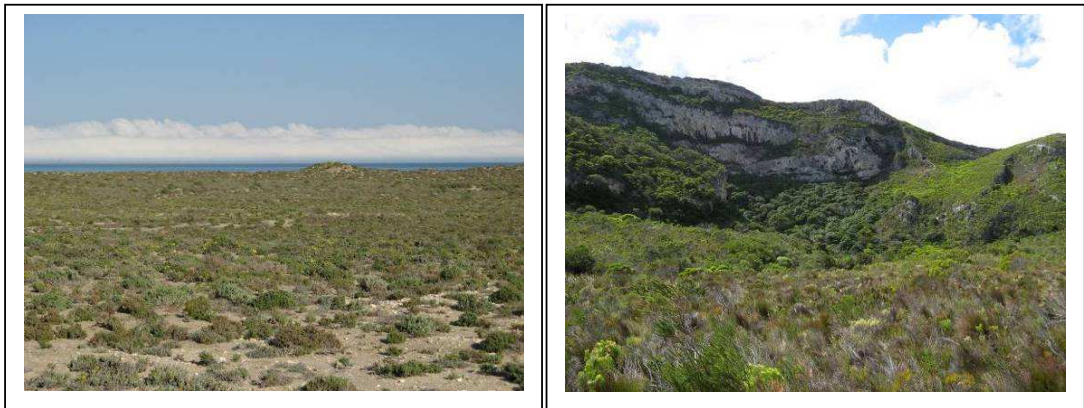


NUCLEAR 1 ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

SPECIALIST STUDY FOR SCOPING REPORT



SPECIALIST STUDY: Vertebrate fauna

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J27035

21 August 2007

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1 EXECUTIVE SUMMARY

Assumptions and limitations

In this Scoping phase of an EIA process it is necessary and appropriate to apply the precautionary principle. In other words, it is assumed that any or all parts of the development site will, or could be, negatively impacted by the proposed development. "Red-flag" issues are identified and used to motivate the next stage of the EIA process, namely the Assessment phase.

Description of sites and surrounding environment

All five sites were found to be in relatively good condition with respect to natural ecosystems, and all are likely to have elements of their terrestrial vertebrate fauna which are sensitive to the impacts of development. These sensitive elements are highlighted. In all cases it is recommended that further field studies be carried out to update the information that already exists from previous studies. In some cases, existing information is good and provides useful background for assessment.

Project impacts on the environment

The negative impacts of the construction of a nuclear power station on terrestrial fauna are essentially of three types: (a) habitat destruction, (b) disruption of ecological processes, and (c) direct exploitation.

Mitigation measures for the three types of impact include the following:

- a. Adopt a minimum-footprint approach to development. This is especially relevant to the construction phase when a lot of unnecessary habitat destruction can occur. Avoid damage to habitats of limited areal extent and special importance, especially wetlands.
- b. Ensure that ecological corridors, with adequate specifications, are maintained to connect otherwise isolated patches of habitat. Keep disruptive elements (e.g., fencing, exterior lighting, service roads, etc.) to a minimum and, wherever possible, use designs that are wildlife friendly.
- c. Draw up an EMP with the assistance of relevant specialists, and implement this rigorously during both the construction and operational phases of the project.

Impacts of the environment on the project

- Some terrestrial fauna are potentially dangerous to humans: venomous snakes are an obvious example.
- Birds can cause damage to electrical installations by causing short circuits. Roosting and nesting birds can cause other forms of damage to buildings. Various terrestrial animals can create problems where electrified security fences are concerned.
- Rodents can be problematic, especially where there are anthropogenic sources of food.

Especially during the construction phase, medical facilities should be in place to deal with possible injuries arising from contact with dangerous animals.

Bird-damage should be anticipated and avoided through installation of appropriate features and devices that help to prevent unwanted bird behaviour. Security fences need to be designed so as to cause as little conflict with wildlife as possible.

Care should be taken not to create anthropogenic sources of food for animals, especially around living quarters.

Site-sensitivity analysis

It is not possible to assess site sensitivity with a high degree of confidence at this stage of the EIA process. However, a preliminary assessment, based on available information and the brief site visits, is possible. These preliminary assessments may be substantively changed during the scoping/baseline phase of the process.

Criteria used to rate and rank the sites are:

- a. Threatened species: taking into account the number of threatened species probably occurring on site, and their level of threat.
- b. Ecosystem processes: taking into account the vulnerability of ecosystem processes to disruption, as determined by the on-site complexity and spatial distribution of habitats and their ecological drivers.

These two criteria are each rated on a 3-point scale. The ratings under the two criteria are averaged to produce a single, integrated rating, with a maximum value of -3. This latter, single figure is used to rank the five sites.

All five sites have significant issues associated with vertebrate terrestrial fauna, and therefore all five sites require further survey work and assessment if they are to be considered for Nuclear 1. However, it is clear that the five sites are not equally problematic with respect to vertebrate terrestrial fauna. The inland portion of Bantamsklip, and Thyspunt, are significantly more problematic than the coastal portion of Bantamsklip and the three west coast sites. If the findings of the other biodiversity specialists follow a similar pattern, it would seem logical to place the emphasis for further work on the less problematic sites, and exclude at least Thyspunt from further consideration for Nuclear 1.

2 INTRODUCTION

This report represents the first stage, namely the Scoping phase, in an EIA process for Nuclear 1. The scope of this report is terrestrial vertebrate fauna, including amphibians, reptiles, birds and mammals. Freshwater and marine fish are covered in the reports on freshwater and marine ecology, respectively. Marine mammals and reptiles are not considered relevant to this study. Those marine birds which frequent the shore are covered in this report.

Five potential sites for Nuclear 1 are assessed, namely Brazil (west coast, Northern Cape), Skulpfontein (west coast, Northern Cape), Duynfontein (west coast, Western Cape), Bantamsklip (south coast, Western Cape) and Thyspunt (south coast, Eastern Cape).

2.1 Description of proposed project

The proposed project involves the construction and operation of a conventional nuclear power station, together with its associated infrastructure. Only one of the five sites is scheduled to be developed for power generation, under the terms of Nuclear 1, but the remaining four sites are likely to be used for additional power stations in future.

2.2 Terms of reference

The TOR were provided by Arcus Gibb Pty Ltd, the company responsible for managing the EIA process on behalf of Eskom. The relevant document is *Arcus Gibb Terms Of Agreement For Sub-Consultants* of June 2007. The template of this report was also provided by Arcus Gibb.

At this stage of the EIA process, the details of the project footprint and physical scope are not available in any detail, therefore this report is based on the characteristics of the sites only. This is standard practice at the Scoping phase as the primary objective is to identify possible issues and problems in the natural environment, and to indicate whether more detailed surveys are recommended in a subsequent baseline/scoping phase.

The findings of this report are based on desktop study and brief visits to each of the five sites. The contents of previous reports for Eskom were taken into consideration.

This report will be used as input into Scoping report on biodiversity (to be prepared by Barrie Low). The other reports relevant to biodiversity cover the topics of flora, invertebrate fauna, marine ecology and freshwater ecology.

3 BACKGROUND

Nuclear 1 is an initial programme to expand Eskom's nuclear electricity-generating capacity. At present there is only one nuclear power station in South Africa (Koeberg), and Nuclear 1 will lead to the development of a second conventional nuclear power station. The experiences and policies from the Koeberg facility are used here to inform the EIA process for Nuclear 1.

A series of surveys were carried out in the 1980s to identify potential sites for additional nuclear power stations. The five sites included in Nuclear 1 were selected from the results of that previous process. The relevant survey reports for the five selected sites were made available to specialists involved in Nuclear 1.

3.1 Legislative framework

For a description of the legislative framework that underpins this EIA process, please refer to the relevant section of the integrated report on biodiversity for the Scoping phase.

3.2 Assumptions and limitations

In the Scoping phase of an EIA process it is necessary and appropriate to apply the precautionary principle. In other words, it is assumed that any or all parts of the development site will, or could be, negatively impacted by the proposed development. Arising from this approach, “red-flag” issues are identified and used to motivate the next stage of the EIA process, namely the Assessment phase.

Insights from this report are limited by the brevity of the site visits (a few hours each) and the unavailability of some of the earlier relevant reports commissioned by Eskom. Shortcomings arising from these limitations are minimized by application of the precautionary approach.

A specific consideration with respect to vertebrate fauna is the availability of recent Red Lists and accurate species distribution maps. In this regard, amphibians, birds and mammals all have relatively up-to-date conservation assessments published (Minter et al. 2004; Barnes 2000; Friedmann & Daly 2004, respectively). Unfortunately, the most recently published work for reptiles (Branch 1988) is badly out of date. A new conservation assessment of South African reptiles is currently underway, but is still in its early stages. For this reason, reference to threatened reptile species is based on a preliminary list of “possibly threatened” species, obtained from the Southern African Reptile Conservation Assessment (SARCA; in lit.).

4 DESCRIPTION OF SITES AND SURROUNDING ENVIRONMENT

The intention here is not to provide spatial detail, but to describe the receiving environments of the five sites in broad outline.

All five sites lie on the coast, but also have portions that extend a few kilometres inland. All have been identified as suitable for the location of a nuclear power station because they include coastal areas, with suitable geological substrates, that are seismically stable.

4.1 Thyspunt



Figure 1: A general view of the Thyspunt site with approximate boundaries and immediate surroundings.

The site lies close to Cape St Francis, to the west. It lies within the Cape Floristic Region (CFR) which is largely restricted to the Western Cape and Eastern Cape provinces. This is an exceptionally biodiverse region with very high levels of species endemism. The CFR has been identified as a global Biodiversity Hotspot by Conservation International (CI; www.biodiversityhotspots.org), and is the focus of a South African government-supported initiative, the Cape Action for People and the Environment (C.A.P.E.; www.capeaction.org.za), based at the South African National Biodiversity Institute (SANBI).

The site is registered with DEA&T as a Natural Heritage Site.

Habitats on site are largely comprised of the following veld types: Algoa Dune Strandveld (Least Threatened) covering the majority of the area, Southern Cape Dune Fynbos (Least Threatened) on a relatively large area, a narrow coastal strip of Cape Seashore Vegetation (Least Threatened), and a relatively small area of Tsitsikamma Sandstone Fynbos (Vulnerable) on an inland extension of the site. The latter inland portion has been largely transformed by agriculture. In addition there are thickets of invasive alien vegetation (mainly Rooikrans *Acacia cyclops*) and extensive wetland systems. The latter systems comprise seasonal wetlands in dune slacks and seeps at the coast. At least some of the seeps are perennial sources of freshwater.

The site slopes quite steeply from its inland reaches, down to the coast. In addition, the larger coastal portion of the site undulates as a result of dune systems – some stable and vegetated, others completely unvegetated – that run parallel to the coast. The coastal areas are rocky in the western parts, with small, sandy beaches in places, and at the eastern end of the site there is a relatively long, sandy beach.



Figure 2: The south-eastern portion of the Thyspunt site. Note the steeply sloped vegetated dunes, mobile dunes, and dense natural vegetation.

It is clear from the description above that the site is environmentally varied and diverse, with several distinctly different habitat types, a complex topography with a complex system of drainage, and a varied coastline. Despite the proximity of the towns of Cape St Francis in the east and Oyster Bay in the west, the site is remarkably wild, unspoilt, and strikingly beautiful. These features collectively indicate the presence of a rich and varied fauna.

With respect to terrestrial vertebrate fauna, reports on previous studies of the site (Courtney & Speirs 1994a; De Villiers 1996) are superficial and lacking in adequate detail. De Villiers (1996) specifically recommended that additional surveys be done. This report also strongly recommends additional sampling.

Features of special significance with respect to species and ecosystem processes include the following:

Amphibians: No threatened species are likely to occur.

Reptiles: Thyspunt lies close to a centre of reptile endemism in the Algoa Bay district. It is therefore possible that a number of species with restricted ranges may occur here at the edge of their distributions. Some of these are potentially threatened.

Birds: The site is unlikely to be important for any threatened terrestrial species, but threatened seabirds are likely to roost and/or forage at the coast, viz., Roseate Tern *Sterna dougalli* (Endangered) and Damara Tern *Sterna balaenarum* (Endangered).

Mammals: The Blue Duiker *Philantomba monticola* (Vulnerable) is almost certain to occur. There have been reliable reports of Leopards *Panthera pardus* both occurring and breeding on site (Gert Greeff pers. comm.). While the Leopard is not a threatened species, its occurrence in coastal environments has become a rare phenomenon. This species is

symbolic of the wild, unspoilt nature of the site, and of an ecosystem that is intact and functioning in, or close to, its original condition.

Ecosystem processes: The presence of several different habitat types means that there are also extensive ecotonal areas where habitats intergrade. Such areas are important in promoting adaptability and resilience of ecosystems. The inter-connectedness of habitats means that a wide variety of resources is available to fauna, thus helping to ensure the sustainability of populations. The presence of perennial water on site is an important feature in sustaining aquatic and semi-aquatic species in particular, and animal life in general. Large areas of mobile dunes, and vegetated dunes, are vulnerable to disturbance and resultant habitat degradation, especially given that the dunes are steeply sloped in many places. Where dune systems are crossed by infrastructural development, environmental management and maintenance of installations is often problematic.

4.2 Bantamsklip



Figure 3: A general view of the Bantamsklip site with approximate boundaries and immediate surroundings. Note the coastal and inland portions, separated by the R43.

The Bantamsklip site lies within the CFR (see 4.1, above, for more detail).

The site lies roughly equidistant between the town of Pearly Beach to the north-west and Quoin Point to the south-east. It is bisected by the R43, creating a coastal and an inland portion (the latter on the farm Hagelkraal), which are distinct from each other in terms of dominant habitats and biotic communities.

The farm Hagelkraal is registered with DEA&T as a Natural Heritage Site.

Habitats on site are comprised mainly of the following vegetation types: a narrow coastal strip of Cape Seashore Vegetation (Least Threatened), Overberg Dune Strandveld (Least Threatened) covering almost all of the coastal portion, Agulhas Limestone Fynbos (Least Threatened) covering the majority of the inland portion, an extensive area of Overberg

Sandstone Fynbos (Least Threatened) on the inland portion, a small area of Agulhas Sand Fynbos (Vulnerable) on the inland portion, a very small area of Southern Coastal Forest (Least Threatened) on the hillsides of the inland portion. In addition, there are significant areas of wetland and drainage lines on the inland portion.

The coastal portion is characterized by an undulating topography created by series of vegetated dunes. The inland portion is a broken landscape with hills – including rocky, limestone hills with numerous caves – and marshy lowlands.

Both portions of the Bantamsklip site are in good condition with only limited disturbance and invasive alien vegetation. There is, however, evidence of abalone-poaching activities at the coast. The site is exceptionally varied in its habitats and can be expected to contain a rich diversity of fauna. The inland portion, in particular, includes some threatened habitat types which are important to some equally rare species. The site has impressive scenic qualities, especially on the inland portion.

With respect to terrestrial vertebrate fauna, a summary report on previous studies of the site (Courtney 1993) is superficial and lacking in adequate detail. On the other hand, specialist reports from the late 1980s (Allan & Hockey 1989; De Villiers 1989; Palmer 1989) provide excellent background information and a basis for assessment. However, it should be noted that the information in those reports is at least 16 year old and should, therefore, be updated. Additional sampling is recommended.



Figure 4: A coastal view of the Bantamsklip site.



Figure 5: A view of the coastal portion of the Bantamsklip site. Note the gently undulating nature of the terrain on vegetated dunes.



Figure 6: A view of the inland portion of the Bantamsklip site. Note the rocky limestone hill with caves and a patch of forest, surrounded by fynbos.

Features of special significance with respect to species and ecosystem processes include the following:

Amphibians: Several threatened species are known to occur and breed on the farm Haagelkraal, including the Micro Frog *Microbatrachella capensis* (Critically Endangered), Cape Platanna *Xenopus gilli* (Endangered) and Western Leopard Toad *Amietophrynus pantherinus* (Endangered).

Reptiles: A few potentially threatened species are likely to occur.

Birds: Some threatened seabirds are likely to roost and forage at the coast. Red Listed raptors, e.g., Peregrine Falcon *Falco peregrinus*, Lanner Falcon *Falco biarmicus* and Black Harrier *Circus maurus*, may have breeding sites in the rocky hills.

Mammals: The caves in the limestone hills are likely to contain important roosting and breeding sites for a relatively large number of bat species, several of which are Red Listed. The threatened Whitetailed Rat *Mystromys albicaudatus* (Endangered) may occur.

Ecosystem processes: The fragmentation of the site by the R43 is an unfortunate feature which partially disrupts ecosystem processes, but otherwise the site is well connected to neighbouring properties and local ecosystems appear to be largely intact and functioning normally. As at Thyspunt, the variety of habitats means that there are extensive ecotones which are important in ecological and evolutionary processes. The inland, fynbos areas have fire as an important ecological driver, and this holds important implications for environmental management. There are a number of watercourses and wetlands, as well as numerous rocky hills and caves, all of ecological importance and potentially vulnerable to disturbance. The coastal portion is sandy, undulating and vulnerable to mechanical disturbance, but to a lesser degree than Thyspunt because the slopes are generally more gentle.

4.3 Duynefontein

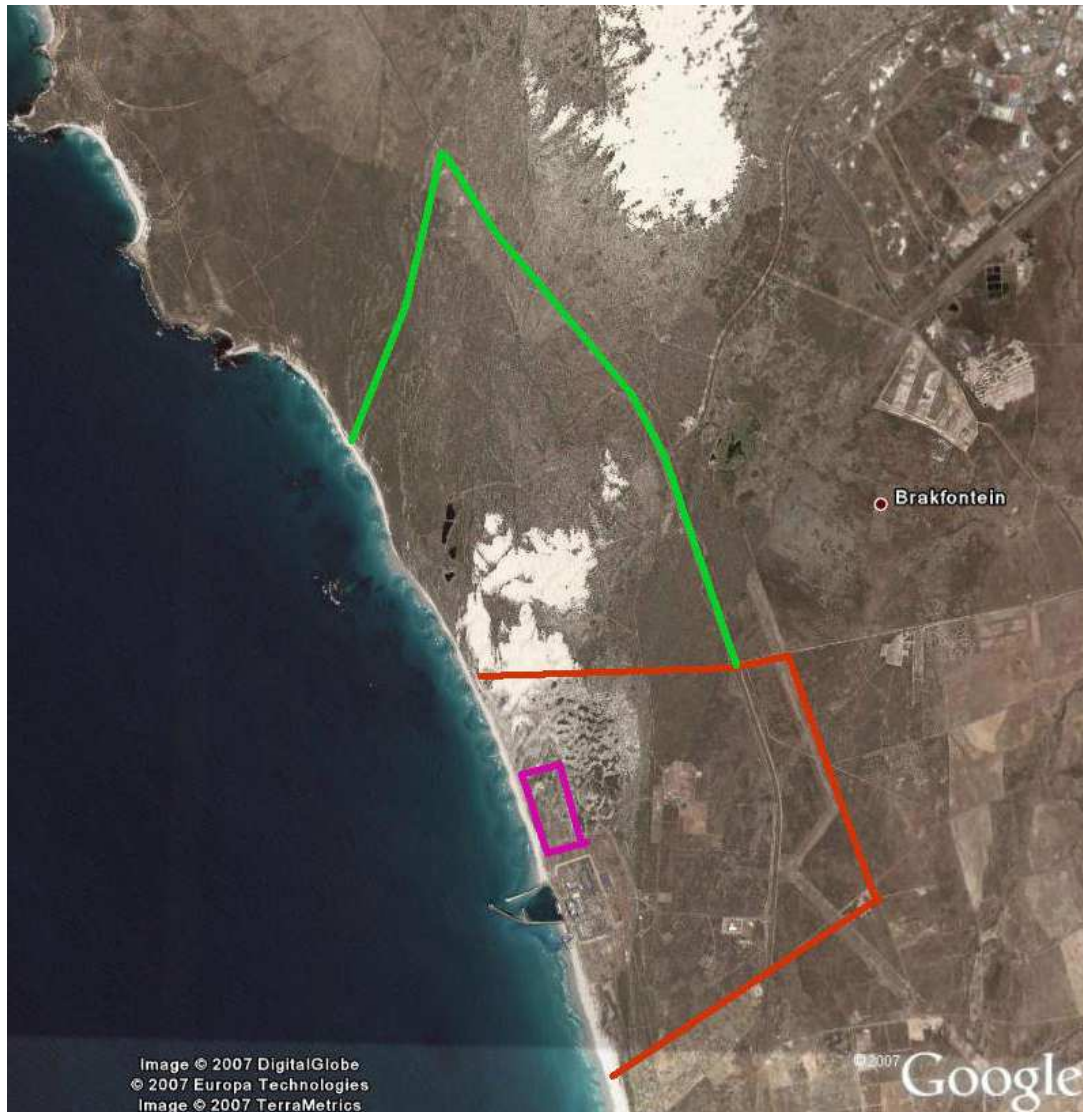


Figure 7: A general view of the Duynefontein site (red boundaries) with approximate boundaries and immediate surroundings. Note the position of the Koeberg Private Nature Reserve (green boundaries) and the approximate location of the terrace on which the power station could be built (purple boundaries), just to the north of the existing Koeberg Nuclear Power Station.

The site lies within the CFR (see 4.1, above, for more detail).

The Duynefontein site lies to the north of Melkbosstrand on the west coast. The site currently houses the Koeberg Nuclear Power Station, and the Koeberg Private Nature Reserve lies immediately to the north (Fig. 7). The site is bisected by the R27, and has numerous buildings and infrastructural features associated with the power station.

Habitats on site are comprised mainly of the following vegetation types: a narrow strip of Cape Seashore Vegetation (Least Threatened) along the coast, Cape Flats Dune Strandveld (Endangered) over most of the site, and some Atlantis Sand Fynbos (Endangered) on inland portions. Natural wetlands on site are small and seasonal, and situated mainly in the slacks of vegetated dunes.

Although detailed species information is available (e.g., Eskom undated; Eskom 2005; Tlukzek & Shippey 1995), there remain significant gaps in information, especially for reptiles. Additional sampling is recommended.



Figure 8: The Duynfontein site, just north of the existing Koeberg plant. Note the high dunes near the coast.

Features of special significance with respect to species and ecosystem processes include the following:

Amphibians: No threatened species are expected to occur.

Reptiles: Several potentially threatened species are likely to occur.

Birds: Several threatened seabird species occur on the coast, e.g., Crowned Cormorant *Phalacrocorax neglectus* (Vulnerable), Bank Cormorant *Phalacrocorax coronatus* (Near Threatened), Capian Tern *Hydroprogne caspia* (Near Threatened). Several species of raptor, some of which are threatened, and waterbirds are among the species which could be problematic in terms of interactions with electrical installations. Several threatened species of raptor occur on site (Eskom undated), some of which may breed on site, e.g., Black Harrier *Circus maurus* (Near Threatened; Simmons et al. 2002).

Mammals: The only threatened species likely to occur is the Whitetailed Rat *Mystromys albicaudatus* (Endangered).

Ecosystem processes: The sandy dunes are vulnerable to mechanical disturbance, especially the sparsely vegetated, high dunes near the coast. It is important to allow mobile dunes to remain mobile, without artificial barriers to the movement of sand, and to avoid causing vegetated dunes to become mobile through disturbance. The erection of a second power station next to Koeberg, and with the addition of a pebble-bed modular reactor to the south of Koeberg, presents the prospect of a long, solid barrier between the coast and the inland portions of Duynfontein. Every effort should be made to maintain ecological corridors linking the coast to the interior as many animals need to move freely between these habitat types.

4.4 Brazil



Figure 9: A general view of the Brazil site (approximate location, south of Kleinsee) and immediate surroundings.

The site is situated within the Succulent Karoo biome, a region of exceptional biodiversity and endemism for an arid zone. The Succulent Karoo has been identified as a global Biodiversity Hotspot by Conservation International (CI; www.biodiversityhotspots.org), and is the focus of a South African initiative, the Succulent Karoo Ecosystem Programme (SKEP; www.skep.org), based at SANBI.

Brazil lies to the south of Kleinsee. It has been explored for diamond-mining potential and there are a few test excavations on site. Marine diamond mining is currently taking place from the coast.

The site is relatively simple in its topography, with only a gentle slope down to the coast. There is a limited amount of undulation created by vegetated dunes. At the coast there are stretches of both rocky and sandy shore. There are many vehicle tracks near the coast, causing considerable habitat degradation.

Habitats on site are comprised mainly of the following vegetation types: a narrow strip of Namaqualand Seashore Vegetation (Least Threatened) along the coast, and Namaqualand Coastal Duneveld (Least Threatened) covering the rest of the site. In comparison to the other four sites, Brazil is exceptionally homogeneous with respect to habitats. Extensive natural salt pans occur near the eastern boundary of Brazil, but not on the property itself.

With respect to terrestrial vertebrate fauna, a summary report on previous studies of the site (Courtney & Speirs 1994b) is superficial and lacking in adequate detail. On the other hand, specialist reports from the early 1990s (Bronner 1991; Haacke 1991; Ryan 1991) provide

excellent background information and a basis for assessment. However, it should be noted that the information in those reports is at least 16 year old and should, therefore, be updated. Additional sampling is recommended.



Figure 10: A general view of the Brazil site. Note the genety undulating terrain and mining excavations in the middle distance.

Features of special significance with respect to species and ecosystem processes include the following:

Amphibians: The Desert Rain Frog *Breviceps macrops* (Vulnerable) is a threatened, range-restricted endemic species under threat from diamond-mining activities (Minter et al. 2004).

Reptiles: Several potentially threatened endemic species occur in the district.

Birds: Several range-restricted terrestrial endemic species occur in the district, but none are threatened (Harrison et al. 2007; Barnes 2000). Several threatened seabird species occur on the coast. Ludwig's Bustard *Neotis ludwigii* (Vulnerable) and several species of raptor, some of which are threatened, are among the species which could be problematic in terms of interactions with electrical installations.

Mammals: Two threatened species of golden mole may occur on site, namely Grant's Golden Mole *Erimalpa granti* and De Winton's Golden Mole *Crytochloris wintoni* (Friedmann & Daly 2004).

Ecosystem processes: The relatively simple, homogeneous nature of the site, together with the absence of any wetlands or watercourses, indicates that the local ecosystem is relatively resilient to disruption through fragmentation or the erection of

barriers. However, as at the other four sites, the dune systems are vulnerable to disturbance. Given the aridity of the system, it is slow to recover from disturbance, and the potential for rehabilitation is relatively poor (De Villiers et al. 2005).

4.5 Skulpfontein



Figure 11: A general view of the Skulpfontein site (approximate location, north of Koiingnaas) and immediate surroundings.

The site is situated within the Succulent Karoo biome (see 4.4, above, for more detail).

Skulpfontein is situated only about 10 km to the south of Brazil (not far north of Koiingnaas) and therefore has environmental features similar to those found at Brazil. In addition to the two vegetation types mentioned for Brazil, Skulpfontein also has areas of Namaqualand Strandveld (Least Threatened) and Namaqualand Sand Fynbos (Least Threatened) on the most inland portion of the site, in the south-east. Skulpfontein, therefore, although similar to Brazil in most respects, does encompass a greater variety of habitat types than its neighbour to the north, mainly because it extends further inland than does Brazil. Other differences include an overall lesser degree of environmental disturbance, more extensive systems of unstable sand dunes near the coast, and at least two wells near the coast with perennially available brackish water.



Figure 12: A general view of the Skulpfontein site. Note the sea spray being carried inland on the breeze.

With respect to terrestrial vertebrate fauna, a summary report on previous studies of the site (Courtney & Speirs 1994b) is superficial and lacking in adequate detail. On the other hand, specialist reports from the early 1990s (Bronner 1991; Haacke 1991; Ryan 1991) provide excellent background information and a basis for assessment. However, it should be noted that the information in those reports is at least 16 year old and should, therefore, be updated. Additional sampling is recommended.

Special features with respect to terrestrial vertebrates and ecosystem processes are similar to those of Brazil.

5 IMPACTS AND MITIGATION MEASURES

Detailed discussion of impacts and mitigations is not appropriate in the Scoping phase of an EIA process, but it is possible to discuss these topics in broad outline, in anticipation of more detailed information later in the process. All impacts and mitigations mentioned below are applicable to all five sites, unless otherwise specified.

5.1 Project impacts and mitigation measures

Impacts and mitigations are outlined (below) for construction and operational phases of the project.

5.1.1 Project impacts on the environment

The negative impacts of the construction of a nuclear power station on terrestrial fauna are essentially of three types: (a) habitat destruction, (b) disruption of ecological processes, and (c) direct exploitation. Impacts of type (a) are relevant mainly to the construction phase. Type (b) will mostly continue during the operational phase of the power station. Type (c) impacts should be adequately controlled through the implementation of an EMP during both phases.

- a. Habitat destruction will, inevitably, take place in the footprint of buildings and infrastructure. Additional habitat destruction and degradation will take place around these footprints, as a consequence of construction activities, and the clearance of areas for firebreaks and security areas. Loss of habitat will be a direct cause of reduction in the sizes of animal populations. If patches of habitat of limited size are entirely destroyed or severely reduced in area, local species extinctions may occur. This is especially true of wetlands which typically occupy small areas, but nevertheless provide essential resources to a wide range of species. This is potentially a major concern on Hagekraal.
- b. Disruption of ecological processes is primarily the consequence of habitat fragmentation resulting from disruption of the continuity of habitats, and from the erection of barriers to animal movements. It is the footprints of buildings and infrastructure that break up habitats into disjunct patches, and security fencing, roads and overhead power cables create barriers to movement. Ecological processes also tend to be disrupted by disturbance (noise, lighting and general human activity), and by the introduction of alien species (e.g., domestic cats and dogs and invasive alien plants).
- c. Additional impacts during the construction phase may arise from unauthorized hunting and trapping of animals, for sport and for human consumption.

Note that this report will not deal with the unlikely event of a nuclear accident. It can be assumed that such an event will have negative impacts on fauna, but these are beyond the scope of this report, and this writer's expertise.

5.1.2 Mitigation measures

Mitigation measures for the three types of impact include the following:

- d. Adopt a minimum-footprint approach to development. This is especially relevant to the construction phase when a lot of unnecessary habitat destruction can occur. Avoid damage to habitats of limited areal extent and special importance, especially wetlands.
- e. Ensure that ecological corridors, with adequate specifications, are maintained to connect otherwise isolated patches of habitat. Keep disruptive elements (e.g., fencing, exterior lighting, service roads, etc.) to a minimum and, wherever possible, use designs that are wildlife friendly.
- f. Draw up an EMP with the assistance of relevant specialists, and implement this rigorously during both the construction and operational phases of the project.

5.2 Environmental impacts and mitigation measures

Terrestrial fauna may have some limited impacts on the project. These are discussed below.

5.2.1 Impacts of the environment on the project

Some terrestrial fauna are potentially dangerous to humans: venomous snakes are an obvious example. The presence of Leopards at Thyspunt could present special problems. Baboons may be a problematic factor at Bantamsklip and Thuyspunt.

Birds can cause damage to electrical installations by causing short circuits. These happen either by means of a bird's body spanning a gap, or through fouling of equipment. Roosting and nesting birds can cause other forms of damage to buildings. Various terrestrial animals can create problems where electrified security fences are concerned.

Rodents can become problematic under certain circumstances, especially where there are anthropogenic sources of food.

5.2.2 Mitigation measures

Especially during the construction phase, medical facilities should be in place to deal with possible injuries arising from contact with dangerous animals.

Bird-damage should be anticipated and avoided through installation of appropriate features and devices that help to prevent unwanted bird behaviour. Security fences need to be designed so as to cause as little conflict with wildlife as possible.

Care should be taken not to create anthropogenic sources of food for animals, especially around living quarters.

6 SITE SENSITIVITY ANALYSIS

It is not possible to assess site sensitivity with a high degree of confidence at this stage of the EIA process. However, a preliminary assessment, based on available information and the brief site visits, is possible. It should be noted that these preliminary assessments may be substantively changed during the Assessment phase of the process, in light of new information derived from field work for that phase.

6.1 Criteria for Site Sensitivity Analysis

From the outset, it should be noted that the terms "sensitive" and "sensitivity" have specific meanings when used in an ecological context. For the purposes of this report, however, these terms are used in a generic, non-technical way. Nevertheless, it is considered preferable to substitute "problematic" for "sensitive", to avoid ambiguity.

For the purposes of this report, an elementary approach is used to rate and rank the five sites under consideration, with respect to terrestrial vertebrate fauna. The relevant criteria are:

- c. Threatened species: taking into account the number of threatened species probably occurring on site, and their level of threat. (See section 4, above, for details.)
- d. Ecosystem processes: taking into account the vulnerability of ecosystem processes to disruption, as determined by the on-site complexity and spatial distribution of habitats and their ecological drivers. Note that disruption of ecosystem processes is relevant to most species, whether they are threatened or not.

These two criteria are each rated on a 3-point scale where -3 is "highly sensitive" or "highly problematic", and indicates a no-go option; -2 is "significantly sensitive" or "significantly problematic" and indicates a need for extensive mitigations; and -1 is only "slightly sensitive" or "slightly problematic", indicating a need for only minor mitigations. A rating of zero would indicate no significant problems. The ratings under the two criteria are averaged to produce a single, integrated rating, with a maximum value of -3. This latter, single figure is used to rank the five sites. (The use of the minus sign is to indicate a negative impact, as opposed to a positive impact, which is theoretically possible.)

Note that the rating of these criteria is based on the assumption that all habitats and species on site will be negatively impacted by the proposed development (see section 3.2, above). This may well not be the case, but needs to be assumed in the absence of spatially specific plans. This is one important respect in which the ultimate assessment of impacts will change in subsequent phases of the EIA process.

6.2 Site Sensitivity

Table 1: Ratings and ranking of the five sites for their “sensitivity” or problematic nature, with respect to terrestrial vertebrate fauna.

	Threatened species rating	Ecosystem processes rating	Average rating	Rank
Bantamsklip	-3	-3	-3	1
Thyspunt	-2	-3	-2.5	2
Skulpfontein	-2	-1	-1.5	3
Brazil	-2	-1	-1.5	3
Duynefontein	-1	-1	-1	4

Table 2: Ratings and ranking of the two Bantamsklip portions, considered separately.

	Threatened species rating	Ecosystem processes rating	Average rating	Rank
Bantamsklip – inland	-3	-3	-3	1
Bantamsklip – coastal	-1	-1	-1	4

6.3 Discussion and Recommendations

While all five sites have significant degrees of “sensitivity”, it is clear that both Bantamsklip and Thyspunt are much more problematic than the other three sites (Table 1). However, the scores of these two most problematic sites may be misleading. Thyspunt is a well-integrated site with a mosaic of habitats that cannot be neatly separated into zones of greater and lesser “sensitivity”. Bantamsklip, on the other hand, has an inland and a coastal portion which are ecologically quite different and also spatially distinct. In addition, these two portions are separated by a major arterial road, the R43.

Of the two portions of the Bantamsklip site, it is the inland portion, the farm Hagelkraal, which is far more “sensitive” or problematic (Table 2). Furthermore, the less problematic coastal portion is spatially extensive and may be large enough to accommodate almost all of the development needed for the power station, leaving the inland portion largely untouched. For these reasons it would be advisable to assess the two portions of Bantamsklip independently. In this regard, it should be noted that, of the five sites, it is only Bantamsklip that lends itself to this type of treatment.

7. CONCLUSION

All five sites have significant issues associated with vertebrate terrestrial fauna, and therefore all five sites will require further survey work and assessment if they are to be considered for Nuclear 1.

On the other hand, it is clear that the five sites are not equally problematic with respect to vertebrate terrestrial fauna. The inland portion of Bantamsklip, and Thyspunt, are significantly more problematic than the coastal portion of Bantamsklip and the three west coast sites.

If the findings of the other biodiversity specialists follow a similar pattern, it would seem logical to place the emphasis for further work on the less problematic sites, and exclude at least Thyspunt from further consideration for Nuclear 1.

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GLOSSARY OF TERMS

Threatened: used in its formal sense to denote one of the three categories of threat, as defined by the IUCN, viz., Critically Endangered, Endangered and Vulnerable.

Critically Endangered: The status of a species that has satisfied the IUCN criteria that indicate that it faces an extremely high risk of extinction in the wild.

Endangered: The status of a species that has satisfied the IUCN criteria that indicate that it faces as a very high risk of extinction in the wild.

Vulnerable: The status of a species that has satisfied the IUCN criteria that indicate that it faces as a high risk of extinction in the wild.

Near Threatened: The status of a species that does not satisfy the IUCN criteria for Vulnerable, Endangered or Critically Endangered, but is close to qualifying, or is likely to qualify for a threatened category in the near future.

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