3.3.5. Assessment of Issues Identified through the Scoping Process

Based on the findings of the Scoping Study, the following issues were identified as being of low significance, and therefore not requiring further investigation within the EIA:

» Potential impacts on topography
» Potential impacts on transmission infrastructure associated with climate and atmospheric conditions

Issues that required investigation within the EIA phase, as well as the specialists involved in the assessment of these impacts are indicated in Table 3.2. Specialist EIA Reports are contained within Appendices F - L. Contact details of specialists are contained within their reports.

Table 3.2: Specialist studies undertaken within the EIA phase

Specialist	Area of Expertise	Qualifications & experience
Riaan Robbeson of Bathusi Environmental Consulting	Biodiversity	MSc (Plant Ecology) 8 years experience South African Council of Natural Scientific Professions (SACNASP) (Ecological Scientist & Botanical Scientist, Reg no: 400005/03)
Megan Diamond of Endangered Wildlife Trust	Avifauna	BSc (Environmental Management) 2 years experience
Garry Patterson of ARC-Institute for Soil, Climate and Water	Agricultural Potential	MSc (Soil Science) 28 years experience President of Soil Science Society of South Africa (2005-2007)
Julius Pistorius	Heritage sites	D Phil Archaeology Member of the Association of Southern African Professional Archaeologists (ASAPA) Member of the South African Archaeological Society 28 years experience
Lourens du Plessis of MetroGIS	Visual Impact Assessment & GIS	BA (Geography and Anthropology) 11 years experience in GIS and visual impact assessments
Anita Bron of MasterQ	Social Impact Assessment, land use & tourism potential assessment	MA (Research Psychology), MA (Social Impact Assessment – in process), BA Hons (Psychology), BA (Psychology, Criminology and Penology) member of the South African Monitoring and Evaluation

Specialist	Area of Expertise	Qualifications & experience
		Association and the IAIA 7 years experience
Anita Bron of MasterQ	Social Impact Assessment, land use & tourism potential assessment	MA (Research Psychology), MA (Social Impact Assessment – in process), BA Hons (Psychology), BA (Psychology, Criminology and Penology 7 years experience
William Mullins of Conningarth Economists	Economic Impact Assessment	Mathematician and Statistician

Specialist investigations included desk-top evaluations of existing information (including that provided by landowners in response to the questionnaires distributed), as well as detailed field surveys of the identified corridors and substation sites. In undertaking the field assessment, contact was made with available landowners. A list of the properties where contact was made is included within Appendix M.

An external review of the EIA process was undertaken by Jaana-Maria Ball and Rueben Heydenrych of GIBB.

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of the Mokopane Integration Project. Issues were assessed in terms of the following criteria:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
» The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional
» The **duration**, wherein it will be indicated whether:
  * the lifetime of the impact will be of a very short duration
  * the lifetime of the impact will be of a short duration (2-5 years)
  * medium-term (5–15 years);
  * long term (> 15 years); or
  * permanent;
» The **magnitude**, quantified as small (will have no effect on the environment), minor (will not result in an impact on processes), low (will cause a slight impact on processes), moderate (will result in processes continuing but in a modified way), high (processes are altered to the extent that they temporarily cease), and very high (results in complete destruction of patterns and permanent cessation of processes).
» The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring and will be rated very improbable (probably will not happen), improbable (some possibility, but low likelihood), probable (distinct

possibility), highly probable (most likely) and definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
» the **status**, which will be described as either positive, negative or neutral.
» the degree to which the impact can be reversed (**reversibility**).
» the degree to which the impact may cause **loss of irreplaceable resources**.
» the *degree* to which the impact can be *mitigated.*

The potential **significance** of identified impacts will be determined using the significance rating system described below.

Significance of environmental impact = Consequence x Probability
The consequence of an impact can be derived from the following factors:

» Extent of impact
» Duration of impact
» Magnitude
» Reversibility

The above criteria will be rated using the criteria indicated in the table below.

Magnitude	Reversibility	Duration	Spatial extent	Probability
5 – Very high / don't know	1 – Reversible (regenerates naturally)	5 – Permanent	5 – International	5 – Definite / don't know
4 – High		4 – Long term (impact ceases after operational life)	4 – National	4 – High probability
3 – Moderate	3 – Recoverable (needs human input)	3 – Medium term (5 – 15 years)	3 – Regional	3 – Medium probability
2 – Low		2 – Short term (0 – 5 years)	2 – Local	2 – Low probability
1 – Minor	5 – Irreversible	1 - Immediate	1 – Site only	1 – Improbable
0 – None				0 - None

The overall consequence of an impact must be determined by the sum of the individual scores for magnitude, reversibility, duration and extent of an impact, multiplied by the probability of the impact occurring.

Significance = Consequence (severity + reversibility + duration + spatial scale) X Probability

The significance is then characterised as follows:

- **More than 60 significance points** indicate **High** environmental significance
- **Between 30 and 60 significance points** indicate **Moderate** environmental significance
- **Less than 30 significance points** indicate **Low** environmental significance.

The impacts are ranked according to the significance rating results obtained. The relevant mitigation measures recommended are then considered and the significance of the impacts after mitigation determined. The impacts are then be ranked again according to the significance results after mitigation.

In order to assess the corridor alternatives in respect of their anticipated social impacts, a distinction was made between the following impacts:

» **Category 1**: Impacts that are not expected to differ between the proposed Corridor alternatives, e.g. the number of construction workers that will be needed for the proposed project remains the same, irrespective of the chosen alternative;

» **Category 2**: Impacts that are expected to differ between the proposed alternative Corridors, e.g. the number of households to be resettled increases if the development traversed densely populated areas as opposed to skirting populated areas.

A specialist workshop was held on 3 September 2009, with a suite of specialists from the EIA team[9] in attendance. The conclusions of each of the specialist studies were discussed and an overall recommendation made regarding the preferred substation sites and transmission line corridors for consideration by DEA. A summary of the outcomes of this workshop is included in Appendix N.

[9] Workshop attendants included Jo-Anne Thomas, Zama Dlamini, Lourens du Plessis, Garry Paterson, Nonka Byker, Megan Diamond, Julius Pistorius, Bhavani Daya, Karin Bowler and Reuben Heydenrych of the EIA team.

3.3.6. Public Review of Draft EIA Report and Feedback Meeting

A draft EIA Report was made available for review from **2 November to 14 December 2009** at the following locations:

Lephalale Library – corner of Joe Slovo and Douwater Street	Agri Lephalale Offices – 6A Jacobus Street
Marken Farmers Hall	Vaalwater Agric Association – NTK Building, Meule Street
Waterberg District Municipality Offices, Modimolle	Potgietersrus DLU, Mokopane
Polokwane Municipality – Environmental Management Office	Polokwane Library – Hans van Rensburg Street
www.eskom.co.za/eia	www.savannahSA.com

Copies of the draft report were also made available to the Lephalale Local Municipality and the Mogalakwena Municipality. Affected parties and stakeholders also received CDs containing the report, on request.

The availability and duration of the public review process was advertised in the Mogol Post, Northern Review Midweek, Polokwane Observer, Seipone, Agri Spectrum, Die Bosvelder, Beeld and The Star. In addition, all registered I&APs were notified of the availability of the report either by e-mail or letter (refer to Appendix D).

Feedback focus group meetings were held during the public review period of the draft EIA Report (refer to Table 3.1). All registered I&APs were invited to attend any of these meetings either by e-mail or letter.

3.3.7. Public Review of Revised Draft EIA Report

During the review period of the draft report, it was requested by the stakeholders and interested and affected parties that a deviation to Corridor 8 in the central portion of the study area where technical constraints were identified be investigated as part of the EIA process. The proposed deviation corridor which has been assessed is indicated in Figure 1.4. A Revised Draft EIA Report was therefore compiled to include the assessment of this additional alternative. This revised draft EIA Report was made available for review from **19 May 2010 to 18 June 2010** at the following locations:

Lephalale Library – corner of Joe Slovo and Douwater Street	Agri Lephalale Offices – 6A Jacobus Street
Marken Farmers Hall	Vaalwater Agric Association – NTK

	Building, Meule Street
Waterberg District Municipality Offices, Modimolle	Potgietersrus DLU, Mokopane
Polokwane Municipality – Environmental Management Office	Polokwane Library – Hans van Rensburg Street
www.eskom.co.za/eia	www.savannahSA.com

Copies of the draft report were also made available to the Lephalale Local Municipality and the Mogalakwena Municipality. Affected parties and stakeholders also received CDs containing the report, on request.

The availability and duration of the public review process was advertised in the Mogol Post, Northern Review Midweek, Polokwane Observer, Seipone, Agri Spectrum, Die Bosvelder, Beeld and The Star. In addition, all registered I&APs were notified of the availability of the report either by e-mail or letter (refer to Appendix D).

3.4. Regulatory Framework, Legislation and Guidelines Applicable for the Mokopane Integration Project Environmental Impact Assessment Process

The scope and contents of this Draft EIA Report have primarily been informed by the following legislation and guidelines:

- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)
- EIA Regulations, published under Chapter 5 of the NEMA (GN R385, GN R386 and GN R387 in Government Gazette 28753 of 21 April 2006)
- All guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006 (DEA, June 2006);
  - Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006 (DEA, May 2006); and
  - Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006 (DEA, June 2006).

Several other Acts, standards or guidelines have also informed the scope of issues to be addressed in the EIA (particularly in terms of the scope and methodology of specialist studies). A review and assessment of legislative requirements applicable to the proposed project, the specialist studies and this EIA process is provided in Table 3.3.

Table 3.3: List of applicable legislation and compliance requirements required for the Mokopane Integration Project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Legislation			
National Environmental Management Act, 1998 (Act No. 107 of 1998)	EIA Regulations have been promulgated in terms of Chapter 5. Activities which may not commence without an environmental authorisation are identified within these Regulations. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant environmental authorisation. In terms of GNR 387 of 21 April 2006, a scoping and EIA process is required to be undertaken for the proposed project	National Department of Water and Environmental Affairs – lead authority. LDEDET – commenting authority.	This EIA report is to be submitted to DEA and DEDET in support of the **application for authorisation** submitted in April 2007.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	In terms of the Duty of Care provision in S28(1) Eskom as the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to ensure that any pollution or degradation of the environment associated with this project is avoided, stopped or minimised. In terms of NEMA, it has become the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	National Department of Water and Environmental Affairs (as regulator of NEMA).	While **no permitting or licensing requirements** arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	» The Minister may by notice in the *Gazette* publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. » The Minister may amend the list by— *(a)* adding other waste management activities to the list; *(b)* removing waste management activities from the list; or *(c)* making other changes to the particulars on the list. » Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that *(a)* the containers in which any waste is stored, are intact and not corroded or in any other way rendered unlit for the safe storage of waste; *(b)* adequate measures are taken to prevent accidental spillage or leaking; *(c)* the waste cannot be blown away; *(d)* nuisances such as odour, visual impacts and breeding of vectors do not arise; and *(e)* pollution of the environment and harm to health are prevented	National Department of Water and Environmental Affairs	As no waste disposal site is to be associated with the proposed project, **no permit** is required in this regard. Waste handling, storage and disposal during construction and operation is required to be undertaken in accordance with the requirements of this Act, as detailed in the EMP (refer to Appendix N).
Environment Conservation Act, 1989 (Act No. 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992).	National Department of Water and Environmental Affairs Local authorities	There is **no requirement for a noise permit** in terms of the legislation. Noise impacts are expected to be associated with the construction phase

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
			of the project and are likely to present an intrusion impact to the local community. On-site activities should be limited to 6:00am to 6:00pm Monday – Saturday (excluding public holidays). Should activities need to be undertaken outside of these times, the surrounding communities will need to be notified and appropriate approval will be obtained from DEA and the Local Municipality.
National Water Act, 1998 (Act No. 36 of 1998)	Section 21 sets out the water uses for which a water use license is required.	National Department of Water and Environmental Affairs	As no water use (as defined in terms of S21 of the NWA) will be associated with the proposed project, **no water use permits or licenses** are required to be applied for or obtained.
National Water Act, 1998 (Act No. 36 of 1998)	In terms of Section 19, Eskom as the project proponent must ensure that reasonable measures are taken throughout the life cycle of this project to prevent and remedy the effects of pollution to water resources from occurring, continuing or recurring.	National Department of Water and Environmental Affairs (as regulator of NWA)	While **no permitting or licensing requirements** arise directly by virtue of the proposed project, this section will find application during the EIA phase and will continue to apply throughout the life cycle of the project.
National Heritage Resources Act, 1999 (Act No. 25 of 1999)	Section 38 states that Heritage Impact Assessments (HIAs) are required for certain kinds of development including » the construction of a road, power line, pipeline, canal or other similar linear development or barrier exceeding 300 m in length; » any development or other activity which will change the character of a site	South African Heritage Resources Agency (SAHRA)	A Phase I Heritage Impact Assessment study was undertaken in the EIA phase of the process and provides a synthesis of the results achieved by the scoping study and the Phase I survey as well as describing the status quo of the study area with regard to its pre-historical, historical and cultural context (Refer to Appendix I).

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	exceeding 5 000 m^2 in extent. The relevant Heritage Resources Authority must be notified of developments such as linear developments (such as roads and power lines), bridges exceeding 50 m, or any development or other activity which will change the character of a site exceeding 5 000 m^2; or the re-zoning of a site exceeding 10 000 m^2 in extent. This notification must be provided in the early stages of initiating that development, and details regarding the location, nature and extent of the proposed development must be provided. Stand alone HIAs are not required where an EIA is carried out as long as the EIA contains an adequate HIA component that fulfils the provisions of Section 38. In such cases only those components not addressed by the EIA should be covered by the heritage component.		A **permit** may be required should any **cultural/heritage sites** of significance be unearthed during the construction phase of the transmission power lines or at the substation site.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	In terms of Section 57, the Minister of Environmental Affairs and Tourism has published a list of critically endangered, endangered, vulnerable and protected species in GNR 151 in Government Gazette 29657 of 23 February 2007 and the regulations associated therewith in GNR 152 in GG29657 of 23 February 2007, which came into effect on 1 June 2007. In terms of GNR No. 152 of 23 February 2007: Regulations relating to listed threatened and protected species, the relevant specialists must	National Department of Water and Environmental Affairs	As Eskom will not carry on any restricted activity, as is defined in Section 1 of the Act, **no permit** is required to be obtained in this regard. **Specialist flora and fauna studies** are required to be undertaken as part of the EIA process. A specialist ecological assessment has been undertaken for the proposed project (refer to Appendix F). A **permit** may be required should any **protected plant species** within the

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	be employed during the EIA phase of the project to incorporate the legal provisions as well as the regulations associated with listed threatened and protected species (GNR 152) into specialist reports in order to identify permitting requirements at an early stage of the EIA phase.		power line corridors or at the substation site be **disturbed or destroyed** as a result of the proposed development.
Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Regulation 15 of GNR1048 provides for the declaration of weeds and invader plants, and these are set out in Table 3 of GNR1048. Weeds are described as Category 1 plants, while invader plants are described as Category 2 and Category 3 plants. These regulations provide that Category 1, 2 and 3 plants must not occur on land and that such plants must be controlled by the methods set out in Regulation 15E.	Department of Agriculture	While **no permitting or licensing requirements** arise from this legislation, this Act will find application during the EIA phase and will continue to apply throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies must be developed and implemented. In addition, a weed control and management plan must be implemented.
Hazardous Substances Act, 1973 (Act No. 15 of 1973)	This Act regulates the control of substances that may cause injury, or ill health, or death by reason of their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products. Group I and II: Any substance or mixture of a	Department of Health	It is necessary to identify and list all the Group I, II, III and IV hazardous substances that may be on the substation site and in what operational context they are used, stored or handled. If applicable, a **license** is required to be obtained from the Department of Health.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	substance that might by reason of its toxic, corrosive etc, nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared to be Group I or Group II hazardous substance; Group IV: any electronic product; Group V: any radioactive material. The use, conveyance or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Road Traffic Act, 1996 (Act No. 93 of 1996)	The Technical Recommendations for Highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges and culverts. The general conditions, limitations and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio,	Limpopo Department of Roads (provincial roads) South African National Roads Agency Limited (national roads)	**An** abnormal load/vehicle permit **may be required to transport the various power line and substation components to site for construction. These include:** » Route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. » Transport vehicles exceeding the dimensional limitations (length) of 22m.

Legislation	Applicable Requirements	Relevant Authority	Compliance requirements
	mass distribution and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.		

DESCRIPTION OF THE ENVIRONMENT AFFECTED BY THE PROPOSED 400KV TRANSMISSION POWER LINES CHAPTER 4

This section of the EIA Report provides a description of the environment that may be affected by the **proposed 400kV transmission power lines** between the Medupi Power Station and Delta Substation, and the Mokopane and Witkop Substations. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the physical, biological social, economic and cultural aspects of the environment that could be affected by, or could affect, the proposed development have been described. This information aims to provide the overall context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F - L.

Alternative power line corridors comparatively assessed within this EIA include **Alternative 1 and 2**, as well as the **alternative of following the existing Matimba-Witkop lines (corridor 8)** and a **deviation of corridor 8**. In addition, **Transmission line alternatives 4, 5, 6 and 7** were assessed (refer to Figure 4.1).

4.1. Location and Baseline Environment of the Study Area

The proposed power line corridors fall within the Lephalale, Mogalakwana, Modimolle and Polokwane Local Municipalities, which are located within the Waterberg District Municipality and the Capricorn District Municipality (refer to Figures 4.2 and 4.3).

The study area is situated between the towns of Lephalale in the west and Polokwane in the east. The greater study area contains elements of both grassland and woodland, but the proposed alignments are situated largely within woodland. The area is situated within the Limpopo River catchment area. Numerous rivers and drainage lines are crossed by the various alternatives. The proposed corridors cross landform types ranging from plains in the north to a hilly and mountainous terrain in the south.

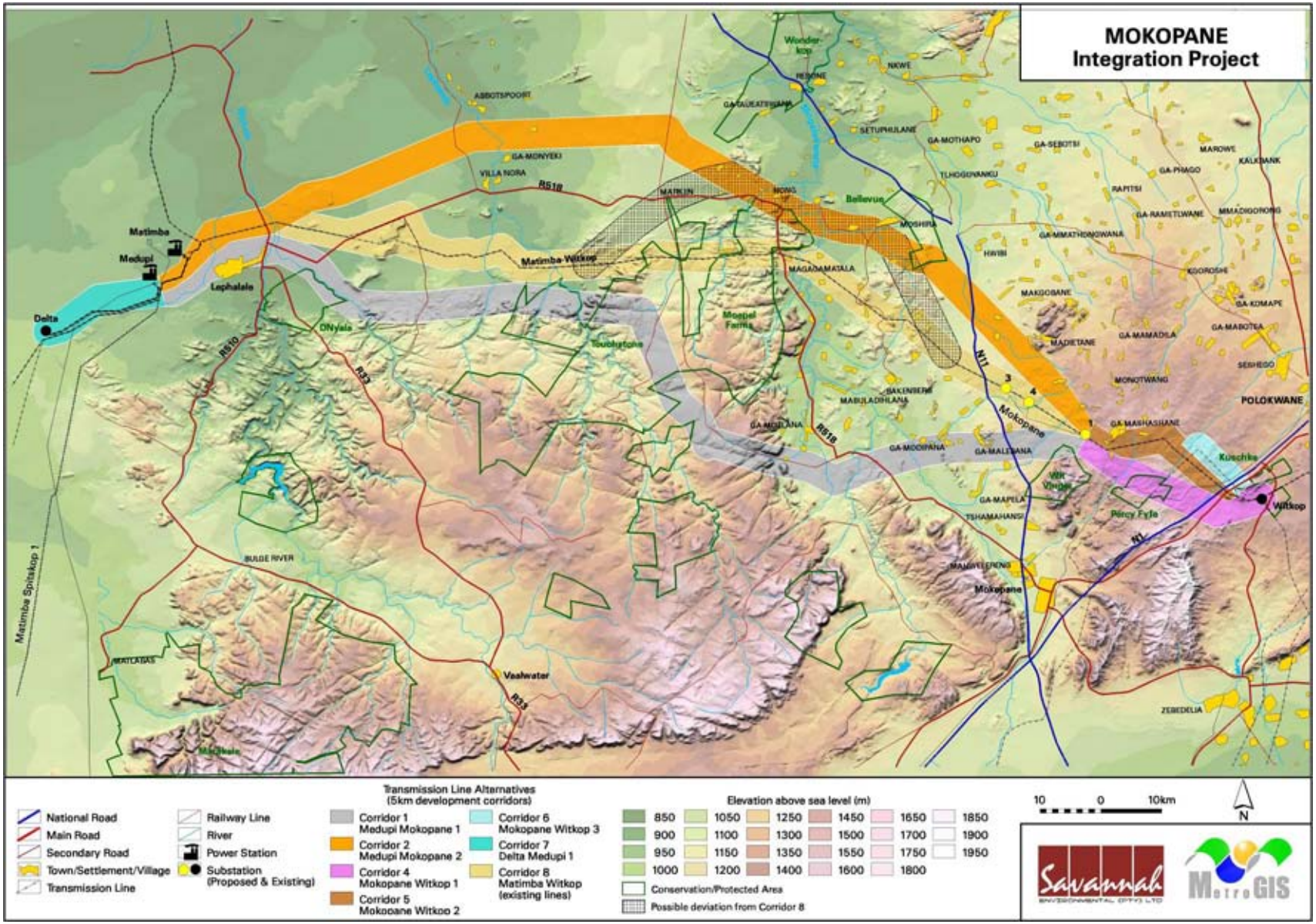

Figure 4.1: Alternatives comparatively assessed in the EIA phase of the process

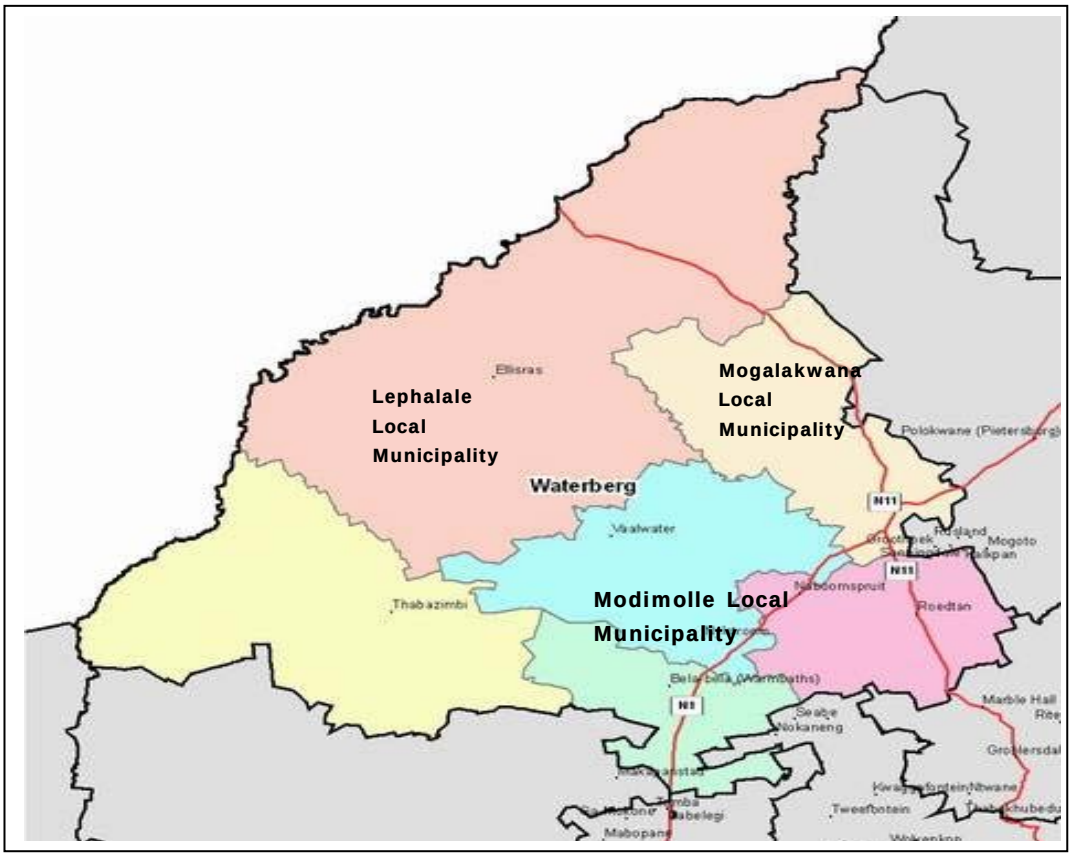

Figure 4.2: Delineation of the Lephalale, Mogalakwena and Modimolle Local Municipalities within the Waterberg District Municipality

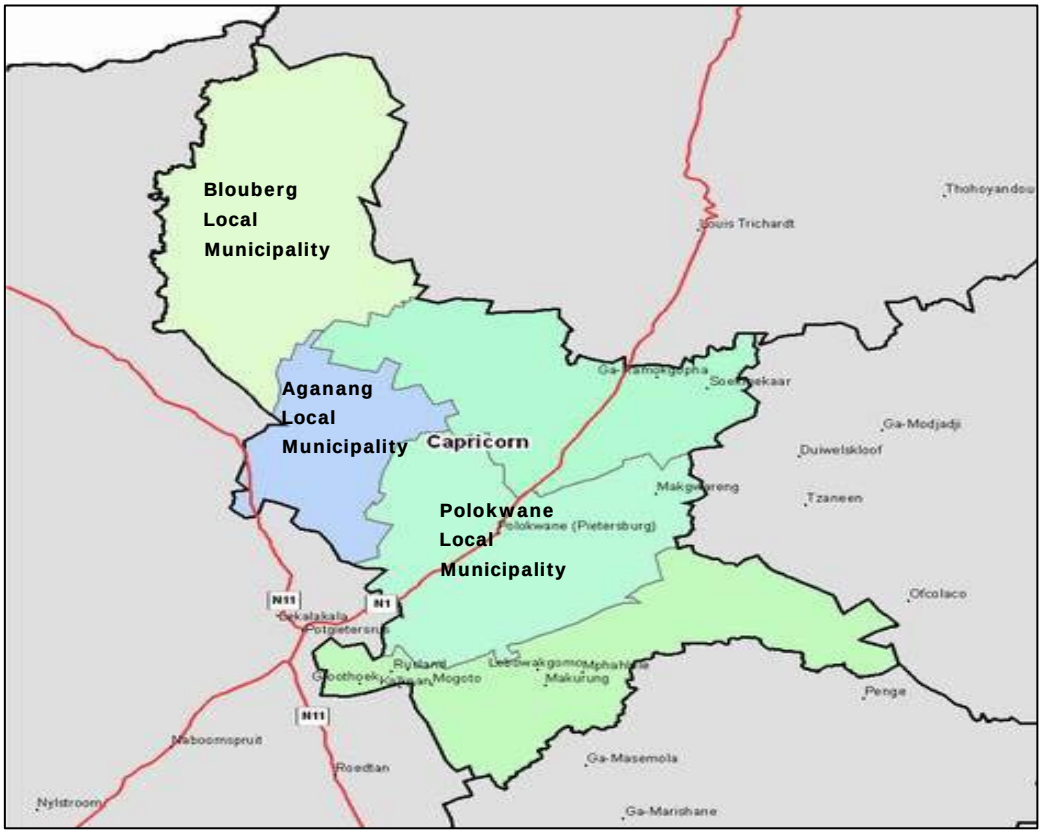

Figure 4.3: Delineation of the Polokwane Local Municipality within the Capricorn District Municipality

The land use within the study area consists of formal and informal residential areas, mining and commercial farming with a mixture of game, cattle and crop cultivation – both dryland and irrigation. Sections of the study area contain subsistence farming, with a mixture of cattle and crop cultivation. The study area includes a number of conservation or protected areas (both provincial and private nature reserves) as well as the Waterberg Biosphere Reserve core, buffer and transitional zones. Industrial and mining land uses occur west of Lephalale in the form of the Groottegeluk coal mine, and the two Eskom coal-fired power stations (the existing Matimba Power Station and the Medupi Power Station currently under construction). Platinum mining activities take place north-west of Mokopane between the R518 and the N11 national road (refer to Figures 4.4 and 4.5).

Large tracts of land within the study area are still in a natural state (undisturbed) with some areas in and along the Waterberg escarpment in a virtually pristine condition. This is due mainly to the low population density (less than 10 people per km^2) of the Waterberg plateau and escarpment and the relative remoteness and inaccessibility of the terrain. The population density increases eastwards with a great number of settlements occurring along the Mogalakwena River (between the R518 and N11). Here the population density is between 100 to 200 people per km^2 and 50 to 100 people per km^2 east of the N11.

The properties that are potentially affected by the transmission power line alignments are owned by either private landowners or Traditional Authorities.

4.1. Social Characteristics of the Study Area

The Waterberg District Municipality is made up of six separate local municipalities, including the Mogalakwena and Lephalale Local Municipalities. The Waterberg District Municipality is the largest of the six districts and lies in the western part of the province. The district is mostly rural in nature and, according to the Community Survey 2007, it has a total population of approximately 596 092 people living in 160 720 households (at an average of 12 people per km^2, much lower than the average provincial density of 40 people per km^2).

In a 2007 Community Survey, the unemployment rate within the district was estimated at around 29.0%, which was much lower than that of the province. Furthermore, approximately a third (33.0%) of the district's population was under the age of 14 years, which would make any job opportunities vital to the future development of the district.

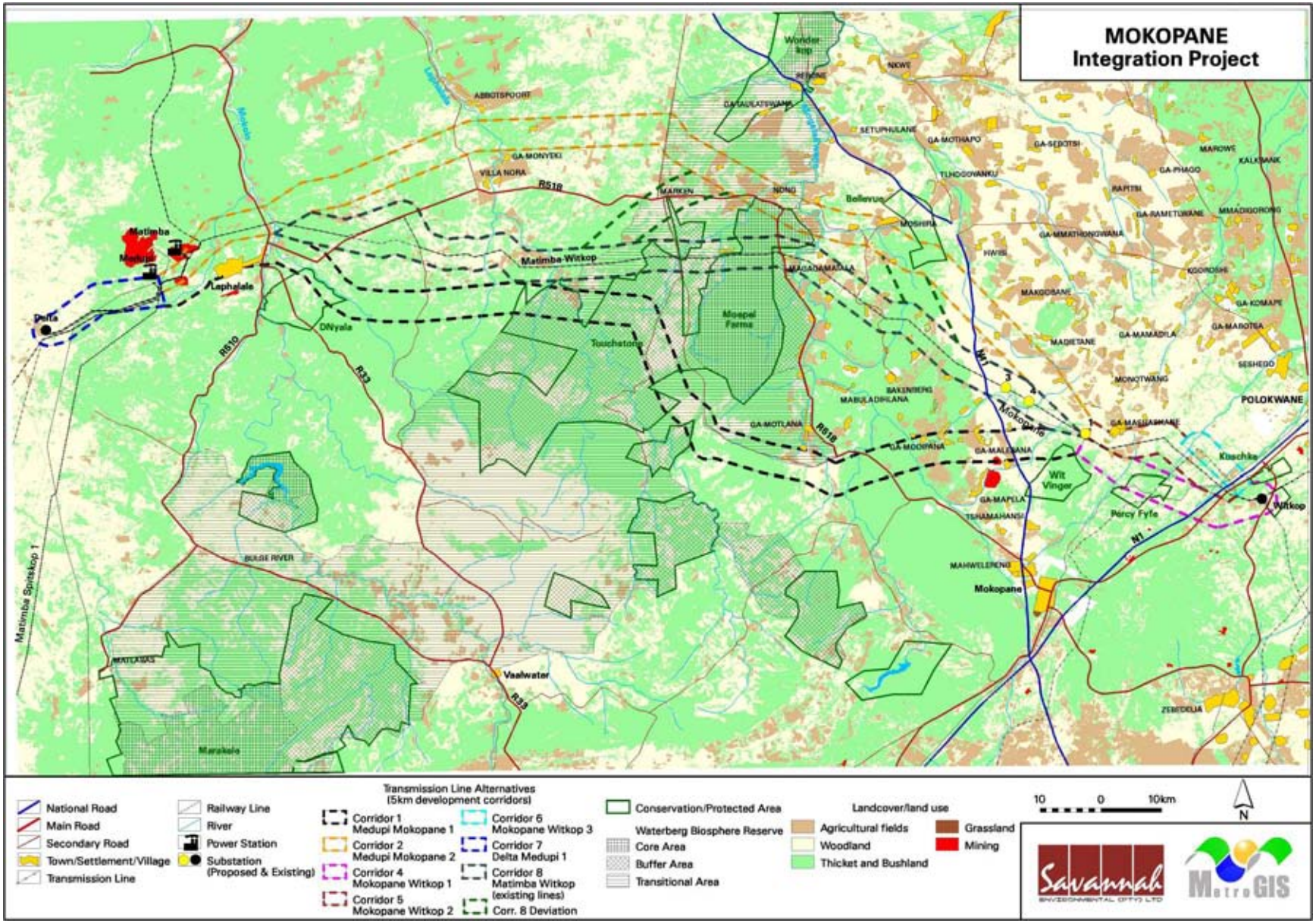

Figure 4.4: Land uses within the study area

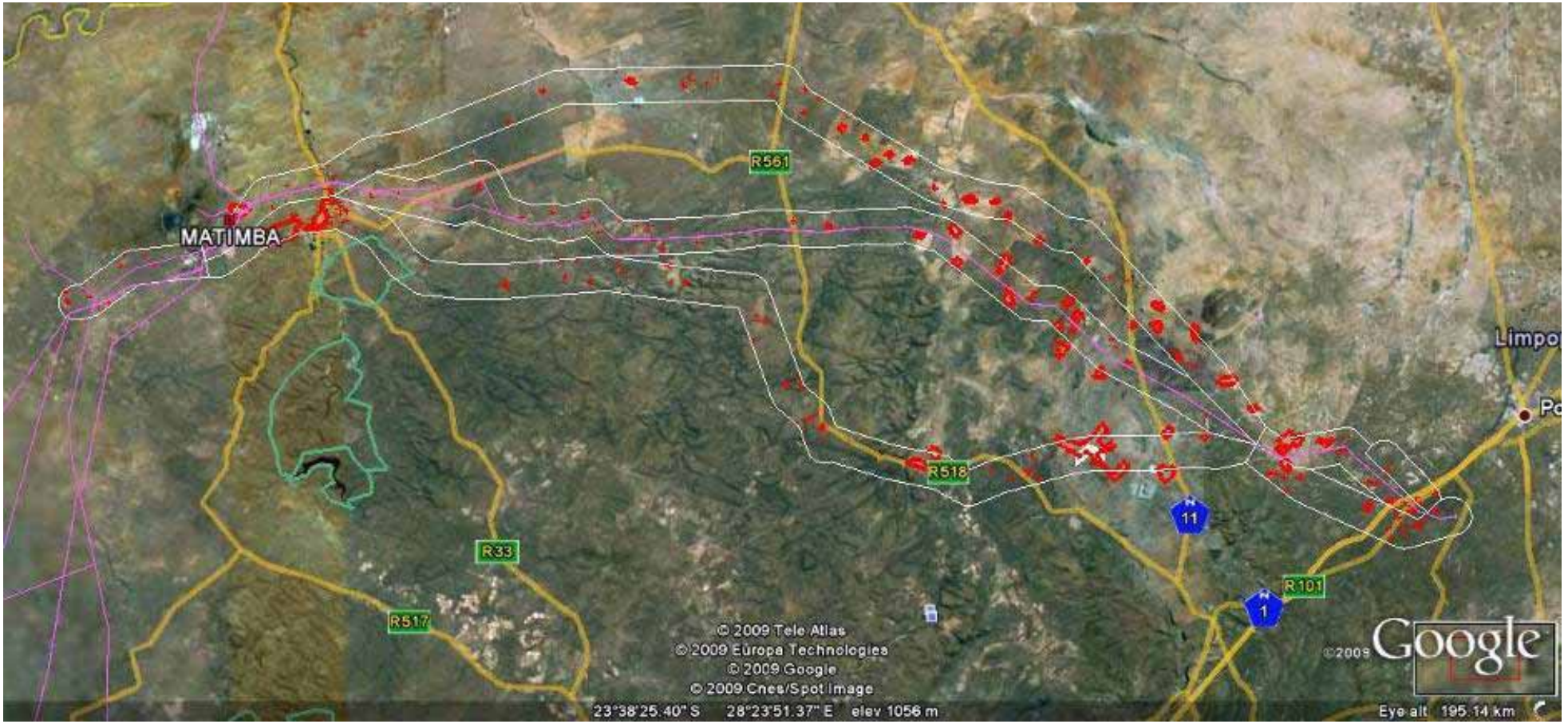

Figure 4.5: Occurrence of Dwellings within the Corridors (Dwellings are indicated by the red circles)

The WDM is characterised by discrepancies in wealth and skills. The majority of households earned an annual income below R18 001 in 2001. Households' production levels are declining leading to a situation where the majority of the population are financially dependent on state pension and social welfare grants as their primary source of income and subsistence. This is linked to the low educational levels, and lack of skills.

The Waterberg District Municipality's (WDM) Integrated Development Plan (IDP 2008/09) states that only approximately 0.43% of the district's total land surface area is used for settlement purposes (i.e. towns and villages). Of these towns and villages, by far the majority (approximately 69%) are located within the Mogalakwena Local Municipality's area of jurisdiction. In Lephalale Local Municipality, only 37% of the population lives in settlements with high population concentrations and growth potential. The urban areas such as Mokopane and Lephalale dominate the district's urban settlement pattern.

The Capricorn District Municipality (CDM) consists of 5 local municipalities, including the Aganang, Blouberg and Polokwane Local Municipalities. The CDM is located within the centre of the Limpopo Province and, according to the Community Survey 2007, has a total population of approximately 1 243 167 people, which is more than double the population size of the WDM. The average population density of the CDM is estimated at around 73.3 people per km^2, which is much higher than that of the WDM and the province as a whole.

Currently there are a large number of manufacturers in the Capricorn District, of which the majority are situated in the Polokwane municipal area. The processing of raw materials from mining and secondary activities emanating from processing of agriculture products in Capricorn will contribute significantly in expanding the manufacturing sector within CDM. Investment in construction has increased in the years immediately preceding 2007. However while there are many manufacturers, few employ more than 100 people and as a result many people engage in hawking and informal household shops, which sustains their basic needs but unfortunately does not contribute to economic growth within the CDM.

A large portion of the eastern section of the study area falls within tribal land. Tribal Authorities identified through the public participation process include: Laka, Shongoane, Seleka, Lekalakala, Bekenburg, Mapela, Mokopane, Dikgale, Moletsi, Bakone, Maraba and Mashashane Traditional Councils (refer to Figure 4.5 and Photograph 4.1).

Photograph 4.1: An Aerial photograph of communities located in the north-eastern section of the study area

4.1.1. Demographic Profile

The Integrated Development Plan of Lephalale Local Municipality envisaged that the total population for Lephalale Municipality will increase from 80 141 to 106 521 in 2010. The estimated future population of Lephalale Municipality will increase with approximately 6 500 people over the next six years (from 2007). It was estimated that the population growth rate for Lephalale Municipality will decrease from approximately 1,345% in the year 2004 to 1,024% in the year 2010.

Despite its beneficial location in terms of international trade, the Limpopo Province is regarded as one of the poorest provinces in South Africa. In the province approximately 59.6% of the population was employed in 2007. Of those employed, 18.4% are employed within the community services sector source.

4.1.2. Economic Profile

The Waterberg District Municipality Integrated Development Plan (2008/09) states that the key economic sectors within the WDM are mining, electricity/water, services, trade/catering and agriculture, with mining making the biggest contribution to the Gross Geographical Product (GGP). The land use pattern within the district is diverse, with most of the mining operations concentrated on the periphery, whereas the central area is mostly characterised by the tourism and game industry. The tourism industry is also a significant contributor to the Gross Domestic Product (GDP). Similar to the province as a whole, a trend in the area is the conversion of agricultural land into game farms, resulting in a rapid expansion of game farming and tourism in the area. The

WDM is malaria free and has a rather mild climate that adds to the district's appeal as a tourist destination. The area is also in fairly close proximity to the Gauteng Province which makes it not only an appealing destination, but also a prime location to develop game farms.

A large portion of Capricorn District Municipality depends on agricultural development and economically on potatoes as the most important crop in the CDM.

Field cropping and animal production are the main activities in the study area. During recent years game farming has become a major economic activity in the area and this upsurge in eco-tourism and commercial hunting has lead to a decrease in traditional agricultural activities. It is likely that game farming activities will increase. The assumption was therefore made that the grazing portions identified along the corridors are for the purposes of game farming.

Extensive mining reserves of the platinum group metals and ferrochrome reserves are present within the study area. This has given rise to extensive mining activities in the eastern portion of the study area. In addition, the prevalence of coal resources to the west of the study area has given rise to extensive coal mining activities in this area. It is expected that mining, electricity/water, services, and trade/catering will increase in future due to the construction of the Matimba Power Station near Lephalale.

4.1.3. Heritage Resources

Four archaeological or heritage zones can be distinguished in the Mokopane Integration Project study area considered from an ecological, historical and pre-historical perspective. These are:

» the plains to the west of Polokwane and Mokopane which are dotted with scattered mountains, kopjes and knolls across a vast plain;
» the Waterberg mountain mass in the central part of the study area;
» flat outstretched bush and sand veldt to the west of the Waterberg mountains and a number of isolated flat-topped hills (mesa); and
» kopjes in thorn-veldt in the north-western part of the study area.

The plains towards the west of Polokwane and Mokopane are characterised by a number of large mountains and smaller kopjes and knolls (refer to Photograph 4.2). Some of these mountains, further towards the west, near the Potgietersrust Platinum Mine, bear historical names such as Mapela, Masenya, Tshaba and the historically well-known Fonthane.

Photograph 4.2: The plains with scattered mountains and kopjes west of Polokwane and Mokopane served as the sphere of influence of the Langa Ndebele during the Late Iron Age and historical period

These mountains serve as historical beacons outlining the spheres of influence of the Langa-Ndebele, a Nguni group that settled in this area during the sixteenth and seventeenth centuries. The Ledwaba/Maune Ndebele clans, who are related to the Langa-Ndebele, live in the Bergzicht-Kalkspruit and Mašašane townships.

The extensive Waterberg mountain mass in the central part of the study area covers the largest part of the project area. This mountainous terrain is divided by both the Mogol and Mogalakwena Rivers which runs from the south to the north through this mountain range. No dense concentrations of archaeological or other heritage sites have yet been recorded in this eco-zone. However, krantzes and ridges along the northern and southern escarp of this part of the project area, as well as valleys that criss-cross the mountain range, harbour some rock paintings. Caves and rock shelters also occur where Stone Age hunter-gatherers established semi-permanent settlements, particularly during the Middle Stone Age. Corridors 2 & 3 traverse the Waterberg mountain range (refer to Photograph 4.3).

Photograph 4.3: The Waterberg mountains mass in the central part of the project area. Some historical farmstead complexes occur in this part of the study area.

On the far western extremity of the Waterberg, after passing the last foothills in this range, open sand veldt covered with thorn trees is predominant. This land was formerly the sphere of influence of the pre-historical San and historical Vaalpense who roamed the area in small family groups acting as nomadic hunters and herders. Early Iron Age farmers also lived near the western perimeter of the Waterberg where they herded cattle, possibly practised limited crop planting but smelted iron on a substantial scale at the site of Diamand. Corridors 2 and 3 traverse the western edge and foothills of the Waterberg mountain range (refer to Photograph 4.3).

Isolated kopjes and flat-topped hills (mesas) in thorn-veldt occur across the north-western part of the study area where these topographical features corresponds with the northern perimeters of the spheres of influence of the Seleka-Ndebele and the Batlhalerwa (Shongwane) (refer to Photograph 4.4). Both these clans have their origins in the Late Iron Age and historical periods. The Shongwane originate from Zimbabwe and settled in the far north-western corner of the study area during the 18th century. They are historically associated with Nora and Bobididi, two of the flat-topped hills in the area. In this far north-western part of the study area these communities practised farming and metal working, the remains of which still occur in the area.

Photograph 4.4: Flat-topped hills in the north-western part of the project area. Here, the Seleka-Ndebele and Shongwane clans established spheres of influence during the Late Iron Age and historical period

Mokopane and Polokwane in the east of the study area represent two of the oldest colonial towns in the former Transvaal Province. This area incorporates the plains with granite hills to the west of Mokopane, which were also home to the Ndebele tribes of Kekana and Langa. These clans occupied places such as Maraba, Mashashane and Vaaltyn to the north-west of Mokopane (refer to Photograph 4.5). Lephalale in the west is much younger, being established as a result of the area's coal reserves.

Each of the eco-zones identified is therefore associated with human groups from the past. Descendants of these populations, such as the Ndebele, Vaalpense, colonials and Shongwane still live and work in the area and can be found in towns and villages in or close to the study area.

A limited number of **Stone Age** sites have been identified in and near the Project Area. This is primarily the result of the fact that Stone Age sites are difficult to detect as they may be (partly) buried under the ground and that they mostly consist of stone tools that are scattered across the surface of the land. It is clear that Stone Age sites are under-represented in the study area and that some of these sites will be found during the walk-through study or even at a later stage, e.g. when the power line corridors are constructed and stone tools are excavated when towers are erected.

Photograph 4.5: The vast, homogenous plains to the west of the Waterberg where the Vaalpense and their predecessors and contemporaries, the San, lived as hunters and foragers in ephemeral types of settlements

Most of the **Late Iron Age** stone walled sites in the study area have been identified in the Witkoppen Mountains, to the west of these mountains and in the former sphere of influence of the Langa Ndebele. A single occurrence also has been recorded on Daggakraal 591LR. In general, however, these types of sites are uncommon towards the central and western mountainous parts of the study area.

A number of widely distributed **colonial farmsteads** have been recorded in the western and central parts of the study area where colonial settlement took place during the nineteenth century. Many of these farmsteads do not necessarily qualify as historical significant structures as they either have been altered (renovated) in the past whilst others have been abandoned and have fallen into disrepair.

At least one commemorative beacon was distinguished in the study area, namely the beacon commemorating the opening of the Kloof Pass.

A significant number of **graveyards** were recorded. These are associated with historical homesteads in the Langa Ndebele sphere of influence, the Luxemburg area, with colonial farmsteads and graveyards occuring in rural villages. The number of graveyards recorded is probably not a true reflection of the real number of graveyards that may exist. Undetected graves or graveyards may occur as many informal and abandoned graveyards are difficult to detect.

Formal, historical graveyards are usually found where colonial settlements occur, such as towards the western and central parts of the study area. Informal graves and graveyards were recorded in the spheres of influence of the Langa-Ndebele, in the Luxemburg area as well as on the outskirts of rural villages where they may occur in or near the study area. Heritage sites recorded in the study area are reflected in Figure 4.6.

4.2. Biophysical Characteristics of the Study Area

4.2.1. Geographical Profile

Situated on a plateau approximately 1 300 m above sea level, the Limpopo Province has warm to hot summers with moderate winters. The province has an average annual rainfall of between 577 and 1 000 mm. Average summer temperatures within the study area rise to approximately 28°C and drop to around 17°C. Average winter temperatures range from 4.7°C to 19°C.

The study area covers a considerable piece of land in the Limpopo Province as it runs from the Delta Substation near Lephalale in the west across the Waterberg mountain range to the Witkop Substation near Polokwane and Mokopane in the east. Most of the study area comprises areas of natural habitat, including Thicket, Bushland and Woodland. The eastern part of the study area is characterised by moderate transformation and extensive areas of cultivation and degraded woodland (Figure 4.6).

The proposed power line corridors cross landform types ranging from plains in the north to areas consisting of hills and mountains in the south. These hills and ridges are especially important since they are likely to sustain populations of conservation-important invertebrate species.

The dominant vegetation type found within the study area is woodland, i.e. Arid or Moist woodland. The woodland biome covers most of the northern and eastern sections of southern Africa. Woodland is defined as having a grassy under-storey and a distinct woody upper-storey of trees and tall shrubs. Arid woodland comprises predominantly fine-leaved, semi-deciduous *Acacia*-dominated woodlands on rich soils. This vegetation type occur where there is intermediate, though variable, rainfall with hot, wet summers and cool, dry winters. Moist woodland comprises predominantly broadleaved, winter deciduous woodland. Soil types are varied but are generally nutrient poor.

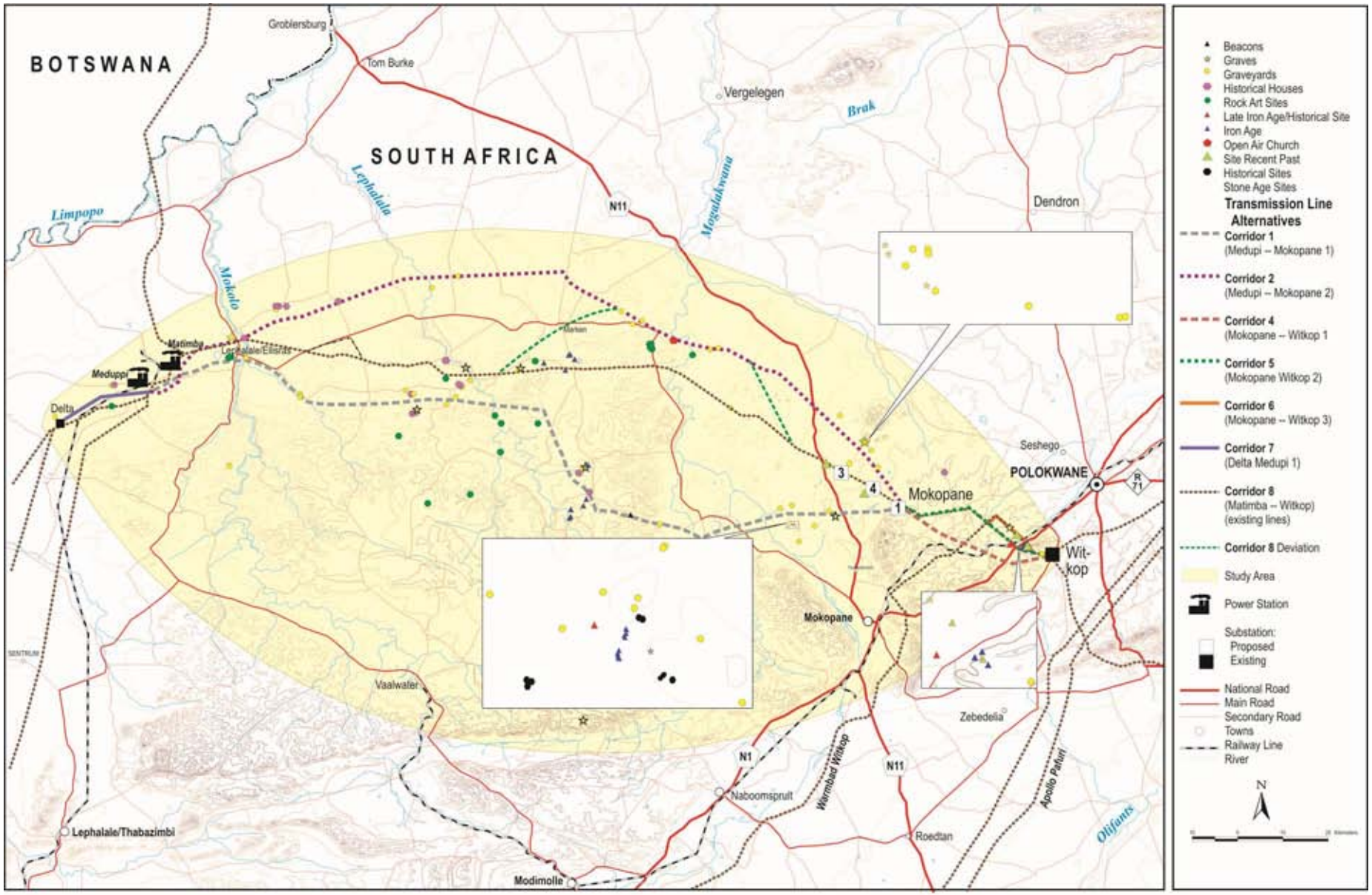

Figure 4.6: Heritage resources recorded in the study area

The majority of the northern and eastern parts of the study area are in a state of transformation, with a number of settlements dotted throughout the immediate surrounds intermingled with mining areas and both commercial and subsistence forms of cultivation. As a result, the vegetation of the areas within corridors 1 and 2 have been largely transformed. This transformation is continuing with increasing development in these areas. The habitat in the area has been subjected to severe pressure from the neighbouring communities and the various land use types.

4.2.2. Ecological Profile

Some areas within the study area have known importance in terms of floristic and faunal attributes. These areas frequently exhibit characteristics of a pristine nature, the presence of Red Data flora species, a high diversity or atypical or threatened vegetation types and habitat types.

The western part of the study area is largely untransformed, but a high degree of transformation is evident in the eastern areas, particularly around urban areas where agriculture constitutes an important land use activity. Agriculture is mainly restricted to the eastern areas and in close vicinity of larger rivers where irrigated agriculture is practised. The transformation of land reflects the land use and topography of the region. Areas that are topographically diverse are generally not suited for intensive land use categories such as urbanisation or agriculture and comprise extensive land uses such as game farming, eco-tourism and cattle farming. Remaining natural habitat within these parts comprise relatively large tracts that are characterised by low isolation and fragmentation factors. Conversely, areas that are characterised by plains and gently undulating topography is generally densely populated and also characterised by fairly intensive utilisation factors. Remaining natural habitat within these parts comprise small areas that are characterised by high isolation and fragmentation factors. A total of 10 regional vegetation types are represented within the proposed power line corridor alternatives, two of which is ascribed a Vulnerable conservation status, namely Central Sandy Bushveld and Makhado Sweet Bushveld.

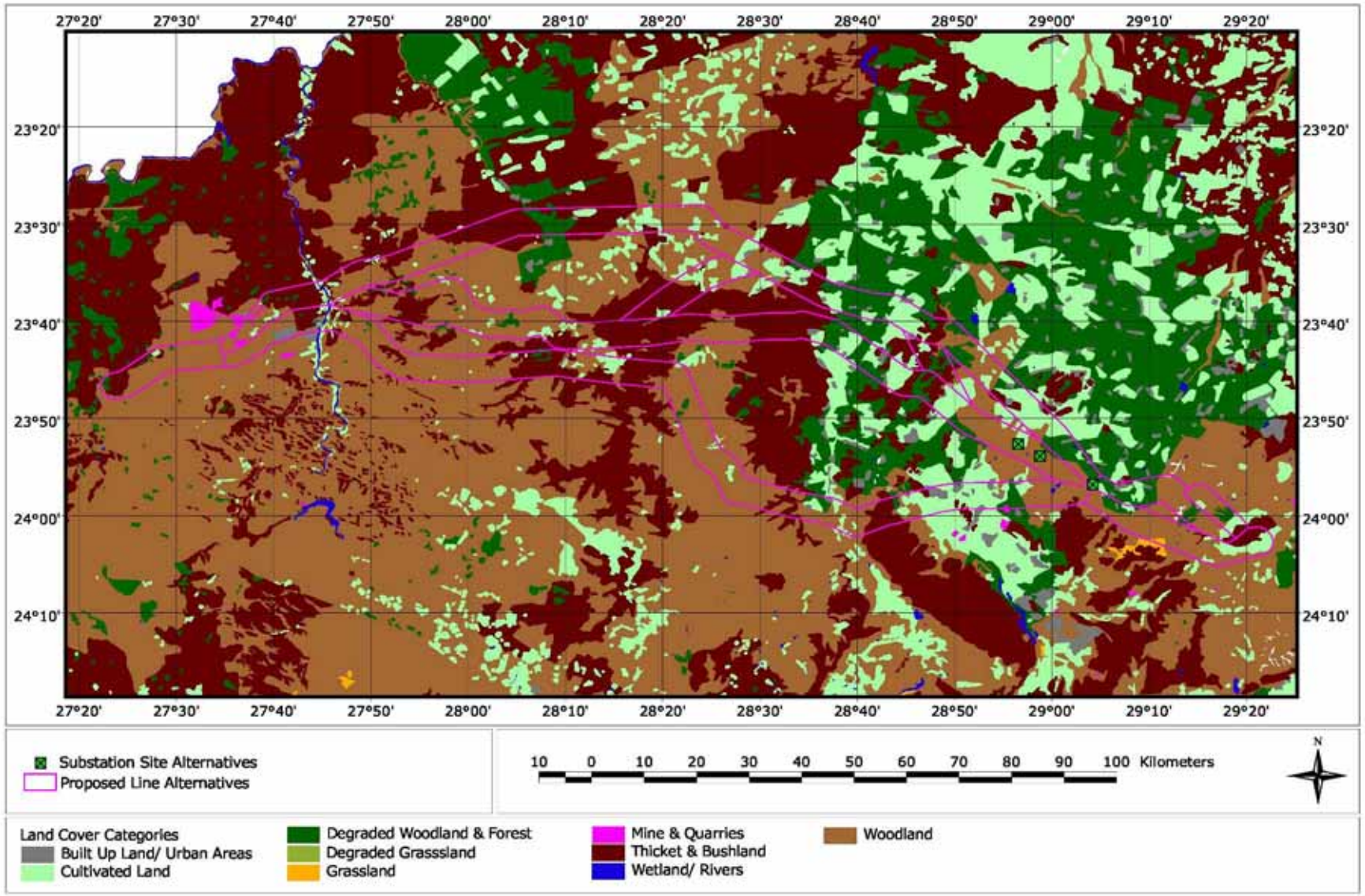

Figure 4.7: Landcover of the study area

The following VEGMAP vegetation units are present within the study area (Figure 4.8):

» Central Sandy Bushveld
» Limpopo Sweet Bushveld
» Makhado Sweet Bushveld
» Mamabolo Mountain Bushveld
» Polokwane Plateau Bushveld
» Roodeberg Bushveld
» Subtropical Alluvial Vegetation and
» Waterberg Mountain Bushveld.

The conservation status of the different vegetation types occurring in the study area is listed below in Table 4.1.

Table 4.1: VEGMAP Conservation Status

VEGMAP Unit	% Conserved	% Transformed	Target	Status
Central Sandy Bushveld	3%	24%	19%	Vulnerable
Limpopo Sweet Bushveld	<1%	5%	19%	Least Threatened
Makhado Sweet Bushveld	1%	27%	19%	Vulnerable
Mamabolo Mountain Bushveld	8%	6%	24%	Least Threatened
Polokwane Plateau Bushveld	2%	17%	19%	Least Threatened
Roodeberg Bushveld	6%	18%	19%	Least Threatened
Subtropical Alluvial Vegetation	71%	16%	31%	Least Threatened
Waterberg Mountain Bushveld	9%	3%	24%	Least Threatened

A number of formal nature reserves and other formalised conservation areas were identified in the study area (refer to Figure 4.9), including, *inter alia*, the D'Nyala Game Reserve, Kwalata, Lapalala Nature Reserve, Touchstone Nature Reserve, Moepel Farms, Shelanti Game Ranch, Keta Cattle Game Project, Witvinger Reserve, Shayamanzi Red Leopards Project, Percy Fyfe Nature Reserve, Kuschke Nature Reserve, Wit Vinger Nature Reserve, and the Waterberg Biosphere Reserve.

The Waterberg Biosphere Reserve was officially established in 1990 with the aim to maximise the Waterberg area's potential for conservation, sustainable development and social upliftment. A key aspect in the formation of the Biosphere was the formation of partnerships amongst all the stakeholders who share the area, ranging from privately owned reserves and game farms, to tribal and state owned areas such as Moepel farms. The total reserve is approximately 14 500 km^2, with an estimated 6 people per km^2.

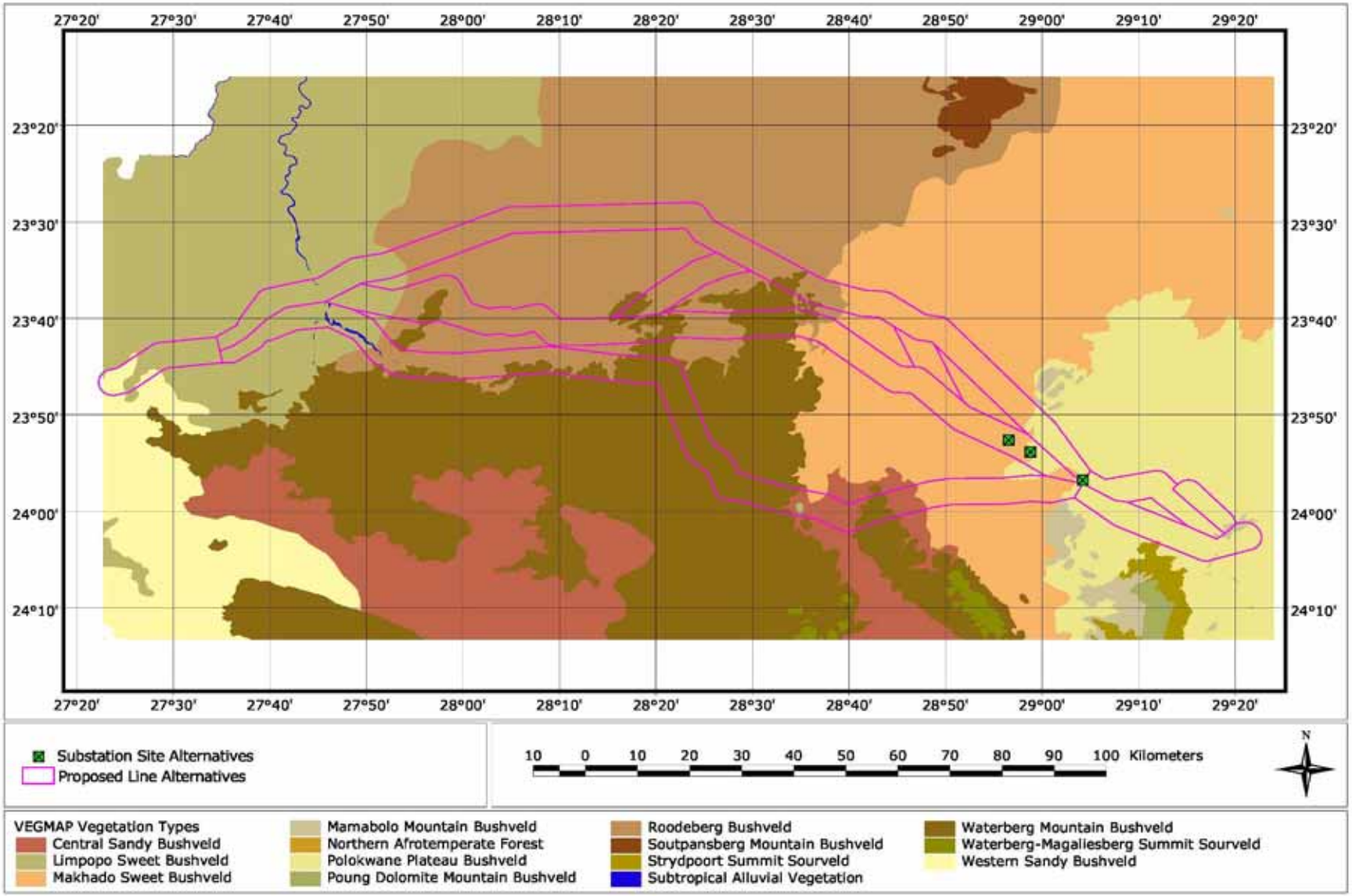

Figure 4.8: VEGMAP Vegetation types of the study area

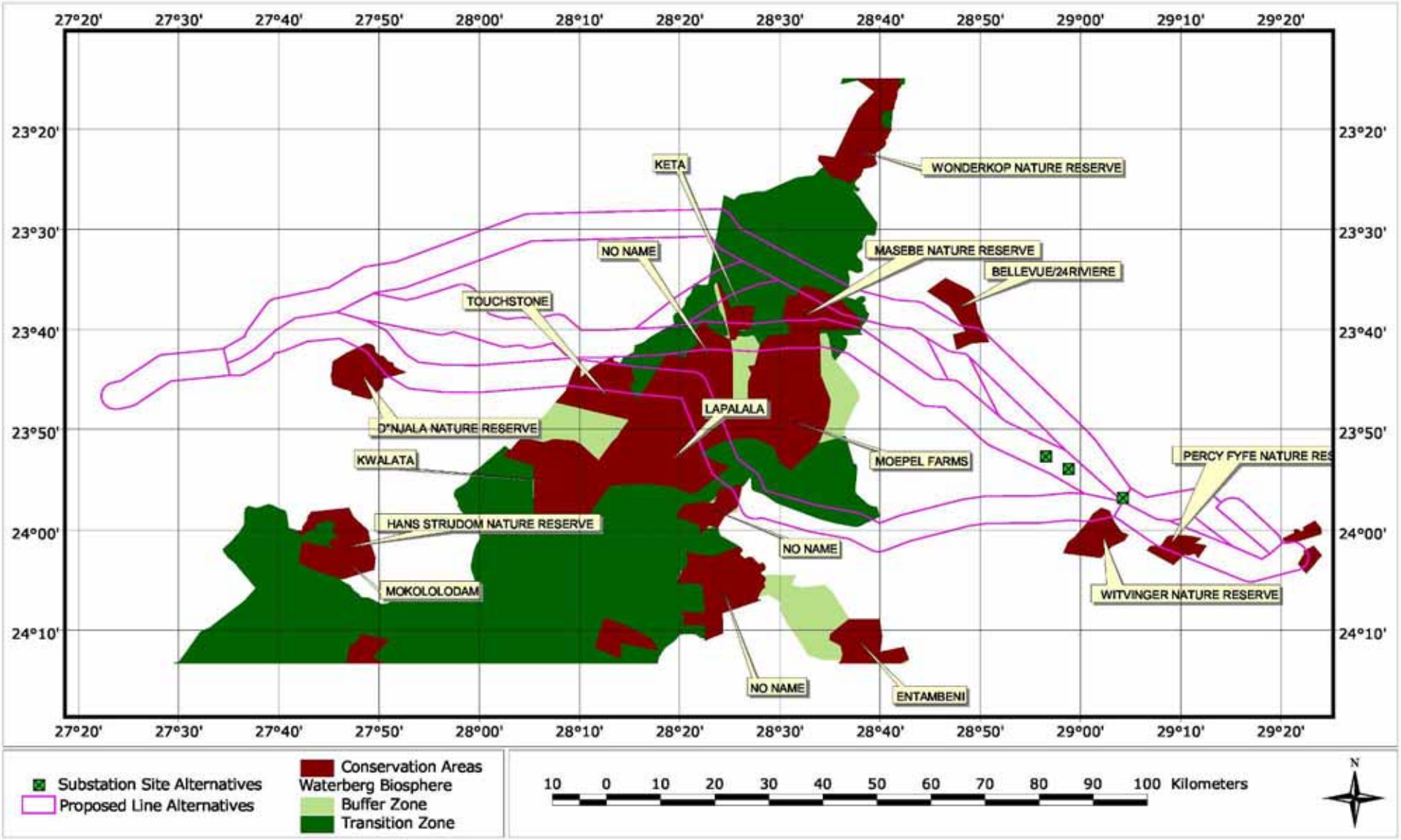

Figure 4.9: Formal conservation areas identified in the study area

The area was mostly characterised by cattle and crop farming, but during the past 15 years there has been a gradual shift in land use to that of conservation and the sustainable use of wildlife ranging from tourism and eco-tourism to hunting.

Woodland habitat, in its undisturbed state, is suitable for a wide range of birds. With the presence of river systems and numerous agricultural fields, the study area is considered to be particularly attractive to many species of birds. The Southern African Bird Atlas Project recorded a total of 30 Red-Data bird species across the study area. In addition, the White Stork and Abdim's Stork (Protected internationally under the Bonn Convention on Migratory Species) are considered as a threatened species for the purpose of this study. Several of the Red Data species recorded here are known to be extremely vulnerable to the impacts of power lines, through collision.

The following bird micro-habitats were identified within the immediate surrounds of the alternative corridors:

» **Dams:** There are several small artificial impoundments within the study area. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall.

» **Arable land:** Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. In this study area, there are significant arable lands, both commercial and subsistence varieties.

» **Rivers, pans and wetlands:** There are at least three major rivers that occur within the study area–the Lephalale, Mokolo and Mogalakwena Rivers. Riparian vegetation is characterised by tall, fringing riverine forest and well developed woodland quite distinct from the surrounding dryland vegetation. These well vegetated areas usually support a diverse and distinct forest and woodland avifauna (Taylor *et al*. 1999). These are areas of particular importance for birds, with riparian vegetation being extremely important to threatened riverine bird species and waterbird communities. Some other small

perennial wetlands and seasonal pan examples are also scattered throughout the study area.

» **Escarpment areas:** The mountainous areas along study Corridors 1, 3 and the existing Matimba-Witkop corridor represent a very distinct habitat type. This is most likely to be used by species such as the Cape Griffon Vulture, various raptors, Black Stork and Bald Ibis.

» **Woodland:** Patches of the study area are communal land, especially along the northern alignment, and are heavily grazed by livestock. In these areas, the tree cover has been drastically reduced, and the vegetation is generally in a severe state of degradation. In the commercial game farming areas, particularly along the central and southern corridors, the original woodland vegetation still persists and human population densities are reasonably limited, compared to some of the other areas. In these areas, the presence of cattle and game carcasses could attract vultures, Marabou Storks and the occasional Tawny Eagle. The open woodland country will also be attractive to snake eagles, particularly Black-breasted Snake Eagles. In these areas, it could be expected that most of the medium to large raptors will still occur.

DESCRIPTION OF THE ENVIRONMENT AFFECTED BY PROPOSED SUBSTATION AND TURN-IN LINES CHAPTER 5

This section of the EIA Report provides a description of the environment that may be affected by the **proposed Mokopane Substation** and associated turn-in lines. This information is provided in order to assist the reader in understanding the possible effects of the proposed project on the environment. Aspects of the biophysical, social and economic environment that could be affected by, or could affect, the proposed development have been described. This information aims to provide the overall context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F - L.

Alternative substation sites comparatively assessed within this EIA include Option 1 (located on the farm Doornfontein 721 LS), Option 3 (located on the farm Zuidholland 773 LS) and Option 4 (located on the farm Noord Braband 774 LS) (refer to Figure 5.1). These properties are all State-owned and are currently administered by the National Department of Land Affairs.

5.1. Location and Overview of the Study Area and Property Description

The proposed substation sites are located within the Mogalakwena Local Municipal area (LIM367), which in turn is located within the Waterberg District Municipality (DC36) of the Limpopo Province (refer to Figure 5.2). The following subsections provide a regional overview of the study area on a broad based provincial and district level.

The proposed substation site alternatives are situated within landform types ranging from lowlands with mountains in the west to low mountains in the east. None of the substation sites are situated within areas of known botanical or faunal importance. Several such sites are however present in close vicinity to the sites and are therefore likely to be affected by the turn-in lines.

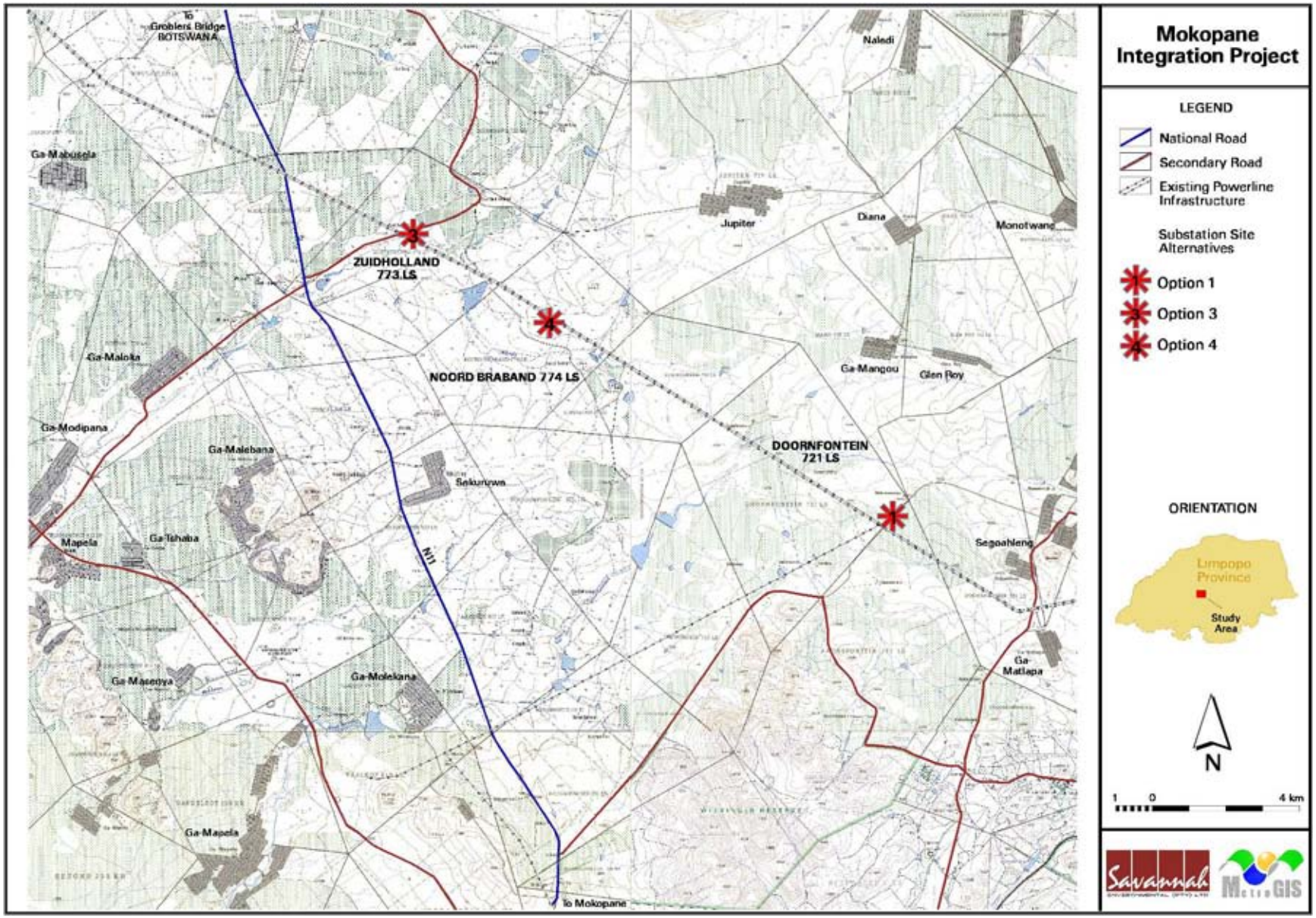

Figure 5.1: Substation site alternatives comparatively assessed in the EIA phase of the process

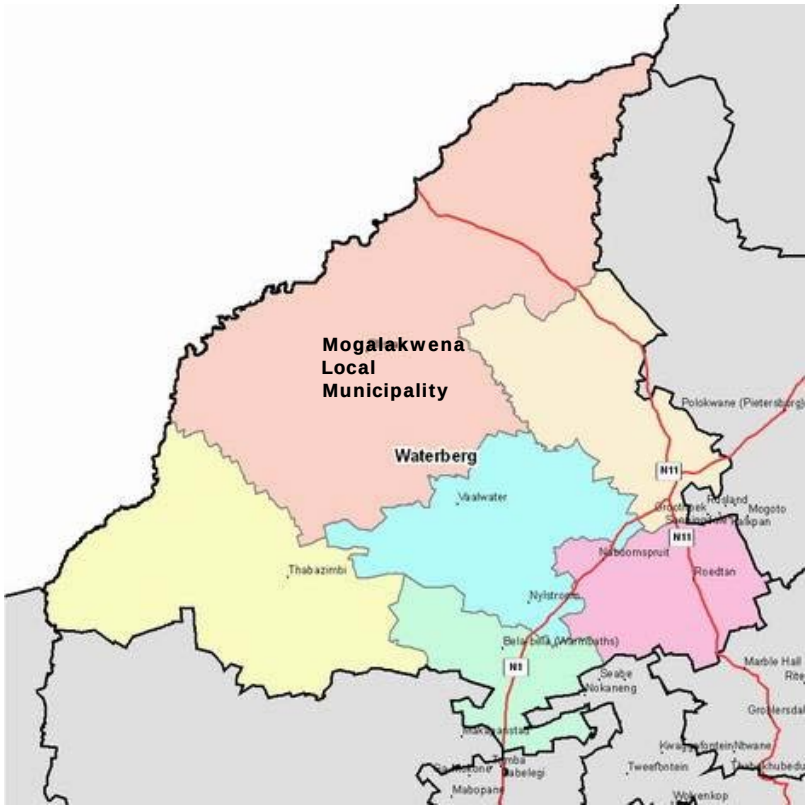

Figure 5.2: Delineation of Mogalakwena Local Municipality within the Waterberg District Municipality

5.2. Baseline and Social Characteristics of the Study Area

Baseline and social characteristics of the Mogalakwena Local Municipal and the Waterberg District Municipality are discussed in Section 4.2. Characteristics specific to the proposed substation sites are discussed below.

5.2.1. Demographic Profile

Figure 5.3 provides an overview of the formal settlements in the study area. At the time of the study, information was not available on the planned future development of these settlements.

» *Option 1*: The closest human settlement to this site is Segoahleng, which is located some 3km east of the proposed site. Other human settlement in fairly close proximity to the proposed site includes Ga-Matlapa (approximately 4.7 km southeast), Glen Roy (approximately 4.3 km north), and Ga-Mangou (approximately 4.1 km north-northeast)

» *Option 3*: The closest human settlements to this option is Dorsland, which is located approximately 2.8 km southeast and Suid-Holland, which is located approximately 3.3 km southwest of the proposed site. Other human

settlement in the vicinity of the proposed site includes Sakuruwa (approximately 6 km south), Ga-Maloka (approximately 7 km west-southwest), Ga-Malebana (approximately 7.5 km southwest), and Ga-Mabusela (approximately 9.1 km west)

» *Option 4*: The closest human settlement is Sukuruwe, which is located approximately 4.9 km southwest of the proposed site. Other formal settlements in fairly close proximity to this option include Jupiter (approximately 5.4 km northeast), Suid-Holland (approximately 6.2 km west), Ga-Mangou (approximately 8.8km east) and Phetole (approximately 8.9 km north).

5.3. Biophysical Characteristics of the Study Area

5.3.1. Geographical Profile

The proposed substation site options are situated within landform types ranging from lowlands with mountains in the west to low mountains in the east (Figure 5.5). The proposed substation sites will be situated within areas described as woodland, regardless of the option selected.

5.3.2. Ecological Profile

The dominant vegetation type found within the study area is woodland of one type or another, i.e. arid or moist woodland. The majority of this study area is, however, in a state of transformation, with a number of settlements dotted throughout the immediate surrounds intermingled with mining areas and both commercial and subsistence forms of cultivation. As a result, a great deal of the vegetation within the study area has been and is being transformed. The habitat in the area has been subjected to severe pressure from the neighbouring communities and the various land use types.

The following VEGMAP[10] vegetation units are present within the study area:

» Makhado Sweet Bushveld
» Mamabolo Mountain Bushveld
» Polokwane Plateau Bushveld.

[10] Refer to Ecological Specialist Report in Appendix F

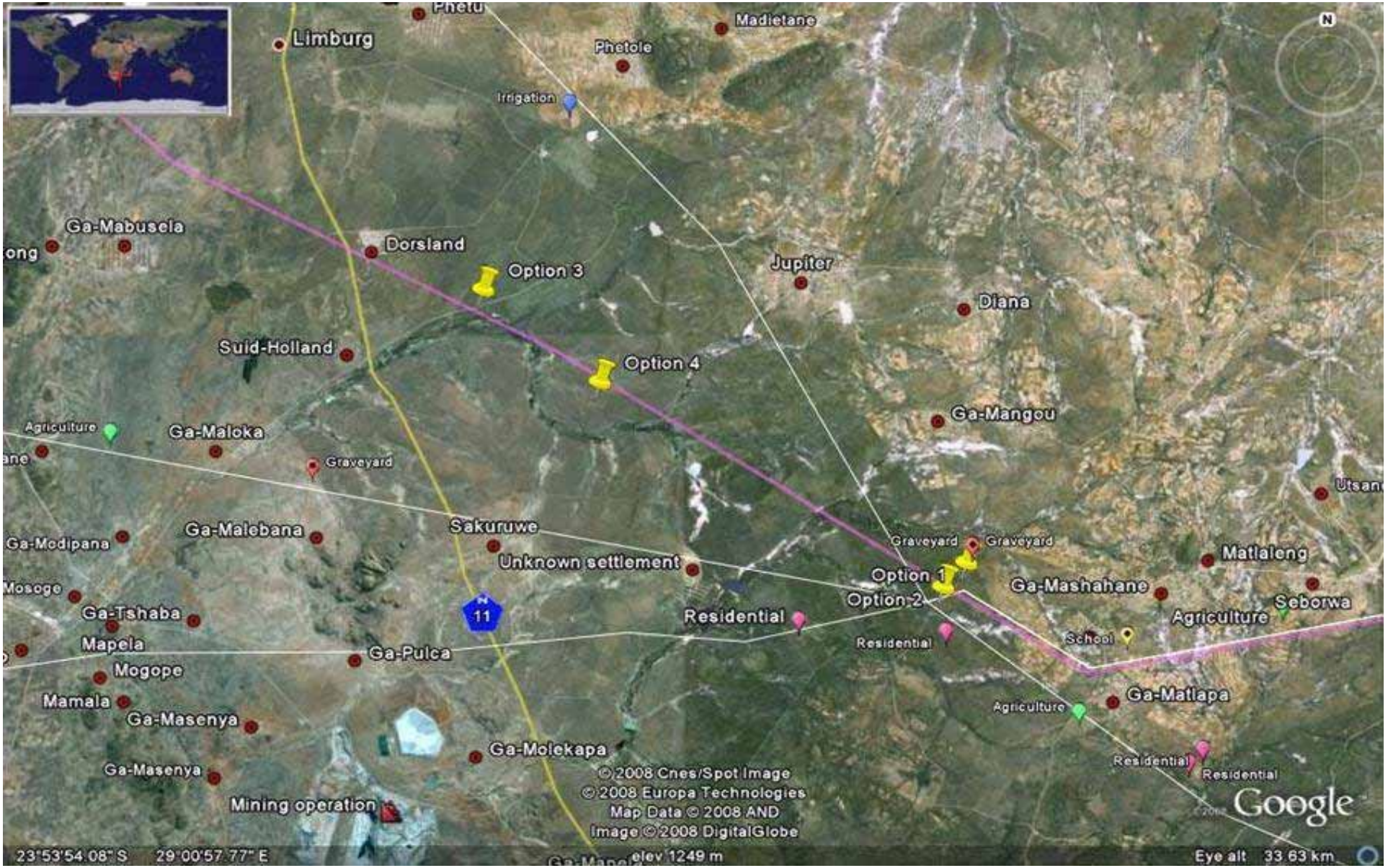

Figure 5.3: Formal settlements within the study area

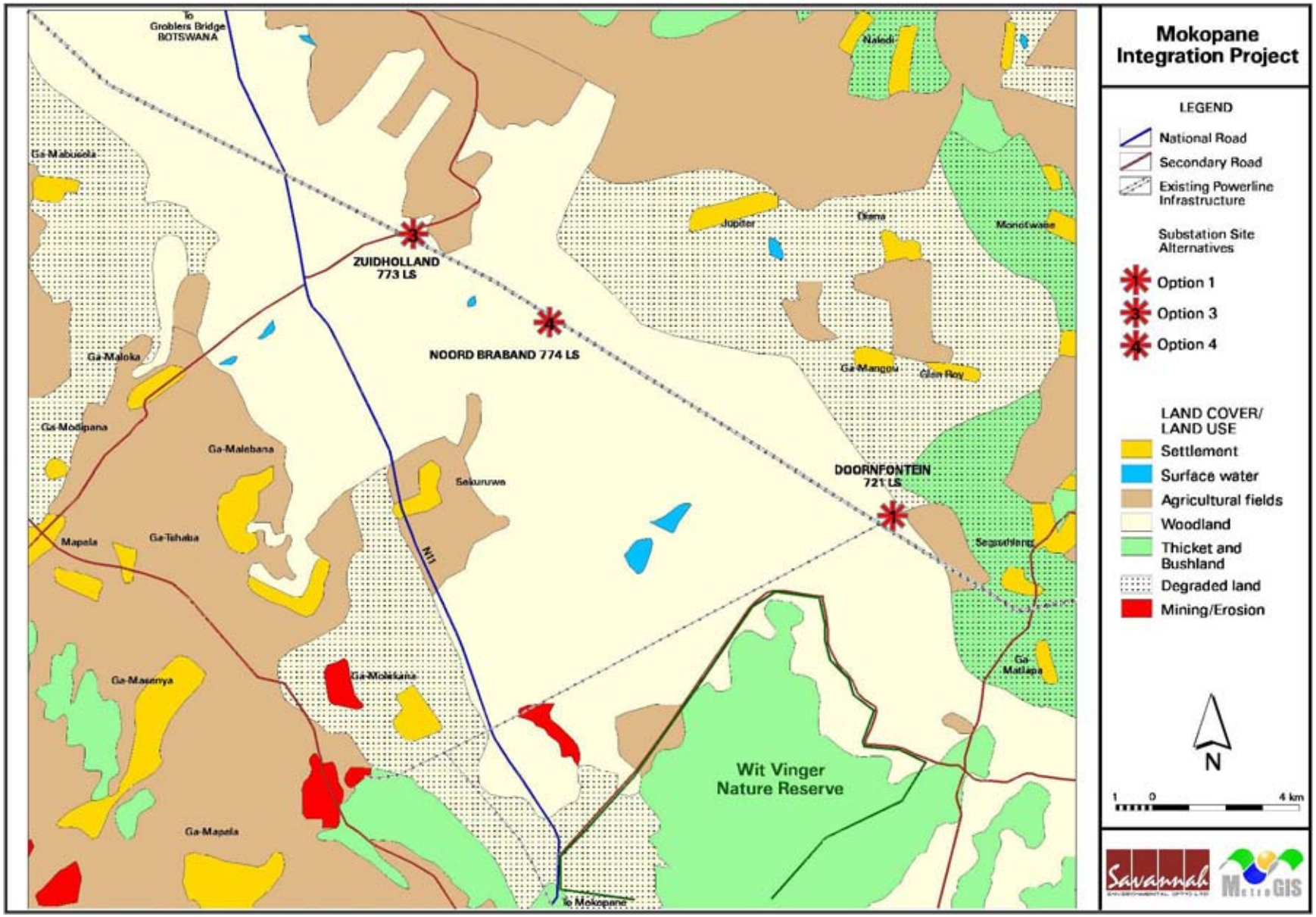

Figure 5.4 Land cover/land use map

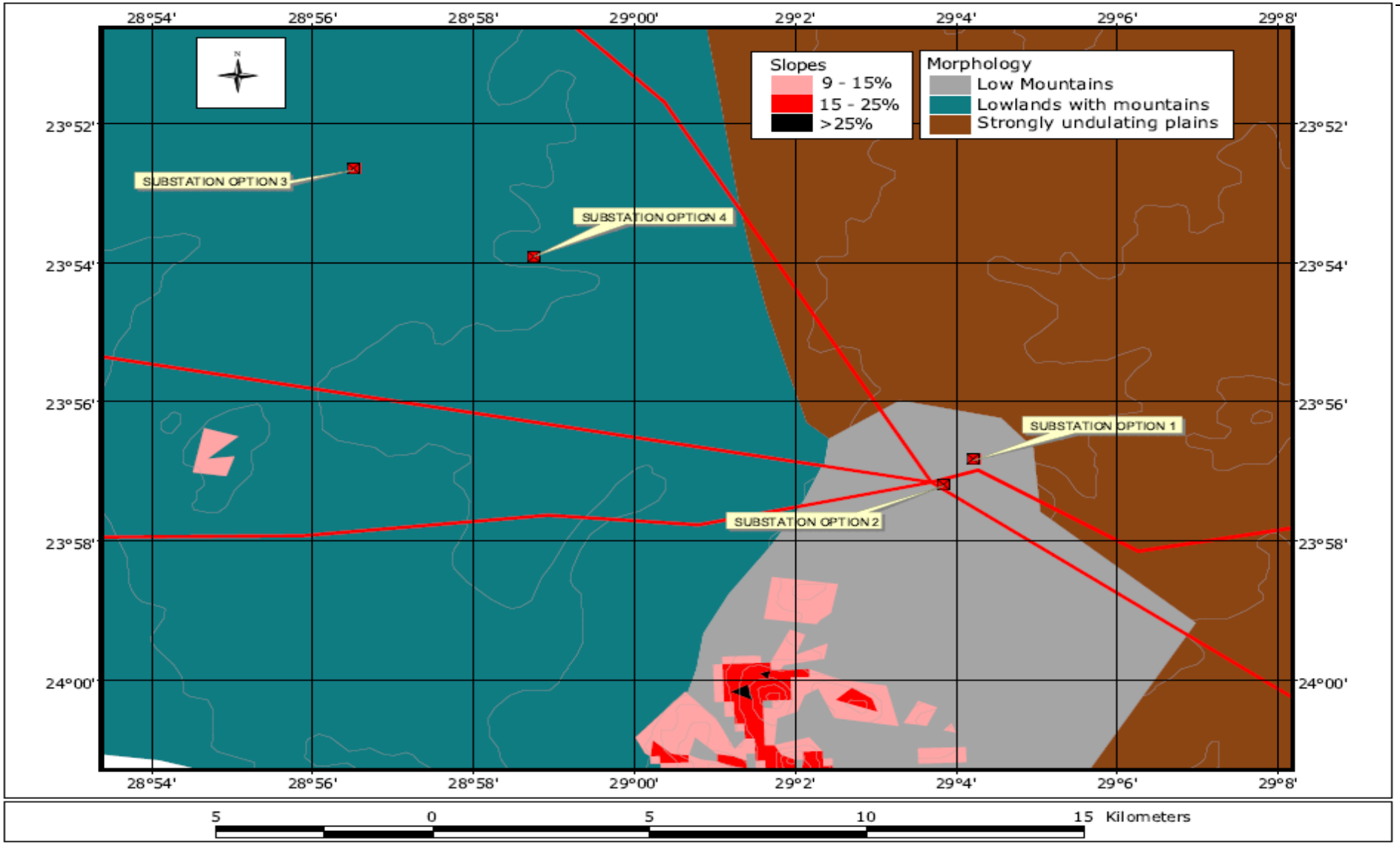

Figure 5.5: Topography & Slope analysis of the study area, highlighting areas with slopes exceeding 9% (Substation Site Option 2, although pictured above, is excluded from this EIA study)

The conservation status of the different vegetation types occurring in the study area is listed below in Table 5.1.

Table 5.1: Vegetation Conservation Status

VEGMAP Unit	% Conserved	% Transformed	Target	Status
Makhado Sweet Bushveld	1%	27%	19%	Vulnerable
Mamabolo Mountain Bushveld	8%	6%	24%	Least Threatened
Polokwane Plateau Bushveld	2%	17%	19%	Least Threatened

Although none of the substation sites are situated within areas of known botanical importance, several such sites are present in close vicinity to the sites and are likely to be affected by the turn-in lines. These areas frequently exhibit characteristics of a pristine nature, the presence of Red Data flora species, a high diversity or atypical or threatened vegetation types (Figure 5.7).

Wit Vinger Nature Reserve is situated approximately 2 km to the south-west of the Substation Option 1. Biodiversity attributes within these areas are not likely to be influenced by the turn-in lines.

No biosphere reserves are present within the immediate vicinity of the proposed development. Biodiversity attributes within these areas are not likely to be influenced by the turn-in lines.

The three alternative substation sites consist predominantly of degraded woodland with some pockets of riparian vegetation still remaining, particularly near Options 3 and 4. The Southern African Bird Atlas Project (Harrison *et al*, 1997) recorded a total of 194 and 206 bird species in the respective quarter degree squares during the atlas development period. Four of these species are classified as 'vulnerable' and six as 'near threatened'. In addition, the White Stork and Abdim's Stork (Protected internationally under the Bonn Convention on Migratory Species) are considered as threatened species for the purpose of this study.

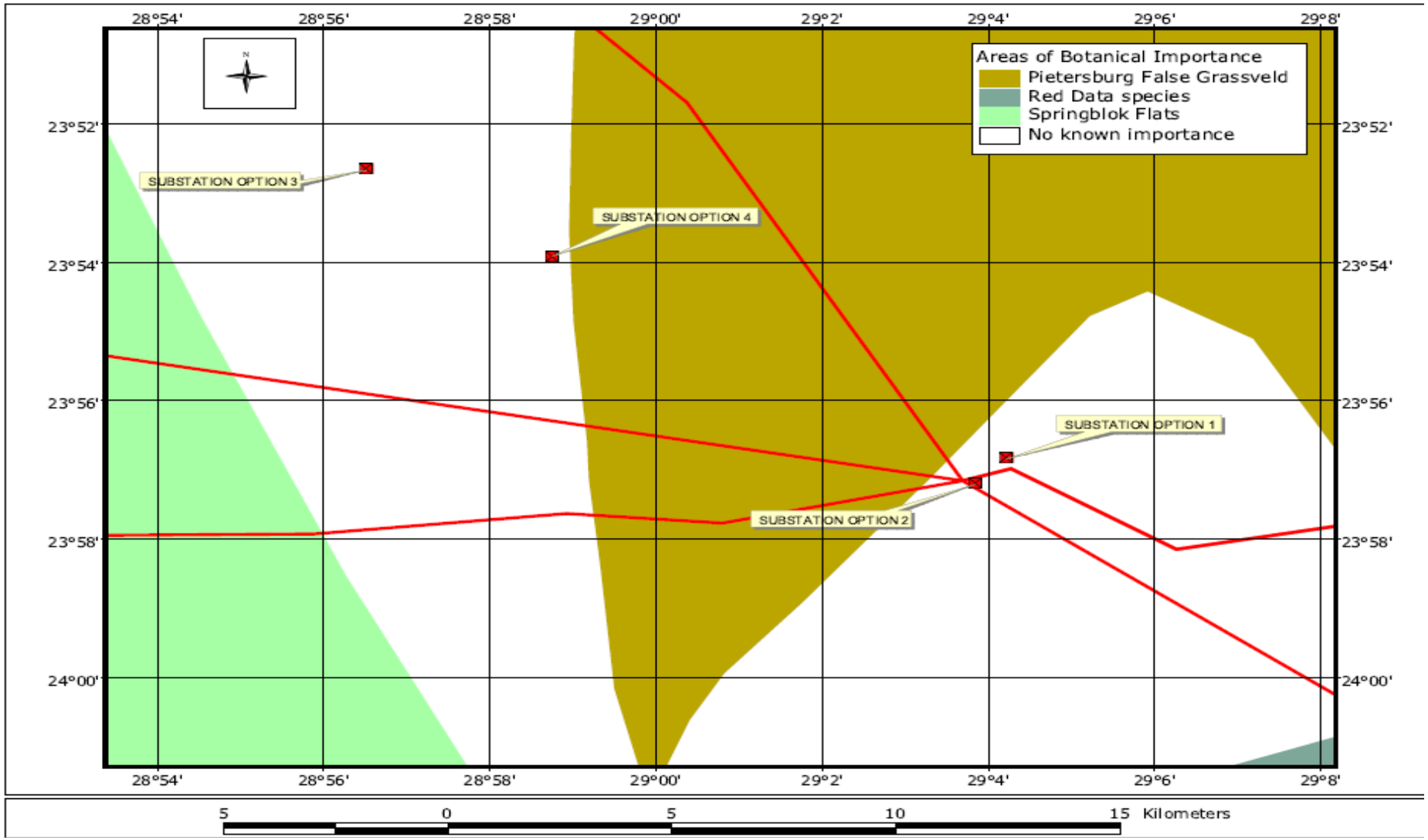

Figure 5.6: Areas of Botanical Importance in the study area (Substation Site Option 2 is excluded from this EIA study)

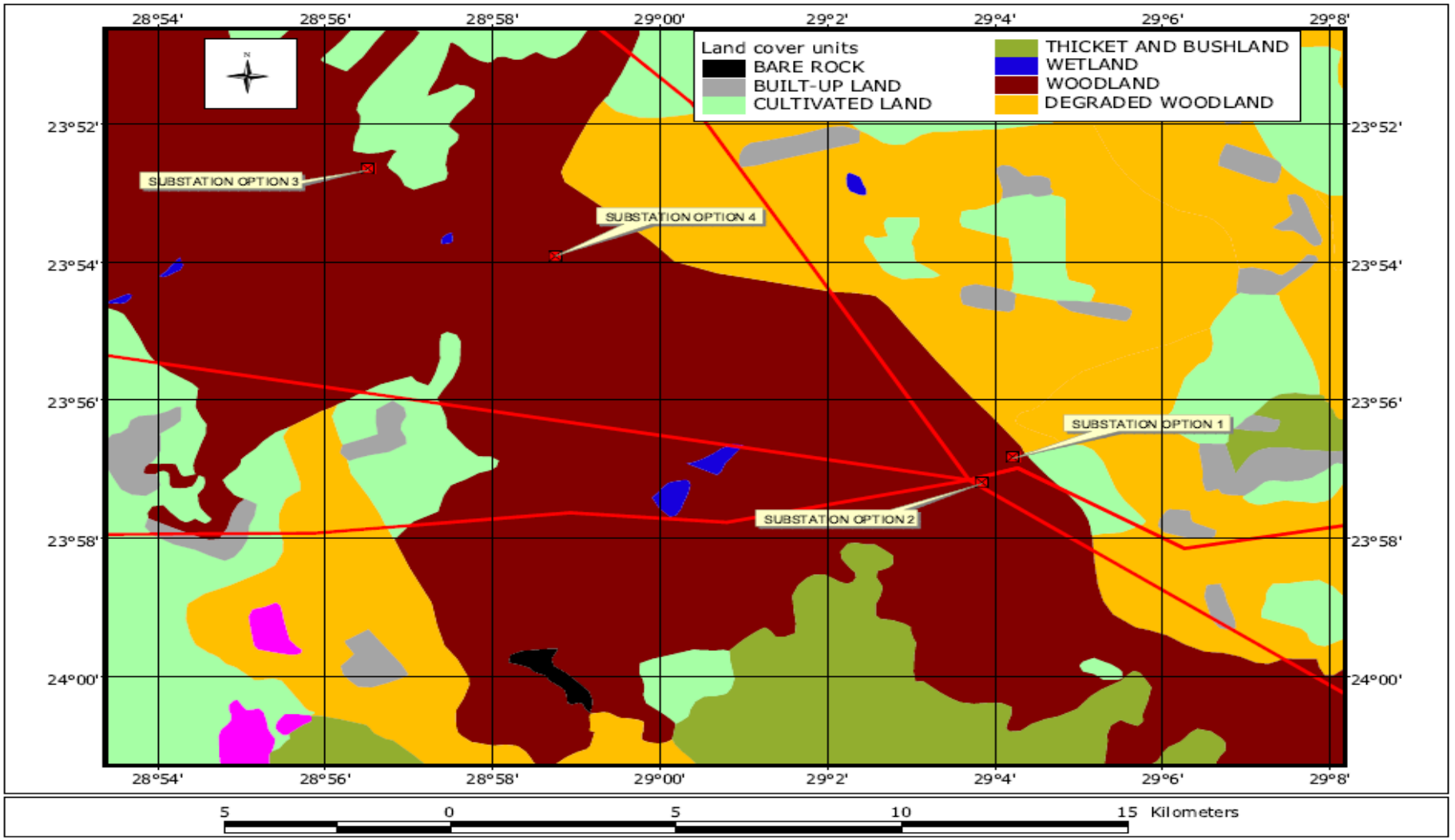

Figure 5.7: Landcover units in the study area (Substation Site Option 2 is excluded from this EIA study)

The following bird micro-habitats were identified within the immediate surrounds of the substation sites:

» **Dams:** There are several small man-made impoundments within the study area. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall.

» **Arable land:** Arable or cultivated land represents a significant feeding area for many bird species in any landscape for the following reasons: through opening up the soil surface, land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten themselves by birds, or attract insects which are in turn eaten by birds; during the dry season arable lands often represent the only green or attractive food sources in an otherwise dry landscape. In this study area, there are significant arable lands, both commercial and subsistence varieties.

» **Rivers, pans and wetlands:** Substation Option 3 is located a short distance (0.3 km) from the Witrivier. Although sections of the river were dry at the time of the field visit, the tall fringing riparian forest and well developed woodland could support diverse and distinct woodland avifauna (Taylor et.al., 1999). These areas are of particular importance for birds, with riparian vegetation being extremely important to threatened riverine bird species and waterbird communities. Relevant to this study, Yellow-billed Stork, Greater and Lesser flamingos will frequent this river system.

Rivers are extremely important sources of water for most bird species and will be regularly utilised not only as a source of drinking water and food, but also for bathing.

ASSESSMENT OF IMPACTS: SUBSTATION AND TURN-IN LINES CHAPTER 6

In order to strengthen the supply of electricity to the Mokopane and Polokwane areas, a new transmission substation is proposed to be established in the Mokopane area. The total footprint required for the new substation site is estimated at an area of approximately 500 m x 500 m.

This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed sites for the development of the new substation and associated turn-in lines, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Plan (refer to Appendix O).

6.1. Assessment of Potential Impacts on Ecology

The proposed substation site alternatives are situated within areas of moderate or moderate-high biophysical habitat sensitivity. Potential impacts on biodiversity associated with the construction and operation of the substation and associated turn-in lines include the following:

- Direct impacts:
  - Destruction of threatened flora species
  - Destruction of protected tree species
  - Direct impacts on threatened fauna species
  - Direct impacts on common fauna species
  - Destruction of sensitive/pristine regional habitat types
- Indirect Impacts:
  - Floristic species changes within the servitudes
  - Faunal interactions with structures, servitudes and personnel
  - Impacts on surrounding habitat/species
- Cumulative Impacts:
  - Impacts on South Africa's conservation obligations and targets
  - Increase in local and regional fragmentation/isolation of habitat
  - Increase in environmental degradation

These are described in more detail within the specialist biodiversity study (refer to Appendix F) and are assessed below for each identified substation site and associated turn-in lines. No impacts that could lead to a beneficial impact on the ecological environment were identified.

Proposed substation sites and associated turn-in lines were comparatively assessed by means of visual observations and GIS analysis of available data, as well as visual observations from ground truthing.

Impact tables summarising the significance of Substation Impacts on Ecology (with and without mitigation)

Nature: Biodiversity Impacts at Substation Site Option 1 & Turn-in Lines		
	Without Mitigation	**With Mitigation**
Extent	2 (Local)	2 (Local)
Duration	4 (Long term)	3 (Medium, 3-15 yrs)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Recoverable, needs input)	3 (Recoverable, needs input)
Probability	3 (Medium probability)	2 (Low probability)
Significance	**36 (Moderate)**	**20 (Low)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)		
Cumulative Impacts » Slight increase in fragmentation and isolation of remaining natural habitat. » Slight increase in general environmental degradation		
Residual Impacts » Cleared servitudes of turn-in lines are likely to become infested with increaser and invasive plant species. » Decommissioning of substation will result in transformed habitat.		

Nature: Biodiversity Impacts at Substation Site Option 3 & Turn-in Lines		
	Without Mitigation	**With Mitigation**
Extent	3 (Regional)	2 (Local)
Duration	4 (Long term)	3 (Medium, 3-15 yrs)
Magnitude	4 (High)	3 (Moderate)
Reversibility	3 (Recoverable, needs input)	3 (Recoverable, needs input)
Probability	4 (High probability)	3 (Medium probability)
Significance	**56 (Moderate)**	**33 (Moderate)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	

Can impacts be mitigated?	Yes	
Mitigation Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)		
Cumulative Impacts » Moderate increase in fragmentation and isolation of remaining natural habitat. » Slight increase in general environmental degradation. » Increased impact on nearby riparian and ridge habitat.		
Residual Impacts » Cleared servitudes of turn-in lines are likely to become infested with increaser and invasive plant species. » Decommissioning of substation will result in transformed habitat in otherwise untransformed area.		

Nature: Biodiversity Impacts at Substation Site Option 4 & Turn-in Lines		
	Without Mitigation	**With Mitigation**
Extent	3 (Regional)	2 (Local)
Duration	4 (Long term)	3 (Medium, 3-15 yrs)
Magnitude	4 (High)	3 (Moderate)
Reversibility	3 (Recoverable, needs input)	3 (Recoverable, needs input)
Probability	4 (High probability)	3 (Medium probability)
Significance	**56 (Moderate)**	**33 (Moderate)**
Status	Negative	Negative
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)		
Cumulative Impacts » Slight increase in fragmentation and isolation of remaining natural habitat, presence of existing lines are noted. » Slight increase in general environmental degradation.		
Residual Impacts » Cleared servitudes of turn-in lines are likely to become infested with increaser and invasive plant species. » Decommissioning of substation will result in transformed habitat in otherwise untransformed area, unless adequate rehabilitation is undertaken.		

6.1.1. Comparative Assessment of Substation Sites

The substation site options are situated within areas of moderate or moderate-high biophysical habitat sensitivity. No environmental fatal flaws from a biodiversity perspective were identified to be associated with the identified substation site options. However, the proximity of Substation Site Option 1 to transformed and degraded areas renders this site the least sensitive in terms of biophysical habitat sensitivity. Site Options 3 and 4 are situated in areas where the vegetation is regarded as natural and are therefore regarded less suitable for the proposed development. Substation Site Option 4 is regarded the least suitable option as the required turn-in lines will inevitably result in localised impacts on natural vegetation.

On the basis of the comparative assessment undertaken, **Substation Site Option 1** is nominated as the preferred alternative from a biodiversity perspective. Site Option 4 is the least preferred option.

6.1.2. Conclusions and Recommendations

From a biodiversity perspective, **Substation Site Option 1** is nominated as the preferred alternative from a biodiversity perspective. Site Option 4 is the least preferred option.

Mitigation measures are required to be implemented in order to eliminate or reduce the significance of potential impacts on biodiversity. In this regard, mitigation measures specified in the specialist biodiversity study (refer to Appendix I) are mainly aimed at limiting the effects of construction and servitude maintenance activities.

Generic mitigation measures and recommendations with regard to impacts on biodiversity are included within the draft EMP (refer to Appendix O). Specific mitigation measures include:

» Conduct a final walkthrough prior to commencement of construction activities. Responsibilities should be ensuring absence of Red Data species from construction sites, marking of protected tree species, identification of localised areas of significance, etc.
» Identify areas of high ecological sensitivity during final walk-through and recommend localised deviations in the power line alignment.
» Obtain permits for pruning, cutting or removal of protected trees. Protected trees should be identified and marked by the ECO/ecologist during a final walk-through prior to commencement of construction.

» Demarcate construction areas in order to control movement of personnel, vehicles, providing boundaries for construction sites in order to limit dilution or spread of peripheral impacts.
» Limit damage/ pruning/ cutting of trees to a minimum in accordance to Eskom guidelines. The pruning of the woody layer is recommended instead of complete removal of all woody plants. Leaving a significant portion of the woody structure intact will prevent the establishment of an atypical habitat, limiting adverse impacts to a large extent.
» Prohibit construction of new access roads in areas of high environmental sensitivity. Use should be made of existing roads, ensuring proper maintenance/upgrade. Alternative methods of construction/access to sensitive areas are recommended.
» Construction of new/temporary bridges as part of access roads to the substation site and turn-in lines across non-perennial streams and larger rivers is regarded as a prohibited activity; use should be made of existing crossings, ensuring proper maintenance/upgrade.
» Ensure surface restoration and re-sloping after construction activities are complete in order to prevent erosion, taking cognisance of local contours and landscaping.
» Ensure that riparian areas are spanned/pole structures are not placed within proximity to rivers, streams. Ensure placement of footprints outside 1:100 year flood lines. Crossing of riparian systems is only permitted at existing/ approved crossing points, taking due care to prevent additional/new impacts.
» Remove invasive and alien vegetation, particularly in vicinity of riparian zones where alien and invasive trees are known to occur. The implementation of a monitoring programme in this regard is recommended, being the responsibility of the ECO/ecologist.
» Rehabilitation of disturbed areas subsequent to construction activities, taking cognisance of factors such as topsoil replacement, removal of introduced materials, local environmental factors.
» Final inspection in order to ensure adherence to EMP guidelines, completion of localised/remaining areas of impact, monitoring of rehabilitation success, etc.

6.2. Assessment of Potential Impacts on Agricultural Activities

In order to determine the agricultural potential of the proposed substation sites, each of the three substation site options was investigated on a 150 x 150 m grid, using a hand-held soil auger. The soils occurring were described and classified according to the latest edition of the South African soil classification system (Soil Classification Working Group, 1991). Similar soils were then grouped into reasonably homogeneous mapping units and the boundaries of these units were then plotted onto a map.

Samples were collected at three locations (one in each area) for analysis in the laboratories at ARC-ISCW. The soils were analysed for particle size (sand, silt and clay), exchangeable cations (Na, Mg, K, Ca), pH, organic carbon and Phosphorus. These sample sites are marked on the soil maps included within the specialist agricultural potential report (refer to Appendix H). The soils associated with the proposed substation sites were found to be generally shallow, grey-brown, often gravelly sandy loams. Only small areas of deeper soils were encountered.

6.2.1. Comparative Assessment of Substation Sites

Both Site Option 4 and Site Option 3 predominately contain soils with a low agricultural potential (shallow, gravelly, rocky in places). Site Option 1 has mixed soils, with the southern half comprising the same shallow soils and the northern half has some deeper soils, although these soils are no deeper than 900 mm, and are therefore classed as having moderate agricultural potential.

Therefore, in terms of soils, **Site Option 4** is strongly recommended (all shallow soils), followed by Site Option 3 (>90% shallow soils). Site Option 1 is not recommended (~40% shallow soils).

6.2.2. Conclusions and Recommendations

The soils at the substation site alternatives are generally shallow and only small areas of deeper soils were encountered. Site Option 4 is nominated as the preferred option, followed by Site Option 3. Site Option 1 is the least preferred.

No other recommendations or mitigation measures are applicable in terms of soils and agricultural potential for the proposed substation site options.

6.3. Assessment of Potential Impacts on Avifauna

Potential impacts on avifauna associated with the construction, maintenance and eventual decommissioning activities of the proposed substation may include:

» Habitat destruction
» Disturbance to habitats and avifauna

These potential impacts are discussed and assessed in the tables below.

Electrocutions of certain bird species within the substation during its operation, could potentially have a negative impact on a variety of bird species, particularly those species that regularly utilise the electrical infrastructure within the substation yard on which to breed and nest (e.g. crows, herons, sparrows, owls

and geese). However, the more sensitive eagle species recorded in the area do not utilise substation yards extensively and therefore the significance of the impact is considered to be negligible. This impact will therefore not be discussed further.

In general, much of the proposed study area surrounding all three of the substation site options is disturbed and degraded to some extent already. In this context, habitat destruction associated with construction of the proposed substation and 400kV lines turn-in lines at any of the sites is not anticipated to be significant from an avifaunal perspective.

None of the proposed corridors or substation sites are located within an Important Bird Area (IBA). The closest IBA's to the proposed substation sites are the Waterberg and Nyl River Floodplain systems, Blouberg Vulture Colony, Wolkberg Forest Belt and Pietersburg Nature Reserve.

Impact tables summarising the significance of Substation Impacts on Avifauna (with and without mitigation)

Nature: Habitat destruction During the construction phase and maintenance of the substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads and the levelling of substation yards. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the power line servitude associated with the turn-in lines, through the modification of habitat.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (4)	N/A
Reversibility	Irreversible (5)	N/A
Probability	Definite (5)	N/A
Significance	**High (80)**	N/A
Status	Negative	N/A
Irreplaceable loss of resources	Yes	
Can impacts be mitigated	No.	
Mitigation: No mitigation available particularly with regards to substation.		
Cumulative impacts: Potential cumulative impacts associated with future development of distribution power lines from substation.		
Residual impacts: There will a residual impact as habitat that is removed will not recover fully.		

Nature: Disturbance of birds During the construction and maintenance of electrical infrastructure, a certain amount of disturbance results.		
	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Low (3)	Minor (2)
Reversibility	Irreversible (5)	-
Probability	Probable (3)	Improbable (2)
Significance	**Moderate (39)**	**Low (14)**
Status	Negative	Negative
Irreplaceable loss of resources	Yes	No
Can impacts be mitigated	Yes	
Mitigation: » Identify active nests during final walk-though survey » Limit construction and unnecessary driving past nests during breeding times. Nest may need to be relocated.		
Cumulative impacts: Potential cumulative impacts associated with future development of distribution power lines from substation..		
Residual impacts: Low residual impacts.		

6.3.1. Comparative Assessment of Substation Sites

All three sites are bordered by secondary roads making them readily accessible for construction and maintenance purposes, preventing further vegetation and possible habitat loss as a result of the construction of an additional road. However, the proximity of the Groot-Sandsloot and Witrivier river systems relative to Site Options 3 (Zuid Holland) and 4 (Noord Braband) must be considered, particularly with regards to future electrical development (i.e. distribution power lines) which will inevitably extend from the new Mokopane Substation. Future construction of power lines in the areas surrounding Options 3 and 4 could potentially impact negatively on the riparian vegetation and resident bird species through habitat destruction. It must be borne in mind that through the establishment of the Mokopane Substation, future electrical infrastructure in the form of distribution power lines will undoubtedly be added to the network in and around the substation site. Although the proposed loop-in and loop-out lines may not necessarily cross any of the afore-mentioned river systems at present, there is the potential that additional power lines might just do so, increasing the likelihood of collisions occurring in these sensitive areas. It is therefore recommended that development be restricted to a minimum around these water sources.

Although Site Option 1 is bordered by cultivated fields (which is a draw card for various species), the area is already in a state of transformation through a change in land use and is also comprised almost entirely of degraded woodland, limiting the number and diversity of bird species. In addition to this, the absence of water sources and riparian vegetation within the immediate area surrounding this option further highlights its relative suitability.

From the comparative assessment of alternatives undertaken, it can be concluded that Substation Site **Option 1** (Doornfontein) presents itself as the preferred substation site from an avifauna perspective.

6.3.2. Conclusions and Recommendations

With the presence of river systems and numerous agricultural fields, the study area is particularly attractive to many species of birds, and as a result the proposed development will undoubtedly have an impact on the birdlife occurring here, as their habitat will effectively be transformed to accommodate the electrical infrastructure. However, it is believed that the key impacts (i.e. collision and habitat destruction) associated with the construction of the substation and turn-in power lines, can be minimised and mitigated with relative ease if **Site Option 1** substation site is selected.

Often pigeons, crows and sparrows roost and nest in substation yards and as a result are occasionally electrocuted on the live hardware. Since it is impossible to predict with any certainty where birds are likely to nest within the substation yard, coupled with the costs associated with insulating the entire substation, electrocutions will need to be mitigated using site specific recommendations if and when they occur.

6.4. Assessment of Potential Visual Impacts

Visual impacts are expected to be associated with the construction, operation and decommissioning phases of the proposed Mokopane Substation.

6.4.1. Potential Visual Impacts associated with the Construction and Decommissioning Phases of the Substation

The construction phase of the substation will see an increase in activities at the substation site. During this time heavy vehicles will frequent the roads in these areas and may cause, at the very least, a visual nuisance to other road users and landowners in close proximity to the construction activities. In the event of decommissioning of the infrastructure, impacts are expected to be similar to those experienced during the construction phase (i.e. as a result of increased activities on site).

Visual impacts associated with the construction phase (and eventual decommissioning phase), albeit temporary, should be managed according to the following principles:

» Reduce the construction/decommissioning period through careful planning and productive implementation of resources.
» Restrict the activities and movement of construction/decommissioning workers and vehicles to the immediate construction/decommissioning site(s).
» Ensure that the general appearance of construction activities, construction camps (if required) and lay-down areas are maintained by means of the timely removal of rubble and disused construction materials.
» Restrict construction activities to daylight hours (if possible) in order to negate or reduce the visual impacts associated with lighting.

6.4.2. Potential Visual Impacts associated with the Operational Phase of the Proposed Substation and Turn-in Lines

The construction of transmission infrastructure such as the proposed substation will impose a visual impact on the surrounding area. The lower density residential areas of the study area, with a decidedly rural character, will be more affected by the project infrastructure than high-density residential areas. This is due to the fact that the higher occurrence of structures and visual clutter within high-density residential areas tend to absorb the visual impact. Visual impact is generally determined by the visual exposure of the proposed development, viewer incidence/perception, visual distance and the visual absorption capacity of the surrounding area. Impacts are expected where sensitive visual receptors occur. Sensitive visual receptors identified within the study area for the substation and turn-in lines include:

» Villages and rural settlements in the vicinity of the proposed alternative substation sites
» Users of national roads (i.e. the N11), arterial routes and secondary access roads
» Formal/statutory conservation and protected areas within and surrounding the study area (i.e. the Witvinger Nature Reserve)

Apart from the infrastructure itself, visual impacts may also be associated with the lighting of the proposed substation. The sites proposed for the placement of the Mokopane substation are all located in relative close proximity to sensitive visual receptors that may experience night time visual impacts in the form of sky glow or glare. Careful planning and sensitive placement of security and operational light fixtures for the substation, designed to contain rather than spread the light, is therefore imperative.

Potential visual impacts are assessed in the tables which follow.

Impact tables summarising the significance of visual impacts associated with the operation of the proposed substation

Nature of Impact: **Potential visual impact on users of main roads in close vicinity of the substation site options**			
	Option 1	**Option 3**	**Option 4**
Extent	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)
Magnitude	Low (2)	Moderate (3)	Low (2)
Probability	Improbable (1)	Medium probability (3)	Improbable (1)
Status	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)
Significance	**Low (13)**	**Moderate (42)**	**Low (13)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated during operational phase?	No	No	No
Mitigation: N.A.			
Cumulative impacts: N.A.			
Residual impacts: N.A.			

Nature of Impact: **Potential visual impact on residents in close vicinity of the substation site options**			
	Option 1	**Option 3**	**Option 4**
Extent	Local (4)	Local (4)	Local (4)
Duration	Long term (4)	Long term (4)	Long term (4)
Magnitude	High (4)	High (4)	Moderate (3)
Probability	High probability (4)	High probability (4)	Medium probability (3)
Status	Negative	Negative	Negative
Reversibility	Recoverable (3)	Recoverable (3)	Recoverable (3)
Significance	**Moderate (60)**	**Moderate (60)**	**Moderate (42)**
Irreplaceable loss of resources?	No	No	No

Can impacts be mitigated during operational phase?	No	No	No
Mitigation: N.A.			
Cumulative impacts: N.A.			
Residual impacts: N.A.			

6.4.3. Comparative Assessment of Substation Sites

Viewshed analyses of the proposed infrastructure, based on a 5m contour interval digital terrain model of the study area, indicate the potential visual exposure (i.e. areas from where the infrastructure could theoretically be visible). The visibility analyses were undertaken at an offset of 20m in order to simulate a worst-case scenario.

From the results of the viewshed analyses, the following conclusions can be made:

» Site Option 1 has a relatively scattered pattern of visual exposure due to the undulating nature of the topography and will potentially be visible from Segoahleng, Ga-Mangou and Glen Roy (refer to Figure 6.1).
» The core area of visual exposure for Site Option 3 is indicated in Figure 6.2. This option is not expected to be visible from any major villages or settlements but it will potentially be visible from the N11 national road at a distance of 3 km at the closest.
» Option 4 is not expected to be visible, or have a significant visual influence on observers travelling along the N11 (located beyond 5km from the proposed site) (refer to Figure 6.3). It is also not in close proximity to any major settlements within the core area of visual exposure.

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed substation sites are displayed below in Figure 6.4. Here the weighted impact and the likely areas of impact are indicated as a visual impact index. An area with short distance visual exposure to the proposed substation, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact when evaluating the issues related to the visual impact.

The visual impact index for the proposed substation sites investigated is indicated in Figure 6.4.

The visual impact index for substation **Site Option 1** indicates an area of **high to very high** visual impact within a 500m radius of the proposed substation structures. This area includes a section of one of the secondary access roads to Morwasethula/Segoahleng/Ga-Mashashane from the N11 national road. The substation is not expected to have a significant visual impact (where visible) on the aforementioned settlements, but residents will have to pass the substation to reach their homes. Potential night time lighting impacts may occur along this section of road and to a lesser degree from the abovementioned settlements. This location could have a **moderate** visual impact on north-facing slopes of the Witvinger Nature Reserve. Substation Site Option 1 is not expected to have any visual impact on observers travelling along the N11 national road.

The visual impact index for substation **Site Option 3** indicates an area of **high to very high** visual impact within a 500m radius of the proposed substation structures. This area includes a section of the secondary access road to the Suid Holland homestead and the Jupiter settlement/village from the N11 national road. The substation is expected to have a **moderate to high** visual impact on residents at Suid Holland, but is not expected to visually influence residents of Jupiter. Residents will however have to pass the substation to reach their homes and will be exposed, at short distance, to the substation infrastructure. Potential night-time lighting impacts may occur along this section of road and at the Suid Holland residence. Substation Site Option 3 is expected to have a **moderate to low** visual impact on observers travelling along the N11 national road.

The visual impact index for substation **Site Option 4** indicates an area of **high** visual impact within a 500m radius of the proposed substation structures. The relatively remote (by comparison) location of this site option, results in most of the potentially exposed areas beyond 1km from the site, experiencing a low to negligible visual impact. This includes the N11 national road, Sekuruwe (south-west of the site) and other homesteads in the area. Residents of the Noord Braband homestead (located just under 2km from the site) may experience a **moderate to high** visual impact of the substation infrastructure, which may include potential night time lighting impacts. Substation Site Option 4 substation site is not expected to have any visual impact on observers travelling along the N11 national road.

Substation **Site Option 4** appears to be an acceptable site, from a visual impact perspective. Localised visual impacts may still occur, but are envisaged to be less significant than the visual impacts that may be encountered at Site Options 1 and 3.

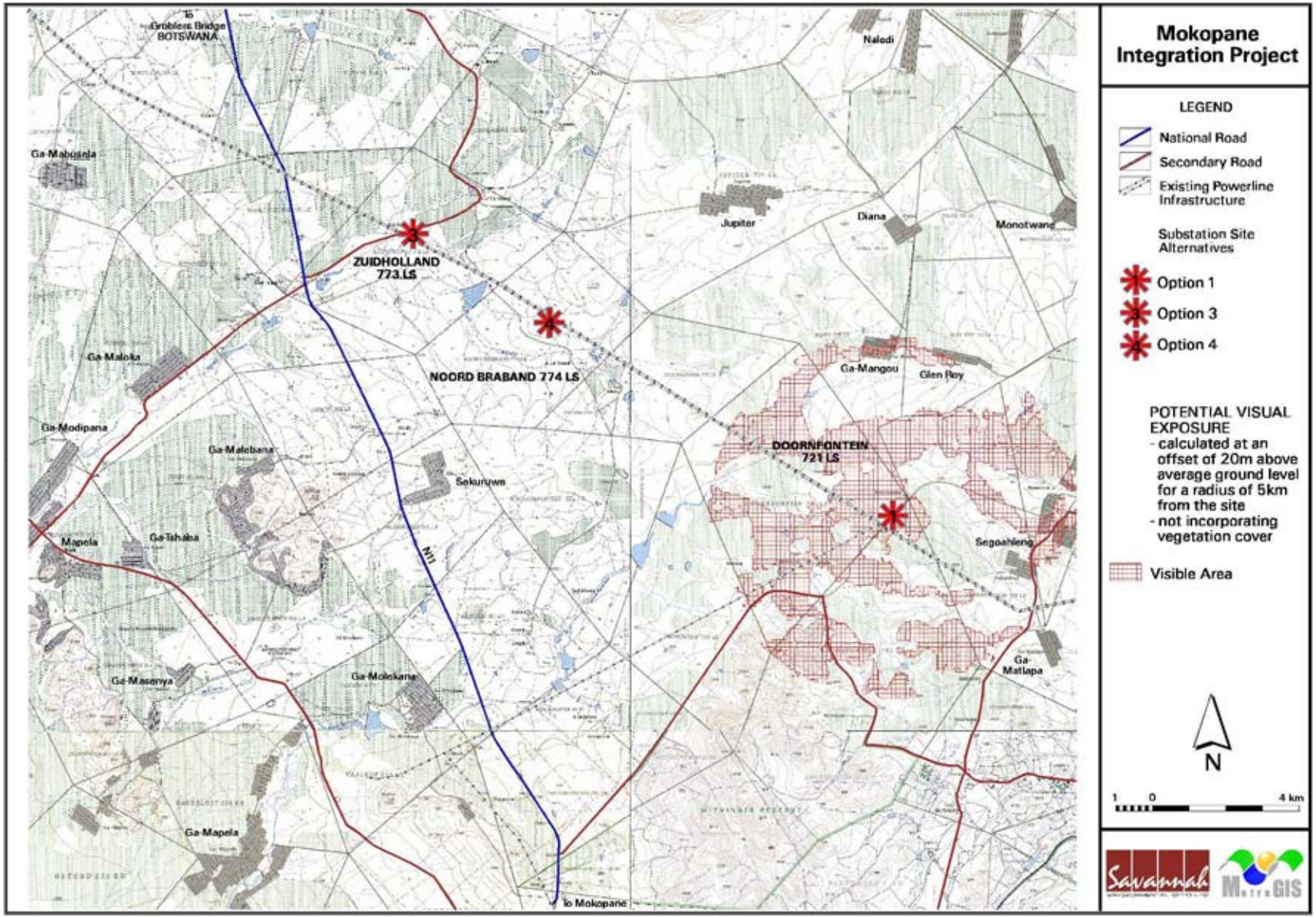

Figure 6.1: Potential visual exposure - substation Site Option 1

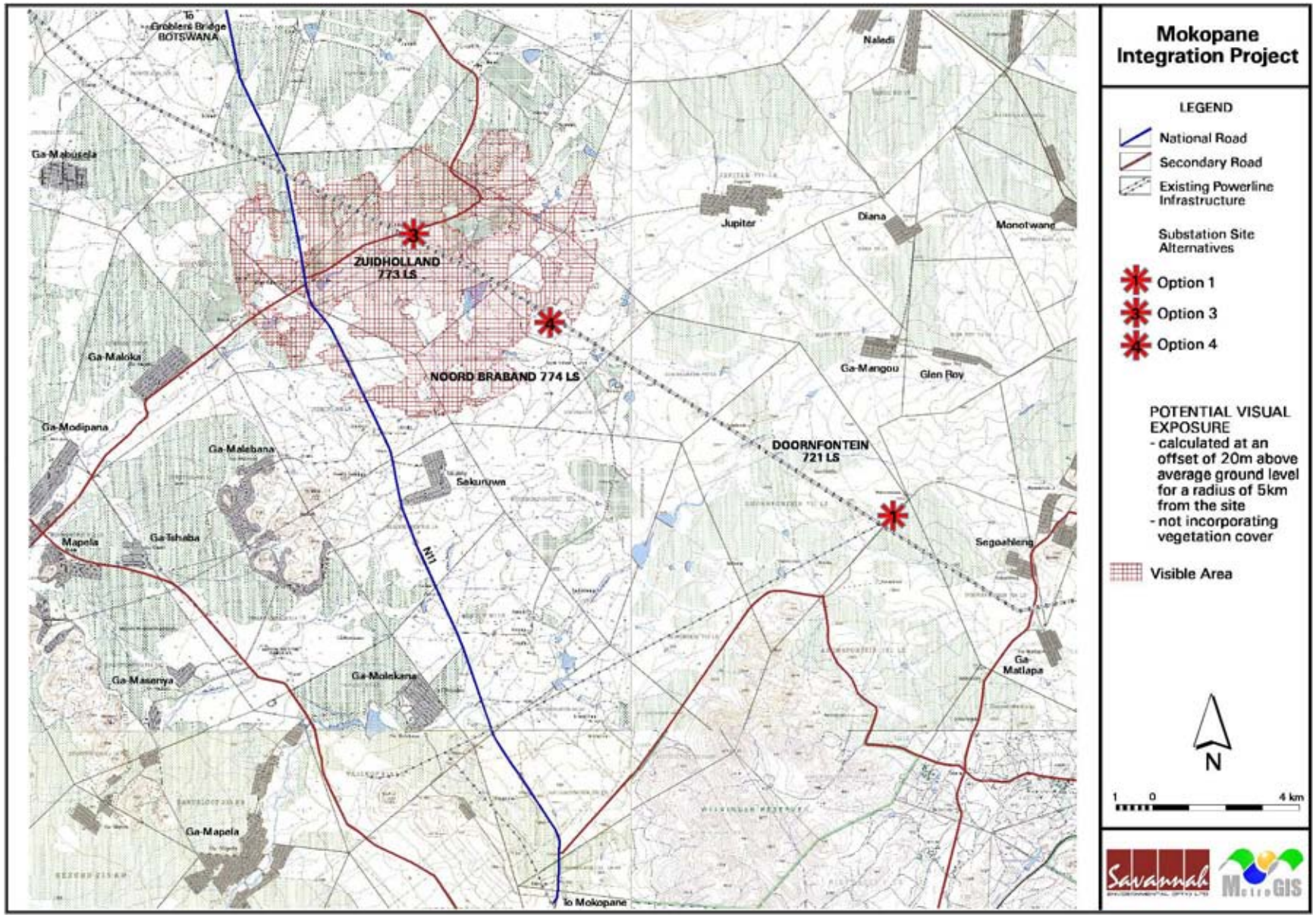

Figure 6.2: Potential visual exposure - substation Site Option 3

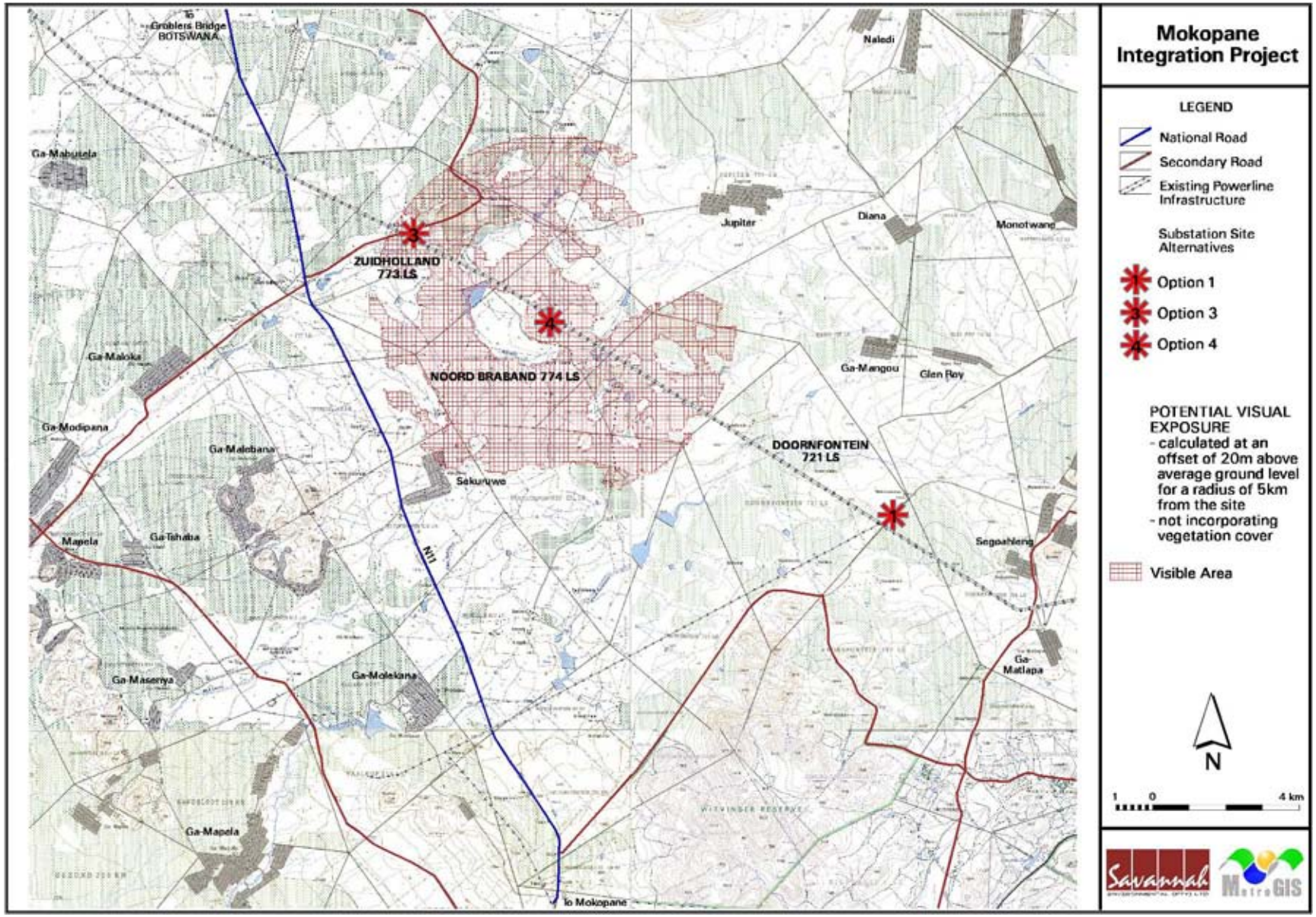

Figure 6.3: Potential visual exposure - substation Site Option 4

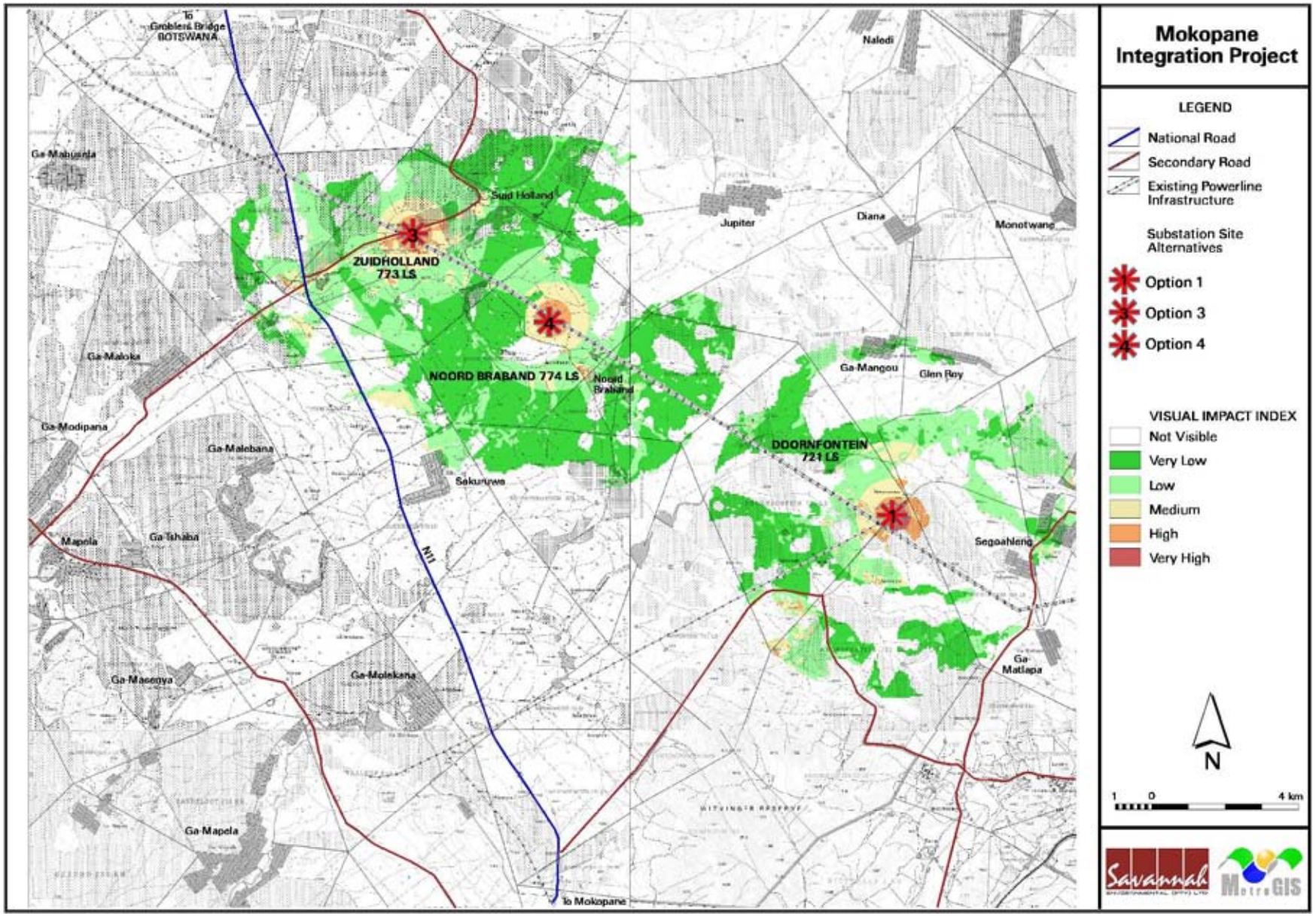

Figure 6.4: Observer proximity and viewer incidence - substation alternatives

6.4.4. Conclusions and Recommendations

Due to its relatively remote location away from major roads and sensitive visual receptors, **Site Option 4** is nominated as the preferred alternative for the placement and operation of the proposed Mokopane substation from a visual impact perspective.

The primary visual impact, namely the appearance and dimensions of the substation, is very difficult to mitigate. The broad functional design of the structures and the dimensions of the substation are unlikely to be changed in order to reduce visual impacts.

The sites proposed for the placement of the Mokopane substation are all located in relative close proximity to sensitive visual receptors that may experience night-time visual impacts in the form of sky glow or glare. Careful planning and sensitive placement of security and operational light fixtures for the substation, designed to contain rather than spread the light, is therefore imperative.

6.5. Assessment of Potential Heritage Impacts

The Ledwaba/Maune Ndebele clans, who are related to the Langa-Ndebele, live in the Bergzicht-Kalkspruit and Mašašane townships in the south-eastern part of the study area, near the proposed sites for the Mokopane Substation. Some of the types and ranges of heritage resources in or near the proposed sites for the Mokopane Substation may be impacted on by the Mokopane Integration Project.

The following known heritage resources occur near Substation Site Option 3 for the proposed Mokopane Substation:

» *Historical remains*
A historical farmstead complex composed of historical houses, associated outbuildings and a graveyard is located on the eastern shoulder of the sharp bend in the Luxemburg road, to the north-east of the proposed site for the substation. This farmstead complex incorporates a magnificent main farm residence dating from the Victorian/Edwardian period, a second farmhouse, several outbuildings and a graveyard holding the remains of the De Jager, Van der Merwe, Schoeman and De Jong families. The graves date from the middle of the 20th century. This historical farmstead complex constitutes a cultural historical landscape of smaller proportions.

» *Remains from the recent past*
Stone walls, probably the remains of a village dating from the more recent past, occur to the south-east of the proposed site for the substation. These remains are considered to be of low significance from a heritage perspective.

The dilapidated remains of a farmstead, which probably dates from the more recent past judging by the concrete rubble, occur to the south-east of Site Option 4 on the border of the farms Noord Braband 774LR and Suid Braband 719LS.

6.5.1. Comparative Assessment of Substation Sites

As no heritage resources with outstanding significance were observed near any of the proposed substation site options, all three proposed options weigh equally from a heritage perspective. Therefore, there is **no preferred alternative** in this regard.

6.5.2. Conclusions and Recommendations

No impacts on heritage resources are expected as a result of the construction of the proposed substation on any of the three identified substation site alternative. Therefore, there is no site preference in this regard.

6.6. Assessment of Potential Social Impacts

Impacts on the social environment as a result of the proposed substation are expected to occur during both the construction and operation phases (as well as during the eventual decommissioning of the infrastructure). The construction phase associated with the proposed substation is expected to last for approximately 12 months.

Potential impacts on the social environment associated with the construction, maintenance and decommissioning activities of the proposed substation are likely to include:

» Psychosocial impact on community level and on individuals as a result of different culture of construction workers, and the presence construction workers.
» Mental and physical health impact as a result of the impact of construction activities on farming.
» Inflow of workers and potential for conflict between locals and outsiders
» Local economic benefits
» Impact on job opportunities
» Impact on local and regional economy
» Impact on sense of place
» Noise pollution

Potential impacts (with and without mitigation) specific to the substation site are summarised in the tables below.

Impact Tables summarising the significance of Social Impacts associated with the proposed substation

Nature: **Mental and physical health impacts as a result of the impact of construction & operation activities on farming**		
CONSTRUCTION		
Category 2[11]	**Without Mitigation**	**With Mitigation**
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude		
Crop farming activities	Low (2)	Minor (1)
Cattle farming activities	Moderate (3)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	High (4)
Significance	**Medium (32)**	**Low (28)**
Status	Negative	Negative

Mitigation

Where possible, towers associated with the turn-in lines should be located on the border of grazing areas and crop fields.

» If necessary, mitigation measures should be implemented to avoid any negative impact on animals (e.g. fencing off the construction area).

» Eskom or its appointed contractor(s) should assist with the temporary relocation of livestock.

» Construction activities should be communicated and finalised with the affected property owners, and adhered to. Should this not be possible, the landowner should be informed and consulted about alternative arrangements.

» A grievances procedure should be implemented.

» Two locks on either side of one chain gate could be used to ensure that the landowner always has access to the same lock even though Eskom/construction team might change the other lock.

» The negotiation process should consider the mitigation of all relevant health and safety impacts on people and animals.

» A common, standard to compensation should be applied to all properties.

» Landowners should be aware that they can refuse to sign the release form after construction until they are satisfied with the level of rehabilitation.

» Discussions on conditions set for construction or maintenance between landowners and Eskom should involve the relevant parties from Eskom Transmission and the Regions when the need arises as *"we know what happens on site and what could be implemented."*

» Consultation between Eskom Lands & Rights and the Regions is important when conditions are set that impact on maintenance of the line.

» The process should be conducted with the necessary respect, and the negotiator

[11] Category 2 impacts are those that are expected to differ between the proposed alternatives, e.g. the number of households to be resettled increases if the development traversed densely populated areas as opposed to skirting populated areas.

should be transparent about the process and expectations (do not engage in "empty promises").

» Negotiators should record everything that is discussed with landowners.
» Infrastructure damage should be repaired to their original or a better state.
» The claim process for damage done by contractors should be simple.
» Landowners can request trees not to be cut. If this does not jeopardise safety or the operation of the line, this can be adhered to and stringing can be done by hand.
» Speed limits should be adhered to and construction vehicles marked.
» Any contact with wild animals should be avoided as far as possible.

OPERATION		
Category 2	**Before Mitigation**	**After Mitigation**
Extent (Scale)	Local (1)	Local (1)
Duration	Very short-Long (1-4)	Very short-Long (1-4)
Magnitude		
Crop farming activities	Minor (1)	Minor (1)
Cattle farming activities	Low (2)	Minor (1)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	High (4)
Significance	**Low-Medium (28-40)**	**Low-Medium (24-36)**
Status	Negative	Negative

Mitigation

» A grievances procedure should be implemented.
» Two locks on either side of one chain gate could be used to ensure that the landowner always have access to the same lock even though Eskom/construction team might change the other lock.
» The maintenance activities, timeframes and maintenance programme should be clearly stipulated during the negotiation process.
» Maintenance workers should not get onto the premises without the permission of the landowner – also for their own safety.
» Landowners should be allowed to carry out servitude maintenance.
» Speed limits should be adhered to and maintenance vehicles marked.
» Any contact with wild animals should be avoided as far as possible.

Cumulative Impacts

None.

Residual impacts

N/A.

***Nature :* Physical health impacts as a result of the presence of construction workers**		
***Category 1*[12]**	**Before Mitigation**	**After Mitigation**
Extent (Scale)	Site-International (1-5)	Site-International (1-5)
Duration	Short-Permanent (1-5)	Short-Permanent (1-5)
Magnitude	Moderate-Very high (3-5)	Moderate-Very high (3-5)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	Medium (3)
Significance	**Medium-High (32-72)**	**Low-Medium (24-54)**
Status	Negative	

Mitigation

» Aim for 30% local employment (PHS MQR 2007).
» An aggressive STD and HIV/AIDS awareness campaign should be launched, which is not only directed at construction workers but also at the community as a whole. Include training with women and focus on family planning and gender relations.
» Access at the construction site should be controlled to prevent sex workers from either visiting and/or loitering at the construction village.
» Construction workers should be clearly identifiable. Overalls should have the logo of the construction company on it and/or construction workers should wear identification cards.
» Local women should be empowered. This could be achieved by employing them to work on the project, which in turn would decrease their (financial) vulnerability.
» Regular leave should be given to workers and workers' families should be given opportunity to visit.
» A clinic should be on site/close to the village and anti retro virals available.
» Improve conditions at the construction village by providing entertainment.
» Mobilise local municipalities/authorities to do a skills audit and communicate skills levels and experience required to be employed by the project.
» Housing construction workers in communities could have more positive economic impacts (e.g. rental of room), but the potential health impacts as a result of more regular and consistent interaction with local inhabitants could be more significant. It therefore seems better to house construction workers in a village or separate housing area.

Cumulative Impacts

As a result of other projects and proposed projects in the study area it is likely that more workers from outside the study area will arrive and contribute to the impact.

Residual impacts

N/A.

[12] Category 1 impacts are those that are not expected to differ between the proposed alternatives, e.g. the number of construction workers that will be needed for the proposed project remains the same, irrespective of the chosen alternative

***Nature:* Physical health impacts as a result of the presence of maintenance workers**		
Category 1	**Before Mitigation**	**After Mitigation**
Extent (Scale)	Site-International (1-5)	Site-International (1-5)
Duration	Short-Permanent (1-5)	Short-Permanent (1-5)
Magnitude	Moderate-Very high (3-5)	Moderate-Very high (3-5)
Reversibility	Reversible (3)	Reversible (3)
Probability	Medium (3)	Low (2)
Significance	**Medium (24-54)**	**Low-Medium (16-36)**
Status	Negative	
Mitigation » Aim for 30% local employment (PHS MQR 2007). » Maintenance workers should be clearly identifiable. Overalls should have the logo of the construction company on it and/or construction workers should wear identification cards.		
Cumulative Impacts None.		
Residual impacts N/A.		

***Nature:* Physical health impacts as a result of the influx of job seekers.**		
Category 1	**Before Mitigation**	**After Mitigation**
Extent (Scale)	Site-International (1-5)	Site-International (1-5)
Duration	Short-Permanent (1-5)	Medium-Permanent (3-5)
Magnitude	Moderate-Very high (3-5)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Medium (3)	Medium (3)
Significance	**Medium (24-54)**	**Low-Medium (27-46)**
Status	Negative	
Mitigation » If the construction camp is located within an established community, employment procedures are discussed with the local leaders and followed to ensure that the community reaps the benefits from employment opportunities. » An Influx Management Plan should be developed and executed. » Have a recruitment desk away from the construction camp and construction areas. » Do not informally employ job seekers on site and at the construction village. » Mobilise local municipalities/authorities to do a skills audit and communicate skills levels and experience required to be employed by the project. » Aim for 30% local employment (PHS MQR 2007).		
Cumulative Impacts As a result of other projects and proposed projects in the study area it is likely that more workers from outside the study area will arrive and contribute to the impact.		

Residual impacts
N/A.

***Nature:* Psychosocial impact on community level and on individuals as a result of different culture of construction workers, and the presence construction workers (construction) and maintenance workers (operation)**		
CONSTRUCTION		
Category 2 Impact	**Before mitigation**	**After mitigation**
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (3)	Moderate (3)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	Medium (3)
Significance	**Medium (32)**	**Low (24)**
Status	Negative	Negative
OPERATION AND MAINTENANCE		
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Moderate (3)	Low (3)
Reversibility	Reversible (3)	Reversible (3)
Probability	Medium (3)	Low (2)
Significance	**Low (24)**	**Low (14)**
Status	Negative	Negative

Mitigation

» To ensure support of the project and reduce the risk of social mobilisation, Eskom should at all times be seen to care about the local community. The community members need to feel that they receive some tangible benefits from the project, e.g. direct and indirect employment. The undertakings in the EMP should also be implemented effectively and with due diligence.
» Construction workers are to be introduced to the local leaders and landowners.
» Local leaders should be made aware that only limited job opportunities will be created.
» The local leaders should also be informed about the nature of a linear project, and that labourers will probably move along the route as construction progresses.
» Educate women regarding gender issues and negotiating safe sexual behaviour.
» No firearms should be allowed on the construction site.
» Security guards should be appointed.
» Construction and maintenance workers should be clearly identifiable by wearing overalls and/or identification cards.
» Consult with local landowners prior to maintenance work taking place on the substation site and/or turn-in power lines, to inform them of when the maintenance team will be on site, for how long, and approximately how many persons the team will consist of.

Cumulative Impacts

Other Eskom projects in the study area: The simultaneous influx of appointed construction workers together with the influx of job seekers would further increase the demand on services to the detriment of the receiving environment.

Residual impacts

N/A.

***Nature:* Change in sense of place as a result of nuisance impacts.**		
CONSTRUCTION		
Category 1 Impact	**Before mitigation**	**After mitigation**
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Low (2)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Medium (3)	Medium (3)
Significance	**Low (21)**	**Low (21)**
Status	Negative	Negative
OPERATION AND MAINTENANCE		
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Low (2)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Low (2)	Low (2)
Significance	**Low (14)**	**Low (14)**
Status	Negative	Negative

Mitigation

Construction Mitigation:

» Affected parties should be informed about the construction schedule.
» Adjacent property owners should also be consulted regarding construction activities.
» Construction activities should not take place between 18:00 and 06:00.
» Construction should not be done on Sundays or public holidays and contractors should get permission from landowners to carry on with construction activities on these days.
» The hunting season (winter) should be taken into account.
» Ensure that the owners/residents are informed about imminent noise before it starts.
» The negotiation process should include agreements on construction activities.
» Dust:
  * Keep to speed limits.
  * Water roads.
» Corona
  * Avoid dwellings / lodges.

Operation Mitigation:

» Affected parties should be informed about the maintenance schedule.
» As far as possible, maintenance should not be done on Sundays or public holidays. It is important to have some mechanism in place that Eskom can undertake maintenance at these times if necessary.

Cumulative Impacts

Could be cumulative impacts due to construction activities from other projects in the area.

Residual impacts

N/A.

***Nature:* Change in sense of place as a result of the presence of the substation.**		
CONSTRUCTION		
Category 2 Impact	**Before mitigation**	**After mitigation**
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Low (2)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	High (4)
Significance	**Low (28)**	**Low (28)**
Status	Negative	Negative
OPERATION SUBSTATION SITES 1 and 3		
Extent (Scale)	Site (1)	Site (1)
Duration	Long (4)	Long (4)
Magnitude	Moderate (3)	Moderate (3)
Reversibility	Reversible (3)	Reversible (3)
Probability	Low (2)	Low (2)
Significance	**Medium (24)**	**Medium (24)**
Status	Negative	Negative
OPERATION SUBSTATION SITE 4		
Extent (Scale)	Site (1)	Site (1)
Duration	Long (4)	Long (4)
Magnitude	Low (2)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Low (2)	Low (2)
Significance	**Low (20)**	**Low (20)**
Status	Negative	Negative
Mitigation Mitigation measures detailed in the Visual Impact Assessment and Ecological Assessment should be implemented.		
Cumulative Impacts Other Eskom projects in the study area: The simultaneous influx of appointed construction workers together with the influx of job seekers would further increase the demand on services to the detriment of the receiving environment.		
Residual impacts N/A.		

***Nature:* Impact on health as a result of pollution of the natural environment by construction / maintenance workers and construction / maintenance activities.**		
Category 1 Impact	**Before mitigation**	**After mitigation**
CONSTRUCTION		
Extent (Scale)	Site (1)	Site (1)
Duration	Very short-Medium (1-3)	Very short-Medium (1-3)
Magnitude	Low (3)	Minor (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Medium (3)	Medium (3)

Significance	**Low-Medium (24-30)**	**Low (21-27)**
Status	Negative	Negative
OPERATION AND MAINTENANCE		
Extent (Scale)	Site (1)	Site (1)
Duration	Very short (1)	Very short (1)
Magnitude	Minor (2)	Minor (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	Low (2)	Low (2)
Significance	**Low (14)**	**Low (14)**
Status	Negative	Negative

Mitigation

» Construction workers are required to be treated for worms.
» Adequate water facilities should be provided.
» Sufficient portable chemical toilets must be provided on site and at the construction village.
» Refuse on site should be discarded in sealed bins and/or in covered skips. Refuse should be removed from the site on regular intervals (at least once a week) and disposed of at an approved waste disposal site.
» Bins should be provided on site and at the camp.
» Some form of punishment should be implemented for littering.
» Construction workers should adhere to a contract with the contractor. These rules of conduct should be stipulated in construction management plans and contracts with workers. These should include the use of sanitation, water and waste as well as informal trading, running of shebeens, and interfering in community affairs.
» The construction management plan should indicate how its water sanitation and waste facilities are in line with legislation.
» Emergency health facilities should be available at the camp.

Cumulative Impacts

The situation will be exacerbated in areas where influx of job seekers occur and as a result of the activities of teams on other power line projects which take place simultaneously in the same area.

Residual impacts

N/A.

Nature: **Increase in employment opportunities due to the construction of the substation.**

Category 1 Impact	**Before Enhancement**	**After Enhancement**
Extent	Local (2)	Local (2)
Duration	Very short (1)	Very short (1)
Magnitude	Minor (1)	Low (2)
Reversibility	Reversible (3)	Reversible (3)
Probability	High (4)	Definite (5)
Significance	**Low (36)**	**Medium (50)**
Status	Positive	Positive

Enhancement

Require contractors to employ contractor staff and temporary labourers are sourced from areas that the power transmission line crosses or from the region whenever possible.

6.6.1. Comparative Assessment of Substation Sites

Considering the assessment of impacts as detailed in the tables above, the following conclusions can be made regarding the proposed substation sites:

» Considering the potential effect of the substation sites on agricultural activities, Site Options 3 and 4 are considered to be preferred from a social perspective. Site Option 1 is more likely to affect cultivation activities on land immediately surrounding the site, and is least preferred. The proposed 400kV transmission power lines will follow a longer length of the existing Matimba-Witkop transmission power lines should Site Option 3 be selected and may localise impacts on agricultural activities. The lines would also follow the existing Matimba-Witkop line if Site Option 4 was selected.
» No involuntary resettlement will be necessary for any of the sites and this impact is therefore not assessed. The existing Matimba-Witkop 400kV Transmission power lines already prohibit development towards the servitude. Development is likely to occur to the north and south of the existing power lines. In terms of scattered dwellings on farm portions, no dwellings will be directly impacted by the proposed substation or turn-in lines at any of the proposed sites.
» The preferred substation site is Site Option 4 in terms of impacts on sense of place.
» Properties on which substation sites are to be located are found in more densely populated and more developed areas close to Mokopane and Polokwane. All substations sites also currently contain power transmission infrastructure. These properties probably do not derive their value largely from a pristine character but rather from an ability to enable economic activity in a context with more development. Any impact on property values due to the location of additional power transmission infrastructure (the substations) is thus unlikely.
» All three alternative substation sites are relatively close to existing local roads. The assumption is therefore that existing roads (be these local gravel roads or power line maintenance roads) will be used to access the preferred site. Considering the potential effect on settlement patterns and development (current and future), the following emerges:
    * In terms of access roads, there is no preferred site.
    * Due to its distance from existing settlements, Site Option 4 is preferred. It is also possible to avoid settlements and not affect their development.
    * Transmission power line corridors not following the existing Matimba-Witkop transmission power lines and entering and exiting Site Options 1 and 3 will potentially affect more settlements.
» To avoid potential negative impacts on health and safety and settlement developments, the preferred site is Site Option 4.

» Considering the potential effect on settlement patterns and development, the existing Matimba-Witkop 400kV Transmission power lines already prohibit development towards the servitude. Development is likely to occur to the north and south of the existing power lines. In terms of scattered dwellings on farm portions, no dwellings will be directly impacted by the proposed substation or turn-in lines at any of the proposed sites.

From an overall social perspective, **Site Option 4** is considered to be the preferred substation site alternative.

6.6.2. Conclusions and Recommendations

Substation site 4 is nominated as the preferred alternative from a social perspective. In order to eliminate or minimise significant impacts identified mitigation measures must be implemented (refer to the specialist social impact assessment in Appendix K and the EMP contained in Appendix O).

6.7. Comparative Assessment and Nomination of a Preferred Substation Site

From the comparative assessment of alternatives undertaken, no environmental fatal flaws have been identified to be associated with any of the identified substation site options. The following conclusions have been drawn:

» Substation Site Option 1 is nominated as the preferred alternative from a biodiversity perspective. Site Option 4 is the least preferred in this regard.
» Substation Site Option 1 is nominated as the preferred alternative from an avifauna perspective.
» Substation Site Option 4 is nominated as the preferred alternative from an agricultural potential perspective.
» Substation Site Option 4 is nominated as the preferred alternative from a visual perspective.
» There is no preference in terms of alternatives from a heritage perspective.
» Substation Site Option 4 is nominated as the preferred alternative from a social perspective.

From the conclusions of the specialist workshop undertaken, it was concluded that Substation Site Option 3 is not preferred and should be avoided. As no environmental fatal flaws were associated with **Substation Site Options 1 and 4**, it was concluded that either of these alternatives would be acceptable for the development of the proposed substation and associated turn-in lines. **Substation Site Option 4** is nominated as the preferred option, due to the lower potential social and visual impacts.

ASSESSMENT OF IMPACTS: 400KV TRANSMISSION POWER LINES CHAPTER 7

As part of its capacity expansion programme, Eskom is currently constructing the new Medupi coal-fired power station in the Lephalale area of the Limpopo Province. In order to integrate this power station into the electricity transmission grid, Eskom Transmission is considering linkages to various points within the electricity transmission system. In order to support the upsurge in demand for the platinum group metals in the Mokopane area, and to improve the reliability of electricity supply to the Polokwane area, Eskom Transmission is therefore proposing the development and implementation of the **Mokopane Integration project**.

This chapter serves to assess the identified potentially significant environmental impacts associated with the proposed transmission power line development corridors, and to make recommendations for the management of these impacts for inclusion in the draft Environmental Management Plan (refer to Appendix O).

7.1. Assessment of Potential Impacts on Biodiversity

The vegetation of the study area, considering the diversity, primary status and availability of habitat types, is regarded as being diverse on a local and regional scale in spite of the poor floristic knowledge of the region. All areas of natural vegetation that are regarded to be in a primary status are considered suitable for the presence of Red Data flora species. It is regarded highly likely that numerous Red Data flora species are present within areas of natural/ pristine habitat contained within the proposed corridors. The ecological sensitivity of the study area has been determined through a combination of the likelihood of a specific biophysical attribute being important in terms of biodiversity attributes and the expected reaction of the particular attribute to impacts associated with the proposed project. A biodiversity sensitivity map of the study area on a regional scale which includes the collation of all sensitivities identified is provided in Figure 7.1. More details in this regard are included in the specialist biodiversity report contained within Appendix F.

Impacts resulting from the construction and operation of power lines on ecological attributes of the study area are largely restricted to physical impacts on biota or the habitat in which they occur. Direct impacts, such as habitat destruction and modifications, are regarded immediate, long-term and of high significance. These impacts are mostly measurable and fairly easy to assess as the effects thereof are immediately visible and can be determined to an acceptable level of certainty.

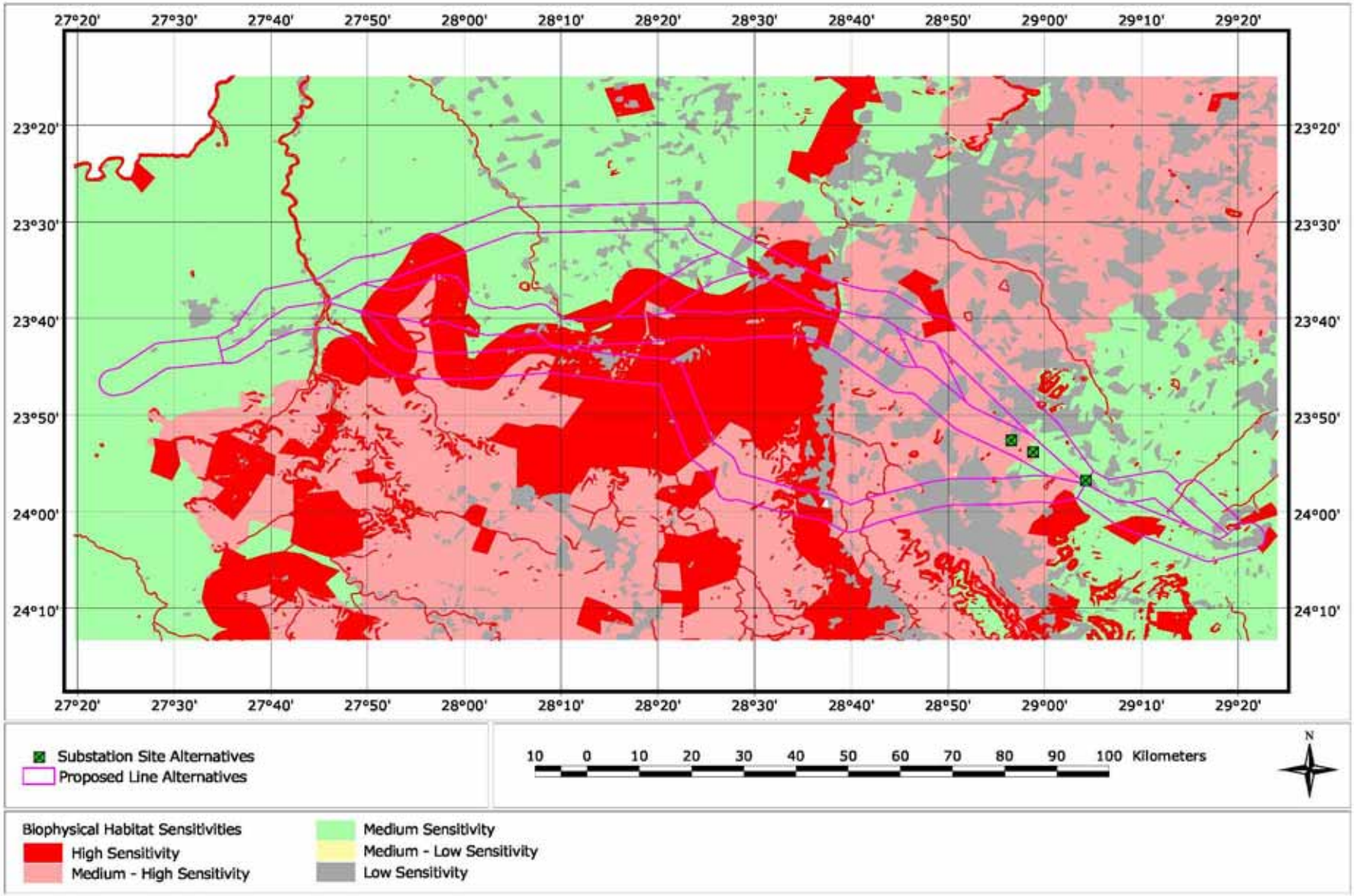

Figure 7.1: Biodiversity sensitivity map of the study area

In contrast, the effect of indirect impacts is not immediately evident and can consequently not be measured immediately. Lastly, impacts of a cumulative nature place direct and indirect impacts of this project into a regional and national context, particularly in view of similar or resultant developments and activities.

Potential impacts on biodiversity associated with the construction and operation of the transmission power lines include the following:

» Direct impacts:
  * Destruction of threatened flora species
  * Destruction of protected tree species
  * Direct impacts on threatened fauna species
  * Direct impacts on common fauna species
  * Destruction of sensitive/ pristine regional habitat types

» Indirect Impacts:
  * Floristic species changes within the servitudes
  * Faunal interactions with structures, servitudes and personnel
  * Impacts on surrounding habitat/ species
» Cumulative Impacts:
  * Impacts on South Africa's conservation obligations and targets
  * Increase in local and regional fragmentation/isolation of habitat
  * Increase in environmental degradation

These are described in more detail within the specialist biodiversity study (refer to Appendix F) and are assessed below for each identified transmission line corridor alternatives. No impacts that could lead to a beneficial impact on the ecological environment were identified.

Impact Tables summarising the Significance of Impacts on Biodiversity (with and without mitigation)

Comparative assessment of biodiversity impacts associated with the construction and operation of power lines along Corridors 1, 2 8 and 8 deviation (Medupi-Mokopane)

	Corridor 1		Corridor 2		Corridor 8 (to the north of the existing lines)		Corridor 8 (to the south of the existing lines)		Corridor 8 deviation	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	Regional (3)	Regional (3)	Local (2)	Local (2)	Regional (3)	Local (2)	Regional (3)	Local (2)	Local (2)	Local (2)
Duration	Permanent (5)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)	Long term (4)
Magnitude	High (4)	High (4)	Moderate (3)	Low (2)	High (4)	High (4)	High (4)	Moderate (3)	High (4)	Moderate (3)
Reversibility	Irreversible (5)	Recoverable, needs input (3)	Recoverable, needs input (3)	Reversible, naturally (1)	Irreversible (5)	Recoverable, needs input (3)	Irreversible (5)	Recoverable, needs input (3)	Recoverable, needs input (3)	Reversible, naturally (1)
Probability	Definite (5)	Definite (5)	Medium (3)	Low (2)	High (4)	High (4)	High (4)	High (4)	Medium (3)	Low (2)
Significance	**High (85)**	**High (70)**	**Moderate (36)**	**Low (18)**	**High (64)**	**Moderate (52)**	**High (64)**	**Moderate (48)**	**Moderate (39)**	**Low (20)**
Status	Negative	Negative	Negative	Negative	Negative	**Negative**	Negative	Negative	Negative	Negative
Irreplaceable loss of resources?	No		No		No		No		No	
Can impacts be mitigated	Yes		Yes		Yes		Yes		Yes	
Mitigation: Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)										
Cumulative Impacts	» Significant increase in fragmentation and isolation of remaining natural habitat, particularly in central		» Slight increase in fragmentation and isolation of remaining natural habitat, particularly in western		» Slight increase in fragmentation and isolation of remaining natural habitat, particularly in central part of study area, mainly because		» Slight increase in fragmentation and isolation of remaining natural habitat, particularly in central part		» Slight increase in fragmentation and isolation of remaining natural habitat, particularly in western	

	part of study area, extensive untransformed areas will be affected. » Significant effect on conservation targets/ areas on a regional scale. » Significant increase in general environmental degradation.	sections. » Slight impact on conservation targets/ areas on a regional scale. » Slight increase in general environmental degradation.	of existing line, otherwise more severe cumulative impact. » Increase in general environmental degradation.	of study area, mainly because of existing line, otherwise more severe cumulative impact. » Increase in general environmental degradation.	sections. » Slight impact on conservation targets/ areas on a regional scale. » Slight increase in general environmental degradation.
Residual Impacts » Cleared servitudes likely to become infested with alien and invasive plant species. » Remains of access roads into topographically challenging areas are likely to remain as visual and environmental impacts. » Physical habitat disturbance is likely to result in permanent scars in sensitive areas (evident from existing line in high sensitivity areas).					

Comparative assessment of biodiversity impacts associated with the construction and operation of power lines along Corridors 4, 5 and 6 (Mokopane-Witkop)

	Corridor 4		Corridor 5		Corridor 6	
	Without mitigation	**With mitigation**	**Without mitigation**	**With mitigation**	**Without mitigation**	**With mitigation**
Extent	National (4)	National (4)	3 (Regional)	2 (Local)	3 (Regional)	2 (Local)
Duration	Long term (4)	Medium term (3)	4 (Long term)	Medium term (3)	4 (Long term)	Medium term (3)
Magnitude	High (4)	Moderate (3)	Moderate (3)	Moderate (3)	High (4)	Moderate (3)
Reversibility	Recoverable, needs input (3)	Recoverable, needs input (3)	Recoverable, needs input (3)	Recoverable, needs input (3)	Recoverable, needs input (3)	Recoverable, needs input (3)
Probability	High (4)	High (4)	Medium (3)	Medium (3)	Medium (3)	Medium (3)
Significance	**High (60)**	**Moderate (52)**	**Moderate (39)**	**Moderate (33)**	**Moderate (42)**	**Moderate (33)**
Status	Negative	Negative	Negative	Negative	Negative	Negative
Irreplaceable loss of resources?	No		No		No	
Can impacts be mitigated	Yes		Yes		Yes	
Mitigation: Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)						
Cumulative Impacts » Slight increase in fragmentation and isolation of remaining natural habitat, particularly in central section. » Slight impact on conservation targets/ areas on a regional scale. » Slight increase in general environmental degradation.						
Residual Impacts Cleared servitudes likely to become infested with alien and invasive plant species.						

Nature: Biodiversity Impacts of power lines along Corridor 7		
	Without Mitigation	**With Mitigation**
Extent	2 (Local)	1 (Site only)
Duration	4 (Long term)	4 (Long term)
Magnitude	3 (Moderate)	2 (Low)
Reversibility	3 (Recoverable, needs input)	1 (Reversible, naturally)
Probability	3 (Medium probability)	2 (Low probability)
Significance	**36 (Moderate)**	**16 (Low)**
Status	**Negative**	**Negative**
Irreplaceable loss of resources?	No	
Can impacts be mitigated	Yes	
Mitigation: Refer to Section 12, 13 and 14 of the Specialist Ecology Report (Appendix F) and to the draft EMP (Appendix O)		
Cumulative Impacts » Slight increase in fragmentation and isolation of remaining natural habitat. » Slight increase in general environmental degradation.		
Residual Impacts Cleared servitudes and immediate surrounds might become infested with increaser and invasive plant species during and subsequent to operational phase.		

7.1.1. Comparison of Transmission Power Line Alternatives

Results of the ecological integration of the biophysical-, floristic- and faunal habitat sensitivity calculations indicate the following:

Corridors 1, 2, 8 and 8 Deviation (Medupi-Mokopane):

» *Corridor 1:*
Corridor 1 is situated in the central-southern part of the study area and is characterised by the escarpments, plains, table-lands, low mountains and lowlands with mountains topographical variations. Vegetation types that occur include Limpopo Sweet Bushveld, Roodeberg Bushveld, Waterberg Mountain Bushveld, Makhado Sweet Bushveld, Central Sandy Bushveld and Polokwane Plateau Bushveld. A matrix of untransformed, degraded and transformed faunal habitats is found in this corridor, including nature conservation areas of Touchstone and Witvinger. This corridor is considered to be of **high ecological sensitivity** and is **least preferred** corridor from a biodiversity perspective.

» *Corridor 2:*
This corridor is situated in the central-northern part of the study area and is characterised by the escarpments, plains (including slightly and strongly

undulating plains), and lowlands with mountains topographical variations. Vegetation types that occur include Limpopo Sweet Bushveld, Roodeberg Bushveld, Makhado Sweet Bushveld and Polokwane Plateau Bushveld. A matrix of untransformed, degraded and transformed faunal habitats is found in this corridor, including nature conservation areas of Bellevue and Masebe. This corridor is nominated as the **preferred alternative** from a biodiversity perspective.

» *Corridor 8:*

This corridor is situated in the central section of the study area and is characterised by escarpments, plains, table-lands and lowlands with mountains topographical variations. Vegetation types that occur include Limpopo Sweet Bushveld, Roodeberg Bushveld, Waterberg Mountain Bushveld, Makhado Sweet Bushveld and Polokwane Plateau Bushveld. A matrix of untransformed, degraded and transformed faunal habitats is found in this corridor; it includes the nature conservation areas of Keta and Moepel. This corridor is considered to be of **moderate ecological sensitivity**. Although corridors 8 follows existing lines and would normally represent lower levels of impacts, it was indicated by Eskom that technical constraints in certain areas will not allow the construction of new lines directly adjacent to the existing lines. These space constraints are mainly the result of topographical diversity of landscape features. New lines will therefore have to deviate from existing lines in certain areas to allow for sufficient space for the servitude. Inevitably, where such topographical constraints occur, ecological sensitivity is invariably high and the expected impacts of construction and operation of power lines in these parts are regarded extremely high, similar to Corridor 1. Sensitivities of natural habitat in Corridor 8, particularly in highly sensitive areas, were therefore ascribed without the consideration of the existing lines. In this regard, corridor 8 is **not preferred** from a biodiversity perspective.

» *Corridor 8 Deviation:*

This corridor follows the existing Matimba-Witkop line for an extensive potion of its length, deviating to the north before the high sensitivity habitat associated with corridor 8, and following part of Corridor 2 until a deviation to the south to reconnect with corridor 8. The central part of the corridor comprises sensitive habitat, but the alignment with the existing line is likely to reduce potential impacts to an acceptable level. This corridor is considered to be of **moderate ecological sensitivity** and is the **second most preferred corridor** from a biodiversity perspective, provided that the new power lines are constructed immediately parallel to the existing power lines. Should the servitude deviate from the existing line outside the deviation, the sensitivity will increase proportionally. Impacts in areas where new lines deviate from the existing corridor are regarded as a 'new' impact, in spite of the presence

of an existing line in the nearby vicinity. Effects of construction and operation will therefore not be lessened or masked by the presence of existing lines in these areas.

Corridors 4, 5 and 6 (Mokopane-Witkop)

» *Corridor 4:*
Corridor 4 represents the southern option of the eastern section of the study area and is characterised by the strongly undulating plains and low mountains with topographical variations. Vegetation types that occur include Polokwane Plateau Bushveld and Mamabolo Mountain Bushveld. Small portions are transformed and degraded and the area is characterised the buffer zones and core conservation areas of the Percy Fyfe and Kuschke conservation areas. This corridor is considered to be of **high ecological sensitivity** and is the **least preferred** corridor from an ecological perspective.

» *Corridor 5:*
This corridor represents the middle option of the eastern section of the study area and is characterised by the strongly undulating plains topographical variations. Vegetation types that occur include the Polokwane Plateau Bushveld. Small portions are transformed and degraded and the area is characterised some buffer zones of the conservation areas of the Percy Fyfe and Kuschke conservation areas. This corridor is considered to be of **low ecological sensitivity** and is the **most preferred** corridor from an ecological perspective.

» *Corridor 6:*
This corridor represents the northern option of the eastern section of the study area is characterised by the strongly undulating plains of Polokwane Plateau Bushveld and Mamabolo Mountain Bushveld. Small portions are transformed (cultivated lands) and degraded. This corridor is considered to be of **moderate to high ecological sensitivity** and is the **second preferred** corridor from an ecological perspective.

Corridor 7 (Delta-Medupi)

» *Corridor 7:*
This corridor is situated at the western end of the proposed lines and is characterised by the plains of Western Sandy Bushveld and Limpopo Sweet Bushveld. Small portions are transformed (cultivated lands) and degraded. No alternative was presented for this line and a comparative analysis is therefore not possible. This corridor is considered to be of **low ecological sensitivity** and therefore no impacts of significance are expected.

7.1.2. Conclusions and Recommendations

Results of the impact assessment generally indicate the high significance of expected impacts associated with development in pristine woodland areas in the southern and central parts of the study area. These impacts are regarded extremely high and the use of these areas for the proposed project is not recommended. Conversely, compared to the central and southern areas, the northern part of the study area is lower in general ecological sensitivity and is more suitable for the proposed development from an ecological perspective.

Results of the ecological integration of the biophysical-, floristic- and faunal habitat sensitivity calculations indicate the following:

» From the integration of the respective biophysical-, floristic- and faunal habitat sensitivity calculations and ratings it is evident that transmission line Corridor 1 and Corridor 4 are not regarded suitable for the proposed project. Even with the application of significant mitigation measures extensive impacts are still expected to occur within sensitive parts of these corridors. Calculations in the respective disciplines mirrored the eventual results. Conversely **Corridor 2** (Medupi-Mokopane) and **Corridor 5** (Mokopane-Witkop) are regarded the least sensitive in terms of ecological attributes and are therefore recommended for the proposed project.
» Although Corridor 8 includes existing lines, and it would normally be preferable to locate new infrastructure adjacent to existing infrastructure to localise the impact, it was indicated by Eskom that technical constraints in certain areas will not allow the construction of new lines directly adjacent to the current lines. These space constraints are mainly the result of topographical diversity of landscape features. New power lines will therefore have to deviate from existing lines in certain areas to allow for sufficient space for the servitude. Where such topographical constraints occur, ecological sensitivity is invariably high and the expected impacts of construction and operation of power lines in these parts are regarded as extremely high, similar to Corridor 1. Overall, expected impacts from the proposed development in areas where new lines deviate from the existing corridor are therefore regarded as a 'new' impact, in spite of the presence of an existing line in the nearby vicinity. Effects of construction and operation will therefore not be lessened or masked by the presence of existing lines in these areas.
» The moderate suitability of Corridor 8 Deviation is strongly biased by the Floristic sensitivity. As indicated in the relevant section, this sensitivity reflects the presence of extensive areas of Medium-high floristic sensitivity which is the result of the length of the alignment. The extent of High floristic sensitivity habitat within this alignment is actually lower than in other corridors. The suitability of this line for the proposed project is also strongly influenced by the presence of an existing line for much of the alignment,