temperate Grassy Wetlands assets	1	4,89
		2	5,51
		3	35,92
		4	101,43
		Sub-total periodic gains (Y)	**21237,42**

Journal entries	Periodic losses (Z)		Hectares equivalents (Ha (eq.)
10	Recording condition-adjusted losses and gains associated to existing condition scores of Northern Afrotemperate Forest assets	5	464,91
11	Recording condition-adjusted losses and gains associated to existing condition scores of Woodland assets	5	161,65
12	Recording condition-adjusted losses and gains associated to existing condition scores of Low Escarpment Moist Grassland assets	5	1274,33
13	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Free State Sandy Grassland assets	5	7833,34
14	Recording condition-adjusted losses and gains associated to existing condition scores of Basotho Montane Shrubland assets	5	331,97
15	Recording condition-adjusted losses and gains associated to existing condition scores of Northern KwaZulu-Natal Moist Grassland assets	5	2019,35
16	Recording condition-adjusted losses and gains associated to existing condition scores of Eastern Temperate Freshwater Wetlands assets	5	1418,73
17	Recording condition-adjusted losses and gains associated to existing condition scores of Temperate Grassy Wetlands assets	5	509,15
		Sub-total periodic losses (Z)	**14013,43**
		Net ecosystem impacts (X = Y - Z)	**7223,99**

Table 13: Ingula's Statement of Ecosystem Position (ecosystem accounts can be aggregated)

Assets (A)			
Ecosystem type	Condition score	Hectares (ha)	Percentage (%)
Northern Afrotemperate Forest	0	0	0
	1	53,69	0,38%
	2	129,08	0,92%
	3	260,86	1,86%
	4	21,29	0,15%
	5	0	0,00%
Woodland	0	0	0,00%
	1	101,68	0,73%
	2	35,14	0,25%
	3	7,04	0,05%
	4	17,80	0,13%
	5	0	0,00%
Low Escarpment Moist Grassland	0	47,07	0,34%
	1	4,28	0,03%
	2	116,89	0,83%
	3	733,41	5,23%
	4	372,68	2,66%
	5	0	0,00%
Eastern Free State Sandy Grassland	0	429,62	3,07%
	1	77,66	0,55%
	2	1940,93	13,85%
	3	4848,65	34,60%
	4	536,48	3,83%
	5	0	0,00%
Basotho Montane Shrubland	0	8,23	0,06%
	1	123,23	0,88%
	2	189,60	1,35%
	3	10,92	0,08%
	4	0	0,00%
	5	0	0,00%
Northern KwaZulu-Natal Moist Grassland	0	478,60	3,42%
	1	10,89	0,08%
	2	156,60	1,12%
	3	1168,35	8,34%
	4	204,91	1,46%
	5	0	0,00%
Eastern Temperate Freshwater Wetlands	0	183,31	1,31%
	1	0	0,00%
	2	40,15	0,29%
	3	688,41	4,91%
	4	506,86	3,62%
	5	0	0,00%
Temperate Grassy Wetlands	0	284,26	2,03%
	1	24,44	0,17%
	2	13,79	0,10%
	3	59,87	0,43%
	4	126,79	0,90%
	5	0	0,00%
Sub-total		**14013,43**	**100,00%**

Accumulated positive impacts (B)			
Ecosystem type	Condition score	Hectares equivalent (ha eq.)	Percentage (%)
Northern Afrotemperate Forest	0	0,00	0
	1	10,74	0,08%
	2	51,63	0,37%
	3	156,51	1,12%
	4	17,03	0,12%
	5	0,00	0,00%
Woodland	0	0,00	0,00%
	1	20,34	0,15%
	2	14,06	0,10%
	3	4,22	0,03%
	4	14,24	0,10%
	5	0,00	0,00%
Low Escarpment Moist Grassland	0	0,00	0,00%
	1	0,86	0,01%
	2	46,76	0,33%
	3	440,05	3,14%
	4	298,15	2,13%
	5	0,00	0,00%
Eastern Free State Sandy Grassland	0	0,00	0,00%
	1	15,53	0,11%
	2	776,37	5,54%
	3	2909,19	20,76%
	4	429,19	3,06%
	5	0,00	0,00%
Basotho Montane Shrubland	0	0,00	0,00%
	1	24,65	0,18%
	2	75,84	0,54%
	3	6,55	0,05%
	4	0,00	0,00%
	5	0,00	0,00%
Northern KwaZulu-Natal Moist Grassland	0	0,00	0,00%
	1	2,18	0,02%
	2	62,64	0,45%
	3	701,01	5,00%
	4	163,93	1,17%
	5	0,00	0,00%
Eastern Temperate Freshwater Wetlands	0	0,00	0,00%
	1	0,00	0,00%
	2	16,06	0,11%
	3	413,05	2,95%
	4	405,49	2,89%
	5	0,00	0,00%
Temperate Grassy Wetlands	0	0,00	0,00%
	1	4,89	0,03%
	2	5,51	0,04%
	3	35,92	0,26%
	4	101,43	0,72%
	5	0,00	0,00%
Sub-total		**7223,99**	**51,55%**

Accumulated negative impacts (B)			
Ecosystem type	Condition score	Hectares equivalent (ha eq.)	Percentage (%)
Northern Afrotemperate Forest	0	0,00	0
	1	42,95	0,31%
	2	77,45	0,55%
	3	104,34	0,74%
	4	4,26	0,03%
	5	0,00	0,00%
Woodland	0	0,00	0,00%
	1	81,34	0,58%
	2	21,09	0,15%
	3	2,81	0,02%
	4	3,56	0,03%
	5	0,00	0,00%
Low Escarpment Moist Grassland	0	47,07	0,34%
	1	3,42	0,02%
	2	70,13	0,50%
	3	293,36	2,09%
	4	74,54	0,53%
	5	0,00	0,00%
Eastern Free State Sandy Grassland	0	429,62	3,07%
	1	62,12	0,44%
	2	1164,56	8,31%
	3	1939,46	13,84%
	4	107,30	0,77%
	5	0,00	0,00%
Basotho Montane Shrubland	0	8,23	0,06%
	1	98,59	0,70%
	2	113,76	0,81%
	3	4,37	0,03%
	4	0,00	0,00%
	5	0,00	0,00%
Northern KwaZulu-Natal Moist Grassland	0	478,60	3,42%
	1	8,71	0,06%
	2	93,96	0,67%
	3	467,34	3,33%
	4	40,98	0,29%
	5	0,00	0,00%
Eastern Temperate Freshwater Wetlands	0	183,31	1,31%
	1	0,00	0,00%
	2	24,09	0,17%
	3	275,36	1,96%
	4	101,37	0,72%
	5	0,00	0,00%
Temperate Grassy Wetlands	0	284,26	2,03%
	1	19,56	0,14%
	2	8,27	0,06%
	3	23,95	0,17%
	4	25,36	0,18%
	5	0,00	0,00%
Sub-total		**6789,44**	**48,45%**

3.1.3.2 Species

Ingula's Statement of Species Performance is presented in Table 14 while Ingula's Statement of Species Position is presented in Table 15. It is important to note that species accounts must be disaggregated as per the BD Protocol. Such Statements were not possible to produce at this stage for four material species (Bearded Vulture, Oribi, Grey Rhebok and Mountain Reedbuck) due to a lack of data.

With active ecosystem management and restoration measures within the Ingula Nature Reserve, and no further vegetation clearance, it is expected that:

- The breeding pair of Secretarybird will be maintained in the foreseeable future, unless external factors affect the broader regional population.
- The population sizes of several material species (Grey-Crowned Crane, Wattled Crane, African Marsh Harrier and Yellow-Breasted Pipit) can be expected to increase at Ingula, reducing the gap to their target number of breeding pairs; they this gap is important only for the Yellow-Breasted Pipit.
- The population size of three mammals (Oribi, Grey Rhebok and Mountain Reedbuck) will also positively be affected, though more information on their actual population size would be needed.

However, a couple of issues need to be highlighted:

- The huge home ranges of Bearded Vultures prevented us from assessing any target population sizes for Ingula and hence recording any accounting journal entries;
- Uncertainty with regards to future land ownership and use (e.g., for communal areas) prevents us from exploring practical scenarios of change with respect to populations of material species.

Table 14: Ingula's Statement of Species Performance (species accounts must be segregated)

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
1	Accounting for the target population size of species assets	Grey-Crowned Crane - target breeding pairs	5 - 8
		Wattled Crane - target breeding pairs	2
		African Marsh Harrier - target breeding pairs	3
		Yellow-Breasted Pipit - target breeding pairs	100
		Secretarybird - target breeding pairs	1
Journal entries	**Periodic losses (Z)**		**Hectares equivalents (Ha (eq.)**
2	Recording losses associated to existing species assets	Grey-Crowned Crane - gap to target breeding pairs	3 - 5
		Wattled Crane - gap to target breeding pairs	0 - 1
		African Marsh Harrier - gap to target breeding pairs	1
		Yellow-Breasted Pipit - gap to target breeding pairs	89
		Secretarybird - gap to target breeding pairs	0
Net ecosystem impacts (X = Y - Z) (separately for each species)			
3	Net periodic gains (Ha eq.)	Grey-Crowned Crane - current breeding pairs	2 - 3
		Wattled Crane - current breeding pairs	1 - 2
		African Marsh Harrier - current breeding pairs	2
		Yellow-Breasted Pipit - current breeding pairs	11
		Secretarybird - current breeding pairs	1

Table 15: Ingula's Statement of Ecosystem Performance (species accounts must be segregated)

	Asssets (A accounts)		Accumulated positive impacts (B accounts)	Accumulated negative impacts (C accounts)
	Target population size (numbers)	Target population size (breeding pairs)	Actual population size (breeding pairs)	Gap to target population size (breeding pairs)
Grey-Crowned Crane	NA	5 - 8	2 - 3	3 - 5
Wattled Crane	NA	2	1 - 2	0 - 1
African Marsh Harrier	NA	3	2	1
Yellow-Breasted Pipit	NA	100	11	89
Secretarybird	NA	1	1	0
Bearded Vulture	NA	NA	NA	NA
Oribi	17 - 87	NA	NA	NA
Mountain Reedbuck	72	NA	NA	NA
Grey Rhebok	260	NA	NA	NA

3.2 Sere's net impacts on biodiversity

Sere's net impacts on biodiversity includes ecosystem and species accounts. Section 3.2.1 presents the Sere's Biodiversity Impact Inventory, section 3.2.2 the net impacts on biodiversity and section 3.2.3 Sere's Statements of Biodiversity Performance and Position.

3.2.1 Sere's Biodiversity Impact Inventory

3.2.1.1 Ecosystems

Sere's Biodiversity Impact Inventory is also composed of ecosystem types and material species. Table 16 presents the three ecosystem types identified, their surface area (7394,46 Ha in total), condition scores and condition-adjusted surface areas at this time and according to the scenarios outlined in section 2.3.2. Figure 15 shows the map of the ecosystem types while Figure 16 highlights vegetation succession stages (natural, secondary natural pre- and post- 1990) and Figure 17 key infrastructures (e.g., turbines, roads, powerlines).

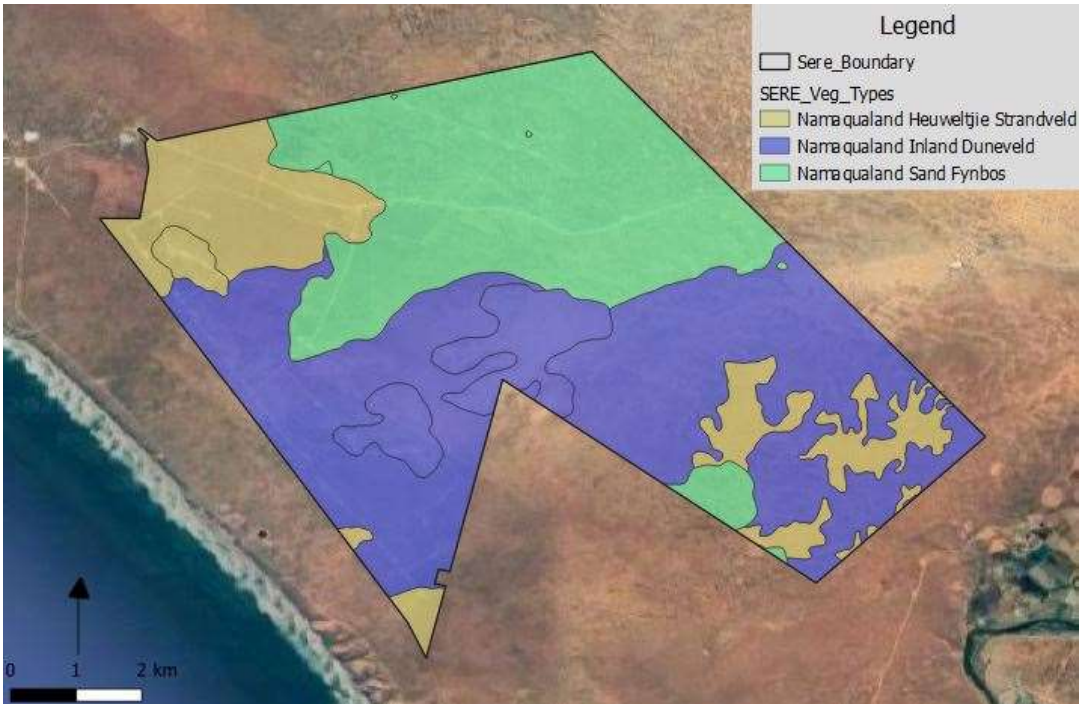

Figure 15: Map of ecosystem types at Sere

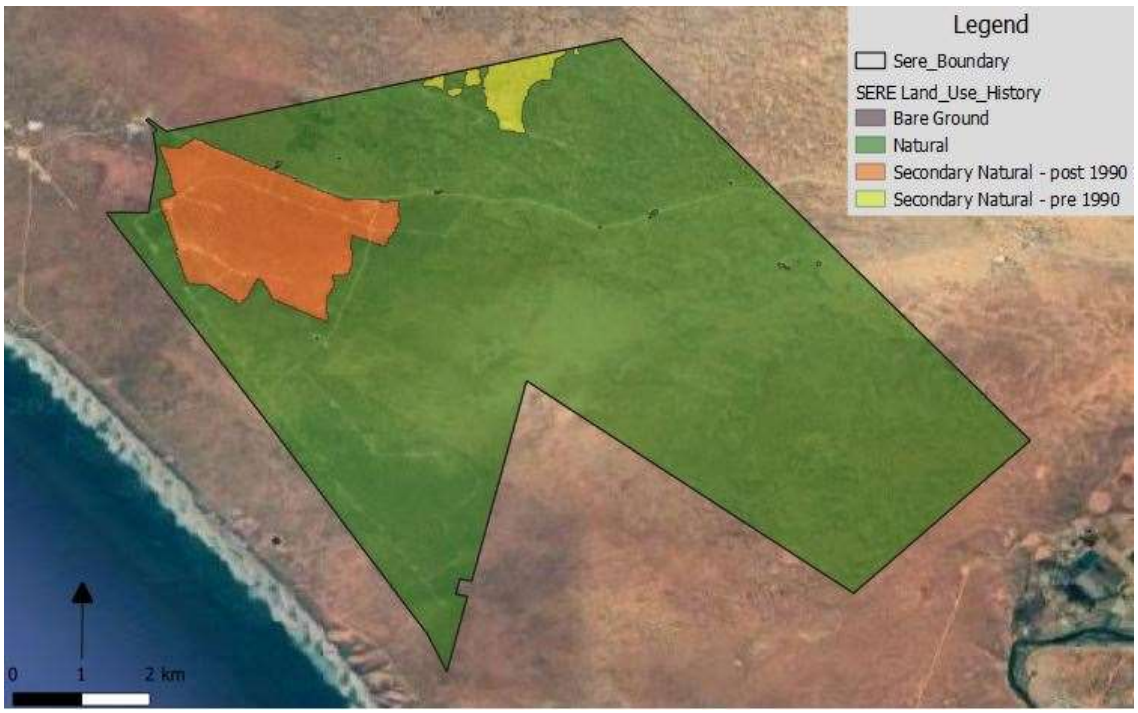

Figure 16: Map of vegetation succession stages (natural secondary natural pre- and post- 1990) at Sere

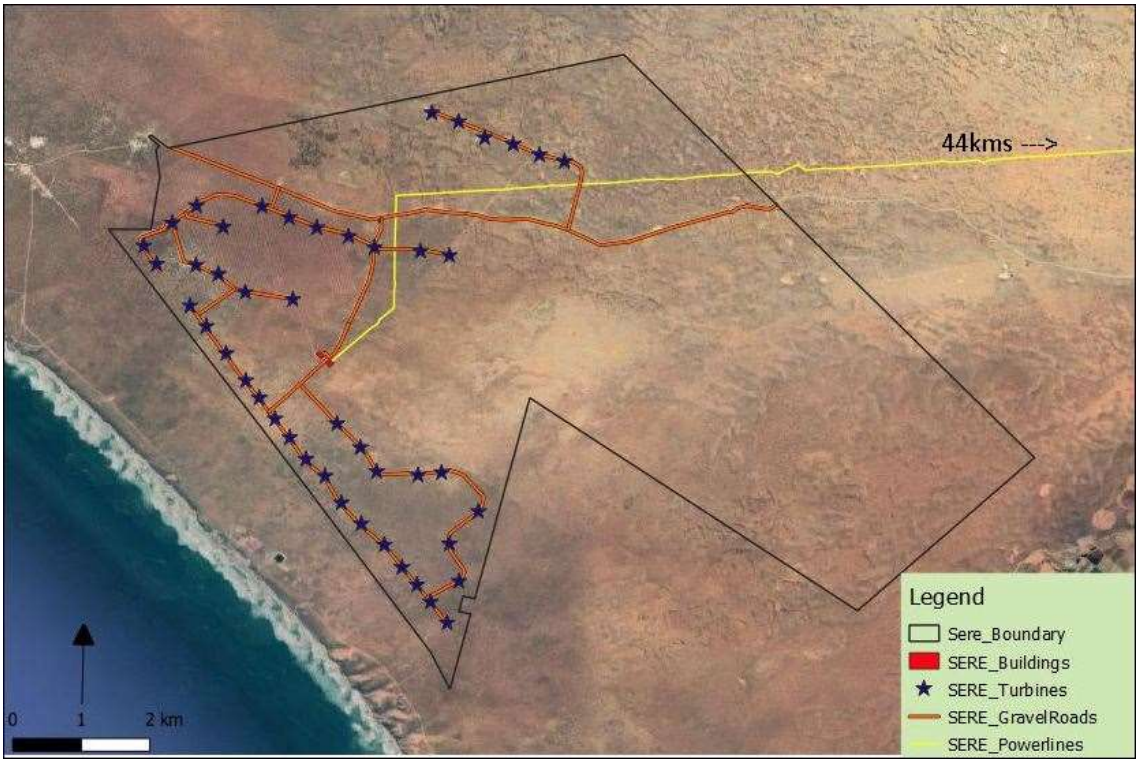

Figure 17: Map of key infrastructures at Sere

Table 16: Ecosystem types identified at Sere, their surface areas, condition scores and condition-adjusted surface areas according to the various scenarios outlined in section 2.3.2

Ecosystem types	Land uses	Area (ha)	% af total area	Condition score					Condition-adjusted surface area			
				Reference state	At time of assessment	Scenario 1 (no action, vegetation gradually worsens)	Scenario 2 (no action, vegetation condition passively improves)	Scenario 3 (active measures are taken to enhance vegetation condition)	At time of assessment	Secnario 1	Scenario 2	Scenario 3
Namaqualand Heuweltjie Strandveld	Buildings	0,20	0,00%	10	1	1	1	1	0,02	0,02	0,02	0,02
	Roads	8,71	0,12%	10	1	1	1	1	0,87	0,87	0,87	0,87
	Thoroughfare road	2,59	0,04%	10	1	1	1	1	0,26	0,26	0,26	0,26
	Turbines and surrounds	2,10	0,03%	10	1	1	1	1	0,21	0,21	0,21	0,21
	rehab road verges	10,50	0,14%	10	4	3	5	8	4,20	3,15	5,25	8,40
	rehab turbines	6,58	0,09%	10	3	2	5	8	1,97	1,32	3,29	5,26
	Secondary natural (post-1990)	502,00	6,79%	10	5	5	6	7	251,00	251,00	301,20	351,40
	Secondary natural (pre-1990)	0,00	0,00%	10					0,00	0,00	0,00	0,00
	Natural	763,00	10,32%	10	8	7	8	8	610,40	534,10	610,40	610,40
	Bare Ground	0,27	0,00%	10	1	1	3	6	0,03	0,03	0,08	0,16
	Mines	0,36	0,00%	10	1	1	2	5	0,04	0,04	0,07	0,18
Namaqualand Inland Duneveld	Buildings	0,00	0,00%	10					0,00	0,00	0,00	0,00
	Roads	9,80	0,13%	10	1	1	1	1	0,98	0,98	0,98	0,98
	Thoroughfare road	0,00	0,00%	10					0,00	0,00	0,00	0,00
	Turbines and surrounds	3,60	0,05%	10	1	1	1	1	0,36	0,36	0,36	0,36
	rehab road verges	11,76	0,16%	10	4	3	5	8	4,70	3,53	5,88	9,41
	rehab turbines	11,28	0,15%	10	3	2	5	8	3,38	2,26	5,64	9,02
	Secondary natural (post-1990)	83,92	1,13%	10	5	5	6	7	41,96	41,96	50,35	58,74
	Secondary natural (pre-1990)	0,00	0,00%	10					0,00	0,00	0,00	0,00
	Natural	3447,00	46,62%	10	8	7	8	8	2757,60	2412,90	2757,60	2757,60
	Bare Ground	0,08	0,00%	10	1	1	3	6	0,01	0,01	0,02	0,05
	Mines	0,00	0,00%	10					0,00	0,00	0,00	0,00
Namaqualand Sand Fynbos	Buildings	1,40	0,02%	10	1	1	1	1	0,14	0,14	0,14	0,14
	Roads	8,80	0,12%	10	1	1	1	1	0,88	0,88	0,88	0,88
	Thoroughfare road	4,21	0,06%	10	1	1	1	1	0,42	0,42	0,42	0,42
	Turbines and surrounds	1,20	0,02%	10	1	1	1	1	0,12	0,12	0,12	0,12
	rehab road verges	7,98	0,11%	10	4	3	5	8	3,19	2,39	3,99	6,38
	rehab turbines	3,76	0,05%	10	3	2	5	8	1,13	0,75	1,88	3,01
	Secondary natural (post-1990)	32,74	0,44%	10	5	5	6	7	16,37	16,37	19,64	22,92
	Secondary natural (pre-1990)	97,38	1,32%	10	6	6	7	8	58,43	58,43	68,17	77,90
	Natural	2370,80	32,06%	10	8	7	8	8	1896,64	1659,56	1896,64	1896,64
	Bare Ground	1,45	0,02%	10	1	1	3	6	0,15	0,15	0,44	0,87
	Mines	0,99	0,01%	10	1	1	1	1	0,10	0,10	0,10	0,10
		7394,46	**100,00%**						**5655,56**	**4992,29**	**5734,90**	**5822,71**

3.2.1.2 Species

Table 17 presents the results of the species materiality assessment, as per section 2.2.2 and Table 1, with an initial candidate list of 17 threatened / rare species. Seven species were eventually included in the net impact assessment process, those with a score of 10 or more: i.e., secretary bird (foraging), black harrier (foraging), martial eagle (vagrant, used to be a breeding pair), Ludwig's bustard (vagrant), southern back korhaan (breeding / resident), black-winged kite (foraging) and angulate tortoise (breeding / resident).

Table 17: Results of the species materiality assessment at Sere (species with a score 10 or more were included in the net impact assessment)

Conservation status		Population assessment / monitoring (capacity to do both)		Likelihood of impacts		Severity of impacts		
Cape Spurfowl	2		3	No hunting, no bird strikes	1	Big population	1	7
Secretarybird	4		2		1		3	10
Black Harrier	5		2		1		3	11
Cape Cormoran	5		2		1		1	9
Martial Eagle	5		2		1		2	10
Ludwig's Bustard	5		2	Confirmed strikes	1		3	11
Pale Chanting Goshawk	2		3		3		1	9
Black-Headed Heron	2		2		1		1	6
Southern Black Korhaan	4		2	Regular bird strikes	3		2	11
Black-Winged Kite (Elanus caeruleus)	2		2	Regular bird strikes	3		3	10
Natal Long-Fingered Bat (Miniopterus natalensis)	2		2	No confirmed strike	1	No confirmed strike	1	6
Egyptian Free-Tailed Bat (Tadarida aegyptiaca)	2		2	Confirmed strikes	3	Regular strikes	2	9
Bat Eared Fox	0		3		2		1	6
Angulate Tortoise	2		3	Confirmed scavenging	3	Increasing	3	11
Leucoptera nodosa	4		2		1		1	8
Lebeckia lotononoides	3		2		1		1	7
Ferraria foliosa	2		2		1		1	6

There was no clear evidence / understanding of current and target population sizes for these material species. While an abundance and density survey was undertaken for angulate tortoises (Henry 2020)[7] and the martial eagle was breeding (1 pair) in the past, undertaking a habitat-based approach to net impact assessment was chosen for the black harrier (i.e. clear habitat preference for areas with no livestock grazing; Rob Simmons, pers. comm.). No further work was undertaken at this stage for the other species for various reasons: Secretary birds (vagrant, rare sightings), Ludwig's bustard (vagrant, rare sightings), southern back korhaan (breeding / resident but insufficient data on population size) and black-winged kite (foraging, rarer sightings).

The aforementioned (section 2.3.1) angulate tortoise survey had the following key results (Henry 2020)[7]:

- A total of 28 tortoises were recorded across the 45 sampling transects. The highest number of tortoises was detected in the central west sampling area (n = 14), followed by north (n = 6), central east (n = 5) (Figure 18). All southern areas had one detection each. There was at least one tortoise detection in all sampling areas except for the lease east area in which there were no tortoise observed after conducting five transects. Observed distances ranged from 0 m (i.e., on the transect line) to 11 m.
- The estimates of abundance in each survey area ranged from 15 (south 1) to 531 (central west), with an estimate of total abundance of 909 individuals across the combined survey areas (note that lease area east was estimated as zero) (Table 18). Estimates of density ranged from 0.2 (south and south 1) to 1.55 individuals per ha (central west) (Table 19). Overlaid on the vegetation map, the highest densities of tortoises occurred in Heuweltjie Strandveld, followed by Sandy Fynbos. The lowest densities and number of tortoises were recorded in the Inland Duneveld habitat.
- Henry (2020)'s estimates of density were much lower than those that have been reported from Dassen Island but closer to those at Pearly Beach. This could be due to a number of factors including: (1) habitats that are not as suitable on Sere compared to those in other parts of the angulate tortoise's range; (2) high levels of predation by crows nesting on transmission lines in close proximity to Sere; and (3) timing of surveys (each site was only sampled once). It is also possible that all these factors are interacting.
- There was evidence of a relationship between angulate tortoise density and ecosystem type as tortoise abundance and density was noticeable higher in Heuweltjie Strandveld and Sandy Fynbos (Henry 2020). Angulate tortoises are able to adapt to disturbed habitats (e.g., those

cleared for agriculture) and so local habitat condition at Sere may be less relevant in driving tortoises density.

Further surveys should be repeated during the appropriate season to improve estimates of current abundance and density as well as make estimations of target abundance and density per ecosystem type.

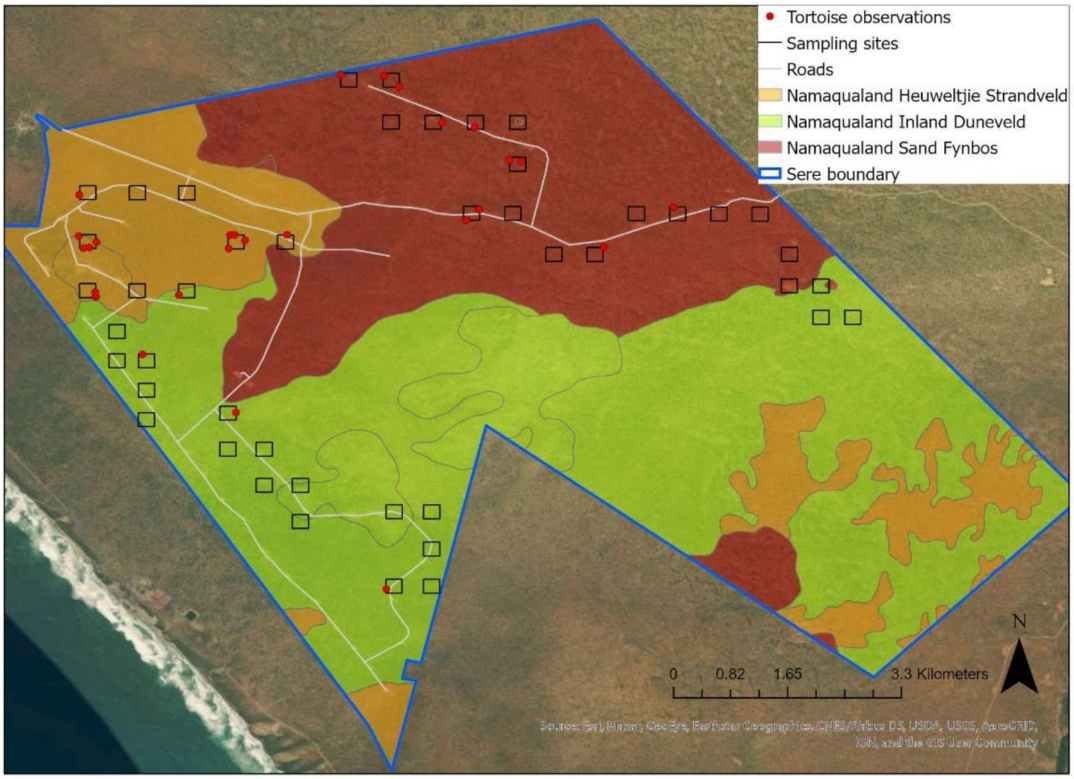

Figure 18: Map of 44 transects (black squares) and tortoise observations overlaid on the vegetation map of Sere Wind Farm in seven survey areas (Henry 2020)

Table 18: Abundance estimates of tortoises across seven sampling areas of Sere wind farm (SE, standard error; CV, coefficient of variation; CI, confidence interval) (Henry 2020)

Survey area	Estimate	SE	CV	Lower CI	Upper CI
Wind farm central east	148.59	64.24	0.43	56.94	387.74
Wind farm central west	531.78	197.07	0.37	237.02	1193.08
Wind farm lease east	0.00	0.00	0.00	0.00	0.00
Wind farm north	161.09	65.87	0.41	63.15	410.91
Wind farm south	29.63	29.78	1.00	2.96	296.19
Wind farm south1	15.38	15.45	1.00	1.54	153.69
Wind farm south2	23.18	23.30	1.00	2.74	196.13
Total	909.65	231.98	0.26	535.66	1544.78

Table 19: Density estimates of tortoises (number per ha) across seven sampling areas of Sere wind farm (SE, standard error; CV, coefficient of variation; CI, confidence interval) (Henry 2020)

Label	Estimate	SE	CV	Lower CI	Upper CI
Wind farm central east	0.62	0.27	0.43	0.24	1.62
Wind farm central west	1.55	0.57	0.37	0.69	3.47
Wind farm lease east	0.00	0.00	0.00	0.00	0.00
Wind farm north	0.85	0.35	0.41	0.33	2.17
Wind farm south	0.20	0.20	1.00	0.02	1.99
Wind farm south1	0.20	0.20	1.00	0.02	1.99
Wind farm south2	0.17	0.17	1.00	0.02	1.40
Total	0.73	0.19	0.26	0.43	1.24

3.2.2 Changes in biodiversity and the associated accounting journal entries

3.2.2.1 Ecosystems

Table 16 also shows that changes in ecosystem condition that have occurred at Sere, with a cumulative condition-adjusted surface area of **5655,56 Ha eq.** out of a total surface area of **7394,46 Ha.** These ecosystem losses can be attributed to several impact drivers (e.g., grazing, infrastructure development) and can be broken down per ecosystem type as follows:

- Namaqualand Heuweltjie Strandveld: 427,31 Ha eq. lost (32,96 %) out of a maximum of 1296,31 Ha eq. (pristine state);
- Namaqualand Inland Duneveld: 758,44 Ha eq. lost (21,26 %) out of a maximum of 3567,44 Ha eq. (pristine state);
- Namaqualand Sand Fynbos: 553,15 Ha eq. lost (21,86 %) out of a maximum of 2530,71 Ha eq. (pristine state).

At the time of assessment, the detailed changes in ecosystem extent and condition are recorded in Table 20 while the associated accounting journal entries are presented in Table 21. Tables 22, 23 and 24 show the accounting journal entries for scenarios 1 (no action, vegetation gradually worsens), 2 (no action, vegetation condition passively improves) and 3 (active measures are taken to enhance vegetation condition).

Table 20: Detailed changes in the extent and condition of ecosystem types at Sere (account categories are presented in section 2.4) (part 1 /3)

"Namaqualand Heuweltjie Strandveld" ecosystem		Condition rating of "Namaqualand Heuweltjie Strandveld"										Total
Accounting events	**Accounts**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1296,31	1296,31
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1296,31	1296,31
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A (Ha): A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1296,31	1296,31
	Changes C (Ha Eq.): C	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes B (Ha Eq.): Y and Z	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	1296,31	1296,31
(b) At time of assessment	Ecosystem account (Ha) (A)	14,23	0,00	6,58	10,50	502,00	0,00	0,00	763,00	0,00	0,00	1296,31
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	1,97	4,20	251,00	0,00	0,00	610,40	0,00	0,00	867,57
	Associated negative impacts (Ha Eq.) (C)	14,23	0,00	4,61	6,30	251,00	0,00	0,00	152,60	0,00	0,00	428,74
	Changes in A (Ha): A	14,23	0,00	6,58	10,50	502,00	0,00	0,00	763,00	0,00	-1296,31	0,00
	Changes C (Ha Eq.): C	14,23	0,00	4,61	6,30	251,00	0,00	0,00	152,60	0,00	0,00	428,74
	Changes B (Ha Eq.): Y and Z	0,00	0,00	1,97	4,20	251,00	0,00	0,00	610,40	0,00	-1296,31	-428,74
(c) Scenario 1 (no action, vegetation gradually worsens)	Ecosystem account (Ha) (A)	14,23	6,58	10,50	0,00	502,00	0,00	763,00	0,00	0,00	0,00	1296,31
	Associated positive impacts (Ha Eq.) (B)	0,00	1,32	3,15	0,00	251,00	0,00	534,10	0,00	0,00	0,00	789,57
	Associated negative impacts (Ha Eq.) (C)	14,23	5,26	7,35	0,00	251,00	0,00	228,90	0,00	0,00	0,00	506,74
	Changes in A (Ha): A	0,00	6,58	3,92	-10,50	0,00	0,00	763,00	-763,00	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	5,26	2,74	-6,30	0,00	0,00	228,90	-152,60	0,00	0,00	78,01
	Changes B (Ha Eq.): Y and Z	0,00	1,32	1,18	-4,20	0,00	0,00	534,10	-610,40	0,00	0,00	-78,01
(d) Scenario 2 (no action, vegetation condition passively improves)	Ecosystem account (Ha) (A)	13,60	0,36	0,27	0,00	17,08	502,00	0,00	763,00	0,00	0,00	1296,31
	Associated positive impacts (Ha Eq.) (B)	0,00	0,07	0,08	0,00	8,54	301,20	0,00	610,40	0,00	0,00	920,29
	Associated negative impacts (Ha Eq.) (C)	13,60	0,29	0,19	0,00	8,54	200,80	0,00	152,60	0,00	0,00	376,02
	Changes in A (Ha): A	-0,63	-6,22	-10,23	0,00	-484,92	502,00	-763,00	763,00	0,00	0,00	0,00
	Changes C (Ha Eq.): C	-0,63	-4,98	-7,16	0,00	-242,46	200,80	-228,90	152,60	0,00	0,00	-130,73
	Changes B (Ha Eq.): Y and Z	0,00	-1,24	-3,07	0,00	-242,46	301,20	-534,10	610,40	0,00	0,00	130,73
(e) Scenario 3 (active measures are taken to enhance vegetation condition)	Ecosystem account (Ha) (A)	13,60	0,00	0,00	0,00	0,36	0,27	502,00	780,08	0,00	0,00	1296,31
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,18	0,16	351,40	624,06	0,00	0,00	975,81
	Associated negative impacts (Ha Eq.) (C)	13,60	0,00	0,00	0,00	0,18	0,11	150,60	156,02	0,00	0,00	320,50
	Changes in A (Ha): A	0,00	-0,36	-0,27	0,00	-16,72	-501,73	502,00	17,08	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	-0,29	-0,19	0,00	-8,36	-200,69	150,60	3,42	0,00	0,00	-55,51
	Changes B (Ha Eq.): Y and Z	0,00	-0,07	-0,08	0,00	-8,36	-301,04	351,40	13,66	0,00	0,00	55,51

Table 20: Detailed changes in the extent and condition of ecosystem types at Sere (account categories are presented in section 2.4) (part 2 /3)

"Namaqualand Inland Duneveld" ecosystem		Condition rating of "Namaqualand Inland Duneveld"										Total
Accounting events	Accounts	1	2	3	4	5	6	7	8	9	10	
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3567,44	3567,44
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3567,44	3567,44
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A (Ha): A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3567,44	3567,44
	Changes C (Ha Eq.): C	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes B (Ha Eq.): Y and Z	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	3567,44	3567,44
(b) At time of assessment	Ecosystem account (Ha) (A)	13,48	0,00	11,28	11,76	83,92	0,00	0,00	3447,00	0,00	0,00	3567,44
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	3,38	4,70	41,96	0,00	0,00	2757,60	0,00	0,00	2807,65
	Associated negative impacts (Ha Eq.) (C)	13,48	0,00	7,90	7,06	41,96	0,00	0,00	689,40	0,00	0,00	759,79
	Changes in A (Ha): A	13,48	0,00	11,28	11,76	83,92	0,00	0,00	3447,00	0,00	-3567,44	0,00
	Changes C (Ha Eq.): C	13,48	0,00	7,90	7,06	41,96	0,00	0,00	689,40	0,00	0,00	759,79
	Changes B (Ha Eq.): Y and Z	0,00	0,00	3,38	4,70	41,96	0,00	0,00	2757,60	0,00	-3567,44	-759,79
(c) Scenario 1 (no action, vegetation gradually worsens)	Ecosystem account (Ha) (A)	13,48	11,28	11,76	0,00	83,92	0,00	3447,00	0,00	0,00	0,00	3567,44
	Associated positive impacts (Ha Eq.) (B)	0,00	2,26	3,53	0,00	41,96	0,00	2412,90	0,00	0,00	0,00	2460,64
	Associated negative impacts (Ha Eq.) (C)	13,48	9,02	8,23	0,00	41,96	0,00	1034,10	0,00	0,00	0,00	1106,80
	Changes in A (Ha): A	0,00	11,28	0,48	-11,76	0,00	0,00	3447,00	-3447,00	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	9,02	0,34	-7,06	0,00	0,00	1034,10	-689,40	0,00	0,00	347,00
	Changes B (Ha Eq.): Y and Z	0,00	2,26	0,14	-4,70	0,00	0,00	2412,90	-2757,60	0,00	0,00	-347,00
(d) Scenario 2 (no action, vegetation condition passively improves)	Ecosystem account (Ha) (A)	13,40	0,00	0,08	0,00	23,04	83,92	0,00	3447,00	0,00	0,00	3567,44
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,02	0,00	11,52	50,35	0,00	2757,60	0,00	0,00	2819,50
	Associated negative impacts (Ha Eq.) (C)	13,40	0,00	0,06	0,00	11,52	33,57	0,00	689,40	0,00	0,00	747,94
	Changes in A (Ha): A	-0,08	-11,28	-11,68	0,00	-60,88	83,92	-3447,00	3447,00	0,00	0,00	0,00
	Changes C (Ha Eq.): C	-0,08	-9,02	-8,18	0,00	-30,44	33,57	-1034,10	689,40	0,00	0,00	-358,85
	Changes B (Ha Eq.): Y and Z	0,00	-2,26	-3,50	0,00	-30,44	50,35	-2412,90	2757,60	0,00	0,00	358,85
(e) Scenario 3 (active measures are taken to enhance vegetation condition)	Ecosystem account (Ha) (A)	13,40	0,00	0,00	0,00	0,00	0,08	83,92	3470,04	0,00	0,00	3567,44
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	0,05	58,74	2776,03	0,00	0,00	2834,82
	Associated negative impacts (Ha Eq.) (C)	13,40	0,00	0,00	0,00	0,00	0,03	25,18	694,01	0,00	0,00	732,62
	Changes in A (Ha): A	0,00	0,00	-0,08	0,00	-23,04	-83,84	83,92	23,04	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	0,00	-0,06	0,00	-11,52	-33,54	25,18	4,61	0,00	0,00	-15,33
	Changes B (Ha Eq.): Y and Z	0,00	0,00	-0,02	0,00	-11,52	-50,30	58,74	18,43	0,00	0,00	15,33

Table 20: Detailed changes in the extent and condition of ecosystem types at Sere (account categories are presented in section 2.4) (part 3 /3)

"Namaqualand Sand Fynbos" ecosystem		Condition rating of "Namaqualand Sand Fynbos"										
Accounting events	**Accounts**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
(a) Reference state	Ecosystem account (Ha) (A)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2530,71	2530,71
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2530,71	2530,71
	Associated negative impacts (Ha Eq.) (C)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes in A (Ha): A	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2530,71	2530,71
	Changes C (Ha Eq.): C	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
	Changes B (Ha Eq.): Y and Z	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	2530,71	2530,71
(b) At time of assessment	Ecosystem account (Ha) (A)	18,05	0,00	3,76	7,98	32,74	97,38	0,00	2370,80	0,00	0,00	2530,71
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	1,13	3,19	16,37	58,43	0,00	1896,64	0,00	0,00	1975,76
	Associated negative impacts (Ha Eq.) (C)	18,05	0,00	2,63	4,79	16,37	38,95	0,00	474,16	0,00	0,00	554,95
	Changes in A (Ha): A	18,05	0,00	3,76	7,98	32,74	97,38	0,00	2370,80	0,00	-2530,71	0,00
	Changes C (Ha Eq.): C	18,05	0,00	2,63	4,79	16,37	38,95	0,00	474,16	0,00	0,00	554,95
	Changes B (Ha Eq.): Y and Z	0,00	0,00	1,13	3,19	16,37	58,43	0,00	1896,64	0,00	-2530,71	-554,95
(c) Scenario 1 (no action, vegetation gradually worsens)	Ecosystem account (Ha) (A)	18,05	3,76	7,98	0,00	32,74	97,38	2370,80	0,00	0,00	0,00	2530,71
	Associated positive impacts (Ha Eq.) (B)	0,00	0,75	2,39	0,00	16,37	58,43	1659,56	0,00	0,00	0,00	1737,50
	Associated negative impacts (Ha Eq.) (C)	18,05	3,01	5,59	0,00	16,37	38,95	711,24	0,00	0,00	0,00	793,21
	Changes in A (Ha): A	0,00	3,76	4,22	-7,98	0,00	0,00	2370,80	-2370,80	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	3,01	2,95	-4,79	0,00	0,00	711,24	-474,16	0,00	0,00	238,25
	Changes B (Ha Eq.): Y and Z	0,00	0,75	1,27	-3,19	0,00	0,00	1659,56	-1896,64	0,00	0,00	-238,25
(d) Scenario 2 (no action, vegetation condition passively improves)	Ecosystem account (Ha) (A)	16,60	0,00	1,45	0,00	11,74	32,74	97,38	2370,80	0,00	0,00	2530,71
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,44	0,00	5,87	19,64	68,17	1896,64	0,00	0,00	1990,76
	Associated negative impacts (Ha Eq.) (C)	16,60	0,00	1,02	0,00	5,87	13,10	29,21	474,16	0,00	0,00	539,96
	Changes in A (Ha): A	-1,45	-3,76	-6,53	0,00	-21,00	-64,64	-2273,42	2370,80	0,00	0,00	0,00
	Changes C (Ha Eq.): C	-1,45	-3,01	-4,57	0,00	-10,50	-25,86	-682,03	474,16	0,00	0,00	-253,25
	Changes B (Ha Eq.): Y and Z	0,00	-0,75	-1,96	0,00	-10,50	-38,78	-1591,39	1896,64	0,00	0,00	253,25
(e) Scenario 3 (active measures are taken to enhance vegetation condition)	Ecosystem account (Ha) (A)	16,60	0,00	0,00	0,00	0,00	1,45	32,74	2479,92	0,00	0,00	2530,71
	Associated positive impacts (Ha Eq.) (B)	0,00	0,00	0,00	0,00	0,00	0,87	22,92	1983,94	0,00	0,00	2007,72
	Associated negative impacts (Ha Eq.) (C)	16,60	0,00	0,00	0,00	0,00	0,58	9,82	495,98	0,00	0,00	522,99
	Changes in A (Ha): A	0,00	0,00	-1,45	0,00	-11,74	-31,29	-64,64	109,12	0,00	0,00	0,00
	Changes C (Ha Eq.): C	0,00	0,00	-1,02	0,00	-5,87	-12,52	-19,39	21,82	0,00	0,00	-16,97
	Changes B (Ha Eq.): Y and Z	0,00	0,00	-0,44	0,00	-5,87	-18,77	-45,25	87,30	0,00	0,00	16,97

Table 21: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 1 /2)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(a) Reference state						
1	Accounting for reference state of ecosystem assets, which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Namaqualand Heuweltjie Strandveld 10	1296,31	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Namaqualand Heuweltjie Strandveld condition 10		1296,31
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Namaqualand Inland Duneveld 10	3567,44	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Namaqualand Inland Duneveld condition 10		3567,44
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Namaqualand Sand Fynbos 10	2530,71	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Namaqualand Sand Fynbos condition 10		2530,71
(b) At time of assessment						
2	Stock tacking of Namaqualand Heuweltjie Strandveld assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	14,23	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	6,58	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	10,50	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5	502,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	763,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	10		1296,31
3	Stock tacking of Namaqualand Inland Duneveld assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	13,48	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	11,28	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	11,76	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5	83,92	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	3447,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	10		3567,44
4	Stock tacking of Namaqualand Sand Fynbos assets, according to their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1	18,05	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	3,76	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4	7,98	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5	32,74	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	97,38	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	2370,80	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	10		2530,71

Table 21: Accounting journal entries associated with the changes in the extent and condition of ecosystem types at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 2 /2)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
5	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Heuweltjie Strandveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	10	1296,31	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		14,23
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		4,61
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		6,30
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5		251,00
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		152,60
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		1,97
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		4,20
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	5		251,00
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		610,40
6	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Inland Duneveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	10	3567,44	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		13,48
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		7,90
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		7,06
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5		41,96
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		689,40
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		3,38
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		4,70
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	5		41,96
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		2757,60
7	Recording condition-adjusted losses and gains associated to existing condition scores ofNamaqualand Sand Fynbos assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	10	2530,71	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1		18,05
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		2,63
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4		4,79
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5		16,37
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		38,95
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		474,16
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		1,13
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	4		3,19
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	5		16,37
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		58,43
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		1896,64

Table 22: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 1 (no action, vegetation gradually worsens) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 1 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(c) Scenario 1 (no action, vegetation gradually worsens)						
8	Recording changes in Namaqualand Heuweltjie Strandveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	6,58	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	3,92	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	0,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	763,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		10,50
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8		763,00
9	Recording changes in Namaqualand Inland Duneveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	11,28	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	0,48	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	0,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	3447,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		11,76
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8		3447,00
10	Recording changes in Namaqualand Sand Fynbos assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	3,76	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3	4,22	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	0,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	2370,80	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		7,98
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8		2370,80
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	6,30	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,20	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8	152,60	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	8	610,40	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		5,26
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		1,32
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		2,74
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		1,18
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		0,00
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		0,00
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		228,90
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		534,10

Table 22: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 1 (no action, vegetation gradually worsens) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 2 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	7,06	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,70	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8	689,40	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	8	2757,60	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		9,02
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		2,26
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		0,34
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		0,14
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		1034,10
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		2412,90
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	4,79	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	3,19	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8	474,16	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	8	1896,64	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		3,01
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		0,75
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3		2,95
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	3		1,27
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		711,24
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		1659,56
14	Closing the Statement of Biodiversity Perfomance (Namaqualand Heuweltjie Strandveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	789,57	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	2		1,32
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		3,15
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	4		251,00
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		0,00
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		534,10

Table 22: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 1 (no action, vegetation gradually worsens) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 3 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
15	Closing the Statement of Biodiversity Perfomance (Namaqualand Inland Duneveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	2460,64	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	2		2,26
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		3,53
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		41,96
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		0,00
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		2412,90
16	Closing the Statement of Biodiversity Perfomance (Namaqualand Sand Fynbos assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	1737,50	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	2		0,75
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		2,39
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		16,37
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		58,43
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		1659,56

Table 23: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 2 (no action, vegetation condition passively improves) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 1 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(d) Scenario 2 (no action, vegetation condition passively improves)						
8	Recording changes in Namaqualand Heuweltjie Strandveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	2	0,36	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	502,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		0,63
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		6,31
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		10,50
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		484,92
9	Recording changes in Namaqualand Inland Duneveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	83,92	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		0,08
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		11,20
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		11,76
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		60,88
10	Recording changes in Namaqualand Sand Fynbos assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	97,38	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		1,45
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		2,31
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		7,98
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		21,00
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6		64,64
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	0,63	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	4,42	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	1,89	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	6,30	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,20	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	242,46	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	242,46	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	2		0,29
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	2		0,07
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		200,80
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		301,20

Table 23: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 2 (no action, vegetation condition passively improves) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 2 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	0,08	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	7,84	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	3,36	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	7,06	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,70	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	30,44	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	30,44	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		33,57
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		50,35
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	1,45	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	1,62	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	0,69	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	4,79	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	3,19	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	10,50	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	10,50	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6	25,86	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	6	38,78	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		29,21
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		68,17
14	Closing the Statement of Biodiversity Perfomance (Namaqualand Heuweltjie Strandveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	920,29	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	2		0,07
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		0,08
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		8,54
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		301,20
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		0,00
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		610,40

Table 23: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 2 (no action, vegetation condition passively improves) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (part 3 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
15	Closing the Statement of Biodiversity Perfomance (Namaqualand Inland Duneveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	2819,50	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		0,02
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		11,52
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		50,35
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		0,00
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		2757,60
16	Closing the Statement of Biodiversity Perfomance (Namaqualand Sand Fynbos assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	1990,76	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	3		0,44
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		5,87
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		19,64
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		68,17
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		1896,64

Table 24: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 3 (active measures are taken to enhance vegetation condition) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (Part 1 /3)

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(e) Scenario 3 (active measures are taken to enhance vegetation condition)						
8	Recording changes in Namaqualand Heuweltjie Strandveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	0,27	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	502,00	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	17,08	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		0,63
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		6,58
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		10,50
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		501,64
9	Recording changes in Namaqualand Inland Duneveld assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6	0,08	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	83,92	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	23,04	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		0,08
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		11,28
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		11,76
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		83,92
10	Recording changes in Namaqualand Sand Fynbos assets and / or according to changes in their condition scores	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	7	32,74	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	8	109,12	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	1		1,45
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	3		3,76
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	4		7,98
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	5		32,74
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	6		95,93

Table 24: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 3 (active measures are taken to enhance vegetation condition) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (Part 2 /3

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	0,63	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	4,61	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	1,97	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	6,30	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,20	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	250,82	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	250,82	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		0,11
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		0,16
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		150,60
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		351,40
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		3,42
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		13,66
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	0,08	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	7,90	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	3,38	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	7,06	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	4,70	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	41,96	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	41,96	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6		0,03
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	6		0,05
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		25,18
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		58,74
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		4,61
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		18,43

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Table 24: Accounting journal entries associated with the changes in the extent and condition of ecosystem types for scenario 3 (active measures are taken to enhance vegetation condition) at Sere (Detailed accounting rules are presented in section 3.3 of the BD Protocol) (Part 3 /3

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	1	1,45	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	3	2,63	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	3	1,13	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	4	4,79	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	4	3,19	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	5	16,37	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	5	16,37	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	6	38,37	
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	6	57,56	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	7		9,82
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	7		22,92
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	8		21,82
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	8		87,30
14	Closing the Statement of Biodiversity Perfomance (Namaqualand Heuweltjie Strandveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	975,81	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	5		0,18
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		0,16
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		351,40
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		624,06
15	Closing the Statement of Biodiversity Perfomance (Namaqualand Inland Duneveld assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	2834,82	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		0,05
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		58,74
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		2776,03
16	Closing the Statement of Biodiversity Perfomance (Namaqualand Sand Fynbos assets)	Net periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Net impacts	2007,72	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	6		0,87
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	7		22,92
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	8		1983,94

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3.2.2.2 Species

Recording accounting journal entries requires the assessment / estimation of target population / habitat size. Yet, no comprehensive information can be produced on net impacts on material species at Sere, as only estimations of current abundances and densities are available for angulate tortoises. While a martial eagle pair was breeding in the past, undertaking a habitat-based approach to net impact assessment was chosen for the black harrier (i.e. clear habitat preference for areas with no livestock grazing; Rob Simmons, pers. Comm). Accounting journal entries are shown in Table 25.

Table 25: Accounting journal entries associated with the changes in the population and habitat sizes of material species at Sere (accounting rules are presented in section 3.3 of the BD Protocol

Journal entries	Accounting events	Account	Account category	Condition score	DR	CR
(a) Reference state						
1	Accounting for the target population / habitat size of species assets	Species asset (pairs)	A (Statement of Biodiversity Position)	Martial Eagle - target breeding pairs	1	
		Periodic gains (pairs)	Y (Statement of Biodiversity Performance)	Martial Eagle - target breeding pairs		1
		Species asset (habitat in ha)	A (Statement of Biodiversity Position)	Black Harrier- target habitat size	7265	
		Periodic gains (habitat in ha)	Y (Statement of Biodiversity Performance)	Black Harrier- target habitat size		7265
(b) At time of assessment						
2	Recording losses associated to existing species assets	Periodic losses (pairs)	Z (Statement of Biodiversity Performance)	Martial Eagle - gap to target breeding pairs	1	
		Accumulated negative Impacts (pairs)	C (Statement of Biodiversity Position)	Martial Eagle - gap to target breeding pairs		1
		Periodic losses (habitat in ha)	C (Statement of Biodiversity Position)	Black Harrier- gap to target habitat size	4056,00	
		Accumulated negative Impacts (habitat in ha)	C (Statement of Biodiversity Position)	Black Harrier- gap to target habitat size		4056,00
3	Closing the Statement of Species Perfomance	Net periodic gains (pairs)	X (Statement of Biodiversity Performance)	Martial Eagle - current breeding pairs	0	
		Accumulated positive Impacts (pairs)	B (Statement of Biodiversity Position)	Martial Eagle - current breeding pairs		0
		Net periodic gains (habitat in ha)	X (Statement of Biodiversity Performance)	Black Harrier- current habitat size	3209,01	
		Accumulated positive Impacts (habitat in ha)	B (Statement of Biodiversity Position)	Black Harrier- current habitat size		3209,01

3.2.3 Sere's Statements of Biodiversity Performance and Position

3.2.3.1 Ecosystems

Tables 26, 27, 28 and 29 present the Statements of Ecosystem Performance for various scenarios presented in section 2.3.2. The corresponding Statements of Ecosystem Position are presented in Tables 30, 31, 32 and 33 (ecosystem accounts can be aggregated as per the BD Protocol). As expected, scenario 3 (active measures are taken to enhance vegetation condition) generates the biggest improvements in Sere's Biodiversity Footprint, with the most gains in Namaqualand Heuweltjie Strandveld assets (250,82 Ha eq.) of condition 5 (out of a maximum of 10) and Namaqualand Sand Fynbos assets (57,56 ha eq.) of condition 6 (out of a maximum of 10).

In essence, Eskom holds a Biodiversity Footprint of 7 394,46 Ha at Sere (i.e., ecosystem assets of 7 394,46 Ha), of which 5650,98 Ha eq. constitute its Positive Biodiversity Footprint (or 51,55 % of the total Biodiversity Footprint) and 1 743,48Ha eq. its Negative Biodiversity Footprint (or 23,58 % of the total Biodiversity Footprint). With active ecosystem management and restoration measures (scenario 3), and no further vegetation clearance, it is expected that the condition of many areas would improve at Sere, thus improving the Biodiversity Footprint of the property. However, would means topping current grazing practices (Figure 19) and investing in targeted ecological restoration (e.g., plant species reintroduction).

Table 26: Sere's Statement of Ecosystem Performance at the time of the assessment (ecosystem accounts can be aggregated) (NB: gains and losses from accounting journal entries at the time of assessment is common to all scenarios).

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
1	Accounting for reference state of ecosystem assets, which underpins their subsequent condition scoring	Namaqualand Heuweltjie Strandveld condition 10	1296,31
		Namaqualand Inland Duneveld condition 10	3567,44
		Namaqualand Sand Fynbos condition 10	2530,71
5	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Heuweltjie Strandveld assets	3	1,97
		4	4,20
		5	251,00
		8	610,40
6	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Inland Duneveld assets	3	3,38
		4	4,70
		5	41,96
		8	2757,60
7	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Inland Duneveld assets	3	1,13
		4	3,19
		5	16,37
		6	58,43
		8	1896,64
		Sub-total periodic gains (Y)	**13045,44**
Journal entries	**Periodic losses (Z)**		**Hectares equivalents (Ha (eq.)**
5	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Heuweltjie Strandveld assets	10	1296,31
6	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Inland Duneveld assets	10	3567,44
7	Recording condition-adjusted losses and gains associated to existing condition scores of Namaqualand Inland Duneveld assets	10	2530,71
		Sub-total periodic losses (Z)	**7394,46**
		Net ecosystem impacts (X = Y - Z)	**5650,98**

Table 27: Sere's Statement of Ecosystem Performance for scenario 1 (no action, vegetation gradually worsens; as expected, net impacts are lower than those at the time of assessment) (NB: gains and losses from accounting journal entries at the time of assessment is common to all scenarios).

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	2	1,32
		3	1,18
		7	534,10
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	2	2,26
		3	0,14
		7	2412,90
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	2	0,75
		3	1,27
		7	1659,56
		Sub-total periodic gains (Y)	**4613,47**
Journal entries	**Periodic losses (Z)**		**Hectares equivalents (Ha (eq.)**
11	Recording condition-adjusted losses and gains associated to new Namaqualand	4	4,20
		8	610,40
12	Recording condition-adjusted losses and gains associated to new Namaqualand	4	4,70
		8	2757,60
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand	4	3,19
		8	1896,64
		Sub-total periodic losses (Z)	**5276,74**
		Net ecosystem impacts (X = Y - Z)	**2840,51**

Table 28: Sere's Statement of Ecosystem Performance for scenario 2 (no action, vegetation condition passively improves; as expected, net impacts are slightly higher than those at the time of assessment) (NB: gains and losses from accounting journal entries at the time of assessment is common to all scenarios).

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
11	Recording condition-adjusted losses and gains associated to new Namaqualand	2	0,07
		6	301,20
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	6	50,35
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	7	68,17
		Sub-total periodic gains (Y)	**419,79**
Journal entries	**Periodic losses (Z)**		**Hectares equivalents (Ha (eq.)**
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	3	1,89
		4	4,20
		5	242,46
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	3	3,36
		4	4,70
		5	30,44
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	3	0,69
		4	3,19
		5	10,50
		6	38,78
		Sub-total periodic losses (Z)	**340,23**
		Net ecosystem impacts (X = Y - Z)	**3583,34**

Table 29: Sere's Statement of Ecosystem Performance for scenario 3 (active measures are taken to enhance vegetation condition; as expected, net impacts are the highest of all scenarios) (NB: gains and losses from accounting journal entries at the time of assessment is common to all scenarios)

Journal entries	Periodic gains (Y)		Hectares equivalents (Ha (eq.)
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	6	0,16
		7	351,40
		8	13,66
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	6	0,05
		7	58,74
		8	18,43
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand	7	22,92
		8	87,30
		Sub-total periodic gains (Y)	**552,66**

Journal entries	Periodic losses (Z)		Hectares equivalents (Ha (eq.)
11	Recording condition-adjusted losses and gains associated to new Namaqualand Heuweltjie Strandveld assets	3	1,97
		4	4,20
		5	250,82
12	Recording condition-adjusted losses and gains associated to new Namaqualand Inland Duneveld assets	3	3,38
		4	4,70
		5	41,96
13	Recording condition-adjusted losses and gains associated to new Namaqualand Sand Fynbos assets	3	1,13
		4	3,19
		5	16,37
		6	57,56
		Sub-total periodic losses (Z)	**385,29**
		Net ecosystem impacts (X = Y - Z)	**3671,15**

Table 30: Sere's Statement of Ecosystem Position at the time of the assessment (Biodiversity Footprint of 7394,46 Ha) with 76,42% of Positive Biodiversity Footprint (5650,98 Ha eq.) and 23,58 % of Negative Biodiversity Footprint (1743,48 Ha eq.).

Assets (A) at time of assessment			
Ecosystem accounts		Hectares (Ha)	Percentage (%)
Ecosystem type	Condition score		
naqualand Heuweltjie Strandv	1	14,23	0,19%
	3	6,58	0,09%
	4	10,50	0,14%
	5	502,00	6,79%
	7	0,00	0,00%
	8	763,00	10,32%
Namaqualand Inland Duneveld	1	13,48	0,18%
	3	11,28	0,15%
	4	11,76	0,16%
	5	83,92	1,13%
	7	0,00	0,00%
	8	3447,00	46,62%
Namaqualand Sand Fynbos	1	18,05	0,24%
	3	3,76	0,05%
	4	7,98	0,11%
	5	32,74	0,44%
	6	97,38	1,32%
	7	0,00	0,00%
	8	2370,80	32,06%
Total		7394,46	100,00%
Accumulated negative impacts (C) at time of assessment			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	1	14,23	0,19%
	3	4,61	0,06%
	4	6,30	0,09%
	5	251,00	3,39%
	8	152,60	2,06%
Namaqualand Inland Duneveld	1	13,48	0,18%
	3	7,90	0,11%
	4	7,06	0,10%
	5	41,96	0,57%
	8	689,40	9,32%
Namaqualand Sand Fynbos	1	18,05	0,24%
	3	2,63	0,04%
	4	4,79	0,06%
	5	16,37	0,22%
	6	38,95	0,53%
	8	474,16	6,41%
Sub-total		1743,48	23,58%
Accumulated positive impacts (B) at time of assessment			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	3	1,97	0,03%
	4	4,20	0,06%
	5	251,00	3,39%
	7	0,00	0,00%
	8	610,40	8,25%
Namaqualand Inland Duneveld	3	3,38	0,05%
	4	4,70	0,06%
	5	41,96	0,57%
	8	2757,60	37,29%
Namaqualand Sand Fynbos	3	1,13	0,02%
	4	3,19	0,04%
	5	16,37	0,22%
	6	58,43	0,79%
	8	1896,64	25,65%
Sub-total		5650,98	76,42%
Total B + C		7394,46	100,00%

Table 31: Sere's Statement of Ecosystem Position for scenario 1 (no action, vegetation gradually worsens; as expected, the Biodiversity Footprint is more negative than that at the time of assessment). The total Biodiversity Footprint stays the same at 7394.46 Ha, with 67,45% of Positive Biodiversity Footprint (4987,71 Ha eq.) and 32,55 % of Negative Biodiversity Footprint (2406,75 Ha eq.).

Assets (A) for scenario 1 (no action, vegetation gradually worsens)			
Ecosystem accounts		Hectares (Ha)	Percentage (%)
Ecosystem type	Condition score		
naqualand Heuweltjie Strand	1	14,23	0,19%
	2	6,58	0,09%
	3	10,50	0,14%
	5	502,00	6,79%
	6	0,00	0,00%
	7	763,00	10,32%
Namaqualand Inland Duneveld	1	13,48	0,18%
	2	11,28	0,15%
	3	11,76	0,16%
	5	83,92	1,13%
	6	0,00	0,00%
	7	3447,00	46,62%
Namaqualand Sand Fynbos	1	18,05	0,24%
	2	3,76	0,05%
	3	7,98	0,11%
	5	32,74	0,44%
	6	97,38	1,32%
	7	2370,80	32,06%
Total		**7394,46**	**100,00%**
Accumulated negative impacts (C) for scenario 1 (no action, vegetation gradually worsens)			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	1	14,23	0,19%
	2	5,26	0,07%
	3	7,35	0,10%
	5	251,00	3,39%
	7	228,90	3,10%
Namaqualand Inland Duneveld	1	13,48	0,18%
	2	9,02	0,12%
	3	8,23	0,11%
	5	41,96	0,57%
	7	1034,10	13,98%
Namaqualand Sand Fynbos	1	18,05	0,24%
	2	3,01	0,04%
	3	5,59	0,08%
	5	16,37	0,22%
	6	38,95	0,53%
	7	711,24	9,62%
Sub-total		**2406,75**	**32,55%**
Accumulated positive impacts (B) for scenario 1 (no action, vegetation gradually worsens)			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	2	1,32	0,02%
	3	3,15	0,04%
	5	251,00	3,39%
	6	0,00	0,00%
	7	534,10	7,22%
Namaqualand Inland Duneveld	2	2,26	0,03%
	3	3,53	0,05%
	5	41,96	0,57%
	6	0,00	0,00%
	7	2412,90	32,63%
Namaqualand Sand Fynbos	2	0,75	0,01%
	3	2,39	0,03%
	5	16,37	0,22%
	6	58,43	0,79%
	7	1659,56	22,44%
Sub-total		**4987,71**	**67,45%**
Total B + C		**7394,46**	100,00%

Table 32: Sere's Statement of Ecosystem Position for scenario 2 (no action, vegetation condition passively improves; as expected, the Biodiversity Footprint is more positive than that at the time of assessment). The total Biodiversity Footprint stays the same at 7394.46 Ha, with 77,50% of Positive Biodiversity Footprint (5730,54 Ha eq.) and 22,50 % of Negative Biodiversity Footprint (1663,92 Ha eq.).

Assets (A) for scenario 2 (no action, vegetation condition passively improves)			
Ecosystem accounts		Hectares (Ha)	Percentage (%)
Ecosystem type	Condition score		
ualand Heuweltjie Stra	1	13,60	0,18%
	2	0,36	0,00%
	3	0,27	0,00%
	5	17,08	0,23%
	6	502,00	6,79%
	7	0,00	0,00%
	8	763,00	10,32%
naqualand Inland Dunev	1	13,40	0,18%
	3	0,08	0,00%
	5	23,04	0,31%
	6	83,92	1,13%
	7	0,00	0,00%
	8	3447,00	46,62%
amaqualand Sand Fynb	1	16,60	0,22%
	3	1,45	0,02%
	5	11,74	0,16%
	6	32,74	0,44%
	7	97,38	1,32%
	8	2370,80	32,06%
Total		**7394,46**	**100,00%**
Accumulated negative impacts (C) for scenario 2 (no action, vegetation condition passively improves)			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	1	13,60	0,18%
	2	0,29	0,00%
	3	0,19	0,00%
	5	8,54	0,12%
	6	200,80	2,72%
	8	152,60	2,06%
Namaqualand Inland Duneveld	1	13,40	0,18%
	3	0,06	0,00%
	5	11,52	0,16%
	6	33,57	0,45%
	8	689,40	9,32%
Namaqualand Sand Fynbos	1	16,60	0,22%
	3	1,02	0,01%
	5	5,87	0,08%
	6	13,10	0,18%
	7	29,21	0,40%
	8	474,16	6,41%
Total		**1663,92**	**22,50%**
Accumulated positive impacts (B) for scenario 2 (no action, vegetation condition passively improves)			
Ecosystem accounts		Hectares (Ha eq.)	Percentage (%)
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	2	0,07	0,00%
	3	0,08	0,00%
	5	8,54	0,12%
	6	301,20	4,07%
	8	610,40	8,25%
Namaqualand Inland Duneveld			
	3	0,02	0,00%
	5	11,52	0,16%
	6	50,35	0,68%
	8	2757,60	37,29%
Namaqualand Sand Fynbos			
	3	0,44	0,01%
	5	5,87	0,08%
	6	19,64	0,27%
	7	68,17	0,92%
	8	1896,64	25,65%
Total		**5730,54**	**77,50%**
Total B + C		**7394,46**	100,00%

Table 33: Sere's Statement of Ecosystem Position for scenario 3 (active measures are taken to enhance vegetation condition; as expected, the Biodiversity Footprint is the highest of all scenarios). The total Biodiversity Footprint stays the same at 7394.46 Ha, with 78,69% of Positive Biodiversity Footprint (5818,35 Ha eq.) and 21,31 % of Negative Biodiversity Footprint (1576,11 Ha eq.).

Assets (A) for scenario 3 (active measures are taken to enhance vegetation condition)			
Ecosystem accounts		Hectares (Ha)	ercentage (%
Ecosystem type	Condition score		
aqualand Heuweltjie Stran	1	13,60	0,18%
	5	0,36	0,00%
	6	0,27	0,00%
	7	502,00	6,79%
	8	780,08	10,55%
amaqualand Inland Duneve	1	13,40	0,18%
	6	0,08	0,00%
	7	83,92	1,13%
	8	3470,04	46,93%
Namaqualand Sand Fynbos	1	16,60	0,22%
	6	1,45	0,02%
	7	32,74	0,44%
	8	2479,92	33,54%
Total		**7394,46**	**100,00%**
Accumulated negative impacts (C) for scenario 3 (active measures are taken			
Ecosystem accounts		Hectares (Ha eq.)	ercentage (%
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	1	13,60	0,18%
	5	0,18	0,00%
	6	0,11	0,00%
	7	150,60	2,04%
	8	156,02	2,11%
Namaqualand Inland Duneveld	1	13,40	0,18%
	6	0,03	0,00%
	7	25,18	0,34%
	8	694,01	9,39%
Namaqualand Sand Fynbos	1	16,60	0,22%
	6	0,58	0,01%
	7	9,82	0,13%
	8	495,98	6,71%
Total		**1576,11**	**21,31%**
Accumulated positive impacts (B) for scenario 3 (active measures are taken to enhance vegetation condition)			
Ecosystem accounts		Hectares (Ha eq.)	ercentage (%
Ecosystem type	Condition score		
Namaqualand Heuweltjie Strandveld	5	0,18	0,00%
	6	0,16	0,00%
	7	351,40	4,75%
	8	624,06	8,44%
Namaqualand Inland Duneveld	6	0,05	0,00%
	7	58,74	0,79%
	8	2776,03	37,54%
Namaqualand Sand Fynbos	6	0,87	0,01%
	7	22,92	0,31%
	8	1983,94	26,83%
Total		**5818,35**	**78,69%**
Total B + C		**7394,46**	100,00%

Figure 19: Sere's management units, showing where grazing is currently allowed through leasing

3.2.3.2 Species

Sere's Statement of Species Performance is presented in Table 34 while Sere's Statement of Species Position is presented in Table 35. It is important to note that species accounts must be disaggregated as per the BD Protocol. Such Statements were not possible to produce at this stage for five material species: Secretarybird, Ludwig's Bustard, Southern Back Korhaan, Black-Winged Kite and Angulate Tortoise due to a lack of data.

With active ecosystem management and restoration measures within Sere, and no further vegetation clearance, it is expected that:

- The Black Harrier's habitat may increase in surface area over time (i.e., stopping grazing in leased areas);
- A Martial Eagle pair could come back to breed at the site.

Table 34: Sere's Statement of Ecosystem Position (species accounts must be segregated)

	(A) Biodiversity asset accounts	(B) Accumulated Positive Impacts	(C) Accumulated Negative Impacts
Martial Eagle	**Target number of individuals / couples**	**Actual numbers of pairs**	**Gap to target (pairs)**
	1 pair	0 (bird strike recently)	1
Black harrier	**Target surface of habitat (ha)**	**Actual surface area of habitat (ha)**	**Gap to target habitat size (ha)**
	7265,01	3209,01	4056,00

Table 35: Sere's Statement of Ecosystem Performance (species accounts must be segregated)

Journal entries	**Periodic gains (Y)**		
1	Accounting for the target population size of species assets	Martial Eagle - target breeding pairs	1
		Balck Harrier - target habitat size (ha)	7265,01
Journal entries	**Periodic losses (Z)**		
2	Recording losses associated to existing species assets	Grey-Crowned Crane - gap to target breeding pairs	1
		Wattled Crane - gap to target breeding pairs	4056,00
Net ecosystem impacts (X = Y - Z) (separately for each species)			
3	Net periodic gains (Ha eq.)	Grey-Crowned Crane - current breeding pairs	**0**
		Wattled Crane - current breeding pairs	**3209,01**

3.3 Net biodiversity impact consolidation

While impacts on species need to be remains segregated[21], the BD protocol enables the consolidation of net impacts on ecosystems across sites. This section hence focuses on consolidated Statements of Ecosystem Performance and Position. For conciseness, this section only presents summary statements[22].

First, Table 35 compares the total, Positive and Negative Biodiversity Footprints of the two Eskom sites, showing that ecosystem losses have been much more important at Ingula than at Sere. In short, the Positive Biodiversity Footprints of Ingula is about 51% of the total surface area while that of Sere is about 76% of the total Biodiversity Footprint of the site. Second, Table 37 shows Eskom's consolidated Statement of Ecosystem Performance. Finally, Table 36 shows how to combine all the ecosystem accounts within a single Statement of Position, an exercise which can be replicated to all properties falling under Eskom's direct operations.

Table 35: Comparing the Total, Positive and Negative Biodiversity Footprint of Ingula and Sere

	Assets (A) (total Biodiversity Footprint)	Accumulated positive impacts / Positive Biodiversity Footprint (B)		Accumulated negative impacts / Negative Biodiversity Footprint (C)	
	Ha	Ha eq.	% of total Biodiversity Footprint	Ha eq.	% of total Biodiversity Footprint
Ingula	14013,43	7223,99	51,55%	6789,44	48,45%
Sere	7394,46	5650,98	76,42%	1743,48	23,58%

[21] Species are not included in this section, but Statements of Species Performance and Position for Ingula and Sere in section 3.1.3 and 3.2.3 would convey the right set of information for management and external stakeholders.

[22] Details of individual ecosystem accounts are presented in sections 3.1.3 (Ingula) and 3.2.3 (Sere) and could be presented in detailed combined Statements of Ecosystem Performance and Position.

Table 36: Eskom's consolidated Statement of Ecosystem Performance

Ingula	21237,42
Sere	13045,44
Sub-total periodic gains (Y)	**34282,86**
Ingula	14013,43
Sere	7394,46
Sub-total periodic losses (Z)	**21407,89**
Net ecosystem impacts (X = Y - Z)	**12874,97**

Table 37: Eskom's consolidated Statement of Ecosystem Position, showing the Total Biodiversity Footprint 21 407,89 ha made up of 60,14% of Positive Biodiversity Footprint and 39,86% of Negative Biodiversity Footprint

Assets (A) (total Biodiversity Footprint)	Accumulated positive impacts / Positive Biodiversity Footprint (B)		Accumulated negative impacts / Negative Biodiversity Footprint (C)	
Ha	Ha eq.	% of total Biodiversity Footprint	Ha eq.	% of total Biodiversity Footprint
21407,89	12874,97	60,14%	8532,92	39,86%

4. Brief discussions and conclusions

This pilot study of the BD Protocol has been highly successful, especially for impacts on ecosystems. The developed ecosystem impact inventory was comprehensive for both Ingula and Sere and the whole set of accounting journal entries and associated Statements of Ecosystem Performance and Position have been produced. For species, while materiality assessment processes could be completed at both Ingula and Sere, comprehensive sets of information regarding current and target population / habitat sizes were only available for a subset of material species (5 out of 9 at Ingula, 2 out of 7 at Sere).

Accordingly, we argue that this pilot study:

- Enables Eskom to report on the total, Positive and Negative Biodiversity Footprints of Ingula and Sere to management and external stakeholders (e.g., GRI-based disclosures, EWT annual biodiversity performance rating).
- Sets a baseline to monitor change in ecosystem extent and condition and the population / habitat size of species over time, in response to management decisions and / or various biodiversity-related activities, thus enabling the integration of evidence-based data in management and budget planning for both sites (e.g., development of Key Performance Indicators such as expenditures per Ha / Ha eq. of ecosystem type over time, showing whether biodiversity expenditure is translated into actual biodiversity improvement);
- Shows that expanding biodiversity footprinting to all of Eskom's sites within its direct operations value chain boundary is feasible, at very limited costs, especially for impacts on ecosystems;
- Enables Eskom to engage with some major suppliers (expanding its Biodiversity Footprint the upstream value chain boundary) so that they undertake their own Biodiversity Footprint assessments, especially when Eskom is one of the main clients.

However, some limitations or gaps were also identified and would need to be addressed in a future review / update of this study:

- The lack of accurate data on the current population size of some material species (e.g., mammals at Ingula, several bird species at Sere);
- The lack of understanding of the target population sizes for 4 species at Ingula and 6 species at Sere;

- The need to consider the potential downstream impacts of the dams at Ingula, which were not included in this study due to the lack of data.

Finally, we emphasise the need to:

- Review / re-assess the biodiversity impact inventory of both Ingula and Sere within the next 2 to 3 years, especially for species (e.g., plants and insects, changes in the situation of some potentially material species);
- Invest in surveys for material species for which there are incomplete data sets;
- Revisit site / biodiversity management plans based on the findings of this study, notably with respect to modelled scenarios at Sere, to increase Eskom's Positive Biodiversity Footprint.

End of Report