FINE-SCALE MAPPING IN THE SKA CORE AREA

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I. Introduction

The core site on which the SKA is situated will be owned by the Department of Science and Technology (DST). However, as the custodians of the SKA site, SKA South Africa will have the responsibility of managing the land under its control, which will occur in accordance with a land management plan. In addition, the management of the site will need to occur in accordance with national environmental principles, most notably, the National Environmental Management Act (NEMA) of 1998. Given the limitations on access and other activities within the SKA Core area, it is anticipated that this area will be withdrawn from farming activities and managed as a natural ecosystem. It is therefore natural to raise the possibility that the SKA Core area should be included within the national protected areas network for South Africa and promulgated as such under the National Environmental Management: Protected Areas Act of 2003 in accordance with the National Environmental Management: Biodiversity Act of 2004.

This section provides a baseline analysis of the species, habitats and ecosystems present within the core area of the SKA as well as place these in a broader context, particularly with respect to the potential contribution of the area to the current protected areas system and the limitations and opportunities represented by the site in this regard. In this analysis, undertaken by Dr Simon Todd (SAEO), the site is considered at an increasingly fine scale and placed within the national or regional context at each level with the goal of understanding the potential contribution and value of the SKA core site as a potential additional to the protected areas network.

II. Existing protected areas and priority focus areas for protected area expansion surrounding the SKA core area

The SKA Core area is located within an area that has very poor protection status (Figure 1). The vegetation types present vary from Not Protected to Poorly Protected, indicating that the ecosystems present are currently not well represented within the protected area network.

There are no significant protected areas in the vicinity of the SKA Core and it is well positioned between the other arid parks of the wider area, especially the Tankwa Karoo National Park, Karoo National Park and Augrabies Falls National Park. Figure 2 illustrates current protected areas and priority focus areas for protected area expansion (NPAES). Although there is not a NPAES Focus Area which includes the SKA Core, there is a large Focus Area which is part of the Upper Karoo Focus Area to the southwest of the site. This area has similar attributes to the SKA Core and the protection of the SKA Core would certainly capture many of the same habitats. In this context it is important to note that within the arid areas, the location of many NPAES focus areas is more flexible than other parts of the country because transformation is not a major issue within the arid areas and so there is significantly more intact habitat available from which to choose. The total extent of the Upper Karoo Focus Area is 320 954ha and the protection of the SKA Core area would provide 131 446ha or approximately 41% of the additional Upper Karoo target. It is clear therefore that the SKA could potentially contribute significantly to meeting national conservation targets within the Upper Karoo.
Figure 1: Protection status of the different vegetation types in South Africa, showing the SKA within an area that has very low protection values.
III. Vegetation Types in the SKA Core area

According to the SA vegetation map, there are four vegetation types within the SKA core area (Figure 3). The majority of the SKA is mapped as Bushmanland Basin Shrubland, with a fairly large amount of Upper Karoo Hardeveld along the southern boundaries of the site. There is a small area of Western Upper Karoo in the south of the SKA and some Bushmanland Vloere associated with the pan systems along the northeastern boundary of the site. Although the larger drainage lines of the site contain associated distinctive alluvial vegetation, this has not been mapped within the national vegetation map and is an acknowledged shortcoming of the map in the broader Upper Karoo region. The extent of the different vegetation present within the site is provided within Table 1. As much as 68% of the SKA site is composed of Bushmanland Basin Shrubland, while about 22% is Upper Karoo Hardeveld and about 5% each for the Western Upper Karoo and Bushmanland Vloere.
Figure 3: Vegetation types of the SKA and surrounding areas, according to the national vegetation map of Mucina & Rutherford (2006).

With a total extent of 34,690 km² Bushmanland Basin Shrubland is one of the most extensive vegetation types in South Africa (Figure 4). Bushmanland Basin Shrubland occurs on the extensive basin centred on Brandvlei and Van Wyksvlei, spanning Granaatboskolk in the west to Copperton in the east, and Kenhardt in the north to around Williston in the south. Areas consisting of this vegetation type are characterized by slightly irregular plains dominated by a dwarf shrubland, with succulent shrubs or perennial grasses in places. The geology consists largely of mudstones and shales of the Ecca group and Dwyka tillites with occasional dolerite intrusions, which are particularly prominent at the SKA. Soils are largely shallow to non-existent, with calcrete present in most areas. Rainfall ranges from 100-200 mm and falls mostly during the summer months as thunder storms. As a result of the arid nature of the area, very little of this vegetation type has been affected by intensive agriculture and it is classified as Least Threatened. It is however not currently protected within any formal conservation areas. There are few endemic species present and only three species are listed by Mucina and Rutherford as being endemic to the vegetation type, which is very few considering the extent of this vegetation type. Typical and dominant genera include shrubs such as Lycium, Rhigozum, Pentzia, Eriocephalus, Osteospermum, Ruschia, Pteronia, Zygophyllum, Salsola and grasses including Stipagrostis, Aristida, Enneapogon and Tragus. Within the SKA large parts of this vegetation type are degraded as a result of historical overgrazing and dominated by extensive stands of Rhigozum trichotomum.
Table 1: The extent (km$^2$) of different vegetation types that occur within the SKA and within the Advantage Areas.

<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Total Extent</th>
<th>Advantage Area 1</th>
<th>Advantage Area 2</th>
<th>Advantage Area 3</th>
<th>SKA</th>
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<tr>
<td>Aggeneys Gravel Vygieveld</td>
<td>62</td>
<td>7</td>
<td>0</td>
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<tr>
<td>Bushmanland Arid Grassland</td>
<td>45 479</td>
<td>23 845</td>
<td>9 329</td>
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<td>Bushmanland Basin Shrubland</td>
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<td>34 726</td>
<td>31 968</td>
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<td>901</td>
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<tr>
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<td>1 205</td>
<td>413</td>
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<td>0</td>
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<tr>
<td>Bushmanland Vloere</td>
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<td>4 427</td>
<td>4 064</td>
<td>2 498</td>
<td>70</td>
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<tr>
<td>Eastern Upper Karoo</td>
<td>49 821</td>
<td>7 382</td>
<td>4 656</td>
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<tr>
<td>Gordonia Duneveld</td>
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<tr>
<td>Hantam Karoo</td>
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<tr>
<td>Hantam Plateau Dolerite</td>
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<td>Lower Gariep Broken Veld</td>
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<td>Namaqualand Blomveld</td>
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<td>Roggeveld Shale Renosterveld</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Upper Karoo Hardeveld</td>
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<td>4 304</td>
<td>3 160</td>
<td>2 278</td>
<td>286</td>
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<tr>
<td>Western Bushmanland Klipveld</td>
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<td>0</td>
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</tr>
<tr>
<td>Western Upper Karoo</td>
<td>17 150</td>
<td>16 357</td>
<td>10 543</td>
<td>3 097</td>
<td>58</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td>297 160</td>
<td>105 608</td>
<td>68545</td>
<td>38 142</td>
<td>1 314</td>
</tr>
</tbody>
</table>

The Upper Karoo Hardeveld vegetation type is associated with 11 734 km$^2$ of the steep slopes of koppies, butts mesas and parts of the Great Escarpment covered with large boulders and stones (Figure 5). The vegetation type occurs as discrete areas associated with slopes and ridges from Middelpos in the west and Strydenburg, Richmond and Nieu-Bethesda in the east, as well as most south-facing slopes and crests of the Great Escarpment between Teekloofpas and eastwards to Graaff-Reinet. Altitude varies from 1000-1900m. Mucina & Rutherford (2006) list 17 species known to be endemic to the vegetation type. This is a high number given the wide distribution of most Nama Karoo species and illustrates the relative diversity of this vegetation type compared to the surrounding vegetation types. Preliminary analysis of this vegetation type indicates that it is not homogenous across its’ distribution and therefore, it is important that different areas of this unit are captured within the conservation network. Typical and dominant species characteristic of these areas includes grasses such as Themeda triandra, Heteropogon contortus, Enneaapogon scaber, Digitaria eriantha, Erogrostis lehmanniana and Aristida diffusa subsp. burkei; shrubs such as Felicia filifolia, Pentzia globosa, Hermannia filifolia, H.munitiflora, Melolobium candidans, Nenax microphylla, Eriocephalus ericoideus, Asparagus suaveolens and Chrysocoma ciliata and low trees and large shrubs such as Searsia burchelli, Ehretia rigid and Lycium oxyacarpum, Cadaba aphylla, Melianthus comosus and Buddleja glomerata. Within the SKA Core site, this is an important vegetation type that significantly contributes to the diversity of the area and many of the plants and animals of the area are associated with the rocky hills characteristic of this vegetation unit.
The Upper karoo Hardeveld Vegetation type in the SKA Core area is associated with the rocky hills and plateaus of the site and is diverse, both in terms of the landscape features present as well as the fauna and flora present within these areas.

Figure 4: Typical example of the Bushmanland Basin Shubland vegetation type from within the SKA, on gravelly soils.

Figure 5: Upper karoo Hardeveld Vegetation type from the SKA Core area.

The pans (Figure 6) within the SKA fall within the Bushmanland Vloere vegetation type, which occurs in the central Bushmanland Basin as well as the broad riverbeds of the Sak River. This vegetation type is associated with the flat and very even surfaces of pans and broad bottoms of intermittent rivers. Although the centre of the pans is often devoid of vegetation, the margins are usually vegetated with species such as Rhigozum, Lycium and Salsola. This vegetation type is classified as Least Threatened and about 2% has been transformed largely for crop production. Alien Prosopis may be a problem in some areas while some pans are used for salt production. According to Mucina & Rutherford (2006) a reliable floristic characterisation of this unit is not feasible at this stage as it has been very poorly studied and the genus Salsola which dominates many of these areas is also under revision. Within the SKA Core site, there are extensive pan systems along the north-eastern boundary of the site and this is an important landscape features of the area that is captured within the SKA. There is an extensive pan network along the north eastern margin of the SKA Core site. These are important but little-known
features of the area and spring to life when they become filled with rain which may happen only sporadically.

Figure 6: Pans within the SKA core area

Although they have not been mapped within the Vegmap, there are extensive drainage lines within the SKA Core area (Figure 7). These are important for the preservation of ecological processes as well as the provision of ecosystem services such as water provision and erosion control.

Figure 7: Drainage lines within the SKA Core area
The low-lying southern-most corner of the SKA consists of Western Upper Karoo, which is a relatively extensive vegetation type which occupies 17 149 km² of the central western Karoo. This vegetation unit is sandwiched between the Bushmanland Basin in the north and the Roggeveld Karoo and edges of the Great Escarpment in the south. This vegetation type is associated with Karoo sediments of the Beaufort Group and to a lesser extent the Waterford Formation, with dolerite intrusions in places. The Fc land type dominates and soils are typically Glenrosa and Mispah with calcrete and lime widespread. Important genera include various shrubs such as Lycium, Eriocephalus, Pentzia, Pteronia, Rosenia, Ruschia and Salsola as well as grasses including Stipagrostis, Aristida and Eragrostis. Typically, this vegetation consists of a mix of grasses and shrubs and has a higher proportion of grasses than Bushmanland Basin Shrubland (Figure 8). Although the western Upper Karoo vegetation unit is mapped within the southern part of the SKA, it mixes with the Bushmanland Basin Shrubland vegetation type across a much larger area.

![Figure 8: Western Upper Karoo, with a high proportion of bushmangrass alternating with areas dominated by shrubs](image)

**IV. Critical Biodiversity Areas in the SKA Core area**

The area falls within the planning domain of the Namakwa District Biodiversity Sector Plan (Desmet & Marsh 2006), which delineates Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) within the Namakwa district. The map for the area is illustrated below in 9 and indicates that the SKA Core area straddles an ecological support area and includes some smaller areas defined as Critical Biodiversity Areas. These are south-facing slopes which are deemed important from a climate-change buffering perspective. It is however important to note that the CBA map is based on a desktop study and does not account for biodiversity features which are not available at the desktop level. This has certainly underestimated the significance of the area as it is much more topographically diverse than the surrounding areas and as such is likely to include a lot more species and ecosystems at the landscape level.
V. Fine-Scale Vegetation Communities in the SKA Core area

A fine-scale habitat map for the SKA site has been developed, which is illustrated below in Figure 10. Although not all parts of the study area been ground-truthed yet, the map indicates the wide variety of habitats present at the site. Although only four vegetation types have been mapped within the area by Mucina & Rutherford, it is clear that there are many more plant communities and even vegetation types present in the area than the VegMap would suggest. Preliminary work indicates that substrate is a driving variable at the site and there is a lot of variation in plant community composition even within a single broad vegetation type such as Bushmanland Basin Shrubland. Common plant communities include areas of weathered shale gravel, dominated by Rhigozum trichotomum, while on areas of exposed calcite, diversity is higher and the vegetation dominated by Stipagrostis and Salsola. There are some extensive and well-developed drainage lines present, usually characterised by Searsia lancea, Acacia karoo and Tamarix usenoides with floodplains dominated by various Salsola, Suaeda and Pteronia species. The dolerite hills contain a higher diversity of both fauna and flora than the surrounding plains. This is due to the rocky nature of the slopes which offer a greater variety of niches and habitats than the homogenous plains. Due to their rocky nature, they are also functionally more mesic than the surrounding plains as the rocks provide a lot of runoff to the adjacent soil pockets. Of significance is that some large populations of Aloe dichotoma are present on some of the hills.
SKA lies near the south-eastern margin of the distribution of this species and it has been identified as a potential indicator of climate change.

Figure 10: Fine-scale habitat map of the SKA, showing habitat units that have been mapped from satellite imagery of the site.

VI. Plant Species Richness

It is difficult to obtain an estimate of the plant species richness of the SKA Core area because the area has been very poorly sampled in the past. There are no vegetation samples from any of the quarter-degree squares which include the SKA, within the SANBI SIBIS database. This is true also for fauna and the poor baseline data for the area is one of the reasons that it has not been identified as an important biodiversity area in the past. The current baseline studies that are being conducted at SKA by SAEON,
indicate that approximately 200 plant species have been identified at the site to date. This is however from a relatively small proportion of the SKA Core area and repeated sampling during different seasons and years would be required to obtain a reliable species list for the area. Based on the extent and results of the surveys that have been conducted to date, it is estimated that there should be at least 400-500 plant species present within the SKA Core area. In terms of complementarity, it is likely that only a small proportion of these are shared with either the Tankwa Karoo National Park or Augrabies National Park as the climate and environment are very different. Although a greater proportion of species is likely to be shared with the Karoo National Park, this is still likely to be a low overall percentage. There are some notable Aloe dichotoma populations at the SKA Core (Figure 11). These are healthy populations with a high proportion of young plants.

**Figure 11: Aloe dichotoma populations at the SKA Core.**

### VII. Mammals

According to the MammalMap database, only 25 mammals have been recorded from the degree square 3021. However, based on distribution maps in the literature, diversity at the site is potentially as high as 40 terrestrial mammals and several bat species. Typical species common in the area include Meerkat, South African Ground Squirrel, Cape Hare, Steenbok, Springbok, Rock Hyrax, Bat-eared Fox, Black-backed Jackal and African Wild Cat. Ten small mammals have been recorded from the area, but it is likely that additional species are present, especially within the rocky hills habitat (a short-eared Elephant Shrew Macroscelides proboscideus was captured at the site during small mammal live-trapping surveys—see Figure 12). The only mammal of high conservation concern that may be present at the site is the Riverine Rabbit Bunolagus monticularis (see Appendix Error! Reference source not found.). Potentially suitable habitat for this species has been identified at the site and camera trap surveys are currently underway order to detect the presence of this species in the area. Although they were not historically know from the area, Kudu have recently moved into the area, which appears to be a common pattern across the Karoo as this species expands it range, possibly aided by human activities and translocations. Within the context of the SKA site it would be largely associated with the drainage lines of the site, but it is also likely to use the rocky uplands as these are less accessible and less frequented by people. Conversations with farmers indicate that there are also feral populations of
Barbary Sheep Ammotragus lervia present in the area. Apparently introduced for hunting purposes they are now widespread in the area and may need to be controlled within the SKA area in the future.

Figure 12: Short-eared Elephant Shrew Macroscelides proboscideus, captured at the site during small mammal live-trapping surveys.

In terms of potential changes that may occur within mammal communities as the land-use at the SKA site changes from agriculture to conservation, it can be expected that most carnivores will increase in abundance. This is likely to be especially true for larger species such as Jackal which are heavily persecuted by farmers. However smaller species are also likely to increase, as a decrease in grazing pressure is likely to result in an increase in plant cover which is likely to favour small mammals, the main prey species of most smaller carnivores. This is likely to have some implications for the management of the SKA Core area going forward as predators may move from the SKA onto neighbouring farms and impact relations and livelihoods in the area.

VIII. Reptiles

The area has been extremely poorly sampled for reptiles and while the literature suggests that as many as 40 reptiles may occur in the wider area, the ReptileMap database lists only 7 species for the degree square 3021, highlighting the poor historical sampling of the area. Clearly, additional sampling in the area is required in order to better characterise the reptile community of the area. It is likely that the rocky hills will contain the greatest reptile diversity as the rocky habitat offer the greatest variety of habitats and shelter sites and species such as geckos, skinks and snakes are likely to be fairly diverse in these areas. Although some range extensions can probably be confirmed with reptile sampling at the site, there do not appear to be any reptile species of high conservation concern that are likely to occur in the area. The Karoo Tent Tortoise Psammobates tentorius tentorius (Figure 13) is one of the more common reptiles at the SKA and is a regional but fairly widespread Karoo endemic.
IX. Amphibians

Despite the arid nature of the site, 8 frog species have been recorded from the broader area. This includes the Giant Bull Frog which is listed as Near Threatened. However, there do not appear to be any suitable pans for this species at the site. Although there are some large pans along the northern boundary of the site, these appear to be saline pans and would not be used by the Giant Bull Frog. The majority of species present in the area are relatively independent of water and includes some species such as Sand Frogs that do not require water to breed, or species such as Karoo Toad or Common Caco that breed in temporary pools. There is some natural perennial water at the site such as the river at Grootpaardekloof which does not dry up due to springs in the river bed. These are important areas for frogs in a landscape that is otherwise generally hostile for amphibians.

X. Avifauna

As with other components of biodiversity, the SKA site has been poorly sampled for avifauna, with the only samples in the area restricted to the vicinity of the larger public access routes. A number of listed bird species can be confirmed present at the site, including Martial Eagle (VU), Lanner Falcon (NT), Secretarybird (NT), Sclater’s Lark (NT) and Ludwig’s Bustard (VU), while both species of Flamingo may also occasionally be present at the pans when they hold water. The SKA Core area is of potential significance for avifauna as there no other extensive protected areas in the vicinity and it is of the scale that would be relevant to larger raptors and other species which move across the karoo in response to rainfall and food availability such as bustards. Notable observations include breeding Verreaux’s Eagles, Sclater’s Lark and resident Hamerkop within the Groot Paardekloof.

XI. Heritage & Cultural Features

Although it is outside the scope of this study, brief mention is made here of some of the heritage observations that were made at the site and serves to highlight the fact that although the area has a rich and diverse cultural heritage, very little is known about the area in this regard. Some notable
heritage observations were made at the site including a locality which was heavily utilised and contained pottery remains, ostrich eggshell beads and numerous grinding stones (Figure 14). As the area has been very poorly investigated by archaeologists in the past, it is likely that there are more such sites in the area.

**Figure 14: Heritage artefacts identified within the SKA core area: pottery remains, ostrich eggshell beads and numerous grinding stones**

### XII. Current Land-Use Impacts in the SKA-Core

Before considering the potential value of the SKA Core area as a conservation area, it is important to assess the current state and condition of ecosystems within the site as degraded ecosystems may have significantly reduced biodiversity and conservation value. Although the vegetation types within the SKA Core are not listed, it is important to understand the ecological impacts on natural ecosystems that are prevalent within arid ecosystems. Although transformation of these ecosystems is generally low, that does not imply that they have not been impacted by human activities. Indeed, in the Karoo, livestock grazing is a pervasive impact that has a knock-on effect through the ecosystem. Livestock grazing has impacts on plant diversity and cover and can lead to large changes in vegetation structure, all of which can impact faunal abundance and diversity as well. In the study area and across large tracts of the Northern Cape, large areas have become dominated by driedoring, Rhigozum trichotomum which has a low production potential. As a result of such changes, large tracts of the Northern Cape do not support their full biodiversity potential.

The condition of the SKA varies significantly from farm to farm as well as across different landscape features. While there are some areas especially on the open plains that are considered fairly degraded, many areas are considered in moderate to good condition. The withdrawal of the SKA Core from livestock production will result in a range of changes in the vegetation over time. Grasses and ephemerals are likely to recover within the space of a few years, but shrubs are long-lived and may persist for many decades retarding the natural recovery of the vegetation. However, in the long-term the spontaneous recovery of the vegetation can be expected in most areas. This is likely to have a significant and positive impact on fauna at the site, which are likely to increase markedly in response to the removal of livestock from the system which are currently consuming a significant proportion of the primary productivity.
Prosopis invasion has occurred along some of the drainage systems in the central and northern parts of the site. Areas of dense invasion are however still relatively limited but a clearing programme will need to be implemented at the site to keep it under control. Prosopis invasion is a significant problem in some parts of the SKA Core area, especially along the drainage lines which drainage northwards from the centre of the site. There are a few hundred hectares of the site which are currently affected and a dedicated and coordinated approach will be required to bring the invasion under control. Apart from the above impacts, there are also a few areas that have been transformed for crop production under irrigation. These are usually around homesteads or on river floodplains, but the total extent is very low and it is not a significant impact at the scale of the SKA Core area. In conclusion with regards to existing impacts at the site, it is clear that while landuse has had a moderate detrimental effect on the biodiversity of the site, this is not considered irreversible and favourable land management within the SKA Core will result in the recovery of most areas to more favourable condition states.

Figure 15: Prosopis

It is pertinent to consider the potential impact of the SKA infrastructure on the conservation value of the core area. Impact on the core area is significantly higher than in the spiral arms and would potentially impact the long-term conservation value and future use options of the core. The highest density of dish-antennas will be erected within the core area for SKA Phase 1 (112 additional dish-antennas planned within the SKA core area) with a maximum anticipated footprint of 1 ha each. In addition to the telescopes, there would also be access roads to access and service the dishes, which are assumed to be 10m wide with a total length of approximately 100km, giving rise to a total access road footprint of approximately 100ha. The total development footprint would therefore be likely to be less than 250ha. In context of the 131,000ha site, this is an extremely small proportion of the site and it is clear that the development will leave the vast majority of the site unaffected by development. The presence and operation the SKA will clearly not have a significant impact on the conservation value and future use options of the SKA Core area and this is not a significant concern regarding the SKA.
XIV. Conclusions & Recommendations

The extremely poor baseline biodiversity information available for the SKA Core and surrounding area has clearly had an impact on the historical lack of recognition of this area as an important area of biodiversity within the Upper Karoo and in the Northern Cape region in general. Although the baseline studies at the SKA are not yet completed as access to many of the farms is not yet possible, it is clear that the area has significantly greater biodiversity than currently appreciated. It is the juxtaposition of plains on various substrates with pans, rocky hills and drainage lines which generates the overall diversity of the area and as such this is an emergent feature of the landscape rather than an attribute of any one of the landscape units on their own. This habitat diversity is also important for the fauna of the area and provides for greater resilience for fauna in the face of a fluctuating environment.

Although the abundance of red-listed species at the site is fairly low except for avifauna, this is typical of the Upper Karoo and the Nama Karoo in general. The SKA core site does however exhibit a high degree of landscape heterogeneity and associated habitat diversity, which makes it a desirable area for conservation purposes as it represents a functional system in which most relevant ecological processes can operate without undue external influence or reliance. In addition, the site contains a full representation of the range of ecosystems that are present in the area and as such effectively captures the biodiversity of the area. There are currently no other protected areas which capture the species, habitats and ecosystems present within the SKA Core and the formal protection of the site would contribute significantly to meeting conservation goals in the Upper Karoo. In terms of meeting targets set within the NPAES, the extent of the Upper Karoo Focus Area is 320,954 ha and the protection of the SKA Core area would provide 131,446 ha or approximately 41% of the Upper Karoo target. The formal recognition of the SKA Core as a protected area would therefore be considered appropriate and warranted.

The following issues and associated actions should be considered going forward:

- The purchase of the core farms is progressing more slowly than anticipated. Most landowners are not willing to grant access to their properties until they have committed to an agreement with SKA. As a result, it has not been possible to access many of the farms within the SKA Core area. As a result, this motivation can only reliably report on those properties that have been purchased or have agreed to sell to SKA. The Motivation should therefore be considered a draft document and it is recommended that at least one additional version is produced once these access issues have been resolved and a full detailed survey of all the properties involved can be conducted and included in the report.
- As more and more properties are purchased by SKA, the management burden on SKA will increase significantly. It is recommended that an ecological survey of each property is conducted to capture and catalogue the biodiversity features present on each property. This would be important for management as well as to ensure that the development of the SKA takes place in an environmentally responsible manner and any sensitive features present can be avoided as appropriate.
- A management authority of some sort should be set up within SKA to oversee the environmental management of the site. This is likely to be especially important in the transition period, as occupation of the farms by the current tenants ceases and management responsibility is transferred to SKA. In addition, there will be a lot of activity in the Core while SKA Phase 1 is constructed and specific attention will need to be paid to these activities to ensure that they occur in accordance with legislation and the SKA management plan.
- Management of the SKA Core site should be informed by baseline status assessments and on-going monitoring of key environmental parameters. While SAEON as part of DST, is ideally placed to provide such input on a long-term basis, there is currently no formal arrangement in
this regard. There should therefore be discussion around this between SKA, SAEON and DEA to consider possible responsibilities and funding mechanisms.

- Although the primary purpose of the SKA is for astronomical research a variety of synergies for using the terrestrial element of the SKA Core Area to increase local science output and student training and also achieve broader conservation objectives within the Upper Karoo, are apparent. In order to bring these potential benefits to fruition, cooperation and collaboration between the various parties involved will be required, especially over the next 5 years as the SKA develops and becomes reality.