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BOTANICAL IMPACT ASSESSMENT OF PROPOSED ARCELOR MITTAL GAS FIRED POWER PLANT, PIPELINE AND POWER TRANSMISSION ROUTES, SALDANHA, WESTERN CAPE.

Compiled for: ERM Southern Africa (Pty) Ltd, Cape Town

Client: Arcelor Mittal (Pty) Ltd

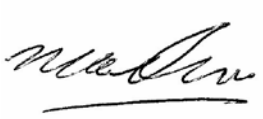
2 September 2016

Draft: 28 June 2016

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, notwithstanding the fact that I have received fair remuneration from the client for preparation of this report.



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Abridged CV:

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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 working on my own and trade as Nick Helme Botanical Surveys, and have undertaken at least 900 site assessments during this period.

A selection of relevant work undertaken over the last few years is as follows:

- Botanical site screening for proposed Sasol power station, Saldanha (ERM 2015)
- Botanical site screening for proposed Globeleq power station, Saldanha (ERM 2015)
- Botanical site screening for proposed Arcelor Mittal power station, Saldanha (ERM 2015)
- Botanical assessment of Langebaan transfer station and landfill area (AECOM 2015)

- Botanical assessment of proposed overnight facilities at Klein Mooimaak, West Coast National Park (SANParks 2015)
- Ecological Assessment for proposed Frontier Minerals Separation Plant, Saldanha (Sedex 2014)
- Botanical assessment of proposed Elandsfontein phosphate mine east of Langebaan (Braaf Environmental 2014)
- Botanical assessment for proposed LNG terminal, Saldanha (PetroSA 2014)
- Botanical Scoping study for proposed Saldanha Municipality Desalination Project (CSIR 2012)
- Botanical inputs into proposed Saldanha IDZ (MEGA 2011)
- Botanical Assessment of site on SAS Saldanha (Footprint Environmental 2011)
- Fatal Flaw Analysis of Ptn of Ptn 16 of Pienaarspoort 197, Saldanha (MOGS 2011)
- Scoping study of proposed Wind Energy Facility near Britannia Bay (Savannah Environmental 2010)
- Scoping and Impact Assessment study of proposed Wind Energy Facility at Rheboksfontein, Darling (Savannah Environmental 2010)
- Scoping and Impact Assessment study of proposed Wind Energy Facility near Vredenburg (Savannah Environmental 2010)
- Scoping and Impact Assessment of proposed Wind Energy Facility near Hopefield (Savannah Environmental 2008 & 2009)
- Botanical Scoping and Impact Assessment of proposed St Helena Hills development (DJ Environmental 2009)
- Botanical Impact Assessment of Portion 4 of Farm 560, Yzerfontein (EnviroLogic 2009)
- Botanical Impact Assessment of Portion 9 of Farm 957, Saldanha (EnviroLogic 2008)
- Botanical Sensitivity study of Portion 4 of Farm Yzerfontein 560 (De Villiers family 2008)
- Botanical Scoping and Impact Assessment of proposed overnight sites in the West Coast National Park (SANParks 2008 & 2010)
- Botanical Impact Assessment of proposed development on Portion 87 of the Farm Witteklip 123, Vredenburg (CCA Environmental 2008)
- Fine Scale Vegetation Mapping and Conservation Planning for Saldanha Municipality (CapeNature & SANBI, 2006 - 2007)

Contents of this report in terms of Regulation GNR 982 of 2014, Appendix 6	Cross-reference in this report (page)
(a) details of— the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a curriculum vitae;	ii
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	ii
(c) an indication of the scope of, and the purpose for which, the report was prepared;	3
(d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process;	3
(f) the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	11
(g) an identification of any areas to be avoided, including buffers;	11-13
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	13
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	3
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	11-18
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	17
(p) any other information requested by the competent authority.	17

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1. INTRODUCTION

This botanical impact assessment was commissioned in order to help inform the planning and environmental authorisation process being undertaken for a proposed gas fired power station in the Saldanha area, in the Western Cape. A botanical screening study was undertaken by Helme in 2015, and examined two alternative sites, along with three possible pipeline routes for landing the gas from the port area (see Figure 1). The Scoping Study narrowed this down to a single power plant site, a single pipeline route and a single transmission line route, each to be assessed at the Impact Assessment stage, and these are shown in Figures 2 and 3. A portion of Site 2 (Figure 1) was selected as the preferred power plant site for the Impact Assessment.

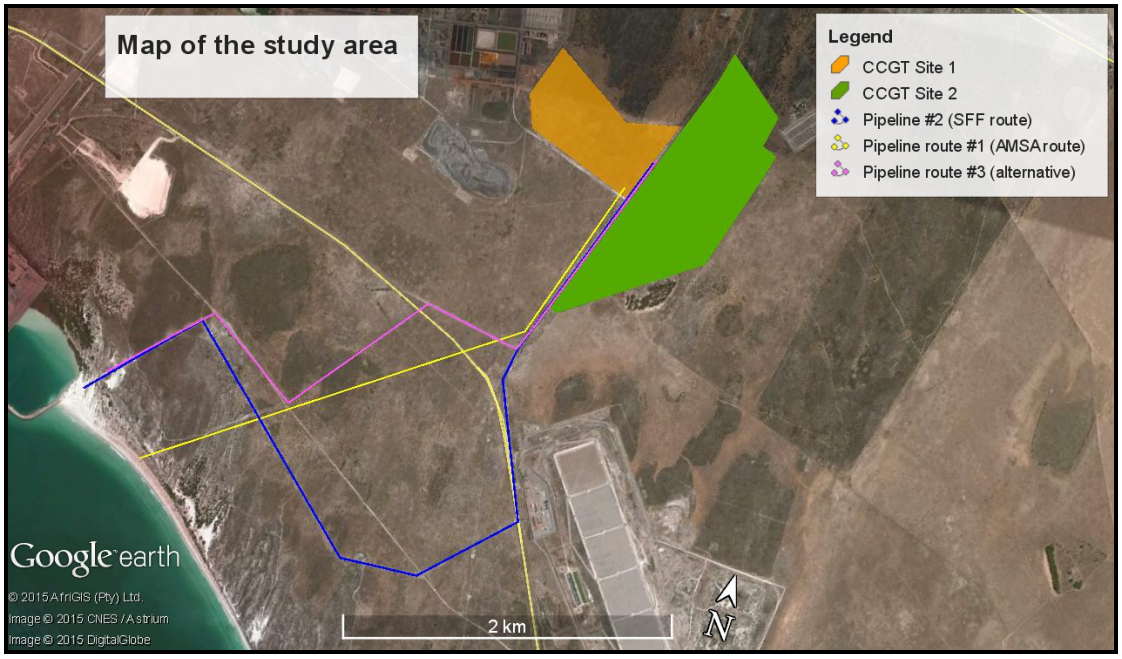

Figure 1: Map showing the two power station sites and the three pipeline routes looked at in the screening study undertaken in 2015 (Helme 2015). It should be noted that the actual study area was taken to be broader than just these tightly defined areas, especially for the pipelines, and encompassed essentially all the Arcelor Mittal owned land surrounding the areas shown.

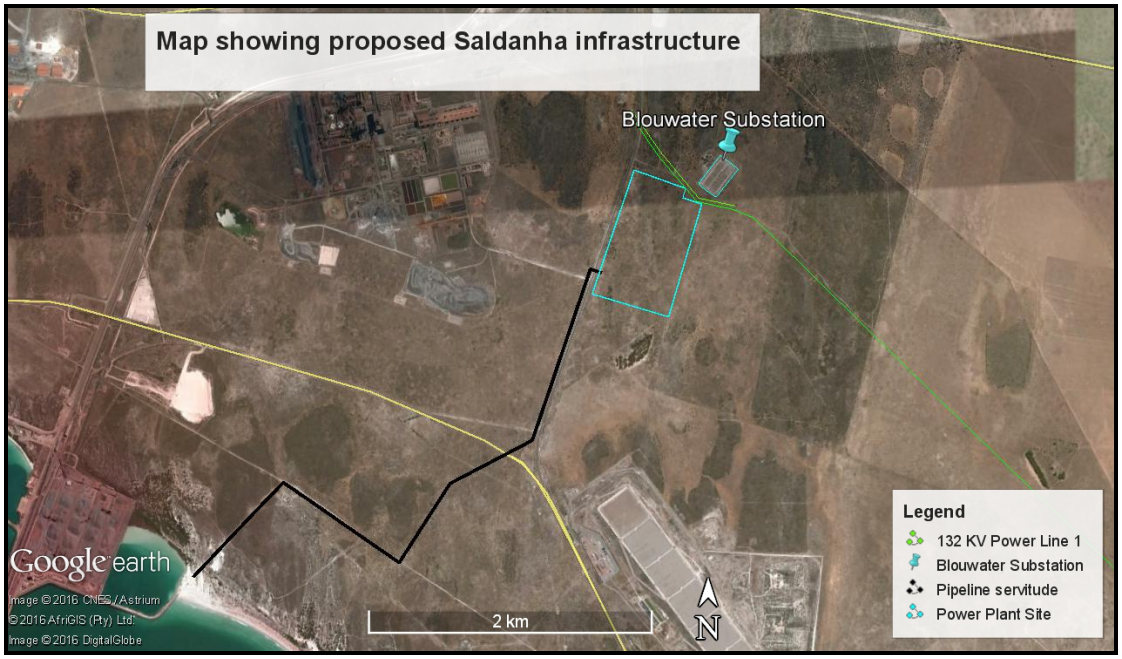

Figure 2: Simplified map of proposed infrastructure footprint in the Saldanha area, as assessed for the Impact Assessment. Note that the Blouwater substation is already in position.

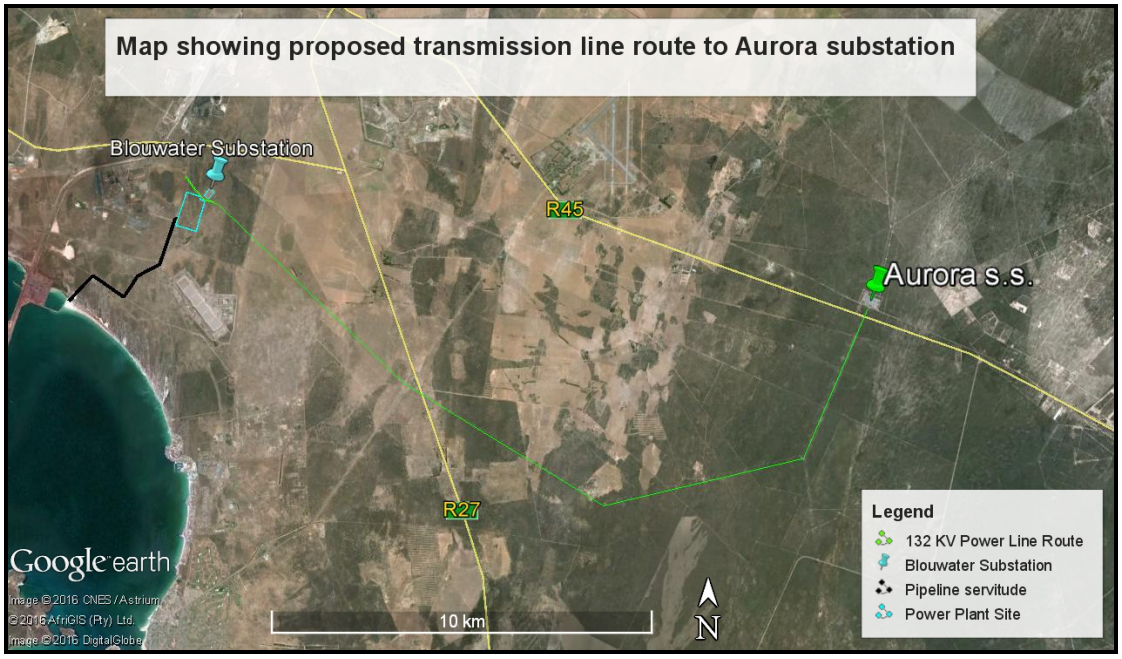

Figure 3: Satellite image showing all proposed infrastructure, as assessed for the Impact Assessment. Note that the Blouwater and Aurora substations are already in position.

2. TERMS OF REFERENCE

The terms of reference for this study were as follows:

- Describe the vegetation in the study area, and note the presence or likelihood of any plant Species of Conservation Concern (SCC; previously known as Red Data Book species).
- Provide a botanical constraints map for the area.
- Assess the local (Saldanha) and regional (West Coast) conservation value of the study area, referring to specialist knowledge and to the National Spatial Biodiversity Assessment (NSBA, Rouget *et al* 2004) and to CapeNature's Fine Scale Conservation Plan for the Saldanha Municipality (Pence 2008).
- Identify the likely botanical impacts associated with each aspect of the proposed development (power plant, pipeline, transmission line).
- Recommend any feasible mitigation that can be used to reduce or avoid the identified impacts, including recommendations for the operational phase of the project.

3. LIMITATIONS, ASSUMPTIONS AND METHODOLOGY

Fieldwork for the baseline study was undertaken on 27 August 2015, which is within the peak spring flowering period in this winter rainfall region. Virtually all the geophytes and annuals were evident and in identifiable condition, and the timing of the site visit was thus optimal, and the seasonal constraints on the comprehensiveness of the botanical findings were minimised (although they are never entirely absent, as some species flower outside of spring). In addition, the available Google Earth imagery (the most recent being January 2015) is of a high resolution and is easily interpreted.

Conservation worthy habitats are those with high species diversity; those that support rare, threatened or localised plant species (plant Species of Conservation Concern); those that are rare in a regional context, and those areas where ecological processes are deemed to be important and vulnerable to disturbance. Sufficient detail was evident in the aerial images and on site to be able to assess the overall conservation value and botanical sensitivity of the area, and confidence in the accuracy of the botanical findings is high.

The development footprints are assumed to be the areas shown in Figures 2 and 3, and no additional associated infrastructure is assessed as part of this study. It is assumed that the actual development footprint will be largely (>98%) within

the areas shown. The 132kV transmission line has been assumed to have an 18m wide servitude, with pylons approximately every 250m. The pipeline infrastructure is understood to be likely to consist of:

- A gas and sea-water forwarding station at the start of the land-based pipeline system
- A dual, parallel gas pipeline for security of gas supply
- A sea water pipeline to provide the power plant with sea water for desalination
- A power cable to provide motive power for a projected air compressor and actuated isolation valves and instrumentation along the pipeline route
- A gas and sea-water receiving station at the Power plant.

Total pipeline length on land is likely to be 4603m, and the pipeline servitude during construction is understood to be 30 – 36m wide, with the trench depth of typically 1-2m.

It should be noted that the actual study area for the baseline work was taken to be broader than just the tightly defined target areas, especially for the pipelines, and encompassed essentially all the Arcelor Mittal owned land surrounding the areas shown. This study does not include an assessment of faunal impacts as a separate faunal study is being undertaken.

Reference was made to the GIS based database of rare plant localities maintained by CREW (Custodians of Rare and Endangered Wildflowers, based at Kirstenbosch, updated to March 2015), to the Red List of South African plants (Raimondo *et al* 2009), to the Fine Scale Vegetation map of the Saldanha Municipality (Helme & Koopman 2007), and to CapeNature's Fine Scale Conservation Plan for the Saldanha Municipality (Pence 2008).

4. STUDY AREA AND REGIONAL CONTEXT

The study area 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 study area is part of the greater West Coast region, and lies within what has been termed the West Strandveld bioregion (Mucina & Rutherford 2006). This bioregion has a fairly distinct flora, and the Saldanha Peninsula is particularly rich in locally and regionally endemic plant species, as well as plant Species of Conservation Concern (Helme & Koopman 2007).

The study area is within the planning domain of the Saldanha Fine Scale Conservation Plan (Pence 2008). This important reference indicates that the majority of the project area is a terrestrial Critical Biodiversity Area (CBA), as shown in Figure 4. Critical Biodiversity Areas are regarded as essential areas for the achievement of regional conservation targets, and are designed to ensure minimum land take for maximum result (Maree & Vromans 2010). It should be noted that the CBA mapping process in this area unfortunately suffered from a lack of groundtruthing and misinterpretation of the satellite imagery, and is therefore not considered particularly accurate or useful for planning purposes, and was in fact redone by Helme (2011) for the IDZ feasibility project. All ecological assessments in this area should thus be based on detailed groundtruthing, as has been the case for the current study.

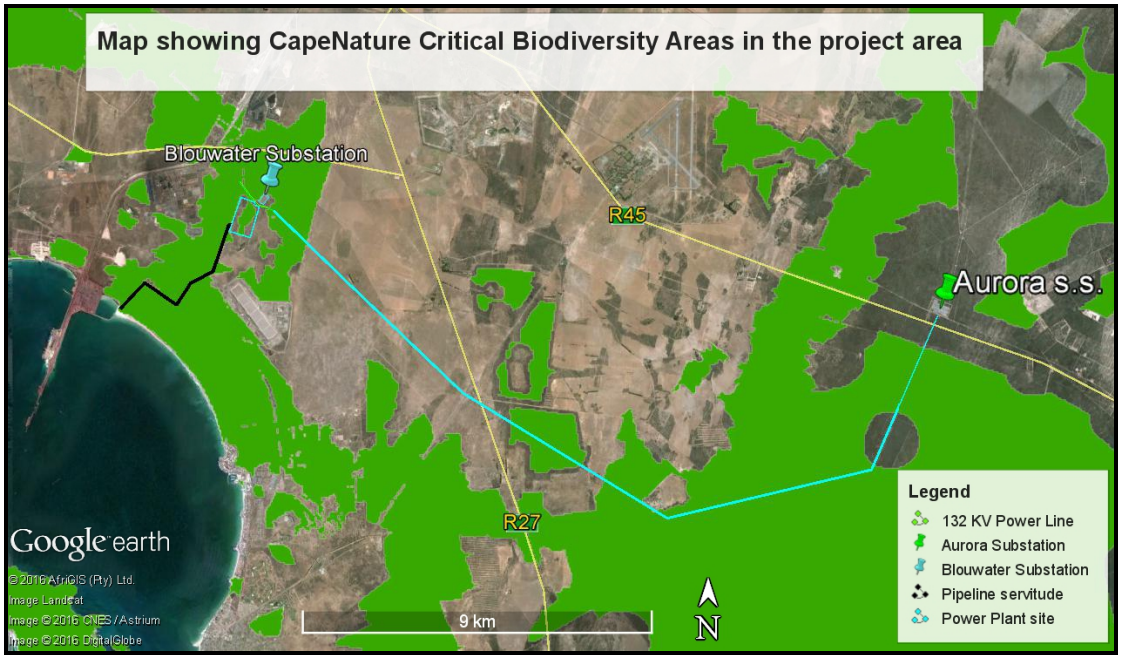

Figure 4: Extract of the Saldanha Municipality Fine Scale Conservation Plan (Pence 2008), showing the project area in relation to the identified Critical Biodiversity Areas (CBAs; green shading).

5. OVERVIEW OF THE VEGETATION

Power Plant Footprint

The underlying vegetation type in the proposed power plant development area is best classified as **Saldanha Flats Strandveld**, which is supported by Helme & Koopman (2007). This vegetation type is officially listed as **Vulnerable** on a national basis (DEA 2011). It should however be noted that Pence (2014) has recently re-assessed this and many other lowland ecosystems in the Western Cape, and the best available data suggest that in fact only 35% of the total original extent of this vegetation type remains, meaning that it should be classified as **Endangered** on a national basis. The unit has a 24% conservation target, but only about half this was conserved in 2004 (Mucina & Rutherford 2006). The percentage conserved has in fact probably increased in the last few years with the inclusion of some fairly large additional areas in the West Coast National Park (WCNP), and the unit can be considered moderately conserved.

The site is largely flat, with shallow to moderately deep neutral sands overlying calcrete, which are seldom exposed at the surface, but which have been piled up into heaps in places. There are no wetlands. Virtually all of the site has been subject to disturbance, probably originally in the form of ripping, but has also been significantly heavily grazed and trampled by cattle on an ongoing basis,

which has reduced the rehabilitation success. The heavy grazing has meant that there were virtually no flowering annuals on the site at the time of the survey, in contrast to many other similar areas.

Plate 1: Spring view of the proposed power plant footprint area, looking northeast towards Blouwaterbaai substation. Note the lack of flowering spring annuals, due to heavy grazing by livestock.

The baseline study (Helme 2015) identified an area north of the existing Blouwaterbaai substation access road that supports intact **Saldanha Limestone Strandveld**, which has not been ripped or heavily disturbed, and is thus more structurally diverse and of higher conservation value than the chosen development area (which is part of this Impact Assessment). Saldanha Limestone Strandveld was previously listed as an Endangered vegetation type (Rouget et al 2004), and then was unfortunately downgraded to Least Threatened (DEA 2011), due to an oversight by SANBI, and this error will apparently only be remedied only in about 2017. The unit has the highest number of threatened and localised plant species of all vegetation types in the Saldanha region (Helme & Koopman 2007). The unit is also poorly conserved (represented) in the West Coast National Park. Typical species in this intact limestone area include *Thamnochortus spicigerus, Zygophyllum morgsana, Limonium capense, Senecio alooides, Pteronia divaricata, Euphorbia burmanii, Othonna cylindrica* and *Searsia glauca*. Two plant **Species of Conservation Concern** (SCC) were recorded in this limestone area, and the likelihood that any others occur here in viable numbers is low. The recorded SSC include *Limonium capense* (Near Threatened), *Aloe*

distans (a large population of this regional endemic, but now regarded as a subspecies of *A. perfoliata*), and *Nenax hirta ssp calciphila* (Near Threatened).

Within the power plant development area indigenous plant species diversity is relatively low (about 25% of what it would be in an undisturbed area), and includes *Galenia fruticosa, Exomis microphylla* (brakbos), *Oncosiphon suffruticosum* (stinkkruid), *Arctotheca calendula* (Cape weed), *Osteospermum incanum* (dune bietou), *O. chrysanthemoides* (bietou), *Muraltia spinosa* (tortoise berry), *Helichrysum niveum, Phyllobolus canaliculatus*, *Tetragonia fruticosa* (kinkelbos), *Stachys ballota, Mesembryanthemum crystallinum* (slaai), *Lycium ferocissimum, Oxalis pes-caprae* (geel suuring), *O. obtusa, Limeum aethiopicum* (koggelmandervoet), *Trachyandra divaricata* (duinekool), *Carpobrotus edulis* (suurvy), *Torilis arvensis, Senecio burchellii* (hongerblom), *Gladiolus cunonius*, *Calobota sericea* (fluitjiesbos), *Felicia hyssopifolia, Ehrharta calycina* (polgras), *Cynodon dactylon* (fynkweek), *Conicosia pugioniformis, Hermannia prismatocarpa, Ehrharta villosa* (pypgras), *Pelargonium myrrhifolium, Thamnochortus spicigerus* (duinriet), *Aspalathus acuminata, Searsia glauca* (kunibush), *Searsia laevigata* (dune taaibos), *Melolobium adenodes, Cissampelos capensis, Asparagus africanus, A. capensis, Amellus* sp., *Gymnosporia buxifolia* (pendoring), *Oxalis luteola, Crassula expansa, C. vaillantii, Ornithogalum sp., Zygophyllum morgsana, Viscum capense* (voelent), *Haemanthus pubescens* (poierkwas), *Trachyandra falcata* (veldkool) and *T. ciliata.*

Various annual alien grasses are also present, including *Bromus pectinatus, Bromus diandrus* (ripgut brome), *Lolium sp.* (ryegrass), *Avena* sp. (wild oats) and *Vulpia myuros* (ratstail fescue), plus the alien herbs *Erodium moschatum* (cranesbill), *Echium plantagineum* (Pattersons's curse), *Raphanus rapistrum* (wildemostert) and *Brassica tournefortii*. No woody alien species are present, and none of the alien herbs or grasses is dominant.

No plant **Species of Conservation Concern** were recorded within the proposed development footprint, and the likelihood that any occur here in viable numbers is low.

The Pipeline Route

There are no areas of particular botanical sensitivity north of the Langebaan - Saldanha road, but there are notable areas of sensitivity between the road and the coast.

The stable part of the coastal dunes support largely pristine Langebaan Dune Strandveld, which is not listed as threatened ecosystem (DEA 2011), and is well conserved within the nearby West Coast National Park. However, the portions outside the Park are under severe threat from coastal and industrial development, and species and structural diversity is high, accounting for the Medium to High botanical sensitivity.

The initial, coastal part of the pipeline would cross partly stabilised coastal dunes such as those shown in Plate 2, which are typical of such habitats on the west coast, and are of Low botanical sensitivity, being high energy environments adapted to change and movement. Species diversity is fairly low and there are no threatened plant species.

Plate 5: View of Low sensitivity partly stable coastal dunes close to where the pipeline would originate.

The Medium sensitivity areas tend to be previously partly disturbed patches of what would have been at the ecotone (transition) of Saldanha Limestone Strandveld and Saldanha Flats Strandveld. Various plant SCC may be present, usually in fairly low numbers, and these include *Limonium capense* (Near Threatened), *Indigofera latiopetiolata* (local endemic; STBA), and *Nenax hirta ssp calciphila* (Near Threatened).

The primary areas of High sensitivity close to the pipeline route are patches of Saldanha Limestone Strandveld, but the final route does not pass through any of the key patches, although the 36m servitude width means that construction is likely to impact on some of the less diverse examples of this habitat in the

southern section of the route. Typical indigenous plant species in the undisturbed, High sensitivity habitats (Saldanha Limestone Strandveld) include *Limonium capense*, *L. peregrinum*, *Pteronia divaricata, P. uncinata, Clutia daphnoides, Othonna cylindrica, Pelargonium gibbosum* (dikbeenmalva), *Felicia elongata, Ruschia macowanii, Putterlickia pyracantha, Eriocephalus racemosus (kapok), Senecio alooides, ordaaniella dubia, Euclea racemosa* (sea guarrie), *Ruschia langebaanensis, Thamnochortus spicigerus* (duinriet), *Searsia glauca* (blue kunibush), *Thesidium fragile, Muraltia spinosa* (tortoise berry), *Zygophyllum flexuosum* and *Pterocelastrus tricuspidatus* (kershout).

At least nine plant Species of Conservation Concern were confirmed from the High sensitivity areas during the site visits, and a few others are confidently expected to occur in this area. The SCC recorded were *Limonium capense* (NT), *Lampranthus vernalis* (NT), *Ruschia langebaanensis* (Threatened), *Felicia elongata* (VU), *Muraltia harveyana* (VU), *Cheiridopsis rostrata* (VU), *Nenax hirta ssp. calciphila* (NT), *Cephallophyllum rostellum* (EN) and *Argyrolobium velutinum* (VU). Photographs of all these species can be viewed on the website www.ispot.org.za.

The Powerline Route

The powerline route west of the R27 crosses mostly cultivated lands with no significant natural vegetation, except one patch which supports Saldanha Flats Strandveld of High sensitivity.

East of the R27 about 75% of the route crosses natural vegetation, with elements of Saldanha Flats Strandveld, but dominated by Hopefield Sand Fynbos in the centre and east. This vegetation type is currently listed as Vulnerable on a national basis (DEA 2011, Pence 2014), although it will be uplisted to Endangered in the next few years, due to the high number of threatened plant species that it supports (>60; SANBI – pers. comm.).

Dominant species in most of this Sandveld area are *Willdenowia incurvata* (zonkwasriet), *Cannomois arenicola, Passerina corymbosa* (gonna), *Leucadendron salignum* (geelbos) and *Phylica cephalantha*. Alien invasive vegetation is rare within most of the actual proposed route, covering less than 1% of the total area. However, there are small patches of invasive alien rooikrans (*Acacia cyclops*) and Port Jackson (*Acacia saligna*).

At least 18 plant Species of Conservation Concern have been recorded within or close to the Hopefield Sand Fynbos portion of the servitude area, including *Leucospermum tomentosum* (Vulnerable), *L. hypophyllocarpodendron* ssp. *canaliculatum* (Vulnerable), *Serruria decipiens* (Vulnerable), *Aspalathus ternata* (Near Threatened), *Metalasia adunca* (Near Threatened), *Protea scolymocephala* (Vulnerable), *Thamnochortus punctatus* (Declining) *Cannomois arenicola* (Endangered), *Caesia sabulosa* (Vulnerable), *Chrysocoma esterhuyseniae* (Endangered), *Macrostylis crassifolia* (Vulnerable), *Diosma aspalathoides* (Near Threatened), *Lachnaea grandiflora* (Vulnerable), *Lachnaea capitata* (Vulnerable), *Capnophyllum africanum* (Near Threatened), *Echiostachys spicatus* (Endangered), *Helichrysum cochleariforme* (Near Threatened) and *Agathosma thymifolia* (Vulnerable). Various other plant SCC can be expected to occur.

5.1 Botanical Conservation Value

The terms conservation value and sensitivity are often used interchangeably, but this is not strictly correct. The term “conservation value” refers to the value of the habitat in local and regional conservation terms (*i.e.* answering the question how important is it?), whilst “sensitivity” strictly means how resilient is the habitat to disturbance. In the case of urban or industrial development (although not buried pipelines) any natural or partly natural habitat would effectively be permanently lost in the development footprint, and thus technically sensitivity would be high, irrespective of the conservation value of the underlying habitat.

The conservation value of a habitat is a product of species diversity, rarity of habitat, rarity of species, ecological viability and connectivity, vulnerability to impacts, and reversibility of threats (ease of rehabilitation). Extensive previous work in the region has allowed the author to make conclusions regarding the overall and relative sensitivity of the vegetation in the study area (see Figure 5). Note that the groundtruthed botanical sensitivity map (Figure 5) is significantly different from the Critical Biodiversity Areas (Figure 4) in the Saldanha Steel area, which is largely due to an unfortunate lack of groundtruthing of the latter product prior to publication, and Figure 5 is regarded as a much more accurate representation of the true situation on the ground.

Areas that have been cultivated or ripped and have relatively low botanical diversity and no significant populations of plant Species of Conservation Concern (SCC) are considered to be of Low botanical conservation value at a regional scale.

The Medium sensitivity areas are generally Saldanha Limestone Strandveld that has been partly disturbed, but which has rehabilitated naturally to some degree, Populations of plant SCC may be present, although in limited numbers.

The Spreeuwal dune area has been mapped as being of Medium to High sensitivity, even though it does not support many known populations of plant Species of Conservation Concern. This area is largely pristine, apart from some alien plant invasion, and has high plant diversity, and a high level of structural (growth form) diversity.

High conservation value areas south of the coast road to Saldanha support relatively intact examples of the locally restricted vegetation type Saldanha Limestone Strandveld, with regionally significant populations of various plant Species of Conservation Concern. These areas may or may not be designated CBAs (Critical Biodiversity Area). These areas are considered ecologically irreplaceable, on account of the presence of relatively intact examples (with both high species diversity and high structural heterogeneity) of a regionally restricted vegetation type (in this case Saldanha Limestone Strandveld), and due to the presence of regionally endemic plant Species of Conservation Concern. Conservation of such areas would contribute significantly to species and/or ecological process targets for the region, and should be considered No Go areas for development.

Along the powerline route there is a patch of High sensitivity Saldanha Flats Strandveld just east of Blouwater substation, and a large High sensitivity section of mostly Hopefield Sand Fynbos east of the R27. This section is about 14km long, and supports at least 18 plant Species of Conservation Concern.

The power plant footprint presents no significant constraints to the proposed development.

The section between the Spreeuwal dunes and the Saldanha – Langebaan road has important areas of High sensitivity vegetation that should not be disturbed, and thus presents significant constraints that need to be taken into account (and which have been taken into account as far as possible in determining the pipeline route).

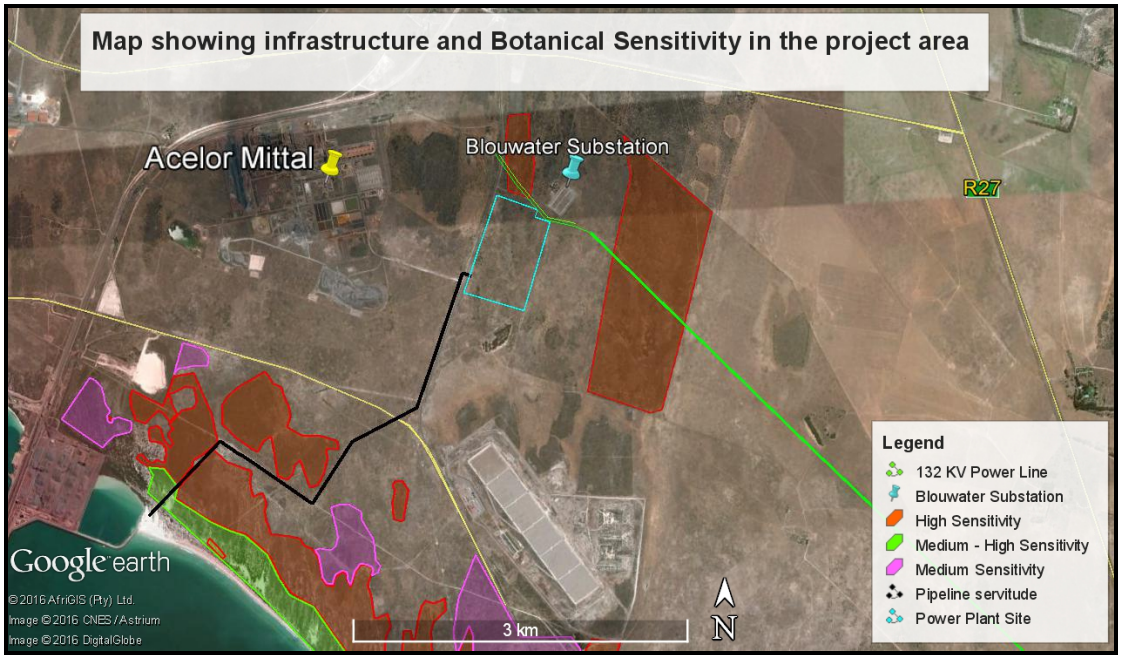

Figure 5: Map of the botanical conservation value (sensitivity) in the vicinity of the project area west of the R27. Note that unshaded areas within the project area are of Low conservation value.

For the powerline route the only sensitive area west of the R27 is shown in Figure 5. East of the R27 essentially all natural vegetation can be considered to be of High sensitivity, and this is generally reflected in the CBA map (Figure 4; apart from an anomalous circle which should be considered as a CBA).

6. ISSUES IDENTIFIED

In terms of the construction of the proposed infrastructure the following ecological issues have been identified:

- Direct, permanent loss of previously ripped and degraded but partly natural vegetation (up to 50ha) of an Endangered vegetation type (Saldanha Flats Strandveld) within the power plant footprint during the construction and operational phases.
- No loss of site populations of plant Species of Conservation Concern within the power plant site.
- Loss of portions of site populations of plant Species of Conservation Concern within the pipeline route and the powerline route is possible, but relatively few such species are likely to be impacted, and only in low numbers.
- Direct loss and damage of small areas of Medium – High and High sensitivity habitat during pipeline and powerline construction. This is likely

to be of a long term duration (5-19yrs), but some form of natural rehabilitation is likely to mitigate the impacts.

- Indirect, permanent botanical impacts at the operational phase. The main impact in this regard would be the fragmentation of the current partial ecological connectivity across the power plant site. This is not likely to be a significant impact for either the pipeline or the powerline routes.

No potentially positive ecological impacts associated with this project have been identified, unless at least some of the adjacent High conservation value areas can be permanently secured for conservation (which seems unlikely).

7. IMPACT ASSESSMENT

7.1 Construction Phase Impacts

Up to 50ha of degraded but partly natural vegetation will be permanently lost within the power plant site, all of it during the construction phase. No plant Species of Conservation Concern are known to occur in this area, and the vegetation in the area is deemed to be of Low sensitivity, and because of this the magnitude of the impact is likely to be Low - Moderate. Loss of this area cannot easily be mitigated and the impact is likely to be Low negative at a regional scale, before and after mitigation.

Although only 4km long the pipeline will have a greater impact than one might imagine, as the disturbance corridor will be up to 36m wide. In about 80% of the route this passes through Low sensitivity habitat where this will have only a Low negative impact, but in about 800m (20%) of the route the corridor passes through High or Medium – High sensitivity habitat, where a number of plant Species of Conservation concern may be present. The magnitude of the impact in this area is Moderate, and most of the impact should be of a long term nature (5-19yrs) rather than a permanent impact, as the corridor should rehabilitate naturally over this period. Disturbance favours certain species, and the more sensitive ones are unlikely to return to the disturbed habitat. Search and Rescue from the Medium – High and High sensitivity area prior to construction, and use of these plants in the active rehabilitation of the disturbed corridor will help speed up habitat recovery.

The transmission line, although fairly long, is not likely to have a significant negative botanical impact, as the pylon footprints (permanent impacts) are relatively small (typically each less than $30m^2$) and the access track impacts are

likely to fade over time, as natural rehabilitation takes place. Half the transmission line route crosses cultivated lands of Low sensitivity, and botanical impacts here will be negligible. The remaining section crosses High sensitivity habitat with at least 18 plant Species of Conservation Concern recorded, although of course not all of these will occur within the exact footprint of the pylons or access track. On balance the transmission line construction is likely to have a Low negative botanical impact.

Potential impacts	Power Plant	Pipeline	Powerline
Nature of impact:	Loss of up to 50ha of degraded but partly natural vegetation (Low sensitivity) with no known plant Species of Conservation Concern	Loss and degradation of up to 1.6ha of High sensitivity vegetation, 0.8ha of Med- High sensitivity vegetation, and up to 13.3ha of Low sensitivity vegetation	Loss and degradation of small portion of Low sensitivity vegetation along 14km of route; Loss and degradation of small portion of High sensitivity vegetation along 14km of route, including impacts on various plant Species of Conservation Concern.
Extent and duration of impact:	Site; permanent	Site; mostly long term (partial natural rehabilitation of disturbed areas)	Site; mostly long term (access tracks), with small permanent impacts in pylon positions
Magnitude of impact:	Low - Moderate	Moderate	Low
Probability of occurrence:	Certain	Certain	Very likely
Degree to which the impact can be reversed:	Not reversible	Partly reversible	Largely reversible
Degree to which the impact may cause irreplaceable loss of resources:	50ha of habitat is technically irreplaceable, but in poor condition	Likely to cause very minor irreplaceable loss of only certain species; habitat itself will rehabilitate to some extent	Unlikely to cause irreplaceable loss as very small footprint in context of available habitat
Cumulative impact prior to mitigation:	Low negative	Low – Medium negative	Low negative
Significance rating of impact prior to mitigation:	Low negative	Low – Medium negative	Low negative
Degree to which the impact can be mitigated:	Cannot be significantly mitigated any further	Minor mitigation possible	Cannot be significantly mitigated
Proposed mitigation:	None	Search and Rescue in High and Med- High sensitivity areas and use of these species for rehabilitation; minimising pipeline disturbance corridor width in these areas	None
Cumulative impact post mitigation:	Low Negative	Low Negative	Low Negative
Significance rating of impact after mitigation:	Low Negative	Low Negative	Low negative

Table 1: Construction phase botanical impacts of the proposed project.

7.2 Operational Phase Impacts

Operational phase botanical impacts of this project are likely to be of very minor significance. The primary operational phase impact is loss of ecological connectivity, related mainly to the 50ha power plant site. A secondary operational phase impact could be proliferation of invasive alien plants in the pipeline route and around the power plant, facilitated by the soil disturbance during construction.

The loss of ecological connectivity in the power plant area is likely to be of **Low** negative botanical significance, as the site does not break a key ecological corridor, with adequate natural or partly natural areas still surrounding the site. The powerline and pipeline will not have any significant negative impacts on botanical connectivity.

The alien invasive plant issue is one that is easily mitigated, by means of ongoing alien invasive plant management around the power plant, and in the servitudes. After mitigation this could be reduced to a Very Low negative level in al three areas assessed.

Potential impacts	Power Plant	Pipeline	Powerline
Nature of impact:	Loss of current levels of ecological connectivity across 50ha site; alien plant invasion in surrounding disturbed areas	Reduction of current levels of ecological connectivity across route; alien plant invasion in disturbed areas	Reduction of current levels of ecological connectivity across route
Extent and duration of impact:	Site and local surrounds; permanent in case of connectivity; temporary in case of alien plants	Site and local surrounds; long term in case of connectivity; temporary in case of alien plants	Site; permanent in case of connectivity; temporary in case of alien plants
Magnitude of impact:	Low	Low	Very Low
Probability of occurrence:	Certain	Very likely	Moderately likely
Degree to which the impact can be reversed:	Not reversible	Partly reversible	Not reversible
Degree to which the impact may cause irreplaceable loss of resources:	Not likely	Not likely	Not likely
Cumulative impact prior to mitigation:	Low negative	Low negative	Very Low negative
Significance rating of impact prior to mitigation:	Low negative	Low negative	Very Low negative
Degree to which the impact can be mitigated:	Loss of connectivity can't be mitigated; alien plant invasion can be fully mitigated	Rehabilitation of corridor will partly mitigate loss of connectivity; alien plant invasion can be fully mitigated	Not possible
Proposed mitigation:	Ongoing alien invasive plant removal around	Rehabilitation of corridor with rescued material and	None

	site	additional species brought in; ongoing alien invasive plant removal within corridor	
Cumulative impact post mitigation:	Low Negative	Low Negative	Very Low Negative
Significance rating of impact after mitigation:	Low Negative	Low Negative	Very Low negative

Table 2: Operational phase botanical impacts of the proposed project.

7.3 Cumulative Botanical Impacts

Assessment of the cumulative impacts of the proposed development was specifically requested by the DEA. There are numerous proposed developments in the Saldanha – Vredenburg region, all of which will contribute to the overall cumulative impact, including:

- The IDZ development itself, covering an area of up to 4000ha (including existing development and conservation areas).
- Afrisam Cement Plant
- LPG storage Facilities – Sunrise and Avidia
- Vredenburg Industrial Development (located between Namaqua Sands and the Fossil Park):
    - Frontier Separation Plant
    - Chlor-Alkali Facility
- Desalination plant
- One additional 1000 MW gas-fired power plant.

The primary construction phase impacts are permanent loss of up to 50ha of currently degraded but technically Endangered Saldanha Flats Strandveld in the power plant footprint, and potential long term loss and degradation of an 800m long strip of Medium – High and High sensitivity vegetation in the coastal section of the pipeline corridor. Additional minor impacts will be associated with other parts of the pipeline route, and with construction of the transmission line through the eastern parts of its route.

As per Table 1 above the construction phase cumulative botanical impact is likely to be Low – Medium negative prior to mitigation, and Low negative after mitigation.

As per Table 2 above the operational phase cumulative botanical impact is likely to be Low negative prior to mitigation, and Very Low negative after mitigation.

All required mitigation is outlined in Section 8. It is strongly recommended that this project, and any others in the greater Saldanha IDZ region, contribute to a regional biodiversity offset, which is an approach supported by CapeNature,

rather than doing it piecemeal, project by project. This will require that all involved parties meet and discuss the quantums of the contributions from each developer.

8. REQUIRED MITIGATION AND EMP REQUIREMENTS

The following mitigation is considered reasonable, feasible and essential, and is factored into the assessment:

- The pipeline construction corridor in the area within and between the High and Medium – High sensitivity areas (as per Figure 5) should be minimised and kept as narrow as possible, and should ideally be less than 25m wide in this area, or 30m at most. The approved development footprint in this area must be surveyed and clearly demarcated with wire or coloured rope, and strung with warning signs, prior to any construction.
- The approved power plant and access road must similarly be surveyed and marked out prior to any development.
- The ECO must ensure that no disturbance occurs outside the approved development footprints of the power plant site or the pipeline route during construction.
- Topsoil removed from the pipeline trench must be kept separate from other fill during the construction process, and must be replaced last, on the soil surface.
- Alien invasive species (such as ryegrass or oats) or straw containing any such species should not be used for temporary soil stabilisation of the pipeline corridor, as these will then rapidly dominate these areas, to the exclusion of indigenous species.
- Plant Search and Rescue must be undertaken from the entire pipeline development corridor south of the Langebaan – Saldanha road, prior to any development. Search and Rescue should also be undertaken for selected species within the power plant footprint prior to development. All translocatable plant species, but notably the succulents and geophytes, must be bagged up and stored in a nursery for later use, once construction of the pipeline has been completed and rehabilitation is required in this area south of the road. Replanting of these rescued specimens should be undertaken in the first autumn – winter (May – June) after construction has been completed, giving the plants maximum time to establish before the next summer dry period.

- Additional rehabilitation of the pipeline servitude south of the coast road should be undertaking using locally indigenous Strandveld species that are additional to those used in the Search and Rescue process. This work should be undertaken by an experienced horticultural contractor who has access to suitable locally grown species. Key elements suggested include shrubs such as *Othonna cylindrica, Limonium peregrinum, Calobota sericea, Thamnochortus spicigerus, Searsia laevigata, Searsia glauca, Lycium ferocissimum, Euclea racemosa* and *Putterlickia pyracantha*.
- Ongoing alien invasive plant management must be undertaken on an annual or biannual basis within any undeveloped portions of the power plant site and within the full pipeline servitude. No spraying of herbicide should be undertaken in these areas as this kills numerous non-target species. The focus should be on removing (using CapeNature approved methodology) all alien invasive shrubs and large herbs (such as *Echium* species), although in some cases it may be possible and necessary to also remove invasive alien grasses such as kikuyu (*Pennisetum clandestinum*) or ryegrass (*Lolium* species).

9. CONCLUSIONS

- The identified site for the proposed power plant presents no significant botanical constraints to the proposed project and can be approved with no significant botanical mitigation.
- All project related botanical impacts are deemed to be of Low or Very Low negative botanical significance after mitigation.
- The primary construction phase impacts are permanent loss of up to 50ha of currently degraded but technically Endangered Saldanha Flats Strandveld in the power plant footprint, and potential long term loss and degradation of an 800m long strip of Medium – High and High sensitivity vegetation in the coastal section of the pipeline corridor. Additional minor impacts will be associated with other parts of the pipeline route, and with construction of the transmission line through the eastern parts of its route.
- Operational phase botanical impacts are likely to be relatively minor and of no regional significance.
- All mitigation outlined in Section 8 is considered feasible, reasonable and essential, and should be included in any Environmental Authorisation.

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