BIODIVERSITY ACTION PLAN (BAP) FOR SENSITIVE SPECIES 15

Welkom, Free State Province

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Report Name	**BIODIVERSITY ACTION PLAN (BAP) FOR SENSITIVE SPECIES 15**	
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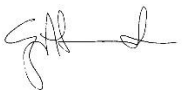
Report Contributor/Reviewer	Professor Graham Alexander (SACNASP 400466/04)	
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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, Amended. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

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1 Introduction

The Biodiversity Company was appointed to undertake a species-specific Biodiversity Action Plan (BAP) for Sensitive Species 15 specifically pertaining to a population based to the north of the town of Welkom in the Free State, South Africa. The population in focus is currently surviving across three farms owned by Harmony Gold Mining Company Limited, including Goedgedacht, Jakobsdal, and Nooitgedacht. For the purposes of this project, the site will henceforth be referred to as 'Nooitgedacht' and the 'project area'. Collectively, the Sensitive Species 15s inhabiting in the project area are hereon referred to as the Nooitgedacht Sensitive Species 15 subpopulation which likely comprises of several Sensitive Species 15 aggregations (defined as a cluster of Sensitive Species 15 burrows within a study site; Stanton-Jones et al., 2024).

The BAP applies specifically to the management of this unique and threatened species. The Free State province is estimated to host 95% of the remaining population of Sensitive Species 15, and Welkom specifically is known to be a Priority Area for Sensitive Species 15s, supporting some of the highest densities across the species geographic range (Parusnath, 2014). This document is intended to be an adaptive synthesis of current knowledge, and as more information is generated in terms of Sensitive Species 15s, the Nooitgedacht Sensitive Species 15 subpopulation, and the project at hand – the BAP can be updated and improved.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations 2014 (GNR 982 as amended) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020): "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria).

The report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

Figure 1-1 A Sensitive Species 15 pictured in its burrow near Welkom, Free State (TBC, 2025).

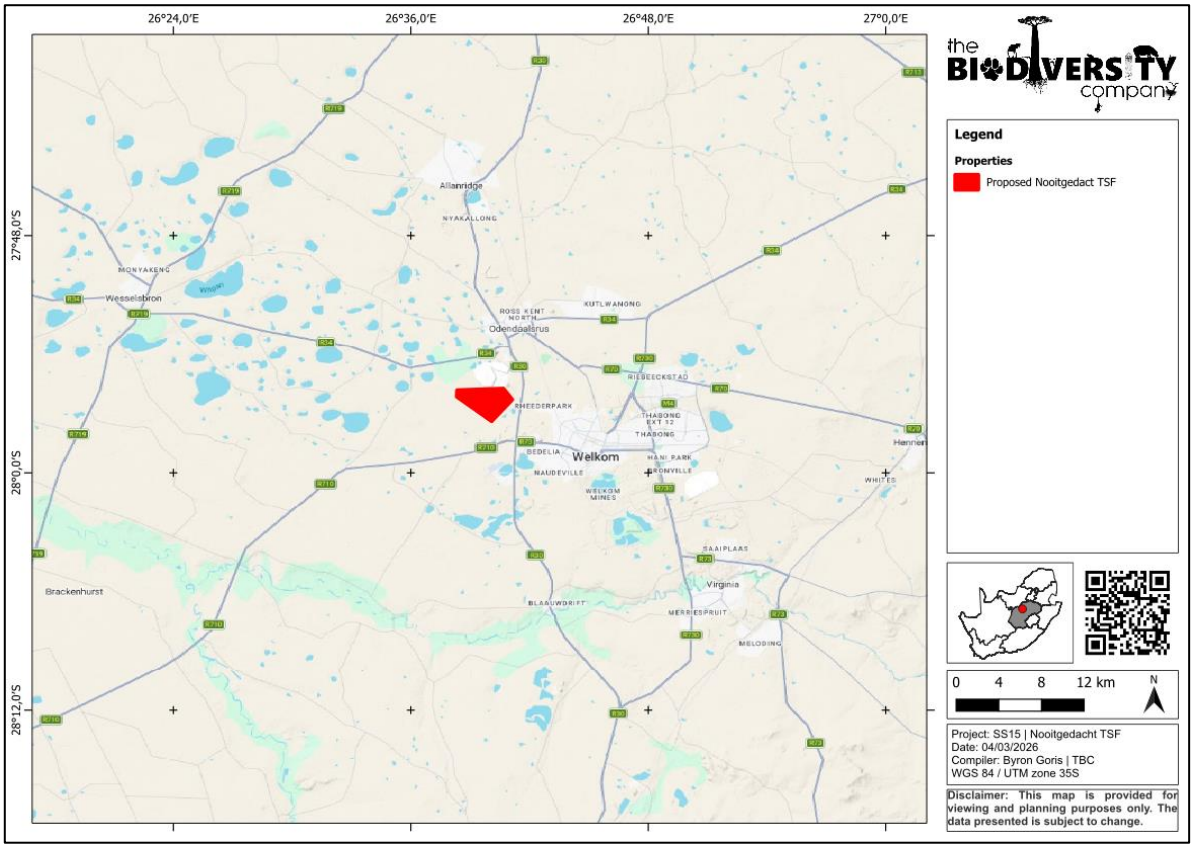

Figure 1-2 Map illustrating the regional context of the Project Area.

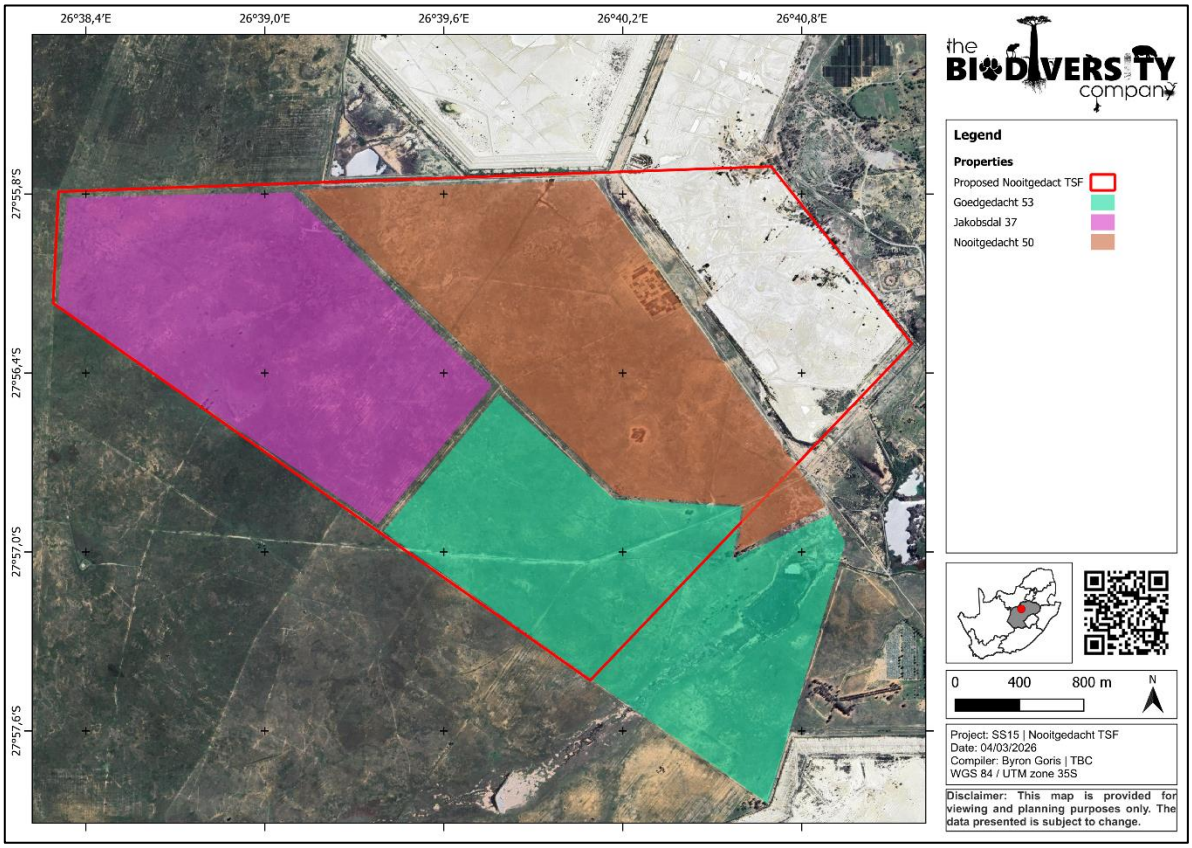

Figure 1-3 Map illustrating the Nooitgedacht TSF project area and relevant farm properties.

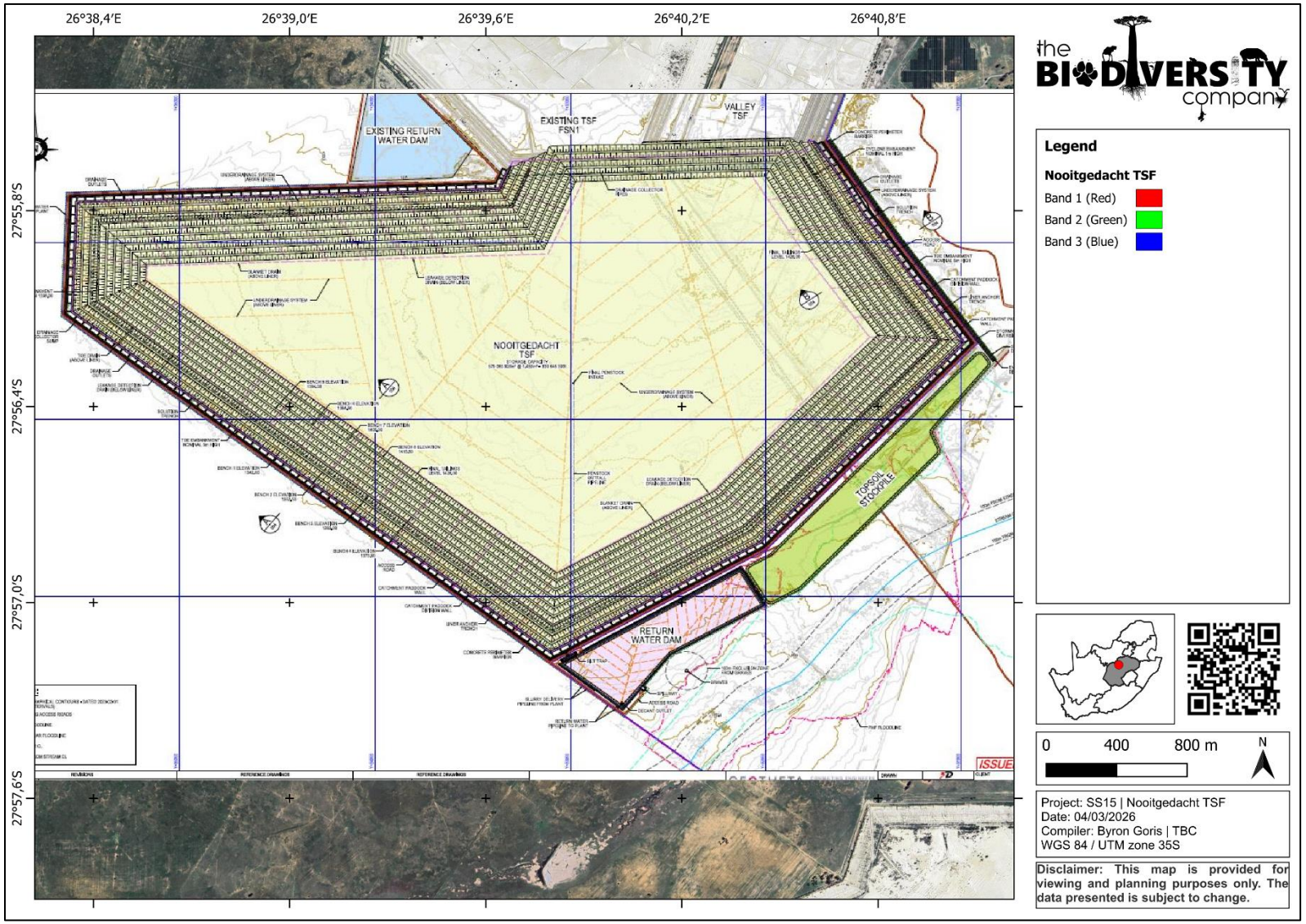

Figure 1-4 Satellite imagery with an overlayed map provided by Harmony which illustrates finer details of the proposed development.

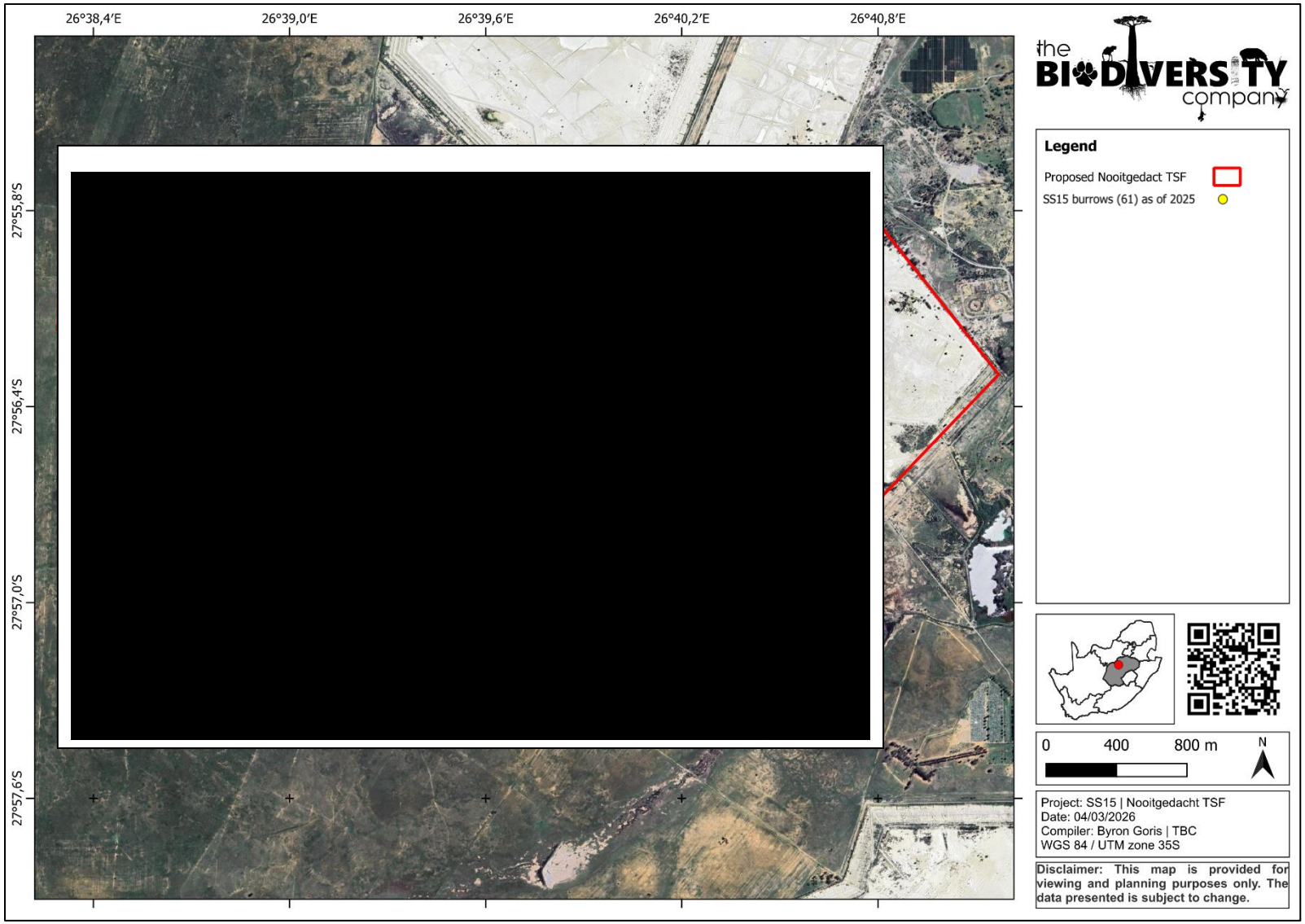

Figure 1-5 A map depicting the locations of the known 61 Sensitive Species 15 burrows as of 2025 site assessments.

1.1 Project Information

The Nooitgedacht Mega-Tailings Storage Facility (MTF) project, proposed by Harmony Gold Mining Company Limited, represents a significant development initiative in the Free State Province, South Africa, near the town of Welkom. The project involves the reclamation and remining 19 of the 43 existing tailings storage facilities in and around the town of Welkom with deposition taking place on the proposed new lined Tailings Storage Facility (TSF) which spans across three farms – Goedgedacht, Jakobsdal, and Nooitgedacht – with a combined storage footprint of approximately 10 km² (1,000 ha). The footprint includes a return water dam (~30 ha), a topsoil stockpile (~36 ha), an existing return water dam (~23 ha), and the main TSF footprint (~842 ha).

The site selection process for the MTF was initiated in 2007 and involved a rigorous, multi-phase evaluation of numerous potential sites according to environmental, social, and economic sustainability criteria. Following comprehensive specialist assessments and a Strategic Environmental Assessment (SEA), the Nooitgedacht site (Site 1) was identified as the most favourable alternative, demonstrating the lowest potential for environmental impacts relative to other options. This selection reflected a strong commitment to the mitigation hierarchy – a structured, stepwise approach to managing biodiversity impacts that prioritises avoidance, minimization, rehabilitation, and offsetting, in that order.

An overarching Mitigation Hierarchy Report (The Biodiversity Company, 2025) was prepared to document - clearly and transparently - how biodiversity risks and constraints have been considered and managed over time, and to demonstrate how the project's planning and design decisions have been guided by the avoid–minimise–rehabilitate–offset sequence. In particular, it was drafted to explain why the project has progressed to a position where residual impacts on high-sensitivity biodiversity features remain, and why a species-specific management response (i.e., the Sensitive Species 15 BAP, including a translocation component) is required as part of a defensible biodiversity risk response and authorisation package

1.1.1 Brief Overview of Key Findings and Decision Progression (2007 to Present)

From 2007 onwards, the project's planning trajectory reflects an iterative constraints-led approach in which alternatives were identified and tested through successive phases of assessment (including strategic-level inputs and specialist studies) to reduce biodiversity risk. Over this period, the key findings that shaped the current position can be summarised as follows:

- Regional and site-level biodiversity sensitivity is a defining constraint in the wider receiving environment, with the preferred project area nonetheless intersecting features that are difficult to fully avoid at a practical engineering level (as reflected in sensitivity mapping and specialist evidence).

- As project definition improved, the mitigation hierarchy was applied through layout refinement, buffering of sensitive features (notably wetlands/watercourses), micro-siting and phasing, and the delineation of avoidance/no-go areas where feasible - demonstrating that avoidance and minimisation were actively pursued and not treated as a formality.

- Despite these measures, the report concludes that residual impacts remain for certain biodiversity receptors because some impacts are effectively permanent and footprint-driven and cannot be reduced to negligible significance through conventional rehabilitation alone.

- Within this residual impact context, the report positions the Sensitive Species 15 as an impact receptor requiring a unique and strategic response, because the species' ecological characteristics and the nature of habitat transformation mean that standard construction mitigation and rehabilitation measures are insufficient on their own to secure persistence of the affected local population.

1.1.2 Ecological Significance and Conservation Challenges

Despite its selection as the preferred site, the Nooitgedacht location overlaps with areas of "Very High" biodiversity sensitivity, including Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), and Endangered grassland ecosystems. Most significantly, the site harbours a substantial population of *Sensitive Species 15*, a Threatened or Protected Species (TOPS) listed under the National Environmental Management: Biodiversity Act (NEMBA), a national sensitive species list (NSSL), and classified as a Species of Conservation Concern (SCC).

Field surveys conducted between 2023 and 2025 have confirmed the presence of a robust Sensitive Species 15 population at Nooitgedacht, comprising at least 61 confirmed burrows and an estimated population of between approximately 100 to 200 individuals distributed across multiple aggregations. Fieldwork established conclusive evidence for the presence of *Sensitive Species 15*, a threatened species within the proposed project area (e.g., sightings, photographs, and video recordings of the Sensitive Species 15 and their burrows, claw and tail tracks outside burrow entrances, scales outside burrow entrances). The Sensitive Species 15 is endemic to South Africa's interior plateau grasslands, it is a habitat specialist and is characterised by very high site fidelity – biological traits that makes the species particularly vulnerable to habitat loss, with the highly specific habitat requirements making Sensitive Species 15s seemingly difficult to translocate. The species' conservation status reflects widespread habitat degradation across its historical range, resulting in a current IUCN classification of Vulnerable (VU; Alexander et al., 2023).

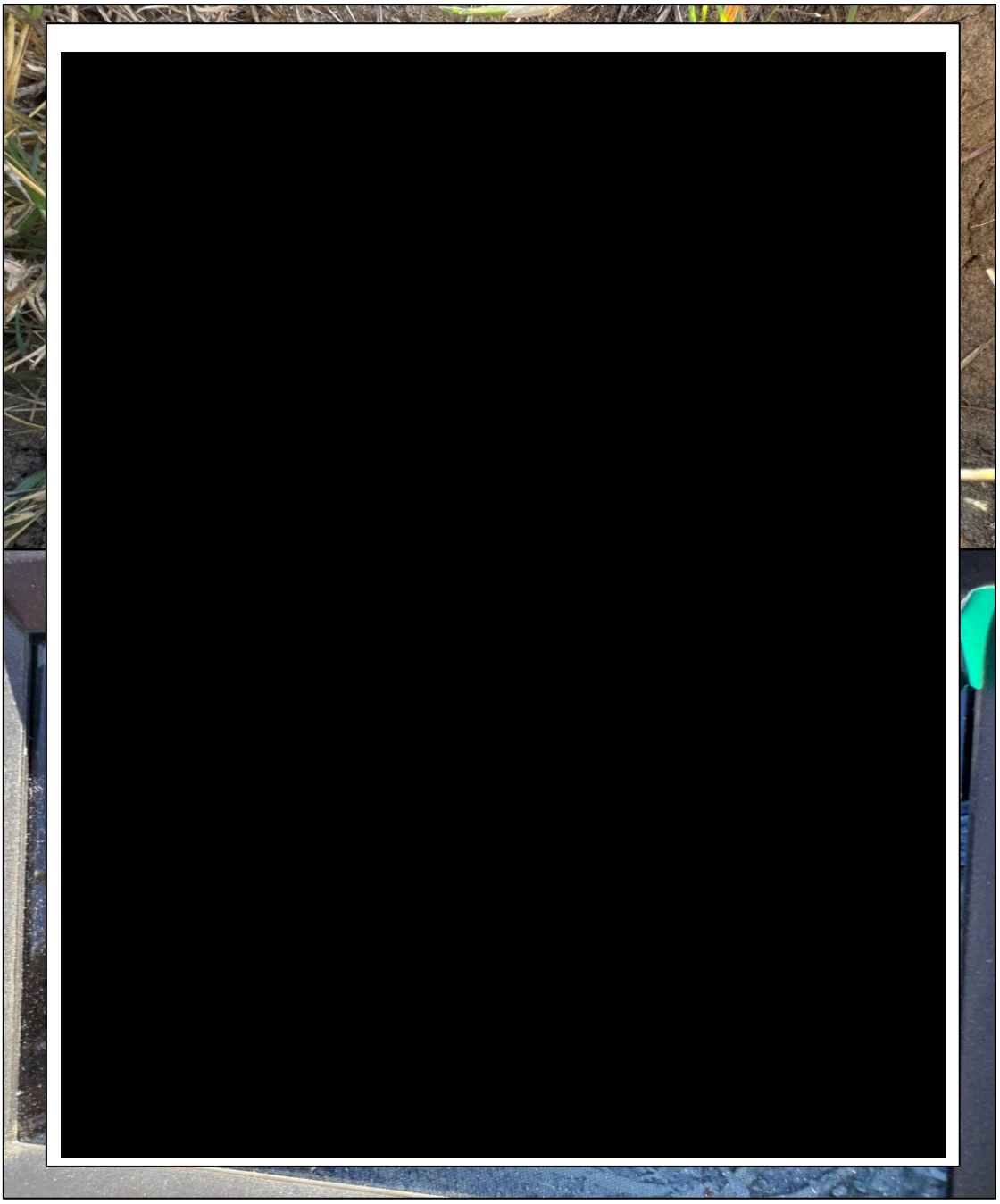

Figure 1-6 A Sensitive Species 15 burrow at Nooitgedacht (top) with a burrow occupant viewed using an endoscope camera (bottom)(TBC, 2025).

1.1.3 The Mitigation Hierarchy and Translocation Decision

The application of the mitigation hierarchy (with reference to the EWT Draft Mitigation Hierarchy Guideline (2023)) to the Nooitgedacht project has been comprehensive and transparent:

- **Avoidance:** The site selection process prioritised avoidance of the most sensitive ecological features at a regional scale. However, complete avoidance of all sensitive features within the Nooitgedacht site is not feasible if the project proceeds.

- **Minimization:** The project design incorporates buffer zones around wetlands and sensitive habitats, restricts construction to already disturbed or lower-value areas where possible, and includes best-practice erosion and sediment controls.

- **Rehabilitation/Restoration:** Restoration actions are planned for degraded grassland and wetland buffer zones, focusing on enhancing ecological connectivity, stabilizing soils, and controlling invasive species. However, full recovery of Sensitive Species 15 habitat is unlikely due to the species' site fidelity, strict habitat requirements, slow recolonization rates and the permanent nature of the proposed MTF.

- **Offsetting::** Offsetting is recognised as a last resort for residual, unavoidable impacts. For Sensitive Species 15 populations and irreplaceable habitats, offsetting is only considered if all other options are demonstrably insufficient and must be based on robust scientific evidence and regulatory approval. Although translocation is not synonymous with offsetting, it may operate as an offset-like compensatory measure where it is used to address residual, unavoidable impacts on a species population.

Given the irreplaceable value and vulnerability of the Nooitgedacht Sensitive Species 15 subpopulation, and the demonstrated impracticability of avoidance, minimization, and rehabilitation measures to fully protect the population, a comprehensive BAP was required. This BAP includes a structured, scientifically justified translocation protocol designed and implemented in accordance with best-practice guidelines, regulatory requirements, and multi-disciplinary stakeholder input. Translocation is considered a last-resort mitigation measure within the mitigation hierarchy and is only justified when avoidance, minimization, and rehabilitation are demonstrably insufficient, and only if a rigorous, science-based plan is in place.

1.1.4 Way Forward: What the Decision Process Implies for the BAP

The mitigation hierarchy report effectively sets the platform for the BAP to become the primary instrument that translates the hierarchy into implementable, auditable actions for *Sensitive Species 15*. Importantly, where translocation is being pursued to address residual, unavoidable impacts, it must be treated as compensation in effect - i.e., an offset-type intervention, albeit species-specific and risk-laden - rather than as routine mitigation.

1.2 Conservation Significance

The Sensitive Species 15 is an endemic species to parts of the Free State and Mpumalanga provinces. This means that the species only occurs naturally in these areas and nowhere else in the world. Sensitive Species 15s are habitat specialists occurring only in natural grasslands across its known distribution (Van Wyk, 1992; Parusnath, 2014; Stanton-Jones et al., 2024). Since the area in which Sensitive Species 15s occur offers support and compatibility for agricultural developments, energy developments, and mining, it is unsurprising that the species is threatened, especially considering that much of the species habitat has been transformed (Parusnath et al., 2017; Stanton-Jones et al., 2023).

The natural grasslands surrounding the town of Welkom are predicted to support some of the highest densities of Sensitive Species 15s and as a result the region may be recognised as a priority area (Parusnath, 2014). Given that Sensitive Species 15s are considered an indicator species of optimal grassland (Parusnath et al., 2017), these high densities suggest that what remains of the natural grassland within the area is in a good state and therefore offers highly suitable habitat for the species. Since Sensitive Species 15s are already being impacted by habitat fragmentation and transformation (Stanton-Jones et al., 2023), further loss of suitable habitat across could have a detrimental impact on the survival of the species.

Some Sensitive Species 15 aggregations from the Nooitgedacht Sensitive Species 15 subpopulation have played a significant role in conservation. For example, McIntyre (2006) investigated the impact of mining contaminants in an aggregation close to the TSFs and surface water streams. Although the sample size was small (n = 7) and conclusions about the Sensitive Species 15s assessed at this site were limited, the same study did report a significant uptake of mining contaminants by Sensitive Species 15s at another much larger site that is also heavily impacted by mining contaminants which resulted in the Sensitive Species 15 having a negative relationship between body condition and mining contaminants (McIntyre, 2006; McIntyre and Whiting, 2012). (*Note: It can be decided at a later stage if this condition change will be investigated during the current translocation process.*) The Sensitive Species 15s studied at Nooitgedacht were also marked with Passive Integrated Transponders (PITs) which gave a unique identifying number to each individual studied. Stanton-Jones et al. (2023) carried out a survey to assess the status of the abundance of the Sensitive Species 15s from McIntyre (2006) and reported a decline of more than 50%. While this might not be a true representation of the entire Nooitgedacht Sensitive Species 15 subpopulation, the findings were consistent with the decline in the abundance of Sensitive Species 15s from another site associated with mining (Stanton-Jones et al., 2023). However, it is important to note that the exact cause of the decline remains speculative, but the findings do highlight the impact that habitat transformation has on the species.

Based on the surveys carried out to date, 61 confirmed Sensitive Species 15 burrows have been located across the land area where Harmony have proposed the development (Fig. 1-2). Since Sensitive Species 15s have an average burrow occupancy of 1.83 individuals/burrow (Parusnath et al., 2017), the 61 burrows may collectively be home to more than 110 individual Sensitive Species 15s. Importantly, given the large size of the project area (totalling approximately 1000 ha), parts of it remain under-surveyed despite multiple surveys having already been carried out. Nevertheless, the size of the Nooitgedacht Sensitive Species 15 subpopulation can be estimated using the formula derived by Parusnath (2014):

Estimated Total Number of Burrows = Mean Burrow Density (MBD; burrows/Ha) ± 95% Confidence Interval around the mean (CI) x Area of Occurrence (AOO)

The above formula accounts the percentage of the area of natural grassland predicted to be occupied by Sensitive Species 15s (AOO). Since 577 Ha of natural grassland is estimated to be within the project area (Fig. 1-3), and Sensitive Species 15s are predicted to occupy 5.05% of what remains (Parusnath 2014), an AOO of approximately 29.14 Ha is estimated. By adapting the above formula to be in line with the mean burrow density (MBD) from our surveys to date (2.22 ± 1.56 burrows/Ha), it is estimated that as many 110 Sensitive Species 15 burrows might occur within the project area. Thus, any decisions pertaining to the Nooitgedacht Sensitive Species 15 subpopulation should not be limited to just the number of burrows located during our surveys.

The final appropriate algorithm for calculating the size of the Nooitgedacht subpopulation is (Alexander, 2026):

Total mature individuals = ((MBD ± 95% CI x AOO) – 14.28%) x BOI) x 0.612

1.3 Legislative and Regulatory Frameworks

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 A list of key legislative requirements relevant to biodiversity and conservation in the Free State Province

Region	Legislation / Guideline	Comment

National	National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004)	Provides for the management and conservation of South Africa's biodiversity and protection of species.
	National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)	Framework for environmental management and conservation, including EIA requirements.
	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)	Regulates the protection and management of protected areas.
	National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)	Provides for the prevention and control of veld, forest, and mountain fires.
	Animal Protection Act, 1962 (Act No. 71 of 1962)	Provides for the prevention of cruelty to animals.
	Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983)	Regulates the conservation of soil, water resources, and vegetation.
	National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Provides for the protection and management of South Africa's heritage resources.
	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	Regulates waste management to protect health and the environment.
	Threatened or Protected Species (TOPS) Regulations, 2007	Regulates the permit requirements for activities involving threatened or protected species.
Provincial	Free State Nature Conservation Ordinance, 1969 (Ordinance No. 8 of 1969)	Regulates the conservation of fauna and flora within the Free State province.
	Free State Environmental Implementation Plan (EIP)	Outlines the provincial strategy for environmental management and sustainable development.
	Free State Biodiversity Plan	Provides guidelines for biodiversity conservation and land-use planning in the Free State.
	Free State Provincial Spatial Development Framework (PSDF)	Guides spatial planning and land-use management to promote sustainable development.
	Free State Provincial Environmental Management Framework (EMF)	Provides a framework for integrated environmental management in the province.
	Free State Provincial Climate Change Response Strategy	Outlines the provincial approach to mitigating and adapting to climate change impacts.

2 Background Knowledge

2.1 Species description

The Sensitive Species 15 is an exclusively terrestrial lizard belonging to the Family Cordylidae (cordylids). As noted in Section 1.2, *Sensitive Species 15* has a restricted South African distribution, occurring naturally in the northern Free State and the southernmost part of Mpumalanga. Within this limited range, Sensitive Species 15s are strongly associated with intact natural grassland habitat and are regarded as extreme habitat specialists (Stanton-Jones et al., 2024). This ecological specialisation translates into a high sensitivity to changes in grassland condition and structure across the species' range. Individuals construct their own burrows which are used as long-term, often permanent refuge sites (Stanton-Jones et al., 2023). Because of this life history trait, Sensitive Species 15s appear to be highly selective on where they choose to excavate their burrows. Their burrows are associated with short grass patches where vegetation cover is low and seem to occur in sandy soil which might support burrow construction (Stanton-Jones et al., 2024). Among the largest members of the Cordylidae family, the species reaches ca. 40 cm in length including the tail. Sensitive Species 15s have heavily armoured bodies which are covered in thick and spiny scaled scales. This armour extends to the tail which serves as a primary mode of defence against burrow intruders.

Sensitive Species 15s are diurnal (active during daylight), ambush hunting Sensitive Species 15 that spend substantial time basking in direct sunlight, where they modify posture and orientation to facilitate their thermoregulation requirements (Stanton-Jones et al., 2018). This also aids in the synthesis of Vitamin D (Parusnath, 2020). Sensitive Species 15s use their burrows for shelter from extreme temperatures, to regulate body temperature through shuttling behaviour, and to escape from predators. Consistent with their strong burrow dependence, most surface activity occurs close to the burrow entrance - typically within ~2 m (Van Wyk, 1992). While individuals may range further during mating movements (Ruddock, 2000) or occasional foraging bouts, movements are generally limited, reinforcing the species' high site fidelity and the importance of suitable burrow-site conditions. Research has also noted characteristics and behaviour in the Sensitive Species 15 which is predicted to be linked to some form of social structure, however this is still not yet well understood (Ruddock, 2000; Parusnath, 2020). However, their burrows appear to play a pivotal role in their social organization, including activities related to offspring rearing (Parusnath, 2020). Sensitive Species 15s are thought to also be the first African lizard known to exhibit kin-based sociality, or family living (Parusnath, 2020) but this could, on the contrary, be a result of low dispersal rates. Juveniles share burrows with either the male or female parent, full-siblings, and occasionally distant relatives (Parusnath, 2020). It has been hypothesised that the young may receive a degree of parental care through protection from conspecifics, burrow sharing and social learning. More research in these areas is needed to confirm the legitimacy of the hypotheses. Sensitive Species 15s are also known for exhibiting territoriality, with common behaviours including head-bobbing and tail lashing.

2.2 Life Cycle and Diet

Life cycle and diet are key aspects to consider when making conservation decisions as these can inform a more robust and species-relevant action plan, particularly for a habitat specialist species such as the Sensitive Species 15.

2.2.1 Reproduction

Sensitive Species 15s are known to breed during the spring and summer months (Van Wyk, 1991), which are September to February in its home range, with males engaging in courtship displays which may involve pushing its body up and down, head-bobbing, and waving of the tail (Parusnath, 2020). The species is viviparous, a trait relatively uncommon amongst reptiles. This means that the Sensitive Species 15 give birth to live young, generally one or two offspring produced by a female after gestation periods lasting several months. Importantly, Sensitive Species 15s may only reproduce every second

year provided that that environmental conditions are suitable (Van Wyk, 1991). This trait may be particularly important when making decisions around the conservation of the species. The young, known as neonates, are relatively large at birth and although they have a similar appearance to adults, their spines are not well pronounced, and their tails have a red colouration which is thought to aid in predator deterrence. Offspring are known to inhabit burrows with the parents for several years, and reach sexual maturity at around four to five years of age. The average life expantancy of the species , in the wild, is 21 years (Stanton-Jones et al., 2023)

2.2.2 Diet & Predation threats

Sensitive Species 15s are relatively sedentary, using a sit-and-wait (ambush) foraging strategy centred on the burrow area. Because of their foraging lifestyle, they are generalist feeders of insects and a variety of other invertebrates (Van Wyk, 1992). Known dietary choices range across six major taxa namely:

- Coleoptera (beetles)
- Diplopoda (millipedes)
- Hemiptera (true bugs)
- Hymenoptera (e.g., wasps, ants and bees)
- Orthoptera (grasshoppers, locusts, and crickets)
- Lepidoptera (e.g., butterflies and moths).

The natural predators of Sensitive Species 15 may include, but are not limited to, larger mammals and birds of prey such as yellow mongoose (*Cynlctis panlcillata*), meerkat (*Suricata suricatta*), secretary bird (*Sagittarius serpentarius*) and rinkhals snakes (*Hemachatus haemachatus*).

2.3 Threat and Population Analysis

The Sensitive Species 15 is listed as ‘Vulnerable’ according to the IUCN Red List of Threatened Species (Alexander et al., 2022). The most recent population assessment of the species reports a decline of nearly 50% from the historical population with habitat transformation and illegal harvesting cited as significant contributing factors (Parusnath et al., 2017). While Parusnath et al. (2017) assessed broadscale changes to the whole Sensitive Species 15 population, Stanton-Jones et al. (2023) assessed site specific changes and found that the abundance of Sensitive Species 15s at sites associated with habitat transformation (e.g., mining and severe overgrazing) had reduced by more than 50%. The findings also suggest that given the widespread fragmentation of habitat across the species range, the current size of the population might be an overestimate (Stanton-Jones et al., 2023). Thus, careful conservation decisions are recommended.

In general, the following factors contribute to the threatened status of Sensitive Species 15s:

- Habitat destruction – Large areas of grassland habitat of the Sensitive Species 15 has been converted for agriculture (e.g., sunflower and maize). Underlying coal beds which differ in quality and extent on grassland habitats leads to coal mining. Gold mining is another activity that occurs within the species range. More recently, because of the open landscape, renewable energy developments (e.g., solar and wind) are becoming prevalent within the species range;
- Illegal exploitation – Sensitive Species 15s are illegally harvested from the wild for both the African traditional medicine market and the pet trade (Parusnath, 2014; Moshoeu, 2017);

- Poisoning – Sources of poisoning include the fumigation of burrows to control mongooses and meerkats, agricultural pesticides on farms and heavy metals from mining (McIntyre & Whiting, 2012; Bates et al., 2014);

- Poor fire management practices (this has been broadly discussed for grassland reptiles but not specifically with Sensitive Species 15s (Masterson, Maritz & Alexander, 2008); and

- Livestock overstocking which may lead to poor grazing management regimes and severe overgrazing (Stanton-Jones et al., 2023). Conversely, under grazing can result in taller grasses surrounding Sensitive Species 15 burrows and may negatively affect foraging, thermoregulatory opportunity, vulnerability to predators, and other effects which have not yet been studied extensively.

Sensitive Species 15s are listed on CITES Appendix II and Vulnerable in the latest Conservation Status of the Reptiles of South Africa, Eswatini and Lesotho (Alexander et al., 2023). They are nationally protected through the list of Threatened or Protected Species, commonly known as a 'TOPS Species'.

2.3.1 Habitat Requirements

Sensitive Species 15s are a unique species among the cordylids. While most cordylid species are rupicolous (living in rocky habitats where they use holes under rocks or rock crevices as shelter), Sensitive Species 15s are one of only a few cordylid species that specialise in living in flat or sloping Highveld Grasslands where they excavate their own burrows (Van Wyk, 1992; Mouton, 2014). They are habitat specialists that have strict microhabitat requirements (Stanton-Jones et al., 2024). Although there are many unknown factors, some key habitat characteristics of Sensitive Species 15s include:

- Geographic location
- Vegetation type and structure
- Burrow characteristics
- Soil composition
- Social structure
- Anthropogenic land use
- Environmental contaminants
- Distance from human infrastructure or other disturbance factors
- Other threats (predators and poaching)

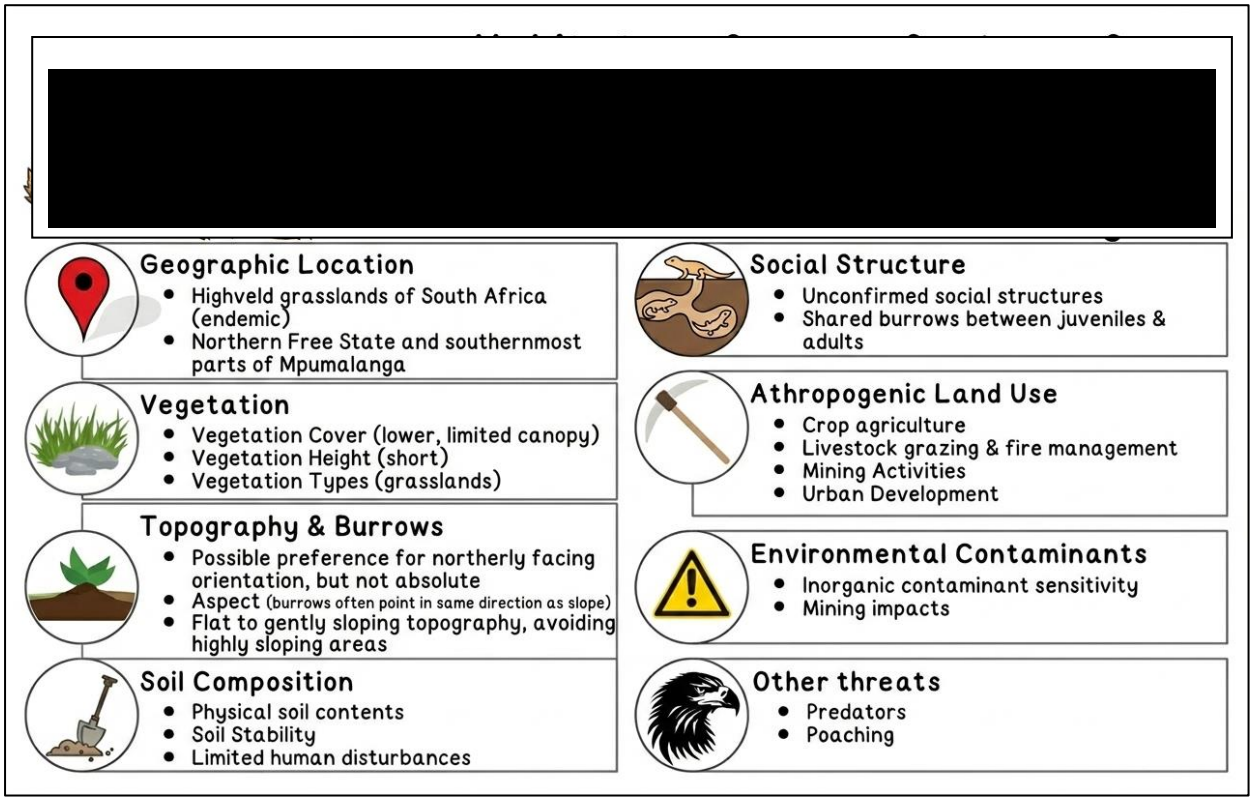

Figure 2-1 A diagram illustrating the Habitat Preferences of Sensitive Species 15

The following criteria are required with regards to suitable Sensitive Species 15 habitat:

- Short, flat primary grassland dominated by red grass (*Themeda triandra*), with little to no tree and shrub cover; Soils where sand and clay are the main components are preferred and soil with adequate stability for digging and maintaining burrows;
- Sites where insect prey congregate (e.g., termite mounds and cattle dung);
- Sensitive Species 15 colonies can persist in areas with moderate levels of grazing by wild herbivores and/or domestic livestock such as cattle;
- Flat topography, avoiding highly sloping areas;
- No water sources required, as Sensitive Species 15s normally receive all their water intake through the prey they consume and dew that may be on the surrounding vegetation;
- A recent study also showed that Sensitive Species 15s have a preference for constructing northerly-facing (N, NE, NW) burrows, but that some burrows may face in the remaining compass directions. More importantly, however, burrows tend to point in the same direction as the aspect of the slope (Stanton-Jones et al., 2024).

Of particular reference for a Sensitive Species 15 monitoring, management, and implementation plan, is that Sensitive Species 15s appear to occupy only primary grassland areas and there are currently no records of them re-colonising secondary grassland. Thus, destruction or transformation of natural grassland is regarded as a permanent loss of suitable habitat for the species. Any proposed action plan (e.g., translocation) for this will only be undertaken if there are suitable existing primary grassland areas adjacent or near to the site that are not already occupied by other Sensitive Species 15 colonies beyond carrying capacity.

Furthermore, if it can be demonstrated how to translocate effectively, the option to translocate to secondary grassland in the future may be worth exploring. At present, however, translocation to secondary grassland is not proposed as part of the current translocation process and should be regarded only as a possible future research or adaptive management consideration.

2.3.2 Illegal Trade

The illegal trade of live Sensitive Species 15s is of serious concern for this species of lizard and the trade in wild-caught individuals is highly unregulated. Sensitive Species 15s are characterised by having a slow reproduction rate, with individuals only reaching sexual maturity after approximately 5 years and producing 1-3 offspring, every 2-3 years (Van Wyk, 1992). The majority of Sensitive Species 15s that are illegally traded are reported as “captive-bred”, but there is a huge discrepancy between the number of substantiated breeding records and the number being traded annually, leading to the extremely high likelihood of wild-caught individuals being laundered as ‘captive-bred’ (Loehr et al., 2016). This poaching for the illegal wildlife trade continues to pose a significant threat to this species.

2.3.3 Translocation Efforts

At present, and although not well-documented, translocations of Sensitive Species 15s from their natural habitat, even into areas with a similar habitat, have not been proven successful, nor entirely unsuccessful even in the short term.

2.3.3.1 History of Sensitive Species 15 Translocations

In one of the most well-documented translocation efforts, a population of Sensitive Species 15s was removed from a particular area and was relocated into the Golden Gate Highlands National Park, following a hard-release strategy. Forty-nine (49) days after translocation, burrow occupancy rate was documented as low as 10% (Groenewald, 1992). Less than 2% of Sensitive Species 15s were estimated to survive the translocation in the two years following the translocation (Parusnath, 2014). However, follow up surveys (and monitoring regimes) have not been done, and there is the possibility that the Sensitive Species 15 dispersed into new areas and have not been found. Nevertheless, the success rate of the translocation is probably still very low.

- *The low burrow occupancy observed in previous Sensitive Species 15 translocations **directly informs the monitoring design for this project**, underscoring the need for intensive early post-release monitoring to distinguish between mortality, dispersal, failure to adopt release burrows, and successful settlement elsewhere within the recipient site.*

The low success rates observed in prior translocation efforts have been correlated with the inappropriateness of artificially constructed burrows and the disturbance of familial and social dynamics within the colony.

- It has been reported that translocated Sensitive Species 15 generally did not make use of the artificial burrows created for them with soil augers with some individuals having travelled as far as 1000 m from the initial point of translocation, exposing themselves to predation by avian predators such as Secretary Birds, terrestrial mammals such as Yellow Mongoose and other threats (Groenewald, 1992), with poaching not excluded.

- Adult females, which are known to share burrows with neonates, (Branch and Patterson, 1975; De Waal, 1978; Van Wyk, 1992) were found to abandon them upon translocation (Groenewald, 1992). This likely had a detrimental impact on the social dynamics of the translocated population especially considering that neonates can live in the same burrows as their parents until sexual maturity is reached (ca. 4–5 years of age).

- In addition, the failure rate of translocations may also be attributed to a hard release translocation protocol and a lack of effective monitoring programmes. Nevertheless, the establishment of a robust and effective translocation protocol has been advocated in the works of Van Wyk (1988), Mouton (2014), Parusnath (2014), Parusnath (2020) and Stanton-Jones (2023). However, the latter three studies, which have significantly advanced scientific knowledge on the species over the last decade, recommend a cautionary approach whereby new translocation efforts that take into account the latest scientific knowledge are trialled on a small Sensitive Species 15 subpopulation or aggregation.

2.3.3.2 Risks and Challenges Associated with Future Sensitive Species 15 Translocations

Translocation operations in general are difficult to implement and not free from risks. For a species such as the Sensitive Species 15 that has a history of translocation failures, the risks may be exacerbated, particularly if translocations are implemented on a large scale as would be the case with the Nooitgedacht Sensitive Species 15 subpopulation. Below are some important risks and challenges to be aware of but note that the list is not exhaustive:

- **Size of available suitable habitat.** Much of Sensitive Species 15 suitable habitat is in fragmented state. Thus, finding suitable habitat that is large enough to accommodate the Nooitgedacht Sensitive Species 15 subpopulation, and avoids disruptions to existing Sensitive Species 15 aggregations at the receiving site, may be challenging. The carrying capacity of the receiving site may also need to be evaluated.

- **Distance to the source subpopulation.** Moving Sensitive Species 15s too far away from their current location may impose genetic, behavioural, physiological, and ecological risks. Ideally, a translocation should mimic the natural movement patterns of Sensitive Species 15s. To date, some Sensitive Species 15s have been observed moving distances of nearly 1.5 km (Stanton-Jones, *Pers Obs.*), and on average individuals are reported to move on average 123 ± 207 m (Stanton-Jones et al., 2023). Clearly, mimicking natural movements for a large-scale translocation of this species is unrealistic and not feasible, but it is recommended that the receiving site be as close to the source population as possible.

- **Distance to existing Sensitive Species 15 aggregations.** Moving Sensitive Species 15s into an existing Sensitive Species 15 aggregation is predicted to likely impose serious social, genetic and health risks, particularly if the existing aggregation is far from the aggregation that is to be moved. Thus, identified receiving sites, or suitable habitat, needs to be between 50 m to 130 m (rounded mean the average distances moved; Stanton-Jones et al., 2023) away from existing Sensitive Species 15 aggregations.

- **Disruption of social structure.** Sensitive Species 15s may have some form of social structure, but this has not been explicitly studied. Changes to burrow orientations and positioning in relation to neighbouring burrows might have an impact on social structure which in turn may influence reproduction ability. At present, this cannot be confirmed as a significant factor in Sensitive Species 15 ecology and is difficult to account for in a large-scale translocation.

- **Artificial burrow rejection.** Sensitive Species 15s have extremely high burrow fidelity considering that they can live in a single self-constructed burrow for almost their entire life (estimated to be more than 21 years in the wild; Stanton-Jones et al., 2023). Thus, the risk of artificial burrow rejection by Sensitive Species 15s appears to be high, and this has also been reported in previous translocation efforts (e.g., Groenewald, 1992). Should rejection occur, the risk of Sensitive Species 15s being predated upon is increased.

- **Transmission of potential diseases and parasites.** Translocated individuals may carry parasites or pathogens to existing fauna which may have no resistance. Similarly, translocated Sensitive Species 15s may be exposed to a new suite of parasites or pathogens at the receiving site. This also signifies the importance of choosing a receiving site as close to the source population as possible.

- **Landowner involvement.** Finding landowners who would be willing to receive a large population of Sensitive Species 15s might be challenging. It would mean that landowners cannot alter the portion of land demarcated for Sensitive Species 15s in the future, and landowners need to be made aware of this. In addition, landowners would need to agree to increased human activity through extensive monitoring programmes of a translocation which would possibly be several years long.

- **Future developments.** Amongst mining and agricultural developments, the habitat in which Sensitive Species 15s occur is also prone to renewable energy developments (e.g., solar and wind). These developments will likely increase over the next few years which poses another significant threat to remaining Sensitive Species 15 habitat.

- **Logistical challenges.** Implementing a large-scale translocation would require a very large team that is composed of *inter alia*, Sensitive Species 15 experts, ecologists, soil experts and environmental officers. Artificial burrow construction needs to be carefully considered with cognisance to previous translocation failures. Equipment is needed for a soft release translocation. An extensive monitoring programme is needed which will likely be several years long.

- **Low chance of success.** Reptile translocations are widely associated with low and uncertain success rates, with many reported attempts either failing or lacking sufficient long-term data to confirm success (Dodd and Seigel, 1991; Germano and Bishop, 2009). Previous attempts to translocate Sensitive Species 15s have also reportedly been unsuccessful (e.g., Groenewald, 1992). Importantly, translocation success should not be measured solely by short-term survival after release, but rather by whether individuals settle, exhibit normal behaviours, survive over time, and, ideally, contribute to a persistent population.

    - For this reason, monitoring should include:

        - **Phase 1 (suggested 0 to 6 months post-release):** an intensive early post-release phase focused on survival, burrow use, movement, and settlement,

        - **Phase 2 (suggested 6 to 24 months post-release):** This should be followed by longer-term follow-up, where feasible, to assess persistence and any evidence of reproduction. Given the life history of Sensitive Species 15s, longer-term monitoring is desirable, but the exact duration and frequency should be determined adaptively and in accordance with available resources and the outcomes observed during the initial monitoring period.

        - **Phase 3 (suggested 2 to 5 years post-release):** Periodic longer-term checks, subject to outcomes and feasibility.

3 Translocation Strategy (*in-situ*)

With cognisance of the many risks and challenges associated with translocations, the operation should only be carried out if it is assessed as the most appropriate management protocol. If Environmental Authorisation is granted and a translocation of the Nooitgedacht Sensitive Species 15 subpopulation is approved, then this section details the methodology that should be applied. Because of the large number of Sensitive Species 15s that may need to be translocated, and given the history of unsuccessful translocation attempts, a research opportunity trialling different methods may be implemented. It is also important to note that adaptive management will be necessary for the duration of the potential translocation.

As suggested by Parusnath (2020) and Stanton-Jones (2023), the following broad-scale factors need to be taken into consideration when attempting a translocation on Sensitive Species 15s:

1. Within-burrow and between-burrow social structure for those located in close proximity.
2. Burrow structure and why Sensitive Species 15s appear to require self-dug burrows.
3. Spatial distribution of Sensitive Species 15s.
4. Environmental variables and climate envelope required by the Sensitive Species 15.
5. Factors driving burrow site selection by Sensitive Species 15s.
6. Future predictions of habitat suitability in relation to climate change.

3.1 Target Sensitive Species 15 Aggregation Monitoring

The Nooitgedacht Sensitive Species 15 subpopulation requires initial monitoring protocols. These serve a dual purpose: firstly, to monitor the existing Sensitive Species 15 aggregations within the development area (pre-translocation), and secondly, to inform the monitoring of post-translocation Sensitive Species 15 movements within the new designated site. The aim therein is to provide a thorough assessment of the current on-site Sensitive Species 15 subpopulation and their responses to potential translocation.

- The initial phase of monitoring involves basic surveying of the existing colonies on the development site. This baseline assessment must characterise the existing populations by gathering data on population density, spatial distribution, and habitat utilization. Observations of behaviour, such as basking patterns and foraging behaviours, are not essential but where possible will also be recorded.
- These baseline data not only offer critical insights into the demographics of the on-site Sensitive Species 15 aggregations but also serve as a reference point after carrying out the translocation procedure.

The priority is to gather data on population Density and Distribution:

- Conduct initial surveys to estimate the population density of Sensitive Species 15s within the development area.
- Thorough identification of active burrows will be paramount.
- Detection of every burrow and total Sensitive Species 15 inhabitants across this large development area is challenging, and therefore consideration of uncounted Sensitive Species

15s is required. Based on previous studies, population size can be estimated using a calculation of 1.83 Sensitive Species 15 per active burrow (Parusnath, 2014).

- Map the spatial distribution of lizard aggregations and key habitat sites – this is of particular importance for isolated colonies which have little or no chance of natural migration to other existing aggregations. Such genetically isolated aggregations would be prime candidates for translocation efforts.

- The use of camera traps at the Sensitive Species 15 burrows is recommended as a pre-construction measure to try and ascertain a rough estimate of the population and lizard abundance within burrows.

    - Drone-based remote sensing was not investigated for this project, given the species' cryptic behaviour, close association with burrows, and the influence of environmental conditions on detectability. Based on the ecology and behaviour of the species, it is not currently considered a sufficiently reliable standalone method for estimating Sensitive Species 15 abundance or burrow occupancy and is therefore not proposed in place of direct burrow-based monitoring approaches (but can be investigated as a supplementary measure).

- Use of endoscopic cameras to assist with estimating the number of occupied Sensitive Species 15 burrows in each aggregation is also recommended. Note: since the camera becomes difficult to control at depths > 1 m into the burrow, if a Sensitive Species 15 has not been seen at that point, an inactive burrow should not be assumed.

3.2 Site Selection (Preliminary)

The initial step of undertaking a fauna translocation is to identify a suitable recipient site with similar habitat characteristics to the source site. The new site for the subpopulation should also be as close to the source subpopulation as possible. Selection of the translocation site will be based on the results of field surveys to the various potentially suitable sites. A thorough ecological assessment must be conducted to confirm the site's suitability, focusing on existing flora and fauna, soil characteristics and quality, vegetation type, vegetation cover, vegetation height, microclimate conditions, grazing management, and the activity of humans and potential predator species.

3.2.1 Habitat Suitability

The new translocation site should, wherever possible, emulate the original habitat of the Sensitive Species 15 subpopulation. Where this is not possible, it is essential that the habitat falls within the acceptable parameters of known preferred Sensitive Species 15 habitat characteristics.

- Use the habitat suitability model developed by Stanton-Jones and Alexander (2024) for initial broad-scale scoping of suitable habitat. Consider the predictions of future suitable habitat under climate change.
- Conduct a **habitat suitability index (HSI)** analysis to quantify habitat suitability.
- Consider the proximity to existing Sensitive Species 15 aggregations to prevent genetic isolation but also to prevent unnecessary competition (e.g. for available food resources).
- Document the broad context of composition, structure, and quality of Sensitive Species 15 habitats – bearing in mind that at this stage Sensitive Species 15s have not been documented to re-populate secondary grassland areas.
- Collect general information about characteristics of vegetation surrounding the current colonies including vegetation density, species composition, and grass cover (where necessary/feasible or where available from Environmental Impact Assessment (EIA) studies).
- Identify suitable receiving areas for translocations based on the vegetation composition, terrain, aspect and soil structure that is present at existing colonies within the project area.

Key habitat features to consider and emulate where possible, as mentioned in the previous introductory section, includes:

- Geographic location and aspect
- Vegetation type, structure and grass cover, including grazing intensity (well-managed grazing regimes are ideal).
- Burrow characteristics
- Soil composition
- Social structure or characteristics of the Sensitive Species 15 aggregations (where feasible)
- Anthropogenic land use
- Environmental contaminants

- Distance from human infrastructure or other disturbance factors
- Other threats (predators and poaching)

3.2.2 Threats to Survival

Ensure that the receiving site has restricted potential threats wherever possible (e.g., invasive species, pollution, severe overgrazing and high predator numbers).

- **Anthropogenic Threats:** Select areas free from ongoing threats such as development, agriculture, and mining. Ensure minimal presence of invasive species that could compete with or predate on the translocated Sensitive Species 15.
- **Predation:** Consider the presence and activity of potential predator species. Previous studies have shown predation by yellow mongoose, suricate, secretary bird, and rinkhals. Consideration should also be given to elevated structures (e.g., powerlines and fences) that that would not naturally exist within Sensitive Species 15 habitat. Such structures may serve as perching sites for some birds of prey and should therefore be avoided where possible.

3.2.3 Long-term Habitat Sustainability

Evaluate the potential for long-term habitat stability, considering climate change projections and land-use plans. Preference should be given to areas under legal protection or with strong community conservation support (e.g., the Sensitive Species 15 Custodianship programme).

3.2.4 Results from Site Assessments

The aforementioned assessments are required for the Nooitgedacht Sensitive Species 15 subpopulation's current location as well as the proposed receiving location of the Sensitive Species 15s.

- **Ecological Surveys:** information available across factors covered in section 3.2.1 to 3.2.3.
- GIS Mapping:
- Use Geographic Information Systems (GIS) to map potential relocation sites, aiding in visualizing habitat suitability and planning logistics.
- Map out existing burrow aggregations that are to be grouped into clusters for a soft-release translocation strategy.
- Map burrow aggregations occurring within the potential translocation site and apply a 50 m buffer of avoidance of existing Sensitive Species 15s.

3.3 Site Preparation

Site preparation establishes the habitat conditions and risk controls needed to support Sensitive Species 15 settlement and persistence at the recipient site. This section describes measures to replicate key habitat features (notably burrow provision/orientation and suitable grassland structure) and to reduce avoidable disturbance and mortality through appropriate security, surveillance, and access control. It also outlines how engagement with local authorities and the public will support compliance and long-term protection of the site.

Table 3-1 Site Preparation for the translocation procedure

Aspect	Considerations	Description
Replicating and Enhancing Habitat	**Burrow Construction and Orientation**	**Artificial Burrows:** Engineer artificial burrows that mimic natural burrow structures (based on field notes and endoscope assessments), considering dimensions, depth, and entrance orientation with its relationship with the slope of the land. Use a paired design to compare microhabitat characteristics between Sensitive Species 15 burrows and random sites.
		Abandoned burrows: Some burrows may be present at the translocation site that are no longer utilized by Sensitive Species 15s and could provide potentially suitable burrows for the translocated individuals. These should only be considered if identified at least 130 m away from an existing Sensitive Species 15 colony.
		Territorial Spacing: Ensure burrows are distributed to mimic natural territorial spacing and social structuring. Sensitive Species 15s exhibit site defence and differential recognition of neighbours, which should be considered in burrow placement.
	Vegetation Management	**Shelter and Foraging:** Enhance vegetation to provide shelter, foraging opportunities, and thermoregulation sites. Introduce native plant species if necessary to restore or improve habitat conditions. Ensure that controlled grazing regimes are present to keep grass height reduced. During the initial phase of the soft release, grass height may need to be controlled with anthropogenic interference.
Security Measures at the receiving property	**Physical Security (fencing, signage)**	**Fencing and Signage:** Install and/or conduct maintenance checks on fencing of the property receiving the Sensitive Species 15s to prevent unauthorised access and ensure the safety of the Sensitive Species 15 from human interference and larger predators. Avoid using signage as this can put the animals at risk.
	Surveillance and Access control options	**Monitor** for poaching activities and disturbances. Engage local authorities and community members to contribute to surveillance and preventative efforts. **Limit access** to authorised personnel only and maintain a log of entries and exits to the site. Any personnel should be searched upon entering and exiting the site. Provide training, if deemed necessary, for staff and volunteers on security protocols.
	Engage with local authorities and public	**Governmental authority:** Ensure compliance with legal requirements and obtaining necessary permits. Considerations should be given to classifying the receiving property of the Sensitive Species 15s as a form of legally Protected Area. **Non-Governmental Organizations (NGOs):** Collaborate with conservation NGOs that have expertise in reptile conservation and habitat management (e.g. EWT). **National Zoo**: Collaborate with the National Zoological Gardens, Pretoria with advice on artificial burrow construction and the husbandry of Sensitive Species 15s in enclosures. **Academic Institutions:** Partner with universities and research institutions for scientific support and monitoring. **Landowners:** Propose that landowners with Sensitive Species 15s on their properties, especially where Sensitive Species 15s have been translocated to their land, become Sensitive Species 15 Custodians (an EWT initiated programme)

3.3.1 Burrow Preparation Options

Artificial burrows may be required at recipient sites to provide immediate refuge and to increase the likelihood of site adoption by translocated *Sensitive Species 15* individuals. The options outlined below are intended to approximate the form and function of natural Sensitive Species 15 burrows while remaining practical to implement under field conditions and adaptable to local soils, slope, and vegetation structure. These approaches should be applied as part of a staged, trial-based preparation programme, with final specifications refined using measurements from reference (natural) burrows in

the donor area and early monitoring feedback from the recipient site (Stanton-Jones et al., 2024; Stanton-Jones, 2023).

3.3.1.1 Option 1: "Starter burrow" approach (encouraging natural completion)

Under this approach, the team constructs only a short, correctly oriented "starter" burrow (i.e., a naturalistic entrance in the same orientation as the original burrow, and the initial tunnel segment aligned to the local slope/aspect and sized against reference burrows), approximately 30-40 cm deep and at a 30° angle to the surface. This option is intended to provide immediate refuge while allowing individuals - where soil conditions are suitable - to modify and maintain the burrow over time rather than relying solely on an engineered end-state. To encourage acceptance of these burrows, a sample of soil from the original burrow should be placed inside the partially-constructed burrow and moulded to the surface (this is to account for any chemical marking of burrows; see Ruddock, 2000). Placement of burrows should prioritise microhabitat conditions consistent with natural burrow-site selection (e.g., north-facing slopes with northerly-oriented entrances, and relatively short/low-cover grassland structure), as these cues may be as important as tunnel form in driving adoption.

- This method is best applied where soils are suitably friable for excavation/maintenance and where post-release monitoring can confirm occupancy and any subsequent modification.

3.3.1.2 Option 2: Flexible "former" method (shape-and-withdraw to leave a natural void)

- This method uses a temporary mould/filler foam ("former") to create a consistent tunnel profile without leaving permanent artificial materials in the ground. In practice, the tunnel would be shaped around a removable sleeve placed at the target angle and orientation, after which excavated soil would be repacked around the former before it is withdrawn to leave an internal space approximating a naturally excavated void. Burrow placement would, as with all options, need to be prioritised in microhabitats consistent with natural burrow-site selection, notably northerly entrance orientation on north-facing slopes and relatively open, short grass structure.

- Abandoned burrows at the development site could theoretically be filled with foam and then excavated to form a mould for new burrow development. However, this remains a conceptual idea only and has not been tested in the field. The method may compromise the natural structure and stability of repacked soil, increasing the risk of collapse deeper underground and potentially trapping Sensitive Species 15. On this basis, and given the uncertainty associated with acceptance of highly artificial burrow solutions, this approach is not proposed further and is retained here only to record an option that was considered and screened out.

3.3.1.3 Auger + hand-finish (efficient where soils permit)

An auger-assisted method is similar to option 1 and these may be used as a combined approach. The auger method can be used to establish the basic tunnel line efficiently, particularly in well-drained sandy to sandy-loam and clay soils consistent with those associated with natural burrow placement. The augered cavity is then enlarged and shaped by hand to match the entrance geometry and internal texture observed in reference burrows, avoiding a uniform "drilled" surface that may behave differently in terms of moisture and thermal properties.

- This option should be treated as a pragmatic compromise between efficiency and realism, and it should be adapted (or avoided) where soils are prone to smearing, excessive compaction, or collapse. As above, placement in appropriate microhabitat and orientation consistent with known burrow-site selection is likely to be critical to adoption.

- It is highly unlikely that this method can be used to achieve the full Sensitive Species 15 burrow depth of around 2 to 3 metres.

3.3.1.4 Option 4: "Trench-and-roof" burrow (stable construction with a concealed roof)

- The trench-and-roof concept focuses on creating a structurally stable tunnel by forming the burrow void from above and reinstating the surface so that only the entrance remains visible. However, because Sensitive Species 15 burrows are closely associated with naturally suitable soil conditions, areas with soils that are unable to sustain stable burrows should generally not be considered appropriate for translocation. Accordingly, this option should not be regarded as a routine means of compensating for unsuitable soils. If considered at all, it should be limited to highly controlled, trial applications in otherwise suitable habitat, and only where it can be demonstrated that the intervention does not create an internal environment that departs materially from natural burrows.

- Where used, the design intent should remain **soil-defined** (i.e. walls and floor in in situ soil, with a reinstated surface profile and vegetation structure that matches the surrounding microhabitat).

- Investigations would be required into roof materials and construction methods that replicate natural burrow conditions as closely as possible, while also mirroring the tight, narrow structure characteristic of Sensitive Species 15 burrows.

- Any such application should be subject to monitoring and evaluation of uptake, stability, and animal welfare outcomes.

-

3.3.1.5 Option 5: Dual-burrow approach (primary "release" starter burrow + secondary augered refuge)

This option is intended to reduce unnecessary disturbance at the intended burrow entrance while still providing translocated Sensitive Species 15s with more than one refuge opportunity during the settlement phase. Rather than attempting to "micro-bore" a single burrow from an offset pit, the approach involves constructing two burrows in close proximity, each serving a different function.

A primary (release) burrow is prepared as a short, naturalistic "starter" burrow (typically shallow/partial, e.g., ~30–40 cm), with the entrance shape, orientation and immediate entrance microhabitat tidied to closely resemble local natural burrows. A secondary refuge burrow is then created nearby using a large auger at an appropriate angle (e.g., ~30°) to provide a deeper, more immediately secure refuge (indicatively to ~1 m depth, where soils allow). The secondary burrow is not treated as the "showpiece" entrance; it is simply made safe and functional, with minimal but careful blending into the surrounding ground surface.

- Translocated individuals are released to the primary burrow but can adopt, switch to, or modify the secondary burrow if they choose, thereby providing an additional refuge option without requiring extensive engineering of a single artificial burrow.

- As with all burrow-preparation methods, reinstatement must be undertaken carefully to avoid creating preferential runoff paths, erosion features, or entrance conditions that differ markedly from typical natural burrow microhabitats

3.3.2 Soft Release Preparations

Soft-release temporary enclosures will need to be constructed prior to translocation. Such enclosures should be setup within their natural habitat, must allow the free movement of prey items (insects) through the enclosure, and should prevent predators such as birds of prey, mongoose and large snakes.

Key considerations include:

- Transitional Soft Release Enclosures
- Acclimatization Period and Requirements
- Frequent Monitoring
- Release Planning

3.3.2.1 Sensitive Species 15 Burrow Placement and Spacing

Artificial burrow placement and spacing must be considered for settlement success of translocated Sensitive Species 15s, because burrow position influences microclimate, predation exposure, interactions between translocated Sensitive Species 15s, and access to resources. This subsection therefore sets out some principles used to position new burrows to promote successful establishment.

- Temporary enclosures should house burrows that are within approximately 50 m of each other to try and maintain ‘social groups’ as much as possible. The distances between these burrows in the enclosures may vary depending on the number of burrows to be housed in an enclosure. Enclosure fencing should be at a distance of least 5 m away from burrows on the peripheries within an enclosure.
- The buffer is necessary to provide Sensitive Species 15s with additional habitat within the enclosure for them to construct their own burrows should they not accept the pre-dug artificial burrow.
- Maintaining similar patterns of burrow dispersal, however more condensed where required, should be prioritised. This approach also intends to respect any possible social structure or grouping and reduces stress by maintaining familiar group dynamics. In addition, this approach facilitates strategic management and monitoring methods.

3.3.2.2 Soft Release Enclosure Designs

Soft-release enclosures will be established at the recipient site to temporarily retain translocated Sensitive Species 15 individuals at the point of release, allowing acclimation to local microclimate and refuge availability while reducing immediate dispersal and predation risk. The proposed soft release enclosure design is centred around a large-scale, open-air structure concept – offering a significant area of natural grassland habitat for re-establishment. The design is engineered for both structural integrity and biosecurity.

The gaps in the fence need to be large enough to allow invertebrates to pass through, but small enough to prevent juveniles from passing through. A solid barrier should be fixed above the base of the fence. Although a likely low risk, this should prevent the Sensitive Species 15 from attempting to climb out of the soft-release enclosures.

Note that all dimensions included for this enclosure are conceptual and can be reworked to better suit predetermined requirements.

- Each enclosure is square in plan (although rectangular variations may be used depending on how many Sensitive Species 15 burrows are incorporated into an enclosure), with size options including approximately 12 x 12 m for 1-2 burrows, 24 x 24 m for 2-4 burrows, and 30 x 30 m for around 5 burrows, which is expected to be the dominant enclosure grouping in most cases.

- Enclosures will be constructed using a robust mesh fence (with a buried skirt/apron to reduce under-digging and will be installed with minimal ground disturbance outside the enclosed footprint.

- The vertical perimeter fencing stands approximately 1 500 millimetres high and features a dual-layer mesh design with anti-climb materials incorporated.

- A fine-gauge wire mesh (e.g. 15 x 25 mm) is used for the first ~500 mm in height,

- Layered over this, the lower section (B) of the enclosure includes a specialised smooth and clear anti-climb barrier (a suggested material is Perspex) placed over the wire mesh (approximately 100 mm above the ground) to prevent the egress of enclosed Sensitive Species 15s and the ingress of other predators.

- This barrier layer is composed of an internally clear anti-climb panel with a height of 400 mm.

- This panel is positioned with a 100 mm gap from the ground (forming a 100 mm fine-mesh skirt).

- The upper wall section measures 1000 to 1300 mm and will consist of a broader mesh material (e.g. 50 x 50 mm)

- Access to the enclosure is provided via a standard side-mounted pedestrian door with a secure latch, ensuring ease of management and secure closure.

- The mesh roof (matching the 50x50mm specifications of the upper wall sections) covers the entire area span, supported by a central array of interior support posts for structural stability against environmental loads.

- The support beams will be incorporated only where necessary and will need to take on a design that minimises shadows over the interior of the enclosure.

- The internal environment is retained as natural grassland.

The below conceptual designs were created with assistance from Gemini, by Google, and ChatGPT, by OpenAI. These are intended to provide illustrations of how the soft-release enclosures could be constructed, not to represent final construction visualisations.

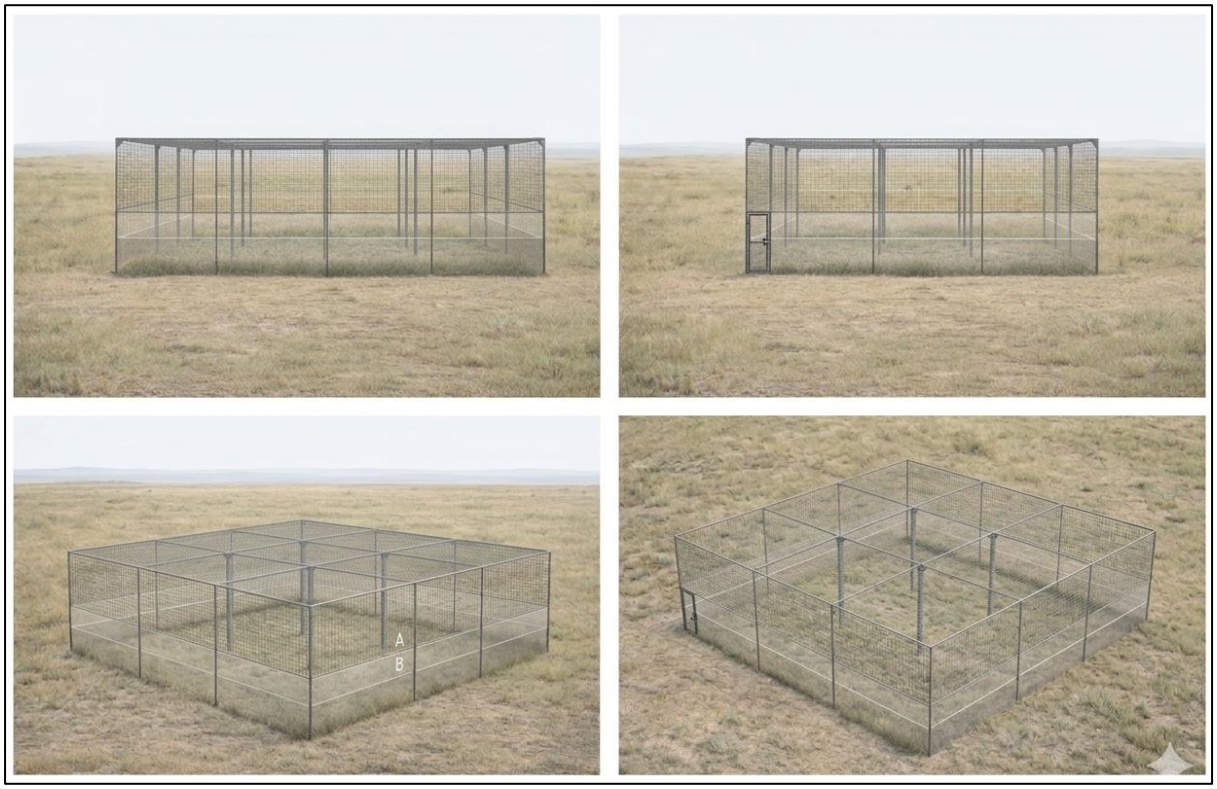

Figure 3-1 ***A 3D design concept of a soft-release enclosure with internal support beams for added stability.***

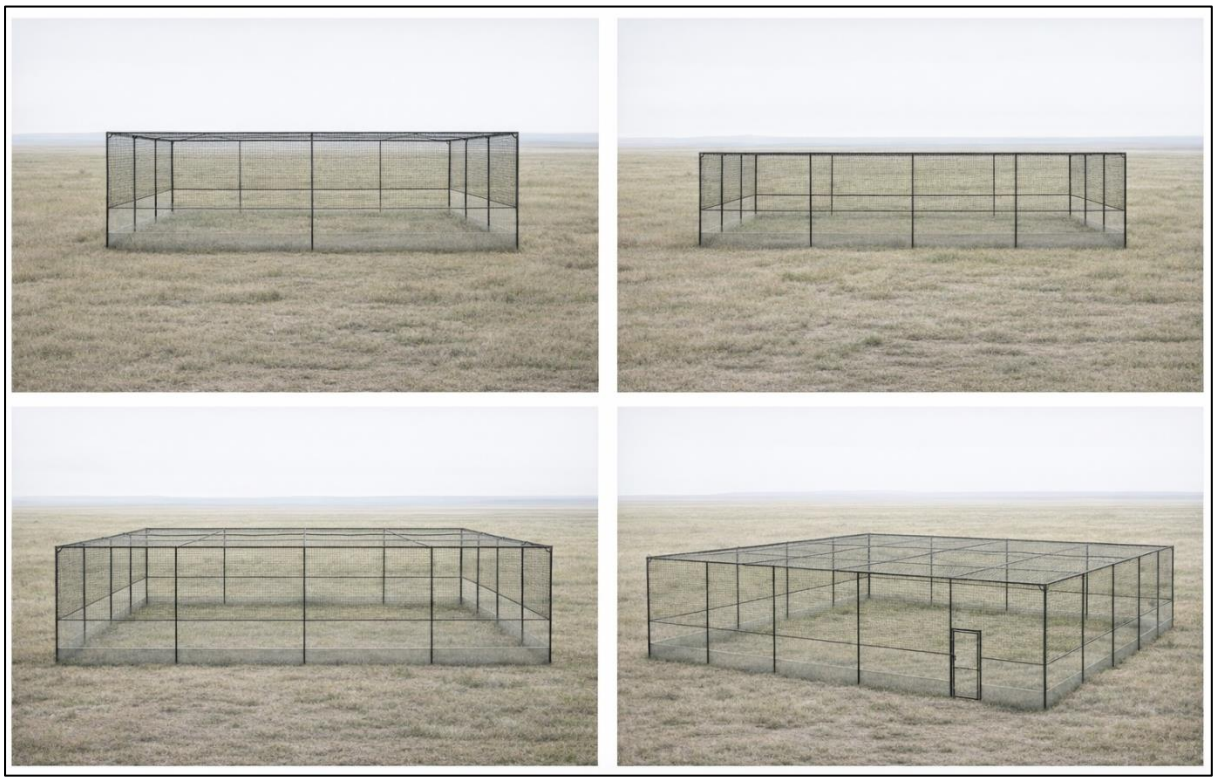

Figure 3-2 ***A 3D design concept of a soft-release enclosure without internal support beams to reduce shadows and internal ground disturbance.***

3.4 Capture and Handling

The key focus during translocation of the Sensitive Species 15 Sensitive Species 15 should be to minimise stress to the animal wherever possible.

- Engage a team of Sensitive Species 15 experts, experienced herpetologists and field technicians for initial search and rescue efforts from the source colony.
- Engage with the National Zoological Gardens, Pretoria for knowledge on artificial burrow construction and husbandry requirements for Sensitive Species 15s.
- All Sensitive Species 15s from the source aggregation must be captured during the operation.
- Given the large number of Sensitive Species 15s to be translocated, a phased approach is recommended focusing on a limited number of burrows at a time.
- All Sensitive Species 15s should be permanently marked with a unique identification number, i.e., a passive integrated transponder (PIT tag), for the purpose of monitoring.
- If feasible, tissue sample should be taken from each individual that will be translocated. These samples should be kept and processed at the National Zoological Gardens, Pretoria.

Table 3-2 Capture and Handling of Sensitive Species 15

Aspect	Considerations	Description
Capture Protocols	**Timing**	• **Peak Activity Period:** Capture individuals during periods where activity is likely to be at the highest. This would be during the Summer and wet season. Carrying this operation out during the wet season means that food will be in abundance and wetter soils will facilitate the natural continuation of Sensitive Species 15 burrows, or the construction of new burrows. Traps should be set up after sunrise.
	Methods	• **Standard Noosing Technique**: An iron nail with two string nooses should be anchored into the roof of the burrow. A noose is placed on either side of the central burrow ridge. Following deployment, traps should be checked at 15-minute intervals. The removal of a Sensitive Species 15 from a noose should be carried out by trained personnel or a Sensitive Species 15 expert. Incorrect extraction of a Sensitive Species 15 from the burrow can lead to physical harm to an individual (e.g., broken tail spines or occipital spines). Following the successful capture of an individual, traps should be redeployed in case there is more than one Sensitive Species 15 in a burrow. Ensure methods avoid disturbing non-target species. • **Digging up Burrows:** A back-up option if there is difficulty with catching the Sensitive Species 15 is to carefully scrape the roof of burrows away, either by hand or with tools and machinery, until the Sensitive Species 15 can be removed. • **At present, no alternative capture methods** such as artificial smoke, scent lures, food baiting, or predator mimics are considered scientifically validated or appropriate for *Sensitive Species 15*. Given the species' strong burrow fidelity, sedentary behaviour, and threatened status, such methods would introduce unnecessary uncertainty and potential welfare risks and are therefore not recommended. Capture efforts should remain limited to established methods implemented by suitably experienced personnel, namely burrow noosing/trapping and, where necessary, careful excavation as a fallback measure.
	Identification and Health Assessment	• **Tagging and Health Checks:** Tag individuals with passive integrated transponders (PIT tags) to give each individual a unique identification number for monitoring.

		Marking with PIT tags should be carried out by a Veterinarian or trained/authorised personnel. Perform health assessments, including checking for parasites, physical injuries, and overall health status. • **Data Collection:** Details such as sex, snout to vent length (SVL), tail length, mass, and number of individuals per burrow must be recorded. A tissue sample in the form of a scale (for adults) and tail tip (juvenile/neonate) should be collected and stored appropriately for processing.
Handling Procedures	**Minimising stress**	• **Gentle Handling:** Handle Sensitive Species 15 gently and for the shortest duration necessary to minimise stress. Use cloth bags or specialised containers for temporary containment during transport.
	Transport Conditions	• **Climate-Controlled Containers:** Prepare climate-controlled containers to maintain appropriate temperature and humidity levels. Containers should be kept cool to minimise stress following capture, data processing and during transport. Ensure adequate ventilation and avoid overcrowding during transport. Cloth bags and containers need to be appropriately marked to ensure that all captured individuals from the same burrow are kept together and released together at the same new burrow. • **Transport procedure:** Establish methods of physically transporting the Sensitive Species 15 between sites, wherever possible facilitating low-stress environments for the animals and ensuring safety and injury-prevention. Artificial burrows and temporary soft-release enclosures should be set up prior to catching Sensitive Species 15 from the source population. This is to ensure that Sensitive Species 15 are moved to their new location within the shortest time possible to minimise stress.

3.5 Regulatory and Ethical Considerations

No translocation of Sensitive Species 15s may be undertaken without the prior approval of the relevant provincial and national authorities, as well as consultation with appropriate conservation bodies such as the Endangered Wildlife Trust (EWT). Any such translocation may only proceed once all required permits have been issued by the competent authorities and, where applicable, formal ethics approval has been obtained from a recognised ethics committee.

The following translocation guidelines and recommendations are expressed under the assumption that the above permissions will have been granted by relevant authorities.

4 Target Translocation Site: Portion 0 of the Farm Hendrik se Nijl 106

Portion 0 of the farm Hendrik se Nijl 106 was assessed as a potential recipient site for the translocation of Sensitive Species 15s from the Nooitgedacht project area. A habitat suitability assessment and field survey for Sensitive Species 15s on Portion 0 of the farm Hendrik se Nijl 106 was undertaken by Prof. Graham Alexander and Dr. Wade Stanton-Jones in April 2026 (Alexander & Stanton-Jones, 2026). The property is located adjacent to, or in close proximity to, Nooitgedacht and falls within the same western genetic clade as the Nooitgedacht Sensitive Species 15 subpopulation, which is favourable from a translocation perspective as it indicates broad genetic and biogeographic compatibility between the source and recipient areas (Parusnath, 2020; Alexander et al., 2023).

4.1 Summary of Key Findings

The assessment of Hendrik se Nijl 106 identified several attributes that support its consideration as a potential recipient site.

Key positive findings:

- The property is located in close proximity to the Nooitgedacht project area.
- The site falls within the same western genetic clade as the Nooitgedacht Sensitive Species 15 subpopulation (Parusnath, 2020; Alexander et al., 2023).
- Relatively extensive areas of primary grassland remain on the property.
- Habitat considered most suitable for Sensitive Species 15s was identified particularly within the north-western portion of the property.
- Habitat characteristics were broadly consistent with known Sensitive Species 15 habitat requirements and burrow-site selection patterns (Stanton-Jones et al., 2024; Parusnath et al., 2017).
- A total of 18 potential release areas were assessed.
- Of these, 9 areas were considered to have relatively high suitability.
    - Suitability was scored using a 10-point habitat assessment approach, based on the extent to which each candidate site exhibited habitat characteristics associated with Sensitive Species 15 occurrence, including grassland condition, vegetation structure, and soil conditions considered favourable for burrow establishment and persistence.
- Approximately 20.18 ha was intensively surveyed during the assessment (Alexander & Stanton-Jones, 2026).

The below heat map shows suitable habitat across the assessed site (Figure 4-1). Warm colours represent increased habitat suitability. Overlayed onto the heat map are the localities of the Sensitive Species 15 burrows identified through the surveys.

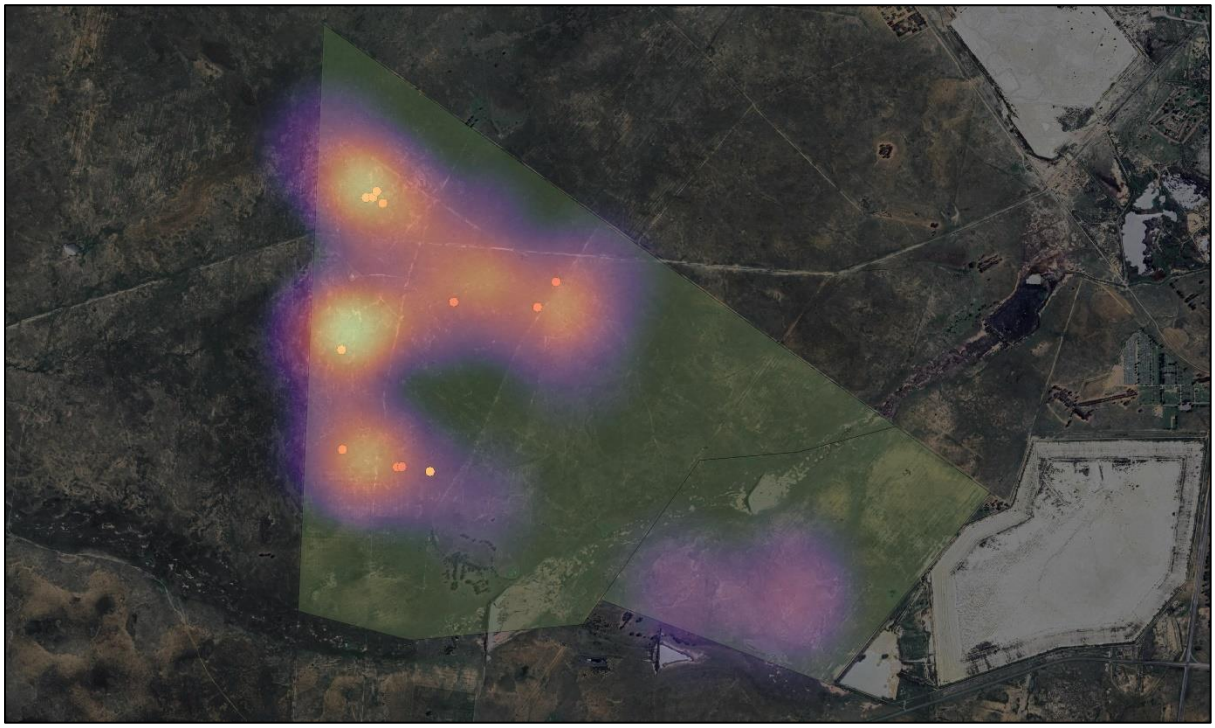

Figure 4-1 Heat map from Alexander & Stanton-Jones (2026) showing suitable habitat across Hendrik se Nijl 106.

4.2 Habitat Suitability Overview

The more suitable parts of Hendrik se Nijl 106 were characterised by habitat attributes broadly aligned with known Sensitive Species 15 habitat requirements (Stanton-Jones et al., 2024; Parusnath et al., 2017).

Habitat features noted as favourable:

- Intact or relatively intact primary grassland
- Suitable grassland structure
- Soils considered appropriate for burrow establishment and persistence
- Habitat heterogeneity sufficient to support Sensitive Species 15 occupancy and refuge use

Table 4-1 Habitat suitability summary table for the target translocation site

Aspect	Summary finding
General habitat condition	Broadly suitable in parts of the property
Most suitable area identified	North-western portion of the property
Grassland type	Predominantly primary grassland in key areas
Soil suitability	Considered suitable for burrowing and persistence
Number of potential release areas assessed	18
Number of relatively high-suitability areas	9
Area intensively surveyed	20.18 ha

4.3 Presence of Resident Sensitive Species 15s

The assessment confirmed that Hendrik se Nijl 106 already supports resident Sensitive Species 15s which can be seen in the Figure 4-1 heat map (Alexander & Stanton-Jones, 2026).

Key findings:

- 11 active burrows were recorded during fieldwork.
- Resident burrows were associated with the more suitable habitat areas on the property.
- One area supporting a comparatively higher burrow density was identified.
- This higher-density area was recommended for exclusion from release planning.

Implications

The confirmed presence of resident Sensitive Species 15s means that:

- the site cannot be treated as vacant habitat;
- release planning must avoid direct impacts on resident burrows;
- potential interactions between resident and translocated individuals must be minimised; and
- final enclosure and release locations must be selected carefully.

4.4 Suitability of the Site as a Recipient Area

Overall, the findings indicate that Portion 0 of the farm Hendrik se Nijl 106 is a **potentially suitable recipient site** for the translocation of Sensitive Species 15s from Nooitgedacht (Alexander & Stanton-Jones, 2026). Importantly, however, this suitability is not unconditional and depends on careful implementation.

Basis for considering the site suitable:

- The site is geographically close to the donor population.
- The site is broadly compatible from a genetic and biogeographic perspective (Parusnath, 2020; Alexander et al., 2023).
- Suitable habitat is present in multiple parts of the property.
- Recorded burrow densities across the surveyed area appear low enough that additional individuals may potentially be accommodated, subject to specialist confirmation and careful spatial planning.

The below map (Figure 4-2) shows all transect surveys completed on site, which were prioritised based on habitat suitability scoring out of 10. Only sites that scored a 7 or higher for habitat suitability were surveyed.

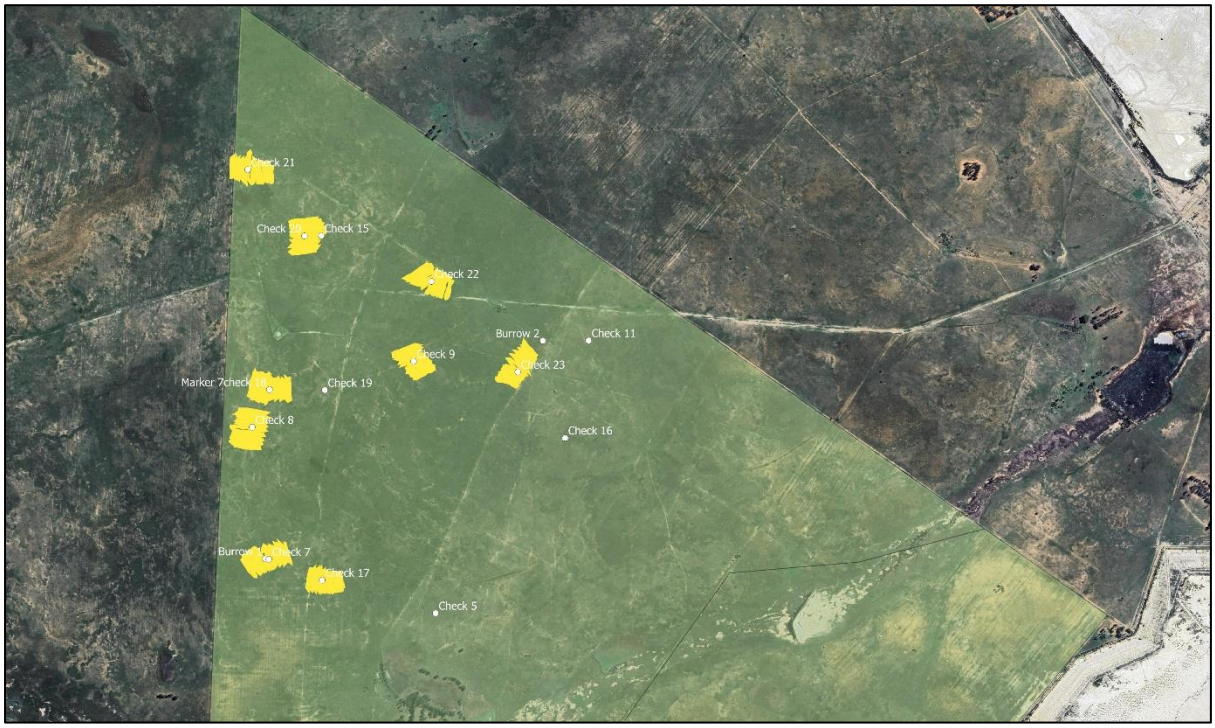

Figure 4-2 ***Fieldwork map from Alexander & Stanton-Jones (2026) representing all transect surveys (in yellow) carried out during fieldwork on the target farm portion (transparent green).***

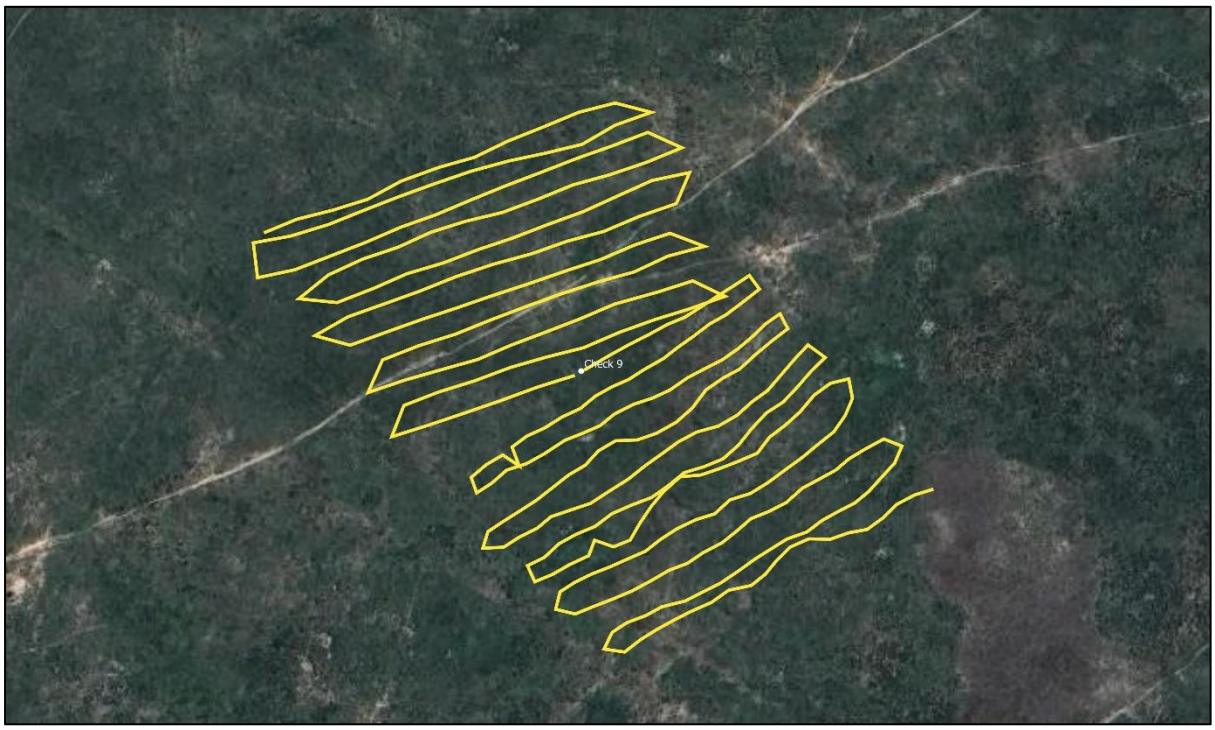

Figure 4-3 ***An example of a transect walked to detect the presence of Sensitive Species 15 burrows (Alexander & Stanton-Jones, 2026). An estimated 1.97 ha were surveyed in this example.***

4.5 Key Constraints and Uncertainties

Notwithstanding the generally favourable findings, a number of important constraints and uncertainties must be recognised.

Table 4-2 A table outlining the main uncertainties surrounding the target translocation site.

Constraint / uncertainty	Relevance to translocation planning
Presence of resident Sensitive Species 15s	Release areas cannot be assumed to be vacant
Undetected burrows	Final release infrastructure may need to be moved
Higher-density resident area	Certain parts of the property should be excluded from release planning
Additional donor-site findings	May affect enclosure number, placement, and configuration
Future habitat condition	Long-term success depends on continued site management

4.6 Management Requirements and Implementation Considerations

If Hendrik se Nijl 106 is used as a recipient site, several management requirements should be implemented as part of the translocation planning and site preparation process.

Pre-release requirements:

- All proposed enclosure locations must be checked immediately prior to installation.
- The purpose of this check must be to confirm the absence of resident Sensitive Species 15 burrows within the intended footprint.
- Appropriate buffers should be maintained around confirmed resident burrows.
- Areas with relatively higher resident burrow density should be avoided.

Site preparation and planning requirements:

- Final enclosure placement, access routing, and any associated preparatory works should be undertaken with specialist oversight.
- Layouts should remain sufficiently flexible to allow for adaptive relocation if additional burrows are identified.
- Any release infrastructure should be positioned so as to minimise:
    - impacts on resident Sensitive Species 15s;
    - habitat degradation;
    - unnecessary disturbance; and
    - future conflict between resident and translocated individuals.

Longer-term management requirements:

- Grassland condition within proposed release areas should be maintained in a state suitable for Sensitive Species 15s.

- Disturbance within and around release areas should be minimised.
- Ongoing specialist input and adaptive management should be retained throughout implementation and post-release monitoring.

4.7 Target Site Conclusion

Portion 0 of the farm Hendrik se Nijl 106 is considered a promising potential recipient site for the Nooitgedacht Sensitive Species 15 translocation. The site offers suitable habitat, is appropriately located relative to the donor population, and appears broadly acceptable from a genetic and ecological perspective (Parusnath, 2020; Alexander et al., 2023; Stanton-Jones et al., 2024). However, the site already supports resident Sensitive Species 15s and therefore requires a precautionary and adaptive approach to release planning. Its use as a recipient site should accordingly remain conditional on:

- confirmation of suitable, low-conflict release areas;
- pre-installation verification of enclosure sites;
- avoidance of resident burrows and higher-density areas;
- continued specialist oversight; and
- adaptive management should new information become available.

5 Release Protocol

Following the release of Sensitive Species 15s into their new burrows during the soft-release phase, an **acclimatization period**, during which the Sensitive Species 15 can adjust to the new environment within the safety of the enclosures before full release, should follow.

5.1 Preliminary Soft-Release

This period has an indeterminate timeline and will be based on the outcomes of a monitoring programme. The monitoring programme will be in place so that frequent checks are conducted on the Sensitive Species 15 during this acclimatization period to monitor their health, behaviour, and adaptation to the new surroundings.

Table 5-1 Soft-Release Translocation strategy considerations for Sensitive Species 15

Stage	Aspect	Considerations	Description
Preparations	Timing and Environmental Conditions	Avoid Extreme Weather	Schedule the initial translocation and soft release on days that are not unusually hot or cold to minimise stress and mortality risks for the Sensitive Species 15s. Optimal conditions are typically during early morning or late afternoon when temperatures are moderate.
	Enclosure Design and Setup	Mesh Fencing	Enclose predetermined burrow clusters, buffered by ~5 m from burrows at the peripheries, with mesh fencing (see Figure 3-1 to Figure 3-2).
		Initial Burrow Construction	Refer to section 3.3.1 regarding burrow preparation options proposed. One or more of the options may be used, or an experimental design can be set up to trial all of the options in order to determine which is most successful for Sensitive Species 15 establishment. A sample of soil from the source burrow should be taken and placed at down partial burrows. Sensitive Species 15s are known to chemically mark their burrows (Ruddock, 2000). Thus, the idea is for Sensitive Species 15s to recognise the artificial burrow as their own. This may require input from a suitably qualified Soil Specialist and/or reference to soil studies conducted during the EIA phase of the project.
	Grouping and Social Structure	Release Groups	**Maintain Existing Social Groups where feasible:** Release individuals that were removed together from a particular burrow into the same artificial burrow within a soft-release enclosure. Burrows within 50 m from each other can be thought of as a 'social group' and where possible must be placed within one soft-release enclosure. See section 3.3.2.1 for more details.
Translocation Procedure	Transport to Soft-Release Enclosures	Careful Handling	Transport the Sensitive Species 15s from their capture location to the soft-release enclosures with minimal handling to reduce stress. Use cloth bags or specialised containers to carry the Sensitive Species 15, ensuring they are kept calm and secure during transport. These containers should offer a dark environment and need to be kept cool to minimise stress.
	Placement in Enclosures	Direct Placement	Place each lizard directly in front of the entrance of the pre-dug burrow within the soft-release enclosure. Ensure that the burrow entrance is clear and that the lizard can easily enter and settle.

		Group Placement	If multiple Sensitive Species 15 were removed from a single burrow, release them together into the same pre-dug burrow within the soft-release enclosure to maintain social structures and reduce stress.
	Initial Acclimatization	**Observation**	Observe the Sensitive Species 15 for the first few days to ensure they are settling into their new burrows and exhibiting normal behaviours such as burrowing, exploring and basking. Place camera traps behind burrows, set to record a photograph at regular intervals. This will assist with initial monitoring.
		Provision of Resources	Placement of water is not necessary as Sensitive Species 15s get water from their food, dew and rain. However, in the event that a dry spell follows the release of individuals, an artificial small puddle, mimicking natural puddles can be positioned near burrows. Following the release of Sensitive Species 15s into artificial burrows, individuals should be supplied with food (e.g., dried crickets or mealworms). • Thereafter food should be supplied in a staggered manner; three days after the release, then five days later, followed by 10 days after that and finally 15 days after the last feed. • A staggered feeding regime will ensure that Sensitive Species 15 are getting nutrition should natural food resources be in low abundance and may also encourage the Sensitive Species 15 to associate the artificial burrows with a food source.
Monitoring and Maintenance	**Daily Checks**	**Initial Monitoring Period**	Conduct daily checks of all release enclosures for an initial period of 4 weeks. These checks should include health assessments, behavior observations, and ensuring that the enclosures remain secure and functional. No handling of Sensitive Species 15s should occur during the initial monitoring period. The use of camera traps can assist in this regard. In cases where there is cause for concern, a Sensitive Species 15 expert and veterinarian should be consulted.
	Expert Evaluation	**Herpetologist Assessment**	After the initial monitoring period, an experienced herpetologist should evaluate whether the Sensitive Species 15s have dug sufficiently deep burrows and are likely to remain in them. Based on this assessment, the decision can be made to remove the soft-release enclosures.

5.2 Removal of Soft Release Enclosures

Assess the success of the initial soft-release and, pending the readiness of the translocated individuals, remove the enclosures completely. Again, a phased approach is necessary. Thus, begin by removing a selected number of enclosures (i.e., those in which the Sensitive Species 15 appear to be the most settled) and monitor those Sensitive Species 15 aggregations carefully for at least a month. Thereafter, a decision can be made to begin removing the enclosures of another few aggregations, following the same monitoring strategy. This should be repeated until all enclosures are removed. Removal of the enclosures should only occur once the Sensitive Species 15 demonstrate consistent use of the natural burrows and show stable behaviour patterns – this should be under the advisement of a Sensitive Species 15 expert.

Once translocation procedures have been completed, thorough monitoring protocols must be undertaken with the Sensitive Species 15 assemblage to assess behaviour, movement, reproduction and survival rates. After the removal of the soft-release enclosures and implementation of hard-release strategies, all aggregations must be monitored regularly (see section 6 below) and must be supported by the following:

- Provide supplementary food and water resources if necessary. Here, water should only be supplied in the form of an artificial puddle if it is unusually dry during the normal wet season.
- If necessary (i.e., invertebrates in low abundance during the wet season), food in the form of dried crickets and/or mealworms may be supplied the day of, or immediately following, the hard release. Thereafter, food may be supplied once a week for two weeks.
- The feeding regime is less than that the soft release because at hard release, the Sensitive Species 15s should be getting their food naturally.

Implement a contingency plan for emergency medical care for translocated Sensitive Species 15.

Table 5-2 Hard-Release Translocation strategy considerations for Sensitive Species 15

Stage	Aspect	Considerations	Description
Preparations	**Assess Soft Release Success**	**Health and Behaviour Monitoring**	Ensure that Sensitive Species 15 have acclimatised well during the soft release period. Check for stable health indicators: • Sensitive Species 15 should demonstrate consistent use of burrows and normal behaviour patterns. Behaviours should be occurring within the near vicinity of the burrows (i.e., ± 2 m radius of the entrance). • For example, some normal behaviours should include: the Sensitive Species 15 should be behaviourally thermoregulating outside their burrows, should be shuttling in and out of the burrows, and, *inter alia*, use them as a safety site from potential predators. • In addition, where possible, observations on feeding events should be made.
		Environmental Familiarization	Confirm that Sensitive Species 15 have become familiar with the new environment and are exhibiting natural behaviours such as foraging and basking. Since Sensitive Species 15s are ambush foragers, feeding events will likely occur within the near vicinity of their burrows. However, they may occasionally move to find prey but should return to their home burrow.

			• Passive evaluation (e.g., pit tag readers, camera traps) of activity patterns are a non-invasive way of assessing acclimation.
	Final Site Preparation	**Burrow Inspection**	Conduct a final inspection of the pre-dug burrows to ensure they are still suitable and free from any disturbances or threats. Assess if Sensitive Species 15 are using the burrows and have dug any further. Evidence of use will be in the form of tail and/or claw markings at the burrow entrance, faecal matter, the entrance will be fairly well-maintained and generally free from debris, and scales may be visible near the burrow.
		Habitat Checks	Verify that the habitat remains conducive to the Sensitive Species 15' needs, including vegetation cover, soil integrity, and absence of predators.
Release Process	**Timing and Conditions**	**Optimal Timing**	Choose a day when environmental conditions are expected to be normal (i.e., no expected rainfall, moderate temperatures). Enclosure removal should either occur during the late afternoon after the Sensitive Species 15 have returned to their burrows for the day, or early morning before the Sensitive Species 15 start becoming active. This is to ensure that monitoring can occur the day of or immediately after the hard release.
		Weather Conditions	Avoid releasing Sensitive Species 15 during extreme weather conditions such as heavy rain, strong winds, or extreme heat.

6 Monitoring, Reporting, and Management

Monitoring protocols and **adaptive** management strategies must be developed, as these are instrumental in ensuring the effectiveness of both the long-term survivability of the translocated Sensitive Species 15 populations and the preservation of their genetic composition, as well as providing information that may support the success of any future Sensitive Species 15 translocation initiatives. Thus, following the hard release, all translocated Sensitive Species 15 must undergo a rigorous monitoring programme. A broad overview has been included below.

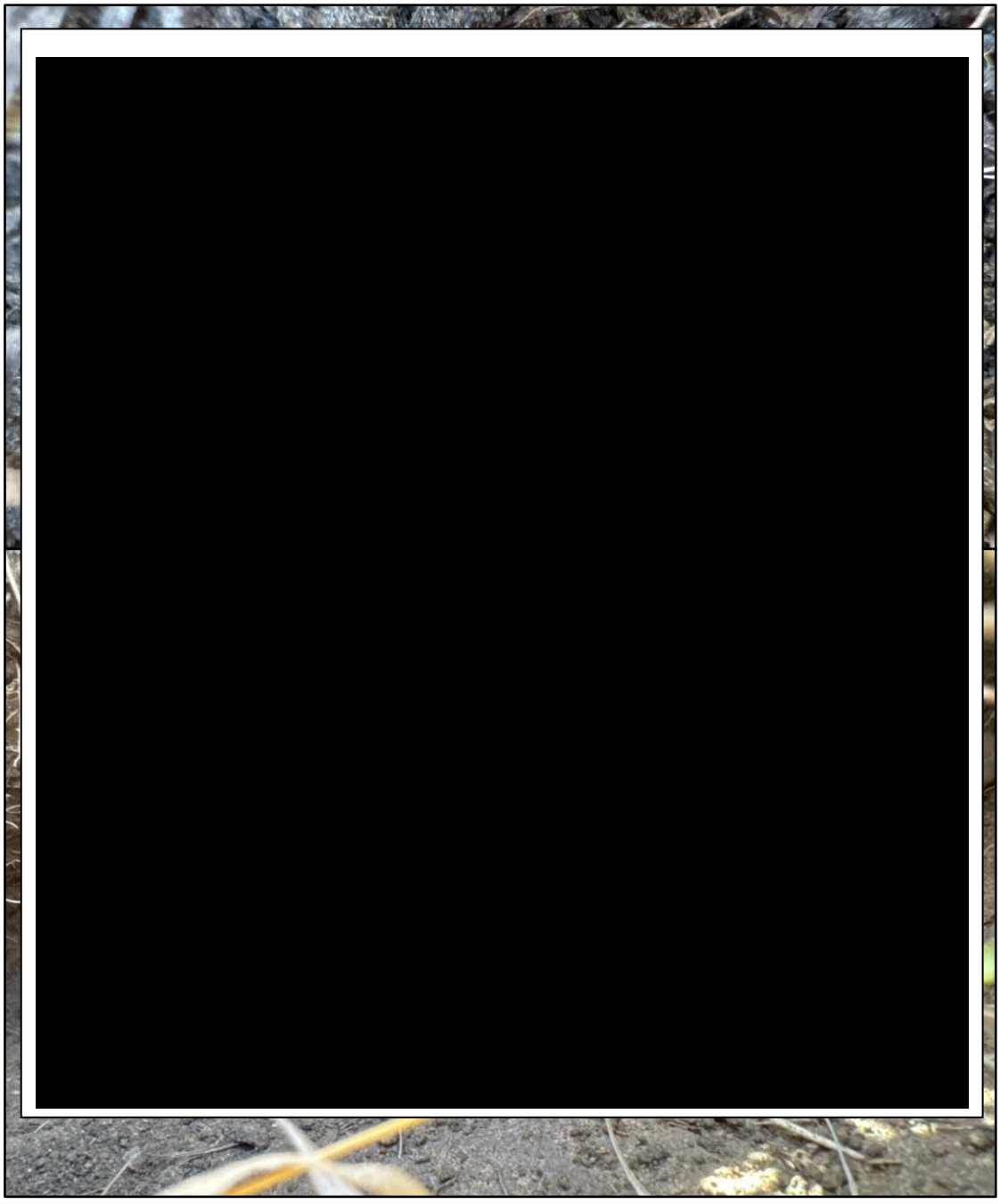

Figure 6-1 A Sensitive Species 15 burrow at Nooitgedacht (bottom) with a scale found at the entrance (top), key monitoring data to be collected post-translocation (TBC, 2025).

The overarching phases of monitoring can be summarised as follows:

- **Phase 1 (suggested 0 to 6 months post-release):** an intensive early post-release phase focused on survival, burrow use, movement, and settlement,

- **Phase 2 (suggested 6 to 24 months post-release):** This should be followed by longer-term follow-up, where feasible, to assess persistence and any evidence of reproduction. Given the life history of Sensitive Species 15, longer-term monitoring is desirable, but the exact duration and frequency should be determined adaptively and in accordance with available resources and the outcomes observed during the initial monitoring period.

- **Phase 3 (suggested 2 to 5 years post-release):** Periodic longer-term checks, subject to outcomes and feasibility.

These phases can be split into a monitoring stepwise programme:

- **Phase 1:**

    1. Daily monitoring is required for the week following the removal of the enclosures.
    2. Biweekly for the following two weeks.
    3. Weekly for the next four weeks.
    4. Bimonthly for the next two months.
    5. Monthly for the next three months.

- **Phase 2:**

    6. Quarterly for the following year.

- **Phase 3:**

    7. Half yearly thereafter for two years.
    8. Yearly for another two years.

The above monitoring schedule is designed to be intense initially such that action can be taken should any issues arise. The relatively long duration of this schedule roughly aligns to the length that it takes for Sensitive Species 15s to reach sexual maturity (4-5 years of age). This is on recommendation of Germano and Bishop (2009) who suggest that a monitoring programme following a translocation should, at minimum, be the duration that it takes for individuals within a species to reach sexual maturity. In addition, during this time if Sensitive Species 15s have become accustomed to their new environment, evidence of reproduction should be present. Survival rates and reproduction are therefore key indicators for a successful translocation.

Table 6-1 Monitoring and management considerations and objectives

Focus Area	Protocol
Tracking	**PIT tags and Camera Traps:** Use of PIT tag readers, camera traps, and/or endoscope assessments to monitor movement, burrow use, and survival. As is always the case, limit disturbance to the Sensitive Species 15 wherever possible.
Data Collection	**Regular Data Recording:** Regularly record data on activity, behaviour, habitat use, and interactions with conspecifics and other species. Environmental conditions should also be recorded alongside the above data.

Frequency	**Intensive and Long-term Monitoring:** Conduct intensive monitoring initially and less frequent, long-term monitoring as Sensitive Species 15 adapt.
Data Analysis	**Continuous Analysis:** Continuously analyse collected data to assess relocation success and identify any emerging issues.
Feedback Loop	**Adjust Management Practices:** Use monitoring data to inform and adjust management practices, habitat enhancements, and ongoing conservation actions as needed.
Contingency Plans	**Develop and Implement Plans:** Develop and implement contingency plans if significant issues arise, such as unforeseen threats or high mortality rates.
Publishing of Results	**Monitoring data and outcomes:** All monitoring results, including successes, failures, and other key findings, should be compiled into feedback reports to inform adaptive management. Where appropriate, these findings should also contribute to the broader scientific evidence base, including potential incorporation into scientific studies and peer-reviewed publications.

7 Stakeholder Engagement

Undertaking successful translocation of this sensitive species is a complex task and has implications to multiple stakeholder levels. With poor success in the past with regard to maintaining long-term survival rates and limited evidence gathered about reproduction after translocating Sensitive Species 15s, this trend should be avoided and the Nooitgedacht Sensitive Species 15 subpopulation given the best chances of survival and re-establishment. To support this aim, it is imperative that wherever possible the relevant stakeholders and role-players are consulted. The main aim therein is to uphold transparency, incorporate perspective-taking, gather support and useful input, as well as promote conservation and interest in this unique lizard species.

Key Stakeholders:

- Government authority (national/provincial/local)
- Endangered Wildlife Trust
- Academic institutions and experts
- National Zoological Gardens
- Private sector partners

Table 7-1 Detailing Stakeholder Engagement Initiatives throughout the translocation stages

Phase	Stakeholder Engagement Initiative	Description
Preparation Phase	Initial Consultation	Organise confidential meetings with key stakeholders to discuss the objectives, steps taken to exhaust the Mitigation Hierachy (refer to section 1.1.3), methods and expected outcomes of the translocation should it be the only last option available.
	Workshops	Conduct workshops to educate stakeholders about the Sensitive Species 15 lizard, its conservation status and threats that the Sensitive Species 15 face, and the risks associated with the translocation, while stressing the need for discretion.
	Feedback Sessions	Provide secure platforms for stakeholders to voice their concerns, suggestions, and expectations regarding the project.
	Education	Develop brochures, fact sheets, and presentations to inform stakeholders about the Sensitive Species 15 lizard and the translocation process.
Translocation & Release	Volunteer/Expert Involvement	Carefully select and vet local community members and biodiversity and grassland experts to participate in the translocation process, including habitat preparation and monitoring activities, ensuring they understand the importance of confidentiality.
	Secure communication	Provide regular, secure updates to all stakeholders on the progress of the translocation, including any challenges encountered and solutions implemented.
	Collaboration	Involve vetted stakeholders in the initial monitoring of the translocated Sensitive Species 15s, including data collection and habitat assessments.
Post-Translocation / Long-term Monitoring	Regular Meetings and Reporting	Meet with key stakeholders and provide periodic reports to review progress, challenges, and address any emerging issues.
	Community-based Conservation	**Local Guardians:** Establish a network of vetted local guardians or stewards, if this is deemed feasible, who are involved with protecting the Sensitive Species 15 Sensitive Species 15 and their habitat. This should ideally be employees/residents of the property in question or local security company to ensure accountability.

	Education & Outreach	**Public Awareness Campaigns:** Continue public awareness campaigns to keep the broader community informed and engaged in conservation efforts, while maintaining confidentiality around sensitive site-specific information. These campaigns should also include general anti-poaching awareness initiatives, particularly through local schools and surrounding communities, to promote understanding of the species' conservation importance and to discourage illegal collection or persecution. **Developer Campaigns:** Conduct workshops with prospective developers with the focus being on the Mitigation Hierarchy and how translocations may only be carried out if all other alternatives have been completely exhausted. The impact on species, in particular sensitive species, should be minimal.
	Policy and regulation	Promote sustainable land-use practices among stakeholders, particularly in the mining industry, to ensure the long-term viability of the translocated aggregations and other local Sensitive Species 15 populations. Where opportunity arises, advocate for stronger legal protections for the Sensitive Species 15 lizard and its habitat at local, regional, and national levels. Even if this translocation is a success, it should not set a precedent for future developments – the Mitigation Hierachy must still be followed.
	Research and Further Collaboration	**Stakeholder Report:** A report at the different stages of the translocation must be compiled and provided to relevant stakeholders. At the end of the monitoring programme, a final report detailing the successes and failures needs to be provided to the relevant stakeholders. **Ongoing Research:** Encourage ongoing research projects to study the ecology, behaviour, and the genetics of the translocated Sensitive Species 15 aggregation. **Data Sharing:** Establish secure data-sharing agreements with academic institutions, NGOs, and government agencies to facilitate collaborative research and conservation planning. Both areas of collaboration hold potential to improve knowledge generation and conservation efforts for Sensitive Species 15s and other threatened/protected species.

8 Conclusion

The Sensitive Species 15 is a remarkable species endemic to the highveld grasslands of South Africa, with subpopulations occurring within the Free State and a small portion of Mpumalanga.

Given the Sensitive Species 15's complex social structure, very specific microhabitat requirements, and long-term, often permanent, reliance on burrows for thermoregulation, shelter, and protection, a successful translocation of this sensitive species is a complex and challenging task. Past efforts have shown limited success in maintaining short- and long-term survival rates with no evidence of reproduction post-translocation. Therefore, a translocation of this species is now being considered only because all alternatives outlined in the Mitigation Hierarchy have been exhausted. Should a translocation for the Nooitgedacht Sensitive Species 15 subpopulation be authorised, to ensure the best chances of survival and re-establishment, it is imperative to engage relevant stakeholders and role-players throughout the translocation process.

This Biodiversity Action Plan (BAP) outlines a comprehensive overview of the biology of the Sensitive Species 15, the threats that the species faces, the history of previous translocation attempts, the risks associated with a translocation and a strategy for the translocation if authorised. This BAP is intended to be an adaptive management tool and emphasizes the importance of stakeholder engagement, informed decision-making and meticulous planning. By upholding transparency, incorporating diverse perspectives, and promoting conservation efforts, we aim to gather support and useful input to safeguard this unique species. Through collaborative efforts and a commitment to responsible development practices, we can enhance the conservation status of the Sensitive Species 15, build perceived value of the species, and ensure its long-term viability. Sensitive Species 15s should be more widely recognized as a distinctive part of South African heritage.

Figure 8-1 A Sensitive Species 15 photographed near Amersfoort, Mpumalanga in 2025 during terrestrial fieldwork by The Biodiversity Company

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PROFILE SUMMARY

Environmental work experience across South Africa (4 years). Theoretical and practical understanding of methodology in terrestrial and global change ecology with experience in sectors including mining, state infrastructure, engineering, renewable energy, and private sector developments. General training and experience in aspects of conservation, biogeography, and socio-economic sustainability. Worked in roles including project managing, as well as environmental permitting manager role involving compliance and applications, South African environmental regulations, and national/provincial authority liaison.

PERSONAL INFO

Nationality: South African

Date of birth: 14 April 1999

EXPERIENCE & SKILLS

- Terrestrial Biodiversity Assessments for EIA requirements, as well as basic Aquatic and Wetland experience
- Environmental field work and basic field methodology
- Habitat delineation, Critical Habitat Assessments, Ecosystem Service Assessments
- Multi-disciplinary Research
- South African EMPr mandated permitting
- Specialist work with Smaug giganteus (Sungazer Lizards) in conjunction with the Endangered Wildlife Trust (EWT)
- Artificial Intelligence (AI) system integration, agent creation and operation
- Translocation of protected flora species.
- Sports Ecology Research
- Business sustainability and urban biodiversity performance

ACADEMIC QUALIFICATIONS

- BSc (Hons) Animals, Plants, and Environmental Sciences; University of the Witwatersrand
- BSc Biology, University of the Witwatersrand
- Certificated Natural Scientist (SACNASP 170720)

LANGUAGES

English – Proficient

Afrikaans – Basic

PROFESSIONAL EXPERIENCE

Jan 2026 – Present	**The Biodiversity Company** Permit Manager
April 2024 – Present	**The Biodiversity Company** Terrestrial Ecologist
March 2022 – April 2024	**The Biodiversity Company** Specialist Intern

COUNTRY EXPERIENCE

South Africa

Signed: Byron Reece Goris