Farm Kleinbos RE/57, 4/55 & 8/55: Terrestrial Biodiversity Impact Assessment

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Summary

Vegetation clearance and the construction of a small dam for agricultural purposes was undertaken on Farm Kleinbos RE/57, 4/55 and 8/55, Western Cape, henceforth referred to as Farm Kleinbos, without an Environmental Impact Assessment (EIA). This impact assessment therefore forms part of a section 24G application process. Two separate areas, with two distinctive footprints, were cleared on the farm, henceforth referred to as the Northern (8.2 ha) and Southern (14.3 ha) sites. The Screening Tool Report of the area, including both sites, and its surroundings delineates the area as of **very high sensitive terrestrial biodiversity** due to the sites' location on two endangered ecosystems as well as Critical Biodiversity Area 1 & 2 (CBA1 & 2), Ecological Support Areas 1 & 2 (ESA1 & 2) and it includes indigenous forest. This document serves as a Terrestrial Biodiversity Impact Assessment. Evidence is presented here of the ecological status quo as assessed during a six-hour visit of the proposed site on 6 March 2021 by an Ecologist, Dr. Marius van der Vyver (SACNASP: Ecological Science, 118303).

The cleared sites lie within two endangered ecosystems, Garden Route Shale Fynbos and Swellendam Silcrete Fynbos, according to the Western Cape Biodiversity Spatial Plan (WCBSP 2017) [1], The National Biodiversity Assessment (NBA) for the terrestrial realm (2018) [2] and the associated National Vegetation Map [3]. Over 90% of the areas within both the cleared sites were designated as CBA1 (Critical Biodiversity Area 1) with small patches of ESA1 (Ecosystem Support Area 1). The Northern site also had small patches of CBA2 (Critical Biodiversity Area 2).

The steep slopes on and around the sites are delineated as Upland-Lowland Interface [1; 5], an important underlying structural feature that contributes to biodiversity. Before clearance, 6.8 ha (83%) of the Southern site and 9 ha (63%) of the Northern site's area was covered by dense stands of alien invasive trees [5]. The clearance of the sites has removed the dense patches of alien trees that would have impeded the ecosystem function prior to clearance thereof.

Before clearance action, 1.4 ha (17%) of the Northern site and 5.4 ha (37%) of the Southern site's area was covered by fynbos and natural vegetation. Since the clearance was undertaken some signs of natural recovery is visible, with a range of pioneer plants and some fynbos elements spontaneously regenerating on the cleared sites. Since fynbos vegetation is capable of natural recovery from a persistent seedbank if left undisturbed, the cleared sites and its immediate surrounding areas, with the continued control of alien infestation, can potentially support ecological processes and biodiversity to a higher level than it could before clearance (Low Impact with IAP control as mitigation). If not managed, the alien infestation is likely to intensify in the cleared sites (High-Medium Impact significance without mitigation).

The significance for development of the planned avocado orchard on the site is considered here as High for all impacts identified (without mitigation), and Medium if a suitable biodiversity offset area is implemented and proclaimed of similar or larger area of the impacted footprint area, within the same endangered vegetation types impacted (Medium impact with mitigation). The loss of 6.8 ha of natural fynbos can be considered of High-Medium impact, as there is a high likelihood that these cleared patches of natural vegetation contained some species of conservation concern (detected in the remaining fynbos adjacent to the cleared sites). Yet, from a terrestrial biodiversity perspective, if these cleared areas are left to regenerate with active restoration management, recruits from these species are likely to return within the span of a

decade. Alternatively if an avocado orchard is to be established, the significance is considered High, in the light of the impacted endangered vegetation types impacted (6.8 ha) already and the long-term impact of the development on ecosystem process and function in the landscape. The cumulative impact of agriculture and IAP infestation in this area are key factors considered.

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1 Introduction

Vegetation or habitat types usually stand as proxies of biodiversity patterns - which entails both fauna and flora components - and generally changes with geographic features over a given landscape. The scale at which a vegetation type is delineated determines its description, and therefore different vegetation types are very likely to emerge from a classification of the same area by the same classifier, depending on the scale it is observed, described and mapped. It consequently also determines the classification's accuracy - in terms of compositional homogeneity - as even small landscape changes over an area may drastically affect species composition in the mega-diverse Cape Floristic Region (CFR) within which our study area is located.

The National Biodiversity Assessments (eg. 2011 and 2018) for example, is based on a scale of 1:1 000 000, while other vegetation maps of an area, such as the Western Cape Biodiversity Spatial Plan (2017) and the Garden Route Vegetation Map (2008) classify, map and describe vegetation units at a much finer scale (1:10 000 – 1:50 000). The finer classification units generally reflect reality better in terms of the relevant scale of the study area. Ecosystem status is a variable that changes over time and, within a mega-biodiverse region such as the Cape Floristic Region, it is still changing very fast, despite the already large degree of transformation within the region due to agriculture and urban development. Therefore the more recent the year in which an assessment was made, the more useful it is in considering the current ecosystem status of the study area in question. National Biodiversity Assessment tools such as the National Biodiversity Assessment (2011, 2018) [2] and the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) [1] provide guidance on ecosystem types, extent and conservation status on which important decisions regarding development planning are to be based - at different scales. Since this is a scientific report, it is not made clear here which ecosystem assessment is ratified by the current relevant legislation, but provides all the available evidence that can be gathered of the specific study area at the appropriate scale relevant to the purpose of the study - as is consistent with the scientific method.

The purpose of this Compliance Statement is to describe and provide evidence of the reality on the ground from a site investigation and interpret it in relation to all existing studies and classifications publicly available, and in relation to the most recently available remotely sensed data of the study area at the appropriate scale. Based on a field investigation of the proposed site and its surrounding landscape, and with the aid of satellite imagery (Google Earth, 2020), different areas of land cover categories are identified and delineated on a landscape scale (1:10 000 - 1:15 000). These categories reflect homogenous vegetation and/or degradation or transformation of the underlying ecosystem. In this way a general view of the current state of ecosystem functioning, together with remaining biodiversity is considered in the context of the potential (or already established) development of the proposed site.

1.1 Study area

The Farm Kleinbos lies in the Leeukloof area on the foothills of the Outeniqua mountains. The closest provincial road R328, leads to Mossel Bay which is located about 38 km south from Kleinbos farm (Figure 1). Multiple landowners on subdivided plots with fences, diverse grazing practices and clearing of natural vegetation for agricultural purposes, especially visible in the valley to the west and below Farm Kleinbos, has rendered the area highly fragmented and transformed, exacerbated by the high level of alien invasion.

Heavy alien plant infestations are present throughout the affected property and its surroundings. In particular, Black wattle (Acacia mearnsii) is strongly invasive within valleys and kloofs and likely several woodlots or plantations of these trees have been established for decades within the area. Both mixed and pure stands of Rooikrans (*Acacia cyclops*), Bluegum (*Eucalyptus* spp.) and Pine (*Pinus* spp.) invade fynbos patches.

1.2 Ecosystem types, Threat and Protection Status

The WCBSP (2017) [1], National Vegetation Map (2019) [3], National Biodiversity Assessment (NBA), terrestrial component (2018) [3], NBA, freshwater component (2011) [4] and Rouget *et al*. (2003) [5] classify the following ecosystem types on the two Kleinbos cleared sites.

1.2.1 Vegetation types

The WCBSP (2017) [1] and National Vegetation Map (2019) [3] classifies the vegetation types on the Farm Kleinbos area as Garden Route Shale Fynbos and Swellendam Silcrete Fynbos (Figure 2).

Figure 1. Three pictures of invasive alien plant (IAP) stands on the site and its broader surroundings.

1. **Garden Route Shale Fynbos [VU NBA 2011; VU Skowno et al 2019; EN WCSBP 2017]**

The Garden Route Shale Fynbos (FFh 9) status is specified as Endangered (EN) by the WCBSP [1] and Vulnerable (VU) by the NBA [2]. In terms of the 2011 national listing, or as per CapeNature's 2016 assessment of threat status, this ecosystems' habitat loss is currently irreversible (WCBSP, 2017) [1]. Skowno's [10] assessment in 2019 remains unchanged from the 2011 NBA status.
From examining Google Earth (2021) imagery within its extent, it is likely that currently more than 80% of this vegetation type is already transformed through crop agriculture, alien plant invasions and coastal developments. Only 4% of this ecosystem is being formally protected and 44% of its original extent remains. This vegetation type contains 8 threatened and 3 endemic plant species. The conservation target for Garden Route Shale Fynbos vegetation unit is 23% of its original extent

2. **Swellendam Silcrete Fynbos [VU NBA 2011; EN Skowno et al 2019; EN WCSBP 2017]**

The national status of Swellendam Silcrete Fynbos (FFc 1) is Endangered [1]. It occurs on undulating hills on the coastal forelands and is described as a medium-tall evergreen shrubland or grassland dominated by asteraceous Fynbos with graminoid Fynbos on disturbed northern slopes [6]. On the southern slopes, proteoid fynbos dominate while ericaceous fynbos occurs in the wetter areas. This vegetation type has 23 Red Data plant species and 14 endemic species. Additionally, over 40 % of this ecosystem has already been transformed [6]. The conservation target for Swellendam Silcrete Fynbos is 30% of its original extent.

1.2.2 Wetland types

1. Eastern Fynbos-Renosterveld Sandstone Fynbos Channelled Valley Bottom Wetland (EN)

The Eastern Fynbos-Renosterveld Sandstone Fynbos Channelled Valley-Bottom Wetland status is specified as Endangered (EN) by the NBA for freshwater (2011) [4] and its Ecological Protection Status is Poorly Protected (PP) [4]. According to the NBA for freshwater [4] a "channelled valley-bottom is a mostly flat wetland area on a valley floor… that is dissected by and typically elevated above a well-defined stream channel… Dominant water inputs to these areas are typically from the channel (when it overtops or from subsurface discharge) and from adjacent valley-side slopes".

2. Eastern Fynbos-Renosterveld Shale Fynbos Channelled Valley Bottom Wetland (CR)

The Eastern Fynbos-Renosterveld Shale Fynbos Channelled Valley-Bottom Wetland status is specified as Critically Endangered (CR) by the NBA for freshwater (2011) [4] and its Ecological Protection Status is Poorly Protected (PP) [4]. The description for Channelled Valley Bottom wetland types is provided in the previous wetland type description above.

3. Eastern Fynbos-Renosterveld Shale Fynbos Flat Wetland (CR)

The Eastern Fynbos-Renosterveld Sandstone Fynbos Flat Wetland status is specified as Critically

Endangered (CR) by the NBA for freshwater (2011) [4] and its Ecological Protection Status is Poorly Protected (PP) [4]. According to the NBA for freshwater [4] a "Flat wetland a near-level wetland area with little or no gradient, situated on a plain or a bench in terms of landscape setting. The primary source of water is precipitation, with the exception of flats along the coast (usually in a plain setting) where the water table may rise to the surface or near to the surface in areas of little or no relief because of the location near to the base level of the land surface represented by the presence of the ocean. Dominant hydrodynamics are vertical fluctuations".

1.2.3 Critical Biodiversity Areas and Ecological Support Areas

The WCBSP (2017) [1] designates over 95% of each of the clearance sites' footprints as CBA1. The Northern site contains small pockets of CBA2 and ESA1 (Figure 3 & 4). The Southern site does not contain CBA2 but does contain small pockets of ESA1 areas (Figure 3 & 4).

1. Critical Biodiversity Areas (CBAs)

CBAs are areas required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure [1]. These include:

a. All areas required to meet biodiversity patterns (e.g., species, ecosystems) targets.
b. Critically Endangered (CR) ecosystems (terrestrial, wetland and river types).
c. All areas required to meet ecological infrastructure targets, which are aimed at ensuring the continued existence and functioning of ecosystems and delivery of essential ecosystem services.
d. Critical corridors to maintain landscape connectivity.

CBAs are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species [1]. Degraded areas should be rehabilitated to natural or near-natural conditions [1]. Only low-impact, biodiversity-sensitive land uses are appropriate [1]. A distinction is made between CBAs that are likely to be in a natural condition (CBA 1) those that are potentially degraded or represent secondary vegetation (CBA 2) [1].

2. Ecological Support Areas (ESAs)

ESA areas are described as not essential for meeting biodiversity targets but play an important role in supporting the functioning of Protected Areas (PAs) or CBAs and are often vital for delivering ecosystem services. ESAs support landscape connectivity, encompass the ecological infrastructure from which ecosystem goods and services flow, and strengthen resilience to climate change. They include features such as corridors, wetlands and water source areas. An ESA1 is still likely to be functional (i.e., in natural, near-natural or moderately degraded state, while an ESA2 are severely degraded or have no natural cover remaining and therefore requires restoration.

The management objectives of ESA1 areas are to maintain the ecosystem in a functional, near natural state. Some limited habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised. The WCBSP (2017) [1] guidelines for land use of ESA1 areas require that these areas should ideally be avoided for any activity resulting in the loss of underlying biodiversity and ecological functioning, by considering cumulative impacts. If it cannot be avoided, it must be shown that the mitigation hierarchy set out in the WCBSP (2017) has been applied [1].

There are sub-categories of ESA1 areas, of which Watercourse Protection is one, and which was delineated for Kleinbos [1]. ESA1 Watercourse Protection areas are areas that are not aimed to meet tartgets, however, still is a protected resource, is essential for delivering ecosystem services, and may support the functioning of PAs or CBAs. The management objective for Watercourse Protection areas, in terms of development and land use planning, is to "...maintain it in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised" [1]. Such systems must be buffered in order to protect it from pressures, maintain the ecosystem and allow for future rehabilitation or restoration [1].

1.2.4 Spatial components that contribute to biodiversity

Landscape spatial components are physical features of an area that contribute to specific ecological and evolutionary processes [5], i.e., contribute to the ecosystem processes and therefore ultimately to biodiversity. Rouget *et al*. (2003) [5] identified six such spatial components for the Cape Floristic Region (CFR) and suggested that these features be incorporated in conservation planning and thus landuse planning.

2. Methods

The result of this report is derived from the findings of a desktop study and a six-hour visit of the proposed site by a Botanical and Terrestrial Biodiversity Specialist, Dr. Marius van der Vyver (SACNASP: Ecological Science, 118303). The site inspection was conducted in March 2021.

Recent Google EarthTM imagery was used to delineate the communities found on site. The Western Cape Biodiversity Spatial Plan (WCBSP, 2017) [1] as well as the National Vegetation Map [3] were extensively consulted. Natural areas were identified from the Google Earth images and possible ecological corridors identified. All identified features were then ground-truthed during the site inspection. The proposed site area was investigated by walking in multiple transects and noting all observed disturbances that impact on the site. The surrounding landscape within a radius of 500m - 1km were delineated in terms of different land use patterns from a recent Google Earth image and investigated where possible. Photographs were taken where relevant.

The identification of sensitive areas was primarily based on consideration of the current state of the proposed site. This state includes the extent to which the area can currently be considered to function as it is designated in terms of currrently applicable conservation plans (WCBSP, 2017 in this case). Highly fragmented, degraded and transformed areas are considered in terms of the capacity, cost and urgency for active restoration action to be applied to regain that biodiversity function. This methodology considers the mitigation hierarchy [1] as guideline (Figure 5).

To distinguish between natural forest patches and alien invasive tree stands that existed on the sites before clearance, a historic forest distribution map of Geldenhuys (1989) was spatially overlayed with imagery of the cleared sites just before clearance. Additionally, satellite images of the fire scar that was left after a 2017 fire, was overlaid with images of before the fire to distinguish between dense tree patches of alien trees and natural forest types in the areas immediately surrounding the sites. We assumed that natural forest patches are less likely to burn than alien invasive tree strands. Inferences could therefore be made from the colours on the satellite image of the fire scar as natural forest patches display green (unburnt) whereas alien patches display brown (burnt) after a fire. We could thereby make inferences of whether the historic tree stands on the sites, visible on historic satellite images, were wattle or natural forest types.

To investigate how clearance activities may have impacted natural vegetation cover and therefore the CBA and ESA areas, the footprint sizes of the cleared sites were calculated using the most recent satellite imagery of the sites in QGIS 3. The percentage loss of natural vegetation within this footprint was then calculated by comparing the size of the area of natural vegetation before and just after clearance, using historic satellite imagery, obtained from Google Earth.

Figure 1: Location of the two clearing sites on Farm Kleinbos and surroundings.

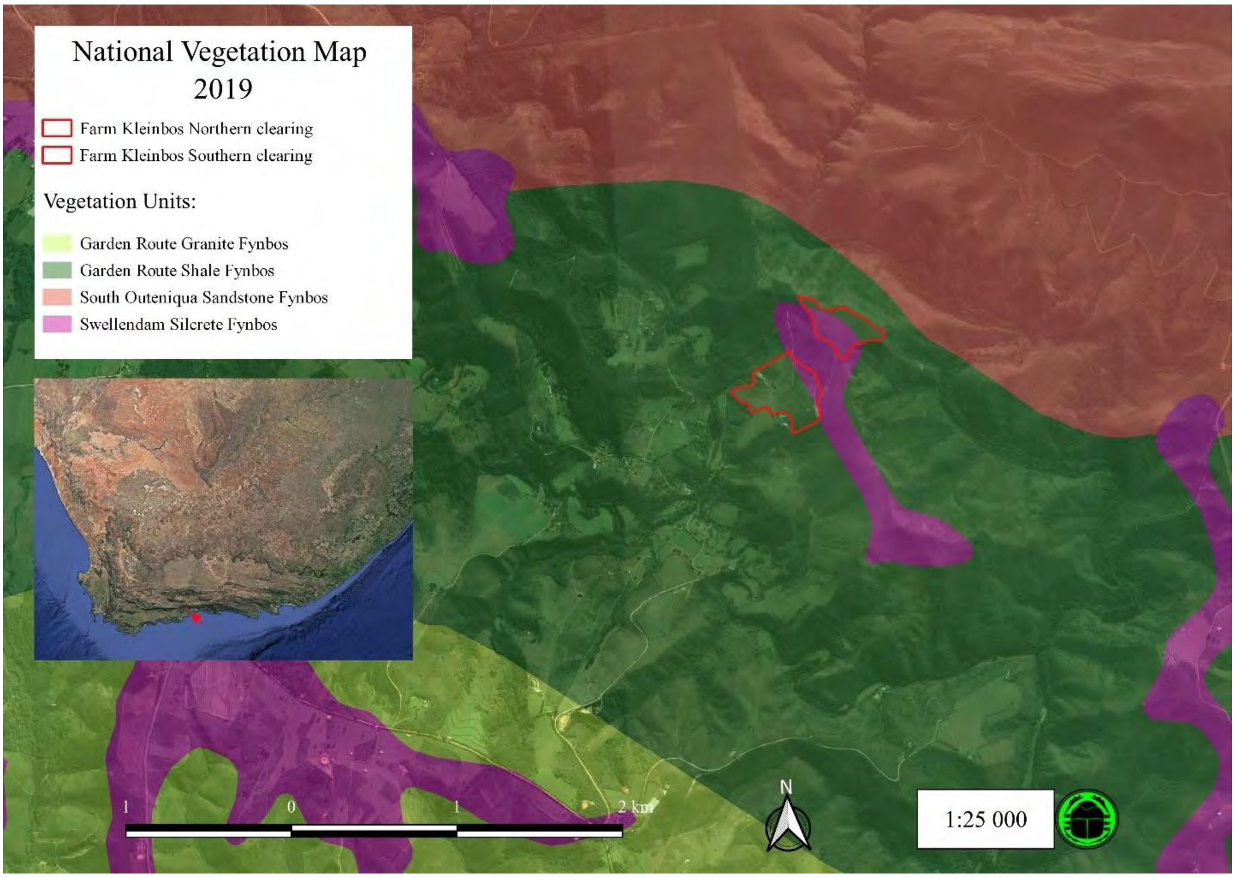

Figure 2: National Vegetation Map [3] delineation of Farm Kleinbos and surroundings.

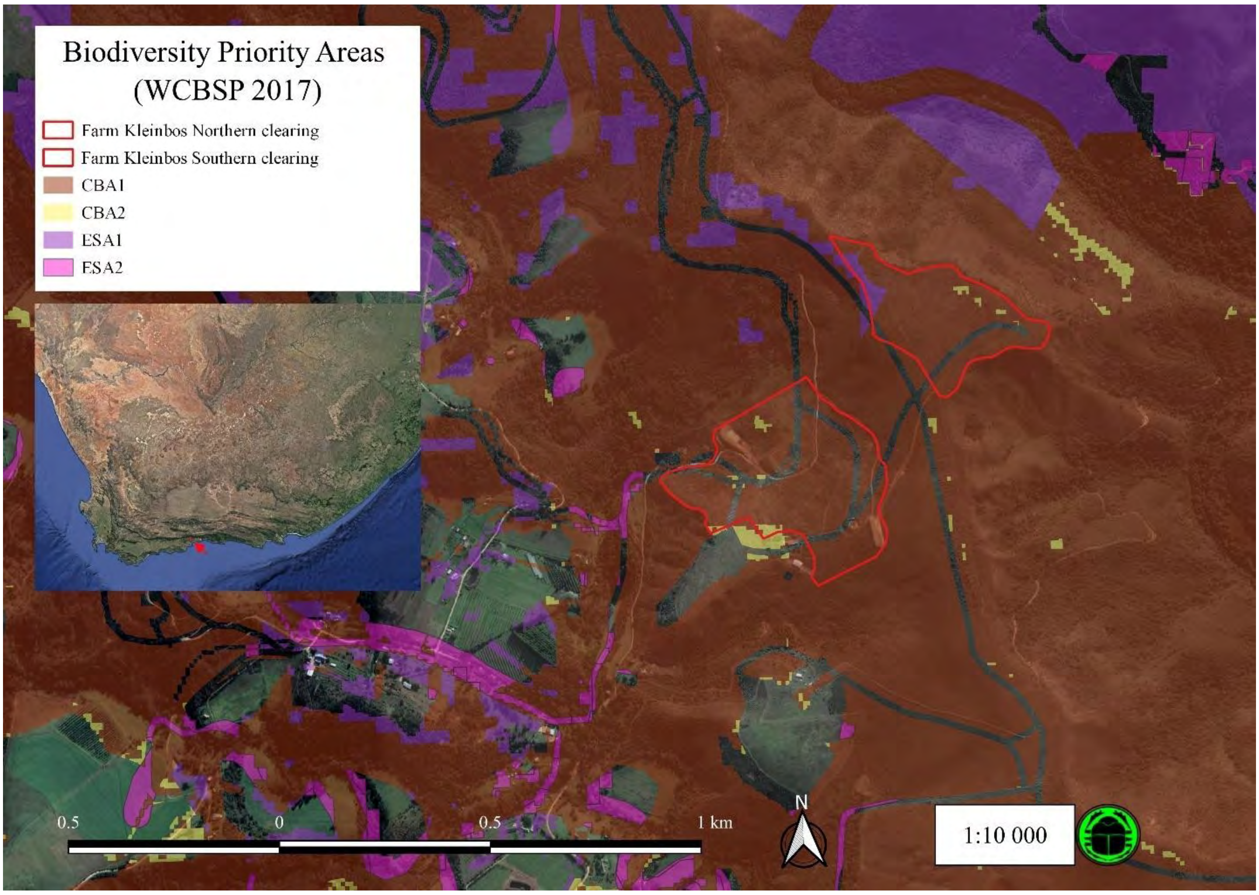

Figure 3: The WCBSP (2017) [1] delineation of Biodiversity Priority Areas for Farm Kleinbos and immediate surroundings.

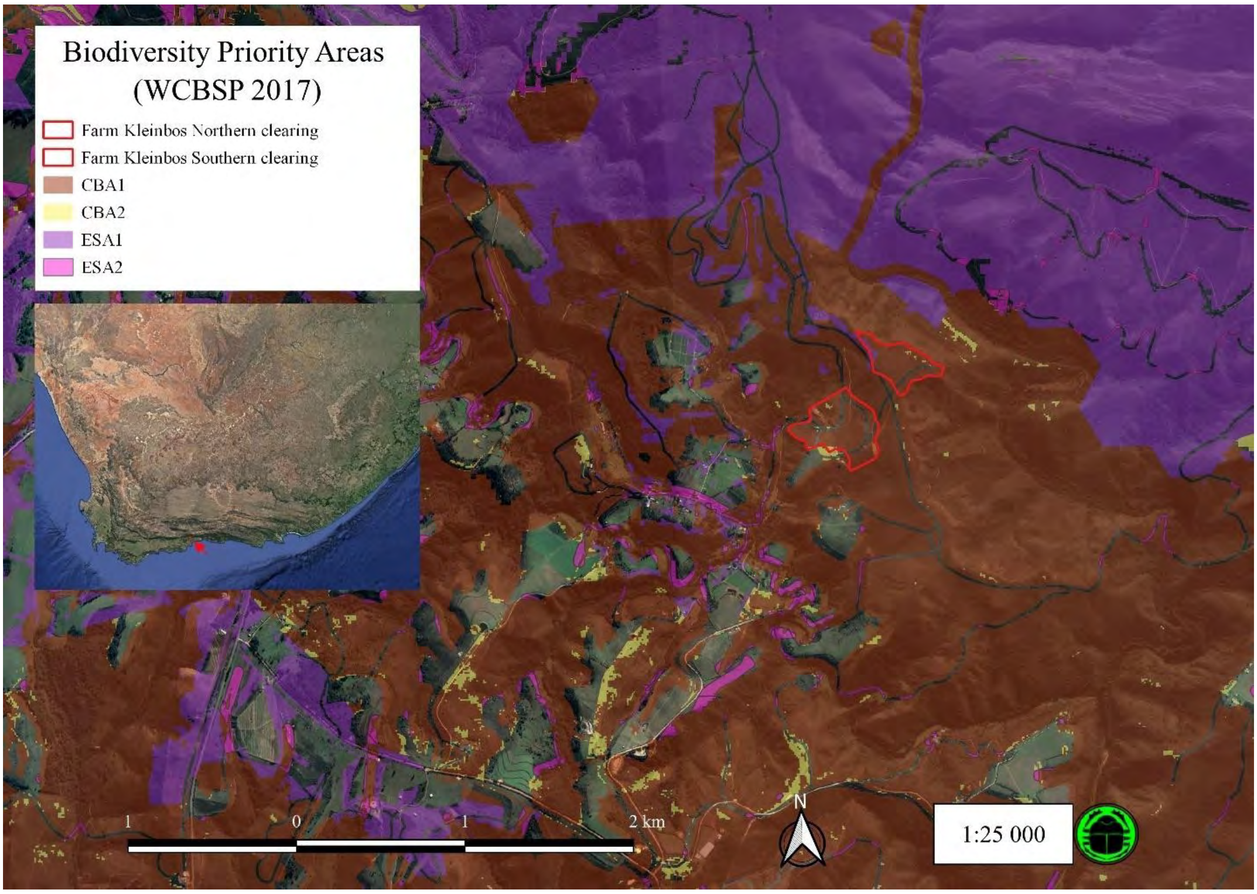

Figure 4: The WCSBP (2017) [1] delineation of the larger landscape around Farm Kleinbos

2.1 Impact Assessment

Since this study forms part of a Section 24G application, the terrestrial biodiversity related impacts were identified and assessed for two scenarios related to the nature of the impact in terms of I) the current extent of transformation and, ii) after full completion of the envisaged development (i.e. an avocado orchard).

The Impact Assessment (IA) was adapted and performed according to the Department of Environmental Affars and Tourism (DEAT 2002,2004) guidelines [11,12,13,14], and takes into account:

1. Impact nature (direct, indirect and cumulative);
2. Impact status (positive, negative or neutral);
3. Impact spatial extent (Table 1);
4. Impact duration (Table 3)
5. Potential impact intensity (Table 2)
6. Impact reversibility (high, moderate, low or irreversible);
7. Irreplaceability of the impacted resource (high, moderate, low or replaceable);
8. Impact probability (Table 4);

9. Confidence in the ratings (high, moderate or low);

Overall impact significance (IS ,) is calculated as:

IS = IM × IP

where IM and IP are Impact magnitude and Impact probability respectively.

Impact magnitude (IM) is calculated as:

IM = II + ID + IE

where II is impact intensity, ID is impact duration, and IE is impact extent, see Table 5.

Table 1: Impact extent categories

Extent.Description	Score
Site specific	1
Local (< 2 km from site)	2
Regional (within 30 km of site)	3
National	4
Global	5

Table 2: Impact intensity categories

Description	Effect Rating Score
Potential to severely impact human health, or lead to loss of species	Negative Fatal flaw 16
Potential to reduce fauna/florapopulation or to lead to severe reduction/alteration of natural process, loss of livelihoods, quality of life and economic loss	Negative High 8
Potential to reduce environmental quality - air, soil, water. Potential loss of habitat, loss of heritage, reduced amenity	Negative Medium 4
Nuisance	Negative Medium-Low 2
Negative change - no other consequence.	Negative Low 1
Potential net improvement	Positive High 8
Potential to improve environmental quality - air, soil, water, improved livelihoods, improved ecosystem function and connectivity	Positive Medium 4
Potential to lead to economic development	Positive Medium-Low 2
Potential positive change - with no other consequence	Positive Low 1

Table 3: Impact duration categories

Duration	Score
Temporary (< 2 yrs) or duration of construction period. This impact is reversible	1
Short term (2-5 yrs). Impact is reversible	2
Medium term (5-15 yrs) The impact is reversible with appropriate mitigation and	3

management	
Long term (> 15 yrs but where the impact will cease with the operational life of the activity). The impact is reversible with the implementation of appropriate mitigation and management action	4
Permanent (i.e. mitigation will not occur in such a way or in such a timespan that the impact can be considered transient). The impact is irreversible	5

Table 4: Impact probability categories

Probability	Score
Improbably (little to no chance of occurring)	0.10
Low probability (10-25% chance of occurring)	0.25
Probable (25-50% chance of occurring)	0.50
Highly probable (50-90% chance of occurring)	0.75
Definite (> 90% chance of occurring)	1.00

Table 5: Impact significance categories

Score	Rating	Description
18-26	Fatally flawed	The project cannot be authorised unless major changes to the design are carried out to reduce the significance rating
10-17	High	The impacts will result in major alteration to the environment even with the implementation of the appropriate mitigation measures and will have an influence on decision-making
5-9	Medium	The impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an impact on decision-making if not mitigated
<5	Low	The impact may result in minor alterations of the environment andf can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making

Cumulative Impact Assessment

Potential impacts of the development were cumulatively assessed using the guidelines provided by [?]. [?] provides a list of generic questions to ask in order to assess a potential cumulative impact on a particular study area. These questions are:

1. Is the proposed action one of several similar past, present or future actions in the same geographic area?

2. Do other activities (whether state or private) in the region have environmental effects similar to those of the proposed action?

3. Will the proposed action (in combination with other planned activities) affect any ecosystems of local, regional or national concern?

4. Have any recent environmental studies of similar actions identified important adverse or beneficial cumulative effects issues?

5. Has the impact been historically significant, such that the importance of the resource is defined by past loss, gain or investments to restore resources?

6. Does the proposed action involve any of the following?

- Long range transport of air pollution;
- Air emissions resulting in the degradation of regional air quality;
- Loading large water bodies with discharges of sediment, thermal or toxic pollutants;
- Contamination of ground water supplies;
- Changes in hydrological regimes of major rivers and estuaries;
- Long-term disposal of hazardous wastes;
- Mobilisation of persistent bioaccumulated substances through the food chain;
- Decreases in quantity and quality of soils;
- Loss of natural habitats
- Loss of biological diversity.

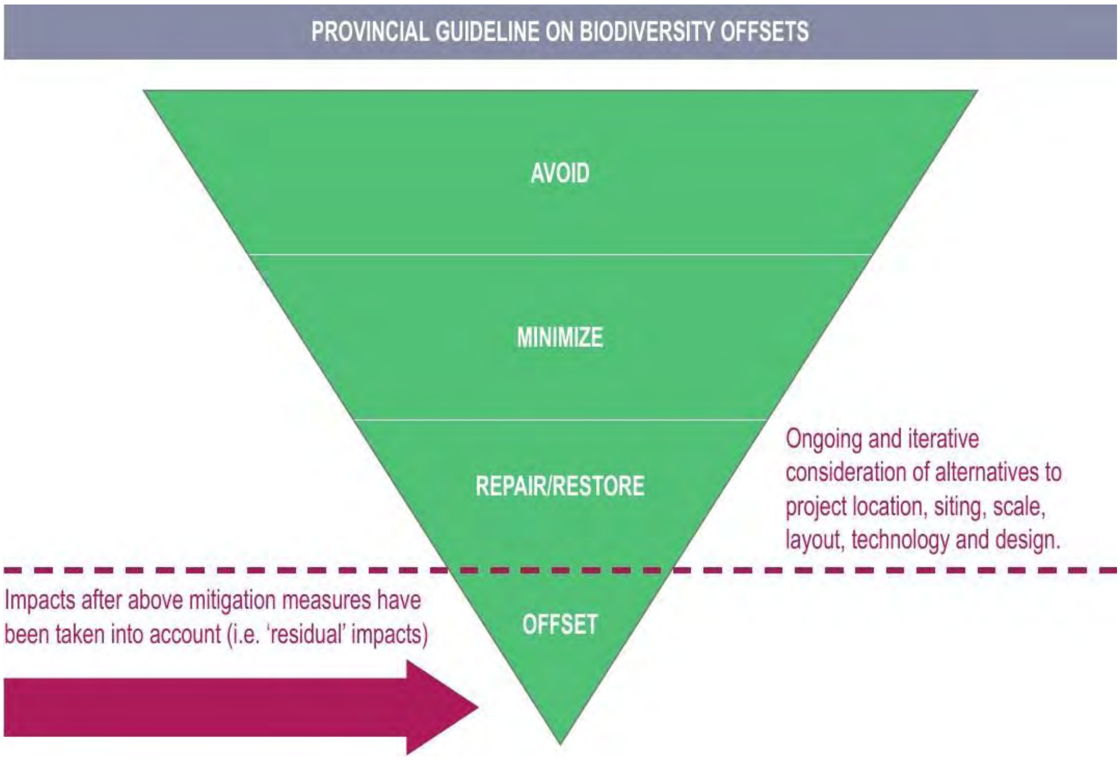

Figure 5: The Mitigation Hierarchy from WCBSP, 2017 provides a guide for impact assessment and mitigation measures.

3. Results

3.2 Landscape description

Figures 6 and 7 reveal the high levels of fragmentation and degradation of the broader landscape and Garden Route Shale Fynbos vegetation. The areas to the west of the Farm Kleinbos sites are moderate to heavily infested by large, dense stands of mostly *Acacia mearnsii* and *Eucalyptus Globulus,* and a range of other invasive alien plant species. The broader landscape is heavily fragmented due to agriculture and its accompanying fences, roads and artificial dams. The areas north, north-west and south-west of Farm Kleinbos appear less fragmented, however, the slopes and river valleys are degraded to some extent due to ever-present alien invasive tree infestation.

The Swellendam Silcrete Fynbos which occurs on the higher altitude ridges in the area, seem to be less fragmented than the Garden Route Shale Fynbos, however, is also infested (Figure 2, 6 & 7).

The landscape is hilly with deep river valleys and altitudes ranging from approximately 100 to 600 m within small spatial scales.

3.2 Site description

The two cleared sites on Farm Kleinbos add up to 22.5 ha, with the Southern site comprising 14.3 ha and Northern site 8.2 ha, lie within close proximity of each other (Figure 1-4, 6 & 7). The Northern site lies on a plateau to the north-northwest of the southern site and on a higher altitude. Its north-northeastern, eastern, and south-southeastern boundaries border the upper edges of a steep downhill slope which ends in the deep Moordkuil River valley. The Northern site's south-southwestern and western boundaries are immediately followed by a downhill slope which ends in the Leeukloof Valley below. The Southern site is situated on this more gradual footslope (Figures 6 & 7).

Altitudes from the Moordkuil River to the top of the Northern site range from 110 to 320 m within a Cartesian distance of about 400 m. On the western side of the two sites, the altitudes from the Leeukloof Valley to the top of the Northern site range from 160 m to 320 m within a Cartesian distance of about 900 m. This hilly attribute of the landscape contributes to the Upland-Lowland Interface spatial feature that was delineated for the sites [1] and identified by Rouget et al. (2003) [5] to be an important structural feature providing environmental gradients which in turn facilitates ecological processes and hence contributes to biodiversity.

Close to the north-northwestern boundary of the Southern site, a new dam was constructed (Figure 6 & 7, 18 & 20). An old dam exists close to the south-southeastern boundary of the site (Figure 6, 7, 14 & 15) The Northern boundary does not contain any artificial dams.

About half of the Northern site's vegetation type was delineated as Garden Route Shale Fynbos and the other half as Swellendam Silcrete Fynbos (Figure 2). A small section of the Southern site's vegetation, lying within the north-northeastern and eastern side of the site was delineated as Swellendam Silcrete Fynbos whilst the majority of the site lies within Garden Route Shale Fynbos (Figure 2).

Although these were the only vegetation types that the National Vegetation Map [3] identified for the Farm Kleinbos area, the WCBSP [1] delineated an "Indigenous Forest Type" for the northern most PU (Figure 8a) and historic satellite imagery clearly show a dense stand of trees on both the sites and on its immediate surrounds (Figure 6, 7 & 8). Because all trees were removed on site during the land clearing in 2017 (Figure 11 E), it was not known whether the stands contained natural or alien tree species. None of the other 5 PUs that cover the sites, except for the most northerly situated PU, delineated any natural forest types (Figure 8). Remaining debris from the clearing activities on the southern site contain mostly Eucalyptus and wattle stumps and adjacent to this clearing to the west a dense stand of invasive alien trees persist. This suggests that at least for the southern site, the dense stand of trees existing before the clearing was mostly invasive alien trees that encroached upon the natural fynbos vegetation occurring on these slopes. Similarly, the northern site is situated on a plateau at a slightly higher elevation than the southern site - suggesting that this area also was dominated by an alien invasive plant stand or woodlot prior to clearing - as forest and thicket vegetation within the broader landscape is expected to occur only within river valleys and fire-protected niches within the broader landscape.

Inferences made from old natural forest patch maps [8], historic imagery (Figure 8, 10 & 11) and photographs of the vegetation on and next to the cleared sites, conclude that the dense tree stands visible from satellite imagery before clearance (Figure 8B, 10, 11A, 11B, 11C & 11D) were patches of *A. mearnsii* and was not natural forest or thicket. No indigenous forest patches were present on or immediately surrounding the cleared sites and *E. mearnsii* and *E. globulus* stands were clearly visible next to the cleared sites (Figure 12, 18, 19, 20). An old georeferenced map of delineated natural forest patches [8] in the area, show how the cleared sites' footprints fall outside of the natural forest patches that follow the natural drainage lines (Figure 9), also the same lower-lying natural forests typically did not burn in a 2017 fire and displays green on a satellite image after the fire (Figure 8C). The fire scar satellite image (Figure 8C) also shows how the dense patches of trees surrounding the farm, confirmed to be alien tree stands during the field visit (Figure 12, 18, 19 & 20) burnt - typical for alien trees such as *A. mearnsii*.

The alien invasive tree stands covered approximately 6.8 ha (83%) of the Northern site and 9 ha (63%) of the Southern site (Figure 10). Therefore, only 17% of the Northern and 37% of the Southern site's area was covered by Fynbos in 2016, before clearing took place. Within the Northern site, the fynbos that were not covered by dense alien tree stands fell within both the Garden Route Shale Fynbos and Swellendam Silcrete Fynbos vegetation types. Within the Southern site, the entire area that was delineated as Swellendam Silcrete Fynbos was covered by alien tree stands whilst the remaining "open" fynbos, uncovered by alien tree stands consisted of Garden Route Shale Fynbos.

The newly constructed dam was built in a previously heavily alien infested area (Figure 7 & 10) and its footprint and impact on the ecosystem, from a biodiversity perspective, is therefore considered lower than the previously occurring alien tree stand.

3.3 Ecosystem status quo

The Northern site's footprint is about 8.23 ha in extent of which 94% was delineated as CBA1, 1% as CBA2 and 5% as an ESA1. (Figure 3 & 4).

The Southern site's footprint is about 14.28 ha in extent of which 98% was delineated as CBA1 and 2% as an ESA1. (Figure 3 & 4).

In areas that were not completely covered by the dense alien tree stands prior to the clearing actions (Figure 10), the state of the fynbos vegetation is unknown, but likely semi-degraded (Figure 13, 16 & 17). However, in areas that were completely occupied by dense alien invasive tree stands, before clearing, some signs of fynbos recovering were present (Figure 21 & 22). A timeline of historic satellite imagery spanning 2005 to 2021 (Figure 11), shows how the alien tree infestations spread in the area from 2005 to 2016, before clearing. It also shows how some pioneer vegetation has emerged (Figure 11F) since clearing occurred. Since fynbos readily restores itself on degraded lands naturally from a persistent seedbank, given the appropriate conditions and natural disturbance regime (fire), it is likely that the cleared footprint will naturally recover, given a few years. Since alien invasive plants require clearance before fynbos can re-establish, the cleared land is thus ready for natural restoration processes. Therefore it is likely that the larger portion of the cleared footprint area that was previously dominated by alien invasive plants is now, at least from a structural vegetation perspective, closer to its WCBSP delineated status than it was before clearance.

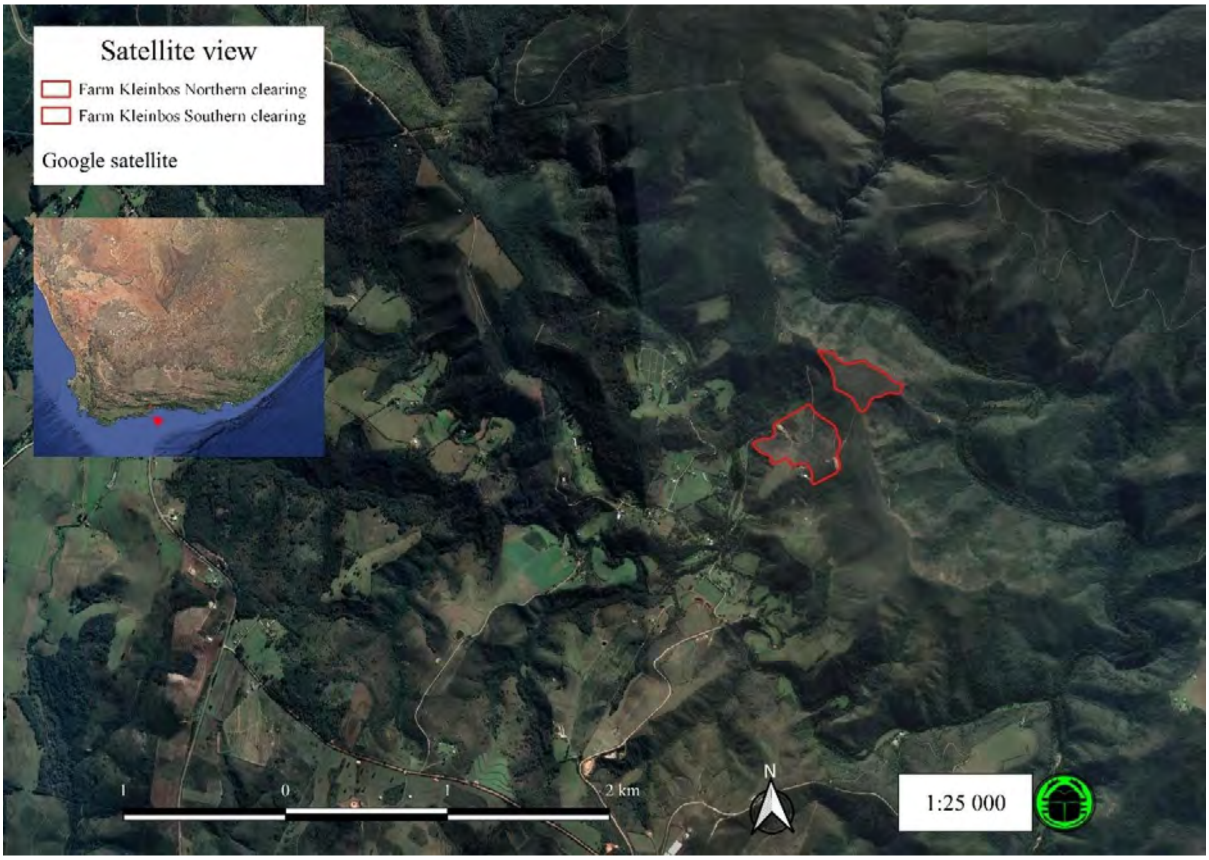

Figure 6: Map showing a satellite view of the Kleinbos Farm cleared sites (red) in its broader landscape.

3.4 Impact Assessment

The identified impacts of the proposed development and current vegetation clearance are identified as:

i. Loss of habitat of an endangered ecosystem / vegetation type

ii. Loss of ecosystem services

iii. Loss of ecosystem function and process

iv. Loss of distinct biodiversity features.

Scenario 1: Current Impact

At present the current impact is assessed as of High-Medium significance. Although large (83% and 63%) areas of the cleared sites consisted of heavy infestation of invasive alien plants (IAPs), some natural vegetation was cleared alongside this. The clearance of IAPs will likely passively regenerate with fynbos species from existing seedbanks if not smothered again with IAPs. IAP re-establishment will mostly likely intensify if not actively managed, especially after clearance of natural vegetation – see Table 6. The prescribed mitigation measure here would involve active alien plant management to foster regeneration of natural fynbos vegetation (see Table 7). This mitigation measure will render all the identified impacts as of Low significance.

Table 6: Scenario 1: Current Impact assessment significance without mitigation.

Impact	Extent	Duration	Intensity	Probability	Score	Significance
Loss of habitat of an endangered ecosystem type	3	4	4	0.9	9.9	High
Loss of ecosystem services	3	4	4	0.8	8.8	Medium
Loss of ecosystem function, pattern and process	3	4	4	0.7	7.7	Medium
Loss of distinct biodiversity features	3	4	4	0.8	8.8	Medium

Table 7: Scenario 1: Post-mitigation impact significance.

Impact	Mitigation	Extent	Duration	Intensity	Probability	Score	Significance
Loss of habitat of an endangered ecosystem type	Restore cleared areas by controlling invasive alien plants	2	4	-4	0.9	1.8	Low
Loss of ecosystem services		2	4	-4	0.8	1.6	Low
Loss of ecosystem function, pattern and process		2	4	-4	0.7	1.4	Low
Loss of distinct biodiversity features		2	4	-4	0.8	1.6	Low

Scenario 2: Impact of planned development

Should the planned establishment of an avocado orchard be applied without any mitigation measures, a High signifcance for each of the impacts is identified. This is compounded as crop agriculture is currently the most destructive landuse in this area (along with alien invasive plant infestations) and on these ecosystems and has been showing an increasing growing trend. Therefore the extent of this impact is considered higher than as the current situation where no orchard development has yet taken place (see Table 8). The only mitigation action that is reasonable within this scenario is the establisment of a proclaimed offset biodiversity area consisting of roughly equal to or larger in size and spanning the same vegetation types as the full proposed development area footprint. With this mitigation measure in place, the impact signifcance is considered Medium (Table 9).

Table 8: Impact assessment significance without mitigation

Impact	Extent	Duration	Intensity	Probability	Score	Significance
Loss of habitat of an endangered ecosystem type	3	4	8	0.9	13.5	High
Loss of ecosystem services	3	4	8	0.8	12	High
Loss of ecosystem function, pattern and process	3	4	8	0.7	10.5	High
Loss of distinct biodiversity features	3	4	8	0.8	12	High

Table 9: Post-mitigation impact significance

Impact	Mitigation	Extent	Duration	Intensity	Probability	Score	Significance
Loss of habitat of an endangered ecosystem type	Find and proclaim a biodiversity offset area of similar size, connectivity and similar vegetation within the respective endangered vegetation types	3	4	4	0.8	8.8	Medium
Loss of ecosystem services		3	4	4	0.8	8.8	Medium
Loss of ecosystem function, pattern and process		3	4	4	0.7	7.7	Medium
Loss of distinct biodiversity features		3	4	4	0.8	8.8	Medium

Figure 7: Historic satellite imagery from the year 2016 of the Farm Kleinbos, just before clearance was undertaken, showing the cleared sites' footprints (red borders) and dense stands of alien invasive trees (red dotted areas) within the footprint areas.

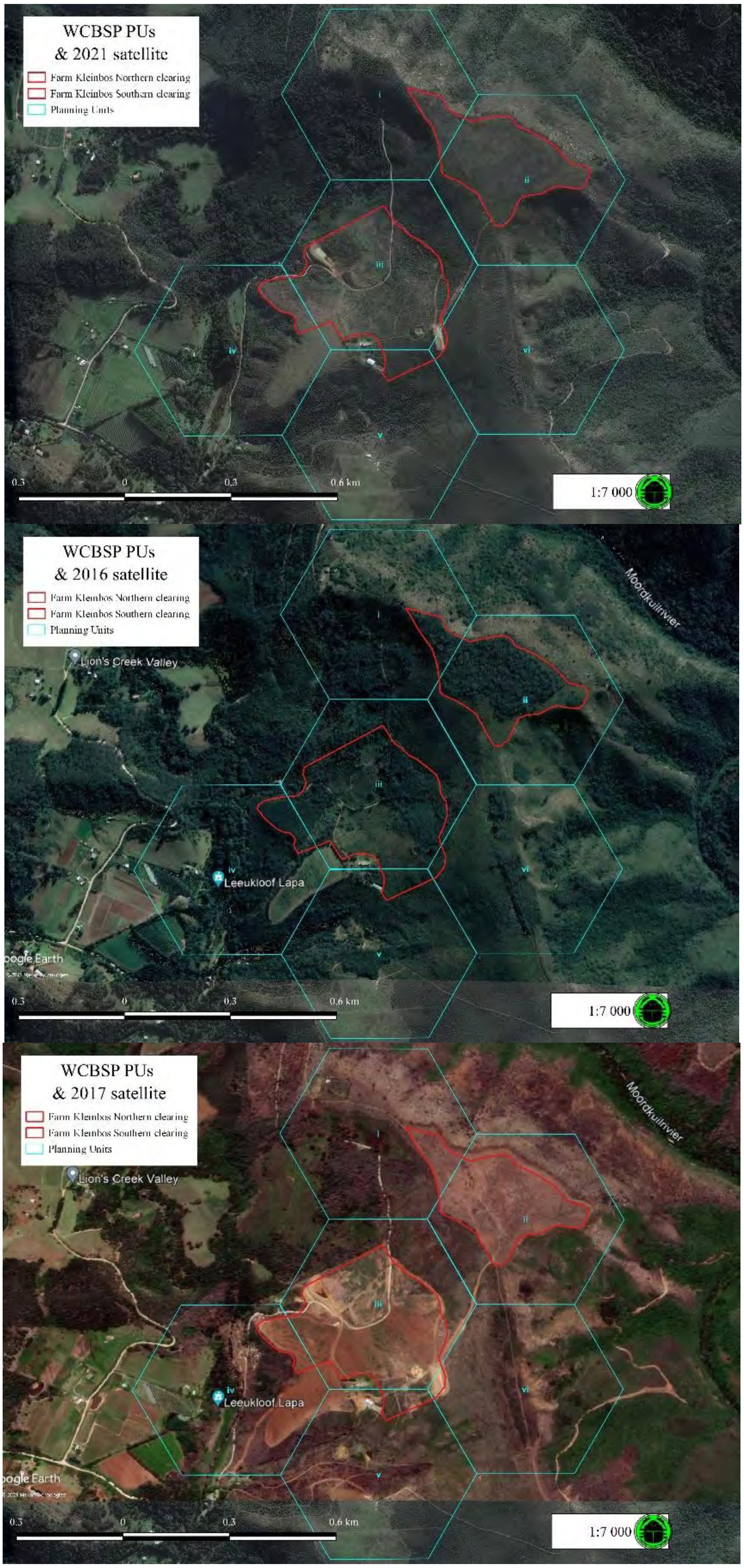

Figure 8: Historic satellite images from 2021 (Top), 2016 (Middle) and 2017 (Bottom) showing the six WCBSP Planning

units (PUs) (i – vi) that cover the two Farm Kleinbos cleared site footprints (red).

Figure 9. Photograph of the intact area lying adjacent to the southern border of the Northern site, showingan endangered fynbos vegetation type.

(A) 2005

(B) 2012

(C) 2014

(D) 2016

(E) 2017

(F) 2021

Figure 10: Satellite imagery of the Farm Kleinbos cleared sites (red borders) at different years, 2005 (A), 2012 (B), 2014 (C), 2016 (D), 2017 (E) and 2021 (F) illustrating vegetation cover changes over this time period.

Figure 11. Photograph of the area immediately bordering the Southern site's southern border, showing habitat degradation and alien plant infestation which mainly includes blue gum trees (*E. globulus*).

Figure 12. Photograph of the south-southeastern area of the Southern site, looking in a southerly direction, showing road tracks and fynbos.

Figure 13. Photograph of the eastern area of the Southern site, looking in a northerly direction, showing road tracks, the edge of an old dam site and recovering fynbos.

Figure 14. Photograph of an old dam in the southeastern area the Southern site, looking in a southerly direction, showing erosion.

Figure 15. Photograph of the southeastern area the Southern site, showing degraded fynbos and a fence.

Figure 16. Photograph of the southeastern area the Southern site, showing fynbos in an area that was not occupied by dense alien tree stands before the sites were cleared in 2017.

Figure 17. Photograph of the dam on the southwestern side of the Southern site, showing pioneer grass, forbs and fynbos species in an area that was infested by a dense stand of alien trees before the sites were cleared in 2017 and showing black wattle (*A. mearnsii*) in the background which borders the western side of the site.

Figure 18. Photograph of the area just north of the Southern site, looking in a south-southwesterly direction, showing fynbos in the foreground, the Southern site in the background, on the dense stands of black wattle and blue gum trees on the site's westerly border.

Figure 19. Photograph of the Southern site, looking in a southerly direction towards Leeukloof, showing the dense stands of alien invasive trees just below the site.

Figure 20. Photograph of the south-southwestern area of the Southern site, showing the remaining fynbos just upslope of the area that was infested by a dense stand of alien invasive trees in 2016, just before it was cleared in 2017.

4 Discussion and Recommendations

From a terrestrial biodiversity perspective, the impact of the clearance of the two sites on Farm Kleinbos at present, can be described as Medium - Low, since the ecosystem was already fragmented and most of the cleared area were infested with dense stands of alien invasive plants. Yet, the clearance of roughly 5.3 ha of remaining fynbos vegetation on the Southern site, and 1.4 ha on the Northern site represents a loss of a fraction of an endangered vegetation type and likely some species of conservation concern associated with it. However, since no planting has been done and the cleared areas were left to regenerate these areas are likely to recover if not infested with alien invasive plants again. The clearance activity did not significantly decrease the importance of the delineated CBA1, CBA2 and ESA1 areas. We argue that the cleared areas that were infested are now, if IAP management and control is applied, in a better position to recover naturally after the clearing action, as all of the alien invasive trees were removed during the clearing process. The CBA and the ESA1 areas which include the Watercouse Protection areas as well as the Upland-Lowland Interface features can continue to recover and contribute more towards biodiversity conservation than it was able to before the clearing of these two sites, when it was dominated by alien tree infestations. The loss of the more intact fynbos patches that was also cleared (6.7 ha combined) is regrettable, but also likely to recover from the clearance activities within a few years with appropriate alien plant control.

The impact tables show that if this cleared area is not managed to control for alien invasive plants, then many of those cleared away will likely start returning and also invade the cleared fynbos areas, and in effect worsening the situation as it was before clearance (Scenario 1 without Mitigation). If however the cleared areas are managed to control alien invasive plant infestation and left to regenerate to fynbos, the terrestrial biodiversity of the site would be in a better condition and the impact considered less in a few years than before clearance (Scenario 1 with Mitigation).

If however the area is to be developed into an avocado orchard (Scenario 2 without Mitigation), the chance of fynbos restoration is eliminated for at least 25 years, and this will likely result in transformation of the whole cleared area and contribute to further fragmentation and loss of biodiversity within an endangered ecosystem and all identified impacts will be of High significance. Here also the cumulative impact of orchard development within the larger landscape is taken into account to increase the extent of the impact (See Tables 8 and 9).

The only mitigation option is the proclamation of a protected biodiversity offset area within the same vegetation type and ecosystem pattern, and of the same size (or larger) as was cleared and maintaining and restoring that habitat. Table 9 show that with such an area established as mitigation measure, the identified impacts caused by the planned development of an avocado orchard is found to be of Medium significance. Since the larger part of the cleared area was already transformed through invasive alien plant infestation, the offset area may also consist of currently infested areas, but should crucially include at least an area of the same size of natural vegetation from the same type identified for the cleared area. If the ioffset area is mostly infested or transformed, it should be actively restored through manual clearance of alien plant infestations, and the institution of a fire regime with a fire return period of approximately 11-15 years, and annually monitored to ensure the restoration trajectory is on course to reflect pre-infestation and pre-transformed biodiversity and biomass benchmarks as reflected in the remaining intact patches within and around the identified offset area.

We recommend the cleared areas to be left to naturally regenerate and continuous alien plant control applied, but since this is a commercial farm, with little options for biodiversity or Payments for Ecosystem Servces (PES) schemes providing incentives to landowners to maintain a conservation landuse on their property as alternative to agricultural development, it is likely that a suitable biodiversity offset area for this footprint area should be found as a suitable mitigation option for further agricultural development of the site.

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Declaration of Independence

I, Dr. Marius L van der Vyver, hereby declare that I

- Act as the independent specialist in this application;
- Will perform the work relating to the application in an objective manner, even if this results in views

and findings that are not favourable to the applicant and that there are no circumstances that may compromise my objectivity in performing such work;

- Have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- Will comply with the Act, regulations and all other applicable legislation;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose to the applicant and the competent authority all material information in my

possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority.

I further declare that all the particulars furnished by me in this form are true and correct; and acknowledge that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

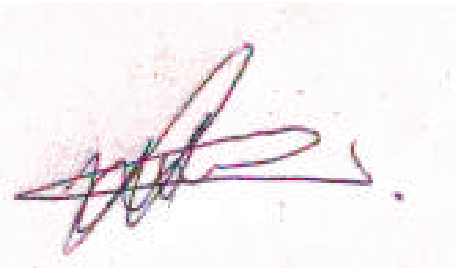
Name of Company

chepri (Pty) Ltd scientific services

Name of Specialist Consultant

Dr. ML van der Vyver

Signature of Specialist Consultant



Date

April 4, 2022

Specialist details

Dr. Marius L. van der Vyver holds a PhD in Botany from Nelson Mandela University and has more than 15 years' experience as an ecologist and botanist. He is registered with the South African Council of Natural Scientific Professions (SACNASP) as an ecological scientist (reg.no. 118303) and a member of the South African Association of Botanists (SAAB).