1. INTRODUCTION

1.1. Motivation for the Proposed Project

The motivation for the establishment of a new substation and the associated Transmission line infrastructure is dictated by the rapid economic and energy demand growth of the Rustenburg area. To support this growing demand, Eskom Transmission is required to both upgrade its capacity and improve the reliability of electrical supply to the greater Rustenburg area. Therefore, the proposed project is to improve and provide a reliable supply of power to the towns of Brits, Marikana, Kroondal, Mooinooi and Rustenburg, as well as surrounding communities, farms, businesses, and the increasing number of platinum and chrome mines and smelters in the Rustenburg area.

1.2. The Purpose and Need for the Proposed Project

The Rustenburg area is characterised by the existence of immense mining operations due to the occurrence of the Merensky Reef. Electricity loads required by platinum and chrome mining and smelting in the Rustenburg area are expected to reach the combined firm capacities of the existing substations in the area (i.e. Bighorn, Trident and Ararat Substations) within the next two years. In addition, the existing Ararat-Spitskop 275 kV Transmission line and the Spitskop Substation 400/275 kV transformers are anticipated to reach their firm capacities within approximately the same period. Additional power supply from proposed upgrades at the existing Ararat Substation has already been committed to customers, and the requirement for additional power to local operations remains high. Therefore, additional Transmission capacity is required in this area to:

a) Ensure reliable supply to consumers
b) Provide for future increased energy demands

Therefore, Eskom Transmission propose the construction of a new 400/132 kV substation (to be known as the Ikaros Substation) on the eastern side of Rustenburg, as well as the extension of the existing Bighorn Substation in order to feed the future supply requirements in excess of the existing Transmission network's capabilities. This is considered to be the most cost-effective alternative to supply the required loads to the surrounding mines, as well as future load requirements in the greater Rustenburg area.

With the increase in mining activity, and the associated increase in energy demand, Eskom Transmission's planning process is required to be based on anticipated load requirements, rather than immediate load requirements. This is due to the time-consuming process of acquiring permission to construct such infrastructure, servitude negotiations, and Transmission line design and construction. Future load areas include Anglo Platinum smelter and refinery, Waterval Mine, as well as new mines, smelters and shafts planned for the area. These load areas would be required to be supplied by Distribution lines from the new substation.

1.3. Eskom's Planning Process and the Role of the EIA Process

The EIA process forms part of the initial planning process of a new Transmission line. Route alternatives (corridors) are identified (typically based on technical feasibility), and the number of options are narrowed down based on environmental criteria through the EIA process. The findings of the EIA determine those areas in which impacts can be anticipated to be significant, and results in the nomination of a preferred corridor for environmental authorisation (by the Department of Environmental Affairs and Tourism).

While there should be reasonable confidence in the environmental feasibility of the preferred corridor nominated, other criteria may require alteration to the alignment which received environmental authorisation. These may include:

- Identification of a technical problem during the detailed design phase which will require excessive cost to resolve (e.g. unstable subsurface conditions identified by detailed geotechnical investigations).
- Request by a landowner during the course of the negotiation process that the alignment be shifted to avoid disruption of a particular activity on his property, but provide a feasible new alignment.

Provided such potential deviations to the alignment are not unreasonable, or outside the original study area, it is fair for Eskom Transmission to investigate and negotiate local adjustments to the authorised alignment. This may be required to occur at a number of points along the alignment. If such deviations fall outside of the original study area, the environmental consultant may, at the instruction of the Department of Environmental Affairs and Tourism, or their provincial office, be required to undertake further investigation. The need and extent of such investigations would be judged individually.

1.3.1. Servitude Negotiation and the EIA Process

The process of negotiating a servitude is independent of the EIA process, and it is important that the aims of the two processes are seen as separate. They share a common cause (the construction and operation of a Transmission line) and may share common landowner databases, but they have different aims. Appendix A provides further information on the negotiation phase.

1.4. Project Overview

The extent of the study area, and the selection of corridors and substation sites within the study area, gives consideration to such aspects as ecological impact, social impact, visual impact, technical feasibility and cost. These aspects were considered at a preliminary planning level by Eskom Technology Services International (Clara, 2001), and provided a number of feasible alternatives upon which the environmental studies were based. The Environmental Scoping Study for the project (Bohlweki Environmental, 2002) investigated these feasible alternatives, and provided further alternatives for consideration. Following the investigations during the Scoping Phase (Bohlweki Environmental, 2002), the corridor and substation site alternatives which have been investigated by this EIA include:

Ikaros Substation Site:	Sites A, B and C
Western Leg:	Northern, Southern and N-S Composite corridors
Eastern Leg:	Corridor parallel to the existing Trident-Bighorn 275 kV line

These alternatives are illustrated in Figure 1.1 overleaf.

This project makes use of “loop-in” technology, which enables the supply of power to an area and a substation via an existing Transmission line. This in itself minimises environmental impact, as the need for an entirely new Transmission line from a generation source (e.g. Matimba Powerstation) has been eliminated. This “loop-in” scheme is discussed in more detail in Section 1.4.2 below.

1.4.1. Ikaros Substation

As discussed in the Environmental Scoping Study Report (Bohlweki Environmental, 2002), the location of a substation site is subject to a number of technical requirements. A broader area (approximately 5 km x 5 km in size) was identified for the establishment of the Ikaros Substation (refer approximately 25° 37' 30"S; 27° 15' 20" E). The site is approximately 4 km south of the Bospoort Dam, straddling the farms Elandsheuwel 282 JQ, Klipgat 281 JQ and Turffontein 302 JQ. The site lies to the south of the existing Trident-Bighorn 275 kV Transmission line in order to avoid the need for the new Transmission lines entering the substation to cross existing lines.

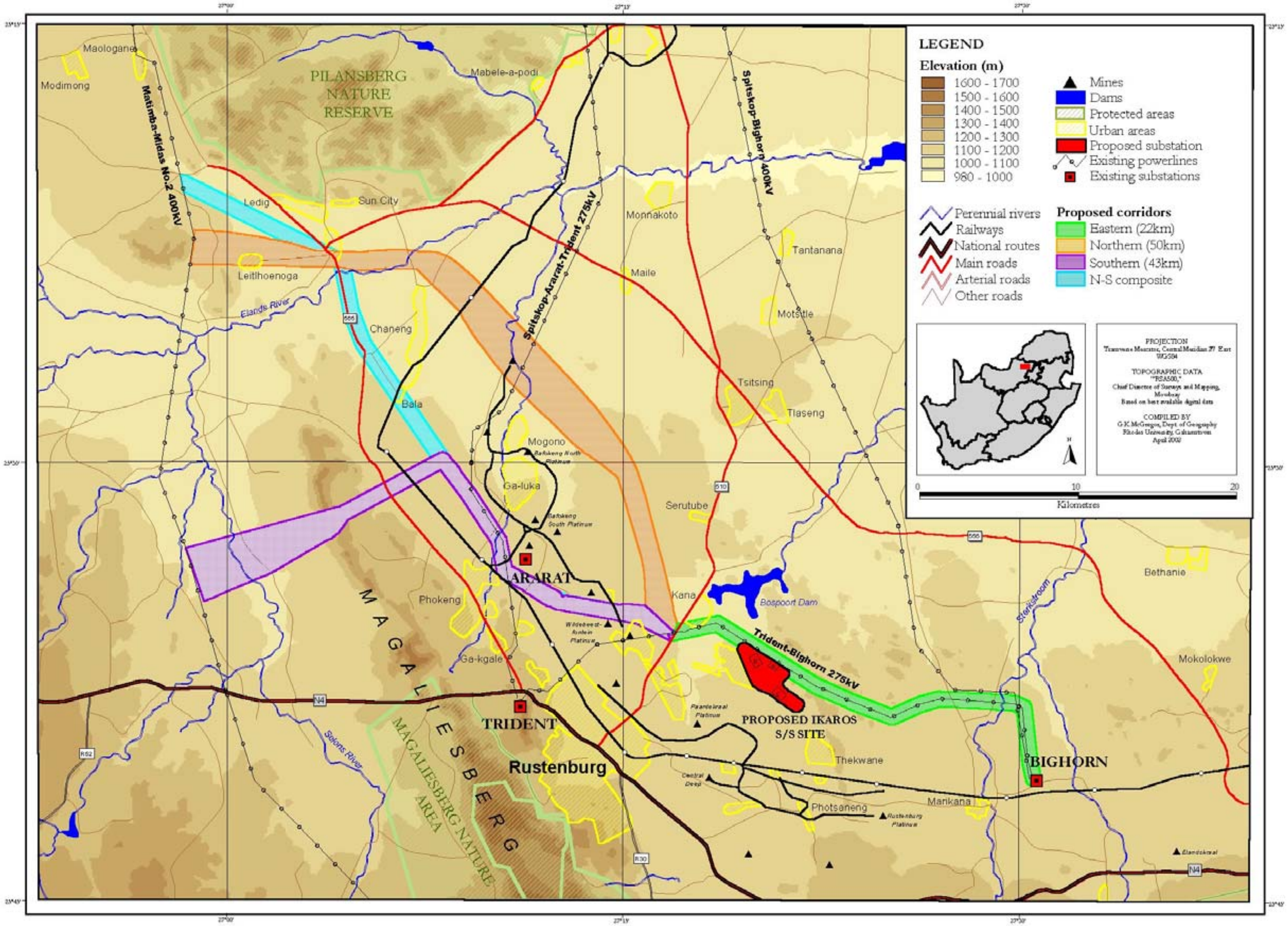

Figure 1.1: Basemap showing identified feasible corridors and substation sites

Within this broader area, approximately 36 ha (600 m x 600 m) is required for establishment of the new Ikaros Substation. Three feasible alternative sites of suitable size have been identified within this broader site for detailed investigation. These sites are referred to as Sites A, B and C.

The locality of the Ikaros Substation site is a primary factor in the identification of feasible Transmission line corridors, which are required to supply the substation with power. In addition, the Ikaros Substation is required to provide sufficient Distribution facilities to supply the local users (in this instance, predominantly mining operations). The general substation layout aims to avoid the cross-over of powerlines entering or exiting the substation. The proposed powerline layout at Ikaros Substation is illustrated in Figure 1.2.

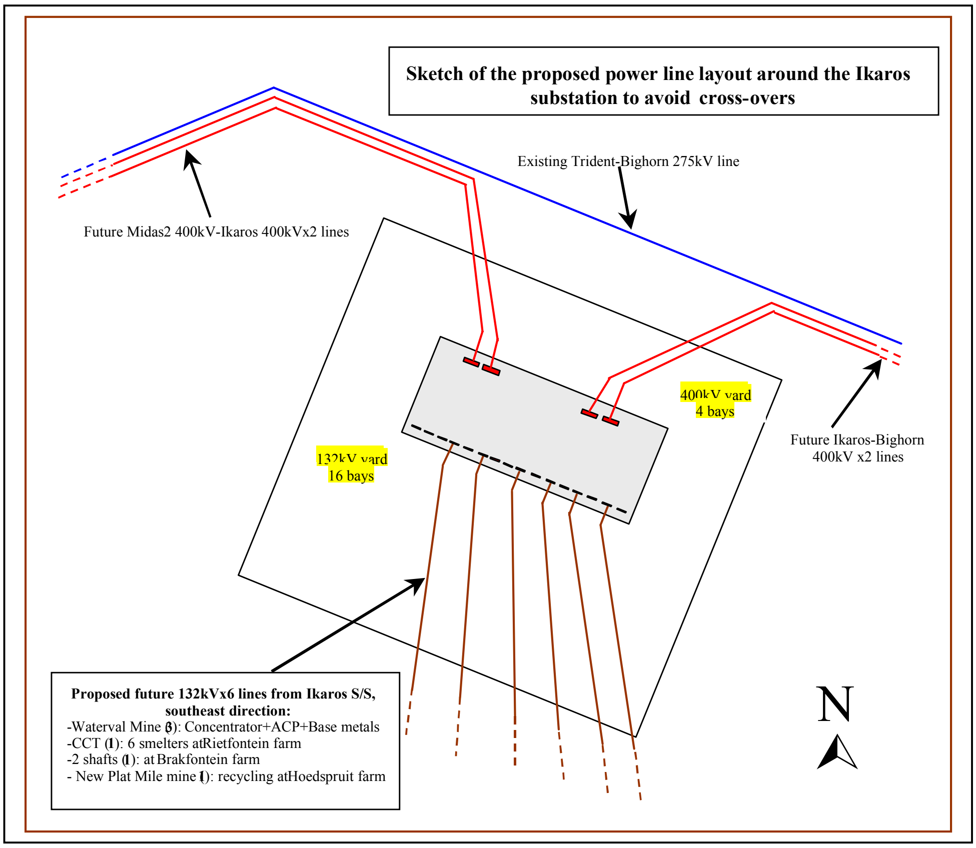

Figure 1.2: Proposed powerline layout at Ikaros Substation (Clara, 2001)

1.4.2. Matimba-Midas No 2 400 kV Transmission Line to Ikaros Substation

The proposed Ikaros Substation is to be supplied via two parallel 400 kV Transmission lines to be looped in from the existing Matimba-Midas No 2 400 kV Transmission line (between Ellisras and Fochville). A loop-in consists of a new 400 kV powerline being turned in off the existing Matimba-Midas 400 kV Transmission line, carrying power to one or more substations (in this instance, Ikaros and Bighorn Substations). The loop is closed through a link back to the existing Matimba-Midas line via a parallel 400 kV line, thus allowing the flow of electricity to continue on to the Midas Substation in Fochville (see Figure 1.3).

This link implies that two servitudes, which as far as possible should be located adjacent to one another (to share the use of access roads and gates), will be required. This will result in a double servitude 110 m wide (i.e. 55 m x 2) being required.

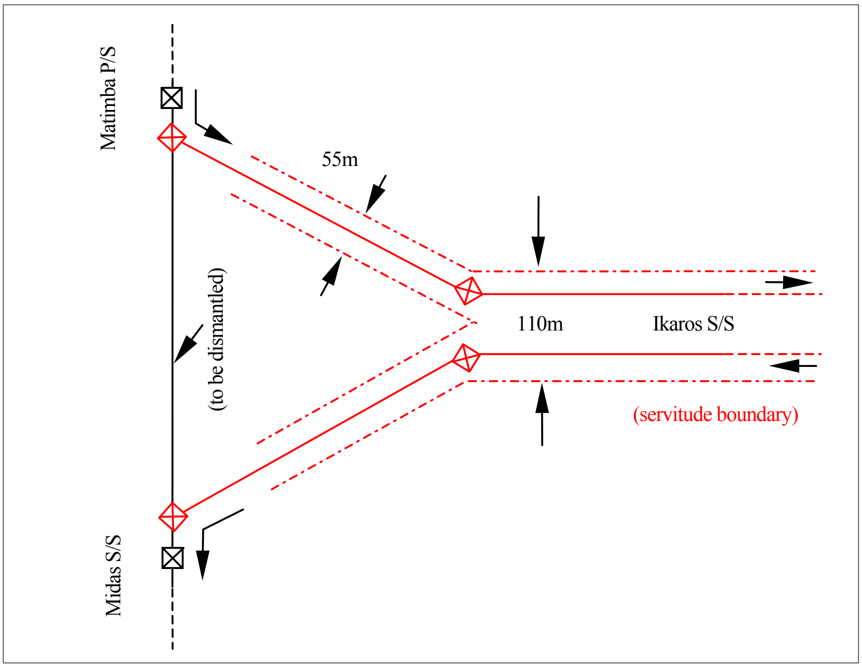

Figure 1.3: Diagrammatic sketch of the "Loop-in" scheme to Ikaros Substation (Clara, 2001)

The distance between the existing Matimba-Midas No 2 400 kV Transmission line and the proposed Ikaros Substation is approximately 50 km (depending on the final alignment). Two feasible alternate corridors were identified by Eskom's technical team between the loop-in point and the Ikaros Substation. These are referred to as the northern (indicated in orange on Figure 1.1) and southern (indicated in purple on Figure 1.1) corridors, and were scoped within the Environmental Scoping Study. A variation of these corridors was identified through the public participation process undertaken within the Environmental Scoping Study (ESS; indicated in blue on Figure 1.1). This proposed corridor (the N-S Composite corridor) loops out of the Matimba-Midas line north of the proposed northern corridor, and follows a south-easterly direction to follow the R565 for a portion of its length. This corridor then joins with the proposed southern corridor east of the Magaliesberg ridge.

The investigation of this proposed composite corridor was supported by the environmental team, as it provides an alternative alignment which would avoid two of the identified “hot spot” areas identified by the ESS (i.e. the Magaliesberg Mountain area identified within the southern corridor, and the mining land identified within the northern corridor).

Therefore, the detailed studies undertaken within this Environmental Impact Assessment investigated the three alternate corridors between the Matimba-Midas No 2 400 kV Transmission line and the Ikaros Substation, as illustrated on Figure 1.1.

1.4.3. Ikaros Substation to Bighorn Substation

Two new 400 kV Transmission lines are proposed to be constructed between the new Ikaros Substation and the existing Bighorn Substation (25° 40' 54" S; 27° 30' 33" E), a distance of approximately 22 km. These lines are proposed to run in parallel to the existing Trident-Bighorn 275 kV line for most of its length (indicated in green on Figure 1.1).

The Bighorn Substation will require an additional 400 kV line bay for the new Transmission line. This extension work will require the expansion of the substation site, which will require additional land adjacent to the existing site. The feeder for the proposed Ikaros-Bighorn lines is required to be situated on the western side of the existing Spitskop-Bighorn 400 kV line feeder (see Figure 1.1 and Figure 1.4).

Figure 1.4: Aerial photograph illustrating the existing and proposed Bighorn Substation out-going lines (Clara, 2001)

1.4.4. *Technical Details*

- *Tower types:*

  Two parallel 55 m servitudes will be required (i.e. a total of 110 m) between the loop-in point on the Matimba-Midas line and the Bighorn Substation, to accommodate the towers upon which the voltage line is strung. The servitude width is based on safety criteria, and has been determined for each particular tower type.

  Where feasible, the "cross-rope suspension" (CRS) tower (Figure 1.5) will be used. It consists of two masts and four guy ropes. These towers have a reduced steel-component, and are therefore both less expensive and less visually intrusive than conventional self-supporting tower structures. The CRS tower has limitations in that bends greater than 3° and steep surfaces will require that more stable "strain" or self-supporting towers be used (Figure 1.6).

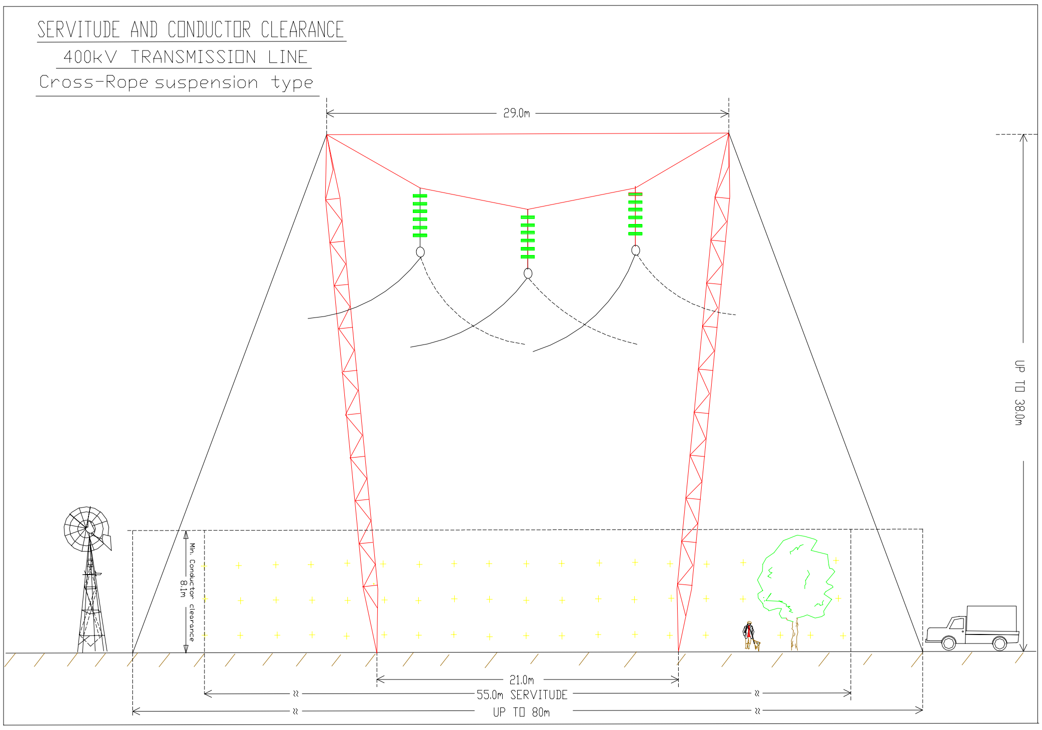

Figure 1.5: Diagrammatic representation of the cross-rope suspension tower

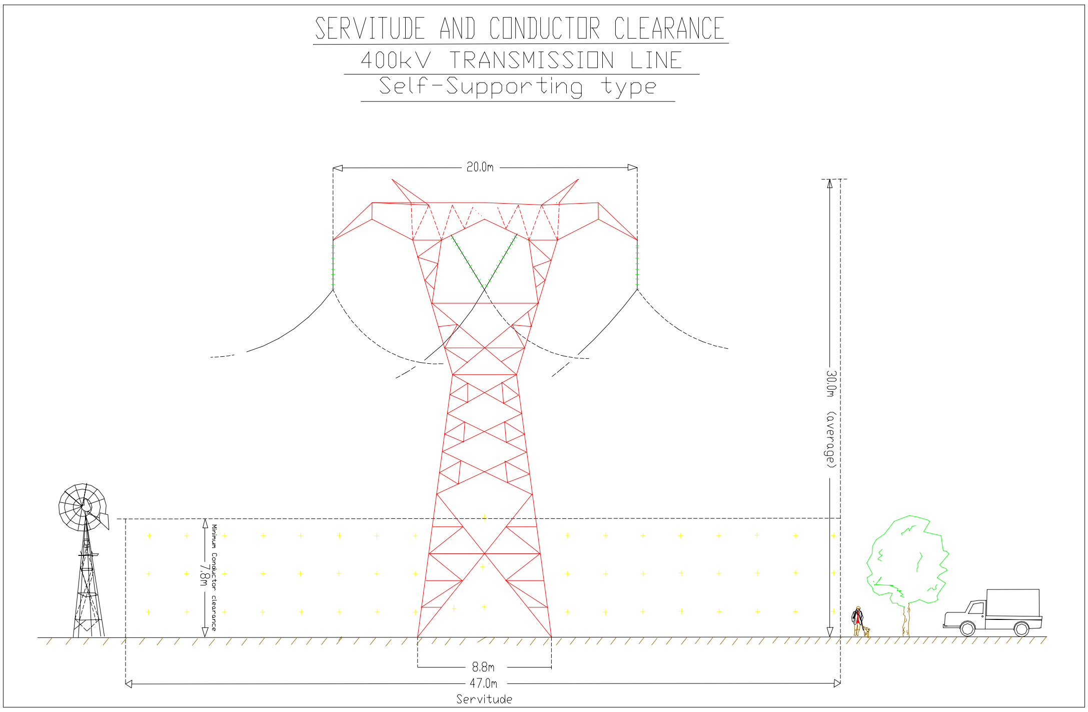

Figure 1.6: Diagrammatic representation of the self-supporting tower

- *Access:*

  A vehicle access road is usually required to be established along the entire length of the servitude (typically along the centre line). This access is required during both the construction and operation/maintenance phases of Transmission line's life-cycle. Where feasible, use is made of existing roads in the area. In environmentally sensitive areas and inaccessible terrain (e.g. steep, rocky or waterlogged areas), alternative means of accessing tower positions may be required (e.g. by foot, or by air in exceptional circumstances). The access points and roads will be negotiated with landowners, and are established during the construction phase. Details of the construction process are presented for information in Appendix B.

  Where necessary for access to properties, gates are built at points where the centre line crosses any existing fence. This is undertaken in consultation with the landowners. Eskom locks are to be installed on such gates, and closed at all times.