ESKOM TRANSMISSION
PROPOSED GAMMA SUB-STATION
EIA: 12/12/20/873

FINAL ENVIRONMENTAL IMPACT REPORT

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Proposed Gamma Sub-Station
EIA: 12/12/20/873

Final Environmental Impact Report

Report prepared for:

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ENVIRONMENTAL IMPACT STATEMENT

Background

Eskom's transmission network, supplying electricity to the greater Eastern and Western Cape areas, is running short of capacity. To counter this situation and to meet projected future electricity demand, Eskom is planning to strengthen its transmission network by constructing a 765 kV transmission line backbone through the centre of the country, linking its main generating facilities in Mpumalanga, with demand centres in the Western and Eastern Cape. The location of the proposed Gamma Sub-station is indicated by an optimal distance between the Perseus (Dealesville) and Omega (Koeberg) Sub-stations, being approximately equidistant. It also serves as an off-take for the proposed 765 kV transmission lines to the Grassridge Sub-station near Port Elizabeth. A sub-station is required to tap off electricity in this way and to house the switchgear.

Gamma Sub-station

The proposed sub-station is located on the farms Uit Vlugt Fontein No. 233 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities and will cover an area of at least 1.5 x 1.15 km^2 (172 ha). When fully operational, the sub-station will have five incoming EHV power lines and five 765 kV feeder power lines going out. In addition, power from the 765 kV incoming lines will also be used to boost the supplies in the existing 400 kV lines. In 2005, environmental authorisation was issued for the proposed Gamma Sub-station to be located on the farm Uit Vlugt Fontein near Victoria West, Northern Cape. However, recent planning has indicated that the proposed Gamma Sub-station would be more ideally located about 10 km to the east of the original site.

For the proposed Gamma Sub-station, there are three alternatives under consideration:

- The proposed site on the farm Uit Vlugt Fontein No 223, bordering on the farm Schietkuil No 3.
- An alternative site on the farm Uit Vlugt Fontein, for which a positive Record of Decision was issued by DEAT (as explained, Eskom has decided to move the location of the sub-station).
- The "no go" or no-development alternative.

Summary of the key findings

To investigate the key issues of the proposed Gamma Sub-station, ten specialist studies were undertaken. In addition, material drawn from Eskom was used to inform the assessment of issues and associated potential impacts. Importantly, for the most part, the impact assessment has been carried out at a high level of confidence.

Faunal Assessment. In total, twenty-two faunal species with conservation concern were identified. Of note is the riverine rabbit (Critically Endangered), which is potentially most vulnerable due to its particularly limited distribution range and the fact that they are extreme habitat specialists. Although potential riverine rabbit habitat does occur on the proposed site, the habitat is thought to be of a low quality. Also, there are currently no records for riverine rabbits at the proposed site. Nevertheless, Eskom will compensate for any potential loss/transformation of habitat by contributing towards the conservation of riverine rabbit habitat elsewhere, i.e. off-set mitigation.

Avi-faunal Assessment. The potential impacts of the proposed sub-station on the birds of the area are: destruction of habitat, disturbance, electrocution of birds on sub-station infrastructure, collision of birds with the communications tower, and the impact of birds on the operation of the sub-station. Importantly, none of these impacts are considered to be of high significance and mitigation measures for these impacts will be implemented.

Wetland Assessment. There are no wetland or riverine areas that will be directly impacted by the construction and operation of the sub-station. The probability that a wetland or riverine area would be impacted is low at a medium confidence level. There are a few intermittent streams that should be avoided if they fall within transportation pathways during the construction of the project.

Vegetation Assessment. The vegetation of the proposed Gamma Sub-station site falls in the Nama-Karoo Biome, more specifically in the Upper Karoo Bioregion. Overall, the Vegetation Type ranks low for conservation value and the use of less than 0.004% of the Eastern Upper Karoo for a sub-station will not jeopardize any conservation plans for this Vegetation Type. Only one species of special concern was recorded on the Gamma Sub-station site (*Boophone disticha* or gifbol), which will transplant easily. All other protected species recorded on site are abundant in the greater area.

Geotechnical Assessment. Findings indicated that both sites are underlain by fairly competent founding material and that the calcrete on Uit Vlugt Fontein can be used both as a founding medium and for the construction of pavement layers. In terms of drainage, ponding and surface run-off, the Uit Vlugt Fontein site does not require any additional preparations/precautions whereas Kleinfontein is located down-slope from a small earth embankment dam and precautions are required to prevent flooding due to over topping of two drainage courses (with their confluence located in the near vicinity). Ample groundwater and surface water are available at Kleinfontein whilst Uit Vlugt Fontein will most probably require one or more boreholes. Good quality pavement layer construction material is available on Uit Vlugt Fontein, whereas material for Kleinfontein will have to be imported. It was recommended that the proposed Gamma Sub-station be located on Uit Vlugt Fontein and that the groundwater sources be investigated and, if required, boreholes drilled, pump tested and the water quality analysed.

Land-use Assessment. The determining elements affecting land-use in the area are rainfall, soils and vegetation, which give rise to a very low level of primary productivity in the study area, which limits primary land-use to extensive livestock production (the dominant form of agriculture throughout the region). The direct impact of the development on land-use will, therefore, not be significant. It is recognised that this is not valuable land and, therefore, the damage done either to the surface of the site or collateral damage off site will not result in costly losses. Nevertheless, it remains necessary to respect the fragility of the environment and, in particular, to ensure that excess sediment is not delivered to the adjacent drainage lines.

Visual and Aesthetics Assessment. The sub-station will be dominant in the landscape due to the low visual absorption capacity of the landscape, and the uniformity of the visual landscape and lack of diversity will result in a visual contrast. However, as the study area has a relatively undefined sense of place, the visual impact will not have a high significance on the modification of the *Genius Loci* as the sense of place has already been affected by existing infrastructure and the close proximity of the R63. The visual intrusion will not have a significant impact or influence on existing land-uses. The visual impact is regarded as significantly low, notwithstanding the large extent and height of the sub-station, the low visual absorption capacity and the close proximity to the R63 and the N1. The significance is tempered by the low surrounding hills, the already altered landscape due to existing transmission lines, a capacitor station and major roads, and the lack of economic activities that rely on the visual environment, such as game reserves, conservation areas and lodges. The visual impact can be reduced to some extent by implementing the recommended mitigation and management measures.

Social and Socio-economic Assessment. The assessment of social and socio-economic impacts (for example, employment opportunities, effects of construction camps, pressure on existing infrastructure, effects on safety and security, effects on farming, operation-specific effects, cumulative impacts, etc.) shows that there are no negative impacts which can be classified as fatal flaws, or which are of high significance thereby blocking the project, provided that mitigation measures are undertaken. Monitoring indicators include employment opportunities and use of local contractors, and health and safety.

Transportation. At the original sub-station site, access would be off the N1, which could cause hazard on the N1 (an upgrade of the existing intersection would be required). At the new sub-station site, access would be off the R63, which has very light traffic and a fairly low standard intersection should suffice. Common to both sites is the Kleinfontein N1/R63 Intersection and it may be necessary to consider safety measures at this intersection due to the very high volume of traffic (and high percentage of heavy vehicles) on the N1. This will be limited to the construction period and will probably consist of speed reductions on the N1 as well as rumble strips in combination with signage. However, depending on from where construction materials come (Johannesburg or Port Elizabeth), this could be relevant to the new proposed site or both sub-station sites. From a transportation perspective, the new proposed sub-station site is preferred to the original site.

Cultural Heritage Assessment. At the sub-station site there is a presence of miscellaneous Middle Stone Age stone knapping debris and the artefacts are water washed and weathered, on patinated shale, and are part of colluvial down slope wash. Also, a concentration of archaeological material exists comprising weathered Early Stone Age flakes and cores are mixed with Middle Stone Age knapping detritus. It appears that episodes of soil deflation and pedogenesis have caused the two temporally disparate traditions to mix. Artefacts are eroding open, exposed by down slope wash, and are mixed with other colluvial debris. These sites have low heritage significance for their scientific value.

Conclusion

The key issues, which require attention and consideration, include the potential impact on the riverine rabbit and the proposed off-set mitigation, the visual and aesthetic impact on the landscape, and the translocation of *Boophone disticha* or gifbol plants. Also of importance is the minor disruption to the social and socio-economic environment, and the few employment opportunities created.

However, importantly, on long high voltage transmission lines, sub-stations are needed every 400 to 450 km to house equipment. For the proposed Gamma Sub-station, Eskom wants to place the sub-station next to its three existing 400 kV transmission lines and reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure. Further, if the Gamma Sub-station is built in proximity to the existing 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines. To this end, the proposed Gamma Sub-station will be built with transformers to step down the voltage from 765 kV to 400 kV, and this additional power can then be fed into the 400 kV lines for onward transmission. Also, by placing both the existing 400 kV and the 765 kV transmission lines close together and bringing them down the same basic route, the voltage correction function that is necessary for all the lines and feeding extra power to the 400 kV line from the 765 kV line can be housed within the confines of the same dedicated facility. Alternatively, if the Gamma Sub-station is built approximately 10 km to the west (where originally it was intended to be), it would require a high voltage line to link the different components. This would require additional lengths of transmission lines, additional servitudes from landowners, and a greater environmental footprint for the requisite infrastructure. Also, Eskom can save a substantial amount of money by not having to construct possibly up to 60 km of additional power lines (at an estimated R 2.5 million per kilometre).

Further, if the project were not constructed, Eskom would not address the purpose, need and desirability for the construction and operation of the sub-station. It would effectively mean that the power supply to large areas of the country would not be made more secure nor bolstered or augmented. It would place the lives of millions of people and expose the economies of large areas to grave risks. Furthermore, new economic developments in the Eastern and Western Provinces would not be possible. Therefore, it is of strategic national importance that the proposed sub-station be constructed and, as shown in this environmental assessment, the new proposed site is favoured over the original site (for which environmental authorization has already been obtained).

OMGEWINGSIMPAKSTELLING

Agtergrond

Eskom se transmissienetwerk wat elektrisiteit aan die Oos- en Wes-Kaap voorsien, se kapasiteit skiet te kort. Om hierdie situasie teen te werk en in voorspelde elektrisiteitsbehoeftes te voorsien, beplan Eskom die versterking van die transmissienetwerk deur die konstruksie van 'n 765 kV transmissielyn deur die middel van die land. Hierdie lyn sal die hoof kragopwekkingsfasiliteite in Mpumalanga, met die aanvraag in die Wes- en Oos-Kaap te verbind.

Die ligging van die voorgestelde substasie word bepaal deur die optimale afstand tussen die Perseus (Dealesville) en Omega (Koeberg) Substasies, en is ongeveer ewe ver van elkeen van hierdie twee substasies af. Dit dien ook as 'n aftakpunt vir die voorgestelde 765 kV transmissielyne na die Grassridge Substasie naby Port Elizabeth. 'n Substasie word benodig vir die aftakking van elektrisiteit en om skakeltoerusting te huisves.

Gamma Substasie

Die voorgestelde substasie is op die plase Uit Vlugt Fontein No. 233 en Schietkuil No 3 in die Pixley ka Seme en Sentraal Karoo Distrik Munisipaliteite geleë en sal 'n area van ten minste 1.5 x 1.15 km^2 (172 ha), beslaan. Wanneer die substasie ten volle in bedryf is, sal daar vyf inkomende EHV kraglyne en vyf uitgaande 765 kV voeder kraglyne wees. Die krag vanaf die inkomende 765 kV lyne sal ook gebruik word om die krag voorsiening aan die 400 kV lyne te versterk. Omgewingsmagtiging vir die Gamma Substasie op die plaas Uit Vlugt Fontein, naby Victoria-Wes in die Noord-Kaap, is in 2005 toegestaan. Onlangse beplanning het egter getoon dat dit meer ideal sal wees indien die voorgestelde Gamma Sub-station ongeveer 10 km oos van die oorspronklike terrein geplaas word.

Daar word drie alternatiewe vir die voorgestelde Gamma Substasie oorweeg:

- Die voorgestelde terrein op die plaas Uitvlugtfontein 265, aangrensend aan die plaas Schietkuil 3.
- 'n Alternatiewe terrein op die plaas Uitvlugtfontein 265, waarvoor 'n positiewe Rekord van Besluit reeds deur DEAT uitgereik is (soos vroeër verduidelik het Eskom besluit om die ligging van die substasie te verskuif).
- Die "no go" of "geen-ontwikkeling" alternatief.

Opsomming van belangrikste bevindinge

Ten einde die sleutel kwessies wat met die voorgestelde Gamma Substasie gepaard gaan te ondersoek, is tien spesialisstudies onderneem. Daarmee saam is materiaal wat deur Eskom voorsien is gebruik om die kwessies en impakte toe te lig. Wat van belang is, is dat die impak studie orr die algemeen met a hoë mate van vertroue uitgevoer is.

Fauna Studie. Daar was in total twee-en-twintig fauna spesies van bewaringswaarde geïdentifiseer. Die spesie wat potensieël die mees kwesbaar is, is die oewer konyn ('n krities bedrygde spesie), weens hul beperkte verspreiding en die feit dat hulle ekstreme habitat spesialiste is. Alhoewel daar potensieële oewer konyn habitat op die voorgestelde terrein voorkom, word dit as van lae gehalte beskou. Daar is vereder ook geen bestaande rekords van oewer konyne op die voorgestelde terrein nie. Desnieteenstaande, sal Eskom vir die potensiële verlies of omvorming van habitat kompenseer deur by te dra tot die bewaring van oewer konyn habitat elders, d.w.s. 'n teëwig maatreël.

Avi-fauna (Voëllewe Studie). Die potensiële impakte van die voorgestelde substasie op voëllewe is soos volg: vernietiging van habitat, versteuring, voëls wat op substasie infrastruktuur deur elektrisiteit geskok word, botsings van voëls met die kommunikasietoring en die impak van voëls op die bedryf van die substasie. Dit is belangrik om daarop te let dat nie een van hierdie impakte as gewigtig beskou word nie en dat versagtingsmaatreëls geïmplementeer sal word.

Vleiland Studie. Daar is geen vleilande of rivierkom areas waarop die konstruksie en bedryf van die substasie 'n direkte impak sal hê nie. Die moontlikheid dat daar 'n impak op 'n vleiland of rivierkom areas mag wees is dus klein, met 'n medium sekerheidsvlak. Daar is 'n paar nie-standhoudende strome wat vermy sal moet word, want hulle sal tydens konstruksie van die projek binne die vervoer roetes val.

Plantkunde Studie. Die plantegroei op die voorgestelde Gamma Substasie terrein val binne die Nama-Karoo Bioom en meer spesifiek, die Bo-Karoo Biostreek. Oor die algemeen het hierdie plantegroei tipe 'n lae bewaringswaarde en die benutting van minder as 0.004% van Oostelike Bo-Karoo vir die substasie sal geen bewaringsplanne vir hierdie plantegroei tipe in die wiele ry nie. Slegs een spesie van spesifieke belang is op die Gamma Substasie terrein opgeteken (*Boophone disticha* of gifbol), maar dié verplant maklik. Alle ander bewaarde spesies wat op die terrein aangeteken is, kom in oorvloed in die omliggende omgewing voor.

Geotegniese Studie. Bevindinge dui daarop dat beide terreine deur redelike stewige fondasie material onderlê word en dat die kalk op Uitvlugtfontein as 'n fondasie medium vir die konstruksie van bestratingslae gebruik kan word. So ver as wat dreinering, poelvorming en oppervlakte afloop betref, noodsaak die Uitvlugtfontein terrein nie addisionele voorbereidings of voorsorg nie. Die Kleinfontein terrein is egter bult af van 'n klein grondwal dammetjie geleë en voorsorg sal getref moet word ten einde vloeding van die twee dreinerings lyne, wat in die omgewing saamvloei te verhoed. Genoegsame ondergrondse- en oppervlakte water is op Kleinfontein beskikbaar, terwyl Uitvlugtfontein heel moontlike een of meer boorgate sal benodig. Goeie kwaliteit bestratingslaag konstruksie material is op Uitvlugtfontein beskikbaar, maar sal vir Kleinfontein van elders ingebring moet word. Dit was aanbeveel dat die voorgestelde Gamma Substasie op Uitvlugtfontein gebou word en dat ondergrondse waterbronne ondersoek word en indien nodig, boorgate geboor en gepomptoets word en die water kwaliteit analiseer word.

Grondgebruik Studie. Die faktore wat grondgebruik in die area beïnvloed is reënval, grondtoestande en plantegroei wat lei tot die lae vlak van primêre produktiwiteit in die studie area. Dit beperk dus die primêre grondgebruik tot intensiewe veeproduksie (die oorwegende landbouvorm deur die hele streek). Die direkte impak van die ontwikkeling op grondgebruik sal dus nie gewigtig wees nie. Dit word aanvaar dat hierdie nie waardevolle grond is nie en dat skade aan die oppervalkte van die terrein, of selfs kollaterale skade dus nie tot ernstige verliese sal lei nie. Desnieteenstaande is dit noodsaaklik om die broosheid van die omgewing te respekteer en spesifiek te verseker dat oormatige sediment nie in aangrensende dreineringslyne beland nie.

Visuele en Estetieka Studie. Die substasie sal dominant op die landskap wees, weens die lae visuele absorpsie kapasiteit van die landskap asook die eenvormigheid van die visuele landskap en die gebrek aan diversiteit wat tot visuele kontras sal lei. Die studie area het egter 'n ongedefinieërde 'sense of place' (*Genius Loci*) en daarom sal die visuele impak op die verandering in die *Genius Loci* nie gewigtig wees nie, omdat dit reeds deur die bestaande infrastruktuur in die nabyheid van die R63 versteur is. Die visuele indringing sal nie grondgebruik beïnvloed of 'n gewigtige impak daarop hê nie. Die visuele impak se gewigtigheid word as laag bestempel, nieteenstaande die groot omvang en hoogte van die substasie, die lae visuele absorpsie kapasiteit, en die nabyheid van die R63 en die N1, nie. Die gewigtigheid word getemper deur die lae omliggende heuwels, die reeds versteurde landskap weens bestaande transmissielyne, 'n kapasitorstasie en hoofpaaie, asook 'n gebrek aan ekonomiese aktiwiteite, soos wildsreservate en bewaringsareas wat op die visuele omgewing staat maak. Die visuele impak kan tot 'n mate verminder word deur die implementering van voorgestelde versagtings- en bestuursmaatreëls.

Sosiale en Sosio-ekonomiese Studie. Die studie van sosiale en sosio-ekonomiese impakte (byvoorbeeld werksgeleenthede, die effek van konstruksiekampe, druk op bestaande infrastruktuur, veiligheid en sekuriteit, die effek op boerdery, bedryfs-spesifieke impakte, kumulatiewe impakte, ens.) toon dat daar geen negatiewe impakte is wat as noodlottige foute geklassifiseer kan word, of wat gewigtig genoeg is om die projek te stuit nie, solank as versagtingsmaatreëls onderneem word. Aanwysers vir monitering sluit werksgeleenthede, die gebruik van plaaslike kontrakteurs, asook gesondheid en veiligheid in.

Vervoer. Toegang tot die oorspronklike terrein sou vanaf die N1 gewees het. Dit kon gevaarlik gewees het, aangesien dit die opgradering van die bestaande kruising sou noodsaak. Toegang tot die nuwe terrein sal vanaf die R63 wees wat baie ligte verkeer dra en 'n redelike lae standaard kruising sal dus voldoende wees. Beide terreine het egter die Kleinfontein N1/R63 kruising in gemeen en weens die hoë verkeersvolumes (waarvan 'n groot persentasie swaar voertuie is) mag dit nodig wees om veiligheidsmaatreëls by hierdie kruising te oorweeg. Dit sal egter tot die konstruksie periode beperk wees en kan heel moontlik spoed beperkings op die N1, tesame met 'n kombinasie van grommelstroke en padtekens insluit. Afhangende van die oorsprong van konstruksie materiaal (Johannesburg of Port Elizabeth), kan dit relevant wees tot die nuwe, of beide substasie terreine. Vanuit 'n vervoer perspektief, geniet die nuwe substasie terrein voorkeur.

Kulturele Erfenis Studie. Daar is algemene Middel Steentydperk klipwerktuigafval op die substasie terrein teenwoordig. Hierdie artefakte is deur water gespoel en verweer op gepatineerde skalie en is deel van kolluviale afspoeling. Verder is daar 'n konsentrasie van argeologiese materiaal wat uit verweerde Vroeë Steentydperk vlokke en kerne, gemeng met Middel Steentydperk klipwerktuigafval, bestaan. Dit wil voorkom asof grondafsetting en bodemvorming die vermenging van die twee veroorsaak het. Artefakte verweer in die oopte, waar dit blootgelê is deur verspoeling en waar dit met ander kolluviale afval meng. Die terreine het 'n lae wetenskaplike erfenis waarde.

Samevatting

Die sleutel kwessies wat aandag en oorweging verg, sluit die potensiële impak op die oewer konyn (met gepaardgaande voorgestelde teëwig maatreëls), die impak op die visuele en estetiese landskap, en die verplanting van *Boophone disticha* of gifbolplante in. Ook van belang is die geringe ontwrigting van die sosiale en sosio-ekonomiese omgewing en die werksgeleenthede wat geskep kan word.

Substasies word elke 400 tot 450 km langs hoogspanning kraglyne benodig om toerusting te huisves. Eskom wil die voorgestelde Gamma Substasie langs die drie bestaande 400 kV transmissielyne plaas. Reaktiewe spanning regstellings-apparaat vir die 400 kV en 765 kV lyne kan dan in een struktuur gehuisves word. Indien die Gamma Substasie in die nabyheid van 400 kV lyne gebou word kan dit ook gebruik word om elektrisiteitsvloei in die 400 kV lyne te versterk. Vir hierdie doel sal die voorgestelde Gamma Substasie met transformators gebou word wat die spanning vanaf 765 kV tot

400 kV verlaag. Hierdie addisionele krag kan dan in die 400 kV lyne gevoer word vir verdere transmissie. Deur die bestaande 400 kV en die 765 kV transmissielyne naby aan mekaar te plaas en hulle met basies dieselfde roete langs in te bring, kan die spanning regstellings-apparaat wat vir al die lyne benodig word om ekstra krag vanaf die 765 kV lyne na die 400 kV lyne te voer, gesamentlik binne een toegewyde fasiliteit gehuisves word. Alternatiewelik, indien die Gamma Substasie ongeveer 10 km verder wes gebou word (waar dit oorspronklik sou wees), sou ‘n hoogspanningslyn nodig wees om die verskillende komponente te verbind. Dit sou addisionele lengtes transmissielyne, addisionele serwitute van grondeienaars, en ‘n omgewingsvoetspoor vir infrastruktuur benodig. Eskom kan ook ‘n aansienlike bedrag geld spaar deurdat dit nie nodig sal wees om nagenoeg 60 km addisionele kraglyne (teen ongeveer R 2.5 million per kilometre) te bou nie.

Voorts, indien die projek nie gebou word nie, sal Eskom nie die doel, behoefte en wenslikheid van die konstruksie en bedryf van die substasie aanspreek nie. In effek sal dit beteken dat kragvoorsiening aan groot gedeeltes van die land nie verseker of versterk kan word nie. Dit sal die lewens van miljoene mense en ekonomieë van groot areas in benadeel. Nuwe ekonomiese ontwikkelings in die Oos- en Wes-Kaap sal ook nie moontlik wees nie. Dit is dus van strategiese belang dat die substasie gebou word en soos in hierdie omgewingsimpakstudie getoon, word die nuwe terrein bo die oorspronklike terrein (waarvoor omgewingsmagtiging reeds ontvang is) verkies.

ENVIRONMENTAL APPLICATION: 12/12/20/873

Adherence to Regulation 387 requirements for an Environmental Impact Report

Reference	Contents of an Environmental Impact Report	Where Covered
(2) (a) (i) and (ii)	Details of the Environmental Assessment Practitioner and relevant expertise	Page xxv
(2) (b)	Detailed description of the proposed activity	Section 4, Page 14
(2) (c)	Detailed description of the property on which the proposed activity is to be undertaken	Section 4.2, Page 15
(2) (d)	Description of the environment (physical, biological, social, economic and cultural) that may be affected by the activity	Section 5, Page 26
(2) (e)	Details of the public participation process	Pages xv, xvi and xvii, Section 6, Page 39 and Appendices 1 – 4, Pages 113 – 116
(2) (e) (i)	Steps undertaken in accordance with the plan of study	Section 6, Page 39
(2) (e) (ii)	A list of persons, organisations and organs of state that were registered as interested and affected parties	Appendix 2, Page 114
(2) (e) (iii)	A summary of comments received from, and a summary of issues raised by interested and affected parties, the date of receipt of these comments and the response from the EAP to those comments	Appendix 3, Page 115
(2) (e) (iv)	Copies of any representations, objections and comments received from registered interested and affected parties	Appendix 4, Page 116
(2) (f)	Description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Section 3, Page 13
(2) (g)	An indication of the methodology used in determining the significance of potential environmental impacts	Section 6, Page 39
(2) (h)	Description and comparative assessment of all alternatives identified during the EIA process	Section 4.9, Page 24
(2) (i)	Summary of the findings and recommendations of any specialist report or report on a specialised process	Section 7, Page 47
(2) (j)	Description of all the environmental issues that were identified during the EIA process, and assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures	Section 8, Page 62
(2) (k)	An assessment of each identified potentially significant impact	Section 8, Page 62
(2) (k) (i)	Cumulative impacts	Section 8, Page 62
(2) (k) (ii)	Nature of the impact	Section 8, Page 62
(2) (k) (iii)	Extent and duration of the impact	Section 8, Page 62
(2) (k) (iv)	Probability of the impact occurring	Section 8, Page 62
(2) (k) (v)	Degree to which the impact can be reversed	Section 8, Page 62
(2) (k) (vi)	Degree to which the impact may cause irreplaceable loss of resources	Section 8, Page 62
(2) (k) (vii)	Degree to which the impact can be mitigated	Section 8, Page 62
(2) (l)	Assumptions, uncertainties and gaps in knowledge	Section 8, Page 62
(2) (m)	An opinion as to whether the activity should or should not be authorised, and if authorised, any conditions that should apply to the authorisation	Page xiii
(2) (n)	An environmental impact statement	Page iii and Section 10, Page 109
(2) (n) (i)	Summary of the key findings of the environmental impact assessment	Page iii and Section 10, Page 109
(2) (n) (ii)	Comparative assessment of the positive and negative implications of the proposed activity and identified alternatives	Section 8, Page 62
(2) (o)	Draft environmental management plan	Section 9, Page 86
(2) (p)	Copies of specialist reports	Appendix 5, Page 117

OMGEWINGSAANSOEK: 12/12/20/873

Nakoming van die vereistes van Regulasie 387 vir 'n Omgewingsimpakverslag

Verwysing	Inhoud van 'n Omgewingsimpakverslag	Waar gedek
(2) (a) (i) and (ii)	Besonderhede van die Omgewingsimpakpraktisyn en relevante ondervinding	Bladsy xxv
(2) (b)	Gedetaileerde beskrywing van die voorgestelde aktiwiteit	Afdeling 4, Bladsy 14
(2) (c)	Gedetaileerde beskrywing van die eiendom waar die voorgestelde aktiwiteit onderneem sal word	Afdeling 4.2, Bladsy 15
(2) (d)	Beskrywing van die omgewing (fisies, biologies, sosiaal, ekonomies en kultureel) wat deur die aktiwiteit beïnvloed kan word.	Afdeling 5, Bladsy 26
(2) (e)	Besonderhede van die publieke deelname proses	Bladsy xv, xvi and xvii, Afdeling 6, Bladsy 39 en Aanhangsels 1 – 4, Bladsy 113 – 116
(2) (e) (i)	Stappe onderneem in ooreenstemming met die studieplan	Afdeling 6, Bladsy 39
(2) (e) (ii)	'n Lys van persone, organisasies en staatsliggame wat as Geaffekteerde en Belanghebbende Partye geregistreer is.	Aanhangsel 2, Bladsy 114
(2) (e) (iii)	'n Opsomming van kommentaar ontvang van Geaffekteerde en Belanghebbende Partye en 'n opsomming van kwessies deur hulle geopper	Aanhangsel 3, Bladsy 115
(2) (e) (iv)	Kopieë van alle voorleggings, besware en kommentaar van Geaffekteerde en Belanghebbende Partye ontvang.	Aanhangsel 4, Bladsy 116
(2) (f)	'n Beskrywing van die behoefte en wenslikheid van die voorgestelde aktiwiteit asook potensiële alternatiewe tot die voorgestelde aktiwiteit, insluitend voordele en nadele wat die voorgestelde aktiwiteit vir die omgewing en gemeenskap wat daardeur beïnvloed kan word, inhou.	Afdeling 3, Bladsy 13
(2) (g)	'n Aanduiding van die metodologie wat gebruik is om die gewigtigheid van potensiële omgewingsimpakte te bepaal	Afdeling 6, Bladsy 39
(2) (h)	Beskrywing en vergelykende studie van al die alternatiewe wat gedurende die OIS-proses geïdentifiseer is.	Afdeling 4.9, Bladsy 24
(2) (i)	Opsomming van die bevindinge en aanbevelings van enige spesialisverslag of verslag oor 'n spesialisproses.	Afdeling 7, Bladsy 47
(2) (j)	Beskrywing van al die omgewingskwessies wat gedurende die OIS-proses geïdentifiseer is en die bepaling van die gewigtigheid van elke kwessie asook 'n aanduiding van die mate waartoe die kwessie aangespreek kan word deur die implementering van versagtings maatreëls.	Afdeling 8, Bladsy 62
(2) (k)	'n Beraming van elke geïdentifiseerde potensiële gewigtige impak.	Afdeling 8, Bladsy 62
(2) (k) (i)	Kumulatiewe impakte	Afdeling 8, Bladsy 62
(2) (k) (ii)	Aard van die impak	Afdeling 8, Bladsy 62
(2) (k) (iii)	Omvang en duurte van die impak	Afdeling 8, Bladsy 62
(2) (k) (iv)	Waarskynlikheid vir die impak om plaas te vind	Afdeling 8, Bladsy 62
(2) (k) (v)	Mate waartoe die impak omgekeer kan word	Afdeling 8, Bladsy 62
(2) (k) (vi)	Mate waartoe die impak onomkeerbare verlies van hulpbronne kan veroorsaak	Afdeling 8, Bladsy 62
(2) (k) (vii)	Mate waartoe die impak versag kan word	Afdeling 8, Bladsy 62
(2) (l)	Aannames, onsekerhede en leemtes in kennis	Afdeling 8, Bladsy 62
(2) (m)	'n Opinie oor of die projek gemagtig kan word, al dan nie, en indien gemagtig, enige voorwaardes wat as deel van die magtiging toegpas moet word	Bladsy xiii
(2) (n)	'n Omgewingsimpakstelling	Bladsy iii en Afdeling 10, Bladsy 109
(2) (n) (i)	Opsomming van belangrike bevindinge van die omgewingsimpakstudie	Bladsy iii en Afdeling 10, Bladsy 109
(2) (n) (ii)	'n Vergelyking tussen die positiewe en negatiewe implikasies van die voorgestelde aktiwiteit en geïdentifiseerde alternatiewe	Afdeling 8, Bladsy 62
(2) (o)	Konsep Omgewingsbestuursplan	Afdeling 9, Bladsy 86
(2) (p)	Kopië van spesialisverslae	Aanhangsel 5, Bladsy 117

ENVIRONMENTAL ASSESSMENT PRACTITIONER'S OPINION ON AUTHORISATION

It is the professional opinion of the Environmental Assessment Practitioner that the proposed construction and operation of the Gamma Sub-station on the farms Uit Vlugt Fontein No. 233 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities should be authorised by the Department of Environmental Affairs and Tourism.

In this proposed project, Eskom is striving to address the purpose, need and desirability for the construction and operation of the sub-station. To this end, Eskom needs to supply power to large areas of the country, and this power supply needs to be made more secure, bolstered and augmented. If the project is authorised, Eskom can provide electrical supply security for millions of people and the economy of large areas of the Eastern and Western Provinces. The new site proposed for the sub-station is best suited due to its close proximity to the existing 400 kV transmission lines and the reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure. Further, if the Gamma Sub-station is built in proximity to the existing 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines.

Primary applicable conditions of authorisation are the following:

- All specifications and mitigation measures contained within the Draft Environmental Management Plan (Section 9).
- Eskom's contribution towards the conservation of riverine rabbit habitat elsewhere in the local area, i.e. off-set mitigation.
- The translocation of on-site species of *Boophone disticha* (gifbol) prior to construction commencing.

OMGEWINGSTUDIEPRAKTISYN SE OPINIE AANGAANDE MAGTIGING

Dit is die professionele opinie van die Omgewingstudiepraktisyn dat die voorgestelde konstruksie en bedryf van die Gamma Substasie op die plase Uit Vlugt Fontein No. 233 en Schietkuil No 3 in die Pixley ka Seme en Sentraal Karoo Distrik Munisipaliteite deur die Departement van Omgewingsake en Toerisme, gemagtig kan word.

Met hierdie projek, streef Eskom daarna om die doel, behoefte en wenslikheid van die konstruksie en bedryf van die substasie aan te spreek. Eskom is verantwoordelik vir die voorsiening van krag aan groot gedeeltes van die land en hierdie krag voorsiening moet versterk en meer betroubaar gemaak word. Indien die projek goedgekeur word kan Eskom betroubare elektrisiteit voorsiening aan miljoene mense en die ekonomie van groot areas van die Oos- en Wes-Kaap verskaf. Die nuwe terrein wat vir die substasie voorgestel word is mees gepas weens die nabyheid van die bestaande 400 kV transmissielyne. Die reaktiewe spanning regstellings-apparaat vir die 400 kV en 765 kV lyne kan in een struktuur gehuisves word. Voorts kan die Gamma Substasie ook benut word vir die versterking van die elektrisiteitsvloei in die bestaande 400 kV lyne indien dit naby hierdie lyne gebou word.

Die primêre voorwaardes vir magtiging is soos volg:

- Alle spesifikasies en versagtingsmaatreëls soos uiteengesit in die Konsep Omgewingsbestuursplan (Afdeling 9).
- Eskom se bydrae tot die bewaring van Oewer Konyn habitat elders in die nabye omgewing, d.w.s ‘n teëwig maatreël.
- Die verplanting van *Boophone disticha* (gifbol) spesies alvorens daar met konstruksie begin word.

YOUR COMMENTS PLEASE

[For record purposes]

Please submit your comments to
Bongi Shinga or June Mottram Gamma Sub-Station EIA Public Participation Office ACER (Africa) Environmental Management Consultants PO Box 503, Mtunzini, 3867 Tel: 0353402715 or 0860104958 Fax: 0353402232 Email: eskomGamma@acerafrica.co.za
The due date for comments on the Draft Environmental Impact Report was 30 July 2007

DRAFT ENVIRONMENTAL IMPACT REPORT DISTRIBUTION

[For record purposes]

The Draft Environmental Impact Report was distributed to key stakeholders and was also left at the following public places in the project area from 16 – 30 July 2007.

Area	Venue and Street
Victoria West	Victoria West Public Library, 7 Protea Street
Victoria West	Schietkuil Guest House, N1.
Murraysburg	Murraysburg Public Library, 37 Beaufort Street

The following methods of public review of the Draft Environmental Impact Report were available:

- Completing the comment sheet enclosed with the report.
- Additional written submissions.
- Comment by email, fax or telephone.

PUBLIC MEETING

[For record purposes]

Date	Venue	Time
24 July 2007	Schietkuil Guest House, N1	09:00 – 12:00

APPRECIATION TO INTERESTED AND AFFECTED PARTIES FOR THEIR PARTICIPATION

To date, many Interested and Affected Parties have participated actively during this Environmental Impact Assessment process, by attending meetings and by making written submissions. Interested and Affected Parties have contributed significant local knowledge, and have contributed information on previous studies undertaken in the project area. Many have also hosted members of the study teams in their homes or offices, and have shown them around the project area. The Environmental Impact Assessment Team should like to express its sincere thanks and appreciation for these efforts and the contributions of Interested and Affected Parties.

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FIGURES

TABLES

ACRONYMS

ABE	Affirmative Business Enterprise
ACER	ACER (Africa) Environmental Management Consultants
DEAT	Department of Environmental Affairs and Tourism (National)
DEADP	Department of Environmental Affairs, Development and Planning (Western Cape)
DTEC	Department of Tourism, Environment and Conservation (Northern Cape)
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act
ECO	Environmental Control Officer
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
ELF	Extremely Low Frequency
EMF	Electro-Magnetic Field
EMP	Environmental Management Plan
FSR	Final Scoping Report
GIS	Geographic Information System
I&AP	Interested and Affected Party
NEMA	National Environmental Management Act
NER	National Electricity Regulator
PCB	Polychlorinated Biphenyl
ROD	Record of Decision
SA RDB	South African Red Data Book
SAHRA	South African Heritage Resources Agency
SME	Small and Medium Enterprise

PROPONENT

Eskom Transmission, a Division of Eskom Holdings Limited, is the project proponent who has commissioned this EIA. Contact details are as follows:

Proponent:	Eskom Holdings Limited (Eskom) Transmission Division
Contact person:	Ms C Streaton, Environmental Practitioner
Physical address:	Megawatt Park, Maxwell Drive, Sunninghill, Sandton
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Fax:	011-8003917
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ENVIRONMENTAL ASSESSMENT PRACTITIONER

Consultant:	ACER (Africa) Environmental Management Consultants
Contact person:	Dr R-D Heinsohn (Pr.Sci.Nat: 400442/04) EAPSA (Certified)
Physical address:	Suites 5 & 6, Golden Penny Centre, 26 Hely Hutchinson Road, Mtunzini
Postal address:	PO Box 503, Mtunzini, 3867
Telephone:	035-3402715
Fax:	035-3402232
Email	dieter.heinsohn@acerafrica.co.za

1. INTRODUCTION

1.1 Background

Eskom's transmission network, supplying electricity to the greater Eastern and Western Cape areas, is running short of capacity to supply the natural load growth, and presents a reliability constraint by 2009 (or immediately if power supply problems are encountered as has recently been experienced country wide). To counter this situation and to meet projected future electricity demand, Eskom is planning to strengthen its transmission network by constructing a 765 kV transmission line backbone through the centre of the country, linking its main generating facilities in Mpumalanga, with demand centres in the Western and Eastern Cape. This involves constructing new 765 kV transmission lines from Standerton, in Mpumalanga, to Cape Town, in the Western Cape, with branch lines to Port Elizabeth, in the Eastern Cape. The approximate length of the total line is 1,300 km (Figure 1).

The location of the proposed Gamma Sub-station is indicated by an optimal distance between the Perseus (Dealesville) and Omega (Koeberg) Sub-stations, being approximately equidistant. It also serves as an off-take for the proposed 765 kV transmission lines to the Grassridge Sub-station near Port Elizabeth. To tap off electricity in this way, a sub-station must be built for this purpose. The extra high voltages (EHV) involved, require the use of large, purpose made switchgear that has to be securely housed in a specially designed sub-station.

The sub-station in question has been given the name Gamma and it is proposed to locate it on the farms Uit Vlugt Fontein No. 233 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities (Figure 2). It will eventually cover an area of at least 1.5 x 1.15 km^2 (172 ha). When fully operational, the sub-station will have five incoming EHV power lines and five 765 kV feeder power lines going out. In addition, power from the 765 kV incoming lines will also be used to boost the supplies in the existing 400 kV lines.

In 2005, environmental authorisation was issued for the proposed Gamma Sub-station to be located on the farm Uit Vlugt Fontein near Victoria West, Northern Cape. However, recent planning has indicated that the proposed Gamma Sub-station would be more ideally located about 10 km to the east of the original site. It will now lie mainly on the farm Uit Vlugt Fontein No. 233 with a small encroachment (approximately 22 m) onto the farm Schietkuil No. 3.

On long EHV transmission lines, sub-stations are needed every 400 to 450 km. Sub-stations house equipment that compensates for and neutralises inductive reactance, or the rise in the voltages along the line due to capacitance effects (Ferranti Effect). In this regard, **Eskom wants to place the sub-station next to its three existing 400 kV transmission lines. Reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure. Also, if the Gamma sub-station is built in proximity to the 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines. To this end, the proposed Gamma Sub-station will be built with transformers to step down the voltage from 765 kV to 400 kV. This additional power can then be fed into the 400 kV lines for onward transmission. Furthermore, placing all the transmission lines closer together and building the proposed Gamma Sub-station at its new position makes great economic sense (saving Eskom substantial capital in terms of transmission line construction costs (R 2.5 million/km)).**

Figure 1 Map showing the 765 kV backbone that is planned by Eskom

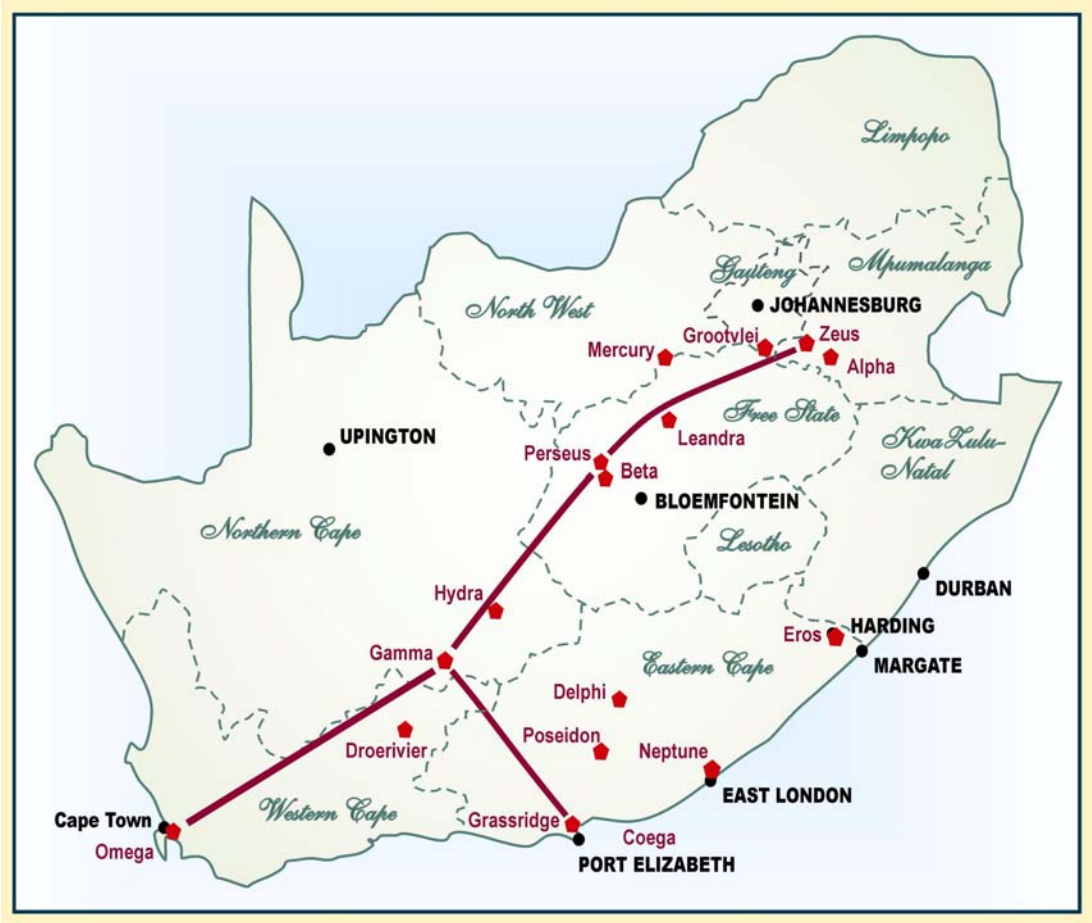
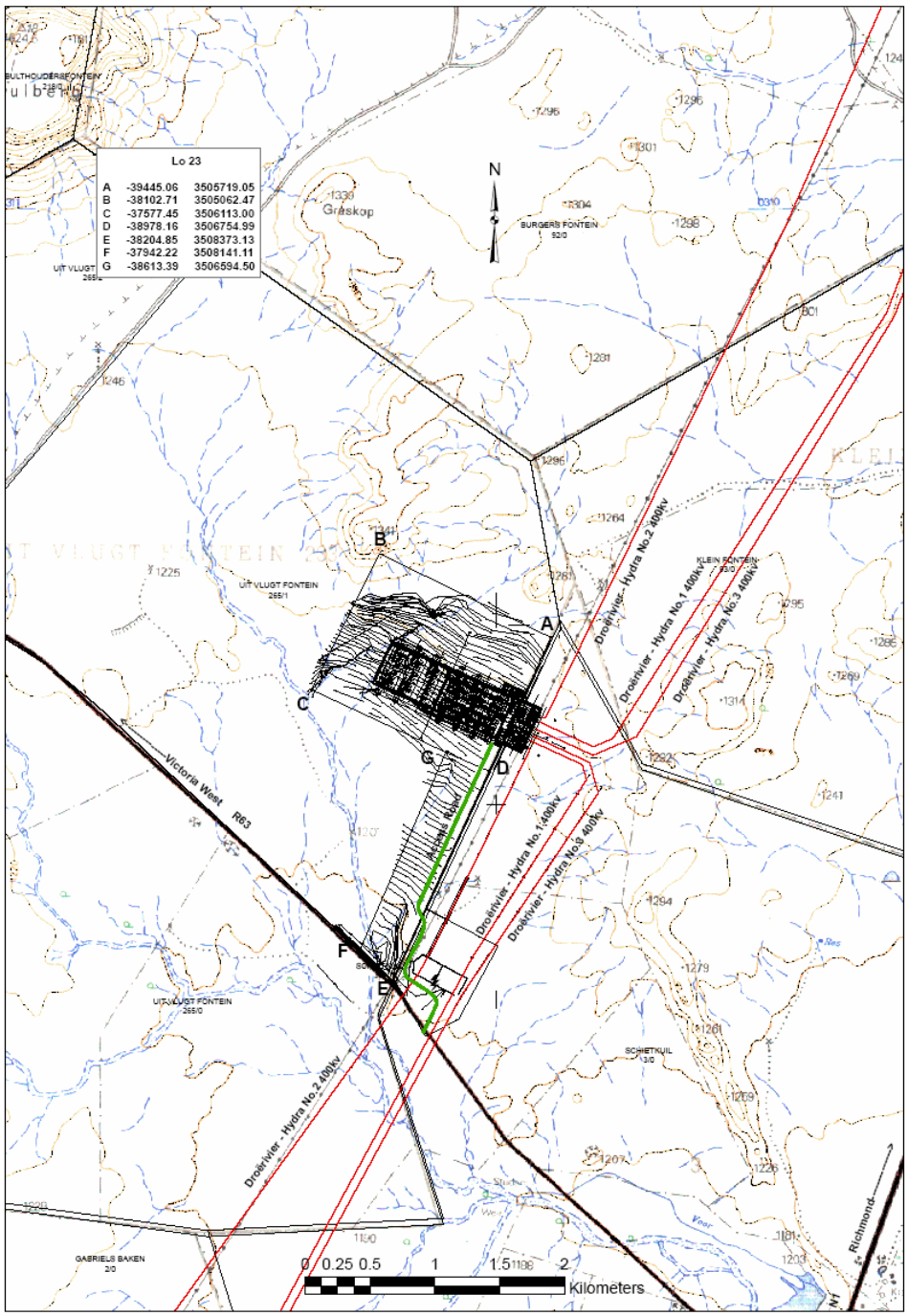


Figure 2 Map showing the new location of the proposed Gamma Sub-station, with turn-in lines



Consistent with environmental best practice and environmental legislation, Eskom (proponent) appointed ACER (Africa) Environmental Management Consultants (ACER) as the Environmental Assessment Practitioner (EAP) to undertake the independent Environmental Impact Assessment (EIA) for the proposed Gamma Sub-station. It should be noted that this EIA deals with the complete Gamma Sub-station, although the construction of individual components will be phased, as indicated by the growth in electricity demand over the next few years.

1.1.1 Eskom's 765 kV national backbone

Over many years, Eskom has built up a national and regional electricity supply grid that connects the centres of power generation to consumers, and to whom electricity can flow on an uninterrupted basis (Figure 3). The network of interconnections between power producers and consumers ensures that power can flow even if one link is disabled.

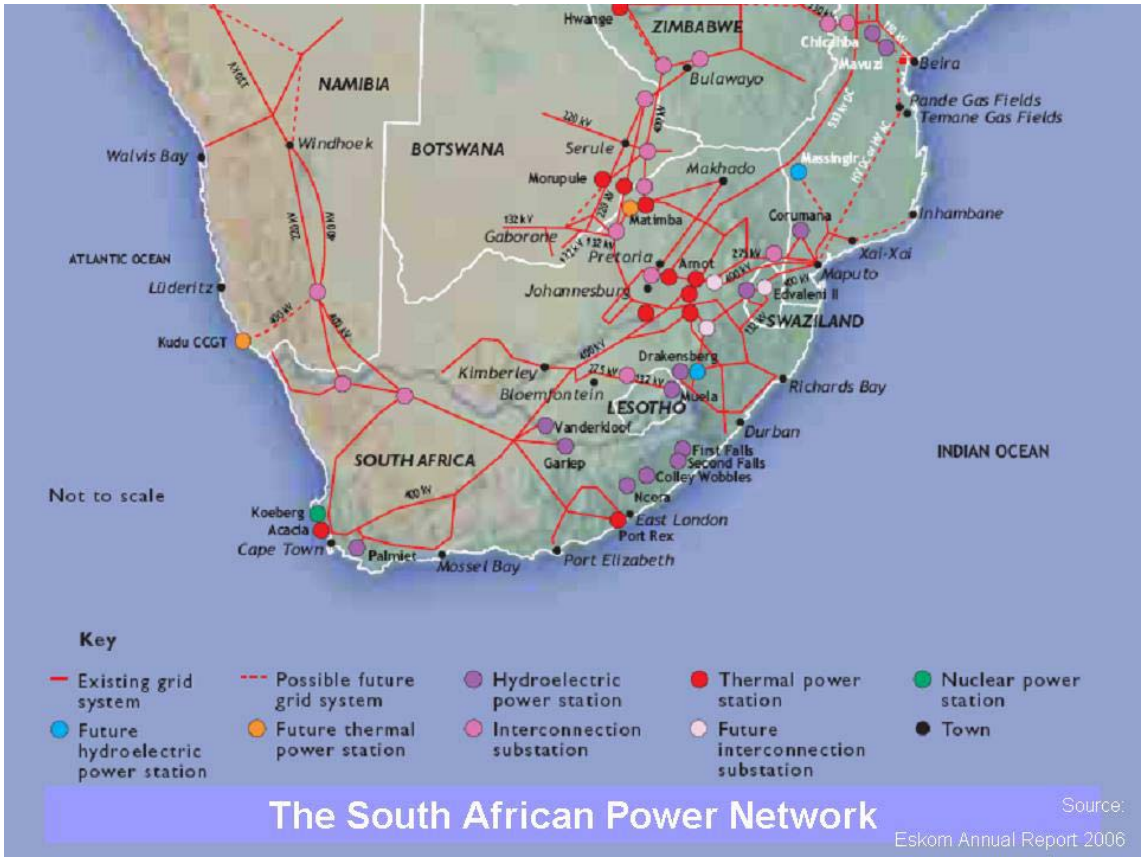
However, all electrical equipment and facilities have a finite commercial life. In the case of power stations and transmission lines, this is assumed to be about 40 years. Therefore, ongoing planned and emergency maintenance, and replacement strategies, have to be applied to achieve reliability and continuity of supply. The combination of ageing equipment and increasing demand, is increasing the risk that Eskom will be unable to assure bulk electricity supplies to consumers on a national scale without some form of load shedding or outages at certain times.

Quantifying and managing these risks is an integral part of Eskom's Integrated Risk Management Strategy and Process. Indeed, large power grids, like the South African one, need close monitoring and technical design audits, analyses and other technical inputs to be carried out on a regular basis. In this regard, Eskom carries out annual audits to international standards, with inputs from international power transmission experts, in order to assess and quantify the maximum reliable capacity of each transmission line. This involves factors such as system safety design and stability considerations, as well as the physical or thermal limits of the transmission lines.

All Eskom's recent audits indicate the need for expansion of the transmission network to attain a higher security of supply. This needs to be achieved through the implementation of a 765 kV backbone through the centre of the country. The position of sub-stations on this backbone, as well as the distance between sub-stations, is determined by the peculiarities of electricity transmission at extra high voltage. In order to comply with the known and laid down safety limits, sub-stations must be about 400 km apart with an absolute maximum distance of 450 km. This is because on long transmission lines the voltage increases along the line because of capacitance in the line (Ferranti Effect). Compensation is done at the sub-station where reactors are installed to neutralize inductive reactance in the long transmission lines. If the voltage is allowed to become too high it will burn out equipment.

An added problem is the increasing reliance that is placed on the Hydra Sub-station at De Aar. This is a major sub-station and a potentially vulnerable point in the network that is in danger of becoming overloaded or unnecessarily stressed. Therefore, it has become necessary to plan, design and implement the 765 kV transmission backbone in a manner that avoids additional reliance on the Hydra Sub-station and, indeed, in a manner that reduces this reliance by providing alternative sub-stations and transmission line routes (particularly in the central parts of the country).

Figure 3 South Africa's generation and transmission network



1.2 Environmental authorisation process

In terms of the National Environmental Management Act (Act 108 of 1998) (as amended) (NEMA) and its EIA Regulations published in July 2006, it is necessary to undertake environmental investigations as an integral part of project planning in order to obtain environmental authorisation for a proposed activity deemed to potentially negatively affect the environment. The construction and operation of a sub-station like Gamma, is identified as an activity which may not commence without environmental authorisation from the Competent Authority and requires assessment and communication of potential environmental impacts of activities based on the procedure as described in Sections 27 to 36 of the Regulation R 385 of April 2006. In this regard, Eskom is applying for environmental authorisation for listed activities as detailed in the application submitted to DEAT.

Further, in accordance with the principles and practice of Integrated Environmental Management to which Eskom subscribes, it is best business practice to understand the environmental consequences of a development. In terms of NEMA and the EIA Regulations, certain listed activities require environmental authorisation before they can proceed. Application for authorisation of the proposed Gamma Sub-station site was submitted to the Competent Authority in November 2006. The process of environmental assessment that has been followed is shown in Figure 4.

The national Department of Environmental Affairs and Tourism (DEAT) is the Competent Authority[1] for this project, and accordingly, is responsible for decision-making on whether or not to authorise the proposed development. However, it is important to note that DEAT works in close collaboration with its provincial counterparts, viz. the Northern Cape Department of Tourism, Environment and Conservation and the Western Cape Department of Economic Affairs and Development Planning.

The EIA for the proposed Gamma Sub-station is being undertaken in four main phases (Figure 4):

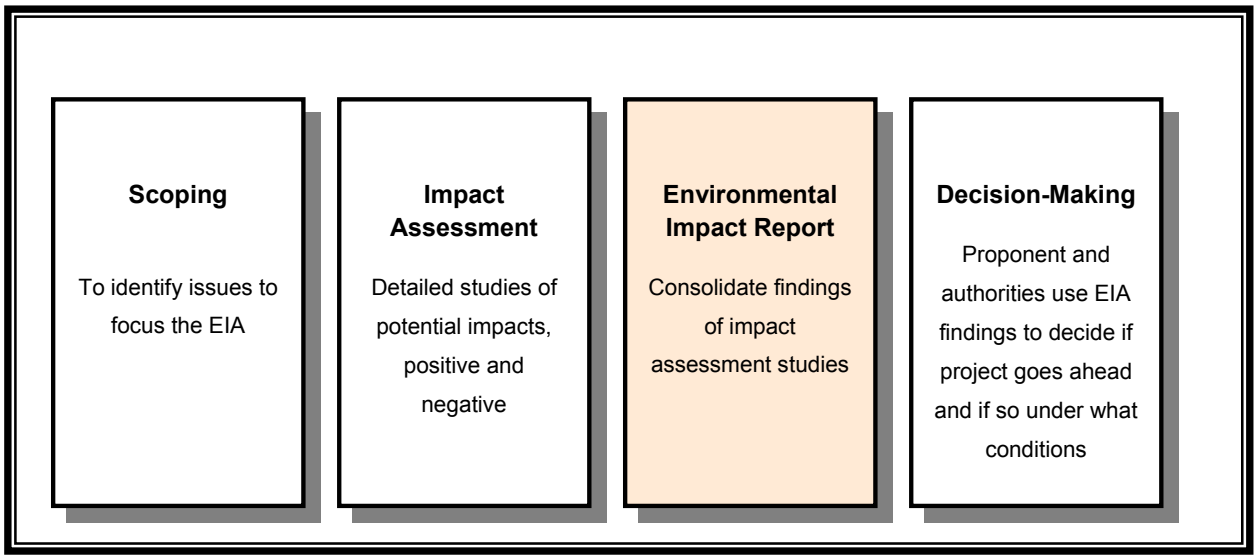
- Scoping.
- Impact Assessment.
- Environmental Impact Report (integrated report of findings) (**this report**).
- Decision-making.

Importantly, these four main phases are underpinned and supported by other sub-phases, for example, pre-application site visit and consultation with the Competent Authority, the preparation and submission of an application for authorisation to undertake listed activities. In addition, there are other activities that will occur further into the process, viz. the preparation of a Plan of Study for Impact Assessment, the preparation of an Environmental Management Plan (EMP) and the issuing of a Record of Decision by the Competent Authority.

The EIA for the proposed Gamma Sub-station is currently ending the Impact Assessment Phase with the issuing of this Final Environmental Impact Report (EIR). This report was available for public scrutiny and comment, after which it was updated prior to submission to the Competent Authority for decision-making.

[1] DEAT is the competent authority when the applicant is a parastatal or when more than one province is involved. In this case, the proposed Gamma Sub-station is located in the Northern and Western Cape Provinces.

Figure 4 The four principal phases of an Environmental Impact Assessment



1.3 Environmental Impact Report

The purpose of the Draft EIR is to collate, integrate, summarise and evaluate the findings of the specialist studies and to consider each of the issues raised during Scoping. This aims at providing the reader with a holistic understanding of the potential positive and negative impacts of the proposed development in a singular congruent unit. A number of inputs have informed the content of the Draft EIR, most notably the outcomes of the different Specialist Studies that were commissioned as part of the Impact Assessment.

The Draft EIR has been structured as shown in Table 1.

Table 1 Structure of the Environmental Impact Report

These Chapters, predominantly both in English and Afrikaans, provide summary information on the proposed project and its potential impacts	**Environmental impact statement**	Provides a summary of the key findings and a comparative assessment of the positive and negative implications of the proposed activity
	Environmental application	Provides a listing of the various listed activities for which authorisation is sought
	Environmental Assessment Practitioner's opinion on authorisation	Provides an opinion of the environmental assessment practitioner on whether or not the proposed activity should be authorised, and, if so, under what conditions
	Opportunities for interested and affected parties to comment	Provides information to the public on opportunities to comment on the Draft Environmental Impact Report
	Details of the Proponent and Environmental Assessment Practitioner	Provides details on the proponent and the environmental assessment practitioner, including relevant experience of the practitioner
These Chapters provide an introduction, describe the assessment framework and process, and describe why the activity is proposed	**Chapter 1 Introduction**	Provides background to the proposed project and introduces the Draft Environmental Impact Report
	Chapter 2 Framework for the environmental assessment	Describes the framework for assessment that was adopted for this project, including a list of applicable legislation
	Chapter 3 Purpose, need and desirability	Describes the purpose, need and desirability of the proposed activity
This Chapter describes the proposed project	**Chapter 4 Detailed description of the proposed activity**	Describes all infrastructural components, activities and alternatives that have been considered
This Chapter describes the receiving environment and considers the current situation	**Chapter 5 Description of the receiving environment**	Describes the receiving environment in which the proposed project will be implemented
This Chapter describes the environmental assessment process followed during Scoping and the Impact Assessment	**Chapter 6 Environmental assessment process**	Describes the technical and public participation processes that have been followed, and provides an indication for future activities
These Chapters present the findings of the different specialist studies and evaluate issues and potential impacts on the environment in an integrated manner	**Chapter 7 Summary of specialist study findings and recommendations**	Presents the findings and outcomes of the specialist studies commissioned to address specific issues identified during Scoping
	Chapter 8 Description and discussion of environmental Issues, and the assessment of potential impacts (without and with mitigation measures)	Integrated results addressing issues and associated impacts as expressed in the Final Scoping Report. Integrated results assessing issues and associated impacts without and with mitigation, including possible mitigation measures
This Chapter considers management measures and mechanisms that could be implemented should the proposed project be authorised	**Chapter 9 Environmental Management Plan for construction**	Outlines an Environmental Management Plan for the construction of the proposed project
For completeness, this Chapter repeats the environmental impact statement provided earlier in the report	**Chapter 10 Environmental impact statement**	Provides a summary of the key findings and a comparative assessment of the positive and negative implications of the proposed activity

2. FRAMEWORK FOR THE ENVIRONMENTAL ASSESSMENT

The key considerations that guided the approach to this EIA and helped to shape the assessment framework that was used, are discussed below.

2.1 Concept of Sustainability

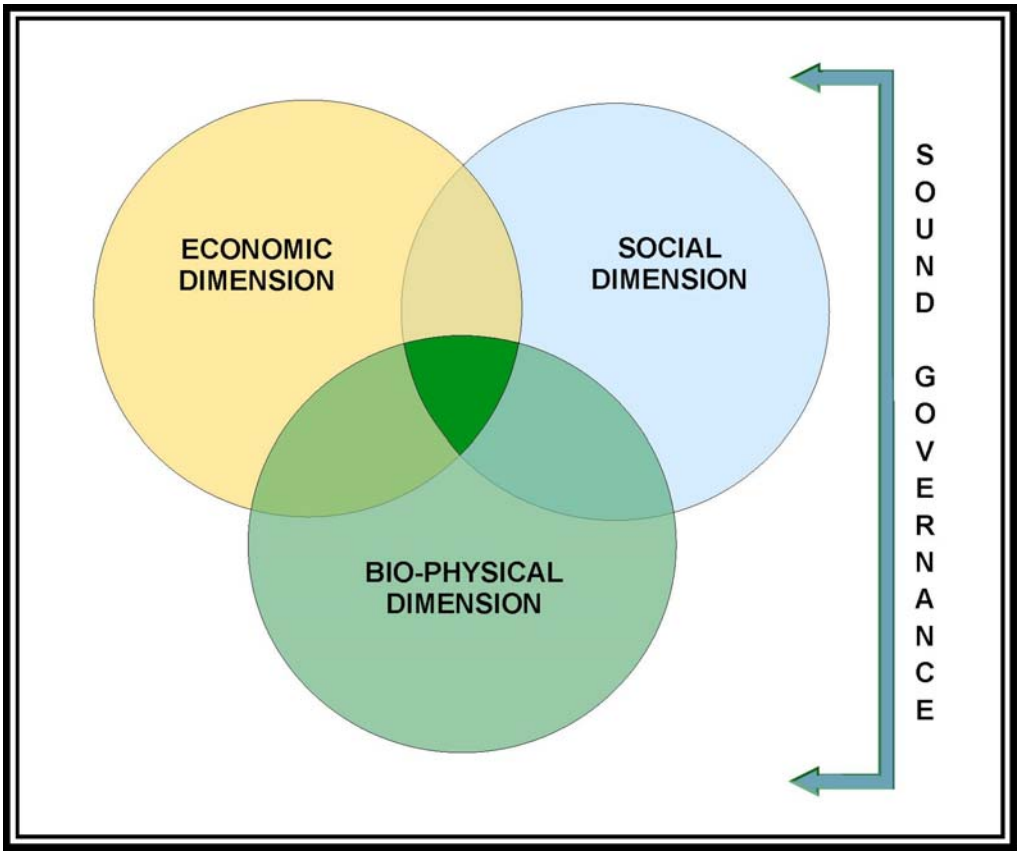
The concept of sustainability underpinning this assessment considers three inter-related dimensions of the environment, viz. the social, economic and biophysical dimensions (Figure 5). For an option or project to be sustainable, it needs to demonstrate economic growth, social acceptability and soundness, and ecological integrity within a framework of good governance.

All three dimensions of the environment, and the interactions between them (two- and three-dimensional), contribute to achieving sustainability and, therefore, each dimension, singly, and as it interacts with the other two dimensions, needs to be taken into account when assessing a proposed option or project, taking due cognisance that the three dimensions are seldom in perfect balance, with optimised solutions often being dictated by local circumstances, and requiring trade-offs between the dimensions.

In terms of sustainability and the assessment framework, key principles included:

- Development must not irretrievably degrade the natural, built, social, economic and governance resources on which it is based.
- Current actions should not cause irreversible damage to natural and other resources, as this potentially precludes sustainable options.
- Where there is uncertainty about the impact of activities on the environment, caution should be exercised in favour of the environment.
- Land-use and environmental planning need to be integrated.
- Immediate and long-term actions need to be identified and planned for, so that urgent needs can be met while still progressing towards longer-term sustainable solutions.

Figure 5 Inter-related dimensions of sustainability



2.2 Legal/Statutory Requirements

2.2.1 Legislative considerations

For a development such as the proposed Gamma Sub-station, there are a host of legal requirements (National, Provincial and Local Government spheres) to which the development proponent must adhere.

The legal environment in which development takes place and in which people and organisations have to function in South Africa has changed fundamentally over the last 12 years and is quite complex. It has altered substantially from the command-and-control type of administrative procedures that were commonly applied before the advent of Constitutional sovereignty in 1994. The situation is now that there is a fundamental requirement for planning and implementation procedures that involve the ongoing integration of environmental values and principles into all decisions and actions that are taken for development purposes.

In particular, the principles of integrated environmental management and assessment are germane to all situations at all times. The Constitutional right that people have to environmental protection as set out in the Bill of Rights in the Constitution (Section 24) has been interpreted in the National Environmental Management Act (Act 107 of 1998). It is this plus many other laws and sets of regulations (> 300) that govern the manner in which integrated environmental management has to be adhered to by any person or organisation that proposes any form of development. The Scoping Report (Draft and Final) dealt extensively with the key pieces of legislation relevant to the proposed Gamma Sub-station. These are not repeated in this Final EIR. Rather, for completeness, the key pieces of legislation are listed below:

- Constitution of the Republic of South Africa Act (Act 108 of 1996) as amended by the Constitution of the Republic of South Africa, Amendment Act (Act 35 of 1997).
- National Environmental Management Act (Act 107 of 1998).
- Environment Conservation Act (Act 73 of 1989).
- Electricity Act (Act 41 of 1987).
- Eskom Conversion Act (Act 13 of 2001).
- Eskom Act (Act 40 of 1987) as amended by the Eskom Amendment Act (Act 51 of 1991).
- National Water Act (Act 36 of 1998).
- National Heritage Resources Act (Act 25 of 1999).
- Conservation of Agricultural Resources Act (Act 43 of 1983).
- Public Finances Management Act (Act 1 of 1999) as amended by Act 29 of 1999.

Other national, provincial and local legislation of potential relevance was identified as follows:

- Agricultural Pests Act (Act 36 of 1983).
- Fencing Act (Act 31 of 1963).
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947).
- Forest Act (Act 122 of 1984).
- Hazardous Substances Act (Act 15 of 1973).
- Land Survey Act (Act 9 of 1921).
- Minerals and Petroleum Resources Development Act (Act 28 of 2002).
- Municipal Structures Act (Act 117 of 1998).
- National Environmental Management: Air Quality Act (Act 39 of 2004).

- National Forests Act (Act 84 of 1998).
- National Veld and Forest Fire Act (Act 101 of 1998).
- Occupational Health and Safety Act (Act 85 of 1993).
- White Paper on the Energy Policy of the Republic of South Africa (December 1998).

3. PURPOSE, NEED AND DESIRABILITY

Eskom is responsible for the generation, transmission and distribution of bulk power supplies throughout South Africa. The national transmission network currently supplies electricity to all parts of the country including the Eastern and Western Cape areas, from power stations situated on the coal fields of the Mpumalanga Highveld. Power is fed to Cape Town and Port Elizabeth over long distances through transmission lines that run from south eastern Mpumalanga, through the Free State to the west of Bloemfontein, and then down across the eastern tip of the Northern Cape, approximately 40 km to the east of Victoria West.

Eskom is now planning to substantially bolster the main power supply to the southern Provinces with additional 765 kV transmission lines that will be constructed alongside the existing 400 kV lines. However, long transmission lines draw a substantial quantity of charging current. If such a line is open circuited or lightly loaded at the receiving end, the voltage at the receiving end may become greater than voltage at the sending end. This is known as the Ferranti Effect and is due to the voltage drop across the line inductance (due to charging current) being in phase with the sending end voltages. Therefore, both capacitance and inductance are responsible for producing this phenomenon.

On long EHV transmission lines, sub-stations are needed every 400 to 450 km to house equipment, which compensates for and neutralises this inductive reactance. For the proposed Gamma Sub-station, Eskom wants to place the sub-station next to its three existing 400 kV transmission lines. Reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure.

Further, if the Gamma Sub-station is built in proximity to the existing 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines. To this end, the proposed Gamma Sub-station will be built with transformers to step down the voltage from 765 kV to 400 kV, and this additional power can then be fed into the 400 kV lines for onward transmission. Also, by placing both the existing 400 kV and the 765 kV transmission lines close together and bringing them down the same basic route, the voltage correction function that is necessary for all the lines and feeding extra power to the 400 kV line from the 765 kV line can be housed within the confines of the same dedicated facility. If the Gamma Sub-station is built approximately 10 km to the west of where originally it was intended to be, it would require a high voltage line to link the different components. This would require additional lengths of transmission lines, additional servitudes from landowners, and a great environmental footprint for the requisite infrastructure. Also, Eskom can save a substantial amount of money by not having to construct possibly up to 60 km of additional power lines (at an estimated R 2.5 million per kilometre).

The main purpose of building the Gamma Sub-station is to safely house the engineering and technical equipment that is necessary for the operation of long distance EHV power lines.

The need for such a facility arises out of the physics of long distance power transmission, where compensation for capacitive voltage generation on power lines has to be provided to avoid uncontrolled voltage rise especially on lightly loaded lines.

4. DETAILED DESCRIPTION OF THE PROPOSED ACTIVITY

4.1 Background

Eskom is an enterprise responsible for the generation, transmission and distribution of virtually all bulk power supplies throughout South Africa. The Holding Company's only shareholder is the State and it is regulated under licences granted by the National Electricity Regulator (NER) in terms of Electricity Acts. The national transmission network currently supplies electricity to the Eastern and Western Cape areas from power stations situated on the coal fields of Mpumalanga. Eskom is planning to construct additional 765 kV transmission lines alongside the existing 400 kV lines that supply power to these provinces. The 400 kV lines currently run to the east of Victoria West, close to where the N1 crosses the R63. The new lines will bring additional electrical capacity to meet demand for electrical power that is urgently needed in the Eastern and Western Cape.

The location of the proposed Gamma Sub-station is indicated by an optimal distance between the Perseus (Dealesville) and Omega (Koeberg) Sub-stations, being approximately equidistant. It also serves as an off-take for the proposed 765 kV transmission lines to the Grassridge Sub-station near Port Elizabeth. To tap off electricity in this way a sub-station must be built for this purpose. The extra high voltages involved, require the use of large, purpose made switchgear that has to be securely housed in a specially designed sub-station.

Although planning and design work for the Gamma Sub-station was completed some time ago (with a positive Record of Decision (ROD) from DEAT), the sub-station was never constructed. In the interim, Eskom has decided to move the site of the Gamma Sub-station to a different but more optimal position, located 10 km to the east of the original site. It will now lie mainly on the farm Uit Vlugt Fontein No. 233 with a small encroachment (approximately 22 m) onto the farm Schietkuil No. 3. Besides being used as a point to split the power transmission to the Eastern Cape, there are other important reasons for the change in location, viz. EHV transmission lines traversing great distances require sub-stations every 400 to 450 km. Sub-stations house equipment which compensates for and neutralises inductive reactance, or the rise in the voltages along the line due to capacitance effects (Ferranti Effect). Also, Eskom would prefer to place the sub-station right next to its three existing 400 kV transmission lines as reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure. Further, if the proposed Gamma Sub-station is built in close proximity to the existing 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines. To this end, the proposed Gamma Sub-station will be built with transformers to step down the voltage from 765 kV to 400 kV and this additional power can then be fed into the 400 kV lines for onward transmission.

The new location of the proposed Gamma Sub-station is a site on the farms Uit Vlugt Fontein No. 233 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities. It will cover an area of at least 1.5 x 1.15 km^2 (172 ha) and is designed to have five incoming EHV power lines and five out-going feeder power lines. Eskom would like to commence construction of the sub-station in the latter half of 2007.

4.2 The site

The site of the proposed Gamma Sub-station lies mainly on the farm Uit Vlugt Fontein No 223 but does also slightly overspill onto Schietkuil No 3 (approximately 22 m), in the Victoria West District of the Northern Cape. An area of land approximately 1.54 km x 1.136 km (172 ha) has been demarcated for the sub-station. It lies at an altitude of about 1,200 m and the whole area will be protected by a substantial security fence.

The site is typical of what is classified as Central Upper Karoo (Acocks Veld Type 27) or Upper Nama Karoo (Veld Type 50, Low and Rebelo, 1996). The vegetation on the stony plains of such areas is made up commonly of Kapokbush *Eriocephalus ericoides,* Silverkaroo *Plinthus karooicus* and Perdekaroo *Rosenia humilis,* amongst others. After good rains grasses, such as Tassel Bristlegrass *Aristida congesta* and Lehmann's Lovegrass *Eragrostis lehmanniana*, may dominate.

The underlying geology of the site is sandstones and shales derived from the Beaufort Group of the Karoo Supergroup. These rocks give rise to weak and structureless clay and sandy soils. The whole system is intruded by numerous dolerite dykes and sills. Soil cover is thin and the soils are sensitive to water and wind erosion.

The climate in the region is warm all year round, with hot summers and winters that frequently have frost. The annual rainfall is low and varies between 200-250 mm per annum. Rainfall is mostly in summer with a greater proportion occurring mainly late in the season. The atmospheric evaporative demand is high and exceeds 2,300 mm per annum.

The two farms, Uit Vlugt Fontein No 223 and Schietkuil No 3 are owned by Mr LA de Jager and Mr I van Heerden, respectively. Both landowners have provided written consent for the siting of the proposed Gamma Sub-station on their farms (Appendix 1).

Additional information on the physical, biological, social, economic and cultural environments is provided in Chapter 5.

4.3 Project description

A sub-station is an important element of an electricity generation, transmission and distribution system. Its function is to transform voltages from high to low or the reverse, using transformers and other heavy-duty electrical switchgear. In the case of the proposed Gamma Sub-station, it has two other important additional functions. The sub-station will house the equipment that will be used to correct or neutralise inductive reactance, or voltage rise induced in the power lines from capacitance effects. It will also enable Eskom to safely tap off power from the 765 kV backbone and distribute it to other geographical areas, for example, the Eastern Cape. When electrical power is tapped off in this way, it cannot be done by simply splitting the lines. Great care must be taken due to the EHV equipment that is used. The electrical feed to the different destinations is fed into common distribution conductors called busbars. From these busbars, electricity is then fed onto dedicated transmission lines running to specific geographic areas where the power is needed. Any of the lines in question can also be isolated in the high voltage yard.

The proposed Gamma Sub-station will eventually accommodate five incoming and five outgoing lines, together with the associated switching, protection and control equipment. This is shown schematically in Figure 6 (with Figure 7 showing the Hydra Sub-station that is typical of Eskom sub-stations in South Africa). Additional power lines will come in from the Perseus Sub-station near Dealesville and new lines will go out to the Omega (Koeberg) and Grassridge (Port Elizabeth) Sub-stations. Circuit breakers will be installed to interrupt any short-circuits or overload currents that may occur on the network. There will also be line termination structures, high-voltage switchgear, reactors, low voltage switchgear, and surge protection controls and metering. Finally, the whole complex will be surrounded by a substantial security fence, which will be properly earthed to protect people from high voltages that may occur during a fault in the transmission system.

By having a sub-station in a transmission network, it is possible for Eskom to de-energise a transmission line or other electrical switchgear for maintenance or for new construction or installation. In this way Eskom is able to maintain reliability of supply as maintenance work is being performed while still keeping the whole system running. More importantly, faults may develop in transmission lines or in the associated switchgear. Examples of this are when a line is hit by lightning and develops an arc or, in extreme cases, a tower may be blown down by high wind. The advantage of the sub-station is that it is then possible to isolate the faulted portion of the system in the shortest possible time. If left unattended, faults cause equipment damage and also destabilise the whole system. A transmission line left in a faulted condition will eventually burn down and, similarly, a transformer left in a faulted condition will eventually blow up. At these times there is a heavy drain of power on the system and it becomes unstable. By disconnecting the faulted components quickly at the sub-stations, such problems can be safely and effectively dealt with.

The proposed Gamma Sub-station will cover a relatively large area. Eskom is planning to purchase an area that is approximately 1,136 m by 1,540 m (approximately 172 ha) on which the facility will be built. In addition, a small corridor (approximately 400 m x 2,000 m, an area of 80 ha) will be used for an access road to the R63. When finally completed, the sub-station itself will cover about 1,290 m x 465 m (approximately 60 ha) (when measured in terms of the outer perimeter lines of the terraces and security fence). There will also be turn-in lines from the existing 400 kV lines to the sub-station. These turn-in lines will require their own servitudes.

4.3.1 Main sub-station switchgear

Power is brought to the sub-station on 765 kV transmission lines that end on a large steel structure called a terminal tower. The centre line of the tower is 43 m from the security fence surrounding the sub-station. Power is then transferred into the main electrical switchgear inside the sub-station perimeter.

Figure 6 Schematic diagram of the proposed Gamma Sub-station layout

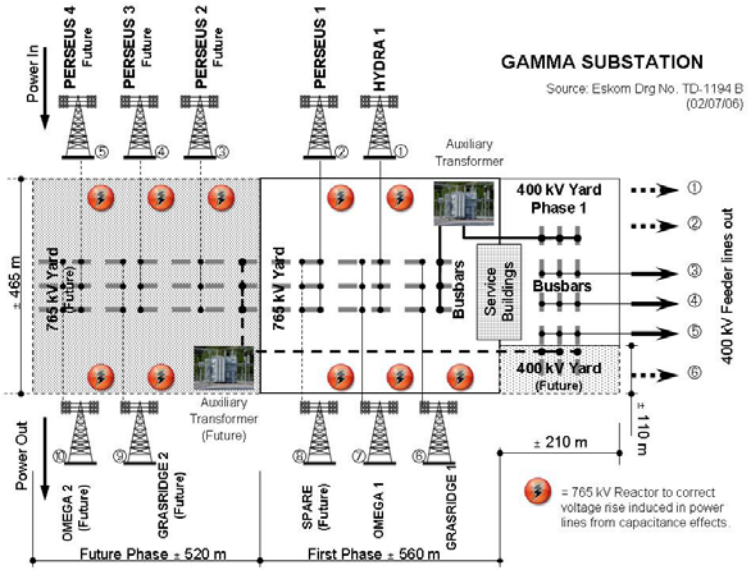


Figure 7 Hydra Sub-station that is typical of Eskom Sub-stations in South Africa

4.3.1.1 Transformers

Eskom is planning to install two EHV transformers at the Gamma Sub-station. Their main purpose will be to boost the electrical power feed in the existing 400 kV lines that run past the site. The voltage will be stepped down from 765 kV to 400 kV, and this additional power can then be fed into the 400 kV lines for onward transmission. The windings of such large transformers are immersed in transformer oil. It is a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant. Also, because it provides part of the electrical insulation between internal live parts, it must remain stable at high temperatures over an extended period.

Formerly, polychlorinated biphenyl (PCB) was used as it was not a fire hazard in indoor power transformers and it is highly stable. However, PCB by-products are unstable and toxic, and also accumulate in the environment. These products are, therefore, no longer permitted and will not be used at the proposed Gamma Sub-station.

Great care is taken in the construction and operation of sub-stations and transformers, in particular, to ensure that there is no uncontrolled release of transformer oil into the environment. Transformer plinths are surrounded by bund walls and potential spillages are drained into sumps (Figures 8 and 9).

One transformer will be commissioned during the first phase of operation of the sub-station. A second will be added when demand for power increases and the sub-station is expanded.

4.3.1.2 Reactors

Each transmission line coming into and going out of the Gamma Sub-station will be provided with a dedicated reactor. These items of equipment are essential for the efficient operation of long, EHV power transmission lines. The reactor compensates the voltage generation on power lines to avoid uncontrolled voltage rise, especially on lightly loaded lines. Reactors are normally disconnected at periods of heavy load and are brought into the line at periods of low load.

Eventually, the Gamma Sub-station will have a total of 10 reactor units, five on the incoming and five on the outgoing transmission lines. Two reactors will be installed initially and the others will be brought into operation as the sub-station expands with increasing power demands from the areas to which the power is provided.

4.3.1.3 Busbars

Once past the switching components, the lines of a given voltage in the sub-station all tie in to a common bus. This consists of a number of heavy metal busbars, usually made of aluminium. In most cases there are three parallel busbars, since electrical power is distributed via three-phase. Sub-stations that require additional reliability often have a double bus or even a double ring of busbars, in which the bus system is actually duplicated. Each feeder as well as each outgoing line has a connection to each separate busbar. This is a safety measure that is required mainly for reliability so that in the case of a failure it would not cause a substantial part of the system to be brought down.

Figure 8 Transformer and bund wall

Figure 9 Oil holding dam

Higher voltages require greater thickness or cross section of busbar metal, which has to be supported by columns, trusses and a lattice work of steel members. The busbars are supported high above the ground and then safely carry and distribute the 765 kV voltages to the different lines. The number of lines and amount of power that has to be fed in and distributed at the Gamma Sub-station will require a substantial amount of supporting steelwork. In order to reduce the gross weight of supporting steelwork and the weight of the busbars themselves, the intention is to use hollow tubular sections for the busbar components. This will help reduce the overall height of the steelwork and electrical switchgear, which will be approximately 25 m.

4.3.1.4 Power out

Power out of the sub-station is fed into the 765 kV outgoing transmission lines, that start from large steel terminal towers about 43 m outside the perimeter fence. There will initially be two feeds going out which will be increased to a total of five, as the capacity of the sub-station is increased to cater for the increasing demand for power from the areas being supplied.

The Gamma Sub-station makes provision for six 400 kV feeder lines going out that can feed into the existing 400 kV power grid. Three of these feeds will be commissioned during the initial construction phase of the work. Three will be added later as the demand for power increases and the feed to the 400 kV grid has to be increased proportionately.

4.3.1.5 Buildings

When operational, the sub-station is not manned on a 24-hour basis. Extensive buildings and service facilities are, therefore, not needed. The main facilities to be provided include a small office, workshop areas and storage space, external storage areas and a control room to house the high voltage monitoring and control instrumentation and equipment. The sub-station will also be equipped with Eskom's own internal micro-wave telecommunications facilities.

4.3.2 Construction of the sub-station

The first construction activity will be to clear the site of vegetation and to level off and terrace the ground surface for those areas where the heavy electrical transformers and other switchgear will stand. After this will follow the concrete and building construction for foundations for the supporting steelwork, transformers and other switchgear, storm water drainage pipes, slabs, bund walls, the control room, small buildings and storage areas that are needed.

All open areas between the transformer plinths and other switchgear foundations will be covered with about a 150 mm layer of 25 mm crushed stone. Before laying the crushed stone, the ground surface is intensively treated to strict specification with insecticide and herbicide to prevent insect activity and the growth of weeds and other plants in the high voltage yard.

The steelwork will then be erected. The transformers, circuit breakers, reactors and other high voltage equipment will be delivered to site, erected and then commissioned. As indicated previously, the sub-station will be built in phases. As the demand for power increases, so the number of incoming and outgoing lines with their electrical switchgear will be increased.

Eskom has decades of experience in the construction and operational use of high voltage equipment such as the proposed Gamma Sub-station. All equipment, commissioning and operational procedures and protocols are subject to strict specifications, which Eskom has had in place for many years. Construction is anticipated to begin in the latter half of 2007, and it is estimated that it will continue for approximately three years thereafter, before the sub-station is finally commissioned. During construction, which is when the civil works are being carried out (foundations, storm water drainage, buildings, etc), there should not be more than 80 people present on the site at any one time. Depending on the level and nature of construction activity taking place, there will be varying numbers of people housed on site in temporary accommodation.

No people will be housed on site on a permanent basis during the operational life of the sub-station. However, there will be ongoing monitoring and control of operations as well as planned and other maintenance work done on an *ad hoc* basis.

4.3.3 Construction and maintenance of access roads

The Gamma Sub-station will be served by a tarred access road to the R63 and internal gravelled traffic areas for access to the EHV equipment. The flow of traffic to the site during the construction period will be relatively light and, during operations, there will be virtually no traffic. The access road will be constructed to a Type 6 gravel road that comprises the following:

- Construction of 6 m wide, tarred access roads (totalling a length of approximately 1.8 km).
- Drainage is to be provided in the form of meadow drains (flat terrain) and “v” drains (steeper terrain). Some new culverts may be required.
- Fencing will be erected where required.
- Gravel will be obtained from the nearest existing borrow pit of suitable material.

Particular attention will be paid to storm water and the management thereof, with erosion protection measures being put in place where indicated by the terrain (geology, soils and topography) and climate (in particular, rainfall and high rainfall events in short periods of time). Furthermore, any access roads will be aligned and constructed within the provisions and specifications of the private landowners. This is considered important for three primary reasons:

- The access road should fulfil multipurpose functions serving the needs of Eskom and the landowners.
- Landowners are acutely aware of sensitivities on their land and should be in an excellent position to inform Eskom of optimum alignments.
- During and post construction, Eskom will be responsible for the maintenance of the access road.

4.3.4 Temporary storage of hazardous substances

The hazardous substances referred to comprise fuels, oils and lubricants that will be stored and dispensed at the construction camp. Specifications for the storage and dispensing of fuels, oils and lubricants include the following:

- Specifically designated areas.
- All storage of fuels, oils and lubricants shall be stored above ground and under cover.
- All designated areas will be bunded.
- Each designated area will be equipped with adequate fire protection equipment appropriate for the nature of the fuels, oils and lubricants that are stored and dispensed.
- All areas shall be properly signed in all applicable languages.
- All employees must be properly trained in the storage and dispensing of specific fuels, oils and lubricants.
- A specific procedure for emergency situations, including accidental spills, will be formulated and available on site at all times.

4.3.5 Telecommunication mast

A telecommunication mast will be required at the Gamma Sub-station. The mast will be a microwave lattice mast, between 30 and 50 m high and will form an integral part of the sub-station.

4.3.6 Use of services and resources during construction

4.3.6.1 Water

Water will be required for potable use and in the construction of the foundations for the sub-station. The water will be sourced from a borehole on site.

4.3.6.2 Sewerage

A negligible sewerage flow is anticipated for the duration of the construction period. On site, use will be made of chemical toilets that will be serviced periodically. For operations, a similarly negligible amount of sewerage will be generated. Septic tanks and soak aways will be provided.

4.3.6.3 Roads

Existing roads will be utilised as far as possible during the construction and operational periods. The use of roads on private property is subject to the provisions of an EMP (Chapter 9) that will include individual landowner specifications, which will be determined during discussions with landowners during the land acquisition negotiation process. The Gamma Sub-station will be served by a gravel access road to the R63 and internal gravelled traffic areas for access to the EHV equipment. The flow of traffic to the site during the construction period will be relatively light and during operations there will be virtually no traffic.

4.3.6.4 Storm water

Soil on site is clayey and sandy (derived from sandstone and shale parent rock in the Karoo geological system) and sensitive to water and wind erosion. Although the mean annual rainfall is relatively low, the area does experience short, sharp or intensive thunderstorm type precipitation. Great care has to be taken in making sure that storm water drainage is carefully designed on all roads as well as the runoff from the sub-station terraces. Storm water will have to be diverted into the veld at low energy levels to make sure that significant erosion problems are avoided in and around the site.

Storm water will be managed according to the *Eskom Guidelines for Erosion Control and Vegetation Management* as well as the provisions of the EMP.

4.3.6.5 Solid waste disposal

All solid waste will be collected at a central location at the construction site and will be stored temporarily until removal to an appropriately permitted landfill site. Waste streams should be kept separate to facilitate recycling.

4.3.6.6 Electricity

Either Eskom Distribution will provide electricity for construction or diesel generators will be utilised for the provision of electricity. For operations, electricity will be sourced from Eskom Distribution.

4.4 Economics and job creation

The proposed Gamma Sub-station will cost approximately R 500 million to construct.

At the busiest time of the construction work, which is when the civil works are being carried out (foundations, storm water drainage, buildings, etc), there should not be more than 80 people present on the site at any one time. Depending on the level and nature of construction activity taking place, there will be varying numbers of people housed on site in temporary accommodation. Employment will be effected either directly with the main contractor or through sub-contractors, which will include Small and Medium Enterprises (SMEs) and Affirmative Business Enterprises (ABEs).

It is important to note that the construction of a sub-station is a specialised undertaking requiring skilled people. It is probable that the appointed contractors will bring in skilled staff from other areas. By implication, job opportunities for local people will be limited to unskilled jobs, on site and in construction camps. Apart from direct employment, local people and businesses will benefit through the supply of goods and services to the appointed contractors.

4.5 Environmental Management Plan

A project-specific EMP has been compiled for the project (Chapter 9). An Environmental Control Officer (ECO) who acts as an intermediary between individual landowners, Eskom and the contractors, will monitor compliance with the EMP.

4.6 Operations and maintenance

During operations, Eskom requires access to the sub-station for maintenance activities. This will require traversing private property. Maintenance activities are specialised and are, therefore, carried out by Eskom employees.

During the operational life of the sub-station, there will be no people housed on site on a permanent basis.

4.7 Decommissioning

The following are assumed:

- The physical removal of the sub-station infrastructure would entail the reversal of the construction process.
- A rehabilitation programme would need to be agreed upon with the landowners before being implemented.
- The disposal of materials from the decommissioned sub-station would be at an approved waste disposal facility. Alternatively, recycling opportunities could be investigated and implemented.

All of the afore-mentioned would be subject to a separate Environmental Impact Assessment and environmental authorisation at the appropriate time.

4.8 Project timeframes

In order to meet the expected electricity demand, the proposed Gamma Sub-station must be operational by 2009[2]. Therefore, construction must commence in the latter half of 2007. This EIA is being managed with a target date for the issuing of a Record of Decision by DEAT by the end of August 2007.

4.9 Alternatives

The identification and examination of alternatives is fundamental to environmental assessment. It provides decision-makers with information that enables them to properly consider optimal solutions to development proposals. Alternatives illustrate and contrast the environmental implications and consequences of different options available to achieve the same end. In this way, both the proponent and the authorities who must consider granting the authorisation, are put in a position where all involved are able to make informed choices or decisions.

For the proposed Gamma Sub-station, there are three alternatives under consideration:

- The proposed site on the farm Uit Vlugt Fontein 223, bordering on the farm Schietkuil 3.
- An alternative site on the farm Uit Vlugt Fontein, for which a positive Record of Decision was issued by DEAT (as explained, Eskom has decided to move the location of the sub-station).
- The “no go” or no-development alternative.

It should be noted that, in this particular case, the existing Gamma site for which environmental authorisation has been obtained remains the default sub-station for Eskom should environmental authorisation not be obtained for the proposed new site.

Similarly, the no-development option simply means that Eskom would do nothing to address the purpose, need and desirability for the construction and operation of the sub-station. It would effectively mean that the power supply to large areas of the country would not be made more secure nor bolstered or augmented. It would place the lives of millions of people and expose the economies of large areas to grave risks. New economic developments in the Eastern and Western Provinces would not be possible.

[2] This is to meet the current and immediate future demand. Additional construction (in phases) may occur over the next 10-15 years, as indicated by growth in demand for electricity.

The positive effect would be the local maintenance of a near natural visual landscape in a sparsely populated and economically low-key area. There would be no visual scarring from the sight of large electrical switchgear and supporting steelwork in a semi desert environment, no aesthetic effects and no effect on the biophysical environment at the site.

However, it is the professional opinion of the environmental assessment team that the no-development option is unrealistic and, therefore, it is submitted that this alternative should be discarded from further consideration in this EIA.

Arising from the afore-mentioned, for the most part, only the new site for the proposed Gamma Sub-station is discussed in any detail in this Draft Environmental Impact Report.

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 Introduction

This section aims to bring insight into the physical, biological, social, economic and cultural characteristics of the receiving environment enabling the identification of issues and potential impacts that the project is likely to have on the environment and *vice versa*. For this project, the study area has been defined as the development site and its immediate surrounds, as well as the broader district and local municipal areas.

5.2 Description of the physical environment

5.2.1 Climate

Interior climatic conditions in the Karoo vary considerably within a diverse, natural and physical environment. The climate in the region of the proposed Gamma Sub-station is warm all year round, with hot summers and winters that frequently have frost. The Gamma Sub-station site may be considered to be dry-cold, with an annual rainfall that is low, varying between 200-250 mm per annum (Figure 10). Rainfall is in summer with a greater proportion of rain falling late in the season. The atmospheric evaporative demand is high and exceeds 2,300 mm per annum. The general areas of the Pixley ka Seme and Central Karoo District Municipalities are considered to be dry-cold, with the majority of the area receiving less than 400 mm of rain per year, which confirms its arid status.

5.2.2 Air quality

Reliable data on ambient air pollution in the study area are unavailable but the absence of significant point and non-point sources of pollution suggests that ambient air quality is good. The sparse population of the Central Karoo and Pixley ka Seme District Municipalities suggests that man-made pollution levels are low in these areas.

5.2.3 Topography

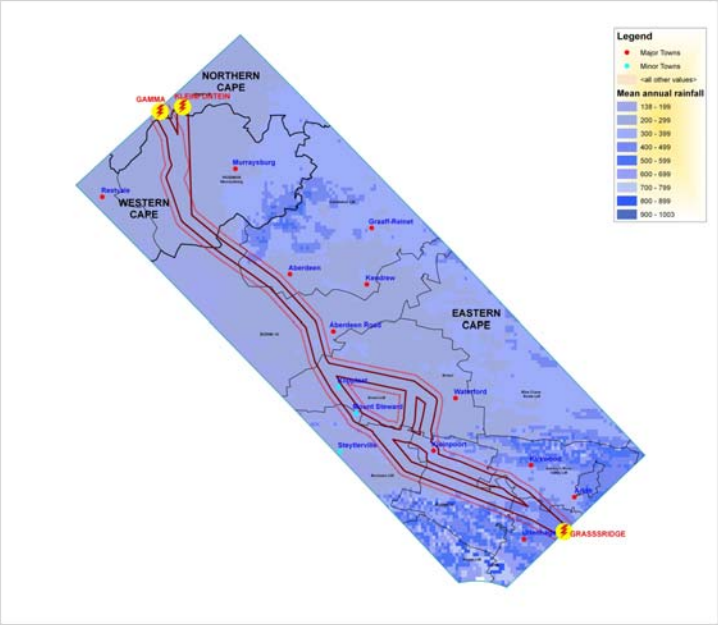
Due to the climatic conditions experienced in these parts, it is expected that mechanical weathering rather than chemical weathering will determine the nature of the topography.

The preferred site is located in a generally flat area, a fair distance to the south of a range of low hills and koppies. The site slopes gently to the south-west at a gradient of not more than about 5 or 6^{o}. Storm water from the site drains towards a watercourse about 1 km away. However, water flows intermittently, only in times of good rain or in the event of heavy or intense thunderstorms.

The development site is located on relatively flat and sparse terrain. Typical Karoo landscapes comprise grasslands and densely vegetated rivers and valleys. Key topographical features in the study area include the Murraysburg Mountains (Ondersneeuberg Mountains) and the Kamdeboo Mountains.

There are no other water bodies, wetlands, streams or dams on the site or nearby.

Figure 10 Mean annual rainfall



5.2.4 Drainage

In general, the study area is considered to be semi-arid to arid, with very low rainfall. Thus, the general area does not support many rivers. However, the study area transects some primary catchment(s) and there are a number of quaternary catchment areas within the study area, with important drainage lines. Primary and secondary drainage lines drain the landscape in a south-westerly to north-easterly direction.

5.2.5 Geology and soils

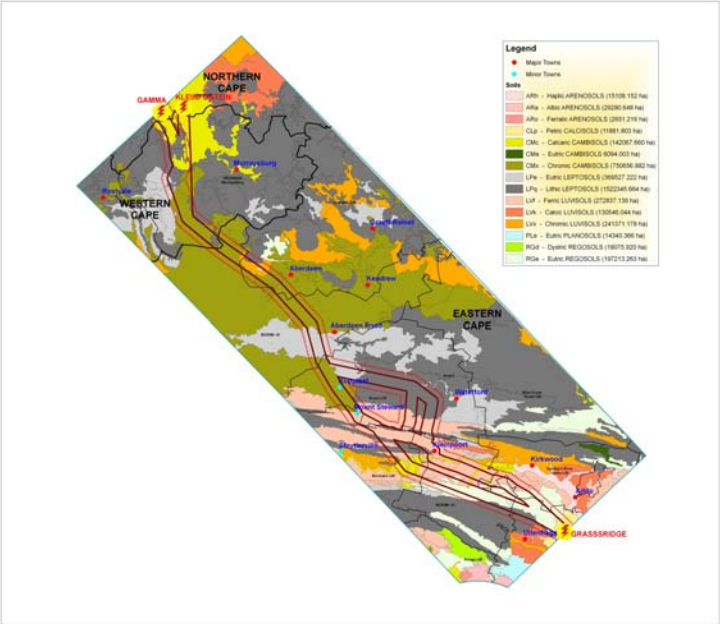
The underlying geology of the site is sandstones and shales derived from the Beaufort Group of the Karoo Supergroup (Figure 11). These rocks give rise to weak and structureless clayey and sandy soils. The whole system is intruded by numerous dolerite dykes and sills. Soil cover is thin and the soils are sensitive to water and wind erosion.

The soils that occur on the sub-station site and in the immediate surroundings can be divided into three main types:

- Red duplex soils.
- Shallow soils with some lime.
- Rocky areas.

The majority of soils in the area are shallow duplex soils mainly of the Swartland form. There is little high potential agricultural land anywhere and only isolated pockets of land with moderate potential can be found, mainly in low lying areas.

Figure 11 Soils in the study area



5.3 Description of the biological environment

5.3.1 Flora

The Northern Cape and Western Cape Karoo areas consist of typical Karoo vegetation (Figure 12). The vegetation is sparse, dry and, once damaged, does not regenerate easily. The presence of fragile soils means that there is much erosion and slippage.

In the Upper Nama Karoo or Veld Type 50, the vegetation on the stony plains of such areas is made up commonly of Kapokbush (*Eriocephalus ericoides)*, Silverkaroo (*Plinthus karooicus)* and Perdekaroo (*Rosenia humilis)*, amongst others. After good rains, grasses, such as Tassel Bristlegrass (*Aristida congesta)* and Lehmann's Lovegrass (*Eragrostis lehmanniana)* may dominate.

The vegetation is fairly dense and semi arid shrubland occurs in the central upper Karoo plateau at altitudes of between about 1,000 m to 1,700 m above sea level. Vegetation differs somewhat between the large plains that are relatively flat and stony, and the hilly areas where more grasses may be found.

Figure 12 Biomes in the study area

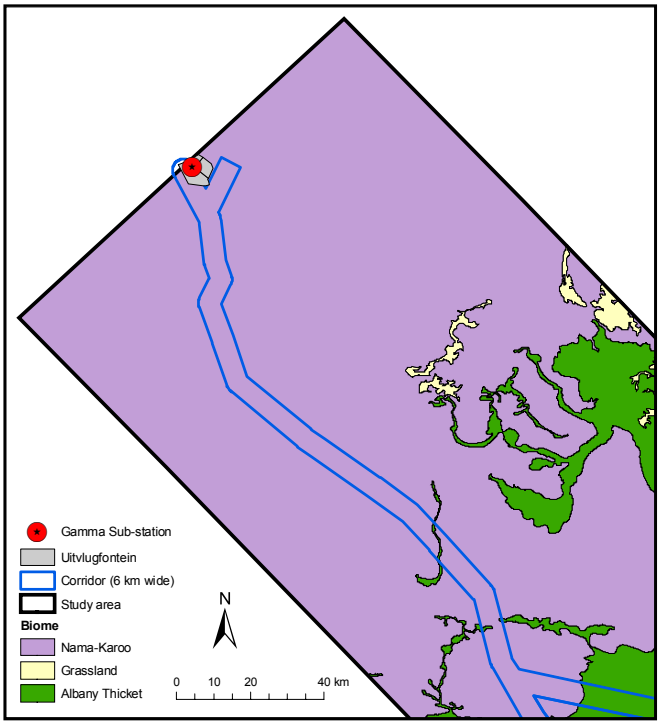
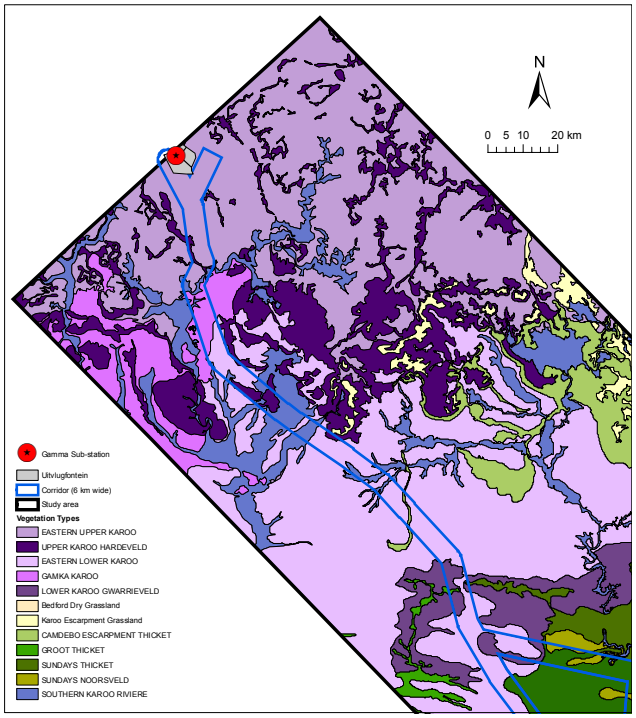


Figure 13 illustrates vegetation types in the vicinity of the proposed Gamma Sub-station. On the plains, many species of typical Karoo bushes are found. These include *Eriocephalus ericoides, Plinthus karooicus, Rosenia humilis, Salsola glabrescens, Pentzia incana, P. globosa, P. spinescens, Felicia muricata, Eberlanzia ferox, Rhigozum obovatum, Aptosimum procumbens* and *Zygophylum incrasata*. After good rains, many grasses flourish briefly between the shrubs including *Eragrostis lehmanniana, E. bicolor, Panicum stapfianum, Sporobolus acinifolius, Arsitida congesta, Stipagrostis obtusa* and *S. ciliata*. *Acacia karoo* is widespread, especially along streams and rivers where *Phragmites australis* is also common.

In the hills and koppies, more grass species are found. These include *Eragrostis lehmanniana, E. bergiana* and *Aristida congesta* subsp. *congesta*, which are the most common. The shrubs and small karoo bushes that are found include *Rhus indulata, R. burchelli, Rhigozum trichotomum, Lycium* spp. and occasionally *Aloe broomii*.

Dominant and important taxa of the Eastern Upper Karoo are listed in Table 2.

Figure 13 Vegetation types in the study area



The National Spatial Biodiversity Assessment classified the area proposed for the sub-station as being low in South African endemics (endemics being those that are unique to a defined geographical area (in this case South Africa). The proposed Gamma Sub-station site falls in an area with very low numbers of threatened plant species and is ranked as being at the lowest level of irreplaceability for vegetation. Furthermore, it ranks lowest for process (including features of high water yield areas, biogeographic nodes, carbon sequestration areas, escarpment and associated mountain ranges, and areas of biome resilience to climate change), habitat value and land capability. There is no afforestation potential and the Upper Nama-Karoo is in the least-fragmented category for vegetation. The potential for alien invasion is low to very low. These factors place it at very low vulnerability, i.e. it has the lowest level of vulnerability. Overall the Vegetation Type ranks at very low for conservation value and the transformation of 172 ha of Eastern Upper Karoo for a sub-station will not jeopardize future conservation plans for the Vegetation Type.

No Red Data Book species were recorded on the site.

Only one non-abundant species of special concern was recorded on the Gamma Sub-station site, viz. *Boophone* disticha (L.f.) Herb. or gifbol. *Boophone disticha* is protected by virtue of belonging to the Amaryllidaceae (Nature Conservation Ordinance 19 of 1974) and is not common in the area.

Table 2 Endemic, dominant and important plant taxa of Eastern Upper Karoo

Endemic Plant Taxa	Dominant Plant Taxa	Important Plant Taxa
Tall Shrubs		
Phymaspermum scoparium (DC.)	*Lycium cinereum* Thunb.	*Lycium horridum* Thunb.
		Lycium oxycarpum Dunal
Low Shrubs		
Aspalathus acicularis E.Mey.	*Chrysocoma ciliata* L.	*Aptosimum procumbens* (Lehm.)
Selago persimilis Hilliard	*Eriocephalus ericoides* (L.f.)	*Felicia muricata* (Thunb.) Nees
Selago walpersii Choisy	*Eriocephalus spinescens* Burch.	*Gnidia polycephala* (C.A.Mey.)
	Pentzia globosa Less.	*Helichrysum dregeanum* Sond. &
	Pentzia incana (Thunb.) Kuntze	*Helichrysum lucilioides* Less.
	Phymaspermum parvifolium (DC.)	*Limeum aethiopicum* Burm.
	Salsola calluna Fenzl ex	*Nenax microphylla* (Sond.) Salter
		Osteospermum leptolobum
		Plinthus karooicus I.Verd.
		Pteronia glauca Thunb.
		Rosenia humilis (Less.) K.Bremer
		Selago geniculata L.f.
		Selago saxatilis E.Mey.
Succulent Shrubs		
Chasmatophyllum rouxii L. Bolus		*Euphorbia hypogaea* Marloth
Hertia cluytiifolia (DC.) Kuntze		*Ruschia intricata* (N.E.Br.)
Rabiea albinota (Haw.) N.E.Br.		
Salsola tetramera Botsch.		
Herbs		
		Indigofera alternans DC.
		Pelargonium minimum (Cav.)
		Tribulus terrestris L.
Geophytes		
	Moraea pallida (Baker) Goldblatt	*Moraea polystachya* (Thunb.) Ker
		Syringodea bifucata M.P.de Vos
		Syringodea concolor (Baker)
Graminoids		
	Aristida congesta Roem. & Schult.	*Aristida adscensionis* L.
	Aristida diffusa Trin.	*Chloris virgata* Sw.
	Cynodon incompletus Nees	*Cyperus usitatus* Burch.
	Eragrostis bergiana (Kunth) Trin.	*Digitaria eriantha* Steud.
	Eragrostis bicolor Nees	*Enneapogon desvauxii* P.Beauv.
	Eragrostis lehmanniana Nees	*Enneapogon scoparius*Stapf
	Eragrostis obtusa Munro ex	*Eragrostis curvula* (Schrad.) Nees
	Sporobolus fimbriatus (Trin.)	*Fingerhuthia africana* Lehm.
	Stipagrostis ciliata (Desf.) De	*Heteropogon contortus* (L.) Roem.
	Tragus koelerioides Asch.	*Sporobolus ludwigii* Hochst.
		Sporobolus tenellus (Spreng.)
		Stipagrostis obtusa (Delile) Nees
		Themeda triandra Forssk.
		Tragus berteronianus Schult.

There are also members of several protected plant families that were recorded on the site but these are all abundant in the surrounding vegetation and occur over a large area. The plant families that are protected according to the Cape Nature and Environmental Conservation Ordinance 19 of 1974 are as listed below:

- Amaryllidaceae.
- Apocynaceae (including previous Asclepiadaceae).
- Euphorbiaceae.
- Iridaceae.
- Mesembryanthemaceae.

The Nama-Karoo vegetation is not particularly susceptible to alien plant invasion. No exotics were recorded at the Gamma Sub-station site.

5.3.2 Fauna and avi-fauna

5.3.2.1 General

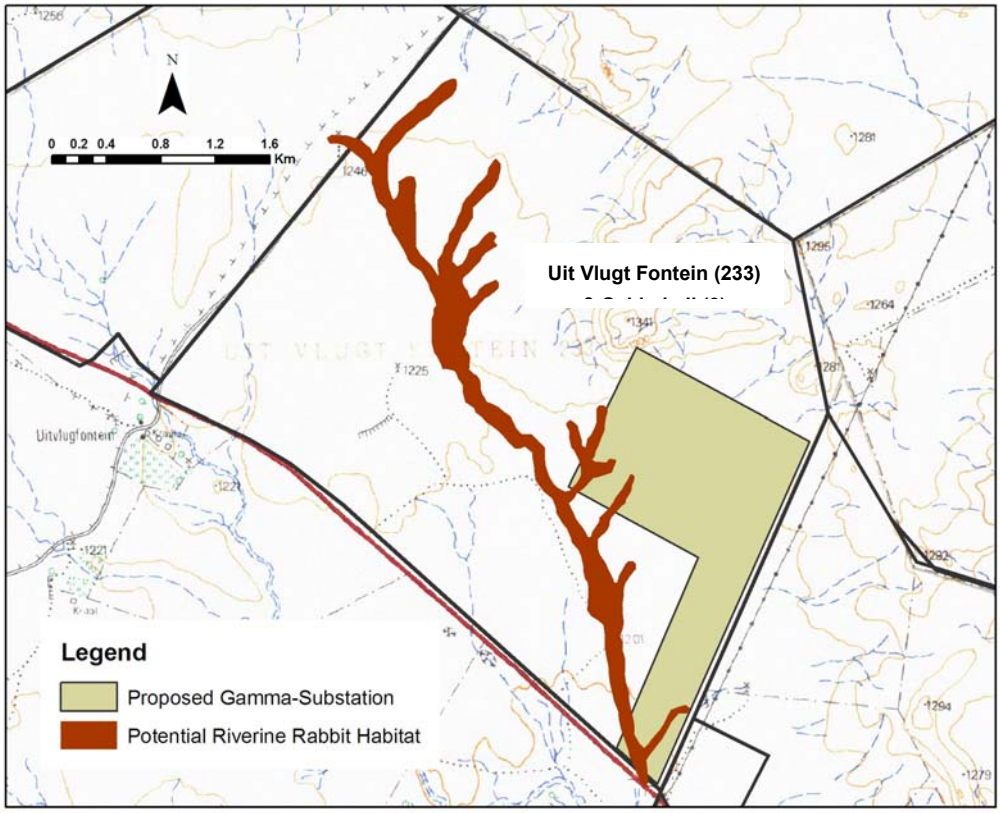
The potential occurrence of fauna in the study area was determined according to the habitat characteristics of the area (vegetation structure, geology, topography etc.) and the particular species' habitat requirements. Recently published literature was consulted to identify fauna with conservation concern that potentially occur naturally in the study area. Conservation concern was defined to include:

- Fauna with a restricted distribution range, where a significant proportion (*c.* ≥ 10%) of the estimated distribution range of the species may be occupied by the proposed sub-station,
- Fauna listed in the South African Red Data Book (SA RDB).
- Fauna listed by the Convention of International Trade in Endangered Species of Wild Fauna and Flora.
- Fauna listed in the National Environmental Management: Biodiversity Act: Publication of lists of Critically Endangered, Endangered, Vulnerable and Protected Species.
- Fauna that are used in traditional healing and to prepare traditional medicines and are, therefore, vulnerable to poaching.

The Gamma-substation site comprises a single faunal habitat of typical Nama-Karoo shrublands, dominated by dwarf (generally < 1 m tall) microphyllous shrubs, succulents, geophytes and grasses. Taller shrubs and small trees occur only along a non-perennial river-course and associated drainage lines that bisect the larger area. The cover of grasses in the area may vary with the occurrence of good autumn and summer rains.

In terms of habitats that support sensitive fauna, riverine rabbits are considered to be habitat specialists that are confined to the riparian shrubs on the narrow alluvial fringes of seasonal, dry river-courses. These riparian areas are usually characterised by shrubs between 50-100 cm tall, with vegetation cover provided by *Lycium* sp. and *Salsola* sp. (30%). Ephemeral grass cover may occur in some places, but usually do not comprise more than 5% of the area. Riverine rabbits may forage up to a distance of 2 km away from riparian areas. Potential suitable habitat for riverine rabbit was identified along the non-perennial river-course and associated drainage lines that bisect the larger Gamma Sub-station area (Figure 14). However, based on assessments undertaken by the EWT Riverine Rabbit Working Group done elsewhere (where riverine rabbits are present), the habitat in the study area is thought to be of a low quality. This is considered to be as a result of overgrazing by domestic herbivores, which has changed vegetation structure and composition.

Figure 14 Occurrence and extent of distribution of potential riverine rabbit habitat on the larger Gamma-substation site (comprising the Uit Vlugt Fontein and Schietkuil properties)



Twenty-two faunal species with conservation concern (i.e. restricted distribution range, SA RDB-NEMBA- and CITES listing, species that are used in traditional healing and to prepare traditional medicines) potentially occur naturally on the proposed Gamma Sub-station site (Table 6). These were characterised by butterflies (*c.* 14 %), reptiles (*c.* 45%) and mammals (*c.* 41%). The absence of semi-permanent/permanent water sources in the study area potentially precludes the occurrence of amphibians. Although riverine rabbits are listed as potentially present in the study area, no records of their occurrence on the proposed substation-site are available.

In terms of birds, it is generally accepted within ornithological circles that vegetation structure is more important in determining bird distribution, than the actual species themselves. The vegetation of the greater study area comprises Nama Karoo (51%) and Grassy Karoo (49%). The relevance of these vegetation types to birds is described hereunder.

5.3.2.2 Nama Karoo

This vegetation type comprises largely low shrubs and grasses. Trees such as *Acacia karoo* and the exotic mesquite *Prosopis glandulosa* are mainly restricted to watercourses, where they often form dense stands. The Nama Karoo has a much higher proportion of grasses and trees than the Succulent Karoo.

The Karoo (both Succulent and Nama Karoo biomes) supports a high diversity of bird species that are endemic to Southern Africa. This is due to the availability of two distinct habitat types in the Karoo, viz. the open areas which support ground dwelling species such as Ludwig's Bustard and Blue Crane, and the watercourses with their taller trees which support species that would normally be found in Arid Woodland, such as the Kori Bustard.

5.3.2.3 Grassy Karoo

Essentially, Grassy Karoo is a transition between the Nama Karoo and Grassland biomes. It is primarily composed of dwarf shrubs, with more grasses and trees than the Nama Karoo. The bird species present in this vegetation type are typical of both the Grassland and Karoo biomes, for example, the Karoo Korhaan. Several grassland species, which have declined due to the loss of grassland habitat, have found refuge in the Grassy Karoo (of which the Blue Crane is a prime example).

5.3.2.4 Micro habitats

The proposed sub-station site is positioned on a slight mid-slope consisting of natural Karoo vegetation. This micro habitat could support a number of bird species, but is not preferred micro habitat for any Red Data species recorded in the area.

5.3.2.5 Relevant bird populations

The primary data source used in determining the distribution and abundance of bird species in the study area was the SABAP Data. Red Data bird species recorded in the study area and their report rates[3] are shown in Table 3. It should be noted that other Red Data species (for example, Ludwig's Bustard, Secretary Bird, Martial Eagle, Tawny Eagle and the Karoo Lark) have been recorded in the broader study area, and could occur on the proposed site, despite not being recorded during the atlas survey period. In addition, it should also be noted that many non Red Data[4] bird species also occur in the study area and could be impacted on by the proposed sub-station. These include: Korhaans, Larks, Karoo Robin, Pipits, Black-shouldered Kite, Jackal Buzzard, Pale Chanting Goshawk and the Rock Kestrel.

5.4 Description of the social environment

5.4.1 The study area

The area affected by the project is divided into a number of District and Local Municipalities, including:

- The affected district municipality in the Northern Cape is the Pixley ka Seme District Municipality (DC 07). The affected local municipal area is the Ubuntu Local Municipality (NC 071).
- The affected district municipality in the Western Cape is the Central Karoo District Municipality (DC 05). The affected local municipal area is the WCDMA 05.

[3] Report rates are essentially an expression (%) of the number of times a species was seen in a square divided by the number of times that square was counted.

[4] Although this impact assessment focuses on Red Data species, the impact on non Red Data species is also assessed, albeit with less emphasis.

Table 3 Red Data bird species likely to occur on the site of the proposed Gamma Sub-station

Species	Conservation Status	3123CB
Total species (total number of bird species recorded in the quarter degree square)		80
# cards submitted (number of counts that were carried out in the quarter degree square)		10
Black Stork	Near Threatened	10
Secretary bird	Near Threatened	10
Lanner Falcon	Near Threatened	10

The main towns, which are situated within the study area, are Victoria West and Murraysburg.

The preferred site for the Gamma Sub-station is on the farms Uit Vlugt Fontein No 223 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities. The former is in the Northern Cape Province and the latter in the Western Cape Province.

5.4.1.1 Northern Cape: Pixley ka Seme District Municipality

The Pixley ka Seme District Municipality (DC 7) is situated in the Northern Cape in the south-eastern portion of the Northern Cape Province (arid western interior of the country). It consists of eight local municipalities and the geographical extent of the province is 361,830 km^2.

The general area is sparsely populated and much of the area is semi-desert. The population numbers and densities are particularly low in the dry Karoo area with the majority of the people living in the scattered towns and settlements. The area mainly consists of large game (springbok and wildebeest), sheep and cattle farms. In the Pixley ka Seme District Municipality 63% of the population is formally employed.

5.4.1.2 Western Cape: Central Karoo District Municipality

The Central Karoo District Municipality (DC 5) is situated in the northern part of the Western Cape Province and covers the municipal areas of Beaufort West, Laingsburg and Prince Albert as well as District Management Area WCDMA 05. The geographical extent of the province is 38,853 km^2.

The general area is sparsely populated (37,000 residents) and much of the area is semi-desert. Approximately half of the population lives in the Beaufort West area, i.e. most of the population is urbanised. The Central Karoo District Municipality has been declared as a Presidential Node by President Mbeki during 2001 due to the high levels of poverty.

5.4.2 Access to electricity

The distribution of electricity in the study area can generally be regarded as reasonable. Disparities exist between areas that are remote and urban areas. Approximately 75% of households in the Pixley ka Seme District Municipality have electricity in their dwellings. In the Central Karoo District Municipality, approximately 77% of households use electricity, either directly from Eskom or distributed by the municipality.

5.4.3 Land-use and settlement

The study area comprises vast expanses of open land with concentrated small settlements. The population density is low. Major land-uses in the study area include:

- Commercial agriculture.
- Live stock farming (dairy, beef, sheep, ostriches, etc.).
- Game farming.
- Peri-urban development (including homesteads, shops and limited subsistence agriculture).
- Rural homesteads.
- Eco-tourism and conservation. Many local landowners practise conservation and maintain conservancies.
- Transportation.

Historical, racially-based, land-ownership patterns persist in the study area and the rural areas are characterised by privately, mainly white-owned commercial family farms. Land claims do exist but are not prevalent. In many towns, the pattern of racially inequitable land distribution persists and the pattern of residential segregation continues, with standards of housing and municipal services considerably higher in “white” areas, although most municipalities are actively addressing the provision of basic services to poorly serviced residential areas. Many areas are facing a shortage of vacant, planned or developed residential land and there is the need for land for communal grazing, small-scale farming and non-residential uses.

5.4.4 Transport

Settlements in the study area are generally linked by an adequate road network that is currently under pressure due to inadequate maintenance related to funding constraints. The importance of the road network has increased, benefiting the settlements located on the main routes. Settlements along major road routes have the advantage that tourist movement benefits their economies. The R61 and N1 are the main roads in the study area. They are supported by a network of minor roads, some black-topped but mostly gravel.

5.4.5 Tourism

The area lacks significant features and is located in a part of the country that is fairly inaccessible because of its distance from the main centres of attraction. Nevertheless, a good national road services the area. Surveys show that this is an area that attracts the least number of foreign tourists that visit South Africa.

Nevertheless, tourism in and around Victoria West is developing, albeit at a slow pace. Several bed-and-breakfast establishments, guesthouses and hunting lodges have been established in and around Victoria West. The Apollo Film Festival, which is an annual event, is now becoming well known and does draw numbers of tourists to Victoria West every year.

5.5 Description of the cultural heritage environment

South African Heritage Resources Agency (SAHRA) is the relevant authority in terms of the conservation of cultural heritage resources, including archaeological resources. In terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999), SAHRA has a mandate to protect these resources acting as the national heritage management organisation.

The proposed development site of the Gamma Sub-station occurs in an area where few or no professional surveys of archaeological sites or research projects have been undertaken. Only a few sites, mainly reported by the public are known in the wider vicinity of the proposed site. These include isolated scatters of stone tools and a small number of rock painting sites.

At the site of the proposed Gamma Sub-station, the cultural heritage practitioner noted the presence of miscellaneous Middle Stone Age stone knapping debris, approximately 50 m of a windmill, at S 31 ^{o} 41'400"; E 23^{o} 24'620". Artefacts are water washed and weathered, on patinated shale, and are part of colluvial down slope wash.

Another concentration of archaeological material is present immediately to the west of the existing entrance gate to the property, at S 31^{o} 41'950"; E 23^{o} 24'325". Here very weathered Early Stone Age flakes and cores are mixed with Middle Stone Age knapping detritus. It appears that episodes of soil deflation and pedogenesis have caused the two temporally disparate traditions to mix. Artefacts are eroding open, exposed by down slope wash, and are mixed with other colluvial debris.

These sites have low heritage significance for their scientific value. However, as is the case for all heritage resources, a permit from SAHRA is required for any alteration to them.

With respect to historical structures in the region, it is anticipated that many of the old farmhouses may exceed the restrictions placed on development, which affects buildings or structures that are more than 60 years old. In other words, all building, or parts thereof, markers, milestones, graves and gravestones or landmarks older than 60 years are protected in terms of the National Heritage Resources Act, and may not be destroyed without a permit. These old buildings, which may relate to the movement of the first Dutch trekboers in the 18th and 19th centuries, are a valuable record of colonial settlement.

In terms of heritage resources, one must also consider the visual and aesthetic landscapes. Much of the study area is considered to be managed for purposes of conservation. Similarly, many private landowners/farmers are entering into the eco-tourism sector on a regional scale. The wilderness landscapes of much of the study area are sensitive and critical to preserve for the conservation of the whole region. The conservation of the sensitive landscapes will promote the entry of private landowners/farmers into the eco-tourism sector on a regional scale. It is, thus, necessary to maintain a near natural visual landscape, with limited aesthetic affects and the continuation of nature-based economic activities such as eco-tourism and hunting.

In this regard, it is an imperative that Eskom be sensitive to the requirements of the local people involved in eco-tourism activities in order to minimise visual impacts. Topographical features influence the environment and these features will need to be utilised and the development site optimised to camouflage the sub-station infrastructure to minimise visual impacts and intrusions.

6. ENVIRONMENTAL ASSESSMENT PROCESS

6.1 Scoping

Scoping was undertaken between late October 2006 and early March 2007. Primary activities and/or products of Scoping are outlined in Table 4.

6.2 Impact Assessment

The primary product of Scoping was the Final Scoping Report that was accepted by DEAT on 2 July 2007. An important Section of the Final Scoping Report was the Plan of Study for Impact Assessment which provided information on which Specialist Studies would be undertaken, what would be investigated within each Specialist Study, how the investigations would be conducted, how potential impacts would be assessed and impact significance determined, public participation activities, and applicable time lines. This information is presented in this Section as a basis for the environmental assessment process during the Impact Assessment Phase of this EIA.

The aim of the Impact Assessment Phase was to investigate the environmental issues and concerns that were identified during Scoping. The technical and public participation processes continued to interact at important stages to ensure that both processes built towards a comprehensive investigation of the issues identified. The main activities during this phase were to:

- Undertake focused scientific studies to assess the issues of concern.
- Maintain ongoing communication and participation with stakeholders.
- Integrate the findings into an Environmental Impact Report, inclusive of mitigation measures to ameliorate the effects of negative impacts and optimise positive ones.
- Prepare an Environmental Management Plan.

6.2.1 Technical process

In order to provide scientifically sound information in regard to the various issues raised, a number of Specialist Studies were commissioned. It is important to note that these Specialists did not work in isolation but were required to interact and discuss aspects during their investigations. An integrated approach was adopted to consider direct, secondary and cumulative impacts wherever possible.

In order to address some of the broader key issues, each Specialist was tasked with assessing the possible impact from the angle of their area of expertise, thereafter, the findings were integrated by the EIA Team to provide a comprehensive understanding of the issue. Importantly, information on certain project components and activities were fed into this EIA process from other project team members that did not necessarily form part of the EIA specialist study group.

Table 4 Key activities and deliverables of Scoping

Activity	Deliverable
Project Announcement	Application for Environmental Authorisation
I&AP Identification	Letters of Invitation to Participate
I&AP Engagement	Draft Scoping Report
Public Meeting	Issues and Response Report
On Site Notice Board	Final Scoping Report
Technical Investigations	
Identification of Issues	
Draft Scoping Report Review	

6.2.1.1 Specialist studies

The Specialist Studies were undertaken by professionals regarded as specialists in their specific disciplines. Arising from Scoping, and the distillation of issues and associated potential impacts, the need for the following Specialist Studies was identified:

- Faunal and avi-faunal assessments.
- Wetlands assessment.
- Vegetation assessment.
- Geotechnical assessment.
- Land-use assessment.
- Visual and aesthetics assessment.
- Social and socio-economic assessment.
- Transportation assessment.
- Heritage impact assessment.

Where applicable, the Specialist Studies needed to comply with Specialist Guidelines produced by the Western Cape Department of Environmental Affairs and Development Planning (June 2005).

The results of the Specialist Studies were used by the EIA Team when undertaking the integrated assessment of the proposed sub-station development. The outcomes of integration and assessment were documented in a Draft Environmental Impact Report, which was released in the public domain for comment. An important component of the EIR is the Section dealing with the EMP for construction. The EMP outlines the mitigation and monitoring measures for avoiding or minimising negative impacts and optimising benefits during project implementation. In this regard, the EMP provides a critical link between mitigation measures described in the EIR and their actual implementation.

Following the period of public review, the Draft EIR was updated with comments received, and this Final Environmental Impact Report was produced.

Key aspects of the different Specialist Studies are outlined below.

FAUNAL AND AVI-FAUNAL ASSESSMENTS

- Description of the current state of fauna and avi-fauns in the study area, outlining important characteristics and components thereof, including species-specific habitats, which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- Identification of Red Data species potentially affected by the proposed sub-station.
- The identification of potential impacts (positive or negative, including cumulative impacts if relevant) of the proposed development on fauna and avi-fauna during construction and operation.
- Particular attention must be paid to wetland areas (requiring close interaction with the wetland specialist) and potential impacts.
- The identification of mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

VEGETATION ASSESSMENT

- Description of the current state of the vegetation in the study area, outlining important characteristics and components thereof, which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- Identification of Red Data species potentially affected by the proposed sub-station.
- The identification of potential impacts (positive or negative, including cumulative impacts if relevant) of the proposed development on vegetation during construction and operation.
- Particular attention must be paid to wetlands (requiring close interaction with the wetland specialist).
- The identification of mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The provision of clear guidelines to reduce vegetation damage and loss, and to assist with rehabilitation where damage and loss are unavoidable, and to reduce the risk of the spread of alien vegetation.
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

WETLANDS ASSESSMENT

- Description of the current state of wetlands and key ground water resources (including geo-hydrological aspects) within the study area, outlining important characteristics and components thereof, which may be influenced by the proposed sub-station or which may influence the proposed sub-station during construction and operation. Collaboration with the Geotechnical Specialists is required.
- Description of the functionality of wetlands identified within the study area.

- The identification of potential impacts (positive or negative, including cumulative impacts if relevant) of the proposed sub-station on wetlands during construction and operation. This aspect of the study must identify sensitive and "no go" areas, and should also include an analysis of construction constraints associated with wetlands.
- The identification of mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

GEOTECHNICAL ASSESSMENT

- Description of the site topography and drainage in the study area.
- Description of the site geology and soils in the study area.
- Description of the groundwater conditions and linkages with surface water resources and soil types and conditions. Collaboration with the Wetlands Specialist is required.
- Description of the slope stability, collapse potential, sub-soil seepage and percolation properties.
- Recommendations on suitable construction materials and from where these can be sourced.
- Suggestions on the following:
  - Earthworks, including cuts and fills.
  - Drainage.
  - Founding.
  - Piling.
- An understanding of construction methods opportunities and constraints offered by geotechnical conditions. This is to include the identification of sensitive areas (as well as "no go" areas) and measures to ameliorate construction constraints.

LAND-USE ASSESSMENT

- A description and broad assessment of impacts of land-uses in the study area.
- The identification of potential impacts (positive and negative, including cumulative impacts if relevant) of the proposed development on land-uses in the study area during the construction and operation of the proposed transmission lines.
- The identification, quantification and assessment of potential impacts of the sub-station on tourism, eco-tourism and related activities, and agricultural activities (livestock and crops).
- The identification of areas of conflict with suggestions for remediation. These aspects need to include suggestions on ways in which the development proponent can achieve the development concept while optimising natural attributes of the development area, through the avoidance of appealing landscapes and sensitive habitats. In addition, this aspect of the study must consider relationships between current land-uses and offer measures for managing these relationships. Collaboration with the Visual and Aesthetics Specialist is required.
- The assessment of future land-use opportunities (and their viability).
- The identification of mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

VISUAL AND AESTHETICS ASSESSMENT

- Description of the visual landscape of the study area with specific focus on topographical features that offer impact mitigation opportunities and constraints.
- Description of the area from which the project can be seen (the view shed) as well as the viewing distance.
- An assessment of the visual absorption capacity of the landscape (i.e. the capacity of the landscape to visually absorb structures and forms placed upon it).
- The appearance of the sub-station from important or critical viewpoints within established and existing planned land-uses/activities. Particular attention must be paid to conservation, tourism, eco-tourism and associated activities, and potential effects on sense of place. Collaboration with the Land-use Specialist is required.
- The identification of potential impacts (positive or negative, including cumulative impacts if relevant) of the proposed sub-station on the visual landscape during construction and operation.
- The identification of mitigation measures for enhancing benefits and avoiding, reducing or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

SOCIAL AND SOCIO-ECONOMIC ASSESSMENT

- Description of the current social and socio-economic environments within the study area, outlining important characteristics and components thereof, which may be influenced by the proposed infrastructure or which may influence the proposed infrastructure during construction and operation.
- The identification of potential impacts (positive and negative, local and regional, including cumulative impacts if relevant) of the proposed development on the social and socio-economic environments during construction and operation. This aspect of the study must consider potential impacts on existing infrastructure, nuisance impacts, possible traffic effects, the transmission of diseases, in particular, HIV/AIDS, and health and safety impacts (including poaching and stock theft).
- The identification of mitigation measures for enhancing benefits and avoiding or mitigating negative impacts and risks (to be implemented during design, construction and operation of the proposed sub-station).
- The formulation of a simple system to monitor impacts, and their management, based on key indicators.

TRANSPORTATION

The transportation specialist was required to provide an assessment of the roads serving both sites for the proposed Gamma Sub-station with a view to seeing which is better in terms of transportation. Further, the specialist was required to identify potential red flag and fatal flaw issues (if applicable) and to recommend mitigation measures (if required).

HERITAGE IMPACT ASSESSMENT

- The consideration of the impacts on cultural heritage resources arising from the construction and operation of the proposed transmission lines and infrastructure.
- Information is to be provided on the following:
  - Results of a survey of the construction footprint and the identification of cultural heritage resources that may be affected by the proposed infrastructure or which may affect the proposed infrastructure during construction and operation.
  - Recommended mitigation measures for enhancing positive impacts and avoiding or minimizing negative impacts and risks (to be implemented during design, construction and operation).
- Formulation of a protocol to be followed by Eskom for the identification, protection or recovery of cultural heritage resources during construction and operation.

OTHER INFORMATION

In addition to the above Specialist Studies, the EIA Team also made use of existing information to address subjects such as dust suppression, noise suppression, the effects of Electro Magnetic Fields (EMFs), compensation matters (from EIA: 12/12/20/801), and designing for and managing emergency situations.

6.2.1.2 Integration and impact description

Each specialist was required to review the background and context of the area in which the proposed development is planned to occur. The terms of reference guided each specialist in order to provide input that would eventually ensure that issues and associated impacts were correctly understood and addressed, thereby enabling an integrated assessment of the development proposal.

Each specialist identified (positive and negative) impacts and assessed these for significance using assessment conventions outlined below:

- Nature.
  This provides a description of the impact.

- Extent.
  This describes whether or not the impact would occur on a spatial scale that:
  - Is limited to the immediate area(s) where construction is to take place.
  - Is confined to a small area with a radius of less than two kilometres around the project site.
  - Extends over a larger area that would include a major portion of an area or province.
  - Covers an even wider area that would have national or international implications.

- Duration.
  This provides a prediction of whether the duration of the impact would be:
  - Short-term (0 to 3 years) – or confined to the construction period.
  - Medium-term (3 to 10 years).
  - Long-term (> 10 years).
  - Should be considered as permanent (beyond the anticipated lifetime of the project).

- Intensity.
  This provides a description of whether or not the intensity (magnitude/size/frequency) of the impact would be high, medium, low or negligible (no impact). Wherever appropriate, the specialists stated clearly to whom (or to what component of the ecosystem) the impact(s) would apply. The specialists attempted to quantify the magnitude of impacts and outlined the method(s) used in the quantification process. Where appropriate, international standards were used as a measure of the level of impact. All assumptions have been clearly stated in the various specialist study reports.

- Frequency of occurrence.
  This provides a description of any repetitive, continuous or time-linked characteristics of the impact(s) as:
  - Continuous (i.e. without interruption).
  - Intermittent (occurring from time to time, without specific periodicity).
  - Periodic (occurring at more or less regular intervals).
  - Time-linked (i.e. occurring only or mostly at specific times of the day or week, for example, the impact only occurs at night, or during normal working hours).

- Probability of occurrence.
  This provides a description of the probability of the impact actually occurring as:
  - Improbable (very low to low likelihood).
  - Probable (distinct possibility).
  - Highly probable (most likely).
  - Definite (the impact would occur regardless of prevention or mitigation measures).

- Legal requirements.
  This provides an identification and list of specific legislation and permit requirements that potentially could be infringed upon by the proposed project or which are required to enable the project to proceed.

Based on a synthesis of the above, the specialists were required to assess the potential impacts in terms of the following criteria:

- Significance.
  The significance of impacts of the proposed project was assessed both with and without mitigation. The significance of the identified impacts on components of the affected environment (and where relevant, with respect to potential legal infringement) were described as:
  - Low, where the impact will not have a significant influence on the environment, and, thus, will not be required to be significantly accommodated in the project design.
  - Medium, where it could have an adverse influence on the environment, which would require modification of the project design or alternative mitigation actions.
  - High, where it could block the project regardless of any possible mitigation.

- Status of the impact.
  This is a statement of whether the impact is positive (a benefit), negative (a cost), or neutral.

- Degree of confidence in predictions.
  This is a statement of the degree of confidence in the predictions, based on the availability of information and the specialist's knowledge and expertise.

Prior to the completion of the specialist studies, a group integration and information-sharing workshop was held. The aim of this workshop was to enable each Specialist to review the findings of the other Specialists, to better identify linkages, and to quantify the impacts where aspects of focus overlapped.

The findings of the specialist studies are summarised in Chapter 7 of this report. Chapter 8 considers issues in an integrated manner, with the assessment and mitigation of impacts, and assessing the significance of potential impacts without and with mitigation measures taken into account. Mitigation measures are taken forward to an EMP for construction (Section 9).

6.2.2 Public participation

Interested and Affected Parties continued to be informed of progress with the Specialist Studies and the EIA, and were requested for their inputs on an ongoing basis (this continued up to the submission of the Final EIR for Authority decision-making). During the Impact Assessment phase, I&APs received one personalised letter advising them of the opportunity to comment on the Draft EIR and associated Specialist Study Reports.

All I&APs were advised in good time of the availability of reports, how to obtain them, and the date and venue of a public meeting where the contents of the reports were presented for comment. The availability of reports was also advertised in the appropriate media. I&AP comments have been incorporated into an updated Issues and Response Report (Appendix 3), which also includes comments received on the Draft EIR.

In addition to continued contact with I&APs, members of the EIA Team communicated with key authorities at local, provincial and national government at necessary times throughout the process to facilitate discussion and understanding.

Where possible, public participation activities for this environmental authorisation process were optimised with those activities forming part of EIA 12/12/20/801 for the proposed Gamma-Grassridge 765 kV Transmission Lines (x 2) (for the most part, the two processes were undertaken concurrently, and involved the same I&APs in the area of the proposed sub-station).

Once the Competent Authority has issued a ROD on the proposed development, this will be conveyed to members of the public via advertisements and personalized letters. All I&APs will receive a letter at the end of the EIA notifying them of the ROD and explaining the appeal procedure.

6.2.3 Programme

In order to meet the expected electricity demand, the proposed Gamma Sub-station must be operational by 2009. Therefore, construction must commence in the second half of 2007. This EIA has been managed with a target date for the issuing of a ROD by DEAT in mid-August 2007.

7. SPECIALIST STUDY FINDINGS AND RECOMMENDATIONS – SUMMARY

Ten specialist studies were undertaken (Table 5), the results of which are presented in this section. In addition, material drawn from Eskom was used to inform the assessment of issues and associated potential impacts.

Table 5 Details of specialist studies and specialists

Specialist Study	Specialists	Organisation
Fauna	Prof G Kerley, Dr A Boshoff and Ms M Landman	Centre for African Conservation Ecology Nelson Mandela Metropolitan University
Avi-Fauna	Mr J Smalie	Endangered Wildlife Trust
Wetland	Dr D Schael	Centre for African Conservation Ecology Nelson Mandela Metropolitan University
Vegetation	Prof E Campbell	Centre for African Conservation Ecology Nelson Mandela Metropolitan University
Geotechnical	Mr P Hansmeyer	Engeolab
Land-Use	Dr D Tapson	David Tapson Consultants
Visual and Aesthetics	Mr M Klapwijk	Cave Klapwijk and Associates
Social and Socio-Economics	Mr J van der Walt	Ntshebe Consulting
Transportation	Mr F Serton	Masise Consulting
Cultural Heritage	Ms B Wahl and Mr L van Schalkwyk	eThembeni Cultural Heritage

7.1 Faunal Assessment

By using the habitat characteristics of the area, viz. Nama-Karoo shrublands, and the particular species' habitat requirements, twenty two faunal species with conservation concern (for example, restricted distribution range, Red Data Book species, etc) were identified (Table 6). Riverine rabbits (Critically Endangered) are potentially most vulnerable (to direct loss/transformation of habitat and indirect effects, for example, poaching and increased predation by raptors), due to their particularly limited distribution range and the fact that they are extreme habitat specialists. Although potential riverine rabbit habitat does occur on the proposed site, the habitat is thought to be of a low quality, presumably as a result of overgrazing by domestic herbivores (resulting in changes in vegetation structure and composition). Moreover, there are currently no records for riverine rabbits at the proposed site. As a precautionary measure, however, it is recommended that Eskom compensates for any potential loss/transformation of habitat by contributing towards the conservation of riverine rabbit habitat elsewhere, i.e. off-set mitigation. Potential impacts on the remaining fauna that occur in the study area may be within acceptable limits as these species are mobile, are more generalistic in their habitat requirements, and the area being transformed is relatively small (172 ha). Impacts associated with the operation of the Gamma Sub-station (for example, increased impact on raptor prey-populations through increased perch-availability, poaching and incidental predation of fauna by domestic dogs) will potentially have a low impact on fauna, provided that the recommended and specific mitigating measures are implemented.

Table 6 List of fauna that potentially occur naturally on the proposed Gamma Sub-station site for which conservation concerns were identified

Class	Species	Common Name	Conservation Concern
Butterflies	*Phasis braueri*	Brauer's arrowhead	Restricted distribution range
	Spialia sataspes	Boland sandman	Restricted distribution range
	Tsitana uitenhaga	Uitenhage sylph	Restricted distribution range
Reptiles	**Chelonians**		
	Geochelone pardalis	Leopard tortoise	Provincial legislation: CITES APP II
	Psammobates tentorius tentorius	Tent tortoise	Provincial legislation: CITES APP II
	Scaled Reptiles – Snakes and Lizards		
	Lamprophis fiskii	Fisk's house snake	SA RDB: Rare
	Acontias meleagris orientalis	Cape legless skink	Restricted distribution range
	Bradypodion karrooicum	Karoo dwarf chameleon	Provincial legislation: CITES APP II
	Chamaeleo namaquensis	Namaqua chameleon	Provincial legislation: CITES APP II
	Cordylus polyzonus	Karoo girdled lizard	Provincial legislation: CITES APP II
	Nucras livida	Karoo sandveld lizard	Restricted distribution range
	Pachydactylus oculatus	Golden spotted thick-toed gecko	Restricted distribution range
	Varanus albigularis	Rock monitor	Provincial legislation: CITES APP II
Small, Medium and Large Mammals	**Bats**		
	Cistugo lesueuri	Lesuer's wing-gland bat	SA RDB: Near Threatened
	Insectivores*		
	Atelerix frontalis	Southern African hedgehog	SA RDB: Near Threatened; National Legislation: NEMBA – Protected
	Medium Mammals – Herbivores		
	Bunolagus monticularis	Riverine rabbit	SA RDB: Critically Endangered; National Legislation: NEMBA – Critically Endangered
	Medium and Large Mammals – Carnivores		
	Caracal caracal	Caracal	Provincial Legislation: CITES APP II
	Felis nigripes	Black-footed cat	National Legislation: NEMBA – Protected; Provincial Legislation: CITES APP I
	Felis silvestris	Africa wild cat	Provincial Legislation: CITES APP II
	Mellivora capensis	Honey badger	SA RDB: Near Threatened; National Legislation: NEMBA – Protected
	Panthera pardus	Leopard	National Legislation: NEMBA – Vulnerable; Provincial Legislation: CITES APP I
	Vulpes chama	Cape fox	National Legislation: NEMBA – Protected

*Insect eating mammals

7.2 Avi-faunal Assessment

The quarter degree square within which the proposed sub-station site occurs (3123 CB) consists of 51% “nama karoo” and 49% “grassy karoo”. A total of 80 bird species, three of which are considered “near threatened”, were recorded in 3123 CB by the Southern African Bird Atlas Project. A number of other bird species, both Red Data and non Red Data, have been recorded in the broader area and could potentially also occur on the site (despite not being recorded by the atlas project).

The potential impacts of the proposed sub-station on the birds of the area are: destruction of habitat, disturbance, electrocution of birds on sub-station infrastructure, collision of birds with the communications tower, and the impact of birds on the operation of the sub-station. Importantly, none of these impacts are considered to be of high significance. All construction activities should be undertaken according to generally accepted environmental best practice, with care taken to destroy as little as possible of the natural vegetation, and to minimise unnecessary disturbance on site. Construction camps should be placed well away from koppies and the drainage line and dam on Uit Vlugt Fontein. Movements of off duty staff should be strictly managed at all times to minimise impact on local avi-fauna. Once operational, the sub-station should be monitored to detect any bird electrocutions, bird impacts on the sub-station, and bird collisions with the communications tower. If necessary, mitigation measures for these impacts can be recommended reactively. This is because the anticipated low significance of these impacts does not warrant implementing mitigation measures proactively.

7.3 Wetland Assessment

Upon review (based on an aerial and ground survey) of the proposed areas for the Gamma Sub-station (Uit Vlugt Fontein No. 233 and Schietkuil No. 3), it would appear that there are no wetland or riverine areas that will be directly impacted by the construction and operation of the planned sub-station. The probability that a wetland or riverine area would be impacted is low at a medium confidence level. However, within the proposed sub-station areas, there are a few intermittent streams that should be avoided if they fall within transportation pathways during the construction of the project. In this event, any impact would be short-term but could have a medium impact on a stream if care is not taken to mitigate potential impacts. In this regard, heavy machinery should be directed around these systems, or the use of existing bridges or crossing points encouraged, in order to prevent damage to already fragile and erosive systems.

7.4 Vegetation Assessment

The vegetation of the proposed Gamma Sub-station site falls in the Nama-Karoo Biome, more specifically in the Upper Karoo Bioregion. The Acocks Veld Type is Central Upper Karoo (Acocks Veld Type 27). White mapped the vegetation as Highveld/Karoo Transition in the Kalahari-Highveld Phytochorion while Low and Rebelo list the Vegetation Type to be Upper Nama-Karoo (Vegetation Type 50). The most recent vegetation map classifies it as Eastern Upper Karoo.

The Eastern Upper Karoo Vegetation Type is Hardly Protected but it has an ecosystem status of Least Threatened. The National Spatial Biodiversity Assessment classified the area proposed for the Sub-station as being poor in threatened plant species and moderate in endemics. The site has the lowest level of irreplaceability for vegetation (0.2 = lowest level of conservation importance) and it ranks in the lowest category for vulnerability. Overall the Vegetation Type ranks low for conservation value and the use of less than 0.004% of the Eastern Upper Karoo for a Sub-station will not jeopardize any conservation plans for this Vegetation Type.

Only one species of special concern was recorded on the Gamma Sub-station site (*Boophone disticha* or gifbol). All other protected species recorded on site are abundant in the areas. *Boophone disticha* is a geophyte that will transplant easily and the few individuals found on site should be translocated before construction.

The vegetation surrounding the proposed study site is highly similar to that on the Gamma Sub-station site and construction camps may be constructed adjacent to the Sub-station site in any direction, avoiding the ridges that are some distance to the north and east.

7.5 Geotechnical Assessment

Both sites are underlain by greyish-blue shale of the Beaufort Group, intruded by north-west trending dolerite dykes, which form prominent landmarks in an otherwise flat topography. At the Kleinfontein site, the shale bedrock is blanketed by a layer of brown sandy colluvium, with abundant flaky shale fragments, approximately 0.3 m thick, sequentially underlain by highly weathered shale bedrock intercalated with dark grey to black carbonaceous lenses. [It should be noted that the Kleinfontein site is covered by construction debris and surplus shale bedrock excavated from a local cutting on the N1]. The Uit Vlugt Fontein site is blanketed by ivory coloured, partially to well cemented calcrete, approximately 1.0 to 1.5 m thick, sequentially underlain by shale bedrock in various stages of weathering. As indicated by the local borrow pits, road cuttings, access roads and drainage courses, the immediate surroundings of the Uit Vvlugt Fontein site are blanketed by calcrete.

Main access roads to the two sites are tarred and in good condition. However, the existing gravel road at Kleinfontein will only be passable in the dry part of the year. With calcrete as a wearing course on Uit Vlugt Fontein, better access is expected in all weather conditions. Both access roads are initially fairly flat. However, substantial fill may be required for the easterly section of Kleinfontein.

Drainage of the immediate areas surrounding both sites is controlled by a north-west trending dolerite dyke on the farm Schietkuil, which separates the two sites. To this end, run-off from Kleinfontein forms the headwaters of the Burgerspruit whilst Uit Vlugt Fontein falls within the catchment of the Brakrivier. The confluence of these drainage channels is located 5 km down stream from the two sites, characterized by a wetland.

The Kleinfontein site is located down-slope from a local but dubiously constructed, small earth embankment dam and close to the confluence of two local, non-perennial drainage courses. Based on visual observations, it is obvious that the area is susceptible to flooding and drainage precautions will be required, with possibly some up-slope flood protection.

At Uit Vlugt Fontein, the terrain is flat and topographically well-suited for the proposed sub-station. The possibility of flooding seems remote.

Generally, boreholes drilled into the shale bedrock normally have low yields (< 0.2 l/s) whilst higher yields and better quality groundwater are associated with dolerite/shale contact zones.

Kleinfontein and the adjacent farm Schietkuil do have a number of motorized boreholes as well as some windmills. Water for construction and operational purposes may be purchased from the owners. However, the boreholes on Uit Vlugt Fontein are equipped with hand pumps and, therefore, if substantial volumes of water are required for construction, a motorized borehole will be needed.

No springs were noticed on either of the sites and ponding was absent. However, deeper pools in the non-perennial drainage courses may yield some water for pavement layer construction purposes.

The shale bedrock exposed in the road cutting near the Kleinfontein site appears to be medium weathered and founding within the competent shale with a bearing capacity of 500 KPa is expected at an average depth of 0.5 m. Consolidation settlement is expected to be < 5 mm and only to occur during the construction period. No heave is expected as the materials are too gravelly. Good site drainage is required.

The shale bedrock at the Uit Vlugt Fontein site is blanketed by partially to well cemented calcrete, approximately 1.0 m thick (and more in places). The ivory coloured calcrete is partially to well cemented with an estimated bearing capacity of 150 KPa and negligible consolidation settlement. However, where the profile is dominated by powdery, partially cemented calcerous soils, some densification will be required. Alternatively, the structures should found on competent shale bedrock below the calcrete. No heave is expected as the materials are too gravelly.

Excavation of loose topsoil, partially cemented calcrete and weathered shale will require light powered machinery (tractor-loader-bucket excavators) whilst well cemented calcrete and medium weathered shale are classified as intermediate, requiring more powerful machinery.

The topsoil, calcrete and bedrock horizons are low permeable and French drain systems can only be implemented where loads are low (five to eight adults). During peak construction periods, alternative systems will have to be considered, such as chemical toilets, conservancy tanks and enzyme absorbent systems.

Inspection of the dry drainage courses, borrow pits and road cuttings revealed the absence of fine aggregate (sand). Concrete stone may be produced on site using dolerite boulders crushed and screened with mobile crushers.

Alternatively, these materials will have to be imported from an approved source. Both fine and course aggregate may be obtained in Port Elizabeth, and concrete stone from De Aar. According to local sources, the Graaff Reinet crusher provides concrete stone to the Western Cape Provincial Authorities for their roads exclusively.

Good quality pavement layer construction material at the Kleinfontein site is rather scarce and unless a borrow pit can be developed within the dolerite dyke on the neighbouring farm Schietkuil, materials will have to be imported from elsewhere.

Abundant calcrete suitable for the construction of wearing courses, to selected and perhaps sub base layers, is available on Uit Vlugt Fontein.

In summary, although both sites are underlain by fairly competent founding material (shale bedrock), the calcrete on Uit Vlugt Fontein can be used both as a founding medium and for the construction of pavement layers.

Access to both sites is good, but Kleinfontein will require some filling. Also, depending on the route and site locality, some stockpiled material will have to be removed.

In terms of drainage, ponding and surface run-off, the Uit Vlugt Fontein site does not require any additional preparations/precautions whereas Kleinfontein is located down-slope from a small earth embankment dam and precautions are required to prevent flooding due to over topping of two drainage courses (with their confluence located in the near vicinity).

Ample groundwater and surface water are available at Kleinfontein whilst Uit Vlugt Fontein will most probably require one or more boreholes.

Foundation conditions are more or less similar on the two sites, but deeper bedrock and possible loose cover materials on the Uit Vlugt Fontein will require some attention. Excavation of material deeper than 1.5 m will require powerful excavators and hard ripping. Deep excavations > 2.0 m will require blasting. Due to low permeable bedrock, French drain applications are limited and alternative waste water disposal systems will be required during peak construction periods.

Concrete aggregate (fine and course) will have to be imported from as far as De Aar and Port Elizabeth.

Good quality pavement layer construction material is available on Uit Vlugt Fontein, whereas material for Kleinfontein will have to be imported.

Based on these findings, it is recommended that the proposed Gamma Sub-station be located on Uit Vlugt Fontein. However, prior to the commencement of any planning or construction, it is recommended that the groundwater sources be investigated and, if required, boreholes drilled, pump tested and the water quality analysed.

7.6 Land-use Assessment

The determining elements affecting land-use in the area are rainfall, soils and vegetation. The key characteristics of these are as follows:

- Rainfall.
  The bulk of the study area experiences approximately 200 mm of rainfall per annum. Typically, such low rainfall regimes are also highly variable, with years of little or no rainfall and others where it could be double or triple the long-term average. Further, the summer rainfall pattern is such that the bulk of the precipitation in any summer could be received in two or three rainfall events. The limited rainfall severely limits the type and scale of agriculture that can be practiced (Figure 10).

- Soils.
  The study area is mainly underlain by sedimentary rocks belonging to the Karoo sequence, comprising thick successions of shale, sandstone and mudstone of the Ecca and Beaufort Groups. Large areas from the Gamma Sub-station to Aberdeen are blanketed by alluvium and calcrete. The study area is characterised by primarily thin residual soils and transported soils of varying thickness. Overall, the soils in the study area are primarily shallow and weakly developed, with surface limestone and rocks and are unsuitable for agriculture (Figure 11).

- Vegetation.
  The vegetation patterns of the study area are the outcome of the interaction between the rainfall and soil conditions described above. They in turn are the prime determinant of the land-use type that will prevail in the area. The study area falls into the Nama Karoo biome, which is described as fragile and sensitive (Figures 12 and 13), with little regenerative capacity once damaged.

The conditions described above give rise to a very low level of primary productivity in the study area, which limits primary land-use to extensive livestock production, the dominant form of agriculture throughout the region. Production systems include sheep, goats, cattle, and in recent years, game animals.

Approximately 80% of the Karoo veld types are severely degraded, an outcome of nearly two centuries of a specific land-management pattern which involved:

- Effectively stable stock numbers on the rangeland, leading to an unvarying level of demand for herbage. In contrast, the supply of herbage is dependent on rainfall, which is extremely variable. Thus, the incremental supply of herbage in any given year could vary from nothing to twice the long-term notional average, while the pressure from livestock remained the same. The prudent response to these conditions is to impose a very light stocking rate, thus, allowing for the possibility that carry-over herbage from good years could sustain the system in poor years.
- However, there has been persistent heavy stocking relative to the productivity of the system over the entire time-span, thus, precluding the opportunity to preserve fodder or to allow recovery periods for the plants.

The effect of this has been the virtual elimination of basal cover of any sort, leaving a landscape dominated by small shrubs and bushes, growing singly or in small mixed clumps, separated by bare fragile soil vulnerable to erosion in intense summer storms. It can be argued that, in the study area, degradation is so far advanced it can go no further, which must be related to the impact that the sub-station and its development process can have on the local ecology.

To summarise, the land in the region has very low potential and most of it is degraded, in the drier areas severely degraded. The direct impact of the development on land-use will, therefore, not be significant.

In terms of potential impacts, the development will be limited to civil engineering works, within the boundary fence of the site. The development itself will, therefore, have no impact on the land-use of the surrounding unaffected area and no mitigation actions are necessary there. However, within the site boundary, the construction work will consist of bush clearing over the whole site and land-levelling where construction items are to be installed. The only hazard arising from this is the possibility of severe erosion from rain and some wind erosion, for as long as the raw soil surface is left uncovered. If the site were to experience a rain storm of say 25 to 50 mm while the surface is exposed, not only would the on-site soil formation be damaged but the flow of water off site would deliver sediment to the nearby drainage lines. It seems likely that this is the only hazard likely to arise during construction. In this regard, three mitigating activities are deemed to be necessary:

- Since sedimentation from erosion is the most important likely impact to the off-site surroundings, in a general sense, ground works must in all cases be planned to minimise erosion. In essence, this amounts to designing drainage so that water accumulation across the ground surface is kept to below that volume which might cause erosion. The elevated area in the north of the site (Figure 2, Point B) might present specific problems that will require attention.
- The exposure of the soil due to bush clearing and land-levelling should be timed to occur during the dry winter months of the year (as far as practically possible).
- As soon as is technically possible, the exposed surface area, which will not be covered in concrete, should be protected by a layer of crushed stone.
- All land-clearing, drainage and shaping must be conducted within the provisions of the Conservation of Agricultural Resources (Act 43 of 1983).

In conclusion, it is recognised that this is not valuable land and, therefore, the damage done either to the surface of the site or collateral damage off site will not result in costly losses. Nevertheless, it remains necessary to respect the fragility of the environment and, in particular, to ensure that excess sediment is not delivered to the adjacent drainage lines.

7.7 Visual and Aesthetics Assessment

A site visit was undertaken during May 2007 to determine the setting, visual character and land-uses of the areas. Analytical maps to determine the extent of the potential impact were developed using Geographic Information System (GIS) algorithms, available in the Arcview Software Suite. 1:50 000 maps and route alignment maps were used together with information gathered in the field to determine the setting, visual character and land-use of the area surrounding the route, the Genius Loci (sense of place), the extent of the affected visual environment, the viewing distance and critical views.

The sub-station will require an area of 1.6 km x 800 m for construction. The maximum height of the development will be 45 m (excluding the incoming 765 kV transmission lines).

Determining a visual resource and the impact thereon in absolute terms is not achievable. By implication, subjectivity cannot be excluded in the assessment procedure. Also, the assessment is based on assumed demographic data. In this regard, no detailed study was done to determine accurate data on potential viewers of the project components.

The landform of the study area slopes gently south to south-east towards the R63. Low hills form a low horseshoe enclosure to the west, north and east, which could provide a low visual barrier. The flat open topography allows direct views onto the site from the R63 and N1. The R63 and N1 are considered the critical viewpoints as these carry most of the viewers that would be exposed to the visual impact.

Due to the low visual absorption capacity of the landscape (the ability of the landscape to visually accommodate the development) the sub-station will be dominant in the landscape. The uniformity of the visual landscape and lack of diversity will result in a visual contrast should a sub-station be placed on it.

However, as the study area has a relatively undefined sense of place, the visual impact will not have a high significance on the modification of the *Genius Loci* as the sense of place has already been affected by existing infrastructure and the close proximity of the R63.

Also, the visual intrusion will not have a significant impact or influence on existing land-uses as these generally do not rely on the visual and aesthetic environments.

The view shed analysis has determined that, in theory, the sub-station could be visible for up to 100 km due to the flat and open terrain. However, studies have concluded that visibility decreases exponentially over distance and it is concluded that the visual impact of the sub-station would be insignificant beyond 10 km.

Therefore, in conclusion, based on the study, and due to the scale, height and bulk of the development components, the visual impact of the project on the local environment will be highly intense but the significance of the impact is considered low. The visual impact can be reduced to some extent by implementing the recommended mitigation and management measures described below:

- Earthworks and landscaping.
  The visual impact during construction will be highly significant and little can be done about reducing the effect since the works cannot be screened nor can it be moved to more visually suitable positions. The mitigation measures during operation will need to focus on effective rehabilitation of the construction area. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result.

  Sculpturing or shaping the cut and fill slopes of platforms and access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing landforms the visual impression made, is that the project component has followed the natural shape of the landscape, rather than engineered through the landscape.

  Vegetation stripping should be done in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp edged as viewers tend to form positive visual impressions such as “gentleness” and “delicacy” and tend to object to negative visual impressions such as “rough”, “rugged” or “violent”. When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines, appear to blend in with the natural configuration and lines in the landscape.

  It is essential that all cut and fill slopes, as well as all areas disturbed by construction activity, are suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.

  All areas affected by the construction works will need to be rehabilitated and re-vegetated. This includes the areas beyond the works area such as temporary access roads, construction campsites, workers’ campsites, borrow pits, laydown areas, etc.

  The special conditions of contract must include for the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at least the top 300 mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should be all areas that will be covered by structures, roads and construction camps. The presence of degraded and disused roads and areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be topsoiled and re-vegetated.

  The rehabilitation and stabilisation of vegetation of all rehabilitated areas, buffer strips and new landforms must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of plant cover, etc) are identified early so that corrective measures can be taken.

- Colour/Texture/Scale.
  To reduce the visual intrusion of the sub-station buildings it is recommended that the colour selected for roofing and walls be of a nature which will help to visually break up the surfaces of the buildings, and that they are matt, not glossy, so as to reduce reflection and glare from the surfaces. Roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture.

Roof material shall not be a silver colour (for example, unpainted galvanised corrugated iron) or be glossy to the extent that it can reflect the sun or artificial light. This is particularly relevant given the harsh sunlight and the flat landform. It is important that the colour choices and patterns should be timeless in that they should not become dated. These colours should be complementary to the colours in the surrounding landscape, such as olive green with buff trim, light grey, grey green, blue grey, dark buff, rust, ochre or natural tones such as variations of tan and be matt in texture.

- Lighting.

  As night lighting, during both construction and operation[5] is one of the more objectionable forms of visual impact, it is important that selective and sensitive location and design of the lighting requirements for the construction camp and the sub-station are developed, for example, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward. It is also important to avoid uplighting of structures and rather to direct the light downwards and focussed on the object to be illuminated. Also, one should avoid directing the light towards the direction from where it would be most experienced.

  Light spill particularly upwards must be minimised. This can be achieved by implementing the following recommendations:
  - All external light fittings shall not allow light to shine upwards.
  - All security lighting shall have “blinkers” or be specifically designed to ensure light is directed downwards while preventing side spill. This may require that light pole numbers will increase to give the required illumination on the ground.
  - Lighting for security and safety must be directed downwards and towards the structures to reduce light spill beyond the property boundary.
  - Area lighting on tall masts should be confined to the lower landform elevations.
  - Tall structures, such as communication towers, will by law have to be fitted with a red flashing light if they exceed 45 m in height[6].
  - There is little that can be done on the location that will reduce the visibility of this light.
  - The viewer will need to make provision for blocking views of these lights by screen planting, screens or orientation to keep the light out of the viewshed.

- Dust suppression

  All areas that will be affected by construction activities and where dust will be generated will require dust suppression by regular wetting, possibly by means of a water bowser, or by means of a soil binding compound. The importance of suppressing the visual aspects of dust cannot be overstressed since the visibility will generate the impression of a polluting industry.

In terms of monitoring and review, the rehabilitation and stabilisation by vegetation of all new landforms, for example, platform side slopes, road fill or cut slopes must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of grass cover, etc) are identified early so that corrective measures can be taken.

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5 It should be noted that the sub-station will not be lit up at night. Rather, emergency lights will illuminate in the event that the perimeter fence is breached.

6 All structures, by default, over 45m high must by law be ‘marked’ either by a flashing red light or in the case of transmission lines with suspended balls. This height could be lower if the structure is considered as a hazard to aviation. These markings then need to be registered with the CAA. Relevant legal aspects are addressed in Part 139.01.33 of Regulation Section 22 of the Aviation Act 74 of 1962. Part 91.01.10 of the same act is also relevant. See also Section 85 of the Act. In terms of 765 kV towers (55 m high), they would require such markings only where they cross major roads and service corridors such as the N1 where aircraft may be used for casavac emergencies or where patrolling and monitoring is done by aircraft, and, also, within the active zone around an airport/strip.

During construction, the detailed requirements, which would have been set during the design phase and incorporated in the contract documentation, must be monitored for compliance.

In closing, the proposed Gamma Sub-station will exert a negative influence on the visual environment, largely due to the following:

- High visibility of the project components.
- Impact on the visual quality and the sense of place.
- Impact on critical views (R63 and N1).
- The height of the structures could be dominant in the landscape.
- The large extent of the sub-station will dominate the surrounding landscape.
- The high visibility of construction and operation activities within a landscape of uniform visual pattern and flat topography.
- The low visual absorption capacity of the setting which is attributable to:
  - Relatively flat to undulating topography.
  - The low vegetation height (less than one metre).
  - The lack of visual diversity.

Therefore, from a visual point of view, the visual impact is regarded as significantly low, notwithstanding the large extent and height of the substation, the low visual absorption capacity and the close proximity to the R63 and the N1. The significance is tempered by the low surrounding hills, the already altered landscape due to existing transmission lines, a capacitor station and major roads, and the lack of economic activities that rely on the visual environment such as game reserves, conservation areas and lodges.

7.8 Social and Socio-economic Assessment

The area affected by the project falls into two provinces, and is divided into a number of District and Local Municipalities, including:

- Northern Cape: the Pixley ka Seme District Municipality (DC 07) and the Ubuntu Local Municipality (NC 071).
- Western Cape: the Central Karoo District Municipality (DC 05) and the WCDMA 05.

The main towns situated within the study area are Victoria West and Murraysburg. Population figures are low, and the population density in either of the municipalities in the study area is more than two people per km².

The greater study area comprises large expanses of open land with concentrated small settlements. Major land-uses in the study area include:

- Commercial agriculture.
- Live stock farming (dairy, beef, sheep, ostriches, etc.).
- Game farming.
- Peri-urban development (including homesteads, shops, and limited subsistence agriculture).
- Rural homesteads.
- Eco-tourism and conservation. Many local landowners practise conservation and maintain conservancies.
- Transportation.

There are no settlements on the project site itself. The homestead on Schietkuil 3/0 is located about 3 km away on the opposite side of the N1, and there is no homestead on Uit Vlugt Fontein 265/1. The next closest inhabited homestead is on Kleinfontein, approximately 6 km from the site, and is occupied by the owner of Uit Vlugt Fontein 265/1. Both Schietkuil 3 and Kleinfontein have eight permanent labourers who reside with their families on the properties in close proximity to the respective farm homesteads.

The site is located on two grazing camps of the two farms where sheep, springbuck, and limited cattle are grazed.

The project site is located in an area with fairly limited existing tourism, although the N1 serves as a main access route between Gauteng, the Free State Province and the Cape.

On Schietkuil 3/0 the old hunting lodge has recently been revamped into a more upmarket Bed & Breakfast, catering for both hunters and overnight tourists. The lodge caters for both local, so-called 'biltong hunters', and international trophy hunters. International hunters predominantly originate from European countries such as Belgium and Germany, and the United States of America. There are no tourist facilities on Uit Vlugt Fontein 265/1, and hunting seldom takes place.

In terms of the description, assessment and mitigation of potential effects of the proposed development, project-specific socio-economic effects were identified and formulated as six questions. In answering these questions, potential effects are described and assessed. The questions and potential effects are as follows:

- What are the potential opportunities for employment and local contractors during the construction and operation of the proposed sub-station?
  These are considered positive effects and include:
  - Employment creation.
  - Opportunities for local contractors, SMEs and ABEs.

- What are the potential effects related to the construction camp during the construction phase of the proposed sub-station?
  There is one positive effect:
  - Potential markets for informal trading.

  There are also a number of negative effects that may manifest themselves, including:
  - Increased pressure on existing infrastructure.
  - Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS).
  - Potential in-migration of people.
  - Potential increase in poaching.
  - Effects on safety and security.
  - Nuisance effects.

- What are the potential effects on farming activities and farm infrastructure?
  There are three negative effects that have been identified:
  - Loss of, or loss of access to farm infrastructure.
  - Disruption of farming and hunting activities.
  - Loss of grazing land.

- What are the potential operation-specific effects of the proposed sub-station on the social and socio-economic environment?
  Two negative effects have been identified:
  - Electromagnetic fields.
  - Emergency situations.

- What are the cumulative effects associated with the proposed development?
  Three cumulative effects were identified:
  - Disruption of traffic flow and logistical difficulties in getting heavy transformers and other equipment to the sub-station site due to limited lane availability on the N1.
  - Exacerbation of negative effects such as induced migration, effects on safety and security, increased poaching, increase in the spread of HIV/AIDS, and increased pressure on existing infrastructure.
  - Competition for construction material from existing quarries and borrow pits.

- What are the potential effects of the proposed sub-station on the social and socio-economic environment, which are specifically dealt with by other specialist studies?
  Two effects were identified (and are discussed elsewhere in this report):
  - Effects on cultural heritage resources.
  - Visual impacts.

In terms of monitoring indicators, there are two broad issues, which are combinations of others, which overarch the majority of impacts outlined above, viz. employment opportunities and use of local contractors, and health and safety. These are as follows:

- Employment opportunities and use of local contractors.
  - Number of people employed per employment category.
  - Number of local people employed per employment category.
  - Number of local contractors, SMEs and ABEs employed.
  - Rand value per employment category and per local employee.
  - Rand value of local, SME and ABE contracts.

- Health and safety.
  - HIV/AIDS awareness as part of all contractor induction.
  - Availability of HIV/AIDS awareness materials and condoms on site.
  - Inclusion of road safety campaigns as part of contractor induction.
  - Number of construction vehicles involved in accidents documented in the accident log.
  - Number of private vehicles involved in accidents documented in the accident log.
  - Number of complaints documented in the complaints register.
  - Nature of complaints documented in the complaints register.
  - Actions taken to address these complaints.
  - Feedback from aggrieved parties regarding the efficacy of resolving complaints.

Arising from the afore-mentioned, the assessment of key issues shows that there are no negative impacts which can be classified as fatal, or which are of high significance thereby blocking the project, provided that the suggested mitigation measures are undertaken.

7.9 Transportation

In terms of transportation, the following evidence is submitted for each site:

- Original sub-station site.
  Access will probably be sought off the N1 (there is an alternative access route via a local gravel road but this is long and tedious, especially for construction.) Vehicles using this intersection could cause a serious hazard on the N1 and a substantial upgrade of the existing intersection would be required.

  The loads imposed on the N1 (for the section of line north of the N1) are limited (one sub-station and 37 transmission line towers) and will not be significant in terms of the lifetime design of the road. Should the sub-station be built at the new proposed site these loads will still be transported on this section of the N1.

- Proposed new sub-station site.
  Access will be off the R63 and via a local gravel road. Traffic on the R63 is very light and a fairly low standard intersection should suffice. Traffic using this intersection should not have a significant impact on through traffic on the R63 (even during construction).

  The loads imposed on the R63 north of the N1 are limited (one sub-station and 32 transmission line towers) and will not be significant in terms of the lifetime design of the road.

Common to both sites is the Kleinfontein N1/R63 Intersection. Due to the very high volume of traffic (and high percentage of heavy vehicles) on the N1, it may be necessary to consider safety measures at this intersection. This will be limited to the construction period and will probably consist of speed reductions on the N1 as well as rumble strips in combination with signage (heavy vehicles crossing/turning). However, it must be noted that depending on from where construction materials come (Johannesburg or Port Elizabeth), this could be relevant to the new proposed site or both sub-station sites.

However, in summary, from a transportation perspective, the new proposed sub-station site is preferred to the original site.

7.10 Cultural Heritage Assessment

At the site of the proposed Gamma Sub-station, the cultural heritage practitioner noted the presence of miscellaneous Middle Stone Age stone knapping debris, approximately 50 m of a windmill, at S 31^{o} 41’400”; E 23^{o} 24’620”. Artefacts are water washed and weathered, on patinated shale, and are part of colluvial down slope wash.

Another concentration of archaeological material is present immediately to the west of the existing entrance gate to the property, at S 31^{o} 41’950”; E 23^{o} 24’325”. Here very weathered Early Stone Age flakes and cores are mixed with Middle Stone Age knapping detritus. It appears that episodes of soil deflation and pedogenesis have caused the two temporally disparate traditions to mix. Artefacts are eroding open, exposed by down slope wash, and are mixed with other colluvial debris.

These sites have low heritage significance for their scientific value. However, as is the case for all heritage resources, a permit from SAHRA is required for any alteration to them.

In the professional opinion of the cultural heritage practitioner, they recommend that this project may proceed with no further heritage resource mitigation. Their independent report has been submitted to SAHRA in fulfilment of the requirements of the Heritage Resources Management Act. At this stage, a formal response is awaited from SAHRA.

8. DESCRIPTION AND DISCUSSION OF ENVIRONMENTAL ISSUES, AND ASSESSMENT OF POTENTIAL IMPACTS

8.1 Issues and concerns

The key issues identified during Scoping were formulated as five main questions:

- What are the potential impacts during the construction of the proposed Gamma Sub-station? This includes aspects such as water (storm water management, water supply and sanitation), geology (soils and geotechnical), air pollution, the influx of construction workers and security concerns, and cultural heritage resources.
- What are the potential impacts during the operation of the proposed Gamma Sub-station? This includes aspects such as the presence of high intensity electro-magnetic fields from EHV equipment, aesthetics, land-use and economic activities, and emergency situations.
- What are the potential impacts of the proposed Gamma Sub-station on flora and fauna?
- What positive or negative economic effects can be expected to the social and socio-economic environments?
- What cumulative effects will the sub-station contribute, seen in association with impacts arising from other activities in the region?

Using the outcomes of the specialist studies, the EIA Team has systematically investigated each issue and assessed potential impacts. The results of the assessment are provided in this section.

8.2 What are the potential impacts during the construction of the proposed Gamma Sub-station?

8.2.1 Water use

In the case of the proposed Gamma Sub-station, there are two important considerations relating to water use, viz. the use of potable water for human consumption and sanitation, and storm water management.

- Potable water for human consumption and sanitation.
  During construction, water for construction activities will be sourced from an on-site borehole. The quantity of water that will be required will be within the general limits specified by the Department of Water Affairs and Forestry and, therefore, no permit is required. Further, given the quantities of water involved as well as the relatively short time during which construction will occur, impacts on groundwater quantity during construction are considered to be insignificant. Mitigation measures are not thought relevant.

  In terms of waste water disposal, as indicated by the geotechnical assessment, during construction, use will be made of chemical toilets that will be serviced regularly (as often as is required). The waste from the chemical toilets will be carted off-site and disposed at the nearest waste water treatment works in Victoria West. It is anticipated that the volumes generated on the construction site will not materially affect the workings of the waste water treatment works in Victoria West and, considering the relatively short duration of construction, potential impacts are considered negligible. There are three management actions that apply:

- It must be stipulated as a condition of contract that ablutions in the veld are unacceptable and will be considered in a serious light, leading to a substantial fine or dismissal.
- The chemical toilets must be serviced as regularly as required.
- The waste water from the chemical toilets must be disposed of at the waste water treatment works in Victoria West.

❑ Storm water management.

The environment within which the proposed sub-station is to be constructed is fragile (soils and vegetation). Added to this, the area receives most of its rain (albeit < 300 mm per annum) during the summer months and, possibly, in a few high rainfall events. The consequence of this is the possibility of severe erosion and vegetation destruction. Furthermore, it is anticipated that sediment will accumulate in natural water ways off-site. Without mitigation, potential impacts are considered of high significance. However, there are mitigation and/or management measures that can be applied which would reduce the impact significance rating to low. These measures include:

- Clearing of areas of vegetation only when these areas are required for construction purposes.
- Rehabilitating and revegetating areas as soon as possible after the completion of construction.
- Designing drainage so that water accumulation across the ground surface is kept to below that volume which might cause erosion.
- The construction of storm water features for construction purposes, including measures to de-energise water prior to its release back into the environment (de-energising will also assist with the settling of sediments, thereby minimising sediment build up in the natural water ways).

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Potable Water	-	Small	Short-term	Low	Periodic	Highly Probable	Nil	Low	High
Waste Water	-	Small	Short-term	Low	Periodic	Highly Probable	Agreement with Local Municipality	Low	High
Storm Water	-	Small	Short-term	Medium	Intermittent	Probable	CARA	Medium	High
With Mitigation and/or Management									
Potable Water	-	Small	Short-term	Low	Periodic	Highly Probable	Nil	Low	High
Waste Water	-	Small	Short-term	Low	Periodic	Highly Probable	Agreement with Local Municipality	Low	High
Storm Water	-	Small	Short-term	Low	Intermittent	Probable	CARA	Low	High

8.2.2 Geology, soils and geotechnical

Both sites are underlain by fairly competent founding material (shale bedrock), with the Uit Vlugt Fontein site also having calcrete that can be used both as a founding medium and for the construction of pavement layers. Concrete aggregate (fine and course) will have to be imported from De Aar and/or Port Elizabeth. Access to both sites is good. In terms of drainage, ponding and surface run-off, the Uit Vlugt Fontein site does not require any additional preparations/precautions whereas Kleinfontein is located down-slope from a small earth embankment dam and precautions are required to prevent flooding due to over topping of two drainage courses. There is ample groundwater and surface water at Kleinfontein whilst Uit Vlugt Fontein will most probably require one or more boreholes. Foundation conditions are more or less similar on the two sites, but deeper bedrock and possible loose cover materials on Uit Vlugt Fontein will require some attention. Excavation of material deeper than 1.5 m will require powerful excavators and hard ripping. Deep excavations > 2.0 m will require blasting. Due to low permeable bedrock, French drain applications are limited to operations only (no permanent staff). During construction, use will have to made of chemical toilets.

It should be noted that the soils are generally susceptible to erosion. Soil stability impacts on erosion potential and, therefore, the removal of vegetation during site clearing will expose the soils enhancing the potential for erosion (Section 8.4.1).

The three primary impacts associated with the geohydrological and geothechnical attributes of the proposed sub-station sites are storm water, waste water and soil erosion. Suggested mitigation measures are provided in Sections 8.2.1 (storm water and waste water) and 8.4.1 (erosion).

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Storm water	-	Small	Short-term	Medium	Intermittent	Probable	CARA	Medium	High
Waste water	-	Small	Short-term	Low	Periodic	Highly Probable	Agreement with Local Municipality	Low	High
Soil erosion	-	Small	Short-term	Medium	Intermittent	Highly Probable	CARA	Medium	High
With Mitigation and/or Management									
Storm water	-	Small	Short-term	Low	Intermittent	Probable	CARA	Low	High
Waste water	-	Small	Short-term	Low	Periodic	Highly Probable	Agreement with Local Municipality	Low	High
Soil erosion	-	Small	Short-term	Low	Intermittent	Highly Probable	CARA	Low	High

8.2.3 Air pollution

The main contributor to air pollution is dust. The environment is arid, the soils are fragile and the vegetation cover is sparse. Given windy conditions, dust is potentially problematic, particularly considering the entire site covers 172 ha, a large proportion of which will be cleared for construction purposes. Particular attention will need to be paid to construction roads that are of a lower design standard because of their temporary status and on which heavy vehicles will travel. Mitigation measures include:

- Clearing areas for construction only immediately ahead of when they are required.
- Apply dust suppression measures, mainly through the application of water via a fan bowser or using a soil-binding agent, as indicated by weather conditions on a day to day basis. Particular attention should be paid to construction roads.
- Limit the speed of vehicles on construction roads to 40 km/h to reduce dust generation, and enforce strictly.
- Reshaping, rehabilitating and revegetating cleared areas immediately once construction has been completed.

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Dust	-	Small	Short-term	Medium	Intermittent	Highly Probable	NEM: Air Quality Act	Medium	High
With Mitigation and/or Management									
Dust	-	Small	Short-term	Low	Intermittent	Highly Probable	NEM: Air Quality Act	Low	High

8.2.4 Influx of construction workers and security

The area where the proposed sub-station is to be constructed is sparsely populated, with a population density of less than two people per km². Apart from the smaller towns, people live on isolated homesteads.

The busiest time of construction is when the civil works are carried out (foundations, storm water drainage, buildings, etc), at which time it is estimated that there will be approximately 80 people on the site. They will be housed in a formalised construction camp that will be established and managed according to contractual specifications contained within an Environmental Management Plan.

Nevertheless, it is acknowledged that it is impossible to manage staff at all times, particularly when they are off duty, and in an isolated environment with few amenities. Therefore, there is a risk that contractors' staff will partake in illegal activities, such as poaching and stock theft (or worse, such as house breaking and assualt).

In addition, it is common for large construction projects to attract people in search of employment. However, it is important to note that the construction of a sub-station is a specialised undertaking requiring skilled people. It is probable that the appointed contractors will bring in skilled staff from other areas. By implication, job opportunities for local people will be limited to unskilled jobs, on site and in construction camps. Nevertheless, while there is a possibility that people will come to the construction site in search of employment, this is considered unlikely given the relatively low numbers of people required for construction and, further, the remoteness of the site. In this regard, it is thought that most people seeking formal employment will come from neighbouring local towns, and would quickly leave the construction site when they learn that there are few or no employment opportunities available.

However, it is possible that local people will establish themselves as vendors to the contractors' staff, deriving an income from informal economic activities. While vending can be regarded as a positive impact during construction, there are also negative attributes associated with an influx of people, notably, crime and prostitution, the latter with the consequence of a risk in the spread of sexually transmitted diseases, of which HIV/AIDS is most important.

In terms of management, it is recommended that the following are implemented:

- An open channel of communication must be established between Eskom, the contractors and the neighbouring landowners.
- A rapid response plan must be formulated to deal with security matters.
- The contractors' camp must be fully fenced, with controlled access.
- Strict controls should be enforced to manage informal trading, preferably in an area specifically designated for this purpose.
- During off-duty periods, contractors should be required to transport their staff to nearby towns where shopping and recreational activities can be undertaken.
- Specific management interventions are required to police prostitution, particularly considering that long-haul delivery vehicles will be arriving and leaving the site on an on-going basis (there is a causal link between long haul drivers and the spread of sexually transmitted diseases).
- Transgressions should be dealt with severely (fines and dismissals).

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Poaching and stock theft	-	Small	Short-term	Medium	Intermittent	Probable	Various	Medium	High
Housebreaking	-	Small	Short-term	Medium	Intermittent	Probable	Various	Medium	High
Informal trading and vending	+	Immediate	Short-term	Medium	Periodic	Highly Probable	Nil	Medium	High
Prostitution and sexually transmitted diseases	-	Small	Short-term	High	Intermittent	Highly Probable	Various	Medium	High
With Mitigation and/or Management									
Poaching and stock theft	-	Small	Short-term	Low	Intermittent	Probable	Various	Low	High
Housebreaking	-	Small	Short-term	Low	Intermittent	Probable	Various	Low	High
Informal trading and vending	+	Immediate	Short-term	Medium	Periodic	Highly Probable	Nil	Medium	High
Prostitution and sexually transmitted diseases	-	Small	Short-term	Medium	Intermittent	Highly Probable	Various	Medium	High

8.2.5 Cultural heritage resources

At the site of the proposed Gamma Sub-station there are miscellaneous Middle Stone Age stone knapping debris. Artefacts are water washed and weathered, on patinated shale, and are part of colluvial down slope wash. There are also weathered Early Stone Age flakes and cores are mixed with Middle Stone Age knapping detritus. It appears that episodes of soil deflation and pedogenesis have caused the two temporally disparate traditions to mix. Artefacts are eroding open, exposed by down slope wash, and are mixed with other colluvial debris. The sites have low heritage significance for their scientific value.

However, as is the case for all heritage resources, a permit from SAHRA is required for any alteration to them, in this case, destruction as part of construction. This is considered the only applicable management action.

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Cultural heritage artefacts	-	Immediate	Permanent	Low	Continuous	Definite	Heritage Resources Management Act	Low	High
With Mitigation and/or Management									
Cultural heritage artefacts	-	Immediate	Permanent	Low	Continuous	Definite	Heritage Resources Management Act	Low	High

8.3 What are the potential impacts during the operation of the proposed Gamma Sub-station?

8.3.1 Electromagnetic fields

Electromagnetic Fields (EMFs) are produced from EHV electrical equipment. An EMF is the electric field generated around conductors through which alternating electric current is flowing. The field is at its maximum closest to the conductor and the intensity drops away from the conductor. Apart from the magnitude of the voltage and current applied to a conductor, the intensity of the EMF depends on the height of the conductors above ground and the spacing between the conductors. For the proposed Gamma Sub-station, Extremely Low Frequency (ELF) fields are likely to be generated.

Eskom is guided by exposure guidelines for electric and magnetic fields as given by the International Commission on Non-Ionising Radiation Protection. Furthermore, sub-stations are designed in accordance with standards of the International Radioactive Protection Agency. Added to this, Eskom adopts the precautionary principle in the control and restriction of activities taking place within the sub-station servitude.

Nevertheless, there are concerns regarding the impact of exposure of humans and animals to EMFs from electrical equipment. In this regard, EMFs are perceived as threats to farm workers and livestock. A number of studies have been undertaken internationally on the biological impact of ELF fields. To date, no conclusive evidence of any health-related impacts has been advanced. To this end, there has been no assessment of potential effects arising from EMFs. However, Eskom must continue to apply existing precautions as related to reducing potential effects of EMFs.

8.3.2 Visual, aesthetics and land-use impacts

The land-use assessment concludes that the land on which the proposed sub-station is to be constructed as well as that surrounding the proposed site, is not valuable. Nevertheless, it does present an appealing landscape that could be impacted negatively by the proposed sub-station, particularly considering the area covered by the sub-station (172 ha) and the height of the proposed infrastructure (45 m, excluding transmission lines, which can be 55 m high for 765 kV transmission line towers). However, this visual intrusion is not considered significant as the current land-uses generally do not rely on the visual and aesthetic environments.

The landform of the area where the proposed sub-station is to be located slopes gently south to south-east towards the R63. Low hills form a low horseshoe enclosure to the west, north and east, which could provide a low visual barrier. However, the flat open topography allows direct views onto the site from the R63 and N1 and, therefore, these are considered the critical viewpoints as these carry most of the viewers that would be exposed to the visual impact.

The ability of the landscape to visually accommodate the development is considered low and, therefore, it is expected that the proposed sub-station will dominate the landscape. Further, the uniformity of the visual landscape and lack of diversity will result in a visual contrast once the proposed sub-station has been constructed.

However, as the study area has a relatively undefined sense of place, the visual impact will not have a high significance on the modification of the *Genius Loci* as the sense of place has already been affected by existing infrastructure (including transmission infrastructure in the form of 400 kV transmission lines and an associated capacitor station) and the close proximity of the R63 and N1.

A view shed analysis shows that, in theory, the proposed sub-station could be visible for up to 100 km due to the flat and open terrain. However, studies have concluded that visibility decreases exponentially over distance and it is concluded that the visual impact of the sub-station would be insignificant beyond 10 km.

Therefore, while the potential visual impact of the proposed sub-station on the local environment will be highly intense, its significance is considered low. Furthermore, there are mitigation measures that be applied to reduce potential visual impacts, as described below:

- Vegetation stripping should be done in a manner where the edges are non-geometric or curvilinear rather than straight or sharp edged.
- The construction area must be rehabilitated and revegetated immediately after the completion of construction activities. Progressive reinstatement should be applied.
- Given that there are few indigenous plants that can be used for screening, it will be necessary to shape and sculpt the cut and fill slopes of platforms and access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact.
- To reduce the visual intrusion, the colour selected for roofing and walls must be of a nature, which will help to visually break up the surfaces of the buildings. Matt finishes must be used. Importantly, the roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture. Roof material shall not be a silver colour or glossy.

- Colours should be complementary to the colours in the surrounding landscape, such as olive green with buff trim, light grey, grey green, blue grey, dark buff, rust, ochre or natural tones such as variations of tan and be matt in texture. It is important that the colour choices and patterns should be timeless in that they should not become dated.
- As night lighting (mainly construction) is one of the more objectionable forms of visual impact, it is important that selective and sensitive location and design of the lighting requirements for the construction camp and the sub-station are developed, for example, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward. It is also important to avoid uplighting of structures and rather to direct the light downwards and focussed on the object to be illuminated. Also, one should avoid directing the light towards the direction from where it would be most experienced.
- Light spill, particularly upwards, must be minimised. This can be achieved by implementing the following recommendations:
  - All external light fittings shall not allow light to shine upwards.
  - All security lighting shall have "blinkers" or be specifically designed to ensure light is directed downwards while preventing side spill. This may require that light pole numbers will increase to give the required illumination on the ground.
  - Lighting for security and safety must be directed downwards and towards the structures to reduce light spill beyond the property boundary.
  - Area lighting on tall masts should be confined to the lower landform elevations.
  - Tall structures, such as communication towers, will by law have to be fitted with a red flashing light if they exceed a height of 45 m.
- There is little that can be done on the location that will reduce the visibility of light (taking note that, during operation, the sub-station will not be lit at night. Rather, security lights will be triggered if the perimeter fence is breached). Therefore, the viewer will need to make provision for blocking views of these lights by screen planting, screens or orientation to keep the light out of the viewshed.

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration*	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Sense of place	-	Small	Long-term	Medium	Continuous	Highly Probable	Nil	Low	High
Visibility	-	Small	Long-term	Medium	Continuous	Highly Probable	Nil	Medium	High
Light	+	Small	Long-term	Medium	Periodic	Highly Probable	Nil	Medium	High
With Mitigation and/or Management									
Sense of place	-	Small	Long-term	Medium	Continuous	Highly Probable	Nil	Low	High
Visibility	-	Small	Long-term	Low	Continuous	Highly Probable	Nil	Low	High
Light	+	Immediate	Long-term	Low	Periodic	Highly Probable	Nil	Low	High

*The duration is assessed as long-term and not permanent. This is because, once the proposed sub-station is no longer required, it would be decommissioned, and the affected area would be rehabilitated.

8.3.3 Water use

In the case of the proposed Gamma Sub-station, there are two important considerations relating to water use, viz. the use of potable water for human consumption and sanitation, and storm water management.

- Potable water for human consumption and sanitation.
  During operation, the proposed sub-station will not be manned on a permanent basis. Nevertheless, it will be necessary to supply potable water for the times that Eskom staff are on site. Again, water will be sourced from an on site borehole and, again, the quantity of water that will be required will be within the general limits specified by the Department of Water Affairs and Forestry and, therefore, no permit is required. However, although the operation of the proposed sub-station is planned for 40 years, the quantities of water required during operation are negligible. Therefore, impacts on groundwater quantity during operation are considered insignificant. Mitigation measures are not thought relevant.

  During operations, waste water will be treated via a septic tank and soak away system on site (which the geotechnical assessment has confirmed feasible for low volumes). The soak away will attract animals and will be a source of moisture in an otherwise arid environment. Therefore, care must be taken to site the soak away in a position where it cannot cause harm to fauna and flora. However, it should be noted that there will be a minor impact on the environment (primarily groundwater quality), although these impacts are considered insignificant given the very small quantities of waste water that will be generated (taking due cognisance that the proposed sub-station will be unmanned and only visited on a periodic basis by Eskom staff). There is one management measure that must be implemented:
  - Plumbing, the septic tank and the soak away must be regularly inspected and remedial measures implemented timeously should faults be identified.

- Storm water management.
  During operation, storm water management is important in two areas, viz. drainage from the site (the terraces and paved areas of the sub-station) and drainage from access roads. In each case, the problem arises where storm water runoff is concentrated and allowed to run uncontrolled into adjacent areas of veld. The fragile soil and vegetation cover will be unable to withstand this and erosion and destruction of vegetation cover will occur. Therefore, the design of storm water control structures will need to ensure that there is adequate provision to contain and de-energise storm water before it is released into the surrounding environment. Also, since sedimentation from erosion is the most important likely impact to the off-site surroundings, in a general sense, ground works must in all cases be planned to minimise erosion by implementing the following management measures:
  - The exposure of the soil due to bush clearing and land levelling should be timed to occur during the dry winter months of the year (as far as practically possible).
  - As soon as is technically possible, the exposed surface area, which will not be covered in concrete, should be protected by a layer of crushed stone.
  - All land-clearing, drainage and shaping must be conducted within the provisions of the Conservation of Agricultural Resources (Act 43 of 1983).

The assessment of the potential impacts, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration*	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Potable Water	-	Small	Long-term	Low	Time-linked and low	Definite	Nil	Low	High
Waste Water	-	Small	Long-term	Low	Time-linked and low	Definite	Nil	Low	High
Storm Water	-	Small	Long-term	Medium	Intermittent	Highly Probable	Nil	Medium	High
With Mitigation and/or Management									
Potable Water	-	Small	Long-term	Low	Time-linked and low	Definite	Nil	Low	High
Waste Water	-	Small	Long-term	Low	Time-linked and low	Definite	Nil	Low	High
Storm Water	-	Small	Long-term	Low	Intermittent	Highly Probable	Nil	Low	High

*The duration is assessed as long-term and not permanent. This is because, once the proposed sub-station is no longer required, it would be decommissioned, and the affected area would be rehabilitated.

8.3.4 Emergency situations

Although the chances are considered small, it is possible that emergencies with the electrical equipment may occur at the sub-station, for example, transformers can become overloaded and blow up and switchgear equipment can explode. Each of these kinds of incidents can have knock on effects and can place humans, animals and the natural environment at risk.

In terms of emergencies, the entire transmission network for the whole country is controlled centrally in Gauteng. In the event of an emergency, the sub-station or portions thereof would be switched off until such time that emergency personnel can attend to the problem. Effecting repairs on a live sub-station is possible as the sub-station is fitted with busbars via which current can be redirected, thereby minimising interruptions to the transmission network.

In the case of an explosion, unless on site within the sub-station, the risk of human or animal injury is small. Apart from the security fence, no additional mitigation measures are required. In the case of fire, Eskom would rely on the services of local emergency response teams. Air pollution is the single largest impact. However, this would be of short duration. Of most concern for explosions and fires is oil spillage into the environment. In this regard, it should be noted that all oil-containing equipment in the sub-station is fitted within a bunded oil sump of sufficient size to capture all oil within a particular piece of equipment (the largest being the transformers). Therefore, the risk of oil spillage is considered remote.

Finally, Eskom has standard emergency response procedures that are automatically applied in the event of an emergency or a malfunction with or within the sub-station.

8.4 What are the potential impacts of the proposed Gamma Sub-station on flora and fauna?

8.4.1 Flora

The vegetation of the proposed Gamma Sub-station site falls in the Nama-Karoo Biome, more specifically in the Upper Karoo Bioregion. Construction of the proposed Gamma Sub-station is expected to destroy most of the vegetation of the site, and, adopting a precautionary principle, it is assumed that all of the vegetation of the site will be cleared for construction.

There are no positive impacts for vegetation arising from the proposed Gamma Sub-station.

However, there are negative impacts that have been identified for the construction and operation of the proposed Gamma Sub-station. Importantly, these negative impacts can be mitigated as indicated in the tables (construction and operation) below.

Construction	
Impact	**Mitigation**
Loss of 172 ha of Eastern Upper Karoo (this represents less than 0.004% of the total natural Eastern Upper Karoo) for the Sub-station.	Clear only the development footprint rather than the whole site.
Loss of additional areas of vegetation for the construction of the access roads.	Clear and build areas for the permanent roads only. For temporary haul roads, do not cut a road. Rather remove large rocks and drive over the veld in designated areas. This will be less damaging than the construction of a road.
An increased risk of alien infestation due to disturbance.	During construction, increased human activity will cause disturbance. Road construction also creates a disturbance along the edges. Disturbance to natural vegetation is a significant cause of infestations by exotic species. Edge disturbance due to construction will be short-term and much of this will be reversible. Fencing the site at the onset of the construction phase will reduce the extent of disturbance.
Destabilisation of soils due to removal of the vegetation with resultant erosion.	Erosion due to clearing of the vegetation can be minimised by clearing the vegetation during the dry season and commencing construction immediately. The soils are prone to erosion and during construction remedial action should be implemented where erosion becomes evident (installation of gabions or some other revetment). Dust storms are rare and wind erosion is not predicted to be significant.
Poaching of harvested plant species due to increased access.	No sought-after harvested plant species were recorded on the site.

Impact	Mitigation
Loss of plants of protected species.	This impact is inevitable where vegetation is to be cleared. All the protected plants are protected because of Family status. With the exception of *Boophone disticha* all protected species on the site are common in the area. *Boophone disticha* is a geophyte that will transplant easily. All individuals could be transplanted to the edges of the site before construction commences, as follows: ❑ Plant removal. Removal of geophytes should be done by, firstly, loosening the soil with a geopick or similar pointed implement. This should be done a few centimetres away from the bulb as damage to the living portion of the bulb severely reduces the translocation success. ❑ Plant storage. Removed Bulbs will benefit by a period of drying, but this should be no more than two weeks after which they should be potted. The soil mixture to be used for the geophytes should be two parts topsoil with one part course sand. When potting the plants, the bulbs must be planted to the same depth as they were when removed. ❑ Planting. Once potted plants have stabilised, they should be placed at the site for a week. Flowers and fruits must be removed to avoid pollen being introduced at the target site from the nursery. Closed buds may be retained. Soil preparation should be by removal of a plug of soil the size of the pot and the plant inserted with its soil after removal from the pot. Water each individual for improved survival. Each individual or cluster of individuals must be clearly marked and a GPS reading noted. This is done to ensure that they can be found during monitoring.

Operation	
Impact	**Mitigation**
Roads cause high intensity runoff from the surface during rainfall events with resultant erosion.	Appropriately designed storm-water drainage for constructed roads will alleviate this impact.
Poaching of harvested plant species due to increased access.	No sought-after harvested plant species were recorded on the site.
"Flash-overs" may cause unplanned fires.	The standing biomass of the Karoo grasses is too low to support a fire and the shrubs are too far apart to provide sufficient fuel load for a run-away veld fire. Should fires occur, they are likely to burn out quickly.

In summary, the significance of the potential impacts to vegetation are considered low, for both construction and operation, as indicated in the assessment tables (without and with mitigation) below, one each for construction and operation.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Loss of 172 ha of Eastern Upper Karoo	-	Limited	Long-term	Medium	Continuous	Definite	NEMA	Low	High
Loss of additional areas of vegetation for access roads	-	Limited	Long-term	Medium	Intermittent	Definite	NEMA	Low	High
Alien infestation	-	Limited	Long-term	Medium	Intermittent	Probable	NEMA and CARA	Medium	High
Destabilisation of soils	-	Limited	Long-term	Medium	Continuous	Highly Probable	CARA	Medium	High
Poaching	-	Limited	Long-term	Low	Intermittent	Improbable	NEMA	Low	High
Loss of protected species	-	Limited	Long-term	Low	Continuous	Highly Probable	NEMA	High	High
With Mitigation and/or Management									
Loss of 172 ha of Eastern Upper Karoo	-	Limited	Long-term	Medium	Continuous	Definite	NEMA	Low	High
Loss of additional areas of vegetation for access roads	-	Limited	Long-term	Medium	Intermittent	Definite	NEMA	Low	High
Alien infestation	-	Limited	Long-term	Low	Intermittent	Probable	NEMA and CARA	Low	High
Destabilisation of soils	-	Limited	Long-term	Low	Continuous	Highly Probable	CARA	Low	High
Poaching	-	Limited	Long-term	Low	Intermittent	Improbable	NEMA	Low	High
Loss of protected species	-	Limited	Long-term	Low	Continuous	Probable	NEMA	Low	High

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Storm water runoff	-	Limited	Long-term	Medium	Intermittent	Highly Probable	CARA	Medium	Medium
Plant poaching	-	Limited	Long-term	Medium	Intermittent	Probable	NEMA	Medium	Medium
Fires	-	Limited	Long-term	Low	Intermittent	Probbale	Nil	Low	High
With Mitigation and/or Management									
Storm water runoff	-	Limited	Long-term	Low	Intermittent	Probable	CARA	Low	Medium
Plant poaching	-	Limited	Long-term	Low	Intermittent	Probable	NEMA	Low	Medium
Fires	-	Limited	Long-term	Low	Intermittent	Probbale	Nil	Low	High

8.4.2 Fauna and avi-fauna

During construction, potential impacts have been identified for four primary components of the proposed sub-station. These are listed below, together with suggested mitigation actions.

- Sub-station site.
  - Potential impacts.
    - Loss of faunal habitats through the clearing of vegetation. Although riverine rabbit habitat has been identified at the sub-station site, this habitat is thought to be of low quality.
  - Mitigation.
    - In collaboration with the EWT: Riverine Rabbit Working Group, rehabilitate riverine rabbit habitat on the sub-station site as well as in an off-set mitigation area.
- Construction camps.
  - Potential impacts.
    - Transformation of faunal habitats through the clearing of vegetation, the collection of fuel wood, domestic waste disposal and the establishment of invasive plant species in disturbed areas. In addition, there are concerns related to poaching (especially of animals used for medicinal purposes) and the incidental predation of fauna by domestic dogs.
  - Mitigation.
    - Avoid vegetation clearing by locating construction camps in transformed habitats or at existing construction sites.
    - Construction camps should not be located in sensitive habitats.
    - All cleared areas must be rehabilitated.
    - Construction camps must be fenced to control the movement of staff.
    - Prohibit the collection of wood for fuel and provide alternative fuels.
    - Manage solid waste and dispose at a registered land fill.
    - Formulate and implement and invasive plant control programme.
    - Implement the strict control of the movement of staff.
    - Implement strict controls over poaching.
    - Dogs should not be allowed on site.

- Temporary storage of hazardous substances.
  - Potential impacts.
    - Transformation of fauna habitats through the clearing of vegetation and the establishment of invasive plant species in disturbed areas. In addition, there is a risk of trapping or drowning of animals in pits.
  - Mitigation.
    - Locate in transformed areas.
    - Do not locate in sensitive habitats.
    - All cleared areas should be rehabilitated.
    - Formulate and implement a system for the professional management of hazardous substances.
    - Formulate and implement and invasive plant control programme.
    - Fence off and secure storage areas and pits.
    - Fill in and rehabilitate storage areas post construction.
- Access roads.
  - Potential impacts.
    - Transformation of faunal habitats through the clearing of vegetation and the establishment of invasive plant species in disturbed areas.
  - Mitigation.
    - Minimise areas cleared for roads.
    - Rehabilitate habitat where indicated.
    - Formulate and implement and invasive plant control programme.

Operational impacts, with mitigation measures, have been identified as follows:

- The transformation of faunal habitats through the on-going maintenance of cleared areas and the establishment of invasive plant species in disturbed areas. These potential impacts can be managed via the rehabilitation of cleared areas, minimising vegetation disturbance during on-going maintenance, and continuing the invasive plant control programme during operations.
- Increased impact on raptor-prey populations through increased perch availability. This can be managed by collaborating with the EWT on methods to reduce perch availability on transmission line towers at or near sensitive habitats.
- Decreased activity of herbivores and predators due to the presence of EMFs. At this stage, no known mitigation is available.
- Poaching and incidental predation of fauna by domestic dogs during on-going management and maintenance of the sub-station. These can be managed by the strict control of the movement of staff, implementing strict controls over poaching and prohibiting dogs from the sub-station site.

The assessment of the potential impacts during construction, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Loss of habitat for the riverine rabbit	-	Immediate	Permanent	High	Continuous	Definite	NEMA	Medium	High
Transformation of habitat	-	Small	Short-term	Medium	Time-linked	Definite	NEMA CARA	Medium	High
Poaching	-	Small	Short-term	Medium	Intermittent	Probable	NEMA	Low	High
Trapping and drowning of animals	-	Small	Short-term	Medium	Time-linked	Probable	Nil	Medium	High
Spread of alien invasive plants	-	Immediate	Medium-term	Medium	Continuous	Probable	NEMA CARA	Medium	High
With Mitigation and/or Management									
Loss of habitat for the riverine rabbit	-	Immediate	Permanent	Medium	Continuous	Highly Probable	NEMA	Low	High
Transformation of habitat	-	Small	Medium-term	Low	Time-linked	Highly Probable	NEMA CARA	Low	High
Poaching	-	Small	Short-term	Low	Intermittent	Probable	NEMA	Low	High
Trapping and drowning of animals	-	Small	Short-term	Low	Time-linked	Probable	Nil	Low	High
Spread of alien invasive plants	-	Immediate	Medium-term	Low	Continuous	Probable	NEMA CARA	Low	High

The assessment of the potential impacts during operation, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Transformation of habitats	-	Immediate	Permanent	Medium	Continuous	Definite	NEMA CARA	Medium	High
Raptor-prey relations	-	Small	Permanent	Medium	Continuous	Highly Probable	Nil	Low	High
Decreased animal activity due to EMFs	-	Small	Permanent	Unknown	Continuous	Probable	Nil	Unknown	Low
Poaching	-	Small	Permanent	Low	Intermittent	Probable	NEMA	Low	High
With Mitigation and/or Management									
Transformation of habitats	-	Immediate	Permanent	Low	Continuous	Highly Probable	NEMA CARA	Low	High
Raptor-prey relations	-	Small	Permanent	Low	Continuous	Probable	Nil	Low	High
Decreased animal activity due to EMFs	-	Small	Permanent	Unknown	Continuous	Probable	Nil	Unknown	Low
Poaching	-	Small	Permanent	Low	Intermittent	Probable	NEMA	Low	High

Due to their size and prominence, electrical infrastructure constitutes an important interface between birds and man. Negative interactions between birds and electricity structures take many forms, such as the destruction of habitat, disturbance, electrocution of birds on sub-station infrastructure, collision of birds with the communications tower, and the impact of birds on the operation of the sub-station. Collisions are the biggest single threat posed by electrical infrastructure to birds in Southern Africa. Most heavily impacted upon are bustards, storks, cranes and various species of water birds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines. Importantly, for the proposed Gamma Sub-station, none of these impacts are considered to be of high significance.

Nevertheless, attention must be paid to the following mitigation/management measures:

- All construction activities should be undertaken according to generally accepted environmental best practice, with care taken to destroy as little as possible of the natural vegetation, and to minimise unnecessary disturbance on site.
- Construction camps should be placed well away from koppies and the drainage line and dam on Uit Vlugt Fontein.
- Movements of off duty staff should be strictly managed at all times to minimise impacts on the local bird populations.

The assessment of the potential impacts during construction, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Birds	-	Small	Short-term	Low	Intermittent	Highly Probable	Nil	Low	High
With Mitigation and/or Management									
Birds	-	Small	Short-term	Low	Intermittent	Highly Probable	Nil	Low	High

- Once operational, the sub-station should be monitored to detect any bird electrocutions, bird impacts on the sub-station, and bird collisions with the communications tower. If necessary, mitigation measures for these impacts can be recommended reactively. This is because the anticipated low significance of these impacts does not warrant implementing mitigation measures proactively.

The assessment of the potential impacts during operation, without and with mitigation, is provided in the table below.

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Birds	-	Small	Long-term	Low	Intermittent	Probable	Nil	Low	High
With Mitigation and/or Management									
Birds	-	Small	Long-term	Low	Intermittent	Probable	Nil	Low	High

8.5 What positive or negative economic effects can be expected to the social and socio-economic environment?

The area affected by the project falls into two provinces, and is divided into a number of District and Local Municipalities, the two important ones being the Pixley ka Seme District Municipality, the Ubuntu Local Municipality, the Central Karoo District Municipality and WCDMA 05. The main towns situated within the study area are Victoria West and Murraysburg. Population numbers and densities are low. The greater study area comprises large expanses of open land with concentrated small settlements. Major land-uses in the study area include commercial agriculture, live stock farming (dairy, beef, sheep, ostriches, etc.), game farming, peri-urban development, rural homesteads, eco-tourism and conservation, and services infrastructure (roads and transmission lines).

There are no settlements on the project site itself. Rather, the site is located on two grazing camps of the two farms where sheep, springbuck, and limited cattle are grazed. Little tourism and eco-tourism (limited hunting) activities take place.

The following potential social and socio-economic impacts of a positive nature were identified. Mitigation/management measures are also provided.

Positive	Commentary	Mitigation/Management
Employment creation.	It should be noted that the construction of sub-stations requires skilled personnel. It is probable that the appointed contractor will import skilled staff to the area. Therefore, employment opportunities are likely to be restricted to a few unskilled and semi-skilled posts. Therefore, although some employment opportunities will be created during construction, numbers are low and the employment is temporary in nature. Therefore, although a positive impact, its significance is low.	❑ Where applicable, as far as possible, employ local staff during construction. ❑ Ensure recruitment measures are aimed particularly at construction workers classified as designated employees in terms of the Employment Equity Act. ❑ Where applicable, as far as possible, trade locally during operations.
Opportunities for local contractors, SMEs and ABEs.	As for employment creation, opportunities for SMEs and ABEs will be limited, most likely to the provision of goods and minor services. Again, although a positive impact, due to limited opportunities of a temporary nature, the significance of the impact is low.	❑ Prioritise sub-contracting to local SMEs and ABEs. ❑ The overall environmental management approach must include provision for the use of local contractors as far as possible.
Potential markets for informal trading.	This is dealt with in Section 8.2.4.	❑ Provide a designated area for informal vendors with appropriate services such as refuse facilities, water and sanitation. ❑ Institute a system whereby vendors can apply to the camp manager for permission to sell their wares in the designated area. ❑ Give preference to local vendors when granting permission. ❑ Allow only vendors with permission to trade, in the designated area. ❑ Allow trading to only take place in the designated area, and nowhere else.

The following potential social and socio-economic impacts of a negative nature were identified. Mitigation/management measures are also provided.

Negative	Commentary	Mitigation/Management
Increased pressure on existing infrastructure.	The sub-station site is remote. Eskom and its appointed contractors will have to provide their own infrastructure and services. At times, Eskom and its appointed sub-contractors will make use of facilities in Victoria West and Murraysburg. However, this is unlikely to put undue pressure on these towns as events will be intermittent and of a short duration. Perhaps the greatest effect relates to transportation and, in particular, on the N1 and R63. However, as indicated in the transportation specialist study, additional traffic should not have a significant effect (although it may be necessary to consider additional safety measures for the intersection of the N1/R63).	❑ Locate the construction camp at the old and currently vacant Uit Vlugt Fontein homestead where basic infrastructure and services are available. ❑ Provide adequate entertainment facilities in the construction camp, such as: ▪ A well equipped games room. ▪ A television/video room. ▪ A small bar selling soft drinks, wine and beer. ❑ Supply firewood to construction workers (regardless of the level of service provided in the construction camp, people like to make a fire during cold weather). ❑ Provide a quality canteen with an appetising menu. Traffic safety measures include speed reductions on the N1 as well as rumble strips in combination with signage (heavy vehicles crossing/turning).
Increase in the spread of diseases (including sexually transmitted diseases and HIV/AIDS).	This is dealt with in Section 8.2.4.	This is dealt with in Section 8.2.4.
Potential in-migration of people.	This is dealt with in Section 8.2.4.	This is dealt with in Section 8.2.4.
Potential increase in poaching.	This is dealt with in Section 8.2.4.	This is dealt with in Section 8.2.4.
Effects on safety and security.	This is dealt with in Section 8.2.4.	This is dealt with in Section 8.2.4.
Nuisance effects.	This is dealt with in Sections 8.2.3 and 8.2.4.	This is dealt with in Sections 8.2.3 and 8.2.4.
Noise.	Noise will be problematic during construction (reversing hooters, clanging steel, etc). Given the remote location of the sub-station site, noise is expected to travel widely (albeit that only a few people will be affected).	As far as practically possible, limit noise on site. In particular, respect quiet times of the day and agree with landowners appropriate working hours, including work on weekends (and at night if this is required).
Loss of, or loss of access to farm infrastructure.	This matter mainly relates to the loss of access to existing boreholes, windmills and watering troughs that is more problematic on Schietkuil than Uit Vlugt Fontein. The impact, although negative is regarded as one of low significance.	Provide alternative stock and game watering points.

Negative	Commentary	Mitigation/Management
Disruption of farming and hunting activities.	During construction, the owners of Schietkuil and Uit Vlugt Fontein would need to move their livestock away from the construction area and surrounds. While this is relatively easy for livestock, it is problematic for game, for which professional assistance is required. Also, hunting will not be able to occur during construction (for safety reasons and because it is unlikely hunters would want to hunt in the vicinity of a construction site). Therefore, there is the potential for financial losses that would need to be compensated by Eskom. However, while negative, the impact is of a short-term duration and is considered of low significance.	Financial compensation for the movement of livestock and game, as well as for the loss of income from hunting.
Loss of grazing land.	There will be a permanent loss of grazing on the land occupied by the proposed sub-station. However, Eskom will acquire the land, with the landowners being compensated financially. The impact is considered of low significance.	Financial compensation as part of land acquisition.
Electromagnetic fields.	This is dealt with in Section 8.3.1.	This is dealt with in Section 8.3.1.
Emergency situations.	This is dealt with in Section 8.3.4.	This is dealt with in Section 8.3.4.
Effects on cultural heritage resources.	This is dealt with in Section 8.2.5.	This is dealt with in Section 8.2.5.
Visual impacts.	This is dealt with in Section 8.3.2.	This is dealt with in Section 8.3.2.

The assessment of the potential impacts during operation, without and with mitigation, is provided in the table below (only those impacts not assessed elsewhere).

Nature of Impact	Impact Status	Extent	Duration	Intensity	Frequency	Probability	Legal	Significance	Confidence
Without Mitigation and/or Management									
Employment and opportunities for SMEs and ABEs	+	Small	Short-term	Low	Continuous	Probable	Nil	Low	High
Informal trade opportunities	+	Small	Short-term	Low	Continuous	Probable	Nil	Low	High
Pressure on infrastructure	-	Immediate	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
Noise	-	Small	Short-term	Medium	Intermittent	Highly Probable	Nil	Medium	High
Access to farm infrastructure	-	Immediate	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
Disruption	-	Small	Short-term	Medium	Continuous	Highly Probable	Nil	Medium	High
Loss of grazing land	-	Small	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
With Mitigation and/or Management									
Employment and opportunities for SMEs and ABEs	+	Small	Short-term	Low	Continuous	Probable	Nil	Low	High
Informal trade opportunities	+	Small	Short-term	Low	Continuous	Probable	Nil	Low	High
Pressure on infrastructure	-	Immediate	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
Noise	-	Small	Short-term	Low	Intermittent	Highly Probable	Nil	Low	High
Access to farm infrastructure	-	Immediate	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
Disruption	-	Small	Short-term	Low	Continuous	Highly Probable	Nil	Low	High
Loss of grazing land	-	Small	Short-term	Low	Continuous	Highly Probable	Nil	Low	High

8.6 What cumulative effects will the sub-station contribute seen in association with impacts arising from other activities in the region?

A cumulative impact is defined as the impact of an activity that may not be significant but may become significant when added to the existing and potential impacts in combination with or in sympathy with the effects from similar or diverse activities or undertakings in the area. To this end, similar or diverse, existing or possible future activities in the vicinity of the sub-station need to be identified.

The proposed sub-station site is remote and the possibility of further infrastructural development in the area is considered unlikely. This is excepting the possible expansion of the sub-station some time into the future (say, in 20 years). In this event, the impacts identified for the current sub-station application would increase in intensity and, probably, significance.

In addition, there are concerns related to cumulative impacts arising from the repair, maintenance and possible future widening of the N1. In this event, impacts associated with road construction would synergise with those associated with the construction of the proposed sub-station. Potential synergies exist for impacts such as: employment creation, induced migration, land acquisition, traffic, dust, noise, water use and waste management. These potential impacts can be managed singly or together should the eventuality arise that road work on the N1 occurs simultaneously with the construction of the proposed sub-station. This will require liaison and joint management between Eskom and the South African National Roads Agency, and their appointed contractors.

9. DRAFT ENVIRONMENTAL MANAGEMENT PLAN (CONSTRUCTION)

9.1 Scope

The scope of this document is to give environmental management guidelines, to the Contractor doing construction work, in fulfilment of environmental authorisation and ISO 14001 requirements. This document is part of the overall contract and is supplementary to Eskom's technical specifications. **Therefore, the recommendations and constraints, as set out in this document are enforceable under the general conditions of contract.**

The EMP has a long-term objective to ensure that:

- Environmental management considerations are implemented from the design phase of the project.
- The Contractor is able to and shall include any costs of compliance with this EMP into the tender price.
- Precautions against environmental damage and claims arising from such damage are taken timeously.
- The completion date of the contract is not delayed due to environmental problems with landowners, Grid staff, communities or regulatory authorities arising during the course of the project execution,
- The assets created conform to the environmental standards required by ISO 14001 and Eskom's policies.

In order to give effect to the above, **Eskom requires a commitment from the Eskom Project Manager and the Contractor on the following matters:**

- To underwrite Eskom Transmission's Environmental Policy TRMPBAAX3 Rev 2 at all times.
- To ensure that environmental conditions stipulated in the Record of Decision (ROD) are implemented.
- To resolve problems and claims arising from damages immediately, to ensure a smooth flow of operations.
- To implement this EMP for the benefit of all involved.
- To preserve the natural environment by limiting destructive actions on site.

The Project Manager and Contractor must take into consideration that this EMP will be amended as required for the duration of the contract. The management of the environment changes over time and, therefore, this document shall be updated regularly to ensure environmental management is implemented during all phases of the project.

9.2 Responsibility matrix

Function	Name and Contact Information	Responsibility
Project Manager (PM)	Tel: Fax: Cell: Email:	Overall management of project and EMP implementation
Contract Manager (CM)	Tel: Fax: Cell: Email:	Contract management
Site Supervisor (SS)	Tel: Fax: Cell: Email:	Site supervision
Environmental Control Officer (ECO)	Tel: Fax: Cell: Email:	Implementation of EMP and liaison between Eskom, Contractor and landowners
Contractor (C)	Tel: Fax: Cell: Email:	Implementation and compliance with recommendations and conditions of the EMP, Appoints/delegates a dedicated person to work with the ECO
Transmission Services Environmental Advisor (Eskom)	Tel: Fax: Cell: Email:	Environmental advice and monitoring

(Table to be completed upon contract award)

9.3 Introduction

The construction, refurbishment or upgrading of the Gamma Sub-station can have a major impact on the environment. It is, therefore, imperative that precautions are taken to ensure that environmental damage is minimised. This will take a concerted effort from Eskom and the Contractor, and detailed planning is of importance.

The Environmental Control Officer shall convey the contents of this document, the conditions of the Record of Decision from DEAT as well as Landowner Special Conditions to the Contractor site staff, and discuss the contents in detail with the Eskom Project Manager and Contractor at a pre-construction meeting. This formal induction is a requirement of ISO 14001 and shall be done with all main and sub-contractors. The ECO shall keep a record of the training date, people who attended and discussion points.

Good relations with the landowner/legal occupier (hereafter referred to as the landowner), Grid staff and communities need to be established and sustained. This will help in the solving of problems and the prevention thereof. Lines of communication should always be open to ensure proper and timeous reaction to complaints. The contact numbers of the ECO and/or Eskom Site Supervisor shall be made available to landowners (for the new sub-station site) and Grid staff. The reputations of both the Contractor and Eskom are at stake and should be the drive for everybody involved to perform in excellence.

During the construction period for the new sub-station, environmental personnel shall monitor the works, to measure compliance with the recommendations of the EMP and conditions of the ROD. The Grid Environmental Advisor shall inspect the works when completed and, if satisfied, the works shall be taken over by the Grid.

9.4 Description of the project

9.4.1 Sub-station

The sub-station where the work will be performed is Gamma, located 40 km east of Victoria West.

9.4.2 Project execution area

Construction activities are limited to the area as demarcated by Eskom and shown on the site plans. Any area outside Eskom owned property, required to facilitate access, construction camps or material storage areas, shall be negotiated with the landowner and written agreements shall be obtained.

Should water be required from sources other than Eskom supply, a written agreement shall be reached between the Contractor and the landowner in the presence of Eskom. Should the Contractor be required to use water from a natural source, the Contractor shall supply a method statement to that effect. Strict control shall be maintained and the ECO shall regularly inspect the abstraction point and methods used.

The works area shall be fenced to prevent livestock or local community members from wandering onto site and getting injured. All works shall be limited to the fenced area and the Contractor’s workforce shall refrain from venturing outside this area onto private property.

No work shall commence until permission is granted from the Environmental Advisor from Transmission Services, and the ROD from DEAT has been obtained. The Project Manager shall ensure that all conditions in the ROD are fulfilled before the Contractor occupies the site. The Grid shall be kept informed of all developments on construction at all times. All the requirements from the Grid must be considered during the construction phase to ensure smooth transition.

9.4.3 Site establishment

Site establishment shall take place in an orderly manner and all amenities shall be installed at campsites before the main workforce moves onto site. The Contractor's camp shall have the necessary ablution facilities with chemical toilets where such facilities are not available at commencement of construction. The Contractor shall supply a wastewater management system that complies with legal requirements and is acceptable to Eskom. A septic tank system is recommended to ensure the best practice environmental solution.

Where Eskom facilities are available, the Contractor shall make use of such facilities where it is viable and negotiated with the Grid. The Contractor shall inform all site staff to make use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities.

The Contractor shall supply waste collection bins where such are not available and all solid waste collected shall be disposed of at a licensed waste landfill. A certificate of disposal shall be obtained by the Contractor and kept on file. Where a licensed waste landfill site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. The disposal of waste shall be in accordance with all relevant legislation. Under no circumstances may solid waste be burned on site unless a suitable incinerator is available.

The construction camp should be located at the old and currently vacant Uit Vlugt Fontein homestead where the basic infrastructure and services are available. The construction camp should be equipped with a quality canteen with an appetising menu, a games room, a television/video room and a small bar selling soft drinks, wine and beer.

9.4.4 Workshop and equipment storage areas

Where possible and practical all maintenance of vehicles and equipment shall take place in the workshop area. During servicing of vehicles or equipment, a suitable drip tray shall be used to prevent spills onto the soil, especially where emergency repairs are effected outside the workshop area. Leaking equipment shall be repaired immediately or removed from site to facilitate repair. All potentially hazardous and non-degradable waste shall be collected and removed to a licensed hazardous waste site. A certificate of disposal shall be obtained by the Contractor and kept on file.

Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediated to the satisfaction of the ECO. The Contractor shall be in possession of an emergency spill kit that must be complete and available at all times on site.

The following shall apply to hazardous substance spills:

- All contaminated soil/yard stone shall be removed and be placed in containers. Contaminated material can be taken to one central point where bio-remediation can be done.
- A clean up kit must be available so that smaller spills can be treated on site.
- A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise are unavailable on site.
- All spills of hazardous substances must be reported to the ECO and appointed Transmission Engineering Environmental Advisor.

9.4.5 Storage areas for hazardous substances

All hazardous substances shall be stored in suitable containers and storage areas shall be bunded. This includes all carbon substances like fuel and oil as well as herbicides and battery acid. A register shall be kept on all substances and be available for inspection at all times. Areas shall be monitored for spills and any spills shall be contained, cleaned and rehabilitated immediately. Any leaking containers shall be repaired or removed from site.

Mitigation actions for the potential impacts on fauna of the temporary storage of hazardous wastes:

- Locate in transformed areas.
- Do not locate in sensitive areas.
- All cleared areas should be rehabilitated.
- Formulate and implement a system for the professional management of hazardous substances.
- Formulate and implement an invasive plant control programme.
- Fence off and secure storage areas and pits.
- Fill in and rehabilitate storage areas post construction.

9.5 Physical issues and their control

9.5.1 Sub-station terrain

Where terracing is required, topsoil shall be collected and retained for the purpose of re-use later to rehabilitate disturbed areas not covered by yard stone. Such areas include terrace embankments and areas outside the high voltage yards. Where required, all sloped areas shall be re-vegetated and stabilised to ensure proper rehabilitation is effected. These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of steep embankments. The contract design specifications and EIR recommendations shall be adhered to and implemented strictly.

The retained topsoil shall be spread evenly over areas to be rehabilitated and suitably compacted to effect re-vegetation of such areas to prevent erosion. Where required, re-vegetation can also be enhanced using a vegetation seed mixture.

Mitigation measures:

- The exposure of the soil due to bush clearing and land levelling should be timed to occur during the dry winter months of the year (as far as practically possible).

- As soon as is technically possible, the exposed surface area, which will not be covered in concrete, should be protected by a layer of crushed stone.
- Design drainage so that water accumulation across the ground surface is kept to below that volume which might cause erosion.
- All land-clearing, drainage and shaping must be conducted within the provisions of the Conservation of Agricultural Resources Act (Act 43 of 1983).

Management Objectives	Measurable Targets
Minimise scarring of the soil surface and land features other than on site	No visible erosion scars once construction is completed
Minimise disturbance and loss of topsoil from site	All disturbed areas successfully rehabilitated
Rehabilitate all disturbed areas in the sub-station area	

9.5.2 Natural drainage

Under no circumstances shall the contractor interfere with any watercourses in the vicinity of the site. Should deviation of such watercourses be required as part of the contract design specification, the specifications shall be adhered to strictly. The ECO shall ensure that all watercourses are adequately protected to prevent downstream siltation due to erosion on site. Rubble from the construction process shall be removed from site and may under no circumstances be dumped into any natural drainage channels. The normal flow of runoff water must not be impeded, as this will enhance erosion.

Management Objectives	Measurable Targets
Avoid damage to natural drainage channels	No damage to natural drainage channels
Avoid damage to river and stream embankments	No damage to river and stream banks
Minimise erosion of embankments and subsequent siltation of rivers and streams	No visible erosion scars on embankments once construction is completed

9.5.3 Access roads to the site

Planning of access routes to the site for construction purposes shall be done in conjunction with the Contractor, Eskom and the landowner. All agreements reached should be documented and no verbal agreements should be made The Contractor shall properly mark all access roads. Roads not to be used shall be marked with a " **NO ENTRY** " sign.

Where new access roads are constructed, this must be done according to design and contract specifications. Drainage channels shall be suitably designed to ensure erosion does not occur, especially at the outflows. The new access road shall be designed to allow for the natural flow of water where required. Crossing of dongas and eroded areas on access routes to the new sub-station shall be thoroughly planned and installed according to design and contract specifications. All areas susceptible to erosion shall be protected with suitable erosion control measures from the onset of the project. Prevention is the total aim as restoration is normally difficult and costly.

Where necessary, suitable measures shall be taken to rehabilitate damaged areas next to the newly constructed road.

Mitigation measures for the potential impacts of access roads:

- Minimise areas cleared for roads.
- Rehabilitate habitat where indicated.
- Formulate and implement an invasive plant control programme.

Management Objectives	Measurable Targets
Minimise damage to existing access roads	No claims from landowners due to damage on existing access roads
Minimise damage to environment due to construction of new access roads	No erosion visible on access roads three months after completion of construction
Minimise loss of topsoil and enhancement of erosion	No loss of topsoil due to runoff water on access roads
Minimise impeding the natural flow of water	No interference with the natural flow of water

9.5.4 Construction rubble disposal

The Contractor shall dispose of all excess material on site in an appropriate manner and at a licensed waste landfill site. All packaging material shall be removed from site and disposed of and not burned on site. Within the parameters of an agreed method statement, a negotiated landfill may be used but when it is closed up, the rubble shall be compacted and there shall be at least 1 m of soil covering the waste material. No landfill may be used without the consent from the landowner. No non-biodegradable materials shall be disposed of in any unregistered waste site.

No material shall be left on site that may harm humans or animals. Broken, damaged and unused spares such as porcelain, glass, nuts, bolts and washers shall be picked up and removed from site. Surplus concrete may not be dumped indiscriminately on site, but shall be disposed of in designated areas as agreed by the landowner. Concrete trucks shall not be washed on site after depositing concrete into foundations. Any spilled concrete shall be cleaned up immediately.

Management Objectives	Measurable Targets
To keep the site neat	No construction rubble left lying around on site
Disposal of construction rubble in an appropriate manner	No incidents of litigation
Minimise litigation	No complaints from landowners
Minimise landowner complaints	

9.5.5 Site clearing

Vegetation clearing to allow for site establishment as well as construction purposes will be required. Vegetation can be cleared mechanically with a bulldozer where terracing is required, but should be cleared by hand on other areas. All alien vegetation shall be eradicated from site during construction. Indigenous vegetation that does not pose any risks to the operation of the sub-station upon completion of the contract should be retained for aesthetic purposes. Such vegetation shall be identified during design and clearly indicated on the site plans.

Protected or endangered species of plants shall be retained where possible. Where such species have to be removed due to interference with structures, the necessary permission and permits shall be obtained by the ECO prior to the commencement of site works. Search, rescue and replanting of indigenous, valuable and protected species are highly recommended where possible and viable.

The use of herbicides shall only be allowed after a proper investigation into the type to be used, the long-term effects and the effectiveness of the agent. Eskom's guidelines regarding the use of herbicides (TRR/S91/032) shall be adhered to strictly. Application shall be under the direct supervision of a qualified technician. All surplus herbicide shall be disposed of in accordance with the supplier's specifications.

The Contractor for vegetation clearing shall comply with the following:

- The Contractor must have the necessary knowledge to be able to identify different species.
- The Contractor must be able to identify declared weeds and alien species that can be totally eradicated.
- The Contractor must be in possession of a valid herbicide applicators licence.

Natural features shall be taken into consideration during design and, where possible, these shall be protected unless they will interfere with the operation of the sub-station.

Mitigation measures for the impacts of site clearing:

- Clearing of areas of vegetation only when these areas are required for construction purposes.
- Rehabilitating and revegetating areas as soon as possible after the completion of construction.

Management Objectives	Measurable Targets
Minimise unnecessary damage to vegetation	Only vegetation cleared as required for site construction purposes
Keep site as natural looking as possible	No vegetation interfering with structures and statutory requirements upon completion of the contract
Minimise possibility of erosion due to removal of vegetation	No de-stumping of vegetation on river and stream embankments
Minimise removal of plant material on river and stream embankments	No visible erosion scars three months after completion of the contract due to vegetation removal
Minimise damage to natural features	No visible damage to the vegetation outside the site one year after completion of the contract due to herbicide leaching
	No litigation due to unauthorised removal of vegetation
	No unnecessary damage to natural features

9.5.6 Fencing

The site shall be fenced to prevent any loss or injury to persons or livestock during the construction phase. All Eskom gates shall be fitted with locks and be kept locked at all times during the construction phase, especially when works are stopped during weekends and holidays. All claims arising from gates left open shall be investigated and, if at fault, settled in full by the Contractor. If any fencing interferes with the construction process, such fencing shall be deviated until construction is completed. The deviation of fences shall be negotiated and agreed with the landowner in writing.

Management Objectives	Measurable Targets
Properly installed gates to allow access to the site	No transgressions of the Fencing Act and therefore no litigation
Minimise damage to private fences	No damage to fences and subsequent complaints from landowners
Limit access to Eskom and Contractor personnel	All gates kept locked at all times to limit access to construction staff

9.5.7 Fire prevention

No open fires shall be allowed on site under any circumstance. All cooking shall be done in demarcated areas that are safe and cannot cause runaway fires. The Contractor shall have operational fire-fighting equipment available on site, especially during the winter months.

The standing biomass of the Karoo grasses is too low to support fire and the shrubs are too far apart to provide sufficient fuel load for a run-away veld fire. Should fires occur they are likely to burn out quickly. Nevertheless, vigilance is required.

Management Objectives	Measurable Targets
Minimise risk of runaway veld fires	No veld fires started by the Contractor's work force
Minimise damage to private property	No claims from landowners for damages due to veld fires
	No litigation

9.5.8 Noise

The Contractor shall ensure that noise levels remain within acceptable limits, especially in this remote rural location where noise will travel easily. This applies especially after working hours and during the night.

Management Objectives	Measurable Targets
Prevention of noise pollution	No complaints from landowner or community
Minimise nuisance factor of construction activities	No litigation

9.5.9 Claims for damages

The ECO shall keep a photographic record of any damage to areas outside the demarcated site area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable. All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment. A register shall be kept of all complaints from the landowner, Grid or community. All complaints/claims shall be handled immediately to ensure timeous rectification/payment by the responsible party.

Management Objectives	Measurable Targets
Minimise complaints from landowners and communities	No claims from the landowner or communities
Prevent litigation due to outstanding claims	All claims investigated and settled within one month
Completion of the contract on time	No litigation due to unsettled claims

9.5.10 Rehabilitation

All damaged areas shall be rehabilitated upon completion of the contract in accordance with design specifications. In accordance with the Conservation of Agricultural Resources Act (Act 43 of 1983), slopes in excess of 2% must be contoured and slopes in excess of 12% must be terraced. Extra seed shall be sown on disturbed areas as directed by the ECO. Other methods of rehabilitating disturbed sites may also be used at the discretion of the Project Manager to comply with the conditions of the ROD and EMP, for example, stone pitching, logging, etc. Contour banks shall be spaced according to the slopes. The type of soil shall also be taken into consideration.

A mixture of vegetation seed can be used provided the mixture is carefully selected to ensure the following:

- Annual and perennial species are chosen.
- Pioneer species are included.
- All the species shall not be edible.
- Species chosen will grow in the area under natural conditions.
- Root systems must have a binding effect on the soil.
- The final product should not cause an ecological imbalance in the area.

Re-seeding will always be at the discretion of the Project Manager, unless specifically requested by a landowner/Grid staff.

Management Objectives	Measurable Targets
Minimise damage to topsoil and environment	No loss of topsoil due to construction activities
Successful rehabilitation of all damaged areas	All disturbed areas successfully rehabilitated within one year of completion of the contract
Prevention of erosion	No visible erosion scars one year after completion of the contract

9.5.11 Material storage areas

Specifications require the protection of Eskom supplied material on site, especially conductor drums. This normally requires that a firebreak be created around a material storage area. Once construction has been completed on site and all excess material has been removed, the storage area shall be rehabilitated. If the area was badly damaged, re-seeding shall be done and fencing of the area shall be considered if livestock will subsequently have access to such an area.

Management Objectives	Measurable Targets
Minimise disturbance of topsoil	No remaining disturbance to vegetation outside the sub-station area
Successful rehabilitation of disturbed areas	No loss of topsoil
	All disturbed areas successfully rehabilitated one year after completion of the contract

9.5.12 Batching plants

In remote areas where batching plants have to be established, these sites shall be negotiated with the landowner/Grid staff depending on their location. These sites shall be cleared of all excess material upon completion of the contract. Such areas shall be rehabilitated to their natural state. Any spilled concrete shall be removed and soil compacted during construction shall be ripped, levelled and re-vegetated.

Management Objectives	Measurable Targets
Minimise complaints from landowners/Grid staff	No complaints from landowners/Grid staff
Successful rehabilitation of disturbed areas	All disturbed areas successfully rehabilitated one year after completion of the contract

9.5.13 Old equipment

All old equipment shall be stored in such a way as to prevent pollution of the environment. Oil containing equipment shall be stored to prevent leaking or be stored on drip trays should such equipment already be leaking. All scrap steel shall be stacked neatly and any disused and broken insulators shall be stored in containers.

Once material has been scrapped and a contract has been placed for removal, the Contractor shall ensure that any equipment containing pollution causing substances is removed in such a way as to prevent spillage and pollution of the environment. The Contractor shall also be equipped to contain and clean up any pollution causing spills. Disposal of unusable material shall be at a licensed waste and/or hazardous waste landfill site and a certificate of disposal shall be obtained and copied to Eskom.

Management Objectives	Measurable Targets
To prevent pollution of the environment	No complaints from landowners/Grid staff/communities
Prevention of litigation due to illegal dumping	No pollution of the environment
	No litigation due to illegal dumping

9.5.14 Transport of equipment

All equipment moved onto site or off site during a project is subject to legal requirements as well as Eskom's specifications for the transport of such equipment. The Contractor shall meet these safety requirements under all circumstances. All equipment transported shall be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used shall be in place.

The Contractor shall ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident.

Management Objectives	Measurable Targets
Safe handling and transport of equipment	All equipment delivered to site intact
Safe handling and transport of hazardous substances	No spillage of hazardous substances
Minimise environmental pollution and damage	No litigation due to environmental pollution

9.6 Social issues and their control

The following measures must be implemented to mitigate potential social impacts:

- A rapid response plan must be formulated to deal with security matters.
- The contractors' camp must be fully fenced, with controlled access.
- During off-duty periods, contractors should be required to transport their staff to nearby towns where shopping and recreational activities can be undertaken.

The following mitigation/management measures were identified to manage the potential positive socio-economic impacts:

- Where applicable and as far as possible, employ local staff during construction.
- Ensure recruitment measures are aimed at construction workers classified as designated employees in terms of the Employment Equity Act.
- Prioritise sub-contracting to local SMEs and ABEs.
- The overall environmental management approach must include provision for the use of local contractors as far as possible.
- Provide a designated area for informal vendors with appropriate services such as refuse facilities, water and sanitation.
- Institute a system whereby vendors can apply to the camp manager for permission to sell their wares in the designated area.
- Give preference to local vendors when granting permission.
- Allow only vendors with permission to trade, in the designated area.
- Allow trading to only take place in the designated area, and nowhere else.

9.6.1 Sanitation

The Contractor shall install mobile chemical toilets on. Staff shall be sensitised to the fact that they should use these facilities at all times. No indiscriminate excretion or urinating on site shall be allowed. Ablution facilities shall be within 100 m from workplaces but not closer than 50 m from any natural water bodies. There should be enough toilets available to accommodate the workforce (minimum requirement 1: 20 workers). Toilets shall be serviced regularly and the ECO shall inspect toilets regularly to ensure compliance to health standards.

- It must be stipulated as a condition of contract that ablutions in the veld are unacceptable and will be considered in a serious light, leading to a substantial fine or dismissal.
- The waste water from the chemical toilets must be disposed of at the waste water treatment works in Victoria West.

Management Objectives	Measurable Targets
Ensure that proper sanitation is achieved	No complaints received from landowners or Grid staff regarding sanitation
Prevent spreading of disease	No litigation or compensation claims

9.6.2 Prevention of diseases

The Contractor shall take all the necessary precautions against the spreading of disease such as measles, sexually transmitted diseases such as HIV/AIDS etc, as well as diseases such as foot and mouth, etc. amongst livestock. A record shall be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against Eskom or the Contractor.

Furthermore, there shall be no fraternisation between the Contractor's staff and local people.

Specific management interventions are required to police prostitution, particularly considering that long-haul delivery vehicles will be arriving and leaving the site on an on-going basis (there is a casual link between long haul drivers and the spread of sexually transmitted diseases). Transgressions should be dealt with severely (fines and dismissals).

Management Objectives	Measurable Targets
Prevent litigation due to infestation of livestock	No complaints from landowners/communities
Prevent spreading of sexually transmitted diseases	No litigation

9.6.3 Interaction with affected parties

The success of any project depends mainly on the good relations with the affected landowner, communities and Grid staff. It is, therefore, required that the ECO and the Contractor establish good relations with all the affected parties at the sub-station site. An open channel of communication must be established between Eskom, the contractors and the neighbouring landowners.

All negotiations for any reason shall be between the ECO, the affected parties and the Contractor. No verbal agreements shall be made. All agreements shall be recorded in writing and all parties shall co-sign the documentation.

The affected parties shall always be kept informed about any changes to the construction programme should they be involved. If the ECO is not on site, the Contractor should keep the affected parties informed. The contact numbers of the Contractor and the ECO shall be made available to the affected parties. This will ensure open channels of communication and prompt response to queries and claims.

All contact with the affected parties shall be courteous at all times. The rights of the affected parties shall be respected at all times.

Management Objectives	Measurable Targets
Maintain good relations with affected parties	No delays in the project due to interference from affected parties

9.6.4 Littering

Littering by the employees of the Contractor shall not be allowed under any circumstances. The ECO shall monitor the neatness of the work sites as well as the Contractor campsite. Where possible, waste streams should be separated for purposes of recycling.

Management Objectives	Measurable Targets
Neat workplace and site	No complaints from affected parties

9.6.5 Dust

The Contractor shall be responsible for dust control on site to ensure no nuisance is caused to the landowner, neighbouring communities or Grid staff at the sub-station. Watering of access roads is recommended, as this is normally the greatest cause of dust pollution. Speed limits can also be effected, especially on private dirt roads leading to the site. Any complaints or claims emanating from the lack of dust control shall be attended to immediately by the Contractor.

Mitigation measures include:

- Limit the speed of construction vehicles on construction roads to 40 km/h.
- Clearing areas for construction only immediately ahead of when they are required.
- Apply dust suppression measures, mainly through the application of water via a fan bowser or using a soil-binding agent, as indicated by weather conditions on a day to day basis.
- Reshaping, rehabilitating and revegetating cleared areas immediately once construction has been completed.

Management Objectives	Measurable Targets
Site works does not cause a nuisance to other people in the area	No formal complaints or claims arising due to dust pollution

9.6.6 Aesthetics

The site shall be kept visually and aesthetically pleasing, especially in and around the Contractor's camp. The ECO shall regularly inspect the site to ensure that it is neat and clean. Where required, the campsite shall be screened by the Contractor to ensure that there is no unacceptable visual intrusion in the area of the site. Screening can be done by use of shade cloth or corrugated fencing.

Mitigation measures that are to be applied to reduce potential impacts, as described below:

- Vegetation stripping should be done in a manner where the edges are non-geometric or curvilinear rather than straight or sharp edged.
- The construction area must be rehabilitated and revegetated immediately after the completion of construction activities. Progressive reinstatement should be applied.
- Given that there are few indigenous plants that can be used for screening, it will be necessary to shape and sculpt the cut and fill slopes of platforms and access roads to angles and forms that are reflected in the adjacent landscape and that can reduce the visual impact.
- To reduce the visual intrusion, the colour selected for roofing and walls must be of a nature, which will help to visually break up the surfaces of the buildings. Matt finishes must be used. Importantly, the roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture. Roof material shall not be a silver colour or glossy.
- Colours should be complementary to the colours of the surrounding landscape, such as olive green with buff trim, light grey, grey green, blue grey, dark buff, rust, ochre or natural tones such as variations of tan and be matt in texture. It is important that the colour choices and patterns should be timeless in that they should not become dated.
- As night lighting (mainly construction) is one of the more objectionable forms of visual impact, it is important that selective and sensitive location and design of the lighting requirements for the construction camp and sub-station are developed, for example, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward. It is also important to avoid uplighting of structures and rather to direct the light downwards and focussed on the object to be illuminated. Also, one should avoid directing the light towards the direction from where it would be most experienced (taking note that the sub-station will not be lit at night. Rather, lights will be triggered if the perimeter fence is breached).
- Light spill, particularly upwards, must be minimised. This can be achieved by implementing the following recommendations:
  - All external light fittings shall not be allow light to shine upwards.
  - All security lighting shall have "blinkers" or be specifically designed to ensure light is directed downwards while preventing side spill. This may require that light pole numbers will increase to give the required illumination on the ground.
  - Lighting for safety and security must be directed downwards and towards the structures to reduce light spill beyond the property boundary.
  - Area lighting on tall masts should be confined to the lower landform elevations.
  - Tall structures, such as towers, will by law have to be fitted with a red flashing light if they exceed a height of 45 m.
- There is little that can be done on the location that will reduce the visibility of light. Therefore, the viewer will need to make provision for blocking views of these lights by screen planting, screens or orientation to keep the light out of the viewshed.

Management Objectives	Measurable Targets
Aesthetically pleasing works area, campsite and storage areas	No complaints from affected parties on or around the site

9.7 Biological issues and their control

9.7.1 Fauna

The Contractor shall under no circumstances interfere with livestock without the landowner or community members being present. This includes the moving of livestock where they interfere with construction activities. Should the Contractor's workforce obtain any livestock for consumption, they must be in possession of a written note from the owner. The transportation of meat for consumption shall take into consideration any legal requirements regarding the spreading of disease. No poaching shall be tolerated under any circumstances.

Mitigation actions for potential impacts of the sub-station site:

- In collaboration with the EWT: Riverine Rabbit Working Group, rehabilitate riverine rabbit habitat on the sub-station site as well as in an off-set mitigation area.

Mitigation measures for the potential impacts of construction camps:

- Avoid vegetation clearing by locating construction camps in transformed habitats or at existing construction sites.
- Construction camps should not be located in sensitive habitats.
- All cleared areas must be rehabilitated.
- Construction camps must be fenced to control the movement of staff.
- Prohibit the collection of wood for fuel and provide alternative fuels.
- Manage solid waste and dispose at a registered land fill.
- Formulate and implement an invasive plant control programme.
- Implement the strict control of the movement of staff.
- Implement strict controls over poaching.
- Dogs should not be allowed on site.

Mitigation measures for the potential impacts of construction on local bird populations:

- All construction activities should be undertaken according to generally accepted environmental best practice, with care taken to destroy as little as possible of the natural vegetation, and to minimise unnecessary disturbance on site.
- Construction camps should be placed well away from koppies and the drainage line and dam on Uit Vlugt Fontein.
- Movements of off duty staff should be strictly managed at all times to minimise impacts on the local bird population.

In the case of disruption of farming and hunting activities, mitigation action will be financial compensation for the movement of livestock and game, as well as for the loss of income from hunting. If there is going to be a permanent loss of grazing land, as is expected on the land to be occupied by the proposed sub-station, financial compensation as part of the land acquisition will be required.

Management Objectives	Measurable Targets
Minimise disruption of farming activities	No stock losses where construction is underway
Minimise disturbance of animals	No complaints from landowners and communities
Minimise complaints and litigation	No litigation concerning stock losses and animal deaths

9.7.2 Flora

Protected or endangered species may occur on the site. Special care should be taken not to damage or remove any such species unless absolutely necessary. Permits for removal must be obtained should such species be affected by construction activities. All plants not interfering with the operation of the sub-station shall be left undisturbed, clearly marked and indicated on the site plan. Collection of firewood outside the site area is strictly prohibited.

Mitigation measures for the potential impacts of the project on the flora:

- Clear only the development footprint rather than the whole site.
- Clear and build areas for the permanent roads only to prevent additional loss of vegetation. For temporary haul roads, do not cut a road. Rather remove large rocks and drive over the veld in designated areas. This will be less damaging than the construction of a road.
- During construction, increased human activity will cause disturbance. Road construction also creates a disturbance along the edges. Disturbance to natural vegetation is a significant cause of infestations by exotic species. Edge disturbance due to construction will be short-term and much of this will be reversible. Fencing the site at the onset of the construction phase will reduce the extent of disturbance.
- Erosion due to clearing of the vegetation can be minimised by clearing the vegetation during the dry season and commencing construction immediately. The soils are prone to erosion and during construction remedial action should be implemented where erosion becomes evident (installation of gabions or some other revetment). Dust storms are rare and wind erosion is not predicted to be significant.
- Loss of protected plant species is inevitable where vegetation is to be cleared. All the protected plants are protected because of Family status. With the exception of *Boophone disticha* all protected species on the site are common in the area. *Boophone disticha* is a geophyte that will transplant easily. All individuals could be transplanted to the edges of the site before construction commences, as follows:
  - Plant removal. Removal of geophytes should be done by, firstly, loosening the soil with a geopick or similar pointed implement. This should be done a few centimetres away from the bulb as damage to the living portion of the bulb severely reduces the translocation success.

- Plant storage. Removed Bulbs will benefit by a period of drying, but this should be no more than two weeks after which they should be potted. The soil mixture to be used for the geophytes should be two parts topsoil with one part course sand. When potting the plants, the bulbs must be planted to the same depth as they were when removed.
- Planting. Once potted plants have stabilised, they should be placed at the site for a week. Flowers and fruits must be removed to avoid pollen being introduced at the target site from the nursery. Closed buds may be retained. Soil preparation should be by removal of a plug of soil the size of the pot and the plant inserted with its soil after removal from the pot. Water each individual for improved survival. Each individual or cluster of individuals must be clearly marked and a GPS reading noted. This is done to ensure that they can be found during monitoring.

- Appropriately designed storm-water drainage for constructed roads will alleviate the impact of high intensity runoff from the road surface during high rainfall events.
- The standing biomass of the Karoo grasses is too low to support fire and the shrubs are too far apart to provide sufficient fuel load for a run-away veld fire. Should fires occur they are likely to burn out quickly. Nevertheless, vigilance is required.

Management Objectives	Measurable Targets
Minimal disturbance to vegetation where such vegetation does not interfere with construction and operation of the sub-station	No litigation due to removal of vegetation without the necessary permits
Prevention of litigation concerning removal of vegetation	

9.7.3 Herbicides

Herbicide use shall only be allowed with the approval of Eskom and according to contract specifications. The application shall be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment shall be properly investigated and only environmentally friendly herbicides shall be used.

Management Objectives	Measurable Targets
Control over the use of herbicides	No signs of vegetation dying due to leaching of herbicides one year after completion of the contract
	No landowner complaints and litigation

9.8 Cultural heritage resources and their control

9.8.1 Archaeology

The position of any known sites shall be shown on the final design plans. Such areas shall be marked as “no go” areas. Artefacts shall not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits shall be obtained from the South African Heritage Resources Agency (SAHRA) should the proposed site affect any heritage sites which are to be destroyed or altered.

Should any archaeological sites be uncovered during construction, their existence shall be reported to Eskom immediately.

Management Objectives	Measurable Targets
Protection of archaeological sites and land considered to be of cultural value	No destruction of or damage to known archaeological sites
Protection of known sites against vandalism, destruction and theft	Management of existing sites and new discoveries in accordance with the recommendations of the Archaeologist
The preservation and appropriate management of new archaeological finds should these be discovered during construction	

9.8.2 Monuments/historical sites

All monuments and historical sites shall be treated with the utmost respect. Any graves shall be clearly marked and treated as “no go” areas. No destruction of any site shall be allowed. Should it be necessary to remove any graves, the necessary procedures shall be followed and permits obtained.

Management Objectives	Measurable Targets
Protection of sites and land considered to be of cultural value	No destruction of or damage to known sites
Protection of known sites against vandalism, destruction and theft	Management of existing sites and new discoveries in accordance with legislation
The preservation and appropriate management of new finds should these be discovered during construction	No litigation due to destruction of sites

9.8.3 Farmhouses/buildings

Most landowners will see the construction period as interference with their daily activities. There will be a negative attitude towards the whole construction process. Landowners are always apprehensive toward changes they do not control and strangers on their properties. Where the sub-station is close to any inhabited area, the necessary precautions shall be taken by the Contractor to safeguard the lives and property of the inhabitants. The Contractor shall under no circumstances interfere with the property of landowners, Grid staff or nearby communities.

Management Objectives	Measurable Targets
Control over actions and activities in close proximity to inhabited areas	No complaints from landowners, Grid staff or communities
	No damage to private property

9.8.4 Infrastructure

No interruptions other than those negotiated shall be allowed to any essential services. Damage to infrastructure shall not be tolerated and any damage shall be rectified immediately by the Contractor. A record of any damage and remedial actions shall be kept on site.

All existing private access roads used for construction purposes, shall be maintained at all times to ensure that the local people have free access to and from their properties. Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect.

Any possible disruptions to essential services must be kept to a minimum and should be well advertised and communicated to landowners and surrounding communities. Care must be taken not to damage irrigation equipment, lines, channels and crops, as this could lead to major claims being instituted against Eskom and the Contractor. The position of all pipelines and irrigation lines in the vicinity of a site must be obtained from landowners or the local community and clearly marked. Where required such lines shall be deviated.

Alternative stock and game watering points will be provided if there is a loss of, or a loss of access to farm infrastructure.

Traffic safety measures to mitigate the potential impacts of increased pressure on existing infrastructure should include speed reductions on the N1 as well as rumble strips in combination with signage (heavy vehicles crossing/turning).

Management Objectives	Measurable Targets
The control of temporary or permanent damage to plant and installations	No unplanned disruptions of services
Control of interference with the normal operation of plant and installations	No damage to any plant or installations
Securing of the safe use of infrastructure, plant and installations	No complaints from Authorities, landowners and communities regarding disruption of services
	No litigation due to losses of plant, installations and income

9.9 Requirements during construction

- Proper and continuous liaison between Eskom, the Contractor and landowners to ensure everyone is informed at all times.
- The landowners shall be informed of the starting date of construction as well as the phases in which the construction shall take place.
- The Contractor must adhere to all conditions of contract including the EMP and landowner special conditions.
- Proper planning of the construction process to allow for disruptions due to rain and wet conditions.
- Where existing private roads are in a bad state of repair, such roads' condition shall be documented before they are used for construction purposes. If necessary, some repairs should be done to prevent damage to equipment and plant.
- All manmade structures shall be protected against damage at all times and any damage shall be rectified immediately.
- The Contractor shall ensure that all damaged areas are rehabilitated to the satisfaction of Eskom and each and every property owner, and that outstanding claims are settled.
- Proper documentation and record keeping of all complaints and actions taken.
- Regular site inspections and good control over the construction process throughout the construction period.
- Appointment of an ECO on behalf of the Contractor to implement this EMP as well as deal with all landowner related matters.
- Environmental Audits are to be carried out during and upon completion of construction (at least two for the project).

9.10 Site-specific problem areas

Site specific problems, if any, will be shown on layout plans **(Design)**. No-go areas, for example, koppies and the drainage line and dam on Uit Vlugt Fontein, will also be shown on the layout plans **(Design)**.

9.10.1 Estimated quantities for special works on site

If applicable, these will be provided once a ROD has been issued.

9.11 Method statements for the contract

The Contractor shall supply method statements for all works required as per specific contract requirement. All agreements regarding extra works for environmental compliance shall be in writing and well documented. Work shall only commence upon approval by Eskom.

The ECO shall ensure that all works are in accordance with method statements and contract specifications.

9.12 Site documentation, monitoring and reporting

The standard Eskom site documentation shall be used to keep records on site. All documents shall be kept on site and be available for monitoring purposes. Site inspections by an Environmental Audit Team may require access to this documentation for auditing purposes. The documentation shall be signed by all parties to ensure that such documents are legal. Regular monitoring of site works by the ECO is imperative to ensure that all problems encountered are solved punctually and amicably. When the ECO is not available, the Contract Manager/Site Supervisor shall keep abreast of all works to ensure no problems arise.

Regular monthly environmental compliance reports shall be forwarded to the Transmission Engineering Environmental Advisor (appointed per project) with all information relating to environmental matters. The following Key Performance Indicators must be reported on a monthly basis by the ECO:

- Complaints received from affected parties and actions taken.
- Environmental incidents, such as oil spills, etc. and actions taken.
- Incidents possibly leading to litigation and legal contraventions.
- Environmental damage that needs specialised rehabilitation measures to be taken.

The following documentation shall be kept on site by the ECO:

- Site daily dairy.
- Complaints register.
- Records of all remediation/rehabilitation activities.
- Copies of monthly reports to the Transmission Engineering Environmental Advisor for auditing purposes.
- Copy of the EMP.
- Copy of ROD.
- Minutes of site meetings including discussions on environmental issues.

9.13 Appendices

The following documents are applicable for implementation of this EMP:

- Aspect and Impact Register for Project Activities.
- Record of Decision.
- Eskom Transmission's Environmental Policy.

10. ENVIRONMENTAL IMPACT STATEMENT

Background
Eskom's transmission network, supplying electricity to the greater Eastern and Western Cape areas, is running short of capacity. To counter this situation and to meet projected future electricity demand, Eskom is planning to strengthen its transmission network by constructing a 765 kV transmission line backbone through the centre of the country, linking its main generating facilities in Mpumalanga, with demand centres in the Western and Eastern Cape. The location of the proposed Gamma Sub-station is indicated by an optimal distance between the Perseus (Dealesville) and Omega (Koeberg) Sub-stations, being approximately equidistant. It also serves as an off-take for the proposed 765 kV transmission lines to the Grassridge Sub-station near Port Elizabeth. A sub-station is required to tap off electricity in this way and to house the switchgear.

Gamma Sub-station
The proposed sub-station is located on the farms Uit Vlugt Fontein No. 233 and Schietkuil No 3 in the Pixley ka Seme and Central Karoo District Municipalities and will cover an area of at least 1.5 x 1.15 km^2 (172 ha). When fully operational, the sub-station will have five incoming EHV power lines and five 765 kV feeder power lines going out. In addition, power from the 765 kV incoming lines will also be used to boost the supplies in the existing 400 kV lines. In 2005, environmental authorisation was issued for the proposed Gamma Sub-station to be located on the farm Uit Vlugt Fontein near Victoria West, Northern Cape. However, recent planning has indicated that the proposed Gamma Sub-station would be more ideally located about 10 km to the east of the original site.

For the proposed Gamma Sub-station, there are three alternatives under consideration:

- The proposed site on the farm Uit Vlugt Fontein No 223, bordering on the farm Schietkuil No 3.
- An alternative site on the farm Uit Vlugt Fontein, for which a positive Record of Decision was issued by DEAT (as explained, Eskom has decided to move the location of the sub-station).
- The "no go" or no-development alternative.

Summary of the key findings
To investigate the key issues of the proposed Gamma Sub-station, ten specialist studies were undertaken. In addition, material drawn from Eskom was used to inform the assessment of issues and associated potential impacts. Importantly, for the most part, the impact assessment has been carried out at a high level of confidence.

Faunal Assessment. In total, twenty-two faunal species with conservation concern were identified. Of note is the riverine rabbit (Critically Endangered), which is potentially most vulnerable due to its particularly limited distribution range and the fact that they are extreme habitat specialists. Although potential riverine rabbit habitat does occur on the proposed site, the habitat is thought to be of a low quality. Also, there are currently no records for riverine rabbits at the proposed site. Nevertheless, Eskom will compensate for any potential loss/transformation of habitat by contributing towards the conservation of riverine rabbit habitat elsewhere, i.e. off-set mitigation.

Avi-faunal Assessment. The potential impacts of the proposed sub-station on the birds of the area are: destruction of habitat, disturbance, electrocution of birds on sub-station infrastructure, collision of birds with the communications tower, and the impact of birds on the operation of the sub-station. Importantly, none of these impacts are considered to be of high significance and mitigation measures for these impacts will be implemented.

Wetland Assessment. There are no wetland or riverine areas that will be directly impacted by the construction and operation of the sub-station. The probability that a wetland or riverine area would be impacted is low at a medium confidence level. There are a few intermittent streams that should be avoided if they fall within transportation pathways during the construction of the project.

Vegetation Assessment. The vegetation of the proposed Gamma Sub-station site falls in the Nama-Karoo Biome, more specifically in the Upper Karoo Bioregion. Overall, the Vegetation Type ranks low for conservation value and the use of less than 0.004% of the Eastern Upper Karoo for a sub-station will not jeopardize any conservation plans for this Vegetation Type. Only one species of special concern was recorded on the Gamma Sub-station site (*Boophone disticha* or gifbol), which will transplant easily. All other protected species recorded on site are abundant in the greater area.

Geotechnical Assessment. Findings indicated that both sites are underlain by fairly competent founding material and that the calcrete on Uitvlugtfontein can be used both as a founding medium and for the construction of pavement layers. In terms of drainage, ponding and surface run-off, the Uit Vlugt Fontein site does not require any additional preparations/precautions whereas Kleinfontein is located down-slope from a small earth embankment dam and precautions are required to prevent flooding due to over topping of two drainage courses (with their confluence located in the near vicinity). Ample groundwater and surface water are available at Kleinfontein whilst Uit Vlugt Fontein will most probably require one or more boreholes. Good quality pavement layer construction material is available on Uit Vlugt Fontein, whereas material for Kleinfontein will have to be imported. It was recommended that the proposed Gamma Sub-station be located on Uit Vlugt Fontein and that the groundwater sources be investigated and, if required, boreholes drilled, pump tested and the water quality analysed.

Land-use Assessment. The determining elements affecting land-use in the area are rainfall, soils and vegetation, which give rise to a very low level of primary productivity in the study area, which limits primary land-use to extensive livestock production (the dominant form of agriculture throughout the region). The direct impact of the development on land-use will, therefore, not be significant. It is recognised that this is not valuable land and, therefore, the damage done either to the surface of the site or collateral damage off site will not result in costly losses. Nevertheless, it remains necessary to respect the fragility of the environment and, in particular, to ensure that excess sediment is not delivered to the adjacent drainage lines.

Visual and Aesthetics Assessment. The sub-station will be dominant in the landscape due to the low visual absorption capacity of the landscape, and the uniformity of the visual landscape and lack of diversity will result in a visual contrast. However, as the study area has a relatively undefined sense of place, the visual impact will not have a high significance on the modification of the *Genius Loci* as the sense of place has already been affected by existing infrastructure and the close proximity of the R63. The visual intrusion will not have a significant impact or influence on existing land-uses. The visual impact is regarded as significantly low, notwithstanding the large extent and height of the sub-station, the low visual absorption capacity and the close proximity to the R63 and the N1. The significance is

tempered by the low surrounding hills, the already altered landscape due to existing transmission lines, a capacitor station and major roads, and the lack of economic activities that rely on the visual environment, such as game reserves, conservation areas and lodges. The visual impact can be reduced to some extent by implementing the recommended mitigation and management measures.

Social and Socio-economic Assessment. The assessment of social and socio-economic impacts (for example, employment opportunities, effects of construction camps, pressure on existing infrastructure, effects on safety and security, effects on farming, operation-specific effects, cumulative impacts, etc.) shows that there are no negative impacts which can be classified as fatal flaws, or which are of high significance thereby blocking the project, provided that mitigation measures are undertaken. Monitoring indicators include employment opportunities and use of local contractors, and health and safety.

Transportation. At the original sub-station site, access would be off the N1, which could cause hazard on the N1 (an upgrade of the existing intersection would be required). At the new sub-station site, access would be off the R63, which has very light traffic and a fairly low standard intersection should suffice. Common to both sites is the Kleinfontein N1/R63 Intersection and it may be necessary to consider safety measures at this intersection due to the very high volume of traffic (and high percentage of heavy vehicles) on the N1. This will be limited to the construction period and will probably consist of speed reductions on the N1 as well as rumble strips in combination with signage. However, depending on from where construction materials come (Johannesburg or Port Elizabeth), this could be relevant to the new proposed site or both sub-station sites. From a transportation perspective, the new proposed sub-station site is preferred to the original site.

Cultural Heritage Assessment. At the sub-station site there is a presence of miscellaneous Middle Stone Age stone knapping debris and the artefacts are water washed and weathered, on patinated shale, and are part of colluvial down slope wash. Also, a concentration of archaeological material exists comprising weathered Early Stone Age flakes and cores are mixed with Middle Stone Age knapping detritus. It appears that episodes of soil deflation and pedogenesis have caused the two temporally disparate traditions to mix. Artefacts are eroding open, exposed by down slope wash, and are mixed with other colluvial debris. These sites have low heritage significance for their scientific value.

Conclusion

The key issues, which require attention and consideration, include the potential impact on the riverine rabbit and the proposed off-set mitigation, the visual and aesthetic impact on the landscape, and the translocation of *Boophone disticha* or gifbol plants. Also of importance are the minor disruption to the social and socio-economic environment, and the few employment opportunities created.

However, importantly, on long high voltage transmission lines, sub-stations are needed every 400 to 450 km to house equipment. For the proposed Gamma Sub-station, Eskom wants to place the sub-station next to its three existing 400 kV transmission lines and reactive voltage correction apparatus for the 400 kV and 765 kV lines can then be housed within one structure. Further, if the Gamma Sub-station is built in proximity to the existing 400 kV lines it can also be used to boost the electrical power feed in the 400 kV lines. To this end, the proposed Gamma Sub-station will be built with transformers to step down the voltage from 765 kV to 400 kV, and this additional power can then be fed into the 400 kV lines for onward transmission. Also, by placing both the existing 400 kV and the 765 kV transmission lines close together and bringing them down the same basic route, the voltage

correction function that is necessary for all the lines and feeding extra power to the 400 kV line from the 765 kV line can be housed within the confines of the same dedicated facility. Alternatively, if the Gamma Sub-station is built approximately 10 km to the west (where originally it was intended to be), it would require a high voltage line to link the different components. This would require additional lengths of transmission lines, additional servitudes from landowners, and a greater environmental footprint for the requisite infrastructure. Also, Eskom can save a substantial amount of money by not having to construct possibly up to 60 km of additional power lines (at an estimated R 2.5 million per kilometre).

Further, if the project were not constructed, Eskom would not address the purpose, need and desirability for the construction and operation of the sub-station. It would effectively mean that the power supply to large areas of the country would not be made more secure nor bolstered or augmented. It would place the lives of millions of people and expose the economies of large areas to grave risks. Furthermore, new economic developments in the Eastern and Western Provinces would not be possible. Therefore, it is of strategic national importance that the proposed sub-station be constructed and, as shown in this environmental assessment, the new proposed site is favoured over the original site (for which environmental authorization has already been obtained).

APPENDIX 1

Landowner Consent Letters

APPENDIX 2

List of persons, organisations and organs of state registered as interested and affected parties

APPENDIX 3

Issues and Response Report

APPENDIX 4

Copies of all comments from interested and affected parties

APPENDIX 5

Copies of Specialist Reports

See Separate Volume