

8. EVALUATION OF POTENTIAL IMPACTS ASSOCIATED WITH THE CONSTRUCTION OF THE PROPOSED 765 kV HYDRA-GAMMA 2 TRANSMISSION LINE

8.1 Potential Impacts on Topography

Disruption or modification of physical landforms to some degree is the most readily noticeable impact associated with the construction of any infrastructure. The direct impact on landforms with the establishment of a substation is mainly one of disruption of surface soils and vegetation. The study area is impacted on by existing Transmission lines (including the No 1, 2 and 3 Hydra-Droërvier 400 kV lines), existing Hydra Substation (near De Aar) and the Victoria capacitor station, which is located in the vicinity of the Gamma Substation site.

Potential impacts on topography associated with the construction of the Transmission line are anticipated to be localised and restricted to foundation areas associated with the Transmission line towers. The potential impact associated with towers is anticipated to be negligible as Eskom tend to select Transmission line corridors which avoid areas which are impassable, thus minimising the need to disrupt the local topography. Potential impacts on topography are, therefore, anticipated to be limited to the construction phase and construction areas and of low significance as no major changes on the landscape are required.

8.1.1 Conclusions

Potential impacts on topography are anticipated to be limited the construction phase and construction areas and of low significance as no major changes on the landscape are required.

8.1.2 Recommendations

No additional studies are required to be undertaken within the EIA with regards to potential impacts on topography, as primary impacts associated with construction of the Transmission line are associated with the disruption of the soil surface.

8.2 Potential Impacts on Substation Components associated with Climate and Atmospheric Conditions

The local climate is anticipated to have very little impact on the conductors or tower structures, but may cause small variations in the transmission of electricity. An increase in temperature has been associated with a drop in capacity in Transmission lines (Skea, 1997). Extreme phenomena are unlikely to pose a threat to the Transmission line, although secondary effects such as flood conditions associated with high rainfall may present problems to the structural

stability of the line. Such events are, however, rare within the study area and, therefore, the risk associated with this potential impact is anticipated to be of very low significance.

With the adoption of mitigating measures to alleviate the threat posed by lightning to the transmission of electricity, no negative impacts are anticipated from this phenomenon.

Levels of pollution within the atmosphere may present operational problems to the Transmission lines. Oxidation and subsequent corrosion of metallic components may occur with time. This potential impacts is considered to be highly unlikely due to the relatively rural nature of the area.

8.2.1 Conclusions

An assessment of the potential impacts of climate and atmospheric conditions (e.g. potential impacts associated with lightning, precipitation and pollution levels) on the proposed Transmission line should be undertaken during the design phase. This is to provide an indication of what conditions are required to be accounted for by the design team to extend the life and reliability of the new infrastructure.

8.2.2 Recommendations

The potential impacts associated with climate and atmospheric conditions are anticipated to be of low significance, therefore, no additional environmental studies are required to be undertaken in this regard.

8.3 Potential Impacts on Surface Water

The study area is located within an arid region in the Karoo. The rivers traversed by the Transmission line are non-perennial. The largest rivers found in close proximity to the study area include the Orange River, Elandsfontein, Ongers River and Brakfontein River.

It is not considered technically feasible by Eskom to locate tower positions within a floodplain. Therefore, the impact on surface water as a result of the construction and operation of the Transmission line is anticipated to be negligible. Potential impacts are anticipated during the construction phase as a result of surface water pollution and sedimentation. However, with the implementation of appropriate mitigation measures as detailed in Eskom's generic EMP, these impacts are anticipated to be negligible. Therefore, impacts on the surface water of the area associated with the construction of the Transmission line is anticipated to be short-term, localised and of low significance.

Several small streams, some with limited areas of wetland vegetation occur within the study area. The possibility of one or more tower structures being placed within or near the stream bank areas of these streams does occur. Disturbance of the stream-flow/wetland areas may result in the partial impairment or loss of function of the specific streams/wetlands and, in the long-term, may affect the drainage patterns and/or drainage function of the area as a whole. This impact is potentially of moderate significance.

8.3.1 Conclusions

Potential impacts on the surface water resulting from the construction and operation of the Transmission line is considered to be of low significance.

Table 8.1: Potential impacts on surface water associated with the establishment of the Hydra-Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Construction of Transmission line	Local	Short-term	Likely	Low	Negative
Impairment/loss of function of the wetland areas	Local	Long-term	Likely	Moderate	Negative

8.3.2 Recommendations

In order to minimise the potential impacts on surface water, the following mitigation measures are recommended:

- Wetlands and stream banks should be avoided as far as possible.
- Placement of tower structures should be outside of the 1:50 year flood lines
- Where new access roads are required to be constructed, these should not disturb the natural drainage patterns of the area. If streams are crossed, special attention should be given to prevent impairment of natural drainage patterns.
- Vegetation stripping should occur in parallel with the progress of construction in order to minimise erosion and/or runoff.
- Exposed areas should be re-vegetated as soon as possible on completion of construction within each area.
- To prevent sedimentation into river channels during construction, sediment should be piled alongside the construction site and removed to a suitable waste disposal site as soon as possible, so as to prevent it entering the aquatic system during rain events. Should sediment have to be stored on site for a period of time, it should be away from the river channel and bunded to prevent run-off.

- Construction activities should be limited to the servitude areas, especially in areas where sensitive vegetation and surface water bodies occur.
- Adequate numbers and placement of portable chemical toilet facilities at construction sites is crucial to prevent unnecessary pollution of the surrounding surface and groundwater, and vegetation.
- Littering should be prevented. Adequate containers for litter removal should be supplied on site. These containers should be emptied on a regular basis and the contents removed to an appropriate and licensed waste disposal site.
- After completion of construction, the site should be properly cleaned of any construction waste, litter etc. and properly rehabilitated/re-vegetated.
- An Environmental Management Plan (EMP) should be compiled outlining site-specific measures which should be implemented to minimise impacts on topography and erosion.

8.4 Potential Impacts Associated with Geology and Soils

The construction of the Transmission line requires foundations to be constructed in order to increase the stability of the structure. The depth of the foundations will be determined by the underlying geology of the area. Soil conditions within the study area are considered to be of satisfactory condition for the construction of foundations for the proposed Transmission line.

The greatest impact on the geology and soil associated with the construction of any structures is soil erosion. This impact depends on the soil erosion potential of the overlying soils. The potential soil erosion rate of the area is high due to the nature of the soils and the limited vegetation cover. Erosion potential is anticipated to increase if towers are to be located on slopes with a gradient greater than 20°, as well as during site clearance and construction activities associated with the Transmission line if appropriate mitigation is not implemented. The construction and maintenance of the access/service roads to the tower sites could potentially pose a very high erosion risk in the future, particularly in steep areas and those areas with soils prone to erosion. Without the implementation of appropriate mitigation measures during construction and maintenance activities, this impact is anticipated to be localised and of high significance. However, the implementation of appropriate mitigation measures will effectively minimise this impact.

With the construction of the proposed Transmission line parallel to the existing Hydra-Droërivier 400 kV Transmission line, existing access roads can be utilised, which will decrease the potential for erosion. This in turn will limit the impacts associated with geology and soils.

8.4.1 Conclusions

The potential impacts on geology and soils associated with the construction of the Transmission line parallel to the existing Hydra-Droërivier 400 kV Transmission line will be minimised through the use of existing access/service roads.

Table 8.2: Potential impacts associated with geology and soils associated with the establishment of the Hydra-Gamma 2 Transmission line

Extent	Duration	Probability	Significance	Status	Extent
Construction of powerline towers	Local	Long-term	Likely	High	Negative
Establishment of new access/service roads	Local	Long-term	Likely	High	Negative
Use of existing access/service roads	Local	Long-term	Likely	Low	Negative

8.4.2 Recommendations

In order to minimise the potential for erosion, the following mitigation measures are recommended:

- As far as possible, use should be made of existing access/service roads during the construction and maintenance of the Transmission line.
- Prior to any construction commencing, it must be ensured that erosion problems on existing access/service roads are addressed.
- Maintenance of access/service roads should be on-going throughout the life cycle of the Transmission line.
- All areas that are disturbed during construction should be suitably rehabilitated, and, if necessary, re-vegetated with a suitable grass mix that complements the surrounding natural vegetation.
- Spoil from tower foundations should be used for the in-filling of erosion gulleys or be used in the rehabilitation, which will ultimately result in an aesthetically pleasing landform which blends in with the existing environment.
- As much of the removed rock from foundation areas as possible should be utilised in the construction of access roads (where required), so as to minimise the amount of spoil material, as well as the need for excessive excavation at borrow pit areas.
- Rehabilitated areas that are susceptible to erosion due to their position in the landscape should be adequately protected by soil conservation measures.
- Re-vegetated areas should be monitored every 3 months for the first 12 months and once a year thereafter until the vegetation is stabilised.

- Rehabilitated areas showing inadequate surface coverage (less than 30% within 9 months after rehabilitation) should be prepared and re-vegetated from scratch with a suitable grass mix that blends with the surrounding vegetation.
- Damage to rehabilitated areas should be repaired promptly.
- As the erosion risk will be reduced significantly during the dry season, i.e. winter, excavation activities should be undertaken within this period, where possible.
- Exotic weeds and invaders that may establish on the rehabilitated areas should be controlled to allow pioneer grasses to adequately establish.
- An Environmental Management Plan (EMP) should be compiled outlining site-specific measures which should be implemented to minimise impacts on topography and erosion.

8.5 Potential Impacts on Agricultural Potential

Due to the low potential of the soils, as well as the low annual rainfall (<250 mm) and high summer temperatures (>35°C), the study area is not suitable for dryland cultivation and has, at best, somewhat of a grazing potential.

In general, the agricultural potential of the soils in this area is not high, due to restricted soil depth, subsoil structure and clay content, as well as the prevailing climatic conditions in the area. Therefore, the impact on agricultural potential as a result of the establishment of the Transmission line is considered to be localised and of low significance.

8.5.1 Conclusions

The agricultural potential of the soils in the study area is not high, therefore the impact on agricultural potential is considered to be of low significance.

Table 8.3: Potential impacts on agricultural potential associated with the establishment of the Hydra Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Construction of power line towers	Local	Short-term	Likely	Low	Negative

8.5.2 Recommendations

As the potential impacts on soils and agricultural potential is anticipated to be of low significance, no additional environmental studies are required to be undertaken in this regard.

8.6 Potential Impacts on Vegetation and General Ecology

With the implementation of appropriate mitigation measures, and the use of existing access/service roads within the area (i.e. those along the existing Hydra-Droërivier No 2, 400 kV Transmission line), the proposed Transmission line is not anticipated to impact on any highly sensitive area in terms of natural vegetation. Potential impacts which are anticipated include:

- the total destruction of the vegetation at the tower footprint,
- the loss of rare, endangered and/or protected species (although none were recorded on site, the potential occurrence of these species cannot be ruled out),
- disturbance of natural vegetation along access/service routes through trampling, compaction by motor vehicles etc.,
- establishment and spread of declared weeds and alien invader plants from disturbed areas, which can lead to the eventual replacement of indigenous vegetation.

Although the majority of these impacts are likely to occur, they will be localised and of moderate significance due to the low sensitivity of the vegetation in the area of the proposed site. Through the implementation of appropriate mitigation measures, these impacts can be effectively minimised.

8.6.1 Conclusions

The construction of the additional 765 kV Transmission line will not impact on highly sensitive areas in terms of natural vegetation since vegetation along the study area is considered to be degraded due to the presence of the existing Transmission power lines and related infrastructure.

Table 8.4: Potential impacts on vegetation and general ecology associated with the establishment of the Hydra Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Total destruction of vegetation at the tower footprint	Local	Permanent	Definite	Moderate	Negative
Fragmentation of undisturbed vegetation	Local	Permanent	Definite	Moderate	Negative
Loss of rare, endangered and/or protected species	Local	Permanent	Unlikely	Moderate to High	Negative
Disturbance of natural vegetation along the access routes through trampling, compaction	Local	Short-term	Definite	Moderate	Negative

	Extent	Duration	Probability	Significance	Status
By motor vehicles etc					
Establishment and spread of declared weeds and alien invader plants from disturbed areas	Local	Long-term	Likely	Moderate	Negative

8.6.2 Recommendations

In order to minimise the potential impacts on vegetation and general ecology, the following mitigation measures are recommended:

- *Disturbance of livestock and game during construction and maintenance activities:*
 - * Eskom should notify the landowners regarding access requirements to their property in advance of construction and maintenance such that they can make appropriate arrangements for any sensitive animal species on their property.
 - * Contractors must take note of the nature of the area, and should adhere to the specifications contained within the EMP regarding working hours and noise levels such that disturbance to animals and tourists is limited.
 - * Excavated tower foundations should be appropriately covered in order to prevent injury to livestock and game.

- *Total destruction of the vegetation at the tower footprint:*

The permanent loss of vegetation at the tower footprint area cannot be prevented. It can, however, be minimised through the implementation of the following mitigation measures:

 - * Construction activities should be restricted to the minimum area needed.
 - * Measures should be implemented to prevent spillage of concrete or other substances that could permanently destroy vegetation.
 - * Removal of all excavated material (rocks, excess soil etc.) and construction rubble after construction is completed.

- *Loss of rare, endangered and/or protected species:*

The final substation site should be surveyed and verified by a vegetation specialist to determine:

 - * the actual occurrence of threatened and or protected plant species; and to ensure that appropriate mitigation measures are taken i.e. removal of plants for genetic propagation, relocation of plants (relocation of sensitive species are seen as the last option because of the often unknown secondary impacts of the relocated plants on the receiving environment

- and the low probability of long term survival of the relocated specimens due to often high habitat specificity)
- * Where indicated, sensitive vegetation, habitat or species populations should be adequately protected (e.g. fenced) during construction. Access to these areas should be strictly prohibited.
- *Disturbance of natural vegetation along the access routes through trampling, compaction by motor vehicles, etc.:*
 - * Optimal use should be made of existing access roads such that construction of new access roads is minimised.
 - * No movement of any construction vehicles along the access routes should be allowed after heavy rains until the surface has dried out sufficiently. Heavy penalty fines should be added to the contract for non-conformance.
 - * Construction vehicles must stay within the servitude area and may under no circumstances venture into the adjacent property. Heavy penalty fines should be added to the contract for non-conformance.
 - * After completion of construction, all access roads that will not be used for future maintenance of the servitude should be rehabilitated and re-vegetated if necessary to blend in with the surrounding vegetation.
 - * Areas on construction sites that were visibly compacted by construction activities should be ripped to allow re-establishment of natural vegetation.
 - *Establishment and spread of declared weeds and alien invader plants from disturbed areas:*
 - * Monitoring the potential spread of declared weeds and invasive alien vegetation to neighbouring land and protecting the agricultural resources and soil conservation works are regulated by the Conservation of Agricultural Resources Act (No 43 of 1983) and should be addressed by Eskom on a continual basis.
 - * In view of the fact that the presence of declared weeds is illegal, Eskom are required to comply with the following legally prescribed requirements:
 - a) Take steps to eradicate the declared weeds by using the methods prescribed in the regulations, namely
 - uprooting and burning, or
 - the application of a suitable chemical weed-killer (herbicide), or
 - any other method which will ensure their permanent eradication.
 - b) One may not uproot or remove such plants and dump or discard them elsewhere to re-grow or to allow their seeds to be spread or blown onto other properties.

- c) Non-compliance with the requirements under a) and b) above will result in Eskom being guilty of a criminal offence.

8.7 Potential Impacts on Avifauna

During the scoping phase for the original line, a strong argument for the positioning of the new line adjacent to one of the existing lines was made for the following reasons:

- The more overhead power lines there are together, the more visible they would be to the birds in the area (Avian Power Line Interaction Committee - 1994)
- Resident birds in an area become accustomed to a power line that crosses their flight paths, and learn to avoid it during their everyday activities. Hence adding a new power line adjacent to an existing line would probably have less impact than putting it in a totally new area, where the resident birds are not yet accustomed to overhead power lines.
- Spatially, it makes more sense to have all the threats to birds (in particular through collision) in one relatively confined area, rather than spread out across the landscape.
- Building the new line adjacent to an existing line should theoretically eliminate the need for new access roads and gates etc, and therefore reduce the levels of disturbance and habitat destruction during construction.

8.7.1 Evaluation of current proposed alignment for original line and additional line.

The current alignment passes more or less along the R388 district road and railway line to the west of Nuwejaarsfontein, before turning eastwards and joining up with the existing Hydra Droerivier 1 and 3 lines. It then stays adjacent to this line up until the new Gamma Substation. The placement of the two new lines adjacent to the existing lines is favourable in terms of collision impacts as explained above.

8.7.2 Evaluation of Impacts

As a result of their size and prominence, electrical infrastructure constitutes an important interface between wildlife and man. It is unavoidable that birds get killed through the interaction with power lines. Negative interactions between wildlife and electricity structures take many forms, but two common problems in Southern Africa are electrocution of birds and other animals, and birds colliding with the earthwire and/or conductors (Ledger & Annegarn, 1981; Ledger, 1983; Ledger, 1984). Other problems include electrical faults caused by bird excreta when roosting or breeding on electricity infrastructure (Van Rooyen *et.al.*, 1999),

and disturbance and habitat destruction during construction and maintenance activities.

8.7.2.1 Electrocutions

Electrocutions of birds on overhead lines are an emotional issue as well as an important cause of unnatural mortality of raptors and storks. It has attracted plenty of attention in Europe, USA and South Africa (APLIC 1994; Alonso & Alonso 1999; van Rooyen & Ledger 1999). However, in the context of overhead lines above 132 kV, electrocutions are not a major issue. Electrocutation refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Due to the large size of the clearances on most overhead lines of above 132kV, electrocutions are generally ruled out as even the largest birds cannot physically bridge the gap between dangerous components. In fact, transmission lines have proven to be beneficial to many birds, including species such as Martial Eagles *Polemaetus bellicosus*, Tawny Eagles *Aquila rapax*, African Whitebacked Vultures *Gyps africanus*, and even occasionally Verreaux's Eagles *Aquila verreauxii* by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce (van Rooyen 2004). Cape Vultures have also taken to roosting on power lines in certain areas in large numbers, while Lappet-faced Vultures are also known to using power lines as roosts, especially in areas where large trees are scarce (pers.obs.).

8.7.2.3 Collisions

Collisions are the biggest single threat posed by transmission lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited maneuverability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004, Anderson 2001).

Unfortunately, many of the collision sensitive species are considered threatened in southern Africa. In the period August 1996 to March 2003, seventy-four percent of collision mortalities on Eskom transmission lines that were recorded on the EWT's central incident register of power line mortalities were South African Red Data species (van Rooyen 2003). This trend has continued to the present; the figure currently stands at 76% (van Rooyen 2004b).

Table 8.5: Red Data species (Barnes 2000) collision mortalities on Eskom transmission lines between August 1996 and March 2003, recorded on the EWT central incident register (van Rooyen 2003):

Species	Number
Ludwig's Bustard <i>Neotis ludwigii</i>	77
Blue Crane <i>Anthropoides paradisea</i>	47
White Stork <i>Ciconia ciconia</i> (not included in the SA Red Data book, but protected under the Bonn Convention on Migratory Species)	25
Greater Flamingo <i>Phoenicopterus ruber</i>	22
Kori Bustard <i>Ardeotis kori</i>	9
Cape Griffon <i>Gyps coprotheres</i>	9
Grey Crowned Crane <i>Balearica regulorum</i>	8
Stanley's Bustard <i>Neotis denhami</i>	4
Secretarybird <i>Sagittarius serpentarius</i>	3
Lesser Flamingo <i>Phoenicopterus minor</i>	3
African Whitebacked Vulture <i>Gyps africanus</i>	2
Tawny Eagle <i>Aquila rapax</i>	1
Martial Eagle <i>Polemaetus bellicosus</i>	1
Lappetfaced Vulture <i>Torgos tracheliotus</i>	1
Corncrake <i>Crex crex</i>	1

Although significant in itself, the figures are not a true reflection of the extent of the problem, because none of the collision localities were closely monitored over a substantial period of time. Where long term monitoring did happen, the picture is disturbing. In one instance, where bi-monthly monitoring did take place, a single 10 km section of 132kV distribution line killed 59 Blue Cranes, 29 Ludwig's Bustard, and 13 White Storks in a three year period (van Rooyen unpubl. data). In 2004, fifty-four Blue Crane carcasses were discovered near Graaf-Reinett in the Northern Cape province under 3.7km of distribution line.

Data collected in the Northern Cape province between 1997 and 1999 provides further evidence of the gravity of the problem. During an initial clearing of transects, a total of 194 large bird carcasses were found under 40km of Transmission line (220 and 400kV) near De Aar in the Northern Cape. Subsequent monitoring of 140 km of power lines (transects of 10km each from 22kV up to 400kV) in the same area over a period of 12 months produced another 196 carcasses (mostly cranes and bustards), the majority under transmission lines (Anderson 2001).

The Red Data species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions. Some require very specific conditions for breeding, resulting in very few successful breeding attempts, or breeding might be restricted to very small areas. A good example of this is the two flamingo species that occur in southern Africa, which have experienced very erratic breeding success in southern Africa for several decades (Williams & Velasquez 1997). These species have not evolved to cope with high adult mortality, with the results that consistent high adult mortality over an extensive

period could have a serious effect on a population's ability to sustain itself in the long or even medium term. Many of the anthropogenic threats to these species are non-discriminatory as far as age is concerned (e.g. habitat destruction, disturbance and power lines) and therefore contribute to adult mortality, **and it is not known what the cumulative effect of these impacts could be over the long term.** Using computer modelling, the South African Crane Working Group recently estimated that an annual mortality rate of 150 adult Blue Cranes could reduce the eastern population of Blue Cranes (app. 2000 individuals in Mpumalanga and KwaZulu-Natal) by 90% by the end of the 21st century (McCann *et al* 2001). At that stage the population would be functionally extinct.

From the figures quoted above, it is clear that power lines are a major contributory cause of avian mortality among power line sensitive species, especially Red Data species. Furthermore, the cumulative effects of power lines and other sources of unnatural mortality might only manifest itself decades later, when it might be too late to reverse the trend. It is therefore imperative to reduce any form of unnatural mortality in these species, regardless of how insignificant it might seem at the present moment in time. The addition of the second line adjacent to the first, will in fact reduce the impact of collision, as explained above under evaluation of alternatives.

8.7.2.4 Habitat Destruction

During the construction phase and maintenance of power lines, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads and the clearing of servitudes. Regular maintenance of the powerline servitudes is required in order to prevent interference of vegetation with the operation of the line. These activities could have an impact on birds breeding, foraging and roosting in, or in close proximity of the servitude, through destruction of habitat.

Potential habitat destruction anticipated as a result of the construction of the Transmission line will be limited to the powerline tower positions and the centre line which is generally cleared of all vegetation for stringing purposes. This impact is anticipated to be of low significance as clearance of vegetation for stringing purposes will not be required due to the characteristic low nature of the vegetation.

The construction of the Transmission line parallel to the existing Hydra-Gamma 765 kV line will not require the construction of new access/service roads as the current access roads can be utilised. This will limit the amount of habitat disturbance and destruction in the area. Therefore, potential impacts on habitats are anticipated to be of low significance.

8.7.2.5 Disturbance

The construction of a power line can result in disturbance to birds breeding in the vicinity of the construction activities as a result of vegetation destruction. Should this disturbance take place during a critical time in the breeding cycle (e.g. prior to eggs hatching, or just prior to the chick fledging), it could lead to temporary or permanent abandonment of the nest or premature fledging, resulting in fatality for the eggs or the fledgling. Such a sequence of events can impact on certain large, rare species that only breed once a year or once every two years. This impact is anticipated to be limited with the construction of the Transmission line as the vegetation in this area is considered to be degraded due to the existence of the power lines and related infrastructure.

8.7.2.6 Nesting

Strain towers could serve as roosts and/or nesting platforms for large raptors such as vultures and eagles. This should not pose a problem to the birds, but could result in streamer-induced faults. This impact can be eliminated by the introduction of appropriate mitigation measures.

8.7.3 Conclusions

Potential impacts on avifauna as a result of the construction of the proposed Transmission line parallel to the existing Hydra-Droërivier No 2 400 kV line are anticipated to be of low significance since there are existing Transmission lines and associated infrastructure in close proximity to the study area.

Table 8.6: Potential impacts on avifauna associated with the with the establishment of the Hydra Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Electrocutions	Local	Long-term	Unlikely	None	Negative
Collisions	Local	Long-term	Likely	Moderate	Negative
Habitat destruction	Local	Permanent	Definite	Low	Negative
Disturbance	Local	Short-term	Likely	Moderate to high	Negative
Nesting	Local	Long-term	Likely	Moderate	Positive

8.7.4 Recommendations

- *Collision with overhead power line*
In order to minimise the impacts summarised above, the following mitigation measures are recommended:

- * A suitable marking device¹ should be fitted to earth wires on all sections of line passing across a dam or adjacent to a dam.
 - * A suitable marking device should be fitted to earth wires on all sections of line passing through flats or plains.
 - * Collision of Secretary birds can occur almost anywhere along the Transmission line. This makes mitigation difficult. This study suggests that the entire line be patrolled annually once constructed such that any "hot spots" for collision of this and other species can be detected.
- *Habitat loss or degradation during construction and maintenance*
In order to minimise the impacts summarised above, the following mitigation measures are recommended:
 - * All construction, maintenance and decommissioning activities in any natural habitat along the route of the Transmission line should be carried out in accordance with best environmental practice principles so as to minimise disturbance of any natural habitat.
 - *Disturbance during construction and maintenance*
In order to minimise the impacts summarised above, the following mitigation measures are recommended:
 - * The EWT should be consulted regarding eagles breeding as they are in possession of a database of pairs of eagles nesting on the existing Hydra-Droërivier No 2, 400 kV Transmission line (as this line is continually monitored as part of the Electric Eagle project). Sensitive areas of the line can then be identified and efforts can be made to minimise the disturbance in these areas if construction of the new Hydra-Gamma line occurs during the eagles breeding season.
 - * All construction, maintenance and decommissioning activities in any natural habitat along the route of the power line should be carried out in accordance with best environmental practice principles so as to minimise disturbance to any bird species present.
 - *Nesting*
No mitigation is required as this is a positive impact.

8.8 Potential Impacts on Visual/Aesthetic Aspects

¹ Bird Spirals (such as those fitted already on Hydra-Droërivier 3 and elsewhere in the country) have been shown to be ineffective for Blue Cranes and Ludwig's Bustards (Anderson 2001) and Great Bustard (Janss & Ferrer 1997). At present the EWT in collaboration with Eskom are conducting extensive testing of all available marking devices. The results of this testing will determine which marking device is recommended in the future.

Any change in a local view through the introduction of a new development in the line-of-sight can be considered as a visual impact. Visual impacts are subjective, and are usually considered most significant when the development is not of a similar nature to other developments in the area, or is readily viewed from areas of public access, paths, roads and view points, or in areas which are characterised by significant natural features.

The visual impact assessment for the proposed Transmission line was informed by the generation of maps indicating the visibility of the Transmission line to surrounding areas. The visibility is ranked on a scale of high to low based on the proportion of the Transmission line that is visible (refer to Figure 8.1).

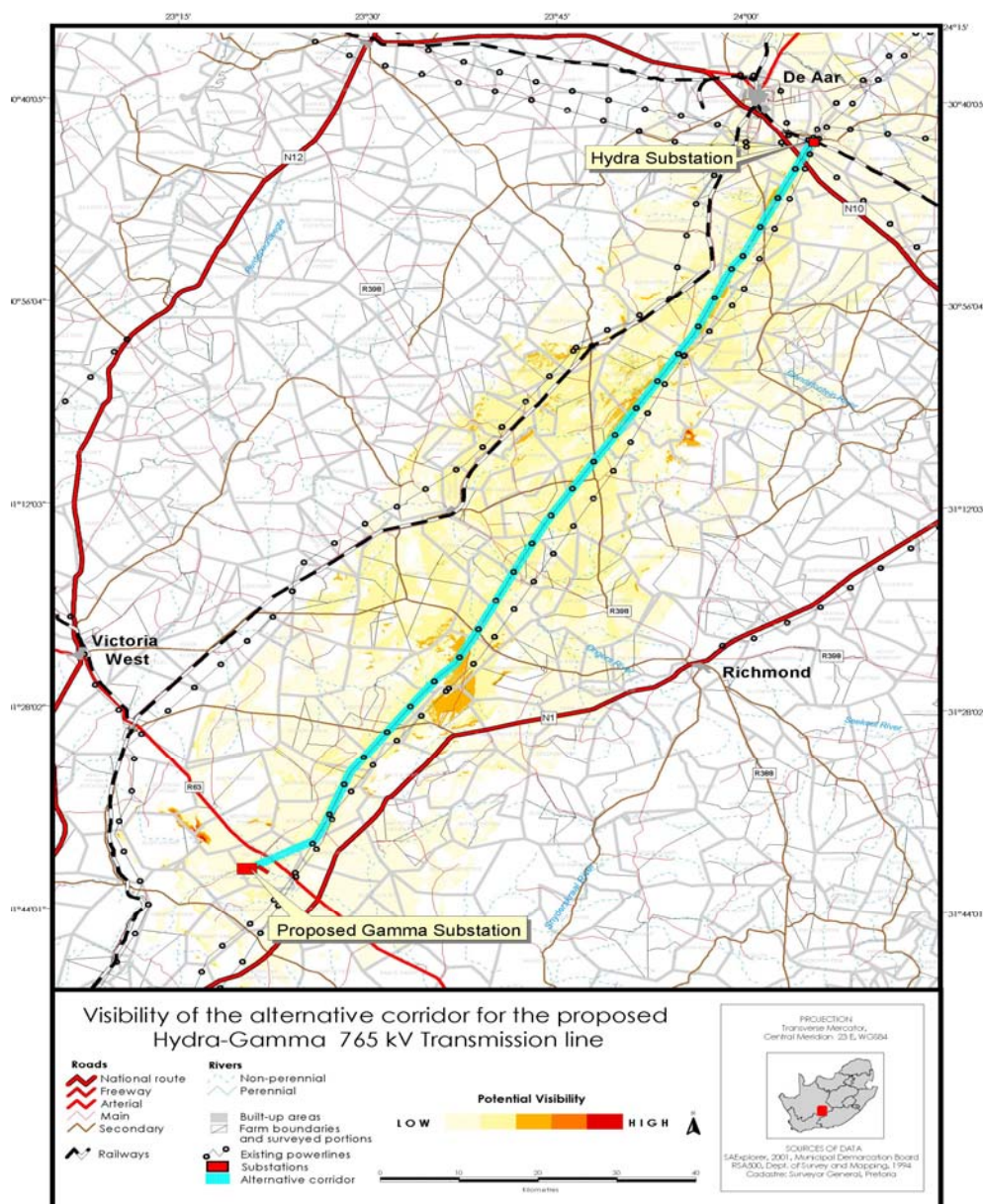


Figure 8.1: Visibility of the proposed Transmission line

8.8.2 Visual Characteristics of the Study Area

The study area can be regarded as having a moderate to low level of aesthetic value, as it consists predominantly of cultivated and grazing lands. In addition, the study area is impacted by existing Transmission line infrastructure (i.e. No 1, 2 and 3 Hydra-Droërivier 400 kV lines and Hydra Gamma 765 kV Transmission power line) Hydra and Gamma Substations and the Victoria capacitor station, which is located approximately 3 km to the east of the Gamma Substation site. Therefore, the visual quality of the area is already impacted by developments of a similar nature.

8.8.3 Visual Intrusiveness

The proposed Transmission line can potentially be viewed from a distance of 10 km (Figure 8.1). The Transmission will be visible from all directions as a result of the flat nature of the topography in the area. However, the visual intrusiveness of the proposed Transmission line will be significantly mitigated as a result of the existing power lines in the area as this new powerline is not anticipated to add significantly to the existing impact. However, where the proposed Transmission line passes in close proximity to residences, this impact is anticipated to be potentially significant. As a result, the potential impact is anticipated to be of moderate to low significance.

8.8.4 Degree of Obstruction

The surrounding flat terrain does not easily obscure the view of the Transmission line. The majority of the proposed corridor is utilised for agricultural purposes, which does not provide a screen against the visibility of the powerline structure. However, the presence of the existing power lines (i.e. No 1, 2 and 3 Hydra-Droërivier 400 kV lines and Hydra Gamma 765 kV Transmission power line) in the vicinity of the proposed corridor will mitigate this impact to some extent and is not anticipated to add significantly to the existing visual impact in the area. Therefore, an impact of moderate to low significance is anticipated.

8.8.5 Character, Quality or Value of the Viewpoint and Compatibility with Surrounding Land Uses

The study area can be regarded as having a moderate to low level of aesthetic value, as it consists predominantly of cultivated and grazing lands. In addition, the study area is impacted by existing Transmission line infrastructure (i.e. No 1, 2 and 3 Hydra-Droërivier 400 kV lines and Hydra Gamma 765 kV Transmission power line) Hydra and Gamma Substations and the Victoria capacitor station, which is located approximately 3 km to the east of the Gamma Substation site.

Therefore, the visual quality of the area is already impacted by developments of a similar nature. Therefore, an impact of low significance is anticipated in terms of this aspect.

8.8.6 Scale of Development

The proposed Transmission line will be 50 m in height. The total footprint area required for each tower is 80 m x 50 m. The Transmission line will be larger than the surrounding developments in terms of height. However, the proposed Transmission line is not anticipated to add significantly to the existing visual impact associated with the existing powerline infrastructure in the area. Therefore, an impact of moderate to low significance is anticipated.

8.8.7 Critical Views

The proposed Transmission line crosses the N10 immediately to the south of the Hydra Substation (near De Aar). The proposed Transmission line will be visible from this road, as well as from the R398, the N1 past Richmond and the R63 (a tar road to Victoria West). However, the visual impact associated with this proposed development is not anticipated to add significantly to the existing impact imposed on the views from this route by the existing Transmission line infrastructure and the capacitor station. Therefore, the potential impact on views from this road is anticipated to be of low significance.

Table 8.6: Potential impacts on visual/aesthetic aspects associated with the establishment of the Hydra-Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Visual intrusiveness	Local	Long-term	Definite	Moderate to low	Negative
Degree of obstruction	Local	Long-term	Definite	Moderate to Low	Negative
Character, quality or value of the viewpoint and compatibility with surrounding land uses	Local	Long-term	Definite	Low	Negative
Scale of Development	Local	Long-term	Definite	Moderate to Low	Negative
Critical views	Local	Long-term	Definite	Low	Negative

8.8.8 Conclusions

The potential visual impact associated with the construction of the Transmission line is anticipated to be of low significance since the study area is already impacted by existing power line infrastructure.

8.8.9 Recommendations

The visual intrusiveness of the proposed Transmission line is anticipated to be significantly mitigated as a result of the existing power lines in the area as this new power line is not anticipated to add significantly to the existing impact, except where this line is proposed to pass in close proximity to residences and/or provincial roads.

8.9 Impacts on the Social Environment

8.9.2 Employment Opportunities

Due to the specialised work to be undertaken during the construction phase of a Transmission line, it is not expected that the proposed project would have any impact on employment opportunities in the area, as locals would not be able to undertake the work.

Limited opportunities for manual labour exist where the local contractor could make use of locals to assist with some activities associated with the construction of the Transmission line (e.g. the installation of gates). The same applies for the construction of the proposed substation (e.g. fencing, access roads).

It is expected that existing Eskom employees would be responsible for the maintenance of the line and servitude, again not impacting on employment opportunities.

8.9.3 Influx of Job Seekers and Impact on Local Population Figures

An influx of workers and job seekers to the area is highly unlikely, as the construction phase of the Transmission line in one specific area is of a short duration and intermittent. The linear type of development of a Transmission line also does not create one central area where job seekers could easily congregate.

The main impact associated with the influx of the temporary construction workers is the activities at the construction camp(s) where these workers would be housed.² It is anticipated that the outsider construction work force could engage in social and sexual relationships with the local communities resulting in the disruption of the social networks in the area. This is especially evident in small-

² It is anticipated that, for the whole duration of the construction period, one construction camp would be situated on the farm Uitvlugtfontein (Eskom's property) where the substation would be built. Additional construction camps could be set up along the way as the construction of the transmission line progresses. These could be situated near the Merriman Station and in the vicinity of De Aar.

scale communities with well established social networks and institutions. Uncontrollable behaviour (e.g. illegal trade in liquor, livestock and other banned substances, unauthorised entry of private properties, sex worker trade, drunkenness, etc.) and the possible dissimilarity in age, gender and race of the outside workforce compared to the resident population could also exacerbate this negative impact.

During the operational phase of the project, local Eskom personnel will be responsible for the maintenance of the Transmission line and servitude. As the general maintenance work would be undertaken approximately once a year, it is not anticipated that these local workers would have a long-term negative impact on the social networks of the area. Some intrusion impacts could be experienced if Eskom workers access properties without prior notification and/or if they do not conform to the specifications as outlined within the EMP (e.g. leaving gates open, travelling on private roads or through open veld, disturbing game etc.). This intrusion impact is, however, only expected to manifest in the short-term.

8.9.3 Population Changes

An additional workforce of approximately 300 individuals in total would have a temporary impact on the local population figures due to the low population density in the study area.

This could result in short-term positive impacts on the local economy as a result of the people staying and spending their money in this area, although it may place additional pressure on the community infrastructure and service requirements (e.g. health care facilities, policing services). This impact is rated as moderate although all 300 individuals would not all be present in the area at any one time.

The operational phase of the project would not result in any population changes and the impact is thus seen as insignificant.

8.9.4 Residential Proximity

Construction related intrusion impacts (concerns regarding the impact on the local environment, public safety, noise and dust effects etc.) on residences are considered to be only temporary and of a moderate significance. The impact on residences (e.g. visual, possible perceived health impacts etc.) would be of a long-term nature once the Transmission line has been erected and concerns have thus been raised with regards to the alignment of the Transmission line near residences, worker accommodation, as well as near accommodation facilities catering for tourists and seasonal hunters.

8.9.5 Disruption in Daily Living and Movement Patterns and Impact on Land-use

During the construction phase it is anticipated that specific Transmission line construction-related activities (e.g. heavy vehicular movement and the construction of access roads) could have an impact on the daily living and movement patterns of the landowners. The intrusion impacts associated with the movement of construction vehicles and workers are seen as a temporary negative impact of moderate significance.

Maintenance of the line and inspection of the servitude will be undertaken for the life of the line. It is not anticipated that this will have a significant impact on the living and movement patterns of the landowners if the conduct of the Eskom workers is in-line with the EMP. Some typical complaints regarding the maintenance of power lines include the following:

- Workers leaving gates open;
- Workers driving on private roads;
- Workers driving through the veld;
- Workers accessing properties without prior notification (disruptive in terms of daily living and movement patterns as property owners would not be able to anticipate the movement through their farms); and
- Workers being suspected of illegal game capturing and poaching, etc.

The effects of misconduct such as those mentioned above would only be temporary, although it could result in long-term secondary negative impacts (e.g. loss of animals and damage to the veld).

8.9.6 Impact on Land and Resource Use

Previously, sheep farming mainly characterised the study area, but there is currently a shift to a combination between sheep, cattle and game farming, as well as eco-tourism activities such as the development of hiking trails. Based on investigations and on comments received from landowners, the proposed Transmission line could, in most cases, have an impact on some of these farming activities. During the construction phase, it is expected that the construction activities of the Transmission line could result in negative impacts on the resource use (displacement of wildlife near the servitude area, impact on breeding patterns of livestock and game, temporary interruption of hunting activities) and land use (e.g. damage to the veld and existing roads, possible erosion) with subsequent income losses.

In most cases these possible negative impacts are expected to manifest in the long-term as any damage to the veld could take some time to be rehabilitated or

recover and the possible loss of animals/wildlife could be seen as a permanent negative impact with severe financial consequences. It should, however, be noted that if the contractor adheres to the guidelines stipulated in the Environmental Management Plan and the contract with Eskom, these negative impacts are not likely to occur.

Although the majority of property owners contacted are of the opinion that the proposed Transmission line would permanently negatively impact on their land value, experience has shown that general commercial farming activities (e.g. sheep farming) could continue without any disruption in terms of the land and resource use in the long-term. Game farming, hunting activities and eco-tourism would also not be severely affected, but one should take into account the fact that the existence of Transmission lines and the subsequent visual impact could negatively influence the "wildlife experience" of hunters and visitors to the area. Property owners accommodating numerous hunters and tourists are of the opinion that these individuals (especially foreigners) are very sensitive with regards to any type of infrastructure development. Some property owners suggested that the proposed new Transmission line therefore be erected adjacent to existing power lines to enable them to concentrate their game farming, hunting and eco-tourism activities away from the concentrated area of power lines. By doing so, they aim to create an "undisturbed" area with no power lines. This would be possible in most cases due to the sizes of the farms, although the power lines traverses the length of some of the farms making this approach less effective. The Social Impact Analysis could, however, not comment on the perceptions and experiences of these hunters and/or tourists as a formal survey regarding this aspect does not fall within the ambit of this study.

The significance of the impact is, nevertheless, still rated as high as any negative impacts on the land and resource use would result in negative financial consequences for the property owners. The Transmission line alignment could play a mitigating role, as the ease and success of undertaking these farming and hunting activities would depend of the final route alignment within the selected corridor.

8.9.7 Formation of Attitudes

At this stage there is no evidence of focused attitude formation by landowners and/or other stakeholders against the proposed project.

8.9.8 Impact on Infrastructure and Services

Infrastructure and services that could be disturbed by power lines include airfields, rivers, roads, railway lines, centre pivot systems and interference with radio and television broadcasts. The following infrastructure may be impacted by

the construction of the Transmission line be parallel to the Hydra-Gamma 765 kV Transmission line:

- The registered airstrip on the farm Verborgfontein, and
- The future planned centre pivot system on the farms Klipkraal and Excelsior.

It is not anticipated that the proposed Transmission line would have any negative effect on the roads and rivers to be crossed, although one property owner indicated his concern about the crossing of the Ongers River. Potential impacts on this river system will be minimised through the implementation of appropriate mitigation measures as will be detailed within the EMP.

The influx of construction workers and job seekers to the area could result in an increased demand for water provision, waste removal and sanitation services, but the contractor is typically responsible for the provision of those services as stipulated in the Environmental Management Plan. If not properly managed, this could have secondary negative impacts on the environment. The impact is thus rated as moderate.

8.9.9 Impact on Local Economy and Regional Benefits

The perception exists that, irrespective of the location of the Transmission line, the existence of such a line on a property would result in the decrease of the property value. Concerns were thus raised that if the proposed Transmission line were constructed within the existing servitude it would divide the properties making it less viable for any hunting and eco-tourism activities with consequent financial losses. Due to the shift to mixed land-use (combination of sheep and game farming and eco-tourism), the preference thus falls with concentrating power lines within a specific section of a property, or to construct these along farm boundaries, or parallel to other infrastructure such as a railway line or road. The majority of property owners therefore indicated that they would prefer the proposed Transmission line to be constructed parallel to existing lines or other infrastructure to minimise the negative economic impact on the properties. Selected property owners, however, oppose this alignment, as they argue that erecting the line parallel to existing lines would again restrict their economic activities thereby negatively impacting their source of revenue.

It is thus not anticipated that the proposed Transmission line would have a significant long term bearing on the Ubuntu and Emthanjeni Municipalities, the local communities and/or on the local economy, although it could assist in improving the electricity service delivery to other parts of the country.

8.9.10 Safety and Security Impacts

Experience has shown that landowners perceive the construction of a power line to impact on their safety and security due to uncontrolled access on their properties and possible game and livestock theft during the construction and operational phase of the project. It is expected that the perceived uncontrolled access to properties could be worsened if there would be a number of lines scattered over a property. The potential influx of workers to the area during the construction phase (especially near the construction camps) is thus seen as an increased security risk.

As concerns have been raised with regards to the misconduct of Eskom workers undertaking maintenance work and accidents that have occurred in the past, it is evident that these concerns would still prevail, irrespective of mitigation measures proposed.

8.9.11 Health Impacts

An increased health risk, such as the spread of HIV/Aids with long-term regional consequences, could be created due to the influx of workers (increase in population) to the area and the social interaction between these outsiders and the local population. Although Eskom or the contractor cannot be held responsible for the social conduct of the workers, they should take note of this impact and assist wherever possible to limit the spread of the disease³.

If construction camp activities and operations (sanitation practices, wastewater management, water provision, solid waste management, facilities, cooking facilities etc.) are not adequately managed, it could have severe negative impacts on the environment with related health problems.

Occupational health risks are also associated with any construction activity such as the construction of a Transmission line and substation. These should be addressed in terms of the requirements of the Occupational Health and Safety Act.

The study acknowledges that the public health risks associated with Electromagnetic fields (EMFs) have not been established within the world-wide scientific community and that no consensus regarding this matter exists. It is therefore difficult to rate the health impact of exposure to Transmission lines on the surrounding communities. Concerns have been raised in this regard, especially in cases where the proposed Transmission line would be situated in

³ According to a representative of the Ubuntu Municipality, the HIV/Aids prevalence amongst the local communities in the area is approximately 20%, which is rated as high.

close proximity to residences. It should be noted, however, that the Eskom servitude requirements take the risks associated with EMF into account, and the EMF levels measured outside of the servitude area are negligible.

8.9.12 Conclusions

Based on the findings from the scoping phase the following interim conclusions can be drawn:

- Due to the size of the farms in the study area it is not expected that the proposed line, irrespective of its exact location, would have adverse social and economic impacts on the properties. Property owners would, in most cases, be able to concentrate their farming, hunting or eco-tourism activities away from the proposed line.
- Construction related activities that could result in negative impacts relate to potential dust and noise pollution
- The majority of landowners consulted indicated that they preferred the proposed Transmission line to be constructed parallel to existing lines or other linear infrastructure. These statements were made against the backdrop of the following anticipated impacts associated with the construction of the Transmission line within the existing Eskom servitude:
 - * Impacts on land-use;
 - * Impacts on future developments including hunting and eco-tourism related activities;
 - * Possible impact on archaeological and historical sites;
 - * The division of farms by the proposed Transmission line and subsequent impact on farming activities and possible economic impacts;
 - * The visual impact of the proposed Transmission line;
 - * Impact on daily living and movement patterns;
 - * Residential proximity (in select cases); and
 - * General construction related impacts.
- Based on the preliminary findings it is anticipated that the negative social impacts could be successfully mitigated.

Table 8.7: Potential impacts on the social environment associated with the establishment of the Hydra-Gamma 2 Transmission line

	Extent	Duration	Probability	Significance	Status
Employment opportunities	Local	Short-term	Likely	Moderate	Positive
Influx of job seekers and impact on local population figures	Local	Short-term	Unlikely	Low	Negative
Population change	Local	Short-term	Likely	Moderate to none	Negative

	Extent	Duration	Probability	Significance	Status
Residential proximity	Local	Long-term	Likely (on certain properties)	High to Low (depending on individual property)	Negative
Disruption in daily living and movement patterns & impact on land-use	Local	Short-term	Likely	Moderate	Negative
Impacts on land and resource use	Local	Long-term	Unlikely	Moderate to high	Negative
Impact on infrastructure and services	Local	Long-term	Likely	Moderate	Negative
Impact on local economy – local properties	Local	Long-term	Likely	Moderate to high	Negative
Impact on local economy and regional benefits	Local & regional	Long-term	Likely	Moderate	Positive
Safety and Security Impacts	Local	Long-term	Likely	Moderate	Positive
Health impacts	Local & regional	Long-term	Likely	Moderate to High	Negative

8.9.13 Recommendations

- *Employment opportunities*
 - * Care should be taken to avoid any potential conflict between the locals seeking employment and the outside workforce. There may be the need for some conflict resolution in this regard.
 - * It was suggested by representatives of the Ubuntu Municipality that the Municipal Manager should be informed of the conditions of the contract to enable him to intervene (if necessary) in the case of conflict between the contractors and the local communities.
 - * Where employment opportunities exist that would require low or medium skills levels, local labour should be used.
 - * Eskom could undertake some skills training to maximise the opportunity for locals to secure employment. In this regard, a labour desk could be created, in consultation with the relevant local authorities, to determine the available skills in the area and the level of training required.
 - * Where possible, on-the-job training should be provided to locals, to develop their existing skills and to ensure that they receive skills that are transferable to other sectors.

- *Influx of job seekers and impact on local population figures*

- * Before construction commences, representatives from the various local authorities, community-based organisations and agricultural unions, as well as the property owners should be consulted. Construction activities and schedules, as well as the location of the construction camps should be discussed and finalised with these representatives and the local property owners.
 - * Illegal and disruptive practices associated with the construction camps such as the selling of liquor, illegal trade in game and livestock, cutting of fences, unauthorised entry on properties, poaching of game and sex worker trade should be avoided. A reporting system should be put in place. The Community Development Office (where locals could lodge general complaints) of the Ubuntu Municipality could serve as a platform where complaints could be lodged.
 - * Property owners should be informed of the correct procedure for lodging complaints with regard to the behaviour of contractors and/or Eskom maintenance workers.
 - * Should there be any dissimilarity between the local population and the outside workforce there might be the need for some conflict resolution. Pro-active conflict resolution practices should be established.
 - * The local police services should be kept informed of the planned developments to ensure that they would be able to adequately deal with any type of disruptive behaviour.
 - * During the operational phase of the project, it would be ideal if the Eskom workers could inform the property owners when they would access the property.
 - * Eskom should continue with the "Gate logbook" system that is currently in place. By using this system Eskom maintenance workers can demonstrate when (date and time) they drove drive through a gate (by referring to the position by means of the tower numbers) and whether the gate was locked, opened or closed.
- *Population change*
 - * Liaison with representatives of the Ubuntu and Emthanjeni Municipalities should continue to enable them to plan for and monitor the impacts associated with the potential population change.
 - *Residential proximity:*
 - * The final route of the Transmission line should, as far as possible, avoid areas of residential development (private residences, worker accommodation and tourist related accommodation facilities) to ensure that the effects on the property owners and tourists in the study area are minimised.
 - * Should the final alignment be located near residences, the property owners should be consulted with regard to the construction schedule and

possible intrusion impacts associated with the construction phase. The negative impacts associated with construction activities should be minimised as far as possible.

- *Disruption in daily living and movement patterns & impact on land-use*
 - * Affected property owners should be notified regarding the construction schedule, as well as the maintenance work schedule.
 - * As far as possible, use should be made of existing access/service roads.
 - * Construction activities, should as far as possible, be scheduled not to coincide with the main hunting and/or lambing season.
 - * Construction camps should be organised in such a manner as to have the least negative impact on the surrounding landowners and local communities. Strict guidelines should be developed to ensure good conduct and these guidelines should be stipulated in the Environmental Management Plan and construction contract.
 - * An on-site Environmental Officer should monitor the contractors responsible for the construction activities.
 - * The erection of uncontrolled informal dwellings at the construction camps should be avoided.
 - * Although the contractor cannot be held responsible for the conduct (especially after hour conduct) of the construction workers, the guidelines as stipulated in the Environmental Management Plan regarding the operation and management of the construction camps should be strictly adhered to.

- *Impacts on land and resource use*
 - * Property owners should be notified of the construction schedule and the maintenance work to be undertaken on properties.
 - * Construction activities, should as far as possible, be scheduled not to coincide with the main hunting and/or lambing season.
 - * Contractors should, at all times, be responsible and act in good faith.
 - * As the impacts on the veld and erosion were noted as grave concerns, contractors should be forced to only utilise existing roads and paths and avoid the creation of additional roads. Fines and penalties should be imposed where this condition is not adhered to.
 - * Strict enforcement of the guidelines should take place.
 - * Livestock and game should, where possible, be moved away from the construction activities or be fenced off without disturbing the rotational grazing system on the farm in question.
 - * Eskom should sensitively deal with concerns regarding the impact on property values and land and resource use.
 - * The final route alignment should be communicated and negotiated with the property owners to ensure the minimum negative financial impact on the property owners.

- * In finalising the route alignment, care should be taken to avoid sensitive areas.

- *Formation of attitudes*
 - * The construction of the powerline near residential developments, tourist facilities and worker accommodation, as well as other hot spots (e.g. airfields, centre pivots etc.) should be avoided as far as possible.
 - * Eskom should take note of the concerns raised with regards to the construction phase of the proposed Transmission line.
 - * Eskom should take note of the alignment preferences of the individual property owners and their concerns regarding the impacts of a new or an additional powerline on their property. These issues must be addressed by Eskom.
 - * Eskom should attend to the existing erosion problems and neglected service and access roads used to access the existing 400 kV Transmission line servitude as soon as possible.
 - * Eskom should continue to communicate with the property owners and inform them of the progress of the proposed project.

- *Impact on infrastructure and services*
 - * In finalising the Transmission line alignment within the selected corridor, Eskom should liaise with the relevant government departments and property owners to identify any possible infrastructure that could be impacted upon.
 - * Areas with landing strips and centre pivot systems should be avoided as far as possible.
 - * Construction camp management should adhere to the guidelines as stipulated in the Environmental Management Plan.

- *Impact on local economy and regional benefits*
 - * Eskom could assist with local skills training to maximise the potential of the local community to establish indirect jobs through the supplying of goods and services to the construction work force.
 - * During the construction phase care should be taken to avoid any negative impacts on farming activities in the area.

- *Safety and security impacts*
 - * Eskom should notify property owners of the construction and maintenance schedules.
 - * Eskom should utilise the latest technology to prevent any fire hazards.
 - * The fire prevention measures as stipulated in the Environmental Management Plan should be strictly adhered to.
 - * Eskom should select the best possible designs and support structures for Transmission line towers.

- * Eskom should adopt high safety standards to ensure that safety and security risks are minimised.
 - * Emergency plans should be developed and implemented in consultation with the property owners and Local Municipalities
- *Health impacts*
 - * Eskom should continue to monitor studies on the subject of EMFs and should make any new information available to communities.
 - * Eskom should commit itself to building a Transmission line that would not be harmful to the health of any residents (e.g. such as the safety exclusion zone of 80 meters).
 - * Any possible exposure effects and related health concerns should be mitigated through the application of relevant design standards.
 - * Contractors should not leave any waste behind upon closure of the construction camp.
 - * Eskom and/or the contractor should provide basic on-site health care facilities for the construction workers.
 - * Adequate and appropriate sanitation and wastewater management facilities should be implemented as specified in the Environmental Management Plan.
 - * Eskom should liaise with the local authorities and health care practitioners with regard to service requirements and the establishment of an emergency plan in the case of accidents.
 - * Aids Awareness Campaigns should be intensified during the construction phase of the project. These could possibly link with the existing work undertaken by the Apollo Love Life centre.

8.10 Impacts on Tourism Potential

The following table indicates the farms along the proposed Transmission line corridors with tourism establishments that might be visually impacted by the proposed Transmission line development. It provides a description of each establishment, as well as an indication of its relation to the Transmission line.

Table 8.8: Tourism operations potentially affected by the proposed Transmission line development

Farm Name / Establishment	Description of Tourism Operation	Existing / Future Operation	Relation to Proposed Transmission Line
Nuwejaarsfontein	Hunting Operation	Existing	Existing lines cross hunting section of the farm
	Look-out point for guests	Future	N/A

Draayfontain	Historical and archaeological sites	Future	Existing lines cross this property
Farm Name / Establishment	Description of Tourism Operation	Existing / Future Operation	Relation to Proposed Transmission Line
Burgersfontein	"Bergskilpad" Nature Reserve with hiking routes	Future	Existing lines cross this property

Potential impacts of the proposed Transmission line on tourism potential include impacts on visitor numbers, visual impacts on lodges and hunting activities, visual impacts on future tourism prospects (such as historical and archaeological sites) and potential impacts on land value.

As the Transmission line is proposed to be constructed parallel to the existing Hydra-Gamma 765 kV Transmission line the visual impact is not anticipated to be of high significance, although there may be some impact on hunting operations on the farm Nuwejaarsfontein's during the construction phase.

8.10.1 Conclusions

The most important tourism related businesses in the area that will be affected by the proposed Transmission line are hunting and farm stays. The landowners in the area are generally accepting of the fact that the Transmission line is required to be constructed. Their suggestion, however, is for it to be constructed adjacent to existing lines in order to minimise the visual impact.

Moreover, existing lines already have access roads for maintenance teams, and therefore additional access roads do not have to be constructed with the construction of the Transmission line. This will also impact on the land value.

8.10.2 Recommendations

As the potential impacts on tourism potential are anticipated to be of low significance, no additional environmental studies are required to be undertaken in this regard.

8.11 Potential Impacts on Sites of Archaeological, Cultural and Historical Interest

The 1994 survey along the route of the Droerivier-Hydra 400 kV transmission line (Morris, 1994) revealed a total of 98 specific sites along the route between Hydra substation and the vicinity of the capacitor bank near the Gamma substation, 21

of them of "higher" and "highest" significance. Few of these were expected to be directly impacted by the line (most lay away from tower positions, and roads were expected to be low-impact 'twee-spoor' tracks). An Earlier Stone Age site (Verborgen Fountain Site 3) at one of the tower positions was salvaged as a mitigation measure. Earlier, Sampson (1985:21) had made the relevant observation that power lines in the Zeekoei Valley had had "no marked impact on surface sites".

Table 8.9: Locales of "higher" (ranked 6-8 out of 10) and "highest" (ranked 9-10 out of 10) significance along the 765 kV corridor between the Hydra and Gamma substations (Based on Morris, 1994).

Abbreviations: ESA = Earlier Stone Age; MSA = Middle Stone Age; LSA = Later Stone Age; OES = Ostrich eggshell.

Site/Farm	Lat-Long	Description	Significance
Hartebeest Hoek 1	30.45.26 24.04.35	Mixed ESA, MSA, LSA high density	9
Ezels Fountain 2	30.58.12 23.57.11	LSA Oakhurst below hill	9
Ezels Fountain 3	30.56.19 23.58.54	LSA surface scatter, East of line.	7
Jaag Poort 1	31.00.06 23.55.33	LSA scatter	6
Orange Valley 1	31.05.47 23.51.48	LSA late Wilton Complex with end scrapers, east of line	10
Droogefontein 1	31.06.07 23.51.33	LSA late Wilton Complex with lithics, OES	10
Verborgen Fountain 1	31.10.09 23.49.10	LSA in middle of flat pan, localized scatter	9
Verborgen Fountain 2	31.12.33 23.47.26	ESA with bifaces, flakes, blades, cores	10
Verborgen Fountain 3	31.13.21 23.46.48	ESA high density on slope and top of terrace. <i>NOTE: This site was salvaged in 1995</i>	10
Patryfontein 1	31.19.30 23.42.36	MSA, LSA and small colonial era stone structures	8
Patryfontein 2	31.20.17 23.41.58	Twin-lobed circular stone structure (not corbelled), west of line	8
Excelsior 1	31.24.12 23.39.17	MSA, heavily weathered	9
Excelsior 2	31.25.30 23.38.00	LSA Oakshurst, MSA	7
Rondavel 1	31.26.46 23.36.41	MSA & LSA – highly weathered	7
Rondavel 2	31.26.48	LSA Wilton Complex in cleared	7

	23.36.40	areas on ridge	
Rondavel 3	31.27.47 23.35.71	LSA Wilton Complex south of ridge	7
Bult en Reitfontein 1	31.31.57 23.31.39	LSA Oakhurst at watercourse	9
Nieuwefontein 1	31.32.49 23.30.50	LSA late Wilton Complex with small stone circle, OES eroding out.	8
Wynandsfontein 1	31.34.16 23.29.36	Colonial era structure at bottom of Blouberg.	9
Kleinfontein 1	31.39.53 23.25.59	MSA, south side of watercourse	8
Kleinfontein 2	31.39.55 23.25.58	MSA, LSA mixed on slight slope with vestigial hairline engravings on badly weathered rock surfaces	7

Inspection of the proposed tower positions may reveal further sites, once these positions are known. In general, features in the landscape where sites can be expected to occur include:

- Hills, generally of dolerite, where rock engravings may often be found. Only one site with vestiges of hairline engravings was found along this stretch of the corridor, but others may well occur. Tower positions on dolerite koppies should be regarded as potentially sensitive in this respect.
- Pans and watercourses would often have been foci of human activity and this is reflected by higher densities of archaeological traces along watercourses and in pan margins.

Several other sites have been identified within the study area. All these heritage resources are protected in terms of the National Heritage Resources Act (No 25 of 1999).

Table 8.9: Heritage sites recorded within the study area

Site/Farm	Description
Bulberg	Numerous fossils; archaeological sites; frontier/colonial era structures, were identified by fieldworkers, all directly within the servitude.
Draayfontein	Rock engravings were reported from the vicinity of Kamrand.
Sterkfontein	Two sets of site(s) – stone age and rock art – were identified by fieldworkers within the servitude
Merriman	Masonry Blockhouse
Deelfontein	Various features including ruin of hospital and cemetery

In addition, known archaeological and rock art sites exist on the farms Nieuwejaars Fountain, Minfontein and Deelfontein (Morris 1991; 2000b).

In general, the proposed corridor does not pass in the vicinity of areas of significant archaeological site (an example is the farm Burgersfontein on which an especially rich Ceramic LSA site occurs) and, therefore, the proposed development is not expected to have a highly negative impact (refer to Sampson 1985:21) on the majority of surface Stone Age sites located en route. However, it should be noted that archaeological material, by its very nature, occurs below ground. Therefore, the possibility exists that archaeological sites may be exposed during the construction work. Therefore, potential impacts on heritage sites are anticipated to occur with the construction of the proposed Transmission line, unless appropriate mitigation measures are implemented. It is anticipated that these potential impacts will be reduced through the construction of the proposed Transmission line in parallel with the Hydra-Droërivier No 2, 400 kV Transmission line as this area has been historically disturbed as a result of the construction of the existing Transmission lines and associated infrastructure.

Table 4.8: Potential impacts on heritage sites associated with the establishment of the Hydra-Gamma Transmission line

	Extent	Duration	Probability	Significance	Status
Construction of Transmission line	Local	Permanent	Likely	Moderate to high	Negative

8.11.1 Conclusions

The potential impacts may be reduced through the construction of the proposed Transmission line parallel to the existing Hydra-Gamma 765 kV line as this area has been historically disturbed as a result of the construction of the existing Transmission lines and associated infrastructure.

8.11.2 Recommendations

Once the final Transmission line alignment has been determined and the tower positions identified, sections of the route which are deemed to be in potentially sensitive locations should be inspected in detail by a suitably qualified heritage specialist.

If an artefact is uncovered on site, work in the immediate vicinity shall be stopped. Reasonable precautions must be taken to prevent any person from removing or damaging any artefacts. In addition, the local Provincial office of the South African Heritage Resources Agency (SAHRA) or the National Monuments Council must be informed such that a heritage consultant can be appointed to

record the site and excavate if necessary. Work may only resume once clearance is given in writing by the heritage consultant.

If a grave is uncovered on site or discovered before commencement of work, all work in the immediate vicinity of the grave shall be stopped. Arrangements must be made for an undertaker to carry out an exhumation and reburial. The undertaker will, together with the National Monuments Council, be responsible for attempts to contact the family of the deceased and for the site where the exhumed remains can be re-interred. It should be noted that any graves older than 60 years can only be exhumed by an archaeologist. Graves of victims of conflict requires additional permits from SAHRA before they can be relocated.