Environmental Impact Assessment for

Weskusfleur Substation

Soils, Agricultural Potential and Land Capability/Land Use Study

Koeberg, Western Cape

By

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Declaration of Independence

I, D.G. Paterson, hereby state that I am a registered Practicing Natural Scientist (*Soil Science* – Registration No. 400463/04) was responsible for supervising the compilation of this report in an impartial manner to acceptable scientific norms and standards.

Furthermore, I state that both myself and ARC-Institute for Soil, Climate and Water are independent of any of the parties involved in this study.

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1. TERMS OF REFERENCE

1.1 Background

Eskom Holdings SOC Limited initiated a study, known as the Weskusfleur Substation project, to investigate possible alternatives and solutions to address the long term reliability improvement of the existing 400 kV gas insulated busbar (GIS) at Koeberg MTS in the Western Grid. The study also included the long term 400/132kV transformation future requirements at Koeberg MTS.

The ARC-Institute for Soil, Climate and Water (ARC-ISCW) was contracted by Lidwala Consulting Engineers (Pretoria) to undertake an investigation into soils and associated agricultural potential aspects. Originally, there were five proposed site alternatives. Four of these sites are located within the Koeberg property while the fifth site is approximately 5 km to the south-west. However, the final investigation only addresses two of these sites, namely Site 1 and Site 4 (see locality map in the Appendix).

1.2 Objectives of the report

The purpose of the investigation is to contribute to the Environmental Impact Assessment (EIA) process for the two sites that were identified. The objectives of the study are;

- To classify the soils in the specified areas
- To assess broad agricultural potential as well as
- Determine the prevailing land capability and land use
- Determine the relevant soil-related impacts and their significance,

1.3 Legislative Framework

National Regulatory Framework

1.3.1 Constitution of the Republic of South Africa (No. 108 of 1996)

Summary of Constitution
The Constitution of the Republic of South Africa is the legal source for all law, including environmental law, in South Africa. The Bill of Rights is fundamental to the Constitution of the Republic of South Africa and in, Section 24 states that:

Everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Applicability to Study

The residents of the immediate and surrounding area have the basic constitutional right to a protected environment that is not unnecessarily and/or irreparably damaged by any industrial or related development.

1.3.2 National Environmental Management Act (Act 107 of 1998)

Summary of Act

The National Environmental Management Act (NEMA) creates the legal framework that ensures the environmental rights guaranteed in Section 24 of the Constitution are abided by.

As such the fundamental principles that apply to environmental decision making are laid out, the core environmental principle being the promotion of ecological sustainable development. These principles serve as a guideline for any organ of state when exercising any function in the process of decision making under NEMA.

NEMA introduces the duty of care concept which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution, and may lead to the incarceration of managers or directors of companies for the conduct of the legal persons.

Applicability to the Study

Any mining-related or other industrial development has the potential to impact on the receiving physical (including soils), biophysical and social environments. As such potential impacts need to be thoroughly and competently assessed prior to execution of the proposed Project.

1.3.3 Subdivision of Agricultural Land Act (No. 70 of 1970)

Summary of Act

The Subdivision of Agricultural Land Act (SALA) was enacted as a measure by which the Legislature, in the national interest, seeks to prevent the fragmentation of agricultural land into small uneconomic units, by (a) curtailing the common law right of landowners to subdivide their agricultural property; and (b) imposing the requirement to obtain the written consent of the National Department of Agriculture, Forestry and Fisheries (DAFF) Minister prior to any subdivision of agricultural land (which may be refused by the Minister if such subdivision will result in the uneconomic fragmentation of agricultural land). SALA also prohibits, amongst others, the change in land use of agricultural land (from use for agricultural purposes to use for any other purpose) without the prior written recommendation of the DAFF Minister.

Applicability to Study

If agricultural land, that is productive in terms of food and/or fibre production, becomes subdivided in some way as to make the reduced land parcel(s) uneconomic or unsustainable, then agricultural production is diminished. Such actions should be resisted wherever possible, especially where the prevailing agricultural potential is high.

1.3.4 Conservation of Agricultural Resource Act (No. 43 of 1983)

Summary of Act

The Conservation of Agricultural Resources Act (CARA) aims at controlling the utilisation of natural agricultural resources in order to ensure that soil, water sources and vegetation are conserved, and that alien and invasive plants are combatted. The Act aims to prevent agricultural practices that contribute to the degradation of the environment.

Applicability to Study

CARA aims to protect the prevailing natural agricultural resources of South Africa from change of land use away from agriculture. This is especially important where high potential soils are present since every time some of these soils are removed from agricultural production, the local, and by implication, regional and national food security situation is affected.

1.4 Methodology

The study area occurs within the boundary of the area of the Western Cape that is covered by existing soil maps at 1:50 000 scale (Jacobs, Oosthuizen & Stehr, 2003). This survey, where soil mapping units were established according to dominant and sub-dominant soil forms, was used as background information. Randomly placed soil observations (see Table 3) were made in each of the sites to verify the soil forms and soil depth which could then be allocated to a class of general agricultural potential and land capability. The soils were classified according to the South African soil classification system (Soil Classification Working Group, 1991) and the specific map units occurring are shown on the soil map in the Appendix.

1.5 Assumptions

The main assumption is that the soil observations made are representative of the range of soils occurring and that no unexpected or otherwise "anomalous" soils will occur.

1.6 Limitations of this Study

There are no significant limitations.

2. DESCRIPTION OF THE PROJECT

The project therefore involved the mapping of the soils occurring in the two areas, the assessment of the soils in terms of agricultural potential, the potential impacts on these soils and the presentation of the results from the field survey exercise.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The Koeberg Nuclear Power Station (KNPS) is situated approximately 30 km north of Cape Town on the west coast on the farm Duinefontein 34 in the Western Cape Province, South Africa (see Locality Map in the Appendix). It falls under the City of Cape Town Metropolitan Municipality. Most of the study area is within the property of Eskom. The proposed location for the new Koeberg substation will extend to the outside of the KNPS security fence and into the area zoned as Rural. See photos of some of the sites.

Site 2 (easterly direction)

Site 2 (westerly direction)

Site 3 (northerly direction)

Site 4 (westerly direction)

3.1 Terrain

The sites under investigation have a gently undulating to flat topography, with slopes less than 4%. No streams or drainageways are present on the site. Altitude is between 25 and 40 m above sea level.

3.2 Climate

The climate of the area (Table 1) shows that the annual rainfall is low, falling throughout the year, with a maximum in the winter months. Temperatures may be high in summer, mainly due to offshore (berg wind) conditions. Winter temperatures will be cool, but frost will not occur.

Table 1 Climate Data

Month	Rainfall (mm)	Min. Temp (°C)	Max. Temp (°C)	
Jan	8.1	15.5	29.5	**Average frost dates**
Feb	10.9	15.6	29.8	Start date: 15/7 End date: 12/8 Days with frost: ± 3
Mar	12.2	14.4	28.4	
Apr	22.8	11.9	25.3	
May	45.8	9.2	21.5	
Jun	59.7	6.9	18.4	
Jul	60.3	5.7	17.6	**Heat units (hrs > 10°C)**
Aug	62.3	5.9	18.4	Summer (Oct-Mar): 1924 Winter (Apr-Sept): 751
Sep	28.2	7.4	20.3	
Oct	19.3	9.4	23.3	
Nov	19.6	12.4	26.3	
Dec	10.4	14.3	28.2	
Year	**359.6 mm**	**17.3°C (Average)**		

3.3 Parent Material

The area comprises aeolian sands of the Springfontein and Witzand Formations, underlain by limestone and calcrete of the Langebaan Formation (Geological Survey, 1990).

3.4 Soils

Sites 1 and 4 both consist of deep, fine- to medium-grained, brownish grey to grey sandy soils, dominantly of the Namib (Nb) and Constantia (Ct) soil forms, underlain by limestone/calcrete or hydromorphic clay in some places. However, water tables from as shallow as 500 mm can occur during the rainy season in some depressions. Prominent dunes occurring at both sites can become unstable when vegetation is

disturbed as all these soils are susceptible to wind erosion due to their low clay content.

Site 1 used to be part of an unstable dune area prior to building of the Koeberg Nuclear Station and the soil was mechanically disturbed in places. Therefore, precautionary measures must be taken to stabilize the dunes in the northern part of Site 1, if considered.

A summary of the main soil characteristics is given in **Table 2** and a list of soil observations in **Table 3.**

Table 2 General Soil Description

NAME	MAP UNIT	DOMINANT SOIL FORM/ FAMILY	SUBDOMINANT SOIL FORM/ FAMILY	EFFECTIVE DEPTH (mm)	GENERAL DESCRIPTION
Site 1	**Nb1**	Nb1200	Cg2000	300 – 1500+	Mainly deep, greyish-brown to grey, fine- to medium-grained, calcareous, aeolian sand. Occasionally underlain by calcrete/limestone at sporadic depths of 300 - 1000 mm.
Site 4	**Ct1**	Ct1100, Fw1110	Kd1000, Nb1100	1000 – 1500+	Deep, greyish-brown to light grey and brown, fine- to medium-grained, aeolian sand underlain by hydromorphic clay in places. 10 – 15% stabilized dunes (height 3 - 5 m), occur in this area.

Table 3 Soil observations

Site	Obs. No.	Soil form	Soil depth (mm)	Depth Limiting material	Latitude	Longitude	Comment
1	K1	Nb1200	1000	Hardpan Carbonate	33.672533	18.435804	
	K2	Cg2000	300	Hardpan Carbonate	33.671331	18.435182	
	K3	Nb1200	1500		33.670033	18.434812	
	K4	Nb1200	1500		33.670231	18.436249	
	K5	Nb1200/Ct	1500		33.671363	18.436689	Non-diagnostic yellow brown sand at 600 mm
	K6	Nb1200/Ct	1500		33.672516	18.437269	Non-diagnostic yellow brown sand at 1 100 mm
	K7	Nb1200/Ag	1200+		33.673729	18.437671	Subsoil slightly higher in clay (6-8%, fine sand)
	K8	Nb1200	1500		33.672516	18.436373	
	K9	Nb1200	1300	Hardpan Carbonate	33.670902	18.433546	
	K10	Nb1200	900+		33.671476	18.434581	
	K11	Nb1200	1500		33.671964	18.434436	Water table can occur at 1.2 m in rainy season
4	K17	Kd1000	1200	Gleyed clay	33.671819	18.460298	
	K18	Kd1000	1000	Gleyed clay	33.672683	18.462219	
	K19	Nb1100	1500		33.671782	18.463935	Dune
	K20	Ct1100	1500		33.671604	18.465469	
	K21	Ct1100	1500		33.673332	18.467395	
	K22	Nb1100/Fw	1500		33.665269	18.464466	

3.5 Soil limitations

The suitability of soils for the production of crops in a specific locality depends mainly on the inherent chemical, physical and morphological properties of the soils, combined with prevailing climate and crop requirements.

The soil limitations that were noted are mainly:

- ***Restricted soil depth*** to hardpan carbonate horizon or clay
- ***Low clay content*** of top- and upper subsoils giving rise to low water-holding capacity, wind erosion susceptibility
- ***Presence of free carbonates*** indicates a low degree of leaching, giving rise to high pH values and low trace element status

3.6 Agricultural potential

The only perennial crop for the area with a low to moderate suitability, with regard to rainfall, is dryland wine grapes, although there is no production of wine grapes in the immediate vicinity (within 5 – 10 km). Small grain (wheat and oats) with a medium production potential (rainfall 300 – 400 mm/year, if <20% in summer) was also taken into consideration as annual crop (Jacobs, 1999). The main limiting factor that will influence the agricultural potential rating of the soil is the above-mentioned limitation of excessive drainage, coupled with limited natural fertility.

3.7 Land Capability

The Land capability system for South Africa (Schoeman *et al*., 2004), was used to get a general idea of the land capability and land use for this area.

The area was assessed as Land Capability Class IV, with land use options: *wildlife, forestry and light grazing, medium grazing and* ***poorly adapted cultivation.***

> ***Concept:*** *Land in class IV has very severe limitations that restrict the choice of plants, require very careful management, or both; it may be used for cultivated crops, but more careful management is required than for Class III and conservation practices are more difficult to apply and maintain; restrictions to land use are greater than those in Class III and the choice of plants is more limited.*

Taking all the above-mentioned factors into account, a general agricultural potential rating for the two sites investigated varies from low to medium as noted in **Table 4,** together with a land capability rating of Class IV.

Table 4 Agricultural potential and Land Capability ratings

Site No	Map Unit	Agricultural potential		Land Capability
		Perennial crop	Annual crop	
1	Nb1	L	L-ML	Class IV
4	Ct1	L-ML	M-L	Class IV

Potential classes

High - H

Medium - M

Low - L

4. IMPACTS

4.1 Substation GIS/AIS

The main potential impact involved in the construction of the substation and its associated infrastructure would be the loss of agriculturally productive soil due to the development. If a construction, such as a substation, is established, then that area is no longer available for cultivation or other forms of agriculture.

The second, associated impact, involves the possible increased wind erosion hazard due to the removal of surface vegetation associated with the construction activities. Without plant roots to bind the sandy topsoil together, the action of the wind could have the effect of removing valuable soil from the site.

4.2 Transmission Lines

Due to the reduced footprint, the impacts will be smaller for any transmission lines, but if access roads are constructed, the wind erosion hazard will also become relevant.

5. ASSESSMENT OF IMPACTS

The soils in the area are generally sandy, with excessive drainage and limited natural fertility (Table 2). Coupled with the low prevailing annual rainfall (Table 1), the potential for agriculture in this area is relatively low. There is almost no agricultural activity in these coastal sands in the immediate vicinity, so this impact is not considered to be significant.

However, the potential wind erosion threat is probably more significant, if specific mitigation measures are not implemented.

The significance of the identified impacts is given in detail on the accompanying spreadsheet.

6. MITIGATION AND MANAGEMENT MEASURES

The main mitigation measure will involve soil conservation and stabilization. When any excavation for construction takes place, the extent of soil disturbance should be restricted to the minimum area possible, so that no unnecessary disturbance occurs.

If necessary, windbreaks (such as netting or similar structures) can be erected perpendicular to the prevailing wind direction.

Once construction is complete, re-vegetation of the disturbed areas, using indigenous vegetation, should take place as soon as possible, under the supervision of a qualified vegetation specialist.

7. CONCLUSIONS

It is concluded that the proposed development will not have large impacts on alternative sites 1 and 4 due to the overall low agricultural potential and the current land use. The main aspects that will have to be managed at the sites when vegetation is removed will involve increased wind erosion susceptibility due to the sandy nature of the soils.

The occurrence of water tables during the rainy season can also possibly be expected in depressions at the sites, especially in times of heavy rainfall. Planning to avoid such occurrences should be done.

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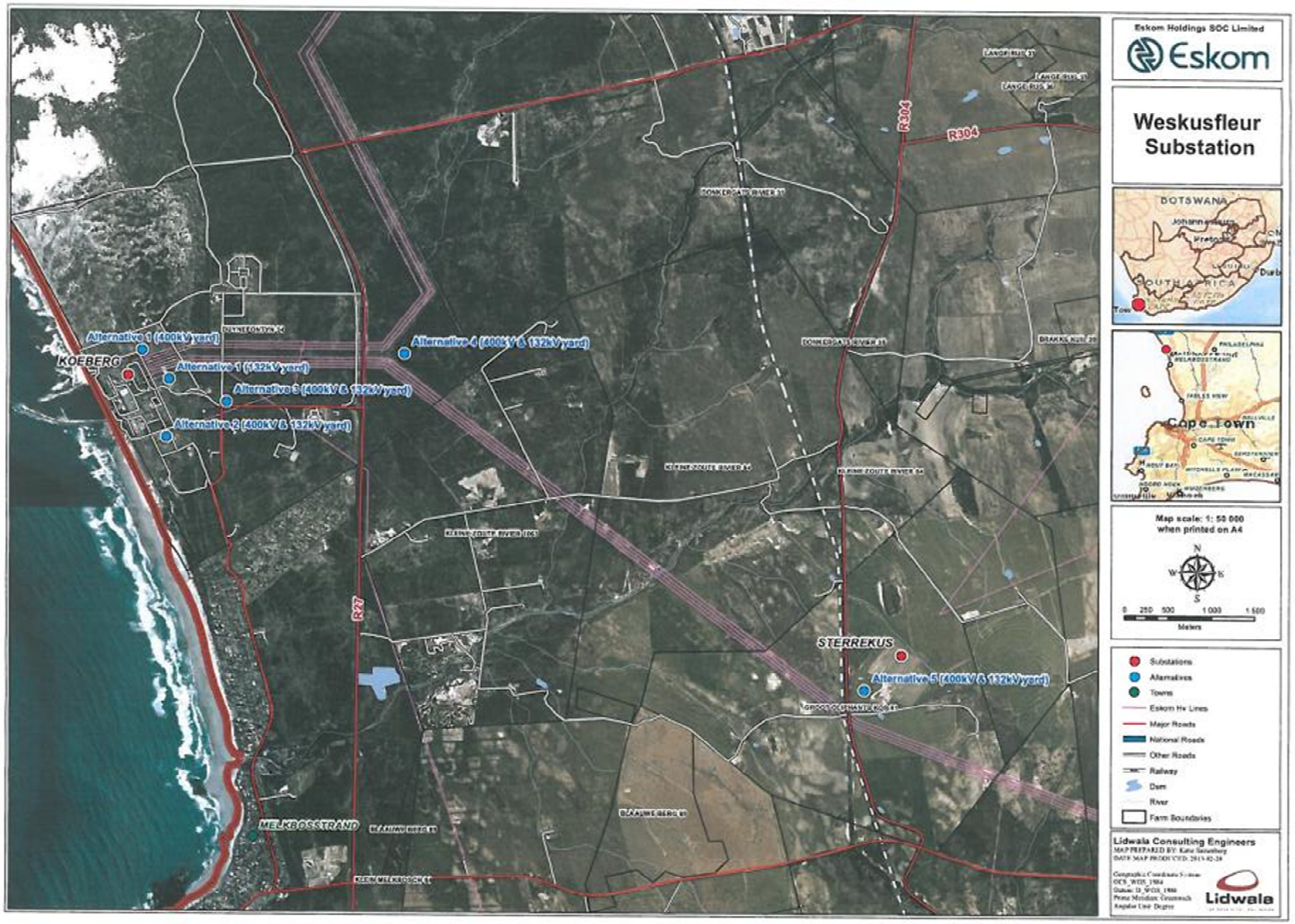
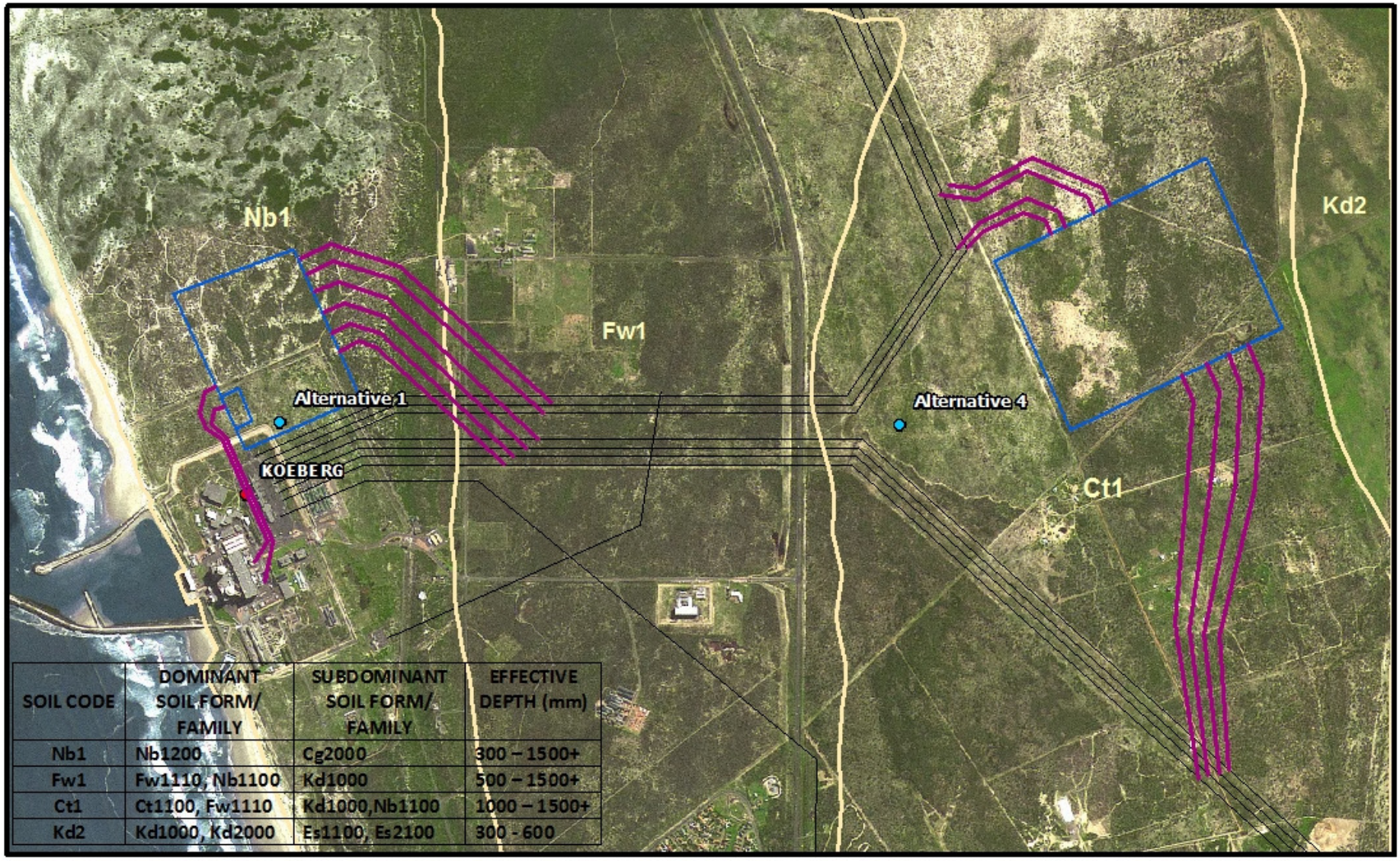
LOCALITY MAP


Eskom Holdings SOC Limited
Eskom
Weskusfleur Substation
Alternative 1 (400kV yard)
Alternative 1 (132kV yard)
Alternative 3 (400kV & 132kV yard)
Alternative 2 (400kV & 132kV yard)
Alternative 4 (400kV & 132kV yard)
Alternative 5 (400kV & 132kV yard)
KOEBERG
STERREKUS
MELKBOSSTRAND
R304
R27
Map scale: 1: 50 000 when printed on A4
Meters
Substations
Alternatives
Towns
Eskom Hv Lines
Major Roads
National Roads
Other Roads
Railway
Dam
River
Farm Boundaries
Lidwala Consulting Engineers
Lidwala

SOIL MAP

Weskusfleur Alternative sites 1 and 4 Soil map

Scale 1:20,000



SOIL CODE	DOMINANT SOIL FORM/ FAMILY	SUBDOMINANT SOIL FORM/ FAMILY	EFFECTIVE DEPTH (mm)
Nb1	Nb1200	Cg2000	300 – 1500+
Fw1	Fw1110, Nb1100	Kd1000	500 – 1500+
Ct1	Ct1100, Fw1110	Kd1000,Nb1100	1000 – 1500+
Kd2	Kd1000, Kd2000	Es1100, Es2100	300 - 600

N

Alternative sites

Alternative lines

Eskom_Hv_lines

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