START

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Our Reference: 10322/Let10

13 May 2010

Attention: Interested & Affected Party

Re: Neptune-Poseidon 400 kV Power Line (DEA Ref. No: 12/12/20/1439) – Notice of Review of Extended Draft Scoping Report

Dear Sir / Madam

Eskom Holdings Limited has proposed the construction of a new 400kV power line as part of the greater East London Strengthening scheme. To this end, the following alternatives have been proposed:

- **Main Route** – Power line (approximately 191km) which runs in an east to west direction from the existing Neptune substation (near East London) to the Poseidon substation (near Cookhouse), in the Eastern Cape. The proposed alignment is situated within the existing vacant Eskom servitude between the aforementioned substations. The substations will also be expanded and upgraded to accommodate the new line. In addition, two turnings of approximately 5km each, will be constructed from the proposed Neptune-Poseidon line to the existing Pembroke substation site.
- **Alternative 2** – Deviation from Main Route, where the power line (approximately 40km) runs in an east to west direction from the Neptune substation to the south around Mdantsane and the Bridle Drift Dam and reconnects to the Main Route to the south of Berlin, at Rini.
- **Alternative 3** – Deviation from Main Route, where the power line (approximately 39km) runs in an east to west direction from the Neptune substation to the north around Nqonqweni, around Berlin and connects to the Main Route south of Berlin, at Hillcrest. The last 16km of this route runs parallel to an existing Eskom line.
- **Alternative 4** – Deviation from Main Route, where the power line (approximately 70km) runs in a west to east direction from the Poseidon substation to the south alongside the existing Eskom 220kV Pembroke-Poseidon 1 transmission line and connects to the Main Route close to Xuxuwa.

To date, the following activities have been undertaken as part of the public participation process for the Main Route:

- Notification of the Scoping process was provided in April 2009, and the registration period for Interested and Affected Parties and submission of comments ended on 25 May 2009.
- Public open days were held from 05-07 May 2009.
- The draft Scoping Report was lodged for public review from 25 January 2010 to 08 March 2010. Public meetings were held to present the draft Scoping Report from 08-09 February 2010.

During public participation of the Scoping Phase, several alternative routes (i.e. Alternatives 2, 3 and 4) were identified and have been incorporated into the extended draft Scoping Report. In accordance with Regulation 58(2) of Government Notice No. R. 385 of 21 April 2006, registered Interested and Affected Parties are granted an opportunity to review and comment on the extended draft Scoping Report. To this end, copies of the extended draft Scoping Report have been lodged at the following places (overleaf) for review from **03 May 2010 until 15 June 2010**:

Copy No.	Location	Address	Tel. No.
1.	Adelaide Public Library	Market Square, Adelaide	046 684 0034
2.	Bedford Public Library	Van Riebeeck St, Bedford	046 685 0187
3.	Buffalo City Municipal Library	Corner Gladstone and Oxford St, East London	043 722 4991
4.	Fort Beaufort Public Library	Campbell Street, Fort Beaufort	046 645 1656
5.	King Williams Town Public Library	Ayliff Street, King William's Town	043 642 3391

In addition, copies of the report were forwarded to certain parties (including Local Authorities and members of the Agricultural Sector). This serves as notification that the comments on the attached extended draft Scoping Report must be submitted to Nemai Consulting on/before **15 June 2010**.

The following public meetings will also be held to present the alternatives and the extended draft Scoping Report:

19 May 2010			
Area:	Thorn Park	**Area:**	Ndevana
Venue:	Thorn Park Trading Store	**Venue:**	Mafigogane Primary School
Time:	09h00	**Time:**	14h00

20 May 2010			
Area:	Fort Beaufort	**Area:**	Bedford
Venue:	Savoy Hotel	**Venue:**	Beford Town Hall, Donkin Street
Time:	09h00	**Time:**	13h00

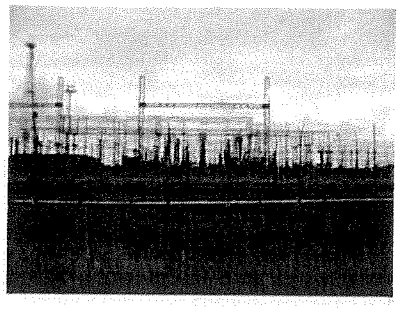
For any queries, please do not hesitate to contact the undersigned.

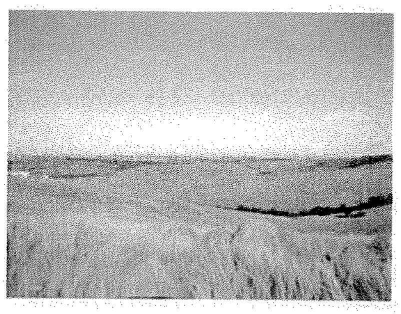
Yours faithfully
Nemai Consulting C.C.

Donavan Henning

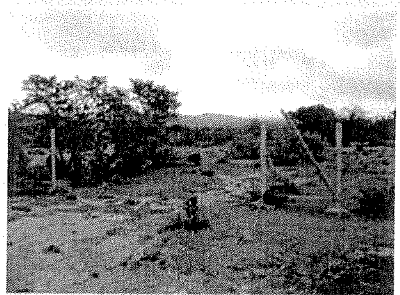
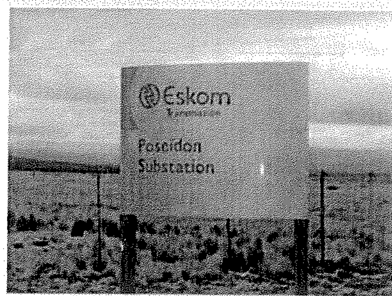
Eskom Holdings Limited
Eskom Transmission Division

NEPTUNE-POSEIDON 400 KV POWER LINE





EXTENDED DRAFT SCOPING REPORT
for
PUBLIC REVIEW

DEA Ref. No: 12/12/20/1439

May 2010

NEMAI CONSULTING

ENVIRONMENTAL AND SOCIAL CONSULTANTS

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PUBLIC REVIEW

This document presents the Extended Draft Scoping Report for the Neptune-Poseidon 400 kV Power Line. The main purpose of the report is the following:

- To describe the need for the project;
- To describe how the proposed project will be executed;
- To provide a description of the receiving environment that could be affected by the proposed project;
- To explain the Scoping and Environmental Impact Assessment (EIA) process;
- To describe the public participation process that was undertaken to date, as part of the Scoping phase;
- To provide a description of the legislation that was considered; and
- To present a Plan of Study for the pending EIA phase of the project.

To date, the following activities have been undertaken as part of the Scoping public participation process for the Main Route:

- Notification of the Scoping process was provided in April 2009, and the registration period for Interested and Affected Parties and submission of comments ended on 25 May 2010;
- Public open days were held from 05-07 May 2009; and
- The draft Scoping Report was lodged for public review from 25 January 2010 to 08 March 2010. Public meetings were held to present the draft Scoping Report from 08-09 February 2010.

During public participation of the Scoping Phase, several alternative routes (i.e. Alternatives 2, 3 and 4) were identified and have been incorporated into this Extended Draft Scoping Report.

In accordance with Regulation 58(2) of Government Notice No. R. 385 of 21 April 2006, registered Interested and Affected Parties are granted an opportunity to review and comment on the Extended Draft Scoping Report. To this end, copies of the report have been lodged at the following places for review from **03 May 2010 until 15 June 2010**:

Location	Address
Adelaide Public Library	Market Square, Adelaide
Bedford Public Library	Van Riebeeck St, Bedford
Buffalo City Municipal Library	Corner Gladstone and Oxford St, East London
Fort Beaufort Public Library	Campbell Street, Fort Beaufort
King Williams Town Public Library	Ayliff Street, King William's Town

The following public meetings will also be held to present the extended draft Scoping Report and the new alternatives:

19 May 2010			
Area:	Thorn Park	**Area:**	Ndevana
Venue:	Thorn Park Trading Store	**Venue:**	Mafigogane Primary School
Time:	09h00	**Time:**	14h00

20 May 2010			
Area:	Fort Beaufort	**Area:**	Bedford
Venue:	Savoy Hotel	**Venue:**	Bedford Town Hall, Donkin Street
Time:	09h00	**Time:**	13h00

EXECUTIVE SUMMARY

PROJECT BACKGROUND AND MOTIVATION

Increased demand for a reliable electricity supply in the Southern Grid has necessitated that Eskom Transmission improves the reliability and capacity of the transmission network into the area. The East London area, which is supplied from the Pembroke and Neptune Main Transmission System (MTS), is presently unfirm.

Based on the analysis of the possible Distribution and Transmission alternatives to mitigate existing and foreseen network constraints, the Neptune-Poseidon 400 kV power line project was identified as the preferred option as part of the greater East London Strengthening scheme. This project will also improve reliability in the Eastern Grid.

SCOPING AND EIA PROCESS

The Neptune-Poseidon 400 kV power line project entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). The process for seeking authorisation is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations (Government Notice No. R385, R386 and R387 of 21 April 2006), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved, the requisite environmental assessment for the project is a Scoping and EIA process. The EIA decision-making authority is the National Department of Environmental Affairs (DEA), as the project proponent (i.e. Eskom Holdings Limited, Eskom Transmission Division) is a parastatal.

Nemai Consulting was appointed by Eskom Holdings Limited, Eskom Transmission Division as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Neptune-Poseidon 400 kV power line.

PROJECT OVERVIEW

During the environmental assessment a 1 km corridor (i.e. 500 m on either side of servitude centre line) was adopted as the study area. This is to allow for any possible deviations from the current servitude alignment within this corridor, deemed necessary by the following factors:

- Findings of the impact assessment and specialist studies;
- Outcome of Eskom negotiations with landowners; and
- Technical requirements.

The following alternatives routes for the transmission line were identified:

- **Main Route** – Power line (approximately 191km) which runs in an east to west direction from the existing Neptune substation (near East London) to the Poseidon substation (near Cookhouse), in the Eastern Cape. The proposed alignment is situated within the existing vacant Eskom servitude between the aforementioned substations. Two turn-ins of approximately 5 km each, which pass between Ndevana and Ilitha, connect the proposed line with the Pembroke substation. From approximately King William's Town the line runs between the R63 road (to the north) and the existing Pembroke-Poseidon 220 kV transmission line (to the south).
- **Alternative 2** – Deviation from Main Route, where the power line (approximately 40km) runs in an east to west direction from the Neptune substation to the south around Mdantsane and the Bridle Drift Dam and reconnects to the Main Route to the south of Berlin, at Rini.
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- **Alternative 4** – Deviation from Main Route, where the power line (approximately 70km) runs in a west to east direction from the Poseidon substation to the south alongside the existing Eskom 220kV Pembroke-Poseidon 1 transmission line and connects to the Main Route close to Xuxuwa.

SCOPING-LEVEL IMPACT ASSESSMENT

The Extended Draft Scoping Report provides a general description of the status quo of the receiving environment in the project area, which allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The possible implications of the proposed Neptune-Poseidon 400 kV power line to the following features are discussed on a qualitative level:

- Climate
- Topography
- Surface Water
- Geology and Soil
- Flora
- Fauna
- Socio-Economic Aspects
- Agricultural Potential
- Air Quality
- Noise
- Archaeological and Cultural Features
- Transportation
- Aesthetics
- Tourism

Pertinent environmental issues, which will receive specific attention during the EIA phase, are tabulated below.

Pertinent Issues (Construction Phase) for prioritisation during the EIA

Environmental Factor	Potential Issues / Impacts	Proposed Resolution
Topography	• Visual impact on ridges • Erosion of affected areas on steep slopes	• Visual Impact Assessment • EMP
Surface Water	• Impacts where access roads cross traverse watercourses	• EMP
Geology and Soil	• Erosion on steep slopes	• EMP
Flora	• Removal of vegetation for stringing, building of new access roads, tower construction and construction camp(s) establishment	• Ecological Specialist Study • EMP
Fauna	• Impacts to animals on game farms • Impacts to livestock	• Ecological Specialist Study • EMP
Socio-economic	• Loss of income from hunting, game viewing, and crop production • Reduction in property value • Damage to property • Relocation of structures situated within servitude	• Economic Study • Socio-economic Study
Agricultural Potential	• Loss of agricultural land • Impacts to animals on game farms • Impacts to livestock	• Agricultural Potential Study • Economic Study • Socio-economic Study
Archaeological and Cultural Features	• Damage to heritage resources	• Heritage Impact Assessment • EMP
Transportation	• Damage to roads by heavy construction vehicles • Disruption of railway line at crossing	• EMP
Aesthetics	• Clearing of vegetation. • Construction-related operations.	• Visual Impact Assessment • EMP
Tourism	• Visual and noise impacts from construction operations. • Influence to hunting practices. • Reduction in tourism to areas affected by construction	• Visual Impact Assessment • Economic Study • Socio-economic Study • EMP

Pertinent Issues (Operational Phase) for prioritisation during the EIA

Environmental Factor	Potential Issues / Impacts	Proposed Resolution
Topography	• Visual impact on ridges from disturbed area and infrastructure. • Erosion along access roads on steep slopes.	• Visual Impact Assessment • EMP
Surface Water	• Inadequate stormwater management on access roads • Damage to towers from major flood events	• EMP
Geology and Soil	• Erosion on steep slopes	• EMP
Flora	• Encroachment by exotic species through inadequate eradication programme. • Clearing of vegetation along maintenance road.	• Ecological Specialist Study • EMP
Fauna	• Risk to birds from collision with infrastructure and from electrocution • Loss of game though improper access control • Electrocution of monkeys	• Ecological Specialist Study • EMP
Socio-economic	• Loss of land with extension of existing servitude • Reduction in property value • Threats to human and animal health from EMF	• Socio-economic Study
Agricultural Potential	• Loss of agricultural land	• Agricultural Potential Study • Socio-economic Study
Transportation	• Use of maintenance roads	• EMP
Aesthetics	• High visibility of transmission lines. • Inadequate reinstatement and rehabilitation of construction footprint.	• Visual Impact Assessment • EMP
Tourism	• High visibility of transmission lines • Loss of "sense of place"	• Visual Impact Assessment • Socio-economic Study • EMP

PUBLIC PARTICIPATION

The draft Scoping Report provides a full account of the public participation process that was followed for the Scoping phase for the proposed Neptune-Poseidon 400 kV power line.

The figure to follow outlines the public participation process for the Scoping phase (current) as well as the Environmental Impact Assessment phase (pending).

Scoping Phase

Advertisements	• Die Burger, • The Herald, • Eastern Cape Voice – 15/04/09; • Die Burger, • The Herald, • Eastern Cape Voice, • Daily Dispatch, • Daily Sun – 22 & 23/06/09
Onsite Notices	14 - 17/04/09
BIDs & Reply Forms	20/04/09 & 29/06/09
Public Meetings	• **05/05/09:** o Nqonqweni / Rini – 10h00 o Zwelitsha – 16h00 • **06/05/09:** o Peddie – 10h00 o Alice – 16h00 • **07/05/09:** o Adelaide – 10h00 o Bedford – 16h00
I&APs Database	Authorities, stakeholders, landowners, general
Public Review of Draft Scoping Report	25/01/10 - 08/03/10
Advertisements	• Die Burger • The Herald • Eastern Cape Voice • Daily Dispatch • Daily Sun
Public Review of Extended Draft Scoping Report	03/05/10 - 15/06/10
Public Meetings	• **19/05/10:** o Thorn Park – 09h00 o Ndevana – 14h00 • **20/05/10:** o Fort Beaufort – 10h00 o Bedford – 13h00

EIA Phase

Notification	Aug '10*
Public Review of Draft EIA Report	Sept – Oct '10*
Notification	January '10*

Scoping Phase:

[shaded box] **First round notification**

[white box] **Second round notification**

Note: * = dates may change during course of EIA process

The issues raised by I&APs during Scoping, to a large extent, determine and guide the investigations during the EIA phase. The Comments and Response Report, which summarises the salient issues raised by I&APs (during meetings and in correspondence received) and the project team's response to these matters, is contained in the Extended Draft Scoping Report.

PLAN OF STUDY FOR EIA

The Extended Draft Scoping Report is concluded with the Plan of Study for EIA, which explains the approach to be adopted to conduct the EIA for Neptune-Poseidon 400 kV power line. The Plan of Study for EIA includes the following:

- Specialist studies to be undertaken -
  - Ecological Study;
  - Heritage Impact Assessment;
  - Socio-Economic Study;
  - Visual Impact Assessment;
  - Agricultural Potential Study;
  - Social Impact Assessment;
- The Public Participation process to be followed -
  - Updating of I&AP Database;
  - Notification – Approval of Scoping Report;
  - Public Meeting;
  - Review of Draft EIA Report;
  - Notification of DEA Decision;
  - Broader Public Involvement Process;
- Contents of the EIA Report; and
- Consultation with the authorities and the EIA timeframes.

TITLE AND APPROVAL PAGE

TITLE: Neptune-Poseidon 400 kV Power Line

CLIENT : Eskom Holdings Limited
Eskom Transmission Division
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Johannesburg
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AUTHOR D. Henning, R. Ajodhapersadh, R. le Roux, S. Pienaar

Signature	Date
____________________	____________

APPROVAL

Signature	Date
____________________	____________

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
25 January 2010	Draft Copy for Public Review	1	
03 May 2010	Extended Draft Copy for Public Review	2	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 PROJECT BACKGROUND AND MOTIVATION

Increased demand for a reliable electricity supply in the Southern Grid has necessitated that Eskom Transmission improves the reliability and capacity of the transmission network into the area. The East London area, which is supplied from the Pembroke and Neptune Main Transmission System (MTS), is presently unfirm.

Box 1: Some facts about electricity transmission

As electricity cannot be stored, power is generated and delivered over long distances at the very instant that it is required. In South Africa, thousands of kilometres of high voltage Transmission lines (i.e. 765 kV, 400 kV and 275 kV Transmission lines) transmit this power, which is predominantly generated at the power stations located within the Mpumalanga Province, to Eskom's major substations (Bohlweki Environmental, 2001). At these major substations, the voltage is reduced and transmitted to smaller substations via Distribution lines (e.g. 132 kV, 88 kV and 66 kV lines). The voltage is again reduced for distribution to the various users.

Distribution is experiencing low 132kV voltage levels at Zimbane, Qumbu, Ugie, Qunu, Tyalara and Idutywa 132kV busbars, which is expected to worsen by 2009 due to sustained growth in the Transkei. Hence, the need to reinforce the network to cater for network reliability under N-1 contingencies and maintain a good quality of supply to Distribution customers.

Subsequent to the network analysis based on regulatory standard the least economic cost network solution, which will mitigate existing Distribution voltage regulation problems and the Transmission network security in the East London Customer Load Network (CLN), was identified. This network solution meets the following minimum requirements:

- Improve reliability of the existing East London Transmission network;
- Improve East London network voltage regulation; and
- Create additional Transmission network capacity to supply the increasing electricity demand in the Southern Grid.

Based on the analysis of the possible Distribution and Transmission alternatives to mitigate existing and foreseen network constraints, the **Neptune-Poseidon 400 kV power line** project was identified as the preferred option as part of the greater East

London Strengthening scheme. This project will also improve reliability in the Eastern Grid.

The phased-in approach of the greater East London Strengthening Scheme is proposed to ensure long-term sustainability of the Cape and Eastern Grid corridor reliability.

2 SCOPING AND EIA PROCESS

The Neptune-Poseidon 400 kV power line project entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). Refer to **Section 8** for further discussion in the project's legal framework.

The process for seeking authorisation is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations (Government Notice No. R385, R386 and R387 of 21 April 2006), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved, the requisite environmental assessment for the project is a Scoping and EIA process.

Box 1:	What is "Scoping"?
Scoping is the first phase in the overall EIA process. Scoping defines the Terms of Reference for the subsequent EIA phase of the assessment by identifying key issues that need further consideration and prioritisation. According to DEAT (2002), the characteristics of a scoping exercise are as follows: • It is an open process that involves the authorities, proponent and stakeholders; • Feasible alternatives are identified and selected for further assessment; • Important characteristics of the affected environment are identified; and • Significant issues to be examined in the assessment procedure are identified.	

The EIA decision-making authority is the National Department of Environmental Affairs (DEA), as the project proponent (i.e. Eskom Holdings Limited, Eskom Transmission Division) is a parastatal. However, the Eastern Cape Province: Department of Economic Affairs, Environment and Tourism (DEAET) is regarded as a key authority during the execution of the EIA, and all documentation will thus be forwarded to this Department.

An outline of the Scoping and EIA process for the proposed Neptune-Poseidon 400 kV power line is provided in **Figure 1**.

Note that additional alternatives were identified during the initial Scoping Process. Following consultation with DEA, it was decided to incorporate the new routes into this Extended Draft Scoping Report to allow I&APs an opportunity to comment on these alignments.

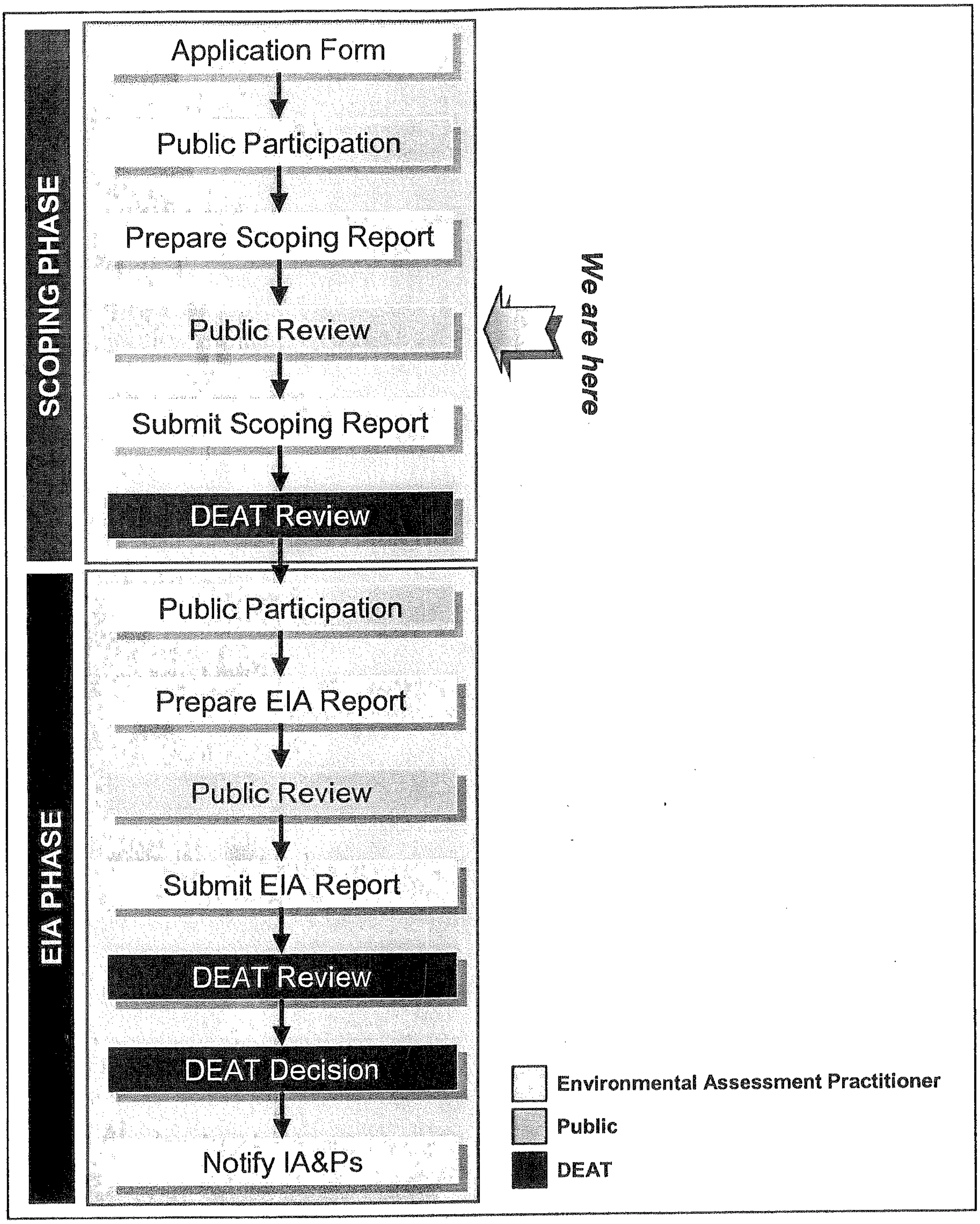


Figure 1: Overview of Scoping and EIA process

3 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by Eskom Holdings Limited, Eskom Transmission Division as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for the proposed Neptune-Poseidon 400 kV power line.

In accordance with Regulation 29(2) of Government Notice No. R. 385 of 21 April 2006, this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng), Rustenburg (North West Province), and Durban (KwaZulu Natal).

The members of Nemai Consulting that are involved with the Scoping and EIA process for the Neptune-Poseidon 400 kV power line are captured in **Table 1** below, and their respective Curricula Vitae are contained in to ***Appendix A***.

Table 1: Scoping and EIA Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	B.Sc Eng (Chem)	17 years	Project Director
Mr D. Henning	• B.Sc (Hons) Aquatic Health • M.Sc River Ecology	9 years	• Project Manager • Compiling Scoping and EIA Reports
Mr S. Pienaar	• B.Sc (Hons) Env Management	3 years	Public Participation Coordinators
Mr C. Chidley	• B.Sc Eng (Civil); • BA (Economics, Philosophy) • MBA	20 years	Quality Reviewer

4 PROJECT LOCATION

The study area is situated in the Eastern Cape Province, which was formed in 1994 by the amalgamation of the former homelands of the Transkei and the Ciskei, as well as an eastern portion of the former Cape Province. The Eastern Cape today consists of 16 958 000 hectares and comprises 13.9% of the total land area of South Africa.

The Neptune-Poseidon routes for the alternative alignment traverse the following municipalities (see **Figure 2**):

- Amatole District Municipality –
  - Buffalo City Local Municipality;
  - Amahlathi Local Municipality (Alternative 2 only);
  - Ngqushwa Local Municipality;
  - Nkonkobe Local Municipality;
  - Nxuba Local Municipality;
- Cacadu District Municipality –
  - Blue Crane Route Local Municipality.

Refer to the locality map contained in **Figure 3** for the discussion to follow.

A 1 km corridor (i.e. 500 m on either side of the servitude centre line) was adopted as the study area, which allows for any possible deviations from the current registered vacant servitude alignment within this corridor.

From its most eastern point, the vacant servitude alignment commences from the Neptune substation in the Thorn Park Area (north-west of East London). It then travels in a predominantly western direction for approximately 191 km until it reaches its destination at the Poseidon substation (± 11 km east of Cookhouse). Two turn-ins of approximately 5 km each, which pass between Ndevana and Ilitha, connect the proposed line with the Pembroke substation. From approximately King William's Town the line runs between the R63 road (to the north) and the existing Pembroke-Poseidon 220 kV transmission line (to the south).

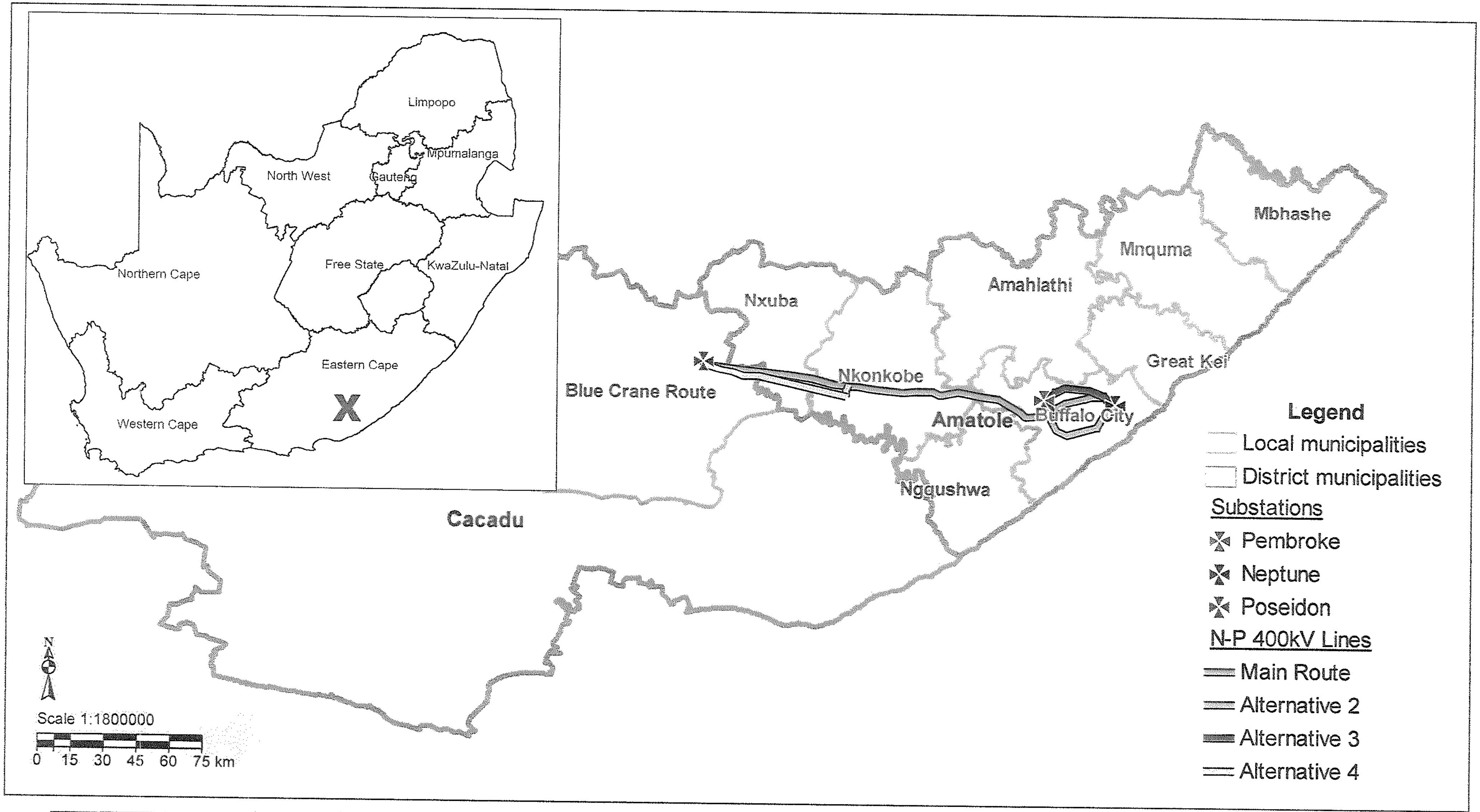


Figure 2: Municipal Areas traversed by proposed corridors

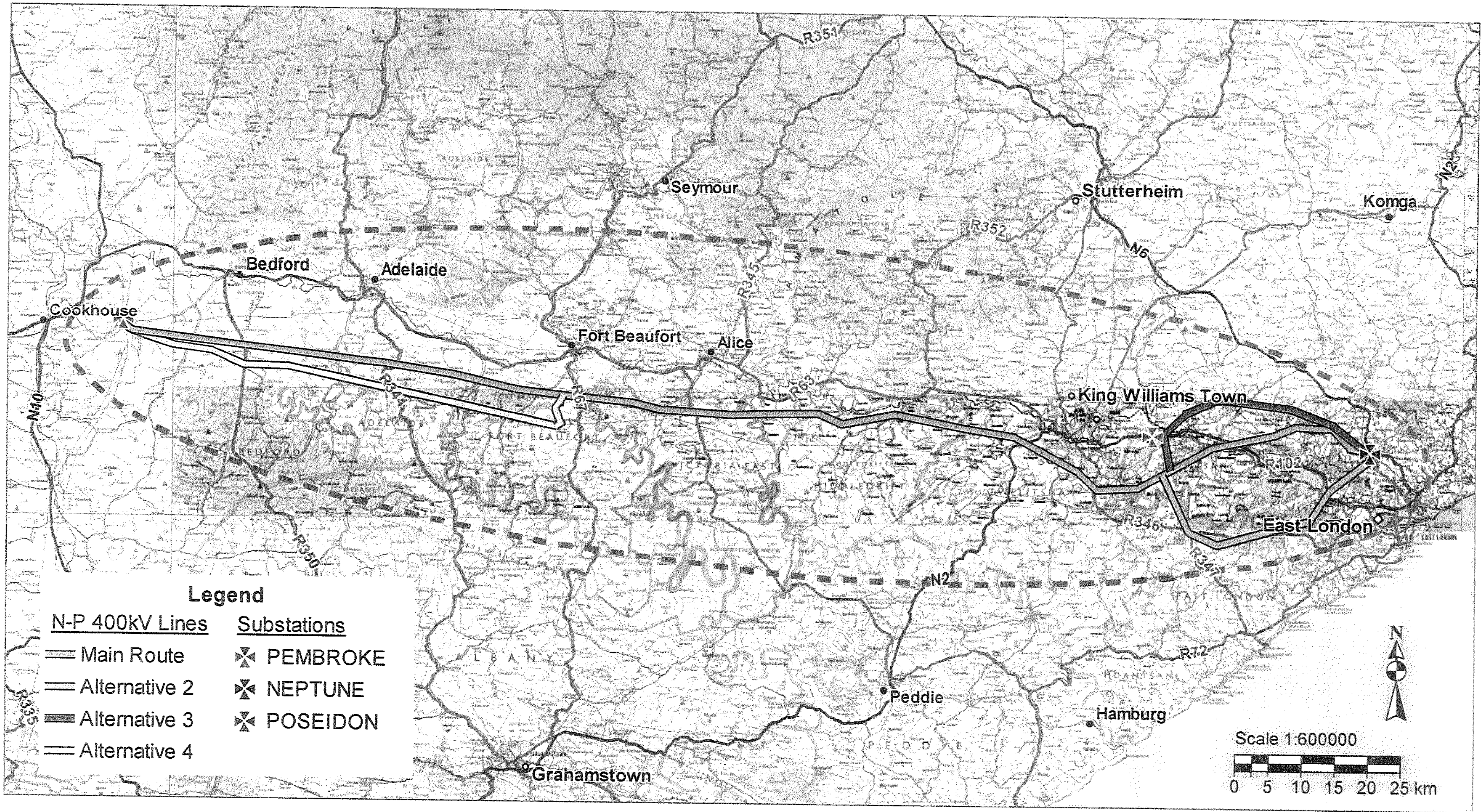


Figure 3: Locality Map

5 PROJECT DESCRIPTION

5.1 Eskom's Main Transmission System in the Region

The Cape Transmission System supplies consumers in the Southern Cape, West Coast, Peninsula, Namaqualand, Karoo, East London, Port Elizabeth, Kimberly and Bloemfontein.

Local generation in the Cape region is limited to the Koeberg Nuclear Power Station (1,840 MW), the Palmiet Pumped Storage Scheme near Grabouw (400 MW), and the Gariep (360 MW) and Van Der Kloof (240 MW) Hydro Schemes. The Cape load centres need in excess of 5,000 MW, and the difference needs to be supplied from power stations in Mpumalanga via the Cape Transmission System (ACER Environmental Management Consultants, 2006).

The substations and power lines that form part of Eskom's MTS in the area are shown in **Figure 4**.

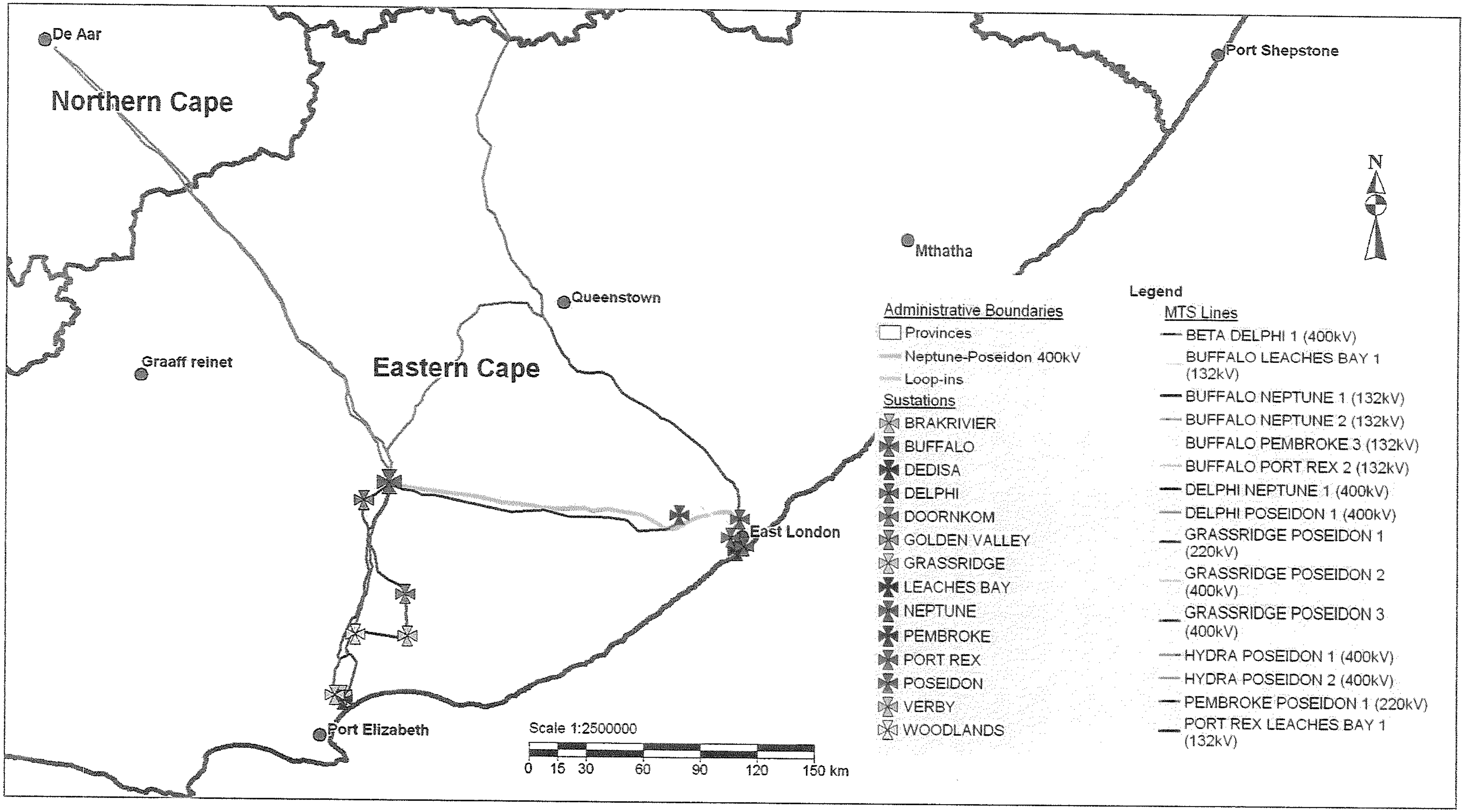


Figure 4: Eskom's Regional MTS

5.2 Project Overview

The project proposes the construction of a new 400 kV power line of approximately 191 km length between the existing Neptune and Poseidon substations (see **Figures 5** and **6**, respectively).

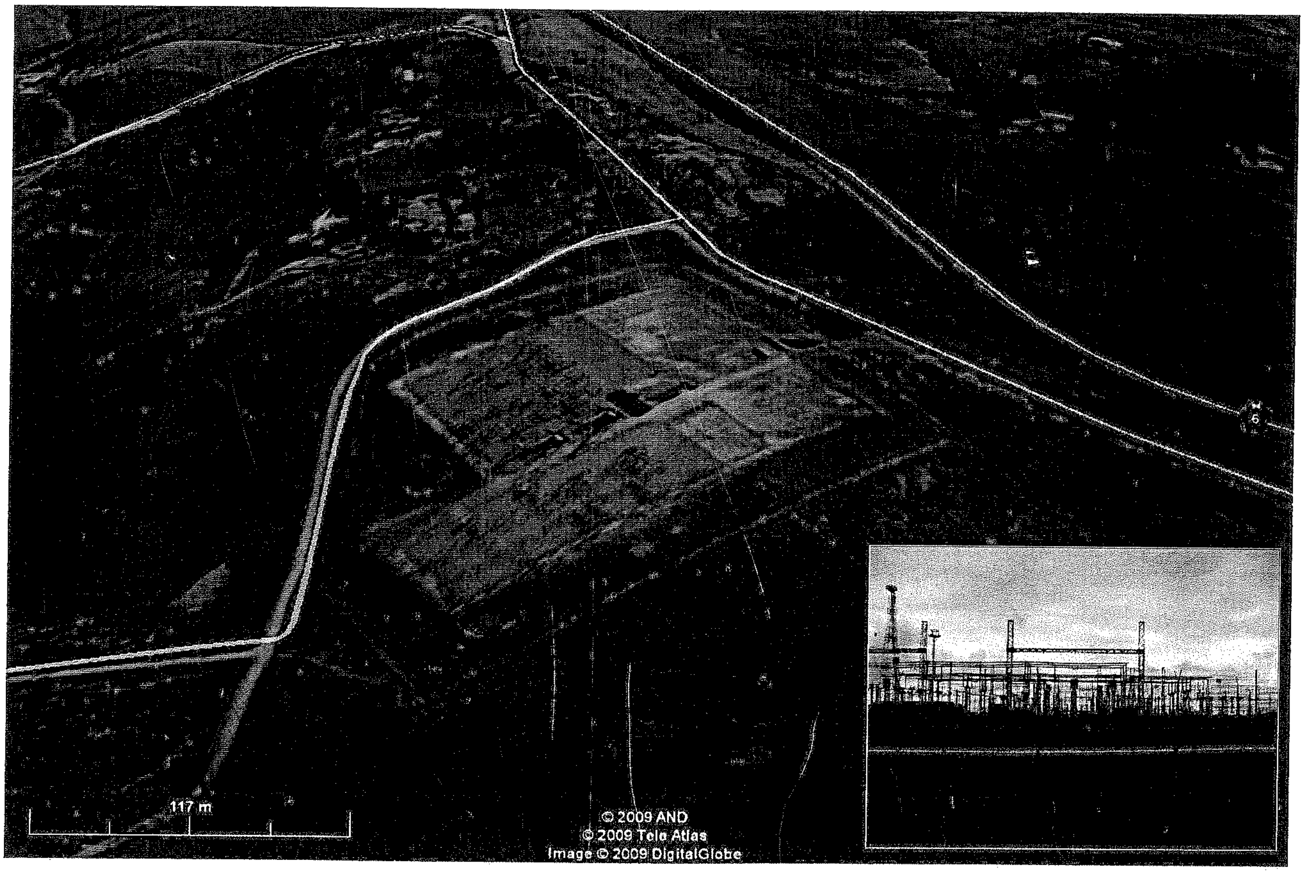


Figure 5: Neptune Substation

The proposed alignment is situated within the existing vacant Eskom servitude between the abovementioned substations, with alternative alignments as deviations along the western and eastern sections of the Main Route. The substations will also be expanded and upgraded to accommodate the new line.

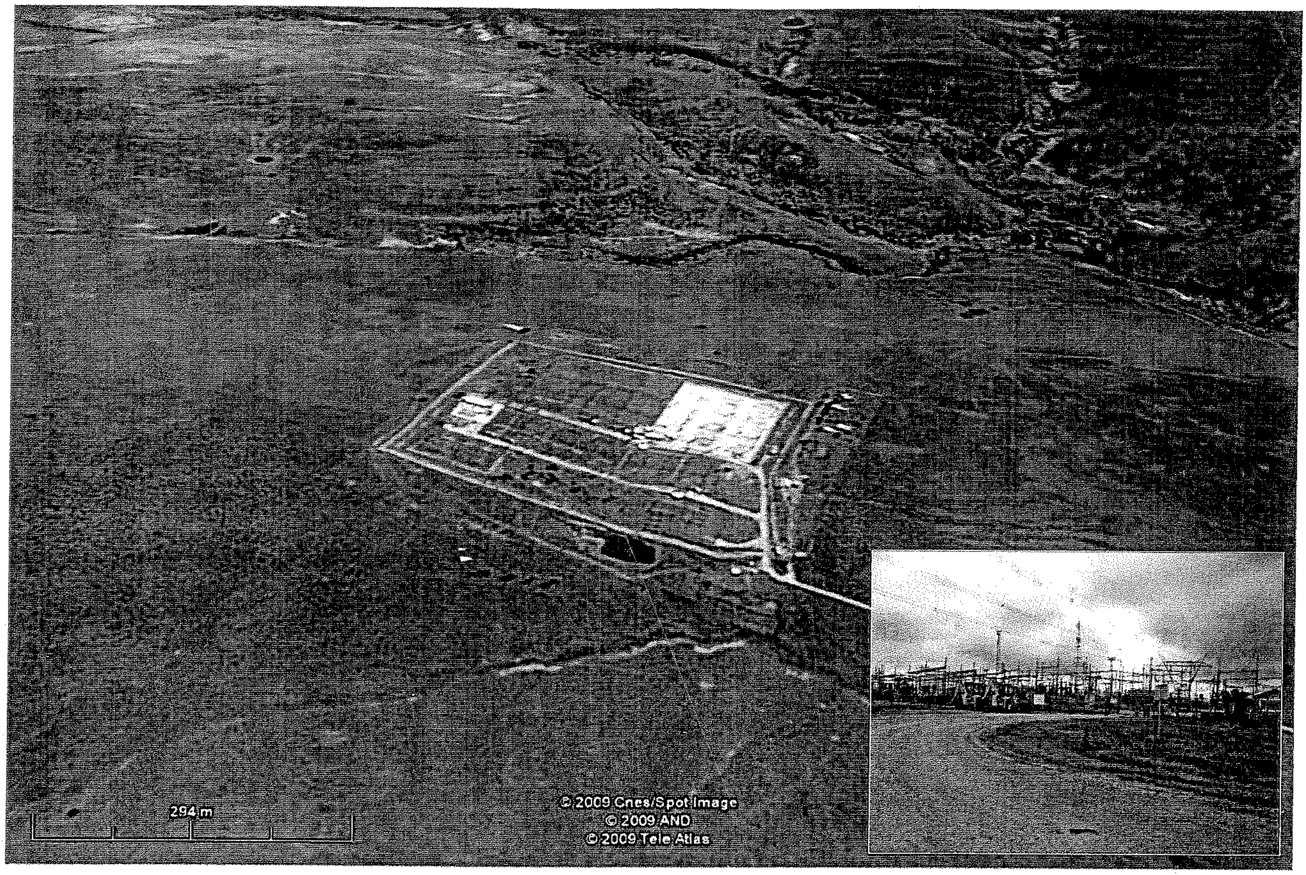


Figure 6: Poseidon Substation

In addition, two turn-in lines of approximately 5 km each will be constructed from the proposed Neptune-Poseidon line to the existing Pembroke substation (see **Figure 7**).

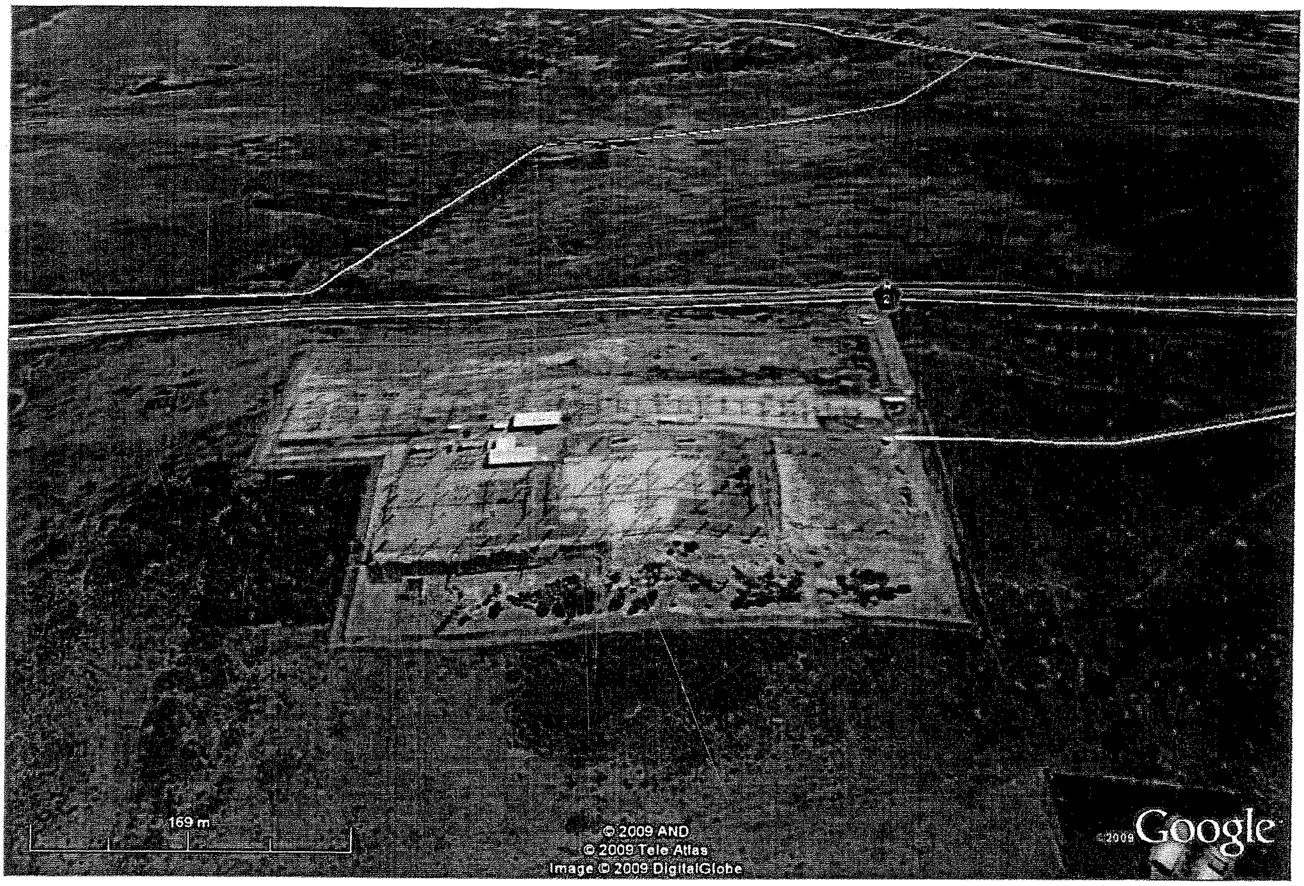


Figure 7: Pembroke Substation

5.3 Existing Vacant Servitude

Eskom owns a registered unused servitude between Neptune and Poseidon substations, which serves as the Main Route for the proposed 400 kV power line. The registration of the servitude took place from the 1970s to the 1990s, and makes provision for a single transmission line. Refer to ***Appendix B*** for cadastral maps of the servitude route.

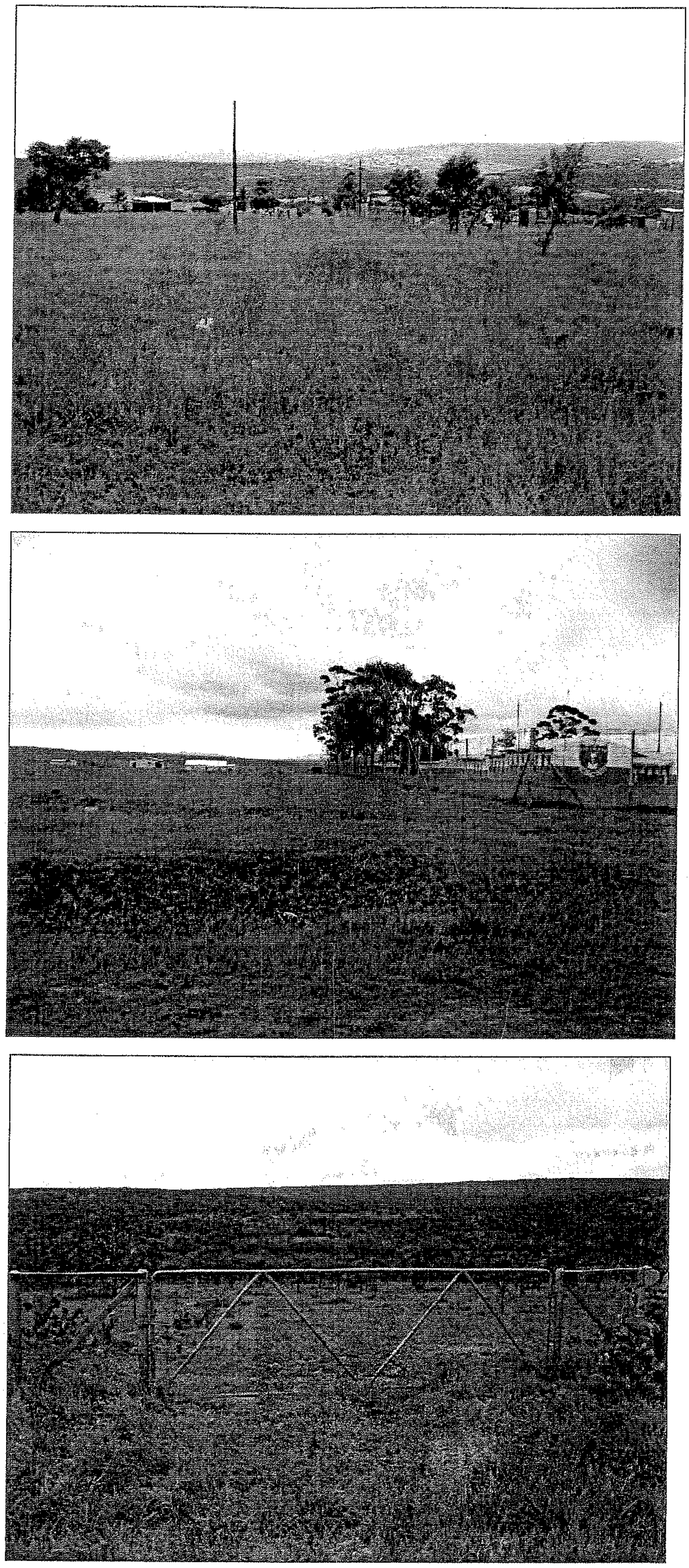


Figure 8: Views along the vacant servitude (Main Route)

For the Main Route, the development footprint is situated within the servitude, however the anchors of some tower designs (e.g. cross rope suspension tower) are situated outside of the servitude. In instances where a new servitude needs to be registered or the existing servitude width needs to be widened (e.g. where the width is only 19.5 m on either side of the centre line), the necessary negotiations will be undertaken with the affected landowners. Following a contractual agreement with a landowner, an application for registration of the servitude is lodged with the Provincial Deeds Office against the property deed. A registered servitude grants Eskom certain defined rights for the use of the specific area of land, which include:

- Access to erect a transmission line along a specific agreed route;
- Reasonable access to operate and maintain the line inside the servitude area; and
- The removal of trees and vegetation that will interfere with the operation of the line.

The landowner is prevented from erecting any structures or carrying out activities under the line that would interfere with the safe operation of the line. However, certain standard farming practices such as some crop cultivation, grazing and the use of farm roads may continue as normal (Eyethu Engineers, 2005).

5.4 Design Considerations

Certain standard design considerations for a 400 kV transmission line include:

- Standard servitude width is 55 m (i.e. 27.5 m on either side of centre line);
- Minimum spacing between pylons is ± 300 m and the maximum spacing is ± 500 m (depending on the topography of the area);
- Line may be no closer than 95 m from the centre line of a national road, unless a relaxation on this is granted by the roads department;
- Minimum clearance between the midspan point of the line and the ground is 8.1 m,
- Minimum distance between any part of a tree or shrub and any bare phase conductor must be 5.6 m;
- Minimum safe distance required from the centre of the power line to the beginning of a domestic house is 27.5m; and

- It is cost-prohibitive to place the transmission line within 10 km of the coast due to the cost of cleaning the conductors of salt build-up once the line is operational, by using a helicopter. In some situations, allowances can be made and the transmission line can run within this 10 km coastal corridor for a short distance.

5.5 Tower Structures

The selection of a tower types depends on several factors, including terrain, expense and recommendations that emanate from the visual impact study.

The towers type has not been finalised as yet, as the type of structure is dependant on the abovementioned factors as well as the final route of the power line. Below are several examples of towers that could be considered for a 400 kV transmission line.

- Cross-rope suspension tower (**Figure 9**);

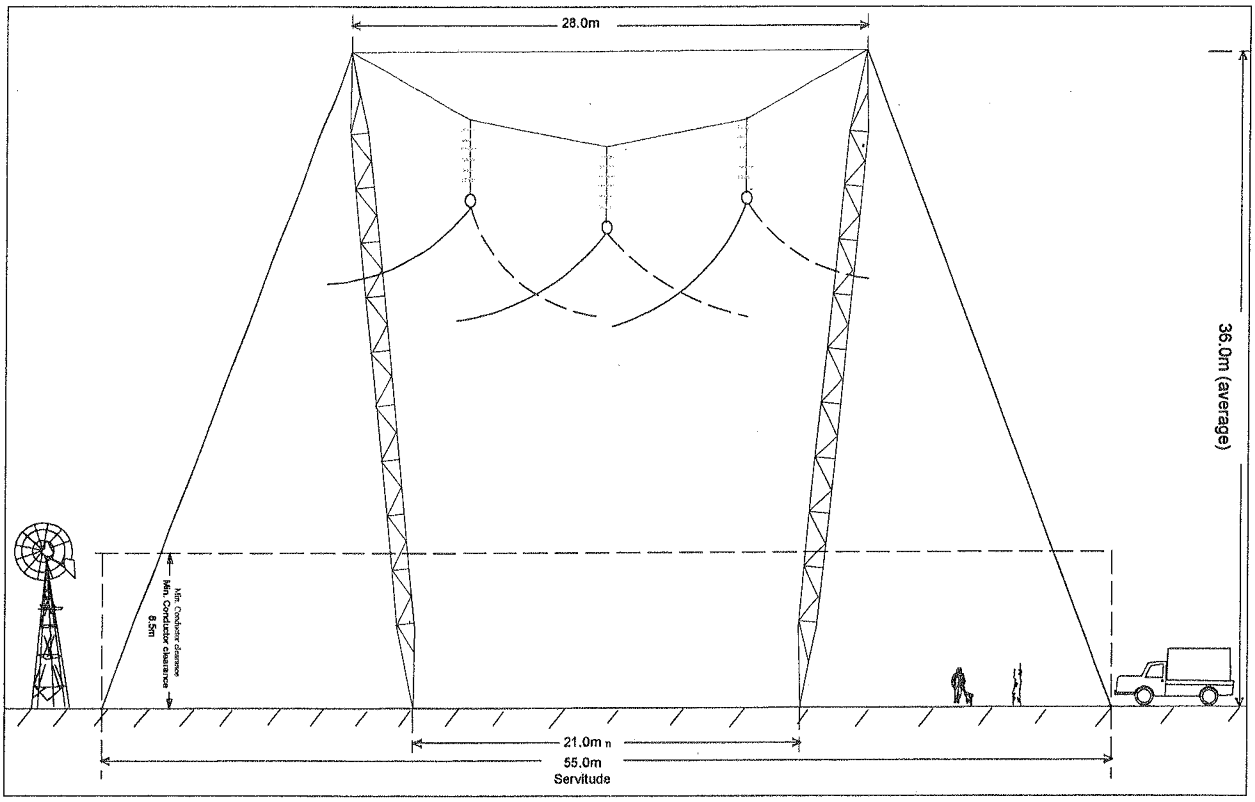


Figure 9: Cross-rope suspension tower

- Self-supporting tower (**Figure 10**);

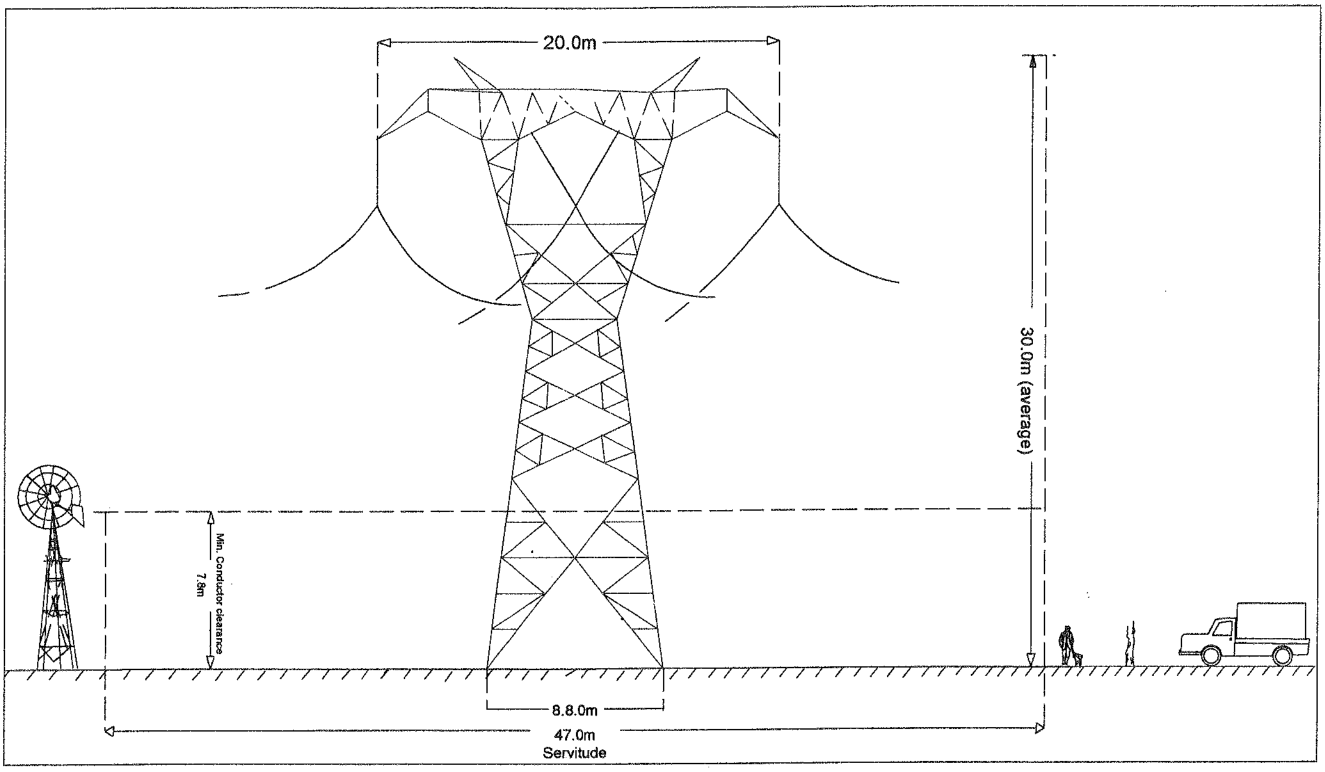


Figure 10: Self-supporting tower

- Guyed suspension tower (**Figure 11**); and

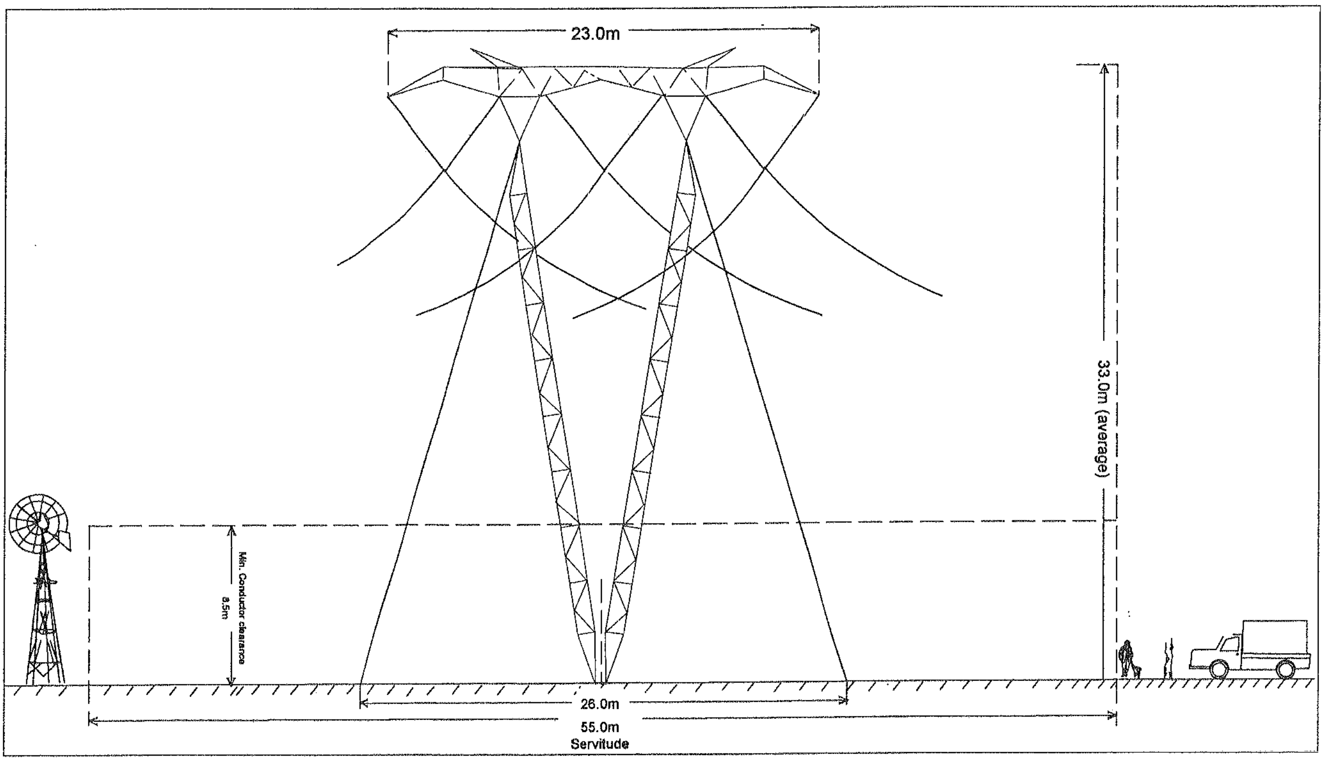


Figure 11: Guyed suspension tower

- Strain or bend towers, which will be required at points where the line deviates at an angle of greater than 3 degrees or on difficult terrain (**Figure 12**).

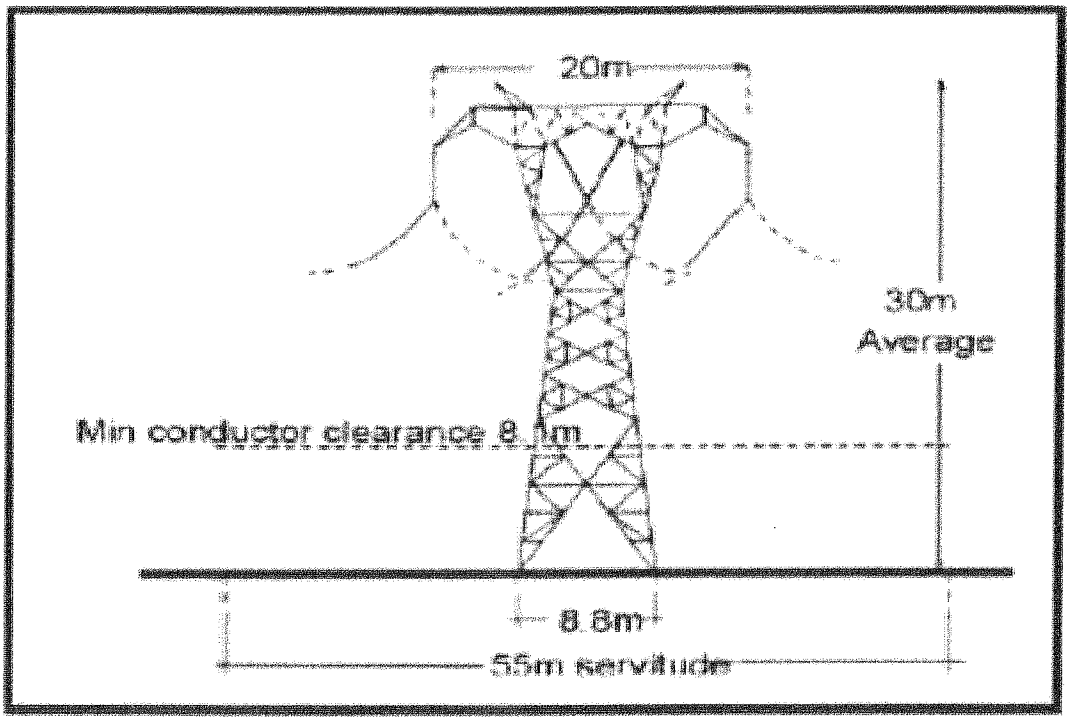


Figure 12: Strain or bend towers

5.6 Upgrading of Substations

The existing Neptune, Poseidon and Pembroke substations will be refurbished and extended to accommodate the new transmission line.

5.7 Turn-in Lines

The proposed Neptune-Poseidon line will link with the Pembroke substation through two turn-in lines of approximately 5km each (see **Figure 13**).

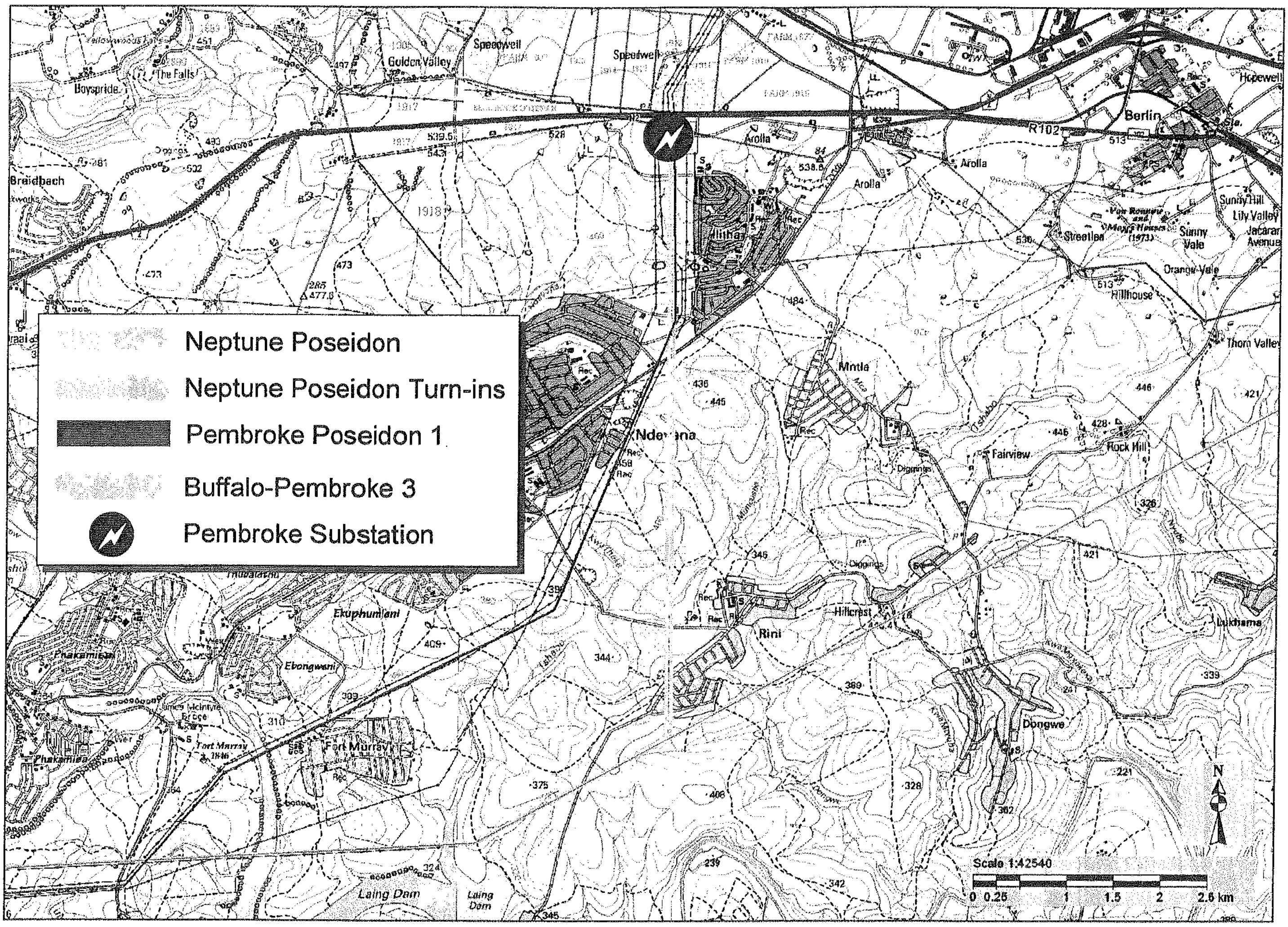


Figure 13: Turn-in lines to Pembroke substation

5.8 Vegetation Clearance

An 8 m-wide strip is generally required to be cleared of all trees and shrubs down the centre of a transmission power line servitude for stringing purposes only (see example in **Figure 14**). Any tree or shrub in other areas that will interfere with the operation and/or reliability of the transmission power line must be trimmed or completely cleared.

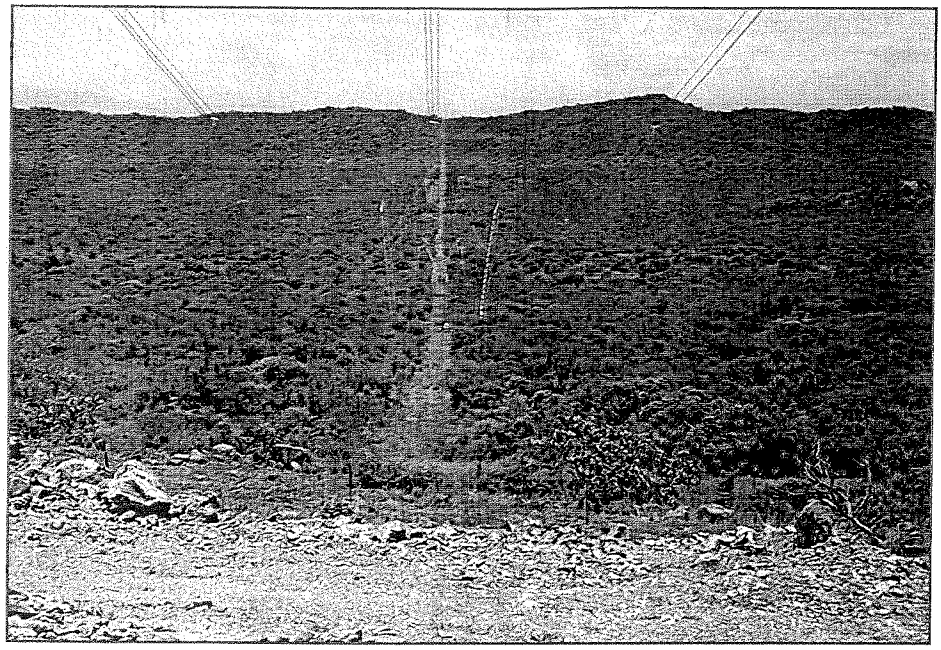


Figure 14: Vegetation clearance for stringing

It is expected that vegetation clearance for the proposed Neptune-Poseidon 400 kV line will be minimal, as the area is generally characterised by low-growing tree species. The clearing of vegetation will take place in accordance with Eskom's minimum standards for the construction of new Transmission power lines), as listed below in **Table 2**.

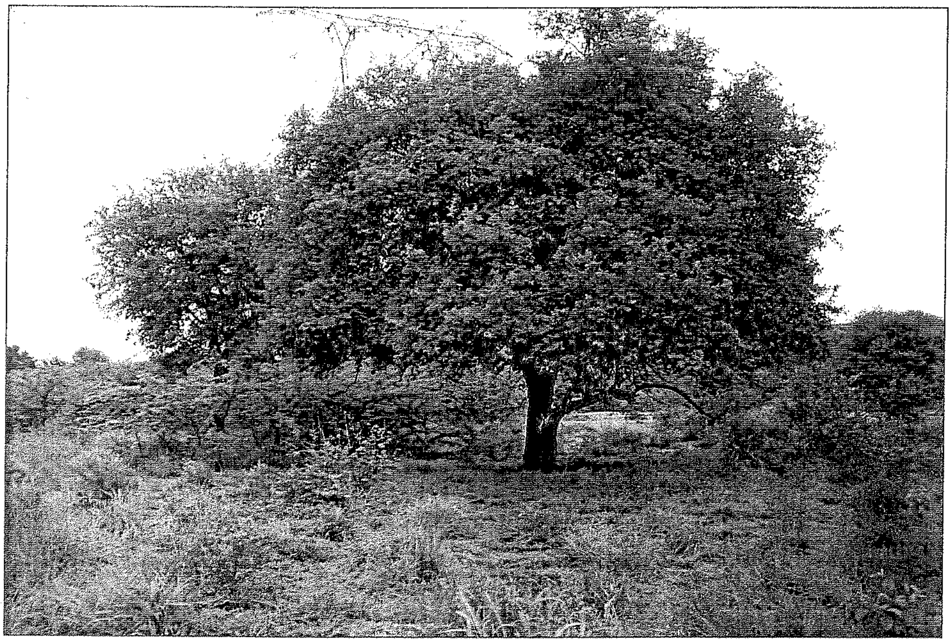


Figure 15: Vegetation clearance for stringing

Table 2: Minimum standards for vegetation clearing for new Transmission power line

Item	Standard	Follow up
Centre line of the proposed Transmission power line	Clear to a maximum (depending on tower type and voltage) of a 4-8 m wide strip of all vegetation along the centre line. Vegetation to be cut flush with the ground. Treat stumps with herbicide.	Re-growth shall be cut within 100 mm of the ground and treated with herbicide, as necessary.
Inaccessible valleys (trace line)	Clear a 1 m strip for access by foot only, for the pulling of a pilot wire by hand.	Vegetation not to be disturbed after initial clearing – vegetation to be allowed to regrow.
Access/service roads	Clear a maximum (depending on tower type) 6 m wide strip for vehicle access within the maximum 8 m width, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Proposed tower position and proposed support/stay wire position	Clear all vegetation within proposed tower position in an area of 20 x 20 m (self-supporting towers) and 40 x 40 m (compact cross-rope suspension towers) around the position, including de-stumping/cutting stumps to ground level, treating with a herbicide and re-compaction of soil. Allow controlled agricultural practices, where feasible.	Re-growth to be cut at ground level and treated with herbicide as necessary.
Indigenous vegetation within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, selective trimming or cutting down of those identified plants posing a threat to the integrity of the proposed Transmission power line.	Selective trimming
Alien species within servitude area (outside of maximum 8 m strip)	Area outside of the maximum 8 m strip and within the servitude area, remove all vegetation within servitude area and treat with appropriate herbicide.	Cut and treat with appropriate herbicide.

5.9 Construction

The construction period of the Neptune-Poseidon transmission line will take approximately 24 months. It involves the following activities, which are most often undertaken sequentially and by different crews.

5.9.1 Construction camp establishment

Suitable site(s) for construction camp(s) still need to be selected. Contractors will negotiate the siting and erection of camps with landowners. These sites must strictly adhere to Eskom Transmission's 'Generic Environmental Management Plan – Line

Construction'. See **Figure 16** for examples of construction camps for Eskom transmission lines.

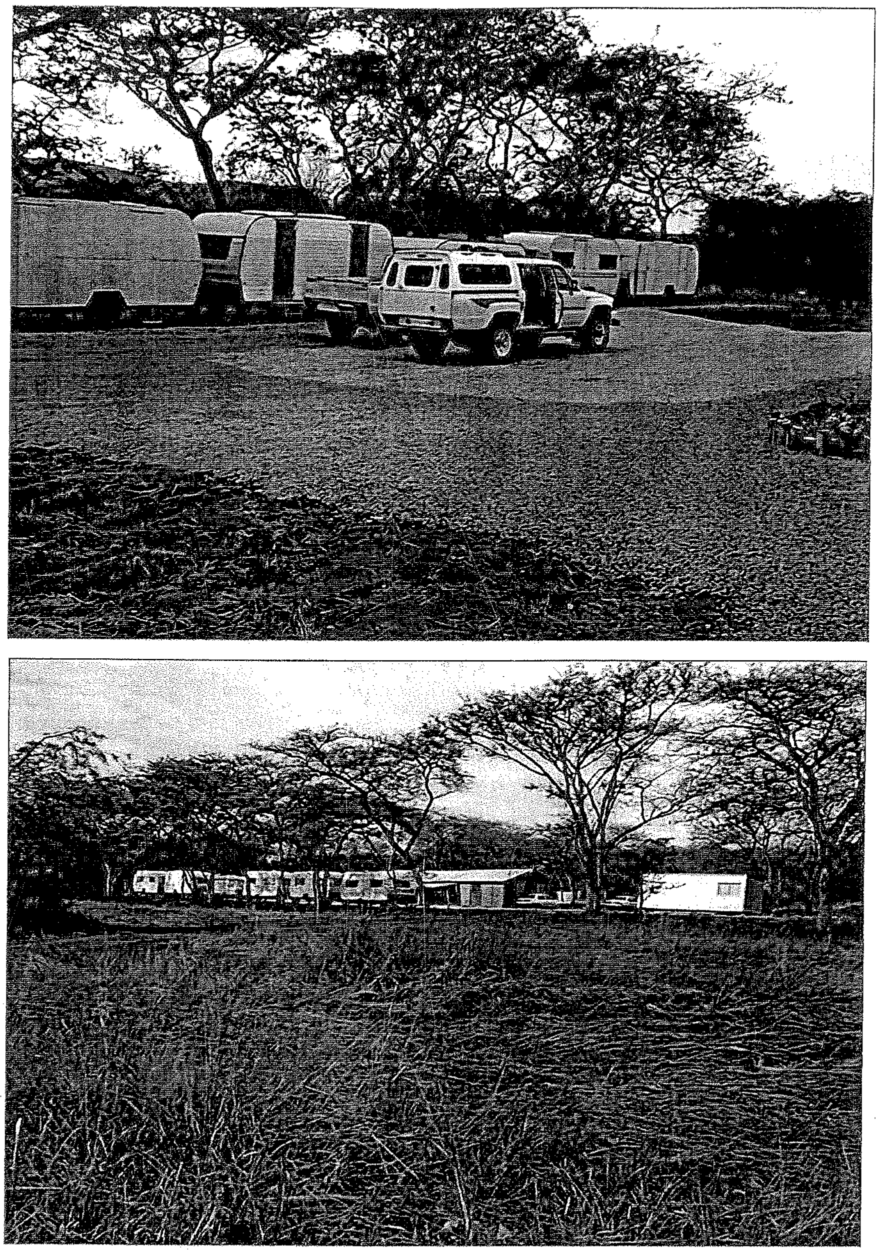


Figure 16: Examples of Construction camps

5.9.2 *Tower pegging*

Following the necessary access negotiations and arrangements with the affected landowners, a surveyor will pegs the central line and then set out the footprint of the development (i.e. transmission line and towers).

Through continual vehicular use, the surveying team will make the first basic track (access route) during their site work. If any flaws with a site are encountered (e.g. gully erosion) the site may need to be relocated.

5.9.3 Gate installation

After tower pegging, gates will be installed at the most appropriate locations to allow for future access to the servitude. An example of an access gate for a 400 kV transmission line is shown in **Figure 17**.

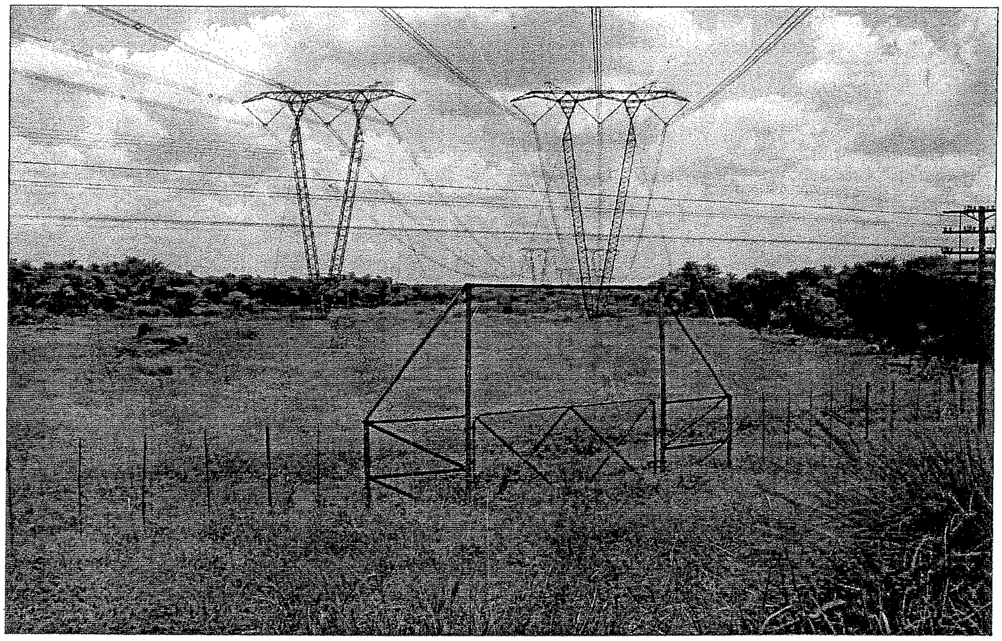


Figure 17: Access gate for an Eskom transmission line

5.9.4 Access roads

Existing access roads will be utilised as far as possible. For the use of private roads, the requisite negotiations will be conducted with the affected landowners.

Alternatively, roads will be built to gain access to the construction areas (see **Figure 18**). These roads will be constructed to a Type 6 gravel road that comprises the following:

- Widening to a final gravel carriageway width of 6 m on raised earthworks;
- Drainage is to be provided in the form of meadow drains (flat terrain) and "v" drains (steeper terrain). Some new culverts may be required;

- Fencing will be erected where required;
- The total width of carriageway and drainage ranges between about 14 m (flat terrain) and 16 m (rolling terrain); and
- Gravel will be obtained from the nearest existing borrow pit.

Suitable erosion control measures will be implemented at watercourse crossings. Examples include the construction of gabion structures to protect the watercourse (see **Figure 18**). Stormwater management measures will also be considered on steep gradients.

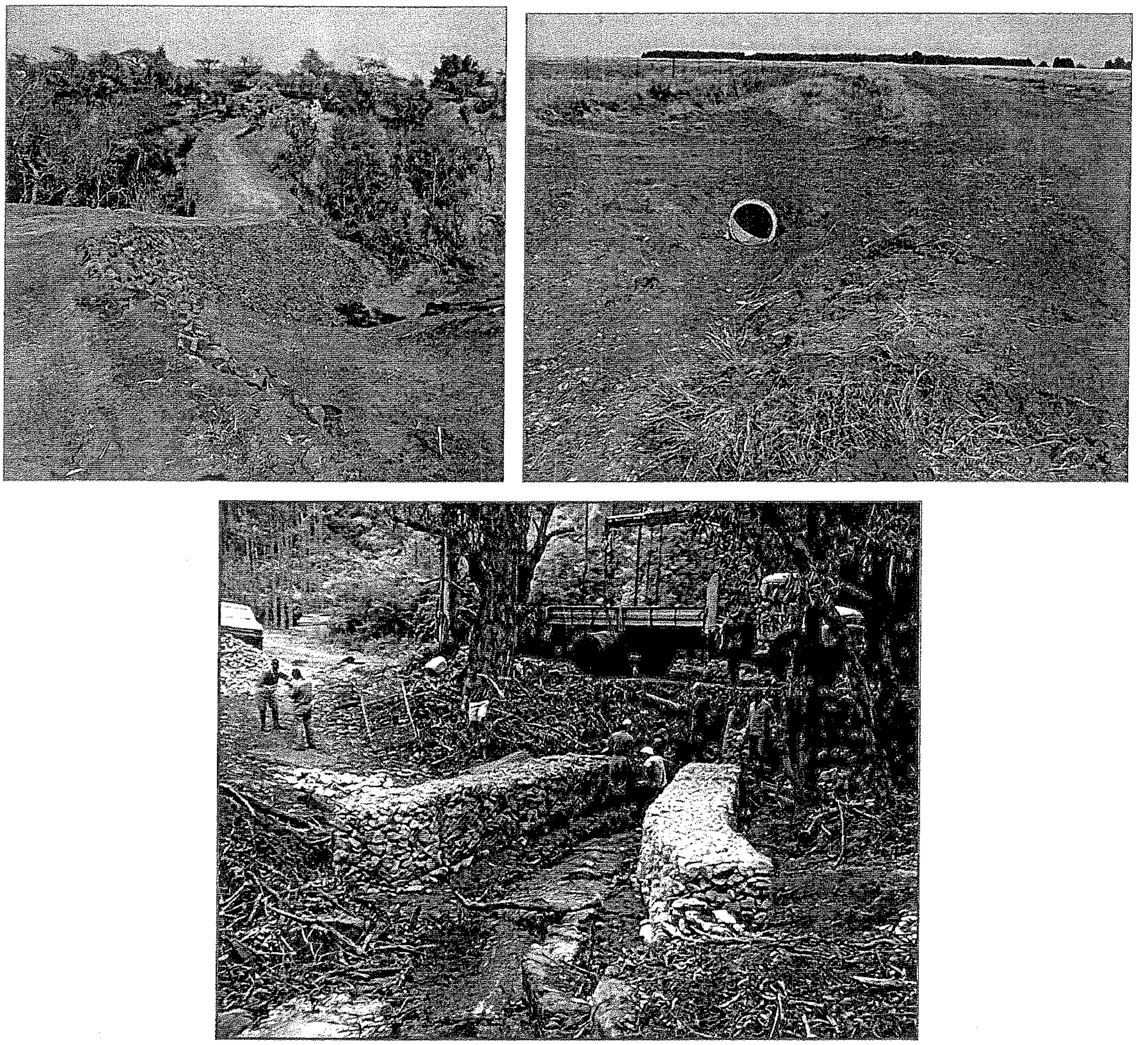
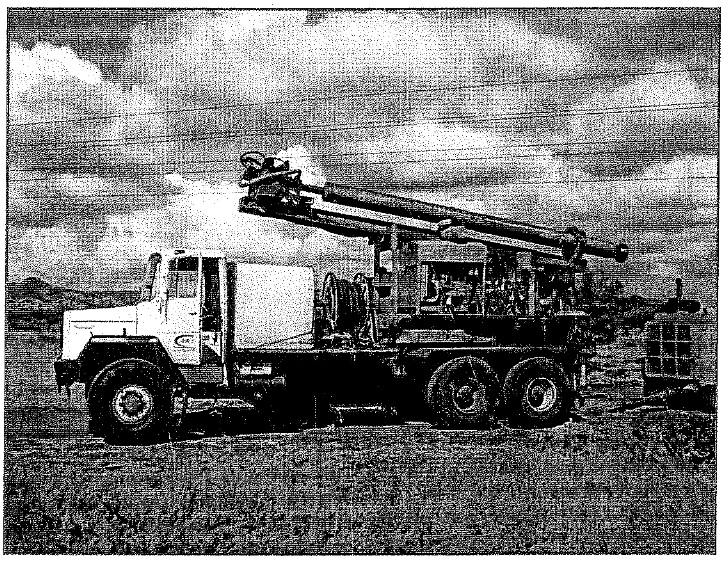


Figure 18: Access roads

5.9.5 *Excavation for foundations*

Excavations will be made for the foundations and anchors of the towers by a team of 10 to 15 people with equipment (i.e. drilling rig, generator) (see **Figure 19**). Foundation sizes are dependent on *inter alia* the tower type and soil conditions. The foundations are ultimately filled with concrete.

Contractors are required to safeguard excavations, which may include erecting a temporary wire fence around the excavations to protect the safety of people and animals.



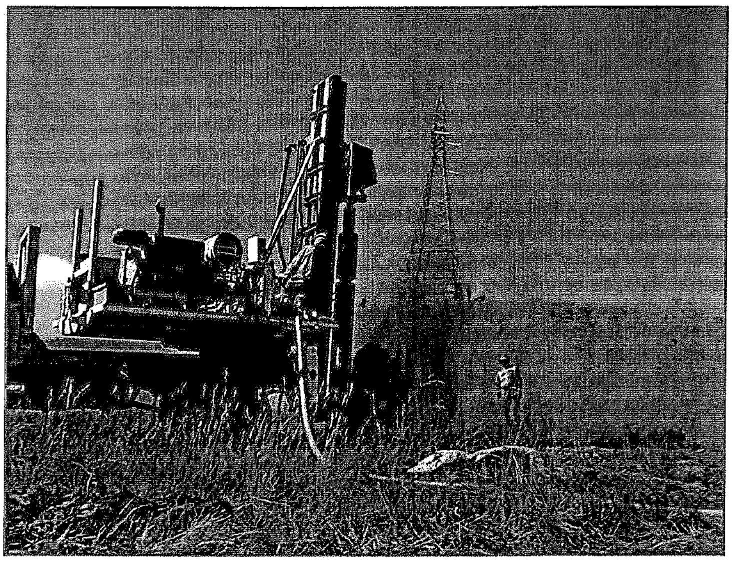


Figure 19: Drilling rig and generator (top) and excavation activities (bottom)

5.9.6 *Foundation of steelwork*

Following the preparation of the excavations, a separate team will position the premade foundation structures into the holes. Thereafter these structures will be tied together for support (see **Figure 20**).

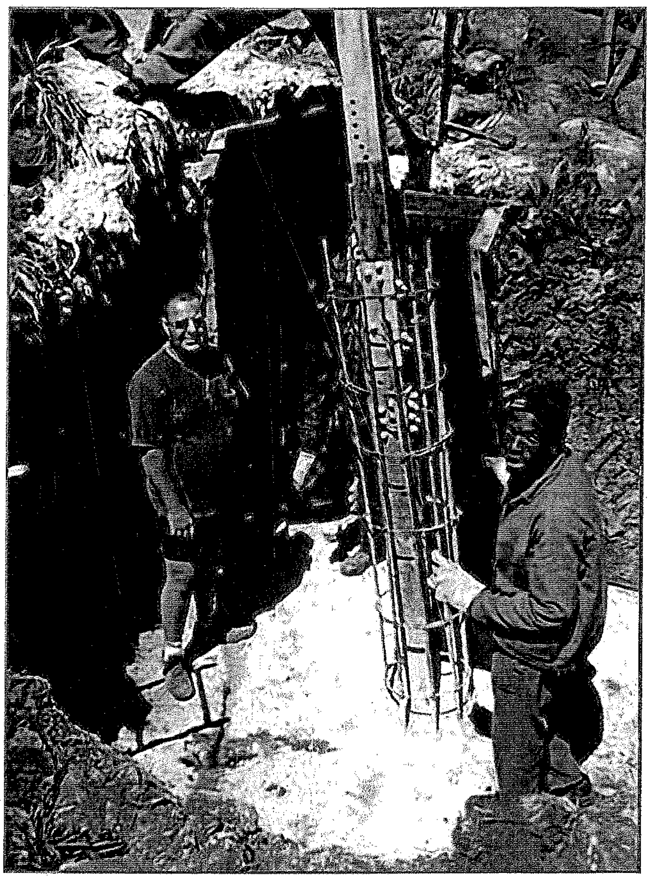


Figure 20: Foundation work

5.9.7 *Concrete works*

A new team will then undertake the concrete filling of the foundation. Concrete is sourced via a 'Ready-mix' truck which accesses the site. If the access roads do not permit use by such a heavy vehicle, concrete will be mixed on site. Once the excavations have been filled, the concrete requires approximately 28 days for curing.

5.9.8 *Erection of steel structures*

Approximately 1 month after the foundation has been poured the steelwork is usually delivered to the site via trucks. The tower will then be assembled on site by a team of approximately 50 people. See examples of steel delivery and assembly shown in **Figure 21**.

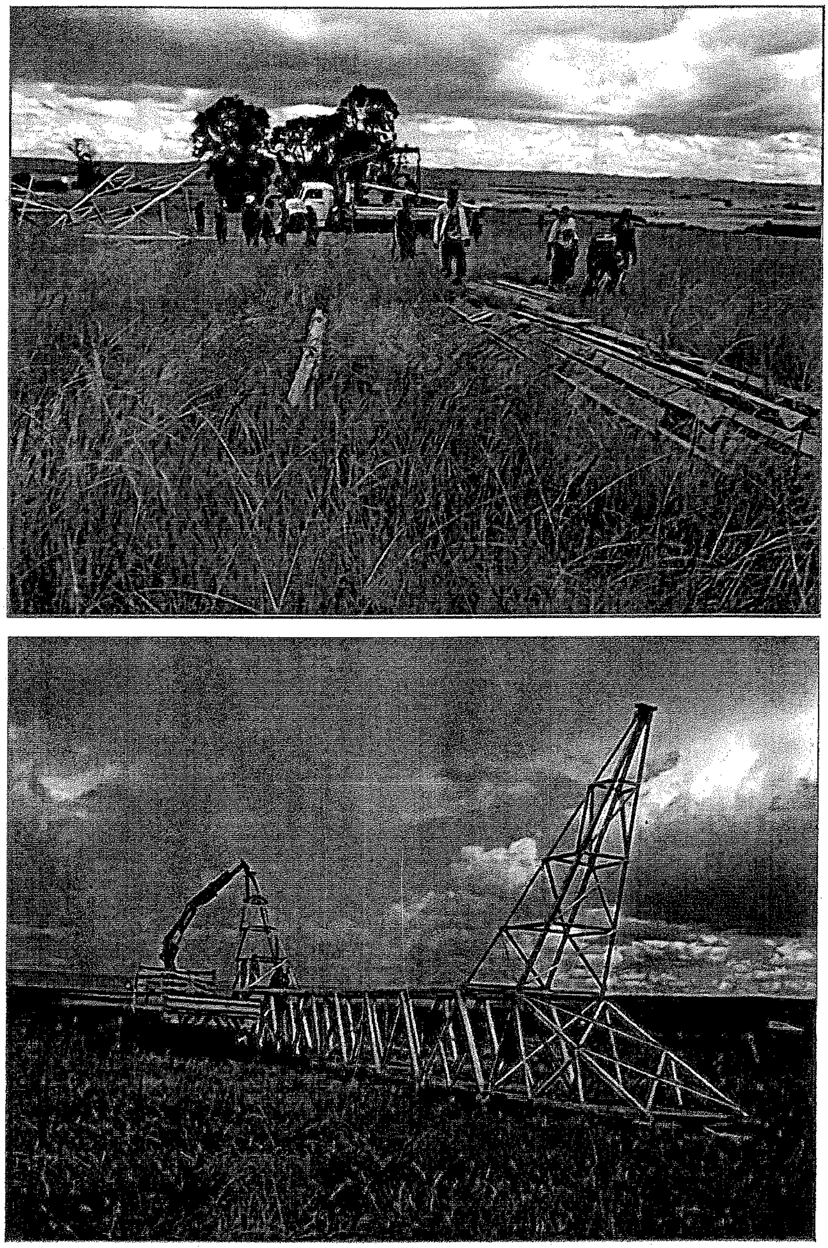


Figure 21: Delivery of steel (top) and assembly of tower (bottom)

A new team will then be responsible for the erection of the towers, with the use of a mobile 70-ton crane (see **Figure 22**).

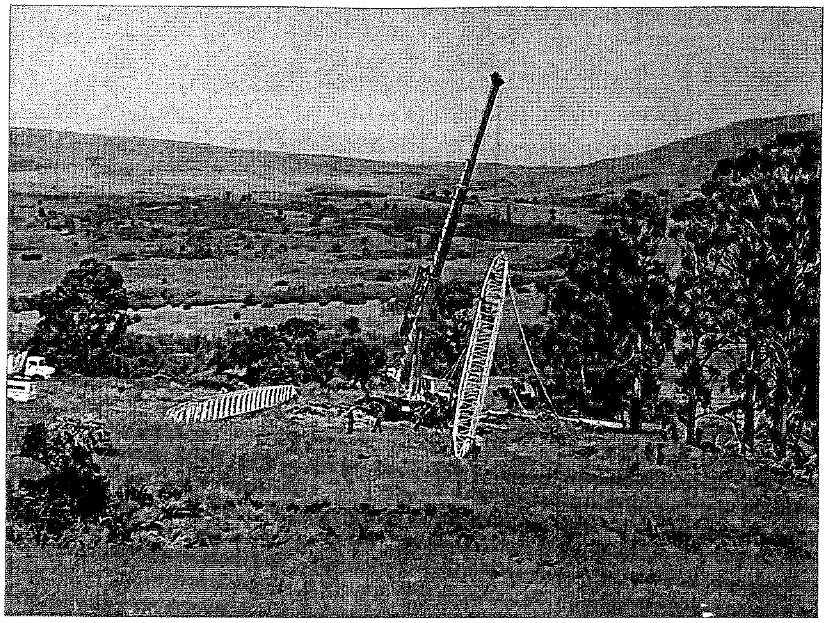


Figure 22: Erection of towers

5.9.9 *Stringing of transmission cables*

Cable drums (see **Figure 23**), which carry approximately 2.5 km of cable, will then be delivered to the site. The conductors are made of aluminium with a steel core for strength. Power transfer is determined by the area of aluminium in the conductors. Conductors are used singularly, in pairs, or in bundles of three, four or six. The choice is determined by factors such as audible noise, corona, and electromagnetic field (EMF) mitigation. Many sizes of conductor are available, the choice being based on the initial and life-cycle costs of different combinations of size and bundles, as well as the required load to be transmitted.

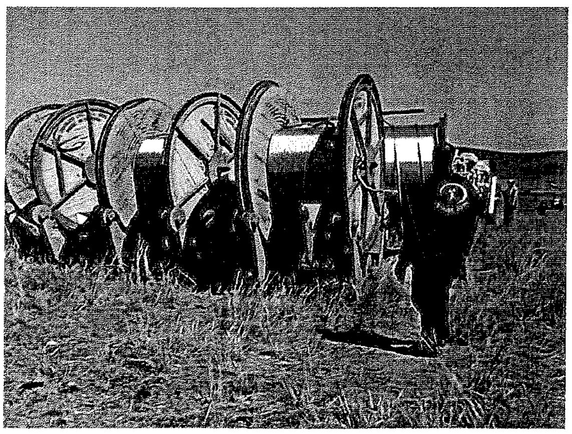


Figure 23: Cable drums

Two cable drums, with a winch in the middle, are placed approximately 5 km apart along the route. A pilot cable, which is laid with a pilot tractor that drives along the route, is pulled up on to the pylons with the use of pulleys (see **Figure 24**). The line is generally strung in sections (from bend to bend). Once the tension has been exacted, the conductor cables are strung.

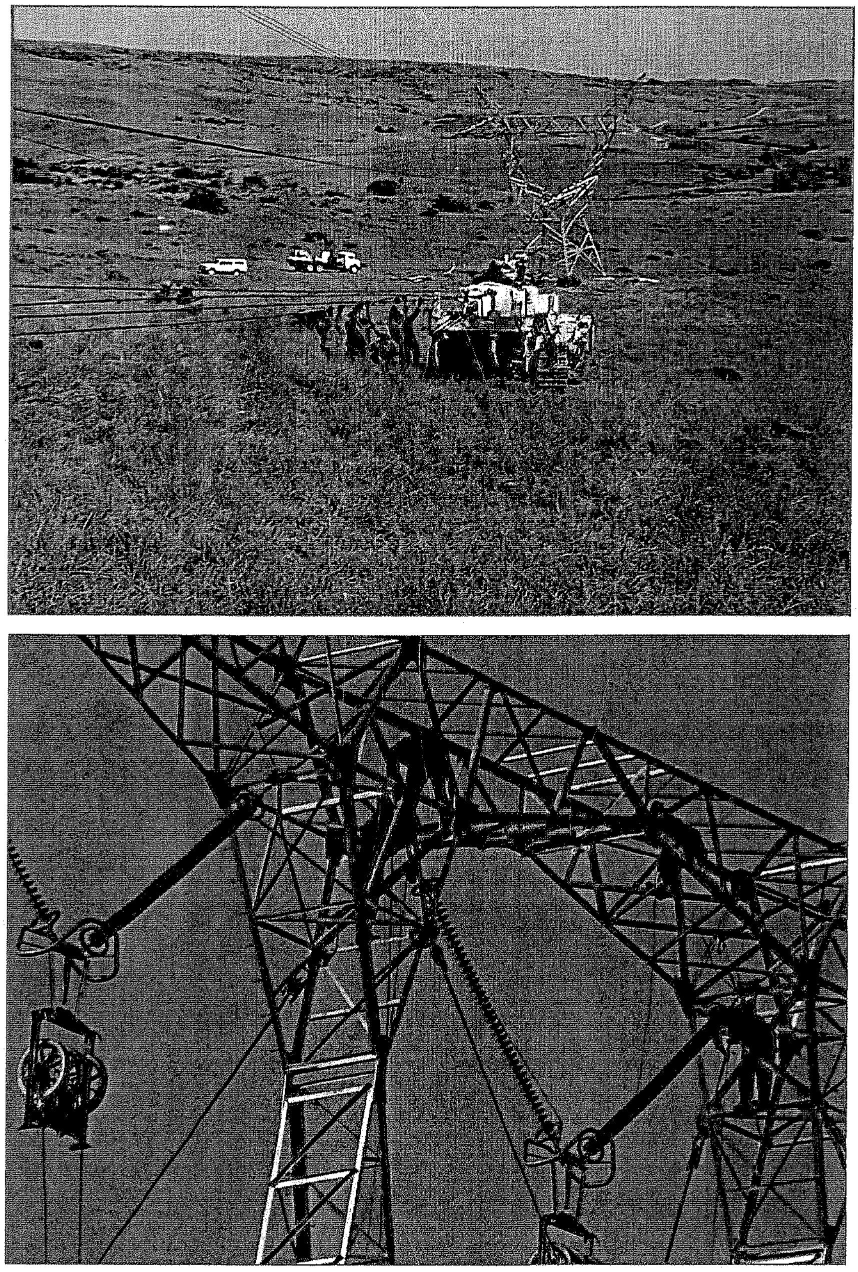


Figure 24: Stringing with pilot tractor (top) and pulleys (bottom)

In mountainous regions, the pilot cables are flown in by helicopter or shot across valleys, to create the correct tension to pull through the conductor.

Tension is created, the conductors clamped at the tower and the excess cable cut off.

5.9.10 Rehabilitation

Site reinstatement and rehabilitation are undertaken for each component of the construction phase, which include the following activities (amongst others):

- Removal of excess building material, spoil material and waste;
- Repairing any damage caused as part of the construction activities;
- Rehabilitating the areas affected by temporary access roads;
- Reinstating existing access roads; and
- Replacing topsoil and planting indigenous grass (where necessary).

5.10 Inaccessible Sites or Sensitive Areas

For a site that cannot be accessed by vehicle (e.g. kloofs) or where environmental sensitive features are encountered, the following approach is followed:

- Excavations for foundations are done by hand;
- Foundation structures, concrete filling and steel towers (pre-fabricated) are transported and delivered by helicopter; and
- Stringing is performed by helicopter.

This abovementioned approach is an expensive operation and not the preferred method of construction.

5.11 Operation and Maintenance

During operations, Eskom Transmission needs to reach the servitude via access roads to perform maintenance of the transmission line. Line inspections are undertaken on an average of 1 – 2 times per year, depending on the area.

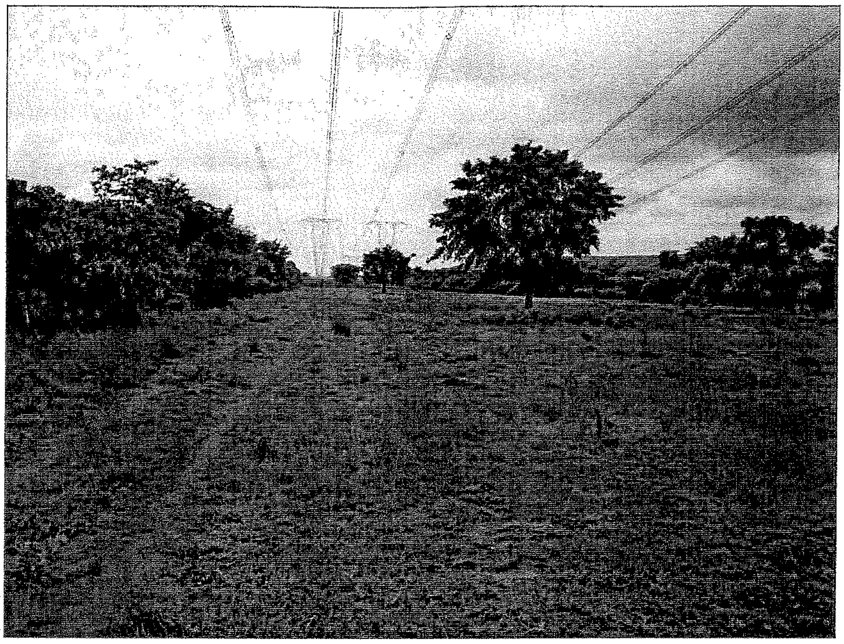


Figure 25: Example of an access road used for maintenance

The servitude will need to be cleared occasionally to ensure that vegetation does not interfere with the operation of the line.

5.12 Decommissioning

Decommissioning of the Neptune-Poseidon transmission line is not anticipated. However, should this be required in the future a decommissioning plan with suitable mitigation measures will need to be developed, including provision for the dismantling of the towers and the disposal or recycling of the material. This plan will also require a site-specific rehabilitation plan for the footprint of the project.

6 ALTERNATIVES

6.1 Alignment

During the environmental assessment a 1 km corridor (i.e. 500 m on either side of servitude centre line) was adopted as the study area. This is to allow for any possible deviations from the current servitude alignment within this corridor, deemed necessary by the following factors:

- Findings of the impact assessment and specialist studies;
- Outcome of Eskom negotiations with landowners; and
- Technical requirements.

Some key considerations during the route determination process include:

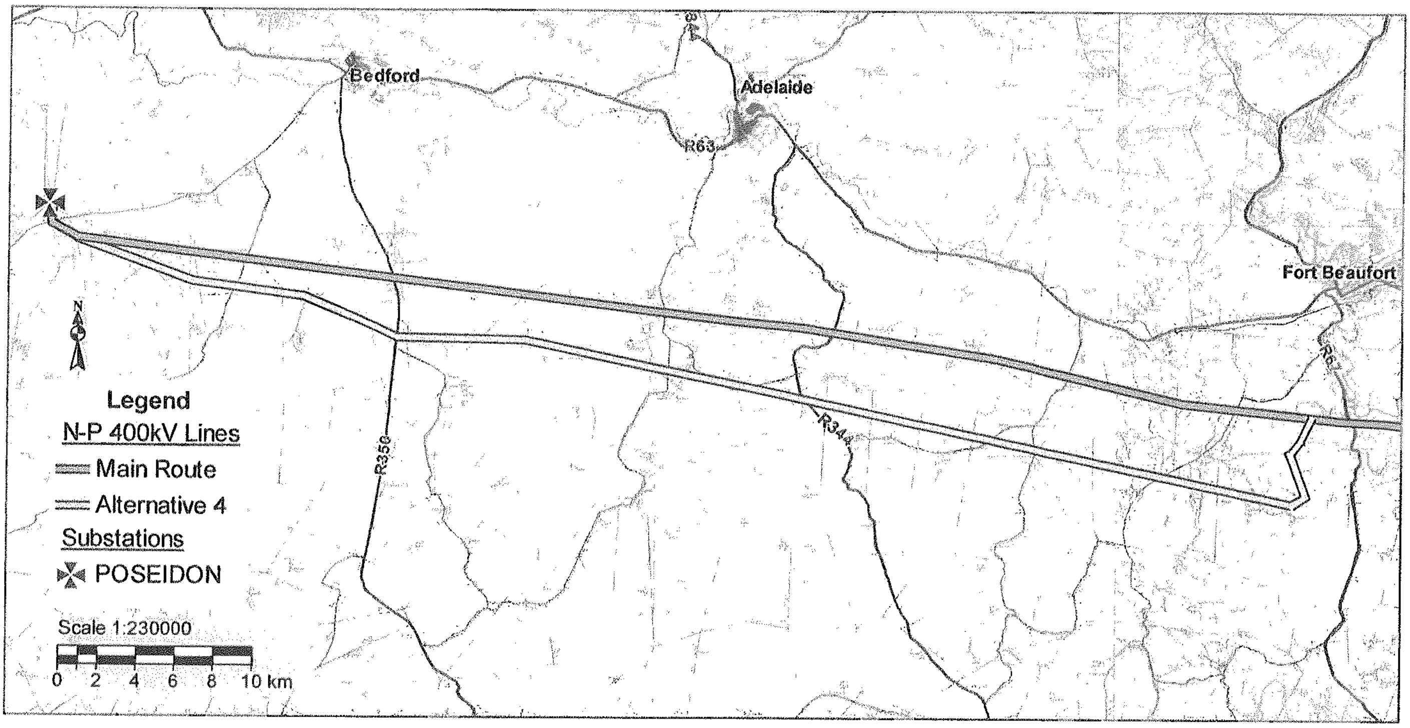
- Tie-points (i.e. a point through which the route must pass to achieve the overall goals and requirements of the project / an area towards which the transmission line is attracted between its terminals), which are the substations or significant demand centres along the alignment.
- There are certain areas where the route is attracted in a certain way due to extreme topography at some river crossings, or for considerations of access for maintenance. Existing infrastructure such as rail lines, road or other powerlines sometimes attract new routes in an effort to create a utility corridor on an already-disturbed area.
- No-Go areas where it is impractical / impossible to build transmission lines, which could include wetlands, steep or unstable terrain, land subject to mineral rights, buffer zones around landing strips or airfields, dense human settlements or highly corrosive zones along the coastline.

During public participation for the Main Route, several alternative routes were identified and have been incorporated into this Extended Draft Scoping Report. The various alternatives alignments for the Neptune-Poseidon 400kV powerline are as follows (Refer to **Figure 26** and route maps contained in ***Appendix B***):

- **Main Route** – Power line (approximately 191km) which runs in an east to west direction from the existing Neptune substation (near East London) to the Poseidon substation (near Cookhouse), in the Eastern Cape. The proposed alignment is situated within the existing vacant Eskom servitude between the aforementioned substations. Two turn-ins of approximately 5 km each, which pass between Ndevana and Ilitha, connect the proposed line with the Pembroke substation. From approximately King William's Town the line runs between the R63 road (to the north) and the existing Pembroke-Poseidon 220 kV transmission line (to the south).

- **Alternative 2** – Deviation from Main Route, where the power line (approximately 40km) runs in an east to west direction from the Neptune substation to the south around Mdantsane and the Bridle Drift Dam and reconnects to the Main Route to the south of Berlin, at Rini.
- **Alternative 3** – Deviation from Main Route, where the power line (approximately 39km) runs in an east to west direction from the Neptune substation to the north around Nqonqweni, around Berlin and connects to the Main Route south of Berlin, at Hillcrest. The last 16km of this route runs parallel to an existing Eskom line.
- **Alternative 4** – Deviation from Main Route, where the power line (approximately 70km) runs in a west to east direction from the Poseidon substation to the south alongside the existing Eskom 220kV Pembroke-Poseidon 1 transmission line and connects to the Main Route close to Xuxuwa.

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners, the final position of the centre line for the Neptune-Poseidon 400 kV Transmission line and coordinates of each bend in the line will be determined by the surveyors.



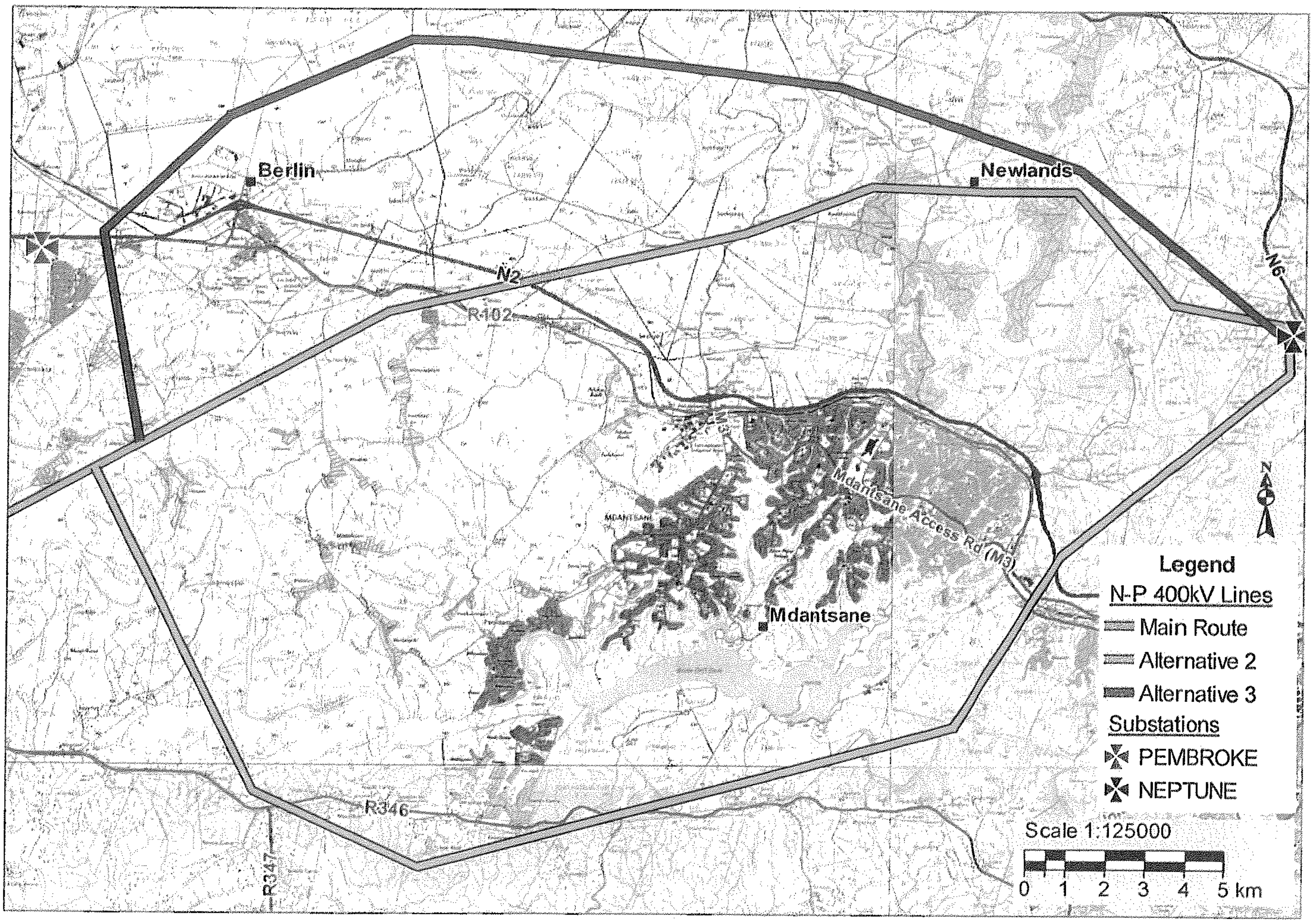


Figure 26: Alternative alignments to the west (top) and east (bottom) of Neptune-Poseidon route

6.2 Tower Structures

The various tower types for a 400 kV transmission line are discussed in **Section 5.5**.

Should authorisation for the final alignment be granted by DEA, and following the negotiations with landowners, optimal tower sizes and positions will be identified and verified using a ground survey in terms of the Environmental Management Plan (EMP) requirements.

Due to the constant endeavour to enhance tower design to minimise adverse environmental impacts in a technical and economically viable manner, the tower types available at the actual time of construction may differ from those currently available.

6.3 Upgrading Existing Transmission Lines

The problems associated with the upgrading of the existing Pembroke-Poseidon 220 kV transmission line (or other existing power lines), which runs to the south of the route, include:

1. Larger pylons would be required as the existing towers would not be tall or strong enough to carry larger conductors carrying a higher voltage than what they were designed for; and
2. The upgrade would require the shutting down of the existing line for a significant period of time to carry out the necessary works. Such a shut down would not be possible as all the existing lines are needed at any one time to meet current power needs of the greater PE area.

6.4 Placing the Transmission Line Underground

There are currently no underground transmission lines of this capacity in South Africa and currently there are no plans to consider this option by Eskom Transmission.

It currently costs in the region of R1 million/km to construct an overhead 400 kV transmission line, whilst placing the equivalent line underground costs approximately 10 times more (i.e. R10 million/km). It is thus not economically viable to place a transmission line of this voltage underground.

In addition to financial considerations, the environmental impact of placing such a line underground is high. This is mainly due to the large area needed for installation to ensure sufficient spacing of the conductors, as they generate high heat and are not naturally cooled. Apart from certain grass types, no vegetation is allowed to grow on top of these underground lines. There are also severe restrictions in terms of land use, to allow for maintenance of the lines.

6.5 "No Go" Option

As stated in **Section 6.1.1**, the implications of the "no go" option are as follows:

- Inability to supply additional Transmission load;
- Poor Transmission reliability and Distribution quality of supply; and
- Possible shedding of Distribution load in the local East London area under N-1 Transmission contingencies involving Delphi – Neptune 400kV line.

This alternative is not supported, as failure to provide the necessary electrical infrastructure could potentially hamper economic activity in the Eastern Cape Province.

In contrast, should the Neptune-Poseidon 400 kV project not go ahead, the negative impact associated with the project highlighted in **Section 10** would be irrelevant.

7 PROFILE OF THE RECEIVING ENVIRONMENT

Aerial perspectives of the proposed route along the vacant servitude (Main Route) are provided in **Figures 27 – 33**.

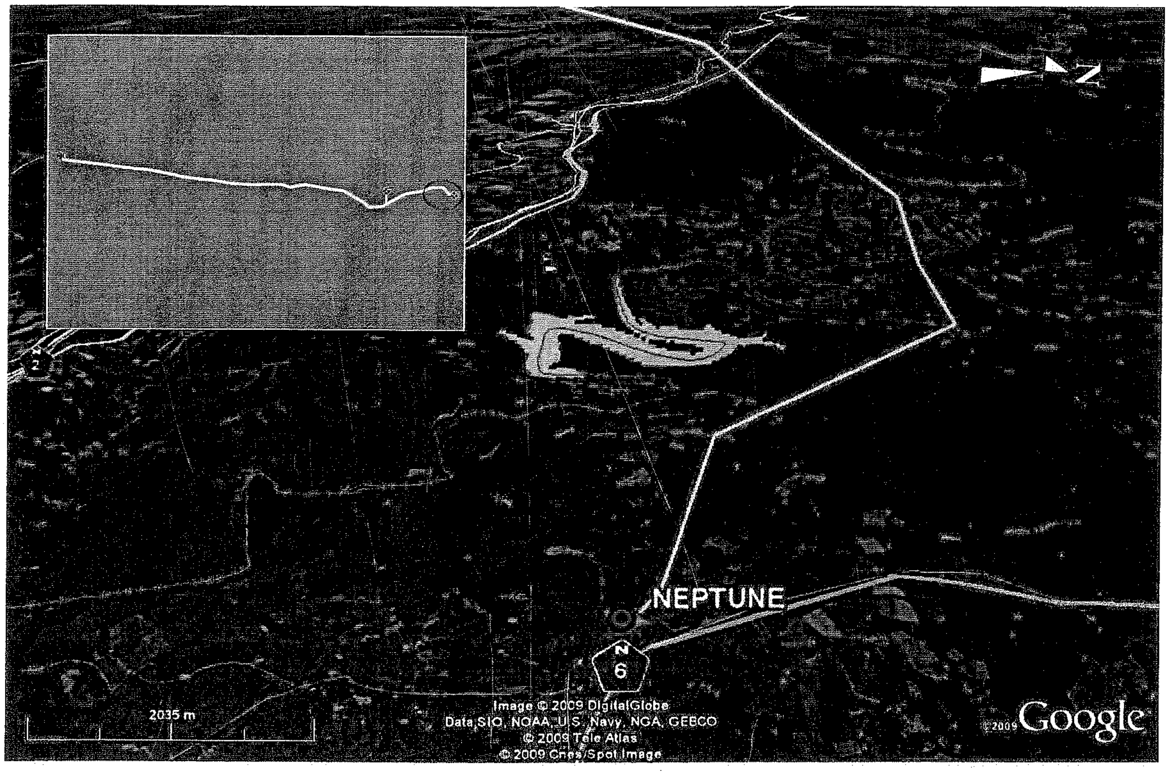


Figure 27: Aerial view in western direction of vacant servitude (green line) – section 1

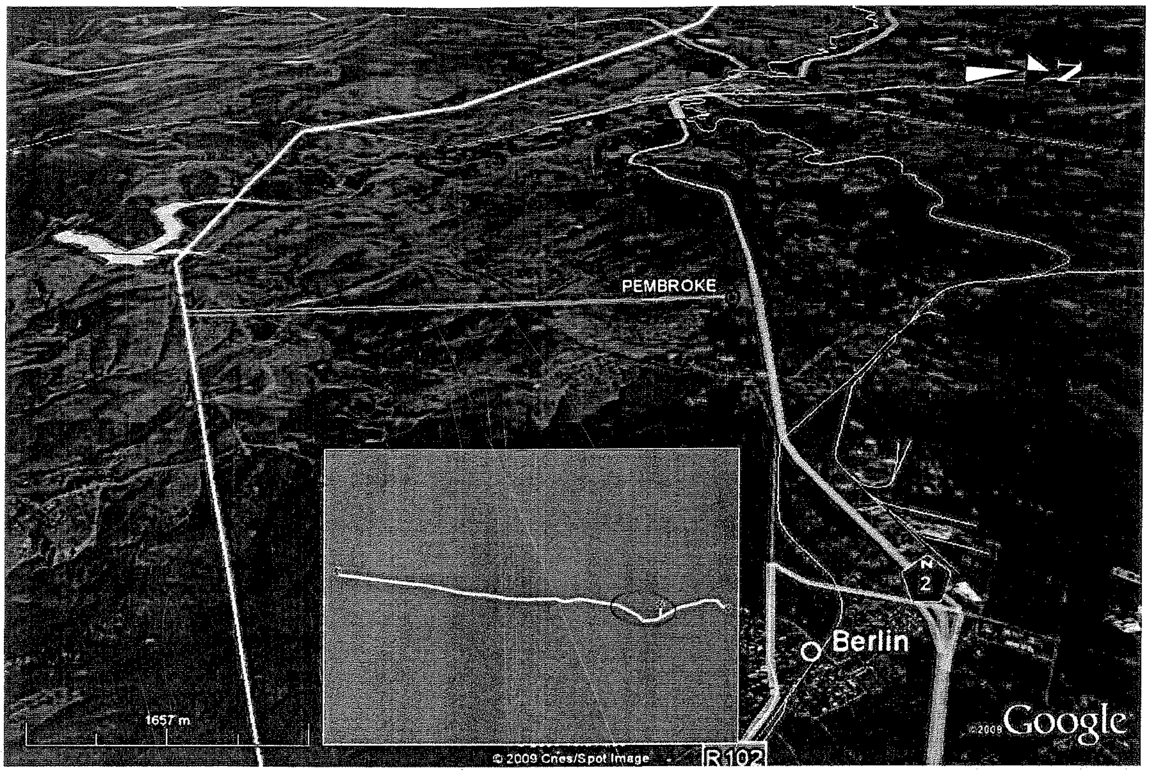


Figure 28: Aerial view in western direction of vacant servitude (green line) – section 2

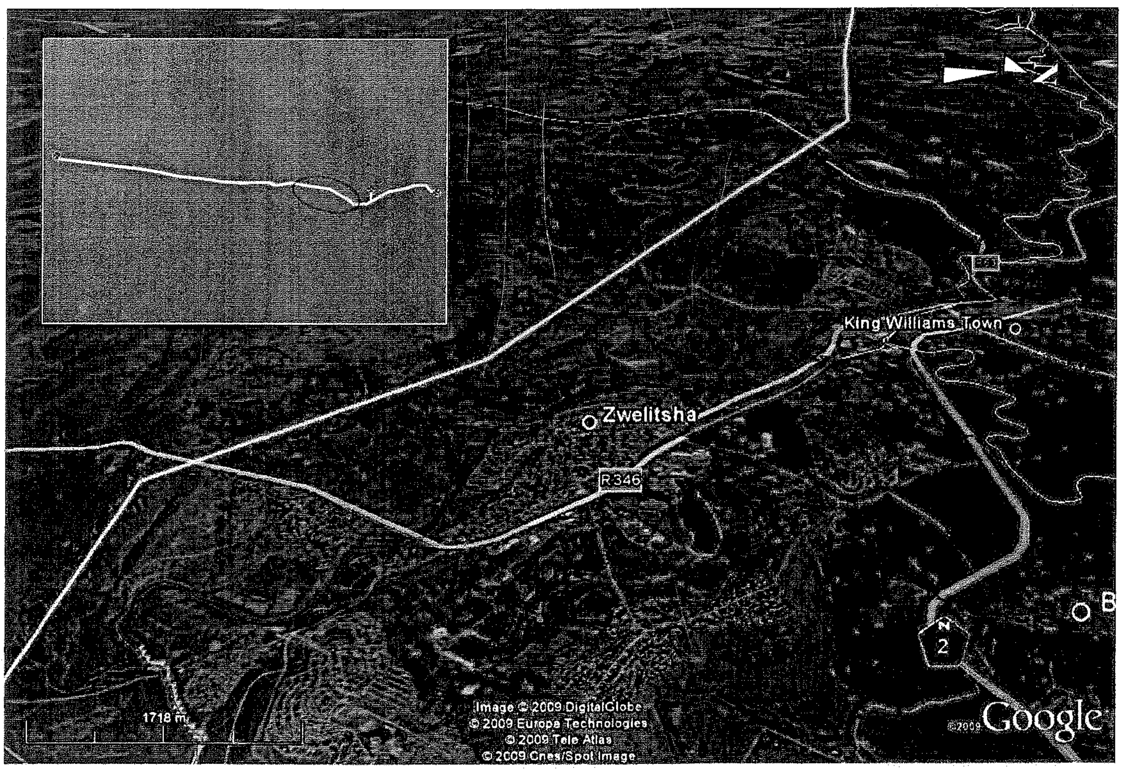


Figure 29: Aerial view in western direction of vacant servitude (green line) – section 3

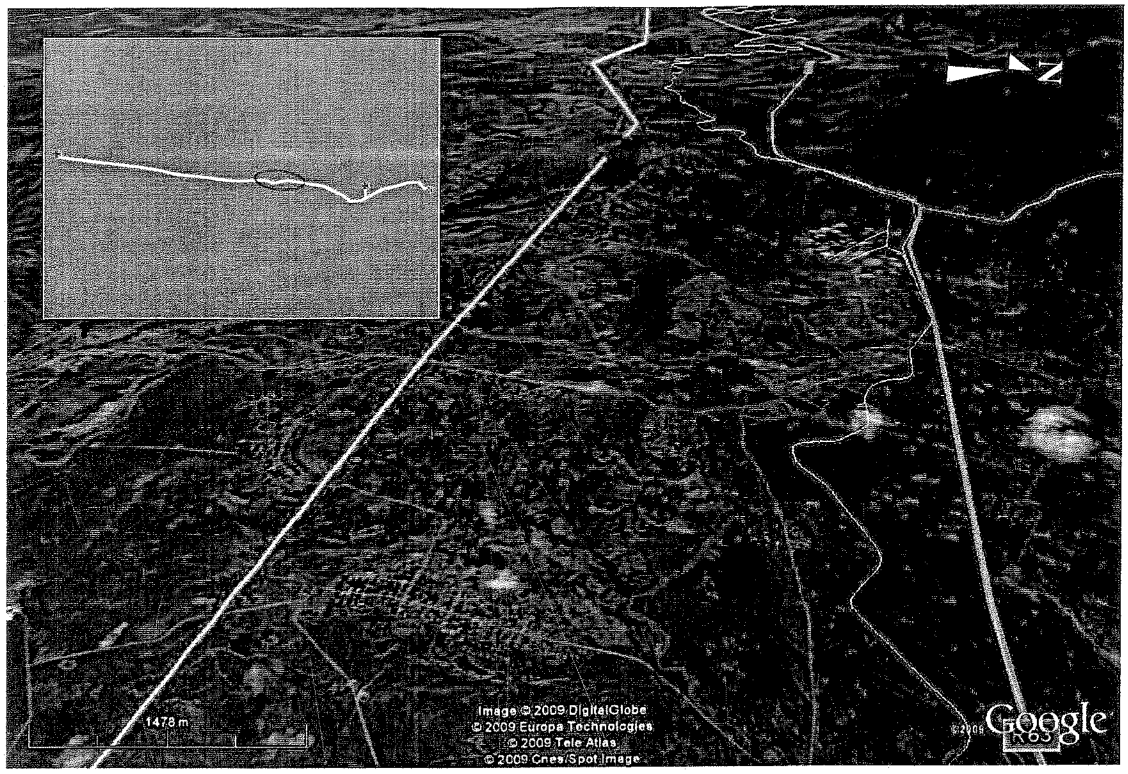


Figure 30: Aerial view in western direction of vacant servitude (green line) – section 4

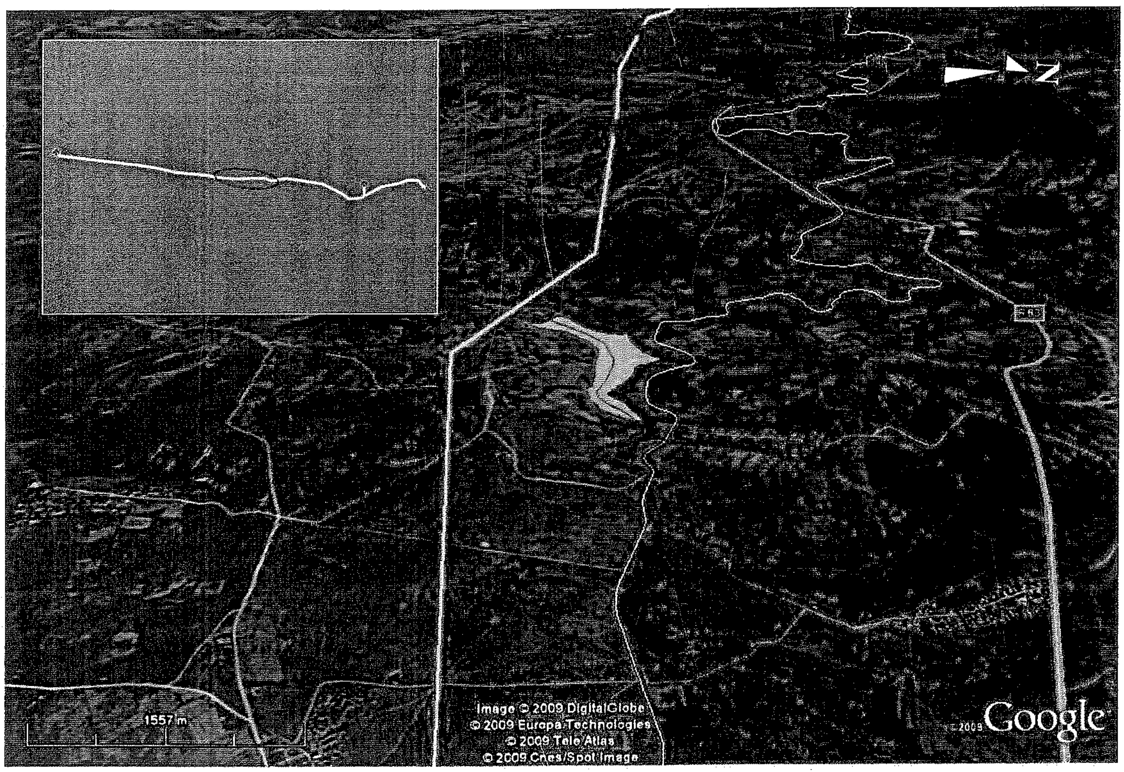


Figure 31: Aerial view in western direction of vacant servitude (green line) – section 5

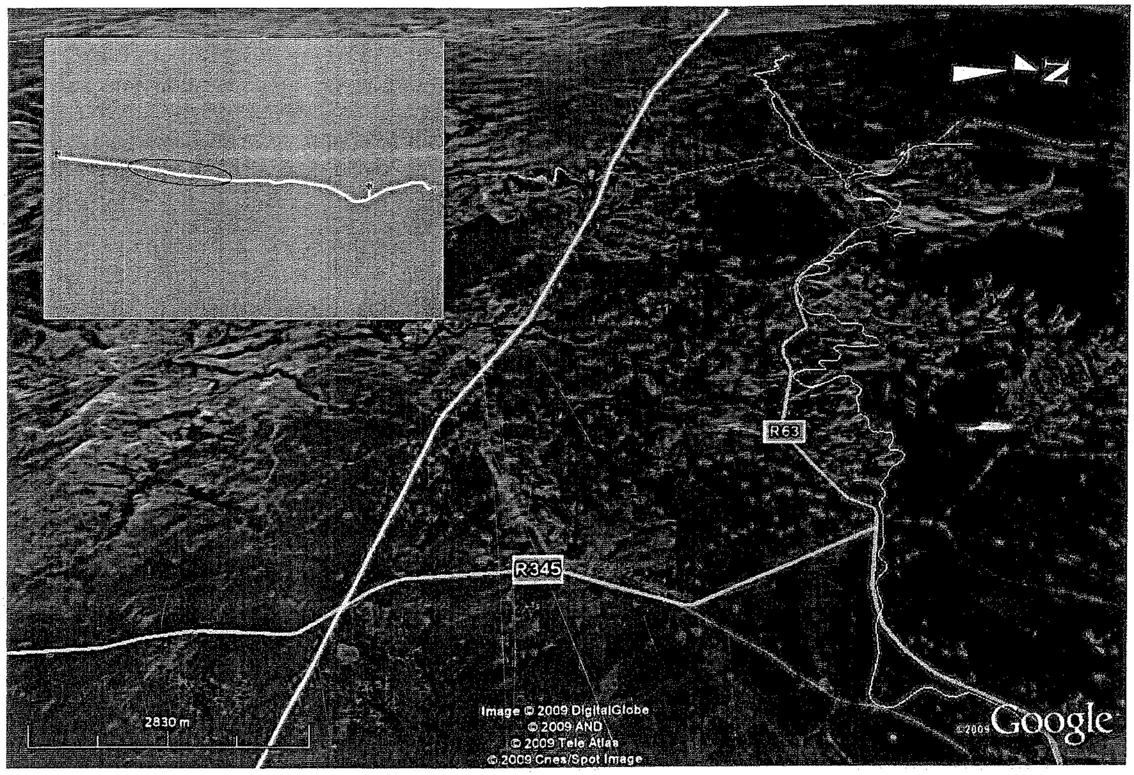


Figure 32: Aerial view in western direction of vacant servitude (green line) – section 6

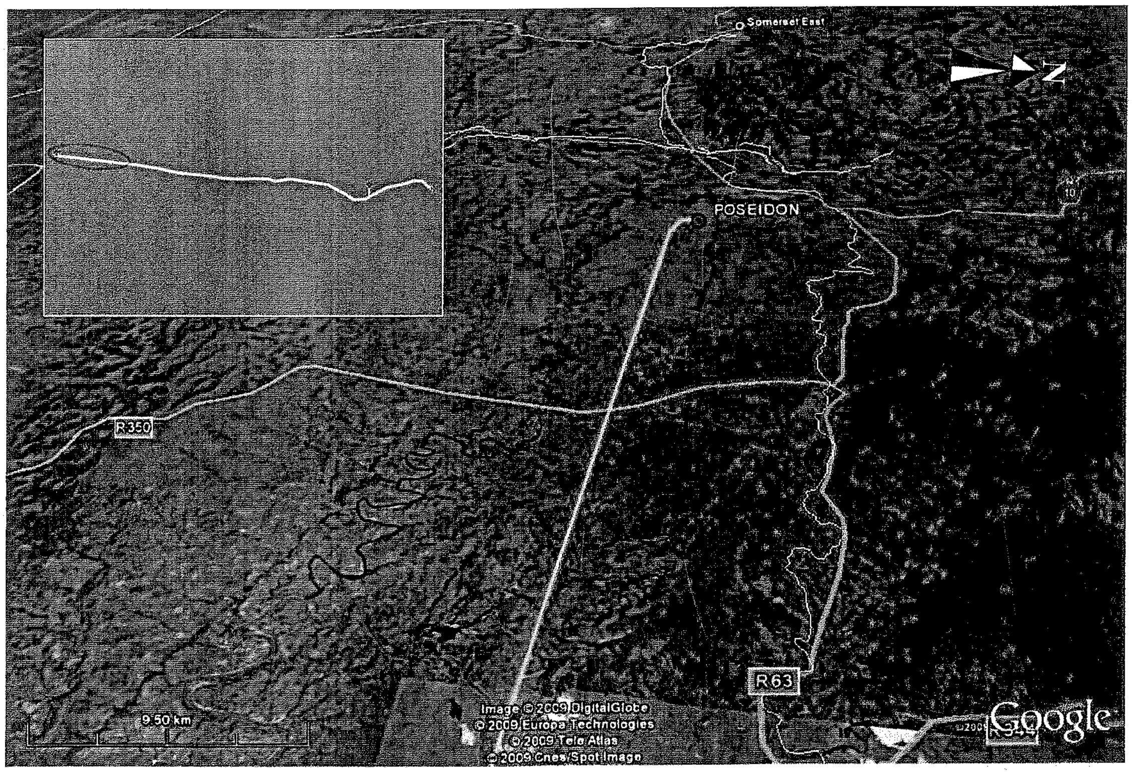


Figure 33: Aerial view in western direction of vacant servitude (green line) – section 7

The sections below describe the status quo of the receiving environment, as well as the manner in which the environmental features may be affected (positively or negatively) by the proposed Neptune-Poseidon project during the construction and operational phases.

Note: the preliminary effects are only discussed concisely on a qualitative level, as part of the Scoping phase. The EIA Report will provide a comprehensive evaluation of the potential impacts, and will quantify the effects to the environment based on the methodology presented in **Section 11**.

7.1 Climate

Status Quo

The information below was obtained from the South African Weather Service for the weather stations in East London, Fort Beaufort and Somerset East.

7.1.1 Temperature

Average daily maximum and minimum temperatures for the last ten years at the three weather stations are tabulated below.

Table 3: Average Daily Maximum Temperature (°C) for station [0059572B8] - EAST LONDON

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	26.9	25.7	26.1	24.5	23.1	23.5	22.9	22.7	22.1	22.9	24.2	26.6
2000	25.7	26.5	25.1	23.6	21.4	22.5	22.5	22.9	21.7	22.2	23.6	24.5
2001	25.4	26	25.3	22.8	25.2	22.7	21.2	21.6	21.6	22.7	24.1	25.2
2002	25.8	26.1	27.5	24.9	23.2	21.7	21.4	21.7	21.8	22.9	23.6	25
2003	26.4	28	26.6	25.3	23	20.2	21.4	20.9	20.6	22.6	23.9	24.5
2004	25.5	26	24.7	25.2	23.2	23.1	19.9	21.7	20.4	22.6	24.9	26.1
2005	25	26	25.3	24.2	23.7	21.1	22.2	22	21.5	23.2	23.3	24.1
2006	25.6	26.5	24.6	23.8	21.3	21.9	21.8	20.4	21.4	21.2	23.1	23.6
2007	26.4	26.3	24.6	23.6	24.1	22.4	21.5	22.5	22.2	22.3	23.5	24.8
2008	25.6	26.2	26.2	23.3	24.3	21.4	22.4	21.3	22.2	21.7	22.7	24.8
2009	24.9	25.9	25.6	24.8	23.6	22.1	22.6=	*	*	*	*	*

Note: = indicates that the average is unreliable due to missing daily values
** No date available at time of request*

Table 4: Average Daily Minimum Temperature (°C) for station [0059572B8] - EAST LONDON

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	19.4	18.9	18.7	15.8	12.6	11.3	12	11	11.8	14.6	16.4	19.4
2000	18.2	19.7	18.9	15.2	11.7	10.6	10.5	11.7	11.7	14.5	16.2	17
2001	17.6	18.4	17.7	15.7	13.6	11.6	10	11.1	13	15.7	16.6	17.7
2002	18.3	17.5	18.1	16.3	12.5	10	9.9	12.3	13.2	13.7	14	18.4
2003	18.6	20.2	18.1	16.9	13.1	10.1	9.6	9.6	11.7	13.8	14.8	16.4
2004	18	19	16.5	14.7	12.9	11	8.9	11.2	11.3	14.1	17.3	19
2005	18	19	17.1	14.9	12.9	9.8	10.2	10.7	12.7	13.7	15.7	15.8
2006	18.7	19.5	16	14.6	10.9	10.5	10.4	11.5	12.6	14.5	15.5	17
2007	18.1	18.8	16.8	15.3	12.6	10.8	9.1	11.1	13.5	13.9	15	17
2008	18.3	18.8	17	13.9	13.9	11.3	10	11.2	10.4	13.8	15.6	17.2
2009	18.2	18.5	17.2	15.7	12.8	11.6	11.2=	*	*	*	*	*

Note: *= indicates that the average is unreliable due to missing daily values*
** No date available at time of request*

Table 5: Average Daily Maximum Temperature (°C) for station [0078227A3] - FORT BEAUFORT

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	31.2	30.3	29.8	27.2	24.5	23.7	23.1	24.4	25.2	27.1	29.6	30.9
2000	27.9	28.9	26	24.1	21.1	23	22.8	25.1	24	25.5	25.5	28.9
2001	29.2	30.7	29.9	23	25.4	22.5	20.9	22.8	23.2	26.7	26.7	28.3
2002	30.3	31.1	31.3	28.4	24.3	20.6	21.2	22.2	22.5	26.3	27.7	29.4
2003	31.6	32.6	28	27	22.9	20.2	21.4	21.3	24.3	27	26.9	29.5
2004	30.3	29.8	27.5	26.4	25	22.7	20	23.6	22.5	26.8	30.4	30.3
2005	28.2	29.7	28.8	25.5	24.1	21.4	23.9	22.3	25.5	27.7	25.4	26.9
2006	30	29.9	28.8	25.6	20.9	21.7	22.1	20.6	23.4	23.3	25.7	26.3
2007	30	30.5	26.8	26.5	25.7	21.6	21.6	23.2	25.8	24.9	27.3	28.5
2008	28.5	29	27.9	24.9	25.1	21	23.2	22.6	24.6	26.5	27.4	29.2
2009	30	28.9	29.4	27.7	24.1	20.8	22.0=	*	*	*	*	*

Note: *= indicates that the average is unreliable due to missing daily values*
** No date available at time of request*

Table 6: Average Daily Minimum Temperature (°C) for station [0078227A3] - FORT BEAUFORT

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	18.1	17.3	17.6	13.6	8.9	8.4	9.5	7.3	9.2	13.4	14.9	18.4
2000	16.2	17.2	16.2	12.6	7.7	6.7	6.9	8.8	8.2	11.7	14	15.1
2001	15.1	15.7	16.4	13.4	10.3	7.7	5.3	8.1	9.9	13.5	14.9	15.7
2002	16.3	16	16.1	13.9	8.9	6.4	7	9.1	11.2	11.1	11.9	17
2003	16.8	18.8	15.2	14.7	10.1	6	4.9	5.8	8.1	11.4	13.7	14.4
2004	17.1	17.5	14.6	11.8	9.5	7.1	4.6	7.6	7.7	12.3	16.1	17.6
2005	17	17.5	15.4	11.7	10.3	4.5	6.2	6	9.6	10.8	13	12.9
2006	17.8	18.4	13.7	12.8	7.9	8	6.7	7.6	10.1	12.5	13.2	14.9
2007	16.7	17.2	14.1	12.2	9.3	6.8	5.1	6.6	10.1	11.3	12.5	15.5
2008	16.8	17.6	15.1	10.6	10.4	7	6.1	6.6	6.5	10.8	13.7	15.8
2009	16.7	16.8	14.9	12.2	9.4	6.9	7.4=	*	*	*	*	*

Note: = indicates that the average is unreliable due to missing daily values
** No date available at time of request*

Table 7: Average Daily Maximum Temperature (°C) for station [0055363 1] - SOMERSET EAST

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	30.8	30.5	30	26.4	22.4	22.2	21.5	22.5	23.8	26	28.7	30.4
2000	28.6	29.7	25.2	23	20.1	21.4	21.1	23.9	22.4	25.7	25.6	28.4
2001	28.7	30.6	29.7	22.6	23	21	19.6	21.2	22	26.2	25.8	28.6
2002	30.5	31	30.7	27	22.1	18.1	18.5	20.1	21.8	26.2	27.3	29.6
2003	30.7	33	28.7	26.2	21.4	18.9	20.1	19.7	23.8	25.9	27.9	30.4=
2004	30.7	30.3	27.3	26.7	24.9	21	19	22.8	23.2	26.4	30.7	30.6
2005	29.4	30.3	29	24.8	23	20	22.6	21.9	25.6	27	25.5	28.5
2006	30.2	30.9	28.9	26.1	21.1	20.2	20.8	19.9	23.1	24	27	27.5
2007	30.7	30.5	26.6	25.9	24.5	20.7	20.5	22.6	25.1	25.3	27.7	29.5
2008	28.9	29.4	27.6	25.2	25.2	20.7	22.4	21.9	24.5	26.3	28.1	30.4
2009	30.5	29.7	30.3	27.8	24.1	20.5	21.6	*	*	*	*	*

*Note: * No date available at time of request*

Table 8: Average Daily Minimum Temperature (°C) for station [0055363 1] - SOMERSET EAST

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	16.2	15.6	16.4	12	5.4	2.2	5.2	4.1	6.4	11.2	13	17.3
2000	15	17.2	16.1	11.6	4.8	2.1	1.8	6	6.3	10.5	13	13.3
2001	13.9	14.9	14.6	12.5	7.1	3	1.9	4.6	7.7	11.6	12.7	13.5
2002	14.3	14.2	13.4	10.8	5.1	1.7	2.1	6.1	8.5	8.5	9	15.5
2003	14.6	17.3	13.3	11.8	6.2	2.2	0.9	2.8	6.6	10.4	13.3	13.7=
2004	17.1	17.4	13	9.9	6.8	3	0.7	5	5.7	10.4	14.1	16.3
2005	15.6	16.1	13.8	10.3	7.1	2.9	1.6	2.6	8	9.1	11.9	10.8
2006	16.2	16.9	11.6	10	4.6	1.1	2.4	4.4	6.3	9.9	11.3	12.7
2007	14.7	15.5	11.9	9.3	4.5	2.2	0.1	2.6	7.3	9.4	10.2	14
2008	15	14.7	13	7.9	6.8	3	1.7	3.6	2.8	8.7	12.1	13.7
2009	14.7	15.7	12.8	10.4	6.8	4.1	1.5	*	*	*	*	*

Note: *= indicates that the average is unreliable due to missing daily values*
** No date available at time of request*

7.1.2 Precipitation

The monthly daily rainfall for the three weather stations for the last ten years is tabulated below. Rainfall occurs throughout the year in the project area:

Table 9: Monthly Daily Rain (mm) for station [0059572B8] - EAST LONDON

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	110.7	93.1	84.8	132.4	18.1	0.6	139.9	10.4	43.3	58.1	85.7	77.6
2000	164.3	76.8	343	80.8	61.4	17.1	12.4	4.9	112.5	68.5	69.6	77.7
2001	148.9	78.4	109.5	101.8	2.6	1.5	51.6	66	75.3	83	182.2	82
2002	138.8	25.4	44	104.2	11.1	18.3	80.9	493.8	143.4	26.5	58.6	62.6
2003	25.5	39.7	142.6	67.1	84.1	17	6.9	20.1	48.4	89.9	40.3	77
2004	178.2	25.5	78.2	22.2	40.6	2	63.6	19.4	205.3	39.2	40	134.3
2005	133	126.9	54.3	116	50.5	16.1	3.5	48.7	4.8	23.6	267.1	7.6
2006	104.3	126	52.5	135.5	126.7	10	6.6	170.7	79.9	246.5	71.4	87
2007	69.4	82	99.4	56.2	43.8	22	7.2	25	32.8	41.2	96.2	81.8
2008	164.2	76.4	48.6	86.2	8.6	54.3	4.2	39.6	15.4	41.6	138.4	25.4=
2009	86.6	44.8	27.6	16.2	21.4	13.8	0.8=	*	*	*	*	*

Note: *= indicates that the average is unreliable due to missing daily values*
** No date available at time of request*

Table 10: Monthly Daily Rain (mm) for station [0078227A3] - FORT BEAUFORT

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	37.2	53.6	63.4	34	4.8	4.8	36.4	4.6	4.4	31.4	19.6	106.8
2000	133.4	33.4	123.4=	114.8	2	8.8	1.4	0.8	75.2	28	87.4	32
2001	113.2	16.4	104.4	94	4.6	3.2	9.6	21.6	43.6	31.3	29.2	45.5
2002	68	14	47.4	19	2.8	20.6	34.2	84.8	71.2	10.2	24.2	80.6
2003	7.4	86.6	50.0=	28.2	56	2.2	4.2	12.8	4.6	39	26.1	17.6
2004	45	69.4	31.2	65.4	5.4	9	6.6	8.8	85.6	9.8	18.6	114.2
2005	41.4	41.4	42	49	21.8=	2	4	45	2.8	26.8=	127.2	29.6=
2006	14.0=	57.6	23.8	50.0=	33.2	6	3.8	99.6=	31.2	86.4	26.6	47.8
2007	45.4	26.4	98.8	17	5.2	21.2	7.4=	13.6	3.2	34.8	27.8	81.2
2008	56.2	70.6	46.8	30.2	3.8	8.2=	0.4	29.6	3.8	6.8=	45.2=	41
2009	19.0=	62.8=	58.4	19	4.2	10.8=	3.8=	*	*	*	*	*

Note: = indicates that the average is unreliable due to missing daily values

** No date available at time of request*

Table 11: Monthly Daily Rain (mm) for station [0055363 1] - SOMERSET EAST

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	64.4	6.8	47.1	24.1	5	1.1	57.4	3.5	4.6	20.5	17.1	88.1
2000	74.7	13.8	92.1	79	0.5	7.7	0.6	0.2	36.7	21.1	162.4	21.5
2001	66.2	2.7	50.3	75.1	11	3.5	17.2	16	62.3	8	81.4	33.4
2002	37.6	29.3	27.4	26.7	8.4	17.9	52.5	87.8	58.4	10.5	11.9	53.2
2003	18.1	31.9	57	44.6	44.1	8.5	0.4	13.3	1.6	65.1	12.3	7.5
2004	45.2	90.3	21.3	39.1	0.3	33	6.5	6.1	49.5	8.4	11.9	47.5
2005	38.6	114.7	32.3	58.7	12.7	9.8	4	10.1	4	18.3	104	23.4
2006	51	55.4	21.4	28.2	15.4	9.4	15.6	77.4	40.2	35.3	15.8	31.2
2007	30.2	46	69.8	20.2	17.4	32	7.2	24.4	1.4	25	34.4	102
2008	62.8	55	11.8	7.4	5.4	19	0.4	28.2	3.6	11.8	41.2	1.4
2009	0.4	79.2	5.4	20.8	5.4	*	*	*	*	*	*	*

*Note: * No date available at time of request*

7.1.3 Wind

The wind roses shown in **Figures 34 – 36** for a 10-year period (1999 – 2009) are interpreted as follows:

- **East London** –
  - Prevailing wind direction is west;
  - Highest percentage of winds blow with speeds of 3.5 – 5.6 m/s;
  - 1.2% of all winds are calm.
- **Fort Beaufort** –
  - Prevailing wind direction is south;
  - Highest percentage of winds blow with speeds of 0.5 – 2.5 m/s;
  - 10.8% of all winds are calm.
- **Somerset East** –
  - Prevailing wind direction is east-southeast;
  - Highest percentage of winds blow with speeds of 0.5 – 2.5 m/s;
  - 21.8% of all winds are calm.

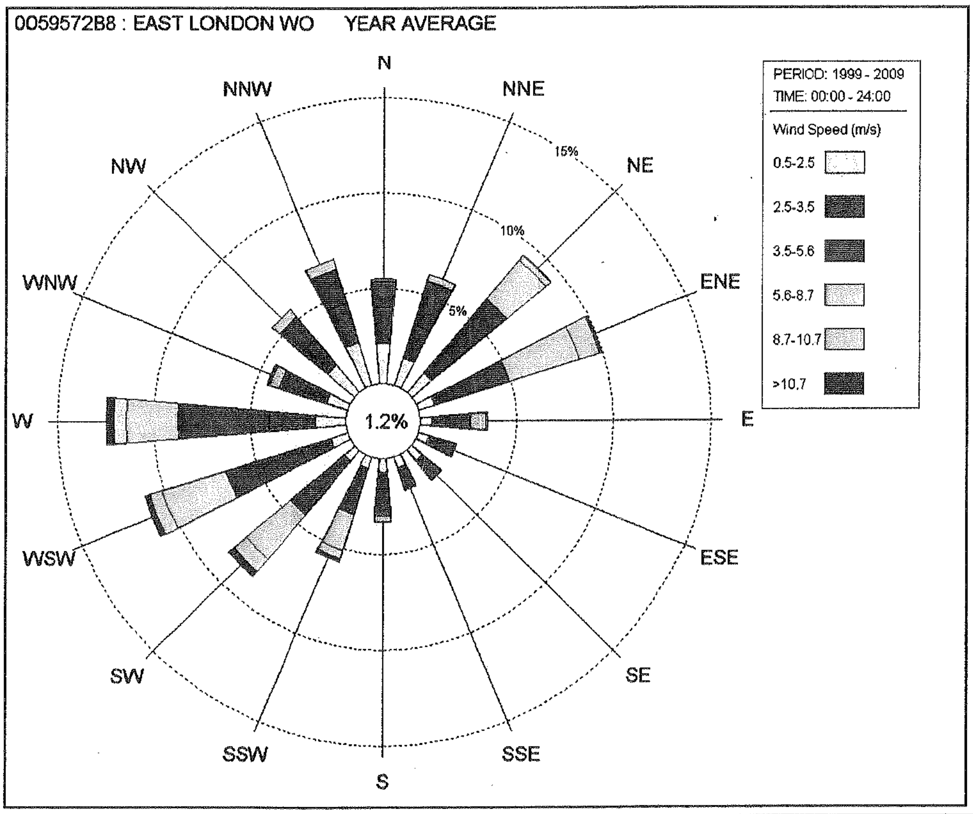


Figure 34: Wind rose for the East London weather station

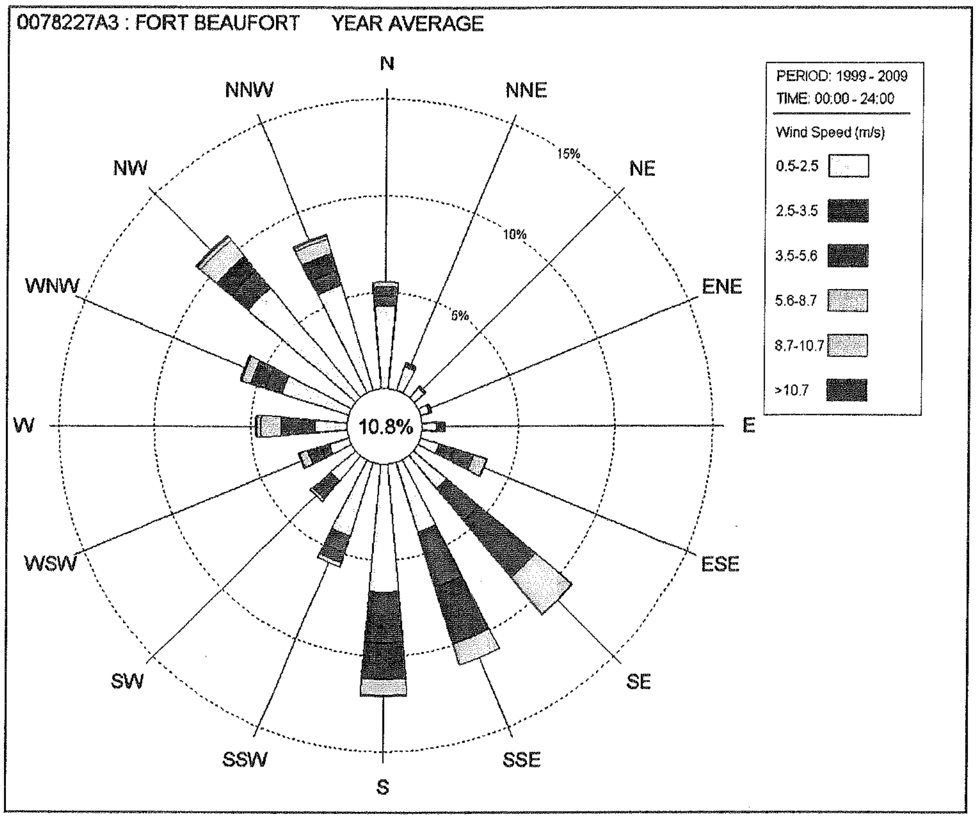


Figure 35: Wind rose for the Fort Beaufort weather station

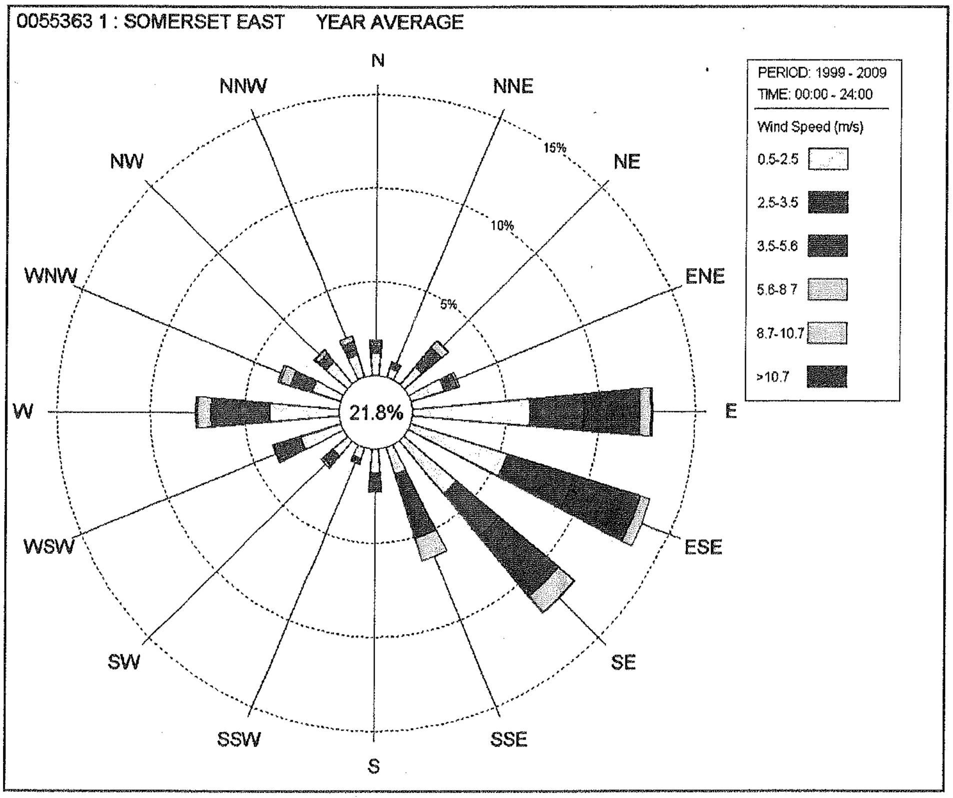


Figure 36: Wind rose for the Somerset East weather station

Potential Impact

Construction:	• No foreseen adverse or beneficial effects.
Operation:	• No foreseen adverse or beneficial effects.

7.2 Topography

Status Quo

The main land forms in the study area comprise hills and lowlands in the eastern part of the route, and plains and hills to the west (see **Figure 37**).

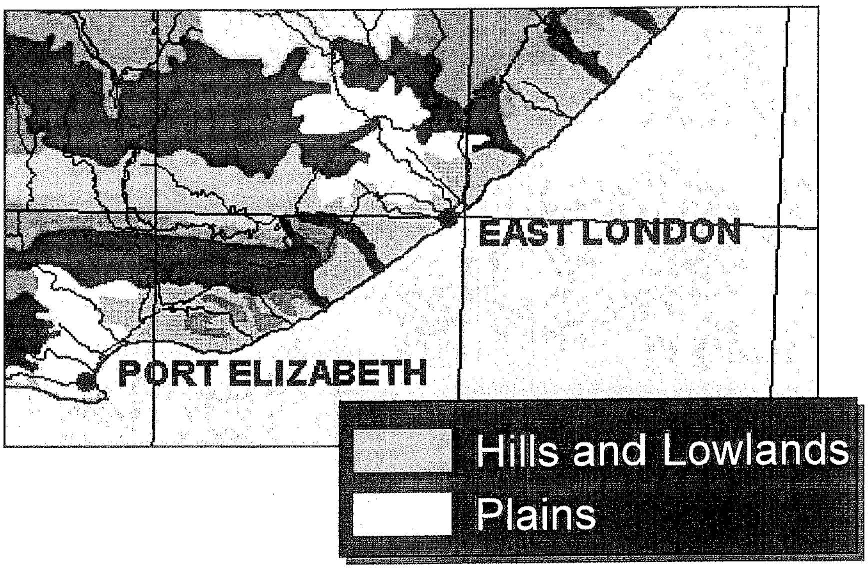


Figure 37: Terrain morphology (adapted from DEAT, 2001)

Generally, the route traverses rolling hills and valleys. This terrain contains a series of deeply incised gorges, notably along the Keiskamma and Great Fish Rivers.

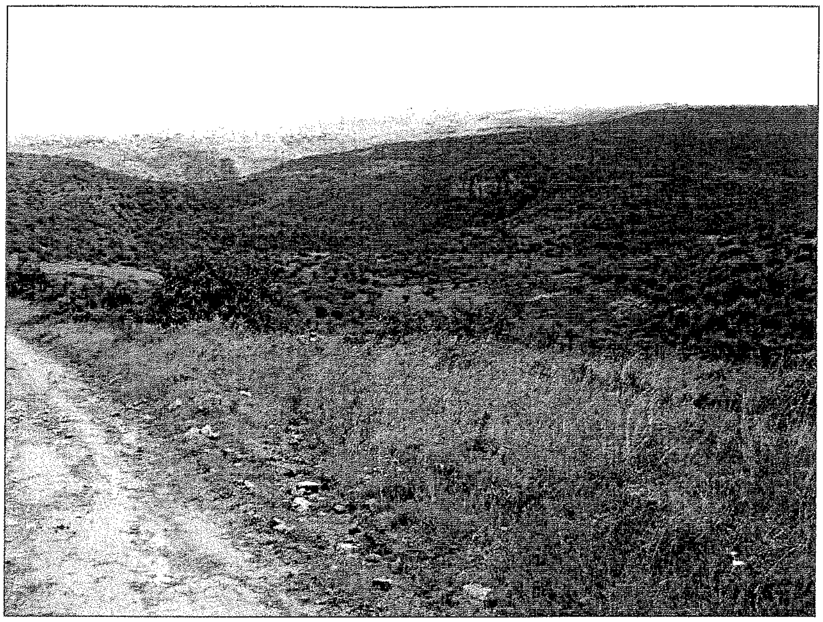


Figure 38: Typical scene of terrain along corridor

Potential Impact

Construction:	• Visual impact on ridges. • Erosion of affected areas on steep slopes.
Operation:	• Visual impact on ridges from disturbed area and infrastructure. • Erosion along access roads on steep slopes.

7.3 Surface Water

Status Quo

7.3.1 Watercourses

Figure 39 illustrates the main watercourses in the project area.

The eastern part of the study area is situated within the Mzimvubu to Keiskamma Water Management Areas (WMAs) and the western section in the Fish to Tsitsikamma WMA. The major rivers affected by the proposed project are tabled and shown below (overleaf).