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Pri.Sci.Nat # 400045/08

ECOLOGICAL ASSESSMENT: SITE FOR NEW INSULATOR POLLUTION TEST STATION AND DECOMMISSIONING OF OLD TEST STATION, KOEBERG NUCLEAR POWER STATION.

Compiled for: Landscape Dynamics, Somerset West

Client: Eskom Holdings (Pty) Ltd

25 May 2017

DECLARATION OF INDEPENDENCE

In terms of Chapter 5 of the National Environmental Management Act of 1998 specialists involved in Impact Assessment processes must declare their independence and include an abbreviated Curriculum Vitae.

I, N.A. Helme, do hereby declare that I am financially and otherwise independent of the client and their consultants, and that all opinions expressed in this document are substantially my own.

NA Helme

ABRIDGED CV:

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University of Cape Town, South Africa. BSc (Honours) – Botany (Ecology & Systematics), 1990.

Since 1997 I have been based in Cape Town, and have been working as a specialist botanical consultant, specialising in the diverse flora of the south-western Cape. Since the end of 2001 I have been the Sole Proprietor of Nick Helme Botanical Surveys, and have undertaken over 900 site assessments in this period.

Peninsula and Cape Flats botanical and ecological surveys include: Rem Farm 643, Eersterivier (DBA 2017); Penhill mixed housing project (Aurecon 2017); Koeberg NPS water tanks (Doug Jeffery 2016); proposed petrol station at CTFS (Chand Environmental 2016); Darwin Rd (Gibb & SEFSA 2016); De Grendel SDF inputs (Footprint 2015); Eersterivier erven baseline (dbas 2015); Eskom Ankerlig – Sterrekus powerline walkdown (Eskom 2015); Welbeloond survey (Headland 2015); Wolwerivier baseline (TEP 2014); De Mitchells Plain & Brentwood Park scans (TEP 2014); CoCT BioSolids Beneficiation IA, Vissershok (RMS; 2013); De Grendel 24G study (De Grendel; 2013); Koeberg Visitors Centre constraints study (Stauch Vorster; 2013); Protea Ridge IA, Kommetjie (Doug Jeffery; 2013); Delft Sand Mine (EnviroSci Africa; 2012); Atlantic Beach study (Kantey & Templer;

2012); Ocean View Erf 5144 updated baseline (GNEC; 2011); Ocean View infill housing BA (I. Terblanche & Associates; 2010), Oakhurst farm, Hout Bay (SEC 2010); Protea Ridge Corridor study (Doug Jeffery; 2009); Oudekraal botanical constraints study (Doug Jeffery 2009); Mitchells Plain hospital site (Doug Jeffery; 2006, 2008); Eerste River Erf 5540 (CCA 2008); Eerste River Erf 5541 (EnviroDinamik 2008); Kommetjie Riverside IA (Doug Jeffery 2008); Strandfontein Road widening (CoCT 2008); Pelikan Park IA (CoCT 2008); Blue Downs Erf 1897 (Environmental Partnership 2008); Driftsands NR Sensitivity Study (CapeNature 2006); Assessment of Driftsands South (Environmental Partnership 2006); Woodgreen housing Mitchell's Plain (CCA; 2006); Assessment of new Eskom Briers Substation and new 66kV overhead powerline (Eskom 2006); Muizenberg erf 108161 (CndeV; 2005); Muizenberg erf 159848 (Headland; 2005); Muizenberg erf 159850 (Headland; 2005); Kommetjie Riverside Ext 2. (Headland; 2005); Ocean View Mountain View extension IA (Ecosense; 2005); Imhoffs farm (Headland; 2005); Rocklands, Simonstown (CCA; 2005); proposed Grand Prix site next to CT International, Belhar (EnviroDinamik; 2005; Environmental Partnership 2007); Dreamworld film studio survey and Impact Assessment (Environmental Partnership; 2004 & 2005); R300 Cape Flats Ring Road surveys (Ecosense and Ecosense/Chand jv; 2003-2007); survey of remaining areas of natural vegetation in the eastern portion of the Cape Flats (Botanical Society of SA; 1999 - 2000).

CONDITIONS RELATING TO THIS REPORT:

The methodology, findings, results, conclusions and recommendations in this report are based on the author's best scientific and professional knowledge, and on referenced material and available knowledge. Nick Helme Botanical Surveys and its staff reserve the right to modify aspects of the report, including the recommendations and conclusions, if and when additional relevant information becomes available.

This report may not be altered or added to without the prior written consent of the author, and this also applies to electronic copies of this report, which are supplied for purposes of inclusion in other reports, including in the report of EAPs. Any recommendations, statements or conclusions drawn from or based on this report must cite this report, and should not be taken out of context, and may not change, alter or distort the intended meaning of the original in any way. If these extracts or summaries form part of a main report relating to this study or investigation this report must be included in its entirety as an appendix or separate section to the main report.

TABLE OF CONTENTS

1. INTRODUCTION

This ecological assessment was commissioned in order to help inform the environmental authorisation process being followed for the decommissioning of the existing Koeberg Insulator Pollution Test Station (KIPTS), the construction of a new Test Station, installation of new water, sewer and power facilities for the new site, and upgrades of existing access roads to the new and old KIPTS.

Two alternative KIPTS sites were identified for assessment, adjacent to the Koeberg Nuclear Power Station (see Figure 1). The test station aims to evaluate the natural ageing and pollution (corrosion) performance of insulator products. A new test station is required as the existing test station and its access road is being overwhelmed by a mobile sand dune, as it is located within the primary dune system of the beach south of the Power Station (see Plate 1).

Figure 1: Satellite image showing the two alternative sites for the new KIPTS, as well as the existing KIPTS site.

Figure 2: Map (provided) of the alternatives and infrastructure assessed. Note that this does not show the Alternative 2 KIPTS site.

Plate 1: Aerial image, looking south, of the current KIPTS (image extracted from Eskom information document), showing the position of the facility within the primary, mobile dune field.

2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- undertake a site visit to inspect the existing facility and the possible alternative sites
- produce an ecological report which describes the vegetation and fauna in the study areas and places it in a regional context, including its status in terms of the latest CoCT Biodiversity Network
- note any plant and animal Species of Conservation Concern likely to occur in the study areas, and indicate the significance thereof
- provide an assessment of the ecological conservation significance (sensitivity) of the areas
- identify the preferred alternative from an ecological perspective
- identify any significant ecological constraints to the potential development of these areas, and provide a discussion of these, with recommendations for mitigation (if required).

3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

The group site visit was undertaken on 31 Jan 2017, and all alternative sites were visited, as well as the existing KIPTS. The site visit was during the summer dry season and there were thus limitations on the botanical observations, in terms of the seasonal geophytes and annuals that could be observed and identified. However, due to the degraded and/or relatively simple structure of most of the study area, and the experience of the author, these limitations are not deemed to have significantly reduced the accuracy or comprehensiveness of this study. The author has undertaken extensive work within the region and on the Koeberg property, which facilitates the making of local and regional comparisons and inferences of habitat quality and conservation value.

The terms study area and site are used interchangeably for Alternatives 1 and 2, and the existing KIPTS site, unless specified. No road access or infrastructure connections were provided for site Alternative 2, and thus none are assessed. The latest information from Eskom is that the most likely access route for the preferred site will be between Alternatives 2 and 3, depending on the location of the proposed new substation, but three road alternatives were nevertheless provided for assessment, in addition to the wide corridor between Alternatives 2 and 3.

The botanical conservation value of a site is a product of plant species diversity, plant community composition, rarity of habitat, degree of habitat degradation, rarity of species, ecological viability and connectivity, restorability of habitat, vulnerability to impacts, and reversibility of threats.

Google Earth satellite imagery dated March 2017 and earlier was used to verify current vegetation patterns and distribution. The study areas are assumed to be as indicated in Figures 1 and 2, and it is assumed that these portray the eventual position of new infrastructure to within about 20m, with the exception of the main access road, which may be anywhere within a corridor between Alternatives 2 and 3. It is assumed that the existing access roads (about 4.5m wide including verges) will need to be widened to about 6.5m for construction purposes. No details on the decommissioning of the existing KIPTS facility were provided, and it is hence assumed that it will involve removal of all aboveground infrastructure, but not of the foundations, and that the existing access road will be cleared and used for this purpose.

4. REGIONAL CONTEXT OF THE VEGETATION

The study area is considered to be part of the West Strandveld bioregion (Mucina & Rutherford 2006), and is part of the Fynbos biome, located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR; Manning & Goldblatt 2012). The GCFR is one of only six Floristic Regions in the world, and is the only one largely confined to a single country (the Succulent Karoo component extends into southern Namibia). It is also by far the smallest floristic region, occupying only 0.2% of the world's land surface, and supporting about 11500 plant species, over half of all the plant species in South Africa (on 12% of the land area). At least 70% of all the species in the Cape region do not occur elsewhere, and many have very small home ranges (these are known as narrow endemics). Many of the lowland habitats are under pressure from agriculture, urbanisation and alien plants, and thus many of the range restricted species are also under severe threat of extinction, as habitat is reduced to extremely small fragments. Data from the nationwide plant Red Listing project indicate that 67% of the threatened plant species in the country occur only in the southwestern Cape, and these total over 1800 species (Raimondo *et al* 2009)! It should thus be clear that the southwestern Cape is a major national and global conservation priority, and is quite unlike anywhere else in the country in terms of the number of threatened plant species.

The West Strandveld bioregion is characterised by relatively high winter rainfall, low altitude and poor, sandy soils, with large urban areas and high levels of alien

invasive vegetation. Due to this combination of factors the loss of natural vegetation in this bioregion has been severe (>60% of original extent lost within the region), and the bioregion has a fairly high number of threatened plant species (Raimondo *et al* 2009). The lowland regions of the Cape metropole (stretching from Atlantis southeast to near Somerset West), generally known as the Cape Flats, are under enormous pressure, and the area has been described as a "conservation mega-disaster" (Rebelo *et al* 2011), in terms of the number of severely threatened plants (some already extinct) and habitats within the area.

The City of Cape Town regularly updates and revises its Biodiversity Network as sites are lost and new information becomes available (Holmes et al 2008), and the latest map (dated July 2016) indicates that core of the Koeberg facility is excluded from the Biodiversity Network, and is thus not mapped as a Critical Biodiversity Area. The surrounding area (Koeberg Nature Reserve) is mapped as Protected in Perpetuity, and the coastal dune area is indicated as Other Natural Vegetation (see Figure 3).

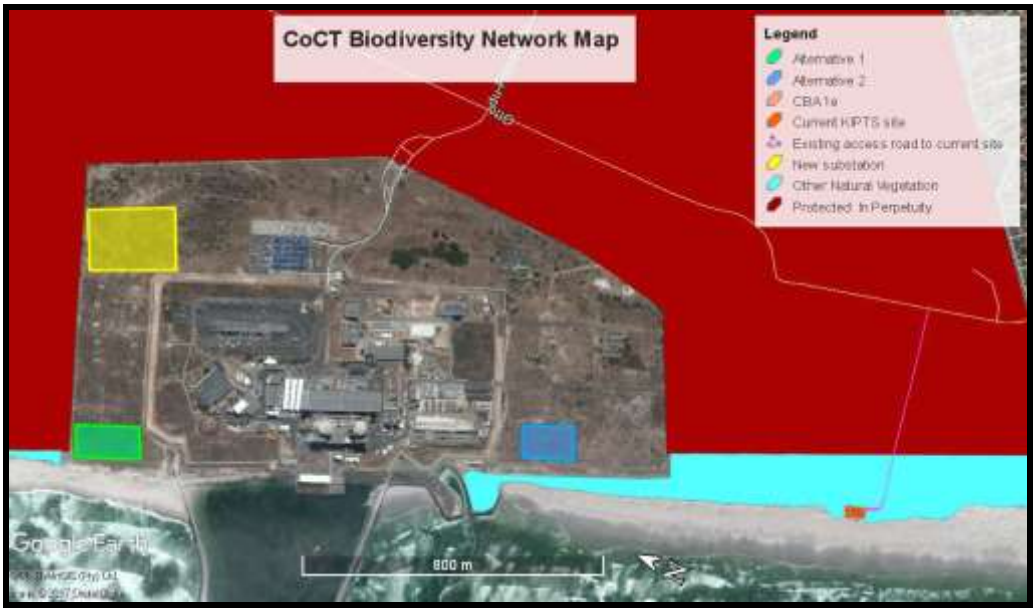

Figure 3: Extract of the City of Cape Town Biodiversity Network mapping (2016), with study areas overlaid.

5. THE VEGETATION AND SENSITIVITY ON THE NEW SITE ALTERNATIVES AND ALONG THE ROUTE ALTERNATIVES.

According to the SA Vegetation Map the original natural vegetation in the entire study area is **Cape Flats Dune Strandveld** (Mucina & Rutherford 2012; Figure 4). This unit is regarded as Endangered on a national (DEA 2011) and regional basis (Holmes *et al* 2008). Less than 60% of its total original extent remains intact, less than 5% is conserved, and the national conservation target is 24% (Mucina & Rutherford 2006). The unit is not known to support a large number of plant Species of Conservation Concern (Raimondo *et al* 2009).

I would suggest that the vegetation within the existing KIPTS site is in fact better categorised as **Cape Seashore Vegetation**, as is typical of primary dunes along this part of the coast. This is a widespread unit along the coast from Lamberts Bay to Mossel Bay, and is regarded as Least Threatened on a national basis, with more than 95% of its original total extent still intact (DEA 2011). The changeover to Cape Flats Dune Strandveld occurs about 100m east of the current KIPTS site. This is likely to have been a recent change associated with the recent sand mobility in the area, and Cape Flats Dune Strandveld would have extended west to the KIPTS access road until about 2012, judging by satellite imagery. The recent sand mobility may have been stimulated or triggered by the "emergency" clearing of sand around the site and along the road during the period 2011 - 2014 (Eskom information document).

Figure 4: Extract of the SA Vegetation map (Mucina & Rutherford 2012) showing that according to this all infrastructure is within what is mapped as Cape Flats Dune Strandveld.

Both new alternative sites are flat, presumably as a result of earthmoving machinery activity during the construction of Koeberg Nuclear Power Station. All (or at least 90%) of vegetation on site today is thus probably secondary, and has re-established since Koeberg power station construction. The two alternative sites are fairly similar in terms of the total amount of natural vegetation on each site (about 40% cover on Alternative 1 and 25% on Alternative 2). Alien invasive annual grasses dominate Alternative 2 (<50% cover), whereas indigenous vegetation probably makes up slightly over half the total cover in Alternative 1.

There is no significant woody alien invasive vegetation on either of the site alternatives, but numerous alien herbs, grasses and annuals are present, as a result of the previous soil disturbance. These include *Senecio burchellii* (indigenous, but invasive in disturbed areas), *Brassica tournefortii, Raphanus rapistrum* (wildemostert), *Eucalyptus* spp. (gums), *Lolium* sp. (ryegrass), *Avena* sp. (wild oats), *Bromus diandrus* (ripgut brome), *Lupinus* spp (lupin), *Vicia* spp. (vetch), *Pennisetum clandestinum* (kikuyu), *Echium plantagineum* (Patterson's curse) and *Conyza bonariensis*.

5.1 Site Alternative 1

Indigenous plant species diversity and abundance on this site is low, being about 20% of what would be expected in a pristine example of this habitat. This is likely to be a result of the previous disturbance of the site, but indigenous plant cover is about 55%, as a result of the presence of many large plants of the weedy but indigenous *Osteospermum moniliferum* (bietou; see Plate 1).

The observed indigenous species in the study area include *Carpobrotus edulis* (suurvy), *Galenia sarcophylla, Cladoraphis cyperoides, Osteospermum moniliferum* (bietou), *Osteospermum incanum (*dune bietou*), Trachyandra divaricata* (duinekool)*, Helichrysum niveum, Ficinia dunensis, Senecio elegans, Gymnodiscus capillaris, Crassula dichotoma, Plantago crassifolia, Didelta carnosa, Cotula turbinata* (gansogies), *Arctotheca calendula* (Cape weed), *Otholobium bracteolatum, Pelargonium capitatum* (dune malva), and *Cynodon dactylon*.

No plant **Species of Conservation Concern** (SCC) were observed on site, and none are likely to occur, given the previous disturbance and the habitat concerned.

Alien invasive species include various annual grasses (*Bromus, Lolium* and *Briza*), and alien herbs include *Brassica tournefortii* (wildemostert), *Raphanus rapistrum* and *Erodium moschatum*.

Botanical sensitivity on the site is deemed to be Low – Medium (see Figure 5).

Plate 1: View of site Alternative 1, looking south. The large, low round shrubs are indigenous *Osteospermum moniliferum* (bitou).

Plate 2: View of site Alternative 2, looking north.

5.2 Alternative 2

Indigenous plant species diversity and abundance on this site is low, and slightly lower than for Alternative 1, being about 15% of what would be expected in a

pristine example of this habitat. This is likely to be a result of the previous disturbance of the site, and indigenous plant cover is only about 25%, with the area dominated by annual, alien grasses (see Plate 2).

The observed indigenous species in the study area include *Carpobrotus edulis* (suurvy), *Galenia sarcophylla, Osteospermum moniliferum* (bietou), *Osteospermum incanum (*dune bietou*), Cladoraphis cyperoides, Trachyandra divaricata* (duinekool)*, Helichrysum niveum, Senecio elegans, Gymnodiscus capillaris, Crassula dichotoma, Ruschia macowanii, Atriplex semibaccata, Plantago crassifolia, Exomis microphylla* (brakbossie), *Cotula turbinata* (gansogies), *Arctotheca calendula* (Cape weed), *Hermannia pinnata, Pelargonium capitatum* (dune malva), and *Cynodon dactylon*.

No plant **Species of Conservation Concern** (SCC) were observed on site, and none are likely to occur, given the previous disturbance and the habitat concerned.

Alien invasive species include various annual grasses (*Bromus, Lolium* and *Briza*), the perennial alien kikuyu grass (*Pennisetum clandestinum*) and alien herbs include *Brassica tournefortii* (wildemostert), *Raphanus rapistrum* and *Erodium moschatum*.

Botanical sensitivity on the site is deemed to be Low (see Figure 5).

5.3 Road Access Alternatives

The latest information from Eskom is that the most likely access route will be between Alternatives 2 and 3, depending on the location of the proposed new substation, but three road alternatives were nevertheless provided for assessment, in addition to the wide corridor between Alternatives 2 and 3.
Road Alternative 1 is currently a narrow (4.5m wide) gravel track and the eastern section passes through a sensitive area of dunes vegetated with diverse Cape Flats Dune Strandveld, within the Koeberg Nature Reserve. Typical species in this area include *Thamnochortus spicigerus, Searsia glauca, S. laevigata, Salvia africana-lutea, Roepera flexuosa, Euphorbia caput medusae, E. burmanii, E. mauritanica, Otholobium bracteolatum, Morella cordifolia* and *Euclea racemosa*. At least two plant Species of Conservation Concern (SCC) were recorded within ten metres of the road in this section, being *Steirodiscus tagetes* (Vulnerable) and *Lessertia tomentosa* (Near Threatened), both of which have significant

populations within the Koeberg Nature Reserve (pers. obs.). The vegetation in most of this area is deemed to be of High sensitivity (see Figure 5).

The western section of the Alt 1 route is shared with road Alternative 2, and passes through similar habitat, of slightly lower sensitivity (Medium), with the same potential SCC. The southern section of road Alternative 2 traverses the western edge of the main vegetated dune ridge, and follows an existing track also about 4.5m wide. This section is deemed to be of High sensitivity east of the road and Low – Medium west of the road, and the former has the potential to support limited populations of the same two plant SCC.

Road Alternative 3 is the preferred alternative from an ecological perspective as it follows an existing road and access track, through an area of mostly Low botanical sensitivity, with only the western terminus being of Low – Medium sensitivity. The road is not likely to impact on any plant SCC.

The broad corridor between Alternatives 2 and 3 is deemed to be mostly of Low botanical faunal sensitivity, with a few areas of Low – Medium sensitivity.

5.4 Pipelines and cabling

The proposed 11kV overhead line follows road Alternative 1 and would thus presumably impact on the same vegetation, at least where new pole positions are needed.

The proposed sewer and water main connections, plus a cabled 11kV line to site Alternative 1 cross a previously disturbed area of mostly Low – Medium botanical sensitivity, with essentially the same species as for site Alternative 1.

6.0 FAUNA AND FAUNAL SENSITIVITY ON THE SITE ALTERNATIVES

No fauna was seen on either of the two site alternatives, but abundant evidence (burrows) of Cape Gerbil (*Tatera afra*) was seen on both sites. The gerbils are common in disturbed, sandy soils, and are often preyed on by Molesnakes (*Pseudaspis cana*) and Cape Cobra (*Naja nivea*), which are presumably also present occasionally. No frogs are likely to be resident in either of the sites, although it should be noted that Rose's Rain Frog (*Breviceps rosei*) is likely to be present in the undisturbed dune areas nearby, as this species does not require open water bodies. Angulate Tortoises (*Chersina angulata*) are likely to be

present in low numbers, but are not likely to be resident on the sites due to the low plant cover available.

No threatened reptiles or frogs are likely to be resident within either of the study areas, due to the disturbed nature of the sites (Measey 2011; Bates *et al* 2014).

Various small mammals, in addition to the gerbils noted, are likely to frequent both sites, although none would be restricted to these areas. Steenbok (*Raphicerus campestris*) and possibly Cape Grysbok (*Raphicerus melanotis*) and Cape Hare (*Lepus capensis*) may graze the sites on occasion, and Small Grey Mongooose (*Herpestes pulverulentus*) and Caracal *(Felis caracal*) may pass through. The relative absence of bulbs and succulents means that porcupines (*Hystrix africaeaustralis*) are likely to be rare in the alternatives sites. No threatened mammals are likely to be resident within either of the study areas.

No threatened butterfly species (Mecenero *et al* 2013) are likely to occur within the two site alternatives, due to the degraded nature of the vegetation, and butterfly diversity is low in these areas.

No threatened bird species (Taylor *et al* 2015) are likely to occur regularly within the two site alternatives, due to the habitat concerned and the degraded nature of the vegetation, and bird diversity is low in these areas.

The faunal sensitivity of both site alternatives is deemed to be Low.

6.1 Road Access Alternatives

Road Alternative 1 is likely to be the most disruptive alternative for fauna, as it crosses the most extensive natural habitat, including the large north – south dune ridges east of Koeberg, and these are likely to be an important ecological corridor for most of the fauna in the area. This area is of High faunal sensitivity. There is a moderate – high risk (of being run over) for Angulate Tortoises on this route, as they are likely to cross the road fairly regularly.

Road Alternative 2 is likely to be less disruptive to fauna than Alterative 1, as it runs parallel to the main dune ridge for about half its length, and borders on the Low and Low – Medium botanical sensitivity area on its western and southern side throughout its length, with High botanical and faunal sensitivity area to the east. There is a moderate risk (of being run over) for Angulate Tortoises on this route,

as they are less likely to cross the road, as there are steep dunes to the east and a fence fairly close to the western side of the road.

Road Alternative 3 is the least likely alternative to be disruptive to fauna, as it runs close to and parallel to a major security fence for most of its length, and generally traverses Low sensitivity habitat. There is a very minor risk (of being run over) for Angulate Tortoises on this route.

The broad corridor between Alternatives 2 and 3 is deemed to be of Low faunal sensitivity.

6.2 Pipelines and cabling

The proposed 11kV powerline along road Alternative 1 is not likely to be a major issue as it will not disrupt connectivity, and 11kV lines are usually low and large enough not be a major collision issue for birds. However, it should be noted that the Black Harrier (*Circus maurus*) has been seen in this area, and the species is Redlisted as Endangered (Taylor *et al* 2015). This species has a High Collision Risk rating (Taylor *et al* 2015).

The proposed sewer and water main connections, plus a cabled 11kV line to site Alternative 1 cross a previously disturbed area of mostly Low faunal sensitivity, with essentially the same potential species as for site Alternative 1. The trenches that are required for this infrastructure will be a temporary entrapment hazard for many small animals (frogs, reptiles and certain insects) and these thus need to be completed and closed up as fast as possible to minimise this hazard. No threatened faunal species are likely to be impacted by this infrastructure.

7. FAUNA AND FLORA OF THE EXISTING KIPTS

As can be seen in Plate 1 the facility is essentially now within a mobile dune field, and the vegetation in the immediate vicinity is thus best categorised as Cape Seashore Vegetation. Hummock dunes are present, sparsely vegetated with *Didelta carnosa, Cladoraphis cyperoides, Arctotheca populifolia, Tetragonia decumbens* and *Thinopyrum distichum* (sea wheat). Vegetation cover is about 10-20%. The vegetation in the vicinity is of Low botanical sensitivity, as all the species are highly opportunistic and able to respond to changing sand conditions.

Where the existing access road crosses natural vegetation that has not yet been inundated by the dunes the vegetation is of High sensitivity, and is best

categorised as Cape Flats Dune Strandveld. The low point of the road, just east of the Reserve fence, crosses an area with a shallow water table, and which supports wetland vegetation typified by species such as *Sarcocornia meyeriana, Orphium frutescens, Phragmites australis* (reeds), *Nidorella foetida, Limonium scabrum, Sporobolus virginicus*, *Thesium frisea, Scirpus nodosa* and *Senecio halimifolius* (tabakbos). The sensitive wetland vegetation extends about 600m to the north of the road, just inland of the primary dunes. As the road climbs to the east, the soils become well drained and typical Dune Strandveld vegetation predominates. At least two plant SCC were observed along the access road, being *Thesium frisea* (Data Deficient) and *Lessertia tomentosa* (Near Threatened). The former is very local along the road in the seasonally damp sands, and the latter is scattered amongst the well drained dunes. No other plant SCC are likely to occur within ten metres of the road.

The terrestrial fauna in the vicinity of the facility is likely to be fairly limited, but surface tracks of golden moles – probably the Cape Golden Mole (*Chrysochlorys asiatica*)- were seen throughout the dunes fringing the facility. This burrowing species is common and widespread in sandy soils and coastal dunes in the Western Cape. Various coastal birds (gulls, terns, cormorants, sandpipers, etc) can be expected to pass by, although very few would be resident within that particular area. At least one pair of African Black Oystercatcher probably breeds on occasion within 200m of the facility (near the base of the dunes), and although this species was previously Redlisted as Near Threatened it has now been downlisted to Least Concern (Taylor *et al* 2015), due to a 37% population increase in the last thirty years.

Fauna within the Cape Flats Dune Strandveld along the access road is likely to be representative of the wider Koeberg Nature reserve, and the primary species of concern during decommissioning would be the Angulate Tortoise (*Chersina angulata*), as they run the risk of being run over on the access road.

Faunal sensitivity is likely to be High within the Cape Flats Dune Strandveld, and Low within the Cape Seashore Vegetation around the facility itself.

8. SUMMARY OF BOTANICAL AND FAUNAL SENSITIVITY

Section 6 discusses the vegetation on the site and the reasons for the different botanical sensitivities assigned. This assessment is informed by:

- the low indigenous plant species diversity and disturbed soils in the Low and Low – Medium sensitivity areas
- the absence of plant Species of Conservation Concern in the Low and Low – Medium sensitivity areas
- high plant diversity in High sensitivity areas, with one or more recorded or likely plant Species of Conservation Concern.

The botanical sensitivity summary map is presented as Figure 5.

The faunal sensitivity is informed primarily by the presence of largely undisturbed habitat, and the cover that this affords to various species, including Angulate Tortoises (*Chersina angulata*), which are at risk of being run over. The intact vegetation is also the favoured habitat for hunting Black Harriers (*Circus maurus*; Endangered) – which are the only threatened faunal species likely to regularly use the study area. The faunal sensitivity summary map is presented as Figure 6.

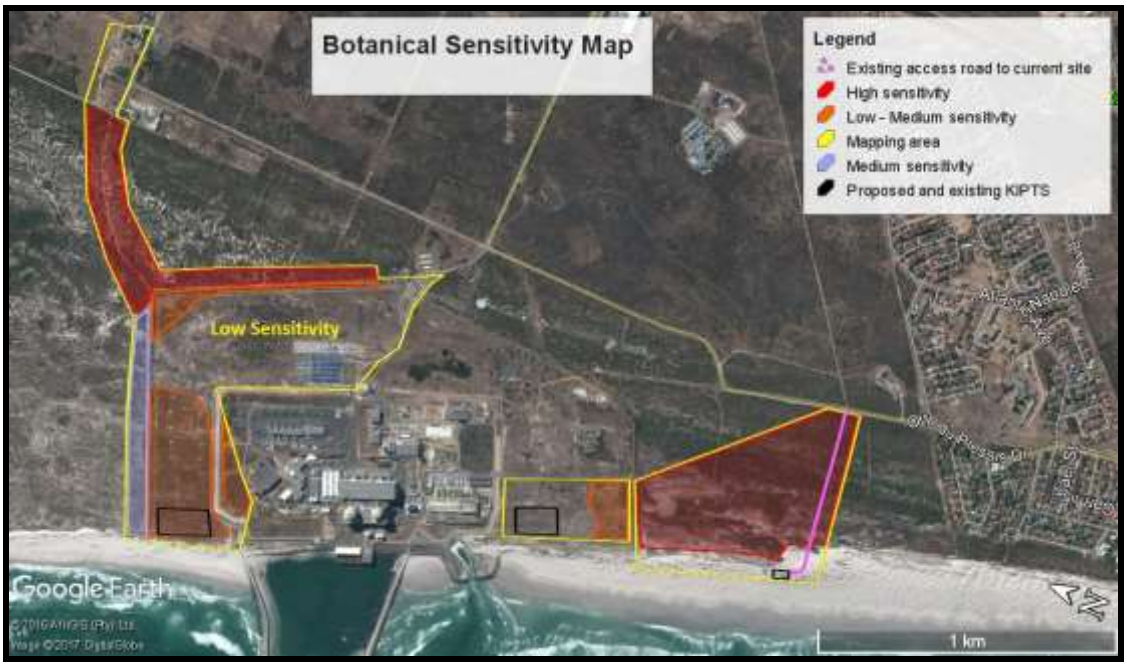

Figure 5: Botanical sensitivity map for the mapped areas (yellow outlines). The unshaded areas within the mapped study areas are of Low botanical sensitivity.

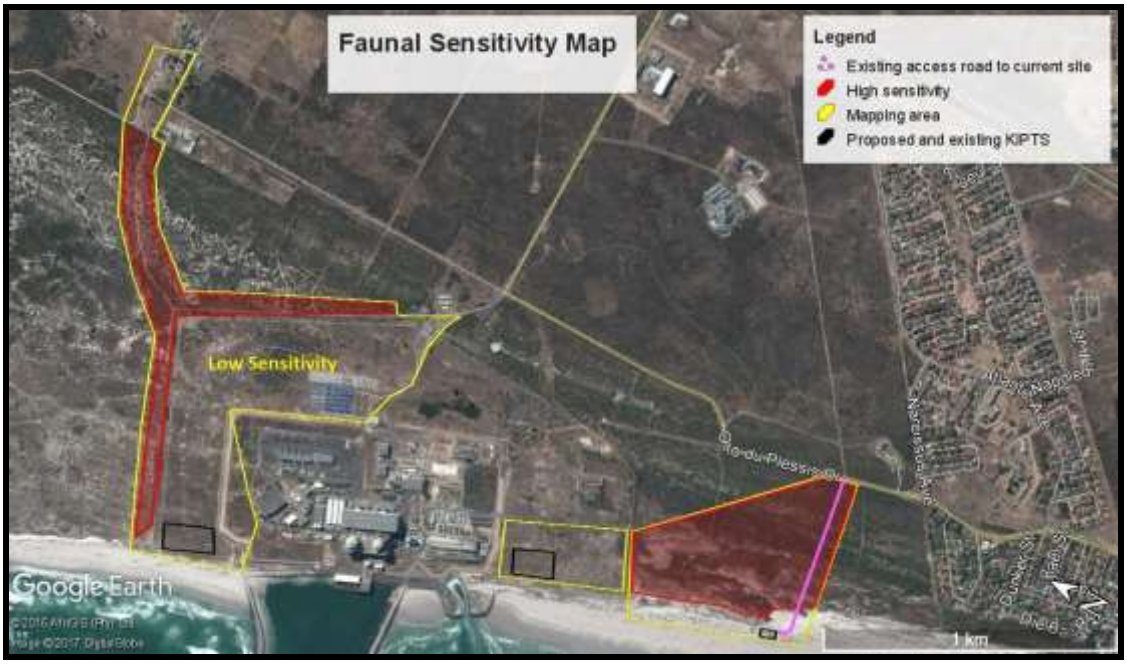

Figure 6: Faunal sensitivity map for the mapped areas (yellow outlines). The unshaded areas within the mapped study areas are of Low faunal sensitivity.

9. IMPACT ASSESSMENT

The ecological impacts of a particular project may be both direct and indirect, although the latter (habitat fragmentation, loss of ecological connectivity) are likely to be less significant for this project than the direct impacts. Construction phase impacts will be both permanent (defined as >15 years) and long term (5-15 years).

In the case of this project the primary construction phase impact is loss of natural and partly natural vegetation within the new KIPTS development footprint, which is likely to be less than 1.5ha in total. All development located within natural or partly natural vegetation will result in the permanent loss of that vegetation. It is assumed that the disturbance will be restricted to the footprint areas shown in Figures 1 & 2, and that is what is here assessed.

9.1 Assessment of Construction Phase Botanical Impacts

Most habitat loss (new KIPTS, widened portions of access roads) is deemed to be permanent (>15 years), with some long term (5-15yrs) loss and degradation in areas that will be cleared to widen access roads (road Alternatives 1 or 2; not applicable for Alternative 3) and in areas where underground cabling and piping will be installed.

Total permanent vegetation loss is likely to be less than 2ha in total, and will be 100% within Low or Low – Medium sensitivity areas if road Alternative 3 is used for site Alternative 1. If road Alternative 1 is used about 0.1ha of High sensitivity vegetation along the road will be lost, and about 0.1ha of Medium sensitivity vegetation. If road Alternative 2 is used the loss will probably be within Low – Medium sensitivity vegetation (about 0.1ha), as well as about 0.1ha within Medium sensitivity vegetation.

Site Alternative 2 (Low sensitivity) is marginally preferred over site Alternative 1 (Low – Medium sensitivity vegetation).

The loss of the Low and Low – Medium sensitivity habitat in the study area is likely to be of **Very Low negative** significance, with the duration being permanent and the magnitude very low. The underlying vegetation type is Endangered Cape Flats Dune Strandveld, and this loss of habitat cannot be easily mitigated. The conservation of good examples of this habitat within the adjacent Koeberg Nature Reserve can be considered an existing offset for the loss.

The loss of about 0.1ha of Medium sensitivity vegetation in the study area is likely to be of **Low** – **Medium** negative significance, with the duration being permanent and the magnitude low – medium. The underlying vegetation type is Endangered Cape Flats Dune Strandveld.

The loss of up to 0.1ha of High sensitivity vegetation in the study area is likely to be of **Medium** negative significance prior to mitigation, with the duration being permanent and the magnitude low – medium. The underlying vegetation type is Endangered Cape Flats Dune Strandveld.

Portions of site populations of at least two plant Species of Conservation Concern (*Lessertia tomentosa* (Near Threatened) and *Steirodiscus tagetes* (Vulnerable) may be lost if road Alternative 1 is used, but these are not likely to be impacted by any of the other development alternatives. The extent of the loss is local and the magnitude will be low, with overall significance being Low negative before mitigation.

Road Alternative 3 is the preferred alternative, followed by road Alternative 2. A route within the wide corridor of mostly Low sensitivity between Alternatives 2

and 3 would be acceptable (Low negative impact) and would be equally preferred to Alternative 3.

Potential impacts on biological aspects:	**Site Alternative 1**	**Site Alternative 2**	**No-go option**
Nature of impact:	Loss of about 1.5ha of Low - Medium sensitivity vegetation on site; no loss of plant Species of Conservation Concern (SCC)	Loss of about 1.5ha of Low sensitivity vegetation on site; no loss of plant SCC	None, or random construction related clearing of vegetation
Extent and duration of impact:	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; variable
Magnitude of the impact:	Low - Medium; destructive	Low; destructive	Variable and unknown
Probability of occurrence:	Definite	Definite	Unknown
Degree to which the impact can be reversed:	Cannot be reversed	Cannot be reversed	Depends on impact
Degree to which the impact may cause irreplaceable loss of resources:	Minor	Very minor	Depends on impact
Cumulative impact prior to mitigation:	Very Low negative	Negligible	Variable; negligible
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Very Low -ve	Neutral to Low -ve
Degree to which the impact can be mitigated:	Minor	Minor	NA
Proposed mitigation:	None	None	NA
Cumulative impact post mitigation:	Low -ve	Negligible	NA
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Very Low -ve	NA

Table 1: Summary table for construction phase botanical impacts associated with the proposed development of the new KIPTS facility.

Potential impacts on biological aspects:	**Road Alternative 1**	**Road Alternative 2**	**Road Alternative 3**	**Underground pipes and cabling**
Nature of impact:	Loss of about 0.5ha of Low – Medium, Medium and High sensitivity vegetation along road; possible loss of portions of site populations of 2 plant Species of Conservation Concern (SCC)	Loss of about 0.5ha of Low – Medium, Medium and High sensitivity vegetation along road; possible loss of portions of site populations of 2 plant (SCC)	Loss of about 0.2ha of mostly Low sensitivity vegetation and no plant SCC	Loss of about 0.1ha of mostly Low – Medium sensitivity vegetation and no SCC
Extent and duration of impact:	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; mostly long term
Magnitude of the impact:	Low - Medium; destructive	Low; destructive	Very Low; destructive	Low; destructive
Probability of occurrence:	Definite	Definite	Definite	Definite
Degree to which the impact can be	Permanent impacts cannot be reversed;	Permanent impacts cannot be	Permanent impacts cannot be	Most of it can be reversed over time

reversed:	long term impacts will be reversed over time	reversed; long term impacts will be reversed over time	reversed; long term impacts will be reversed over time	
Degree to which the impact may cause irreplaceable loss of resources:	Minor	Fairly minor	Negligible	Negligible
Cumulative impact prior to mitigation:	Low -ve	Very Low -ve	Negligible	Negligible
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low – Medium -ve	Low -ve	Very Low -ve	Very Low -ve
Degree to which the impact can be mitigated:	Minor	Minor	Minor	Minor
Proposed mitigation:	None	None	None	None
Cumulative impact post mitigation:	Low -ve	Very Low -ve	Negligible	Negligible
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low – Medium -ve	Low -ve	Very Low -ve	Very Low -ve

Table 2: Summary table for construction phase botanical impacts associated with the proposed development of the access roads and other infrastructure to and from the new KIPTS facility.

9.2 Assessment of Construction Phase Faunal Impacts

The only significant negative impact on fauna expected at the construction phase at the two site alternatives is the risk of entrapment of small animals in the excavations, and neither site is preferred in this regard. The required mitigation is for the ECO to undertake daily inspection of any excavations during the foundation development stage.

Potential impacts on biological aspects:	**Site Alternative 1**	**Site Alternative 2**	**No-go option**
Nature of impact:	Loss of about 1.5ha of Low sensitivity faunal habitat; no loss of faunal Species of Conservation Concern (SCC); disturbance (noise, vibration, etc); entrapment in excavations	Loss of about 1.5ha of Low sensitivity faunal habitat; no loss of faunal SCC; disturbance (noise, vibration, etc); entrapment in excavations	None, or random construction related clearing of vegetation
Extent and duration of impact:	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; mostly permanent; some adjacent longterm disturbance	Site scale; variable
Magnitude of the impact:	Low - Medium; destructive	Low- Medium; destructive	Variable and unknown
Probability of occurrence:	Definite	Definite	Unknown
Degree to which the impact can be reversed:	Cannot be reversed	Cannot be reversed	Depends on impact
Degree to which the impact	Minor	Minor	Depends on impact

may cause irreplaceable loss of resources:			
Cumulative impact prior to mitigation:	Low negative	Low negative	Variable; negligible
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low -ve	Neutral to Low -ve
Degree to which the impact can be mitigated:	Minor	Minor	NA
Proposed mitigation:	Daily inspection of any excavations by ECO and removal of any trapped animals	Daily inspection of any excavations by ECO and removal of any trapped animals	NA
Cumulative impact post mitigation:	Very Low -ve	Very Low -ve	NA
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Very Low -ve	Very Low -ve	NA

Table 3: Summary table for construction phase faunal impacts associated with the proposed development of the new KIPTS facility.

Construction phase faunal impacts for the roads are likely to be related mainly to road mortality of small animals such as tortoises, due to increased heavy vehicle traffic during this time. This is difficult to mitigate, and impact significance before and after mitigation is likely to be Low – Medium negative, with the preferred road alternative being Alternative 3, which traverses the most disturbed habitat, with fewest animals. A route within the wide corridor of Low sensitivity between Alternatives 2 and 3 would be acceptable (Low negative impact) and would be equally preferred to Alternative 3.

Construction phase faunal impacts for the associated infrastructure is related mainly to the risk of falling into open trenches and excavations. This can only be mitigated by regular checking of these excavations and removal of any entrapped animals, plus closing thee holes up as soon as possible. Overall impact is likely to be Medium negative before mitigation, and Low – Medium negative after mitigation.

Potential impacts on biological aspects:	**Road Alternative 1**	**Road Alternative 2**	**Road Alternative 3**	**Underground pipes and cabling**
Nature of impact:	Loss of about 0.5ha of faunal habitat along road; road mortality of small animals	Loss of about 0.5ha of faunal habitat along road; road mortality of small animals	Loss of about 0.2ha of faunal habitat along road; road mortality of small animals	Temporary degradation of about 0.1ha of faunal habitat; entrapment in open trenches
Extent and duration of impact:	Site scale; mostly permanent	Site scale; mostly permanent	Site scale; mostly permanent	Site scale; mostly temporary
Magnitude of the impact:	Low - Medium; destructive	Low- Medium; destructive	Low; destructive	Low; destructive
Probability of	Fairly likely	Fairly likely	Fairly likely	Fairly likely

occurrence:				
Degree to which the impact can be reversed:	Impacted populations should recover over time with reduced vehicle usage of roads	Impacted populations should recover over time with reduced vehicle usage of roads	Impacted populations should recover over time with reduced vehicle usage of roads	Most of it can be reversed over time
Degree to which the impact may cause irreplaceable loss of resources:	Minor	Minor	Very minor	Very minor
Cumulative impact prior to mitigation:	Low -ve	Low -ve	Very Low -ve	Low -ve
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low -ve	Very Low -ve	Low -ve
Degree to which the impact can be mitigated:	Minor	Minor	Minor	Significant mitigation possible
Proposed mitigation:	None	None	None	ECO to monitor all open trenches every day and remove any animals
Cumulative impact post mitigation:	Low -ve	Low -ve	Very Low -ve	Negligible
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low -ve	Very Low -ve	Negligible

Table 4: Summary table for construction phase faunal impacts associated with the proposed development of the access roads and other infrastructure to and from the new KIPTS.

9.3 Assessment of Operational Phase Botanical Impacts

The primary operational phase botanical impacts are likely to be the spread of alien invasive vegetation associated with the soil disturbance caused by construction, plus reductions in the current levels of ecological connectivity across the albeit degraded KIPTS sites.

The impact of both these is assessed as Low negative, for both KIPTS sites. Loss of ecological connectivity cannot be easily mitigated, but is in any event not likely to be significant, as both sites are essentially adjacent to existing infrastructure, and will not be very large. The proliferation of alien invasive vegetation can be relatively easily mitigated, by means of ongoing alien invasive vegetation management in the area. The significance of the impact would be Low negative after mitigation, for both sites, as mitigation is deemed unlikely in the case of the

primary invasive species in this area, which are ubiquitous annual grasses and herbs.

Potential impacts on biological aspects:	**Site Alternative 1**	**Site Alternative 2**	**No-go option**
Nature of impact:	Spread of alien invasive vegetation associated with the soil disturbance caused by construction; loss of ecological connectivity	Spread of alien invasive vegetation associated with the soil disturbance caused by construction; loss of ecological connectivity	Variable; unknown
Extent and duration of impact:	Site; ongoing	Site; ongoing	Possibly ongoing
Magnitude of the impact:	Low	Low	Low
Probability of occurrence:	Very likely	Very likely	Unknown
Degree to which the impact can be reversed:	Alien vegetation issue can be reversed; loss of connectivity cannot be reversed	Alien vegetation issue can be reversed; loss of connectivity cannot be reversed	Can be reversed
Degree to which the impact may cause irreplaceable loss of resources:	Unlikely	Unlikely	Unlikely
Cumulative impact prior to mitigation:	Very Low -ve	Very Low -ve	Very Low -ve
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low-ve	Low -ve
Degree to which the impact can be mitigated:	Partial	Partial	NA
Proposed mitigation:	Ongoing alien invasive vegetation management	Ongoing alien invasive vegetation management	NA
Cumulative impact post mitigation:	Very Low -ve	Very Low -ve	NA
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Very Low -ve	Very Low -ve	NA

Table 5: Summary table for operational phase botanical impacts associated with the proposed development of new KIPTS facilities.

The new road, powerline and pipe infrastructure is not likely to have any significant operational phase botanical impacts, and is not further assessed.

9.4 Assessment of Operational Phase Faunal Impacts

The new KIPTS facility is not likely to have any significant faunal impact at the operational phase, at either of the alternative sites.

The primary operational phase faunal impacts are likely to be possible bird collisions with the new 11kV powerline (unlikely; Low negative), and possible road mortality for species such as the Angulate Tortoise (fairly likely, but in low numbers). The road impact is likely to be most negative for Alternative 1 (Low – Medium negative) and least negative for Alternative 3 (Low negative).

Potential impacts on biological aspects:	**Road Alternative 1**	**Road Alternative 2**	**Road Alternative 3**	**11kV Powerline**
Nature of impact:	Road mortality of small animals	Road mortality of small animals	Road mortality of small animals	Collision risk for birds
Extent and duration of impact:	Site scale; mostly permanent	Site scale; mostly permanent	Site scale; mostly permanent	Site scale; mostly permanent
Magnitude of the impact:	Low - Medium; destructive	Low- Medium; destructive	Low; destructive	Low; destructive
Probability of occurrence:	Fairly likely	Fairly likely	Fairly likely	Fairly likely
Degree to which the impact can be reversed:	Mortality likely to remain at stable, low levels	Mortality likely to remain at stable, low levels	Mortality likely to remain at stable, low levels	Mortality likely to remain at stable, low levels
Degree to which the impact may cause irreplaceable loss of resources:	Minor	Minor	Very minor	Minor
Cumulative impact prior to mitigation:	Low -ve	Low -ve	Very Low -ve	Low -ve
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low -ve	Very Low -ve	Low -ve
Degree to which the impact can be mitigated:	Minor	Minor	Minor	Mitigation possible, but probably not really necessary for 11kV line
Proposed mitigation:	None	None	None	None
Cumulative impact post mitigation:	Low -ve	Low -ve	Very Low -ve	Low -ve
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low -ve	Low -ve	Very Low -ve	Low -ve

Table 6: Summary table for operational phase faunal impacts associated with the proposed roads and above ground infrastructure.

9.5 Assessment of Decommissioning Phase Botanical & Faunal Impacts

The botanical and faunal impact of decommissioning and removal of the existing KIPTS infrastructure should be minimal, provided that the existing access road is used, and that the foundations are left in situ. The site is likely to be reclaimed by sand as soon as the surface infrastructure is removed and the Cape Seashore Vegetation already in the area is likely to rapidly colonise the available habitat, and within two years nobody would know that a facility was once there. The removal of the current KIPTS facility will have a minor positive ecological impact over time, notably in that no further road maintenance will be required in the highly mobile sandy area around the facility, and the ultimately reduced road traffic on the rather long road to this isolated facility will lead to a small reduction on road mortality for small faunal species. Overall botanical and faunal impacts should thus be Low positive.

Potential impacts on biological aspects:	**Botanical Impacts**	**Faunal Impacts**	**Leaving it in place; No Go**
Nature of impact:	Temporary habitat disturbance around site; permanent improvement of ecological connectivity; less long term disturbance around site as no maintenance required	Temporary habitat disturbance around site; permanent improvement of ecological connectivity; reduction in road mortality once decommissioning is complete	Slight disruption of ecological connectivity
Extent and duration of impact:	Temporary (-ve) and Permanent (+ve); site scale	Temporary (-ve) and Permanent (+ve); site scale	Long term to permanent
Magnitude of the impact:	Low	Low	Low
Probability of occurrence:	Very likely	Very likely	Likely
Degree to which the impact can be reversed:	Temporary disturbance easily reversed	Temporary disturbance easily reversed	Can be reversed by removal
Degree to which the impact may cause irreplaceable loss of resources:	Very unlikely	Very unlikely	Unlikely
Cumulative impact prior to mitigation:	Low +ve	Low +ve	Very Low -ve
Significance rating of impact **prior to mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low +ve	Low +ve	Very Low -ve
Degree to which the impact can be mitigated:	High	High	NA
Proposed mitigation:	Use only existing cleared access road; leave foundations in place	Use only existing cleared access road; leave foundations in place	NA
Cumulative impact post mitigation:	Low +ve	Low +ve	NA
Significance rating of impact **after mitigation** (Low, Medium, Medium-High, High, or Very-High)	Low +ve	Low +ve	NA

Table 7: Summary table for botanical and faunal impacts associated with the decommissioning phase of the existing KIPTS facility.

The use of the existing access road will require temporarily clearing away the extensive (2-3m deep in places) loose sand that has swamped this area, but that should have no significant botanical or faunal impact. No additional access roads should be considered, as any new roads will have High negative faunal and botanical impacts, as the entire area east of the site is of High botanical and faunal sensitivity, and this is thus the primary mitigation recommendation.

The No Go alternative for this aspect of the project is leaving the entire facility in place. This will have only a Very Low negative botanical and faunal impact, and the facility will soon be largely swamped by sand and associated Cape Seashore Vegetation.

9.6 The No Go Alternative

The status quo would appear to range from Low negative current ecological impacts (currents KIPTS) to neutral (new infrastructure sites). Ongoing

development plans associated with Koeberg NPS also mean that the No Go scenario is variable in terms of ecological impact. Given this variability it is thus difficult to generalise about the No Go impact, and to infer likely future impacts. On balance, assuming continuation of the status quo, it is likely that the No Go alternative will have a Neutral ecological impact in terms of the new KIPTS sites and infrastructure, but that the No Go would have a Low negative impact at the current KIPTS site.

9.7 Cumulative Impacts

The cumulative botanical impacts are equivalent to the regional botanical impacts, in that the vegetation type and faunal habitats to be impacted by the proposed development has been, and will continue to be, impacted by numerous developments and other factors (the cumulative impacts) within the region. The various cumulative impacts are assessed in Tables 1-7. The overall cumulative botanical impacts vary for the different components of this project.

9.8 Positive Impacts

The removal of the current KIPTS facility will have a minor positive ecological impact over time, notably in that no further road maintenance will be required in the highly mobile sandy area around the facility, the ultimately reduced road traffic on the rather long road to this isolated facility will lead to a small reduction on road mortality for small faunal species, and the ecological connectivity should be slightly improved by the absence of above ground infrastructure.

10. REQUIRED MITIGATION

The following mitigation is deemed feasible and reasonable, and is thus factored into the assessments, and should be considered mandatory:

- no new access road should be authorised for the decommissioning of the existing KIPTS site; the existing road should be cleared of sand and used for all decommissioning work and all vehicles must stay on the road
- the existing KIPTS foundations should be left *in situ*, as removing them will cause unnecessary ecological disturbance, and they will soon be covered by sand
- if Alternative 1 is authorised for the new KIPTS site then only road Alternative 3 or within the Low botanical sensitivity corridor between Alternatives 2 and 3 should be authorised for providing access during

construction, as this routing will have significantly lower temporary and permanent ecological impacts than the other two alternatives.

- basic alien invasive vegetation management should be undertaken in the disturbed areas around the new development footprints for the first two years after construction
- an ECO must be appointed to oversee construction and decommissioning, and should be responsible for ensuring that all open excavations are checked twice daily for any animals that fall into these excavations, and should then remove them to a safe place for release.

11. CONCLUSIONS AND RECOMMENDATIONS

- The natural vegetation in most of the study area is Cape Flats Dune Strandveld (Endangered), with Cape Seashore Vegetation (Least Threatened) on the coastal dunes at the existing KIPTS site.
- Both proposed KIPTS sites have been heavily disturbed and support low diversity vegetation, with no plant Species of Conservation Concern. Alternative 1 is marginally more sensitive from a botanical perspective (Low – Medium sensitivity) than Alternative 2 (Low sensitivity) and neither presents any significant constraints to the proposed development.
- The marginally preferred new KIPTS site from an ecological perspective is Alternative 2, and development of this area is likely to have Very Low negative botanical and faunal impacts, whereas development of Alternative 1 is likely to have Low negative botanical and faunal impacts.
- The preferred access road for the Alternative 1 KIPTS site is road Alternative 3, and this is consequently the recommended road access route for the construction phase. The Low sensitivity corridor between Alternatives 2 and 3 could also be used for road access without significant negative ecological impacts. Road Alternative 2 is in turn likely to have slightly lower ecological impacts than road Alternative 3.
- The proposed development, at either of the proposed alternative sites, and using road Alternative 3, could hence be authorised without significant negative botanical impacts.
- All mitigation outlined in Section 10 should be implemented.

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