

"THE HILL" HOUSING DEVELOPMENT, SEDGEFIELD:

FAUNA & FLORA SPECIALIST REPORT FOR IMPACT ASSESSMENT

DEA & DP Ref.No:



PRODUCED FOR CAPE EAPRAC

BY



Simon.Todd@3foxes.co.za

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DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, as the appointed independent specialist hereby declare that I:
- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.



Simon Todd Pr.Sci.Nat 400425/11.
September 2015

EXECUTIVE SUMMARY

Liberty Lane Trading 111, (PTY) Ltd, intends to develop a mixed housing development on Erf 1638, Sedgefield and Portion 82/205, Ruigte Valley, known as "The Hill". Although the affected property is approximately 90ha in extent, the footprint of the development would be less than 20ha and the layout provided for the assessment consists of three distinct nodes of development. As part of the Impact Assessment process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts likely to be associated with the construction and presence of the housing development. This is however not the first assessment of a development proposal at the site and the results of the previous specialist studies are also included as relevant in this study, as are the concerns raised by CapeNature and SANParks regarding the previous development proposals.

A site visit and field assessment of the site and the proposed development areas was conducted in order to identify and characterize the ecological features of the site and develop an ecological sensitivity map for the site. The majority of the site is heavily invaded by a variety of woody aliens especially Pine, Black Wattle and Eucalyptus and the level of invasion suggests that the extent and severity of invasion has increased significantly since the original specialist studies about 10 years ago. A single area of near-natural vegetation of less than 2ha was identified at the site and supports the national vegetation map which maps the area as Knysna Sand Fynbos which is listed as Critically Endangered.

The majority of the site which is highly degraded and invaded by woody aliens is considered low sensitivity. The remnant of near-natural fynbos is considered high sensitivity on account of the high threat status of the Knysna Sand Fynbos. Under the current layout, more than half of the remnant would however be lost to the development. On its own, the intact remnant is not considered functional and with time the fynbos elements would be lost and would give way to coastal thicket or forest. Although there is potential to rehabilitate parts of the site to increase the extent of fynbos vegetation at the site, the property would still be isolated within an area dominated by aliens and transformed farmland. As a result, restoring a functional fynbos-fire driven ecosystem at the site is not considered a practical reality. From a functional perspective, coastal thicket would be of similar ecological value to fynbos for most fauna in the area and as it would be significantly easier to restore and maintain such an ecosystem that does not require fire, this would be the recommended course of action.

The nodes of development indicated in the layout assessed are not likely to be within the major routes of faunal movement which are likely to be lower down the slopes of the hill, with little ecological pattern to drive movement north-south over the top of the hill. As it stands, habitat quality within the site is very poor, offering little in the way of favourable habitat for most species to allow for resident populations. In addition, the site is currently

open access with extensive woodcutting, dumping and probably poaching taking place within the site. Provided that the habitat quality and connectivity of the landscape can be improved in the areas of the property outside of the development footprint, this could largely negate the negative impacts of the development. However, this would be contingent on the compatible management of the property. Issues of specific significance would be restoring a functional ecosystem to the site and maintaining it free of alien invasion as well as ensuring that any fencing around the site is porous and allows fauna to pass through the site.

In summary, the site is considered potentially sensitive, but the impact of the development is mediated largely by the condition of the site and the location of the development footprint in this context. Although CapeNature have emphasized their wish to see the site rehabilitated to Sand Fynbos, this is no longer a practical reality due to fundamental changes to soil properties that are likely to have occurred as a result of long-term alien invasion. From a functional perspective, there is no imperative towards Sand Fynbos and the practical reality is that the site is isolated and a functional fire-driven ecosystem in close proximity to a housing development is not a feasible outcome. In the absence of fire, the vegetation will have a tendency towards coastal thicket and forest and a variety of such species can already be observed invading the site. It would significantly more practical and ecologically more feasible to rehabilitate the site towards coastal thicket and emergent forest than sand fynbos. From a functional perspective, coastal thicket would be of similar ecological value to fynbos for most fauna in the area and given the practical realities of the site, this would be the recommended target for restoration of the site.

The commitment of the developer to the rehabilitation of the site would however need to be entrenched in the authorisation conditions for the development, along with time frames for implementation as if this is not explicitly included, there is the danger that the development would proceed and the rehabilitation of the wider site relegated to a low priority that is never actualised.

1 INTRODUCTION

Liberty Lane Trading 111, (PTY) LTD, intends to develop a mixed housing development on Erf 1638, Sedgefield and Portion 82/205, Ruigte Valley. Although the affected property is approximately 90ha in extent, the footprint of the development would be less than 20ha. As a result, a Basic Assessment process is being conducted in order to obtain authorisation for the development. As part of this process, this ecological specialist study details the ecological characteristics of the site and provides an assessment of the likely ecological impacts likely to be associated with the construction and presence of the housing development. The full scope of the study and the details of the development are described below. It is however important to recognise that the development has already gone through numerous planning phases and applications and this is not the first EIA that has been submitted for the development of the site. As such, the previous specialist studies conducted at the site are used to inform this study and the concern raised by the authorities regarding the previous development plans are also explicitly included here as part of the scope of the study.

1.1 SCOPE OF STUDY

The scope of the study includes the following activities

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project
- a description and evaluation of environmental issues and potential impacts (incl. using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential environmental impacts
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria :
 - the nature of the impact, which shall include a description of what causes the effect, what will be affected and how it will be affected
 - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
 - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5- 15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity) or permanent
 - the probability of the impact, describing the likelihood of the impact actually

- occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
 - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit) severe/beneficial (long-term impact that could be mitigated/long-term benefit) moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight or have no effect
 - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
 - the status which will be described as either positive, negative or neutral
 - the degree to which the impact can be reversed
 - the degree to which the impact may cause irreplaceable loss of resources
 - the degree to which the impact can be mitigated
- a description and comparative assessment of all alternatives
 - recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
 - an indication of the extent to which the issue could be addressed by the adoption of mitigation measures
 - a description of any assumptions uncertainties and gaps in knowledge
 - an environmental impact statement which contains :
 - a summary of the key findings of the environmental impact assessment;
 - an assessment of the positive and negative implications of the proposed activity;
 - a comparative assessment of the positive and negative implications of identified alternatives

General Considerations:

- Disclose any gaps in information or assumptions made.
- Recommendations for mitigatory measures to minimise impacts identified.
- An outline of additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP) for faunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided which will be separated into the following project phases:

- Preconstruction
- Construction
- Operational Phase

Apart from the above considerations, CapeNature has provided comment on previous applications for the development of the site. The major concerns expressed regarding the ecological impacts of the development included the following:

- High conservation value of the Knysna Sand Fynbos vegetation type that dominates the site.
- Use of the site as corridor by fauna the potential of the development to disrupt this ecological function. Several recommendations were made regarding the layouts supplied with that assessment and CapeNature requested that the development consist of no more than 3 nodes. SANParks made similar comments regarding the potential disruption of landscape connectivity resulting from the development and requested that ecological corridors be at least 100m wide.
- Degradation at the site caused by woody aliens.
- There is no Rehabilitation and Fire Management Plan for the development, which would be required in order to restore the original vegetation composition of the site.

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the EIA Regulations, as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.
- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

- In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
- Avoid degradation of the environment;
- Avoid jeopardising ecosystem integrity;
- Pursue the best practicable environmental option by means of integrated environmental management;
- Protect the environment as the people's common heritage;
- Control and minimise environmental damage; and
- Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following approach forms the basis for the study approach and assessment philosophy:

The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.

- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
 - endemic to the region;
 - that are considered to be of conservational concern;
 - that are in commercial trade (CITES listed species);
 - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological “drivers” of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed site is located on the northern margin of Sedgefield, north of the N2. The site is currently heavily invaded by alien vegetation, which would be cleared as part of the development of the site. The proposed details of the development provided for the assessment are as follows:

- 130 single residential erven;
 - Group-housing (30 large, 40 medium & 40 small) (medium density housing);
 - One commercial site;
 - Membrane Bio-Reactor (MBR) sewerage package plant;
 - Upgrade of the main access road, from Egret/N2 intersection to the development;
 - Two water storage reservoirs (700kl each);
 - Dual water supply system (for treated water & potable water);
 - Associated service infrastructure (water, electricity, stormwater, road network etc.);
- and
- Private Open Space, with recreational amenities (hiking/walking trails, lookout points etc.).



Figure 1. Satellite image of “The Hill” site, which is located north of the N2 at Sedgefield. The map indicates the extent of the property as well as the three proposed nodes of development.

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011).
- The fine-scale vegetation map for the area produced by Vlok et al (2008) was also used as reference to inform the study and especially the sensitivity mapping.
- Critical Biodiversity Areas for the site and surroundings were extracted from the CBA maps for the Garden Route (Holness et al. 2010).
- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 3422BB was extracted from the SABIF/SIBIS database hosted by SANBI.
- The IUCN conservation status (Figure 2) of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2014).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Apart from the literature sources, additional information on reptiles were extracted from the SARCA web portal, hosted by the ADU, <http://vmus.adu.org.za> for the above quarter degree squares
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 2014.2 (See Figure 2) and where species have not been assessed under these criteria, the CITES status is reported where possible.

These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

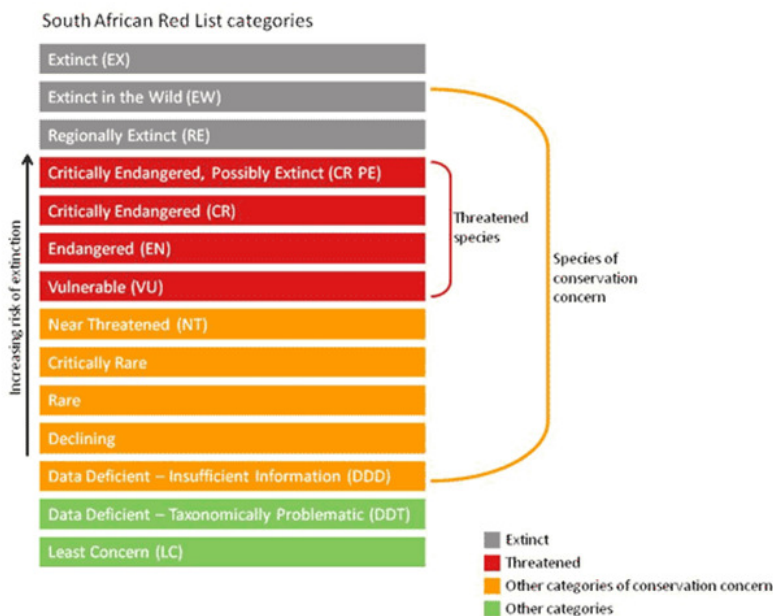


Figure 2. Schematic representation of the South African Red List categories. Taken from <http://redlist.sanbi.org/redcat.php>

2.2 SITE VISIT

The site visit took place on the 14th of July 2015. During the site visit, all the roads at the site were driven and the proposed development areas were walked and investigated on foot. A full plant species list for the site was developed and all areas of intact vegetation were mapped. Specific attention was also paid to the presence of fauna at the site and the use of the site as faunal habitat or as a corridor for movement through the area. The current state of the site was also compared to that described by the previous specialist studies of the site. Numerous photographs of features of significance were taken for documentation and reference purposes.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An ecological sensitivity map of the site was produced by integrating the information collected on-site with the available ecological and biodiversity information available in the literature and various spatial databases. This includes delineating the different habitat units identified in the field and assigning sensitivity values to the units based on their ecological properties, conservation value and the observed presence of species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium** – Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for faunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

In some situations, areas were also classified between the above categories, such as Medium-High, where it was deemed that an area did not fit well into a certain category but rather fell most appropriately between two sensitivity categories.

2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are captured. However, this is rarely possible due to time and cost constraints and therefore, the representivity of the species sampled at the time of the site visit should be critically evaluated. As the site was visited in the wet season, conditions at the time of sampling

were very favourable for the assessment and there are no major limitations or constraints that are deemed to have occurred as a result of timing of the site visit.

The lists of amphibians, reptiles and mammals for the site are based on those observed during the site visit as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach which takes the study limitations into account.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 BROAD-SCALE VEGETATION PATTERNS

The vegetation in and around the site is illustrated below in Figure 3. The whole site is mapped by Mucina and Rutherford (2006) as falling within the Knysna Sand Fynbos vegetation type. This vegetation unit has an extent of 154km² and occurs from the vicinity of Wilderness to the Robberg peninsula near Plettenburg Bay. It typically occurs as undulating hills and moderately undulating plains covered with a dense, moderately tall, microphyllous shrubland, dominated by species more typical of sandstone fynbos. At least three Red Data List plant species occur in the ecosystem. According to the National List of Threatened Ecosystems, less than 17% of the original extent of this vegetation unit remains and it is not well protected with less than 1% within formal protected areas. Due to low total extent of this unit and high levels of transformation that it has experienced, it is classified as Critically Endangered. Any further loss of intact remnants of this unit is therefore highly undesirable. As the majority of this vegetation type within the site has been lost to transformation and alien invasion, it is not described in detail here as the actual remnants observed at the site are described in the following sections.

According to the vegetation map for the Garden Route (Vlok et al. 2008), the site falls within the Hoogkraal Sandplain Fynbos vegetation type. Although there are some differences in the mapped extents, this vegetation unit is essentially very similar to the Knysna Sand Fynbos of Mucina & Rutherford (2006) and are considered synonymous. As Vlok et al. (2008) provide little detail about this vegetation unit, little useful additional insight can be gathered from their map and description and the description in Mucina & Rutherford is considered definitive.

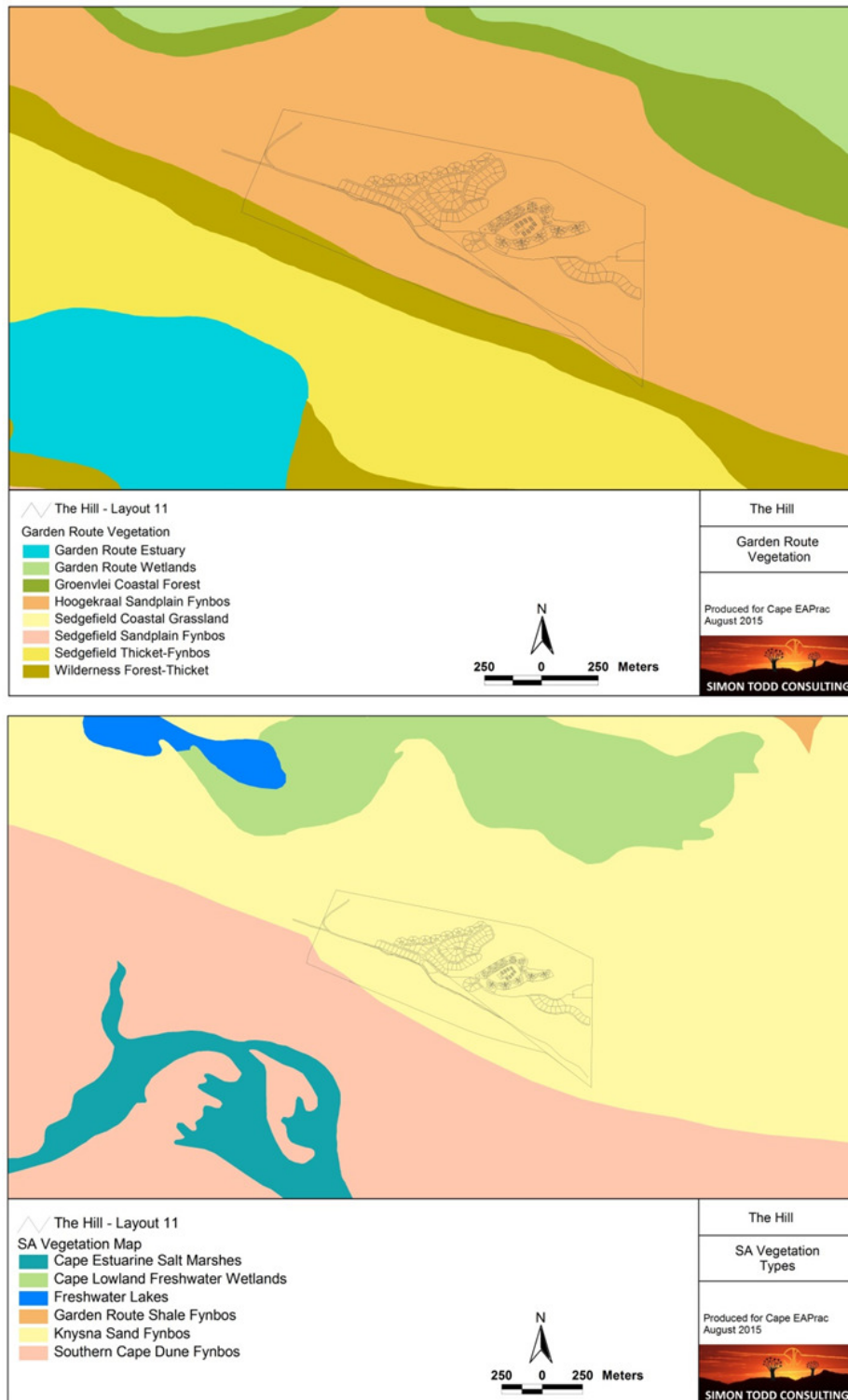


Figure 3. Vegetation in the vicinity of "The Hill" according to Vlok et al. (2008) top and Mucina & Rutherford (2009) bottom.

3.2 LISTED AND PROTECTED PLANT SPECIES

According to the SANBI SIBIS database, 578 indigenous plant species have been recorded from the quarter degree square containing the site. This includes 25 species of conservation concern, none of which were observed at the site. The extent of remaining vegetation at the site is very low and while some protected species are present, there were no species of conservation concern present and given the very low extent of intact vegetation, it is not likely that any such species were overlooked. If any such species are present at the site, it is likely that they would be dormant and present as seed in the seedbank. Protected species observed at the site, within the intact remnant, include *Leucospermum cuneiforme* and *Brunsvigia orientalis*.

3.3 CRITICAL BIODIVERSITY AREAS & BROAD-SCALE PROCESSES

The site falls within the planning domain of the Garden Route Biodiversity Assessment (Holness et al. 2010). This biodiversity assessment identifies Critical Biodiversity Areas (CBAs) which represent biodiversity priority areas which should be maintained in a natural to near natural state. The assessment is designed to identify an efficient set of Critical Biodiversity Areas (and Ecological Support Areas) that meet the targets for the underlying biodiversity features in as small an area as possible and in areas with least conflict with other activities. Of fundamental importance is that these areas are identified in a configuration that deliberately facilitates the functioning of ecological processes (both currently and in the face of climate change) which are required to ensure that the biodiversity features persist in the long term. The CBA map for the area is illustrated below in Figure 5 and the landcover map for the area in Figure 6. The site is not within a CBA which relates to the fact that the site is not considered intact on account of the heavy alien invasion.

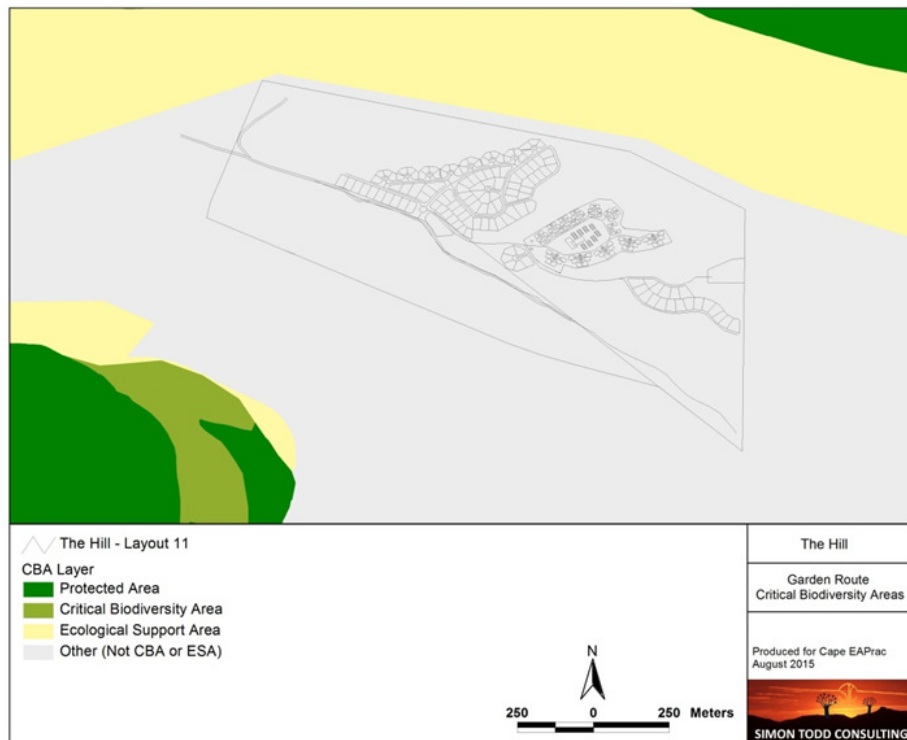


Figure 4. Critical Biodiversity Areas map of the broad study area around “The Hill” site.

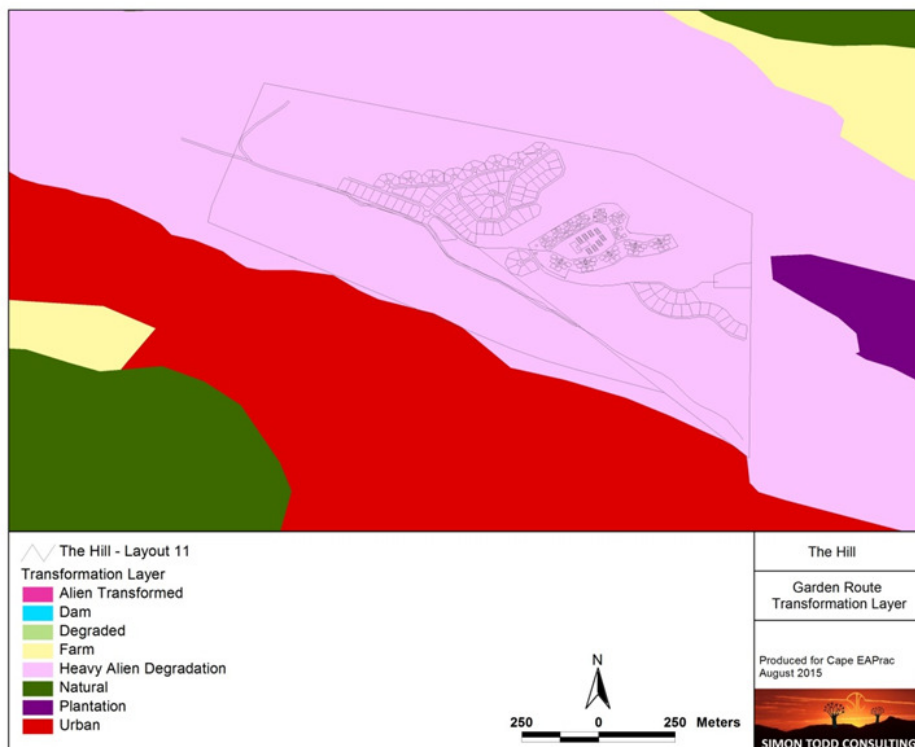


Figure 5. Landcover map of the broad study area around “The Hill” site (Holness et al 2010).

3.4 FINE-SCALE SITE DESCRIPTION

The site is overwhelmingly invaded by woody aliens, some of which appear to have originally been planted at the site for commercial forestry, but all of which are now recruiting unregulated across the site. The lower slopes of the site and western half of the site is dominated by *Eucalyptus camaldulensis*, while the upper western half of the hill is dominated by *Pinus radiata* and the eastern half of the site has extensive areas dominated by Black Wattle *Acacia mearnsii*. There are also other aliens present in abundance including *Acacia melanoxylon*, *Acacia longifolia*, *Acacia saligna*, *Rubus fruticosus* and *Lantana camara*. There was only one area observed that can be considered near-natural which was less than 2 ha in extent. The results of the site visit clearly indicate that degradation as a result of alien invasion at the site is continuing rapidly and significant additional invasion has occurred since the previous round of specialist studies which took place in 2006.

The fragment of near-natural vegetation at the site can be described as apparently typical of Knysna Sand Fynbos as described by Mucina & Rutherford (2006). Species observed at the site include *Diospyros dichrophylla*, *Tarchonanthus littoralis*, *Gymnosporia heterophylla*, *Leonotis leonurus*, *Grewia occidentalis* var. *occidentalis*, *Carpobrotus deliciosus*, *Senecio angulatus*, *Asparagus asparagoides*, *Anthospermum aethiopicum*, *Erica discolor*, *Felicia echinata*, *Geranium incanum*, *Leucospermum cuneiforme*, *Muraltia squarrosa*, *Oedera imbricate*, *Passerina vulgaris*, *Salvia africana-lutea*, *Hermannia hyssopifolia*, *Zehneria scabra* subsp. *scabra*, *Chironia baccifera* and *Selago canescens*.

Within the invaded areas, there is some recruitment of indigenous forest species in these areas such as *Halleria lucida*, *Olea exasperata*, *Pterocelastrus tricuspidatus* and *Sideroxylon inerme* subsp. *inerme*.



Figure 6. The intact remnant at the site is disturbed and threatened by further alien invasion. On its own, this is not a functional unit and would require the restoration of driving ecological processes in order to maintain diversity.



Figure 7. Parts of the site heavily invaded by *Eucalyptus*, showing the density of invasion as well as the large number of emergent saplings. There is little remnant indigenous vegetation in the understorey as the trees and the leaves smother the vegetation beneath them.



Figure 8. Areas of dense black wattle invasion, which may also contain other alien species. Even where there are clearings in the trees as pictured right, these are degraded and invaded by alien annual grasses and weedy species.

3.5 REHABILITATION POTENTIAL & MANAGEMENT OPTIONS

The comment regarding the rehabilitation of the site from CapeNature implies that their perception of the site is that significant recovery of the natural vegetation can be achieved and additional Sand Fynbos established at the site. However, the previous botanical specialist study contends that significant recovery of the vegetation cannot be achieved. Given these contradictory perceptions, this issue warrants some discussion given the intended nature of the development and the management requirements of the area should the development proceed.

The potential recovery of the vegetation depends on several factors including whether or not the site was ploughed in the past and the length of time the area has been invaded which would impact the soil-stored seedbanks and the expected amount of spontaneous vegetation recovery. An additional consideration is the extent to which restoring the vegetation to its original state would be a desirable outcome for the development. These issues are further expounded below.

Where fynbos vegetation has been invaded by species which maintain the acidity of the soil such as pines, the potential for recovery is good. However, where fynbos is invaded by woody legumes such as wattle, this increases the nitrogen levels in the soils which encourages the invasion of these areas by weedy species and impedes the recovery of the fynbos vegetation for decades. Therefore, in the areas of dense wattle invasion, it is not likely to be practical or possible to restore the original vegetation composition. In addition, as it would be highly undesirable to have flammable vegetation in close proximity to the development, other alternatives are likely to be required at least in the vicinity of the development nodes. A final question that deserves consideration is if and why it would be desirable to restore the original vegetation of the site. From a conservation perspective this would be desirable given the high conservation status of the Knysna Sand Fynbos. However, from an ecological function perspective, there are likely to be a variety of solutions that would restore the basic ecological function of the site for most fauna. This would include restoring the invaded areas with a greater proportion of forest and coastal thicket species that do not require fire in order to drive their dynamics. Given that the site occurs on a moist south-facing slope, it is likely that fire historically prevented the development of thicket or forest in this area and that with protection from fire, the site will naturally tend towards these types of ecosystems rather than fynbos. This would be of little consequence for most fauna in the area which are accustomed to a mosaic of ecosystem and vegetation types. Furthermore, the development of thicket and forest is driven largely by bird dispersal of emergent species and clearing the aliens from the site would encourage the return of such birds which would then help to facilitate further recovery of the natural vegetation.

Given the above considerations, it is concluded that attempting to restore the original fynbos vegetation is not likely to be a practical or possible solution for most of the site. Where there is still some remnant fynbos, this may be a viable solution and could occur reasonably spontaneously provided that aliens are cleared on a regular basis and occasional managed fire is used to stimulate the germination and recruitment of fynbos species. However, within the areas invaded by wattle, the nutrient status of the soil has been altered and here it would be more practical to rehabilitate the site with forest and thicket species which are more stable on the nutrient enriched soils and are not fire-prone and do not require fire in order to maintain their dynamics and diversity. Given the very high density of invasion currently present at the site, cleared areas would experience very high rates of

re-invasion and it would be very difficult to maintain cleared areas free of aliens. As such, the rehabilitation of the site would have to occur in a stepwise manner and it would be likely to take decades to clear the whole site and be able to simultaneously maintain it free from serious reinvasion. Restoring the site to coastal thicket and emergent forest species should be the target for rehabilitation at the site.

3.6 FAUNAL COMMUNITIES

Mammals

According to the MammalMap database, 35 mammals have been recorded from the quarter degree 3422B. Species of conservation concern known from the broad area include Honey Badger *Mellivora capensis* (NT), Blue Duiker *Philantomba monticola*, Fynbos Golden Mole *Amblysomus corriae* (NT), Long-tailed Forest Shrew *Myosorex longicaudatus* (NT). As the number of sightings of Honey Badger is high, this suggests that it is fairly common in the area and would therefore be likely to occur in the vicinity of the site. The Blue Duiker is less likely to occur at the site given the degraded nature of the site and the regular disturbance that occurs at the site due to unregulated human presence. Indications at the sight suggested that mammal diversity within the alien invaded areas was very low and it was conspicuously higher in the intact remnant.

Given the location of the site along the fringe of Sedgefield and the relative lack of rare or important mammal habitat within the site, it is not considered to be highly sensitive from a faunal perspective. It is also unlikely that the development of the site in its current layout would disrupt the connectivity of the landscape for mammals as there is a large amount of untransformed habitat to the north of the hill as well as uninterrupted alien bush along the base of the hill towards Sedgefield. As mammals tend to minimise energy expenditure when moving about, most species would avoid traversing the hill and rather skirt the edges of it. Consequently, the major impacts of the development would be habitat loss for resident species which is likely to be a relatively low proportion of the overall mammal species richness of the area and some disruption of landscape connectivity mostly for shy species which avoid human contact.

Reptiles

According to the SARCA database 27 reptiles have been recorded in the QDS 3422BB. No listed species have been recorded from the area. Given the degraded nature of the majority of the site, it would not be important for reptiles although some species such as Puff Adder are likely to be fairly common at the site. The higher-lying parts of the site which would be the focus of the development are not likely to be very important for landscape connectivity for reptiles, as they would be more likely to be using the lower-lying parts of the site. In

addition, the sterile understorey across large parts of the site would be unfavourable for many species and diversity across large parts of the site is likely to be low. Some kind of rehabilitation of the site would be likely to be highly favourable for reptiles and some open space would encourage the return of a variety of species including species such as Angulate Tortoise.

As the extent of the development is not very large and there are no habitats of high significance for reptiles within the site, the impacts on reptiles would be local in extent and not of broader significance.

Amphibians

Twelve frog species have been recorded in the FrogMap database for the area. This includes the Endangered Knysna Leaf-folding Frog *Afrixalus knysnae*, which has a restricted distribution along the coastal plain from Groenvlei to Covie. There is however no suitable habitat for this or any of the other water-dependent species within the site. Due to the degradation of the site due to alien invasion and likely associated aridification of any mesic habitats, the species richness and abundance of frogs at the site is likely to be low, with the only species present likely to be toads and sand frogs. As with reptiles, rehabilitation of the wider site would be likely to be beneficial for frogs. The establishment of water features within the development would also be potentially beneficial for frogs although it would most likely benefit the more common and generalised species of the area.

The development of the site is not likely to generate a highly significant impact on frogs and if the lower lying parts of the site were cleared of aliens and more functional ecosystems restored to these areas, there may be an overall benefit for frogs.

3.7 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the site is illustrated below in Figure 9. The majority of the site is considered low sensitivity habitat which is highly degraded and invaded by woody aliens. The remnant of near-natural fynbos is considered high sensitivity on account of the high threat status of the Knysna Sand Fynbos. Under the current layout, more than half of the remnant would be lost to the development. There are however several issues that require further discussion. On its' own the intact remnant is not functional and with time the fynbos elements would be lost and would give way to coastal thicket or forest. Although there is potential to rehabilitate parts of the site to increase the extent of fynbos vegetation at the site, the property would still be isolated within an area dominated by aliens and transformed farmland. As a result, restoring a functional fynbos-fire driven ecosystem at the site is not considered a practical reality. In this regard it is important to note that from a functional perspective, coastal thicket would be similar to fynbos for most fauna in the area and as it would be significantly easier to restore and maintain such an ecosystem this would be the recommended course of action.

Although the lower slopes of the site are classified as low sensitivity, they are very steep and development in these areas would be highly likely to encourage erosion. Even within the development areas, the slope is fairly steep and specific precautions to limit runoff and erosion impacts would be required during construction.

The current layout consists of three nodes with some space between them, designed to act as ecological corridors. However, the nodes of development are not likely to be within the major path of faunal movement and these are depicted below in Figure 10. Provided that the connectivity of the landscape can be improved in these areas, where they fall within the site, then it is possible that landscape connectivity could be improved for many species. However, this would be contingent on the compatible management of the property. Issues of specific significance would be restoring a functional ecosystem to the site and maintaining it free of alien invasion as well as ensuring that any fencing around the site is porous and allows fauna to pass through the site.



Figure 9. Ecological sensitivity map for “The Hill” property, showing the layout in relation to the identified sensitive features of the site



Figure 10. Major ecological corridors in the vicinity of “The Hill” and around Sedgefield in general. The major corridors would be along the drainage systems of the area as well as in an east-west direction along the lower slopes of the hills. It is not likely that there are large faunal movement paths through the site, directly over the hill.

4 IDENTIFICATION & NATURE OF IMPACTS

The majority of impacts associated with the development will occur during the construction phase as a result of the disturbance, clearing and levelling associated with the construction of the housing development. After construction, impacts would be generated by human activity and the presence of the development which may reduce broad-scale ecological processes such as landscape connectivity.

Impacts on Vegetation Types of Conservation Concern

The Knysna Sand Fynbos is listed as Critically Endangered and the development would ultimately be likely to result in the total loss of the remnant Sand Fynbos vegetation at the site. Outside of the near intact remnant, the development would occupy about 20% of the site and would limit the space available for restoration of functional ecosystems at the site.

Faunal Impacts

The development of the site will result in the loss of some faunal habitat. Although the majority of the site is currently degraded, the presence of the development would exclude the possibility that these areas can be restored. In addition, noise, light and other forms of disturbance from the development would deter sensitive fauna from the area.

Soil erosion and associated degradation of ecosystems

The large amount of disturbance that would be created during construction would leave the site vulnerable to soil erosion. The site is steep to moderately sloping and site clearing and preparation will certainly increase the risk of erosion. Although the development nodes are likely to be prepared with hardened streets and stormwater reticulation, the runoff would need to be appropriately directed so as not to cause erosion in the receiving area. The construction phase would be relatively short and most erosion is likely to manifest during after construction.

Impacts on Broad-Scale Ecological Processes

Although the site does not lie within a Critical Biodiversity Area, concern has been raised that it would disrupt the connectivity of the landscape for fauna. This impact would manifest after construction due to the presence of the development and would also be dependent on whether or not the alien vegetation on the rest of the site is cleared and the restoration of a functional ecosystem of indigenous species across the site.

5 ASSESSMENT OF IMPACTS

The following assessed impacts are those for the solar facility itself, for the planning and construction and operational phases of the development

5.1 CONSTRUCTION PHASE

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Impacts on vegetation types of conservation concern.	Local	Long-Term	Medium-Low	Definite	Low	Medium-Low Negative	Low Negative	High
Mitigation/ Management Actions <ul style="list-style-type: none"> That part of the intact remnant that is not within the development footprint should be marked with tape as a no-go area. All geophytes such as <i>Brunsvigia</i> as well as other species which are likely to survive translocation should be translocated from the intact area within the development footprint into the adjacent unaffected intact area in order to aid the rehabilitation of the unaffected area. Specific precautions should be made to limit runoff and erosion from the cleared areas impacting intact vegetation remnants. This may require the use of silt traps and soil savers as necessary. 								
Direct Faunal Impacts During Construction	Local	Short- Term	Medium	High	High	Medium Negative	Medium-Low Negative	High
Mitigation/ Management Actions <ul style="list-style-type: none"> All personnel should undergo environmental induction with regards to fauna and in particular awareness about not harming or collecting species such as snakes and tortoises. There should be a search and rescue of densely vegetated areas within the site just before they are cleared for species such as snakes and tortoises, this especially pertains to the intact remnant which was observed to have a faunal abundance. Any fauna threatened by the construction activities should be removed to safety by the ECO or appropriately qualified environmental officer. All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. 								

5.2 OPERATIONAL PHASE

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Impacts on vegetation during operation	Local	Long-term	Medium	High	Low	Medium Negative	Low Negative	High
Mitigation/Management Actions <ul style="list-style-type: none"> There should be regular alien clearing across the site, not just in the proximity of the development area. Active rehabilitation and reseedling with target species should occur in areas vulnerable to erosion or slow to recover some vegetation cover naturally. There should be a vegetation management and rehabilitation plan implemented for the site. 								
Faunal impacts during operation:	Low	Long-term	Medium	Moderate	High	Medium-Negative	Low-Negative	High
Mitigation/Management Actions <ul style="list-style-type: none"> There should be some refuge areas at the site which are safe from human disturbance and are not publically accessible. Access to the site should be controlled and precautions should be taken to ensure that there is no illegal hunting or poaching at the site. All litter and waste should be appropriately managed to ensure that it does not attract pest species or encourage the habituation of fauna. Any ponds associated with the wastewater treatment works should be animal-friendly in design, allowing fauna to escape if they fall in. 								
Soil Erosion Risk During Operation	Local	Long-term	Medium-High	High	Low	Medium Negative	Low Negative	High
Mitigation/Management Actions <ul style="list-style-type: none"> There should be a stormwater runoff system in place at the site. This should include litter traps to prevent litter from entering the stormwater system and ultimately rivers and drainage systems in the area. All runoff water should be captured in control ponds before being released into natural waterways. All roads should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. There should be regular erosion monitoring and control at the site as the steep slopes will leave the site vulnerable to erosion from any disturbance. 								

5.3 CUMULATIVE IMPACTS

The following are the cumulative impacts that are assessed as being a likely consequence of the development.

Nature of impact	Spatial Extent	Duration	Intensity	Probability	Reversibility	Significance and Status		Confidence level
						Without Mitigation	With Mitigation	
Impact on landscape connectivity and broad-scale ecological processes due to cumulative loss and fragmentation of habitat.	Local	Long-Term	Medium	Moderate	Low	Medium-Low Negative	Low Negative	Moderate-High
Mitigation/Management Actions <ul style="list-style-type: none"> The footprint of the development should be minimized as far as possible and the areas adjacent to the development nodes should be landscaped with indigenous species. If the site must be fenced, it should be done using non-electrified fencing of a standard wire-strand type that allows fauna to pass through. The areas outside of the development footprint should be rehabilitated towards coastal thicket and emergent forest and maintained free of aliens. 								

6 CONCLUSION & RECOMMENDATIONS

The potential impacts of "The Hill" development are mediated largely by the condition of the site and the location of the development footprint in this context. The majority of the site is severely invaded by woody aliens and contains very little remnant indigenous vegetation. A single area of near-natural vegetation of less than 2 ha was observed which is considered high sensitivity on account of the high threat status of the affected Knysna Sand Fynbos vegetation type. Under the current layout, more than half of the remnant would be lost to the development. However, even if the remnant is kept clear of alien vegetation, the long-term persistence of the patch is not guaranteed or even likely. On its own, the intact remnant is not considered functional and with time the fynbos elements would be lost and would give way to coastal thicket or forest. Although there is potential to rehabilitate parts of the site to increase the extent of fynbos vegetation at the site, the property would still be isolated within an area dominated by aliens and transformed farmland. As a result, restoring a functional fynbos-fire driven ecosystem at the site is not considered a practical reality and would be of limited ecological benefit compared to some alternative rehabilitation options. From a functional perspective, coastal thicket would be of similar value to fynbos for most fauna in the area and as it would be significantly easier to restore and maintain such an ecosystem this would be the recommended course of action.

Although the development footprint is only 20ha, the actual amount of habitat loss for some fauna would be higher as they may avoid the proximity of the development due to noise and other disturbance sources. As such, it is considered likely that some species would experience an approximate loss of about half the site. However, under the current situation this is only potential habitat and cannot be realised under the current conditions. The assessed layout consists of three nodes with some space between them, designed to act as ecological corridors. However, the nodes of development are not likely to be within the major routes of faunal movement which are likely to be lower down the slopes of the hill, with little ecological pattern to drive movement north-south over the top of the hill. As it stands, the site may allow for movement of fauna, but as the habitat quality is very poor for most species, it represents only a transition zone with little offered in the way of favourable habitat to allow for resident populations. Furthermore, the site is currently open access and extensive woodcutting, dumping and probably poaching are take place within the site, which calls its current value as faunal habitat into question.

Provided that the habitat quality and connectivity of the landscape can be improved in the areas of the property outside of the development footprint, this could largely negate the negative impacts of the development. However, this would be contingent on the compatible management of the property. Issues of specific significance would be restoring a functional ecosystem to the site and maintaining it free of alien invasion as well as ensuring that any fencing around the site is porous and allows fauna to pass through the site. Furthermore,

this would need to be stipulated in the authorisation conditions for the development, along with time frames for implementation as if this is not explicitly included, there is the danger that the development would proceed and the rehabilitation of the wider site relegated to a low priority that is never actualised.

Provided that the above mitigation measures can be implemented, then the impact of the development is considered acceptable and would not result in net biodiversity loss.

7 REFERENCES

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8 ANNEX 1. LIST OF MAMMALS

List of mammals which have been recorded in the vicinity of "The Hill" site. Conservation dependent large mammals and non-free ranging or introduced species are not included in the list.

Family	Genus	Species	Subspecies	Common name	Red list category	No. records
Bathyergidae	Bathyergus	suillus		Cape Dune Mole-rat	Least Concern	56
Bathyergidae	Cryptomys	hottentotus		Southern African Mole-rat	Least Concern	18
Bovidae	Damaliscus	pygargus	pygargus	Bontebok	Vulnerable	14
Bovidae	Philantomba	monticola		Blue Duiker	Vulnerable	17
Bovidae	Raphicerus	melanotis		Cape Grysbok	Least Concern	612
Bovidae	Tragelaphus	oryx		Common Eland	Least Concern	13
Bovidae	Tragelaphus	scriptus		Bushbuck	Least Concern	462
Cercopithecidae	Papio	ursinus		Chacma Baboon	Least Concern	1
Chrysochloridae	Chlorotalpa	duthieae		Duthie's Golden Mole	Least Concern	28
Felidae	Caracal	caracal		Caracal	Least Concern	126
Felidae	Panthera	pardus		Leopard	Least Concern	17
Gliridae	Graphiurus	murinus		Forest African Dormouse	Least Concern	13
Herpestidae	Atilax	paludinosus		Marsh Mongoose	Least Concern	16
Herpestidae	Cynictis	penicillata		Yellow Mongoose	Least Concern	9
Herpestidae	Herpestes	ichneumon		Egyptian Mongoose	Least Concern	28
Herpestidae	Herpestes	pulverulentus		Cape Gray Mongoose	Least Concern	53
Hystriidae	Hystrix	africaeauralis		Cape Porcupine	Least Concern	199
Molossidae	Tadarida	aegyptiaca		Egyptian Free-tailed Bat	Least Concern	2
Muridae	Mus	minutoides		Southern African Pygmy Mouse	Least Concern	66
Muridae	Myomyscus	verreauxi		Verreaux's Mouse	Least Concern	26
Muridae	Otomys	irroratus		Southern African Vlei Rat	Least Concern	104
Muridae	Rhabdomys	pumilio		Xeric Four-striped Grass Rat	Least Concern	897
Mustelidae	Aonyx	capensis		African Clawless Otter	Least Concern	71
Mustelidae	Ictonyx	striatus		Striped Polecat	Least Concern	17
Mustelidae	Mellivora	capensis		Honey Badger	Near Threatened	88
Mustelidae	Poecilogale	albinucha		African Striped Weasel	Data deficient	1
Nesomyidae	Steatomys	krebsii		Kreb's African Fat Mouse	Least Concern	7
Procaviidae	Procavia	capensis		Rock Hyrax	Least Concern	14
Pteropodidae	Epomophorus	wahlbergi		Wahlberg's Fruit Bat	Least Concern	2
Soricidae	Crocidura	flavescens		Greater Red Musk Shrew	Data Deficient	13
Soricidae	Myosorex	varius		Forest Shrew	Data Deficient	26
Suidae	Potamochoerus	porcus		Bushpig	Not listed	135
Vespertilionidae	Neoromicia	capensis		Cape Serotine	Least Concern	13
Viverridae	Genetta	genetta		Common Genet	Least Concern	80
Viverridae	Genetta	tigrina		Cape Genet	Least Concern	15

9 ANNEX 2. LIST OF REPTILES

List of reptiles which are likely to occur in the vicinity of “The Hill” site. Conservation status is from Bates et al. (2014).

Family	Genus	Species	Subspecies	Common name	Red list category	No. records	Area
Gekkonidae	Chondrodactylus	bibronii		Bibron's Gecko	Least Concern	1	3322CA
Agamidae	Agama	atra		Southern Rock Agama	Least Concern	5	3322CA
Gekkonidae	Pachydactylus	geitje		Ocellated Gecko	Least Concern	3	3322CA
Gekkonidae	Pachydactylus	maculatus		Spotted Gecko	Least Concern	2	3322CA
Gekkonidae	Pachydactylus	mariquensis		Marico Gecko	Least Concern	2	3322CA
Gekkonidae	Pachydactylus	kladaroderma		Thin-skinned Gecko	Least Concern	1	3322C
Gekkonidae	Pachydactylus	purcelli		Purcell's Gecko	Least Concern	1	3322C
Gekkonidae	Goggia	hewitti		Hewitt's Pygmy Gecko	Least Concern	6	3322CA
Gekkonidae	Afrogecko	porphyreus		Marbled Leaf-toed Gecko	Least Concern	25	3322C
Varanidae	Varanus	albigularis	albigularis	Rock Monitor	Least Concern	4	3322CA
Chamaeleonidae	Bradypodion	damaranum		Knysna Dwarf Chameleon	Least Concern	17	3322C
Chamaeleonidae	Bradypodion	gutturale		Little Karoo Dwarf Chameleon	Least Concern	2	3322C
Agamidae	Agama	atra		Southern Rock Agama	Least Concern	23	3322C
Lacertidae	Nucras	lalandii		Delalande's Sandveld Lizard	Least Concern	1	3322C
Lacertidae	Nucras	livida		Karoo Sandveld Lizard	Least Concern	1	3322CA
Lacertidae	Nucras	tessellata		Western Sandveld Lizard	Least Concern	1	3322CA
Lacertidae	Pedioplanis	lineoocellata	pulchella	Common Sand Lizard	Least Concern	1	3322CA
Lacertidae	Tropidosaura	gularis		Cape Mountain Lizard	Least Concern	9	3322C
Lacertidae	Tropidosaura	montana	montana	Common Mountain Lizard	Not listed	1	3322CA
Scincidae	Acontias	meleagris		Cape Legless Skink	Least Concern	4	3322CA
Scincidae	Trachylepis	capensis		Cape Skink	Least Concern	1	3322CA
Scincidae	Trachylepis	homalocephala		Red-sided Skink	Least Concern	1	3322CA
Scincidae	Trachylepis	sulcata	sulcata	Western Rock Skink	Least Concern	4	3322CA
Scincidae	Trachylepis	variegata		Variegated Skink	Least Concern	1	3322C
Cordylidae	Chamaesaura	anguina	anguina	Cape Grass Lizard	Least Concern	7	3322C
Cordylidae	Ninurta	coeruleopunctatus		Blue-spotted Girdled Lizard	Least Concern	42	3322C
Cordylidae	Cordylus	cordylus		Cape Girdled Lizard	Least Concern	7	3322C
Cordylidae	Karusasaurus	polyzonus		Karoo Girdled Lizard	Least Concern	1	3322C
Cordylidae	Hemicordylus	capensis		Graceful Crag Lizard	Least Concern	8	3322C
Cordylidae	Pseudocordylus	microlepidotus	microlepidotus	Cape Crag Lizard	Least Concern	21	3322C
Gerrhosauridae	Tetradactylus	seps		Short-legged Seps	Least Concern	5	3322C
Typhlopidae	Rhinotyphlops	lalandei		Delalande's Beaked Blind Snake	Least Concern	2	3322CA
Colubridae	Lamprophis	aurora		Aurora House Snake	Least Concern	1	3322CA
Colubridae	Boaedon	capensis		Brown House Snake	Least Concern	3	3322CA
Colubridae	Lycodonomorphus	inornatus		Olive House Snake	Least Concern	2	3322C
Colubridae	Lycodonomorphus	rufulus		Brown Water Snake	Least Concern	1	3322CA
Colubridae	Duberria	lutrix	lutrix	South African Slug-eater	Least Concern	2	3322CA

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<i>Colubridae</i>	<i>Crotaphopeltis</i>	<i>hotamboeia</i>		Red-lipped Snake	Least Concern	1	3322CA
<i>Colubridae</i>	<i>Dispholidus</i>	<i>typus</i>	<i>typus</i>	Boomslang	Least Concern	2	3322CA
<i>Colubridae</i>	<i>Dasypeltis</i>	<i>scabra</i>		Rhombic Egg-eater	Least Concern	2	3322CA
<i>Colubridae</i>	<i>Psammophis</i>	<i>crucifer</i>		Cross-marked Grass Snake	Least Concern	1	3322CA
<i>Colubridae</i>	<i>Prosymna</i>	<i>sundevallii</i>		Sundevall's Shovel-snout	Least Concern	1	3322CA
<i>Colubridae</i>	<i>Amplorhinus</i>	<i>multimaculatus</i>		Many-spotted Snake	Least Concern	3	3322C
<i>Atractaspididae</i>	<i>Homoroselaps</i>	<i>lacteus</i>		Spotted Harlequin Snake	Least Concern	1	3322CA
<i>Elapidae</i>	<i>Aspidelaps</i>	<i>lubricus</i>	<i>lubricus</i>	Coral Shield Cobra	Not listed	5	3322CA
<i>Elapidae</i>	<i>Naja</i>	<i>nivea</i>		Cape Cobra	Least Concern	8	3322CA
<i>Viperidae</i>	<i>Causus</i>	<i>rhombeatus</i>		Rhombic Night Adder	Least Concern	1	3322C
<i>Viperidae</i>	<i>Bitis</i>	<i>arietans</i>	<i>arietans</i>	Puff Adder	Least Concern	1	3322CA
<i>Testudinidae</i>	<i>Chersina</i>	<i>angulata</i>		Angulate Tortoise	Least Concern	9	3322CA
<i>Testudinidae</i>	<i>Stigmochelys</i>	<i>pardalis</i>		Leopard Tortoise	Least Concern	6	3322CA
<i>Testudinidae</i>	<i>Homopus</i>	<i>areolatus</i>		Parrot-beaked Tortoise	Least Concern	1	3322CA
<i>Testudinidae</i>	<i>Psammobates</i>	<i>tentorius</i>	<i>tentorius</i>	Karoo Tent Tortoise	Not listed	2	3322CA
<i>Pelomedusidae</i>	<i>Pelomedusa</i>	<i>subrufa</i>		Central Marsh Terrapin	Least Concern	3	3322CA

10 ANNEX 3. LIST OF AMPHIBIANS

List of amphibians which are likely to occur in the vicinity of “The Hill” site.

Family	Genus	Species	Common name	Red list category	No. records
<i>Brevicipitidae</i>	<i>Breviceps</i>	<i>fuscus</i>	Plain Rain Frog	Least Concern	3
<i>Bufo</i>	<i>Amietophrynus</i>	<i>rangeri</i>	Raucous Toad	Least Concern	2
<i>Hyperoliidae</i>	<i>Afrixalus</i>	<i>knysnae</i>	Knysna Leaf-folding Frog	Endangered	4
<i>Hyperoliidae</i>	<i>Hyperolius</i>	<i>horstockii</i>	Arum Lily Frog	Least Concern	4
<i>Hyperoliidae</i>	<i>Hyperolius</i>	<i>marmoratus</i>	Painted Reed Frog	Least Concern	9
<i>Hyperoliidae</i>	<i>Semnodactylus</i>	<i>wealii</i>	Rattling Frog	Least Concern	1
<i>Pyxicephalidae</i>	<i>Amietia</i>	<i>fuscigula</i>	Cape River Frog	Least Concern	4
<i>Pyxicephalidae</i>	<i>Cacosternum</i>	<i>boettgeri</i>	Common Caco	Least Concern	3
<i>Pyxicephalidae</i>	<i>Cacosternum</i>	<i>nanum</i>	Bronze Caco	Least Concern	7
<i>Pyxicephalidae</i>	<i>Strongylopus</i>	<i>fasciatus</i>	Striped Stream Frog	Least Concern	7
<i>Pyxicephalidae</i>	<i>Strongylopus</i>	<i>grayii</i>	Clicking Stream Frog	Least Concern	10
<i>Pyxicephalidae</i>	<i>Tomopterna</i>	<i>delalandii</i>	Cape Sand Frog	Least Concern	2