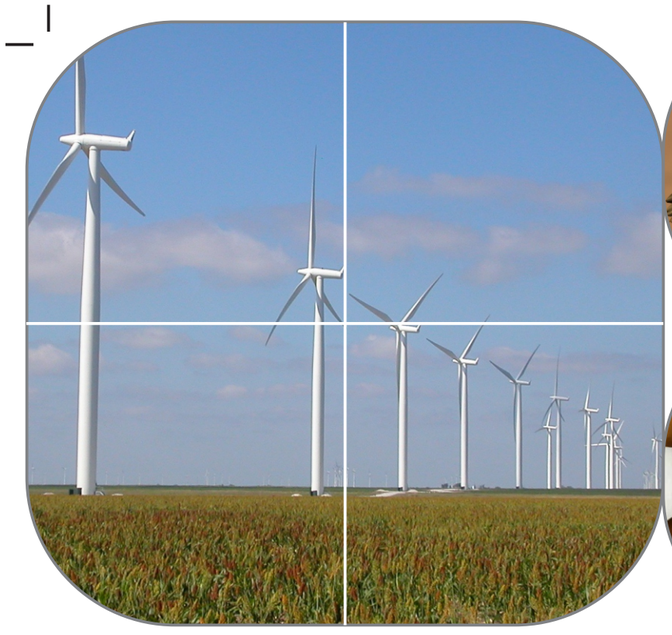
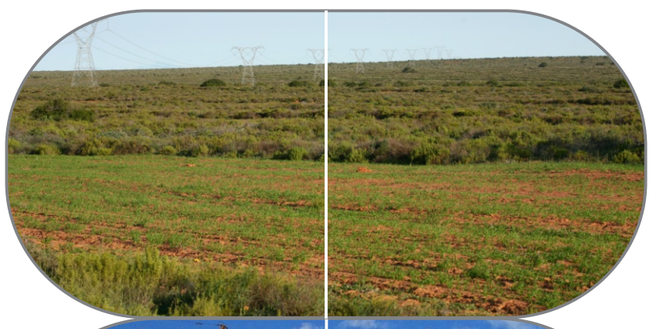






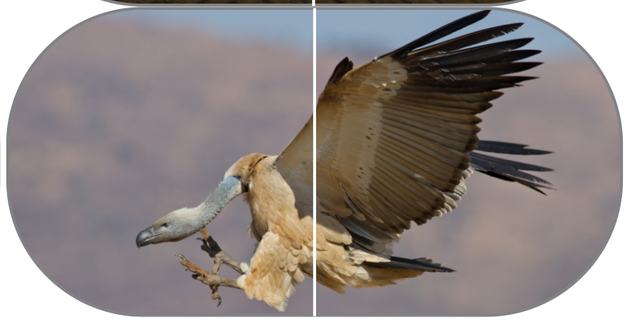

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR ELECTRICITY GRID INFRASTRUCTURE IN SOUTH AFRICA

2016







SANBI
Biodiversity for Life
South African National Biodiversity Institute

Eskom

CSIR
our future through science

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

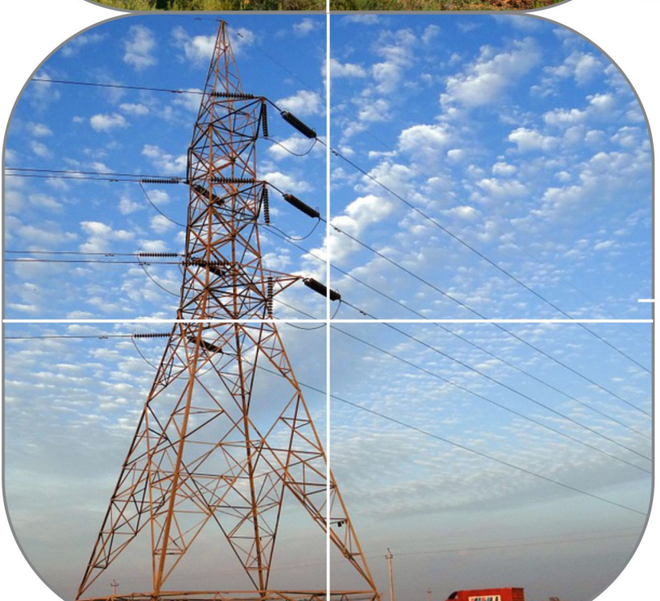






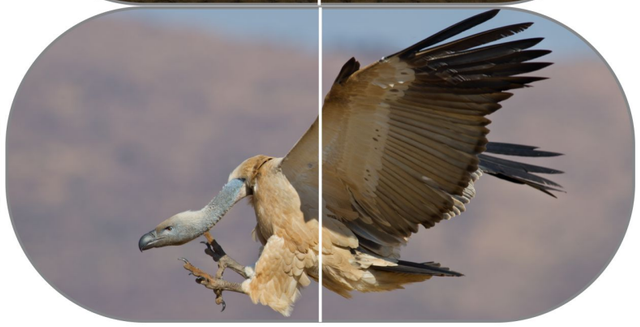

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR ELECTRICITY GRID INFRASTRUCTURE IN SOUTH AFRICA

2016







SANBI
Biodiversity for Life
South African National Biodiversity Institute

Eskom

CSIR
our future through science

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

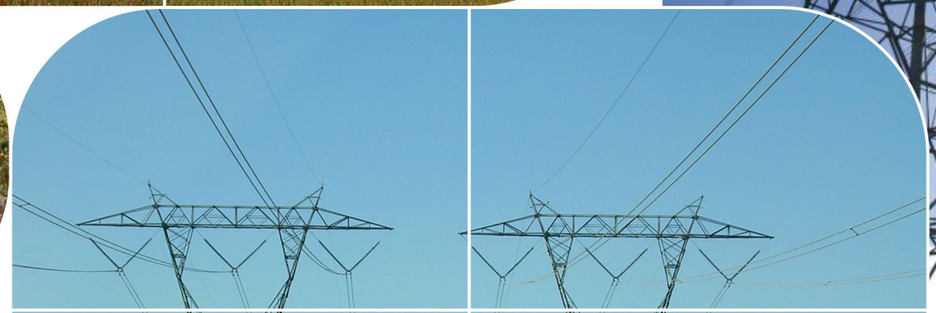
STRATEGIC ENVIRONMENTAL ASSESSMENT FOR ELECTRICITY GRID INFRASTRUCTURE IN SOUTH AFRICA

Prepared by:
Marshall Mabin[1]
Paul Lochner[1]
Wisaal Osman[1]

With contributions from:
Dee Fischer[2], Surprise Zwane[2], Sujata Carlyle[2]
Ronald Marais[3], John Geeringh[3], Kevin Leesk[3], Lené Grobbelaar[3]
Jeff Manuel[4], Fahiema Daniels[4], Tsamaelo Malebu[4]
Johann Lanz
Chris van Rooyen[5], Albert Froneman[5]
Simon Todd[6], Donovon Kirkwood[6], Kate Snaddon[6], Justine Ewart-Smith[6]
Jayson Orton[7]
Nicholas Wiltshire[8], Mariagrazia Galimberti[8]
Hugo van Zyl[9], Tony Barbour[9]
Quinton Lawson[10]
Bernard Oberholzer[11]
Karen Jodas[12]
Pat Morant

To be cited as:
Department of Environmental Affairs, 2016. Strategic Environmental Assessment for Electricity Grid Infrastructure in South Africa. CSIR Report Number: CSIR/02100/EMS/ER/2016/0006/B. Stellenbosch.

[1] Council for Scientific and Industrial Research
[2] Department of Environmental Affairs
[3] Eskom
[4] South African National Biodiversity Institute
[5] Chris van Rooyen Consulting
[6] Freshwater Consulting Group
[7] ASHA Consulting
[8] Cedar Tower Services
[9] Independent Economic Researchers
[10] MLB Architects
[11] BOLA Architects
[12] Savannah Environmental



SUMMARY

PREFACE

The design of the future transmission grid in South Africa is undergoing a major shift to cater for significant spatial changes to South Africa's future energy generation footprint. Currently the electricity generation is dominated by coal in a centralised power pool in the north-east of the country. However the Government of South Africa has made an international commitment to reduce the carbon footprint of the country and adopted a generation policy requiring large scale renewable energy and other generation sources in order to achieve this. This is embodied in the Integrated Resource Plan (IRP) for the country which specifies the future energy mix until 2030.

The largest impact from a transmission grid perspective is the widespread distribution of the new generation mix. Almost all the renewable energy sources are located in the southern part of the country where currently there is limited electricity demand and transmission infrastructure. The other sources such as natural gas or nuclear power will also be predominantly located in the southern part of the country along the coast. The load centres however will not change significantly in the future with around 75% of the total electricity demand of South Africa still expected to be in the northern part of the country and along the north-east coast. The future transmission network will be required to move most of the new power generation from the south to these northern load centre areas. This means new power corridors and expansion of existing ones is needed.

A further challenge facing the expansion of the grid is obtaining the necessary environmental approvals and authorisations to construct the new power lines and substations within these future power corridors. Taking this process into account means that new electricity grid infrastructure projects can take between five and ten years to complete. However for new power generation, particularly renewable energy where allocation is determined through a competitive bidding process, new power plants can be operational within two to three years. Therefore in the instance where new transmission infrastructure is required to connect this renewable energy to the grid, there is the risk that the required grid infrastructure will not be ready in time. Thus a new and strategic approach to planning and obtaining environmental authorisations for the transmission grid of the future is needed.

To address this issue and to support the National Infrastructure Development Plan's Strategic Integrated Project 10: *transmission and distribution for all*, the Department of Environmental Affairs in collaboration with Eskom Holdings Ltd is undertaking a Strategic Environmental Assessment (SEA), titled Electricity Grid Infrastructure SEA. Based on scoping level pre-assessment of strategic areas for grid development, the SEA aims to streamline the environmental authorisation process and better integrate the environmental assessment process in terms of the National Environmental Management Act with the environmental permitting and licensing requirements of other relevant legislation, such as water use licensing in terms of the National Water Act. In so doing, the SEA intends reduce the timeframes for achieving project level environmental approvals as well as facilitate strategic and responsible planning of electricity grid infrastructure in South Africa. The Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI) were commissioned in January 2014 to undertake the SEA.

The first component of the SEA was undertaken by Eskom and involved identifying strategic transmission corridors (referred to as Preliminary Corridors in the SEA) on the basis of regional scale long term forecasting of electricity demand and power generation balance scenarios. The Preliminary Corridors then underwent a process of refinement based on a spatial assessment of the local scale need for grid infrastructure whilst considering environmental and engineering constraints to grid infrastructure development. The output of this process was five "Power Corridors" 100 km in width which best support areas where grid expansion is needed whilst minimising the potential impacts to the environment.

The Power Corridors then underwent specialist scoping level environmental pre-assessment and were mapped according to levels of sensitivity (Very High, High, Medium and Low) for environmental aspects sensitive to grid infrastructure development including avifauna, terrestrial and aquatic biodiversity, heritage, visual impact and agriculture. Existing and planned land uses in conflict with grid infrastructure were also mapped including civil aviation and defence facilities and the Square Kilometre Array (SKA). Development protocols including the additional project level assessment requirements proponents will be subject to when applying for environmental authorisation inside of the corridors were also developed in consultation with specialists and relevant stakeholders (including competent authorities and the scientific community).

Based on the scoping level pre-assessment of the corridor areas and agreement amongst relevant competent authorities responsible for the approval permitting and licensing, electricity grid infrastructure projects proposed for inside of the Power Corridors will be subject to a Basic Assessment process in terms of NEMA. The assessment requirements to inform permitting/licensing in terms of additional legislation will be undertaken within the stipulated timeframes of the Basic Assessment process. Furthermore, and where applicable, integrated authorisation including environmental authorisation in terms of NEMA and authorisations/approvals related to other relevant legislation, will be awarded simultaneously by the relevant competent authorities.

Subsequent to being reviewed by the authorities represented on the Project Steering Committee (PSC), and key stakeholders represented on the Expert Reference Group (ERG), this report will be presented for Cabinet approval. The outputs of the SEA in the form of maps and Development Protocols will be put forward for adoption and released for public comments through publication in the *Government Gazette*. The gazetting process is envisaged to take place in 2016 and will also constitute the formal public consultation process on the outcomes of the SEA process.

CONTENTS

PART 3: SENSITIVITY MAPPING & DEVELOPMENT PROTOCOLS — PART 3, pg 6

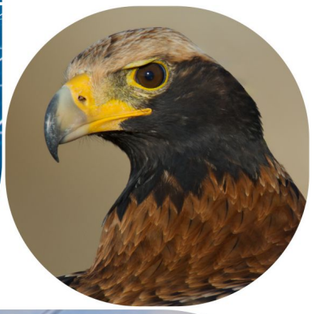
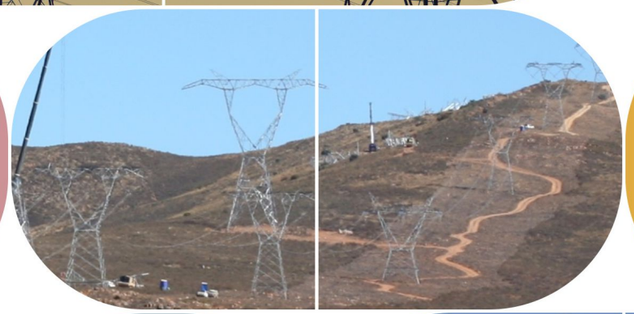
PART 4. PROCEDURE FOR ELECTRICITY GRID INFRASTRUCTURE ENVIRONMENTAL ASSESSMENT APPLICATIONS INSIDE THE POWER CORRIDORS — PART 4, pg 2

ABBREVIATIONS & ACRONYMS

AIA	Archaeological Impact Assessment
AM	Amplitude Modulation
Amafa	Heritage KwaZulu-Natal
ATNS	Air Traffic and Navigation Control Service
BA	Basic Assessment
BID	Background Information Document
BLSA	Birdlife South Africa
BRICS	Major emerging national economies of Brazil, Russia, India, China, and South Africa
BUSA	Business Unity South Africa
CBA	Critical Biodiversity Area
C-BASS	C-Band All Sky Survey
CD-NGI	Chief Directorate: National Geographic Information
CEF	Central Energy Fund
CGS	Council for Geoscience
CoGHSTA	Department of Co-operative Governance, Human Settlements and Traditional Affairs
CoM	Chamber of Mines
CRSES	Centre for Renewable and Sustainable Energy Studies
CSIR	Council for Scientific and Industrial Research
CV	Curriculum Vitae
CWAC	Coordinated Waterbird Counts
DAFF	Department of Agriculture, Fisheries and Forestry
dB(A)	A-weighted Decibels
DEA	Department of Environmental Affairs
DEADP	Western Cape Department of Environmental Affairs and Development Planning
DEDEAT	Eastern Cape Department of Economic Development, Environmental Affairs and Tourism
DEDECT	North West Department of Economic Development, Environment, Conservation and Tourism
DEM	Digital Elevation Model
DENC	Northern Cape Department of Environmental Affairs and Nature Conservation
DMR	Department of Mineral Resources
DoD	Department of Defence
DoE	Department of Energy
DoT	Department of Transport
DRDLR	Department of Rural Development and Land Reform
DST	Department of Sciences and Technology
DTEEA	Free State Department of Tourism, Environmental and Economic Affairs
DTI	Department of Trade & Industry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
EC	Eastern Cape
EC	Eastern Cape
eCRAG	Eastern Cederberg Rock Art Group
EGI	Electrical Grid Infrastructure
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EIUG	Energy Intensive User Group
EMF	Electromagnetic Fields
EMI	Electromagnetic Interference
EMPR	Environmental Management Programme Report
ERG	Expert Reference Group
ESA	Ecological Support Areas
ESMAP	World Bank Energy Sector Management Assistance Program
eTOD	Electronic Terrain and Obstacle Database
EWT	Endangered Wildlife Trust
Exco	Executive Committee
FA	Focus Area
FAQ	Frequently Asked Question
FEPA	Freshwater Ecosystem Priority Area
FM	Frequency Modulation
GA	General Authorisation
GAU	Gauteng
GCCA-2016	Generation Connection Capacity Assessment of the 2016 Transmission Network
GDP	Gross Domestic Product
GG	Government Gazette
GHI	Global Horizontal Irradiation
GIS	Geographical Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit / German Federal Enterprise for International
GN	Government Notice
GW	Gigawatt
ha	Hectare
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IAIA	International Association for Impact Assessment
IBA	Important Bird Areas
ICAO	International Civil Aviation Organisation
IDA	Infrastructure Development Act
IDC	Industrial Development Corporation
IDP	Integrated Development Plan
IDZ	Industrial Development Zone
IPP	Independent Power Producer
IRP	Integrated Resource Plan

J OP HQ	Joint Operational Headquarters
KCAAA	Karoo Central Astronomy Advantage Area
km	Kilometre
kV	Kilovolt
KZN	KwaZulu Natal
LEDS	Local Economic Development Strategy
LM	Local Municipality
m	Metres
MPRDA	Mineral and Petroleum Resources Development Act
MW	Megawatt
NASA	National Aeronautics and Space Administration
NBA	National Biodiversity Assessment
NC	Northern Cape
NCOP	National Council of Provinces
NDP	National Development Plan
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NFEPA	National Freshwater Ecosystem Priority Area
NGI	National Geo-spatial information
NGO	Non-Governmental Organization
NHRA	National Heritage Resources AcT
NID	Notification of Intent to Develop
NIP	National Infrastructure Plan
NPAES	National Protected Areas Expansion Strategy
NSDP	National Spatial Development Perspective
NW	North West
NWA	National Water Act
OEC	Obstacle Evaluation Committee
OSM	Open Street Maps
PAPER	Precision Array for Probing the Epoch of Re-ionisation
PES	Present Ecological State
PIA	Paleontological Impact Assessment
PICC	Presidential Infrastructure Coordination Committee
POI	Points of Interest
PPP	Public Participation Process
PSC	Project Steering Committee
PV	Photovoltaic
QDGC	Quarter Degree Grid Cells
RDB	Red Data Book
REDZ	Renewable Energy Development Zone
REFIT	Renewable Energy Feed-In Tariff
REI4P (or REIPPPP)	Renewable Energy Independent Power Producer Procurement Programme
RFI	Radio Frequency Interference
S&EIA	Scoping and Environmental Impact Assessment
SAA	South African Army
SAAF	South African Air Force
SABAP	South African Bird Atlas Project
SABAAP	South African Bat Assessment Advisory Panel
SABC	South African Broadcasting Corporation
SACAA	South African Civil Aviation Authority
SACAR	South African Civil Aviation Regulation
SACATS	South African Civil Aviation Technical Standard
SACNASP	South African Council for Natural Scientific Professionals
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SALA	Subdivision of Agricultural Land Act
SALGA	South African Local Government Association
SALT	South African Large Telescope
SAMHS	South African Military Health Services
SANBI	South African National Biodiversity Institute
SANDF	South African National Defence Force
SANEDI	South African National Energy Development Institute
SANParks	South African National Parks
SANS	South African National Standards
SAPAD	South African Protected Areas Database
SAPVIA	South African Photovoltaic Industry Association
SAREC	South African Renewable Energy Council
SARPs	Standards and Recommended Practices
SARPs	Standards and Recommended Practices
SASTELA	Southern Africa Solar Thermal and Electricity Association
SAWEA	South African Wind Energy Association
SAWS	South African Weather Services
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SED	Socio-Economic Development
SEF	Solar Energy Facility
SEZ	Special Economic Zone
SIP	Strategic Integrated Project
SKA	Square Kilometre Array
SKEP	Succulent-Karoo Ecosystem Programme
SMME	Small, Medium and Micro Enterprise
SOE	State Owned Enterprise
SPLUMA	Spatial Planning and Land Use Management Act
Spp	Species
SRTM	Shuttle Radar Topographic Mission
ToR	Terms of Reference
TV	Television
UCT	University of Cape Town
WC	Western Cape
WULA	Water Use License Application






PART 1

Background to the Electricity Grid Infrastructure Strategic Environmental Assessment

CONTENTS

FIGURES

PART 1. BACKGROUND TO THE ELECTRCITY GRID INFRASTRUCTURE STRATEGIC ENVIRONMENTAL ASSESSMENT

1.1 Introduction

The National Development Plan (NDP) and New Growth Path are the adopted blueprints for economic growth and job creation in South Africa up to 2020 and 2030, respectively. A fundamental component of these overarching plans is the National Infrastructure Plan (NIP) which aims to catalyse economic development and job creation through infrastructure development. 18 Strategic Integrated Projects (SIPs), largescale infrastructure projects located across all nine provinces, have been identified as central to the realisation of the NIP.

Inefficient processes and poor integration between government departments responsible for infrastructure related authorisations has resulted in significant backlogs to development in South Africa. To ensure that environmental authorisations are not a cause for delaying the roll-out of SIP projects, the Department of Environmental Affairs (DEA) has embarked on a programme of Strategic Environmental Assessments (SEAs) for infrastructure activities considered central to the realisation of the SIP programme. The intention of undertaking the SEAs is to identify optimal regions for sustainable infrastructure roll out and pre-assess environmental sensitivities within these areas to simplify the site specific environmental impact assessment (EIA) process for project level authorisation. The SEA aims to encourage development in areas of low environmental sensitivity as well as to focus the EIA processes on site sensitivities only.

The initial focus of the SEA programme has been on energy related SIPs. The first in a series, the wind and solar PV SEA, was commissioned in January 2013 in support of SIP 8: Greening the Economy. The SEA identified eight focus areas (referred to as Renewable Energy Development Zones or REDZs) where large scale wind and solar PV facilities can be developed under streamlined regulatory conditions that limit negative impacts to the environment.

The Electricity Grid Infrastructure (EGI) SEA, the basis of this report, succeeds the identification of the REDZs. The EGI SEA is closely aligned to SIP 10: Electricity Transmission and Distribution for all, and aims to provide guidance for the efficient and sustainable expansion of strategic electricity grid infrastructure in South Africa. The EGI SEA aligns itself closely with the wind and solar PV SEA to enable grid development in the REDZs and the appropriate evacuation of power generated from these areas.

The EGI SEA identified the optimal location for strategic corridors where transmission infrastructure expansion is needed to enable the regionalised balancing of future demand and supply requirements, whilst minimising negative impacts to the environment. The corridors are referred to as the "Power Corridors" and represent the transmission backbone of South Africa up to 2040. On the basis of the scoping level pre-assessment undertaken as part of the SEA, proposed transmission and distribution level infrastructure developments triggering either a Basic Assessment (BA) or Environmental Impact Assessment (EIA) process will benefit from improved environmental regulatory treatment inside of the Power Corridors.

Furthermore, the identification and official adoption of Power Corridors in terms of SIP 8 will give designation to these areas in terms of the Infrastructure Development Act (IDA) (Act No. 23 of 2014), thereby mandating the Presidential Infrastructure Coordinating Commission (PICC) to assist with streamlining the authorisation and implementation of transmission and distribution projects in the Power Corridors. The Spatial Planning and Land Use Management Act (SPLUMA) (Act 13 of 2013) compliments the IDA by giving National Government the authority to make decisions on planning applications deemed to be of national interest.

1.2 EGI SEA Rationale

A reliable transmission network with adequate capacity to meet customer needs is a fundamental condition for the provision of a reliable electricity supply in South Africa. To remain reliable, the transmission system requires not only maintenance, but must also be developed and expanded to meet changing electricity demand and energy generation requirements. A reliable transmission network and an effective process for enabling network expansion, is therefore critical to the realisation of development plans and services, including job creation, the provision of quality education and health care, and the upliftment of previously disadvantaged communities.

Eskom's current transmission grid is designed to transport the power generated in the large centralised coal generation pool in Mpumalanga, where it is closely accessible to dominant load centres in Gauteng and Kwa-Zulu Natal. The existing transmission grid is designed to deliver on this spatial arrangement.

South Africa is however in the process of diversifying its energy generation mix in response to the Integrated Resource Plan (IRP) 2010-2030. According to the revised IRP 2011, coal power will represent only 48% of South Africa's power needs by 2030, the majority of which is expected to be generated in the Limpopo Province. Furthermore, much of the new generation, including wind, solar, gas and nuclear, is likely to be located in the Northern, Western, South-Western and Southern areas of the country where conditions for development are more favourable. These distributional changes represent a fundamental shift in South Africa's future energy generation footprint and importantly have major implications for the current transmission grid in terms of energy flow. The exiting transmission grid is inadequate to integrate these changes. As a result, significant investment into the upgrade of transmission and sub transmission infrastructure is required. The shrinking evacuation capacity of the current grid network as a result of successful initiatives such as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), as well as the need to bring new generation options online to satisfy South Africa's current energy deficit, are further reasons why immediate expansion and long term investment into grid infrastructure is necessary.

The speed at which new generation assets can be built typically ranges between two to ten years, depending on the technology. The timeframes for renewable energy and gas projects are characteristically shorter than coal and nuclear, ranging between two to five years. Conversely, the time taken for Eskom to build a long transmission line to support the evacuation of electricity from a new generation asset is between six to ten years. The misalignment in development timeframes means that Eskom is often unable to respond fast enough to the connection requirements of new energy generation.

Long lead times to grid expansion can be attributed to two main factors, as follows:

1. *Protracted environmental authorisation and permitting process*
   For a major transmission route, it takes on average between three to four years for an EIA process to be completed in terms of the National Environmental Management Act (NEMA). For long power lines crossing many different land parcels, the risk of an appeal is high, which often results in significant delays in receiving the authorisation. Major routes often trigger additional environmental permitting requirements, such as Water Use Authorisation, each managed by a different Competent Authority under an independent authorization process. Only upon EIA authorisation do many of these additional authorising processes commence. This lack of integration between the different licensing processes means that it can take up to seven years for all the necessary environmental approvals to be awarded, before construction can start.

2. *Retroactive servitude negotiation process*
   The EIA process is important in the initial planning and route selection of new power lines. For this reason, it is common practice for the servitude negotiation process to begin after the EIA has been completed. At that stage there is greater confidence in the route to be adopted. The problem with this sequence of events however, is that the Environmental Authorisation (EA) locks the developer into a predefined route. Therefore, should a grid developer encounter an unwilling landowner during the servitude negotiation process, there is little to no flexibility to adapt the position of the route. In these instances, the developer is forced pay above market rate to the landowner for access to the servitude, undergo an expropriation process or reroute the line, the latter requiring an amendment to the EA, and all options resulting in increased costs and delays to the project.

To assist with resolving these problems, the DEA have undertaken the EGI SEA to better enable streamlined and integrated environmental authorisation for transmission and distribution infrastructure projects in areas (hereafter referred to as the Power Corridors) identified as strategically important from a grid development perspective. Furthermore, on the basis of scoping level environmental pre-assessment of the Power Corridors, the SEA seeks to enable pre-negotiation of servitudes and additional upfront investment in strategic areas in advance of project level environmental authorisation, thereby reducing the risk of delays during, and after, the environmental assessment process.

PROBLEM STATEMENT

Limited consideration by grid developers of environmental constraints in the early planning stages is proving costly (both environmentally and economically) and affecting the ability to make strategic investment decisions

1.3 Study Objectives

Significant expansion of the electricity grid is required to facilitate the introduction of future generation and load requirements in South Africa. In order for grid development to proactively satisfy future demand, strategic planning is necessary. A clear regional understanding of future demand allows for upfront strategic investment in backbone grid infrastructure, well in advance of specific project level requirements. The development and official adoption of Power Corridors demonstrates a long term commitment to grid investment and provides industry with the necessary assurance that grid dependent development will receive the required support in these areas. Therefore the identification of Power Corridors, which best represent the needs of industry and society whist satisfying the necessary supply and demand balance calculations, is crucial to their success. Furthermore, consideration must also be given to the realisation of tangible socioeconomic benefits and the avoidance of significant environmental impacts.

The Vision of the EGI SEA is that strategic electrical grid infrastructure is expanded in an environmentally responsible and efficient manner that responds effectively to the country's economic and social development needs. With this vision in mind, the following objectives were developed to guide the study:

- Sustainable Development

Sustainable development is a process for meeting societal development needs whilst maintaining the ability of natural systems to continue to provide the natural resources and ecosystem services upon which the economy and society depends. This SEA aims to facilitate sustainable development through the identification of a set of strategic corridors, which fundamentally serve the purpose of connecting future priority generation areas with load areas, but are positioned in such a way to maximise opportunities for economic and social development whilst minimising constraints to the environment. Development inside of the Power Corridors will be encouraged to proceed in areas of low environmental sensitivity.

- Participation

The identification of strategic corridors that meet the long term requirements of industry and society, but also consider factors such as financial cost and environmental constraints, requires inputs from a diverse group of stakeholders. Furthermore, the successful implementation of strategic planning initiatives requires the buy-in and commitment from a range of role players. Early consultation and formal agreement amongst stakeholders is thus central to the success of the SEA. From the onset of the SEA process, extensive consultation was undertaken with all three levels of government, the private sector, non-governmental agencies and the general public.

- Coordination

Legal recognition of the Power Corridors is required to facilitate effective implementation. This process should start with the formal adoption of the Power Corridors in terms of SIP 10 through a publication in the Government Gazette and end with the recognition of these areas within relevant national, provincial and local plans and policies. The alignment of the corridors across the relevant plans and policies of all three levels of governments will signify the high level agreement needed to facilitate effective implementation of the Power Corridors.

- Streamlining

In the context of this study, 'streamlining' means better coordination of environmental assessment procedures with the aim of reducing unnecessary administrative burdens, creating synergies and speeding up the environmental assessment process. 'Streamlining' does not imply a weakening of environmental protection requirements under NEMA. Instead, the outputs of the SEA are designed to improve the quality of the environmental assessment process and decision making; and better facilitate strategic grid development in the Power Corridors.

Agreement on and official adoption of the Power Corridors in relevant plans and policies should serve to create an enabling environment for the streamlining of environmental authorisations linked to grid infrastructure development. Furthermore, the environmental pre-assessment of the corridors undertaken as part of the SEA will serve to replace the scoping phase of a Scoping and Environmental Impact Assessment (S&EIA) and hence assist with focusing additional assessment requirements required in the environmental assessment process. As an output of the SEA, all future electricity grid infrastructure development inside of the Power Corridors triggering either a Basic Assessment (BA) or Environmental Impact Assessment process in terms of NEMA will follow a streamlined Basic Assessment process.

- Integration

The SEA seeks to achieve integration between the different competent authorities responsible for environmental authorisation and licensing. This will be facilitated through the creation and adoption of a commonly agreed upon 'Development Protocols'. The scope of the project level BA process in the Power Corridors will be informed by requirements specified in the development protocol, and undertaken in accordance with the relevant existing regulations. This will ensure that where separate environmental legislation requires separate assessments, those assessments and associated decision making processes should, as best as possible, be aligned with the respective BA procedure. Where possible, assessment and decision making procedures will also be integrated to maximise efficiencies. Integration will assist with streamlining processes.

- Facilitation of Strategic Investment

The integrated approach followed to identify Power Corridors, official agreement to these areas, and the alignment of policies and plans together with the pre-assessment work undertaken as part of the SEA, should help to create and enabling environment for electricity grid infrastructure development within the Power Corridors.

Streamlined and coordinated processes will ensure that development can take place more quickly. However, the provision of environmental

information at the earliest opportunity to inform route planning will also assist with identifying environmentally acceptable routes which should enable developers of grid infrastructure to make upfront strategic investment in these areas in advance of formal environmental approval. Also official adoption of the Power Corridors should assist developers with motivating for the necessary funding to enable grid expansion in the Power Corridors as well as serve as a commitment to industry that investment in grid development will be undertaken in these areas.

1.4 Legal Framework

The three key pieces of legislation that enable the identification and implementation of Power Corridors are summarised below:

1.4.1 National Environmental Management Act (NEMA), (Act No. 107 of 1998)

NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance, and procedures for coordinating environmental functions exercised by organs of state.

The SEA is undertaken under in terms of Section 24(2) of NEMA which allows for the identification of geographical areas (e.g. Power Corridors) based on environmental attributes, and specified in a spatial development tool adopted in the prescribed manner by the Competent Authority, in which specified activities may not commence without environmental authorisation from the Competent Authority. Sensitivity maps prepared as part of the SEA process give effect to Section 24(3) of NEMA that allows for the compilation of information and maps that specify the attributes of the environment that need to be taken into consideration by all Competent Authorities. The assessment requirements in the form of Development Protocols prepared through the SEA process further give effect to Section 24(5) of NEMA which allows for the laying down of procedures to be followed in respect of application for environmental authorisation and decision making as well as any matter necessary for dealing with and evaluating applications for environmental authorisation.

1.4.2 Infrastructure Development Act (Act No. 23 of 2014)

This act provides for the facilitation and co-ordination of public infrastructure development which is of significant economic or social importance to the country. It ensures that infrastructure development in the country is given priority in planning, approval and implementation. It furthermore ensures that the development goals of the state are promoted through infrastructure development and improves the management of such infrastructure during all life-cycle phases. The act designates SIP 10: 'electricity distribution and transmission for all' and gives the PICC the mandate to ensure that infrastructure development in respect of any SIP is prioritised. The official adoption of Power Corridors as geographical areas associated with SIP 10 will give effect to Sections 7 and 8 of this act and give the PICC the mandate to give priority to the planning, approval and implementation of distribution and transmission infrastructure in the Power Corridors.

1.4.3 Spatial Planning and Land Use Management Act (SPLUMA), (Act No. 16 of 2013)

SPLUMA as a framework act for all spatial planning and land use management legislation in South Africa seeks to promote consistency and uniformity in procedures and decision-making in this field. The other objectives of the act include addressing historical spatial imbalances and the integration of the principles of sustainable development into land use planning, regulatory tools and legislative instruments. Chapter 8 of the 2014 draft SPLUMA regulations prescribes the institutional, spatial planning, and land use management requirements for municipalities in whose jurisdiction a SIP has been designated. The designation of the Power Corridors as areas associated with SIP 10 will give effect to these regulations and mandate local government to take these areas into consideration in terms of local planning.

1.5 Process Overview

The process followed to identify and assess the Power Corridors is briefly summarised below and discussed in detail in Part 2.

1.5.1 Context

The SEA process attempts to add spatial context to national level policies, plans and programmes. In particular, it can be considered as a link between the objectives of the National Development Plan and the primary electricity grid infrastructure projects required to make this plan a reality. The SEA will allow for proactive investment in areas of low environmental sensitivity as well as faster and more coordinated permitting procedures. This will ensure that priority grid infrastructure projects are implemented more effectively, whilst maintaining the highest level of environmental assessment and protection.

It should be noted that the SEA process is undertaken at a strategic level and cannot replace the requirements for project level environmental assessment. The high level environmental, social and economic data utilised to identify the corridors and undertake environmental pre-assessment of the corridors, is not sufficient for project-level decision making. The SEA should therefore be considered as a scoping level exercise used to identify key potential impacts. Additional assessment will be necessary at a project level, together with effective public participation, to determine the significance of impacts and inform environmental authorisation.

1.5.2 Eskom Preliminary Corridors

A set of 100 km wide preliminary corridors was the starting point of the SEA. The preliminary corridors were identified by Eskom and are based on the results of a detailed Eskom Strategic Grid Plan Study. The study considered a number of possible future generation and load scenarios, and in so doing, identified the need for five national transmission infrastructure corridors to facilitate the balancing of South Africa's electricity supply and demand needs up to 2040. The corridors are orientated on a number of strategic anchor points (substations) identified by Eskom as critical future load injection points.

The corridors and substations are illustrated in Figure 1. The corridors are titled as follows:

- The Eastern Corridor
- The Western Corridor
- The Northern Corridor
- The Central Corridor
- The International Corridor

1.5.3 Phase I: Constraints Mapping

As illustrated in Figure 2, the SEA process consisted of four phases. A brief summary of the two tasks undertaken as part of Phase I is provided below while a more detailed description is provided in Part 2: Section 1.

Phase I involved identifying key constraints to electricity grid infrastructure development. Two categories of constraints where identified: 'environmental constraints' and 'engineering constrains'. Environmental constraints in the context of this process were regarded as environmentally sensitive features which may be negatively impacted by grid development, such as protected areas, known bird areas or wetlands. Sensitive environmental features also included future planned land uses sensitive to grid development such as the Square Kilometer Array (SKA) and civil aviation assets. Engineering constraints are environmental features which impact upon the development of electricity grid infrastructure. These are features which developers preferably avoid when planning a power line development due to the increased cost of constructing and or maintaining grid infrastructure in these areas, such as sugar cane fields and steep slopes. Dedicated national scale environmental and engineering constraints maps highlighting areas of sensitivity across four tiers (Very High, High, Medium and Low) were developed as outputs from Phase I.

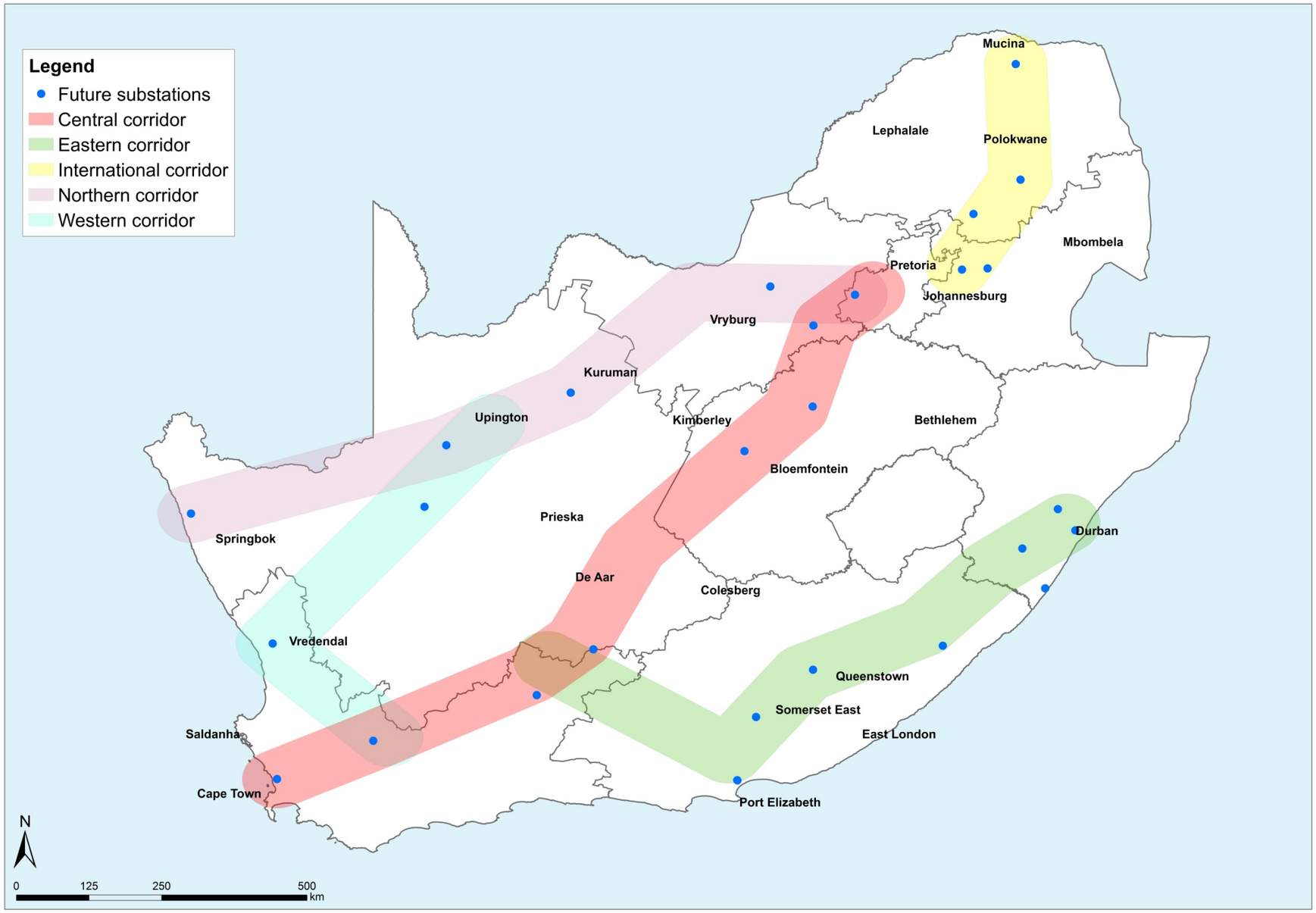


Figure 1: Eskom Preliminary Corridors

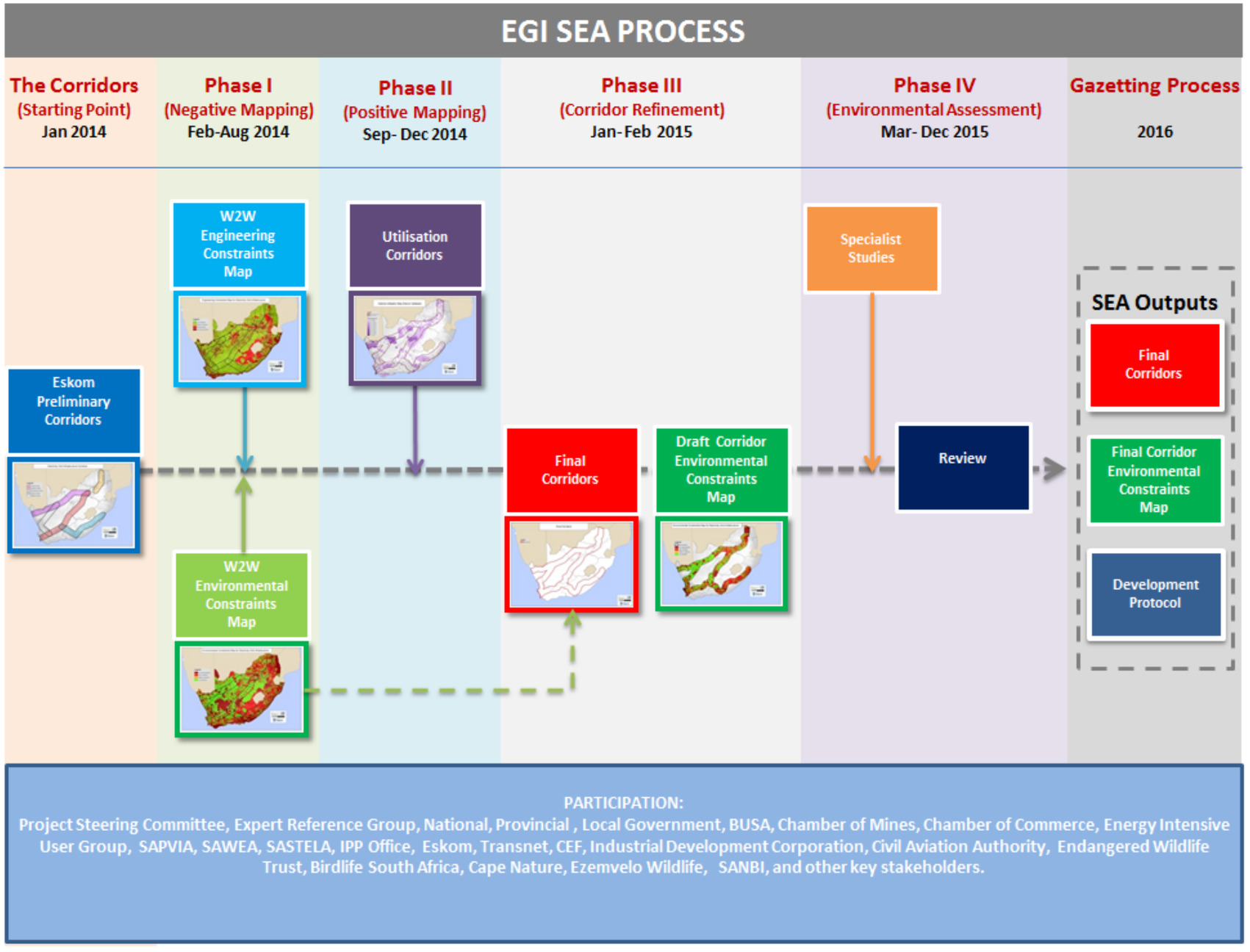


Figure 2: EGI SEA Process

1.5.4 Phase II: Utilisation Corridors

Phase II involved identifying areas both inside and adjacent to (within a 25km buffer either side of) the preliminary corridor boundaries where transmission infrastructure development might be best utilised. Utilisation was considered from both a bulk load and bulk generation perspective. Information was gathered from a range of sources including national, provincial and local government spatial planning documentation. This was supplemented with information gathered through consultation with government and industry on spatial plans for load and generation activities. Utilisation was represented spatially in terms of load and generation potential scored in Megawatts at a 10 km by 10 km grid cell resolution. The position of the preliminary corridors was then digitally enhanced to maximise overlap with areas of highest utilisation potential. The output of this exercise was a refined set of corridors, referred to as Utilisation Corridors, which best represent where transmission infrastructure might be best utilised in the future. The refinement of the corridors was undertaken without compromising linkages to critical anchor points.

1.5.5 Phase III: Pinch Point Analysis

Phase II involved overlaying the Utilisation Corridors with the constraints mapping outputs from Phase I to determine whether any pinch points, significantly constrained areas, exist at any position within the corridors. A complete pinch point was defined as point within the Utilisation Corridors where no clear power line routing opportunities exist without having to traverse an area delineated as Very High sensitivity from either an environmental or engineering perspective. Partial pinch points, instances where fewer than five unique routes through different land parcels without having to traverse an area delineated as Very High sensitivity, were also identified.

In the event of a complete or partial pinch point, the area outside and immediately adjacent to that point in the corridor was considered from an environmental and engineering constraints perspective. Where relief (less sensitive area) was shown to be present, and without compromising the intersection of the corridors with the key anchor points, the corridor boundary was shifted in the direction of relief. Where no obvious relief was shown to be present, the position of the corridor remained unchanged. The output from this process was a final set of corridor positions i.e. the Power Corridors, which represents areas of highest demand for grid infrastructure without compromising on the environment.

The national environmental constraints map from Phase I was the reduced to the extent of the Power Corridors to produce a draft environmental constraints map for the Power Corridors. This map was carried through to Phase IV.

1.5.6 Phase IV: Scoping Level Pre-assessment

Phase IV of the study involved scoping level pre-assessments and sensitivity mapping in each of the Power Corridors. Specialists were required to review, validate and enhance the draft environmental constraints map for a range of environmental aspects including agriculture, visual impact, heritage, terrestrial and aquatic biodiversity, avifauna and socio economic. The spatial sensitivity of further aspects including aviation, defence, and SKA were determined in consultation with the relevant authorities. Sensitivity maps were produced for all but the socio-economic assessment. The results were used to develop further assessment requirements in the form of Development Protocols that will inform project level environmental assessments and authorisation processes.

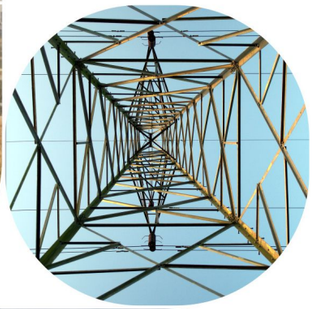
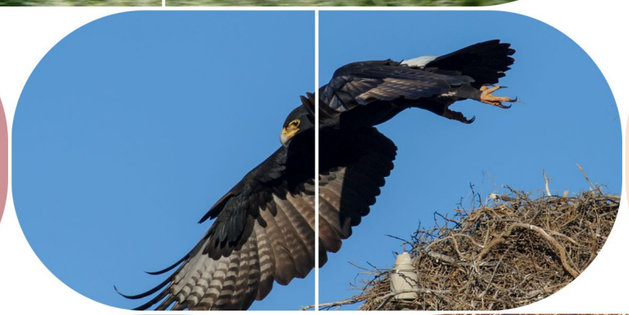
1.6 EGI SEA Report Structure

The report comprises five parts. Parts 1 to Part 3 describe the approach and outputs of the EGI SEA process. Part 4 of the report describes the process for utilising the SEA outputs to plan strategically including the role of key stakeholders (developers, EAPs Competent and Commenting Authorities) in the context of the proposed streamlined Basic Assessment process. Part 5 introduces a generic power line and substation construction Environmental Management Programme for standardising the prevention and mitigation of potential impacts as a result of power line and substation construction.

PART 1	PART 2	PART 3	PART 4	PART 5
	SEA DEVELOPMENT		SEA IMPLEMENTATION	
BACKGROUND	**IDENTIFICATION OF POWER CORRIDORS**	**SENSITIVITY MAPS AND DEVELOPMENT PROTOCOLS FOR POWER CORRIDORS**	**APPLICATION PROCESS INSIDE POWER CORRIDORS**	**ENVIRONMENTAL MANAGEMENT PROGRAMME FOR CONSTRUCTION**
• SEA rationale • Objectives of SEA • Legal Framework • Process overview	• Eskom Preliminary corridors • Constraints Mapping • Utilisation Mapping • Corridor Refinement • Power Corridors • Consultation Process	• Specialist studies • Consultation • Sensitivity Maps • Development Protocols	• Screening • Specialist inputs • Basic assessment • Post-Authorisation	• Specialist site walk through • Final line profile • Update construction EMPR • Implement

Figure 3: EGI SEA Report Structure



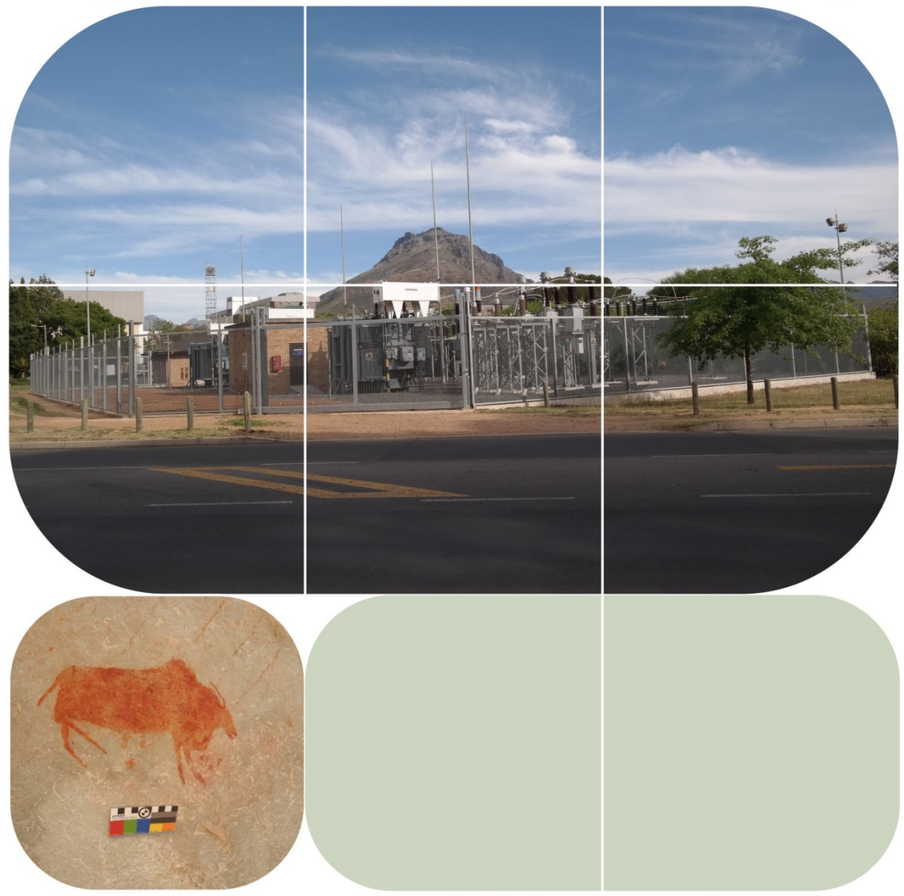






PART 2

Identification of Power Corridors

CONTENTS



TABLES

MAPS

PART 2. IDENTIFICATION OF POWER CORRIDORS

2.1 Introduction

This section of the report describes the process undertaken to identify the Power Corridors. The Power Corridors are founded on a set of five corridors, referred to as Preliminary Corridors in this report, identified on the back of the Strategic Grid Plan Study 2040 undertaken by Eskom Holdings Limited in 2013. The SEA undertook to refine the positions of the Preliminary Corridors to ensure optimal placement in support of sustainable development. The approach undertaken for refining the corridors was developed in line with the context and study objectives described in Part 1 of the report. The approach is broadly based on an integrated spatial analysis of the best available data at the time. The process of refining the Preliminary Corridors consisted of three phases. Phase I involved negative mapping to determine areas of environmental and engineering constraint in the context of electricity grid development. By the completion of Phase II the Preliminary Corridors had been refined to best represent areas where transmission grid expansion might support the unlocking of future development. Phase III modified the corridor positions further to minimise the occurrence of environmental and engineering constraints inside of the corridors. The output of Phase III was the final corridor positions, referred to as the Power Corridors.

2.2 Identification of Preliminary Corridors

The Eskom 2040 Strategic Grid Plan Study was undertaken to determine the requirements of the future transmission grid to accommodate the expected demand needs and the potential impact of future generation scenarios. Three generation scenarios were considered, including:

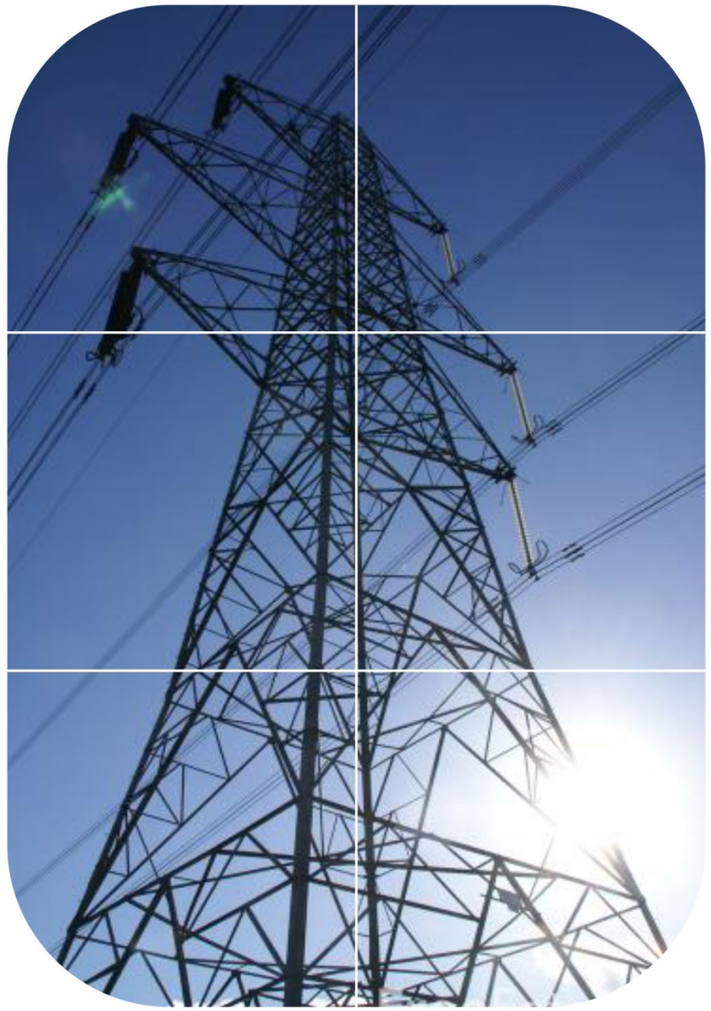
- 2010-2030 Integrated Resource Plan (IRP) base scenario (extended to 2040), which assumed that the contribution of coal to South Africa's energy mix would be fixed at the 2030 level with the balance of energy generation proportionally the same as the 2030 energy mix;
- Increased renewable energy scenario, which assumed that the nuclear power generation component of the IRP (9600MW) is replaced with baseload renewable energy generation equivalent in the form of Concentrated Solar Power generation with storage capacity;
- Increased imports scenario, which assumed a doubling of imported power by the year 2030 and with equivalent reductions in the contributions from coal and nuclear.

The study examined the long term balance between the demand and supply of electricity for provinces and within the provinces for each generation scenario. Through these calculations the likely power transfer capacities between different network areas was projected. The results indicated that by 2040, for all three scenarios and combinations thereof, power needs to be evacuated from the Limpopo, Eastern, Northern and Western Cape provinces and transported to major load centres, namely the Gauteng, North West, Kwa-Zulu Natal and Mpumalanga provinces. These findings differ significantly from the current interprovincial electricity flow requirements where the majority of South Africa's power requirements are generated in Mpumalanga in close proximity to major load centres in Gauteng and Kwa-Zulu Natal. In order to integrate these changes it will be necessary to create a new transmission backbone across South Africa. The study specifically identifies the need for five major corridors where grid reinforcement or the creation of new lines and substations will be necessary. Theses corridors are:

- Western Corridor
- Northern Corridor
- International Corridor
- Central Corridor
- Eastern Corridor

Eskom anticipates that a number of new transmission lines (≥ 400kV) and substations will be required within each of the corridors. The precise number of lines will be dependent on which generation scenario unfolds. The five corridors are collectively referred to as the Preliminary Corridors in the context of the SEA. The Preliminary Corridors as well as the positions of planned new/upgrades to existing Eskom substations is illustrated in Map 1. The substations are considered anchor points[1] in the context of the SEA process. Therefore any refinement to the position of the corridors undertaken as part of the SEA process was done within the parameters of the anchor points. The Preliminary Corridors and associated substations represent the starting point of the SEA process. The corridors are 100 km wide to allow for the consideration of multiple routing alternatives within the corridors.

[1] Any positional change made to the corridors must not compromise the intersection of the corridors with the fixed position of the substations.



2.3 Phase I - Constraints Mapping

Constraints refer to environmental features which grid developers seek to avoid, where possible, due to the additional time and cost incurred when developing infrastructure in these areas. In the context of the constraints mapping exercise, constraints were mapped according to two categories, namely environmental constraints and engineering constraints.

2.3.1 Environmental Constraints

Environmental constraints in the context of the study refer to environmental features negatively impacted by the construction and or maintenance of electricity grid infrastructure. The mapping exercise was undertaken for the entire country and involved identifying high level environmental constraints for electricity grid infrastructure development based on the best available data at a national scale. The identification of sensitive features, applicable buffers and datasets was undertaken in consultation with the relevant authorities and key stakeholders. In instances where data for certain environmental aspects was not available (e.g. birds and bats) indicative sensitive areas were provided by relevant key stakeholders (e.g. BirdLife South Africa and the Endangered Wildlife Trust) in consultation with the specialist fraternity. Further environmental constraints considered during the analysis included various environmental features such as protected areas, wetlands and recognised heritage sites. Also included were existing and future conflicting planned land uses such as agriculture, civil aviation facilities and the Square Kilometre Array (SKA). Projects which encroach upon these features are considered more likely to encounter delays, appeals or a negative decision for environmental authorisation.

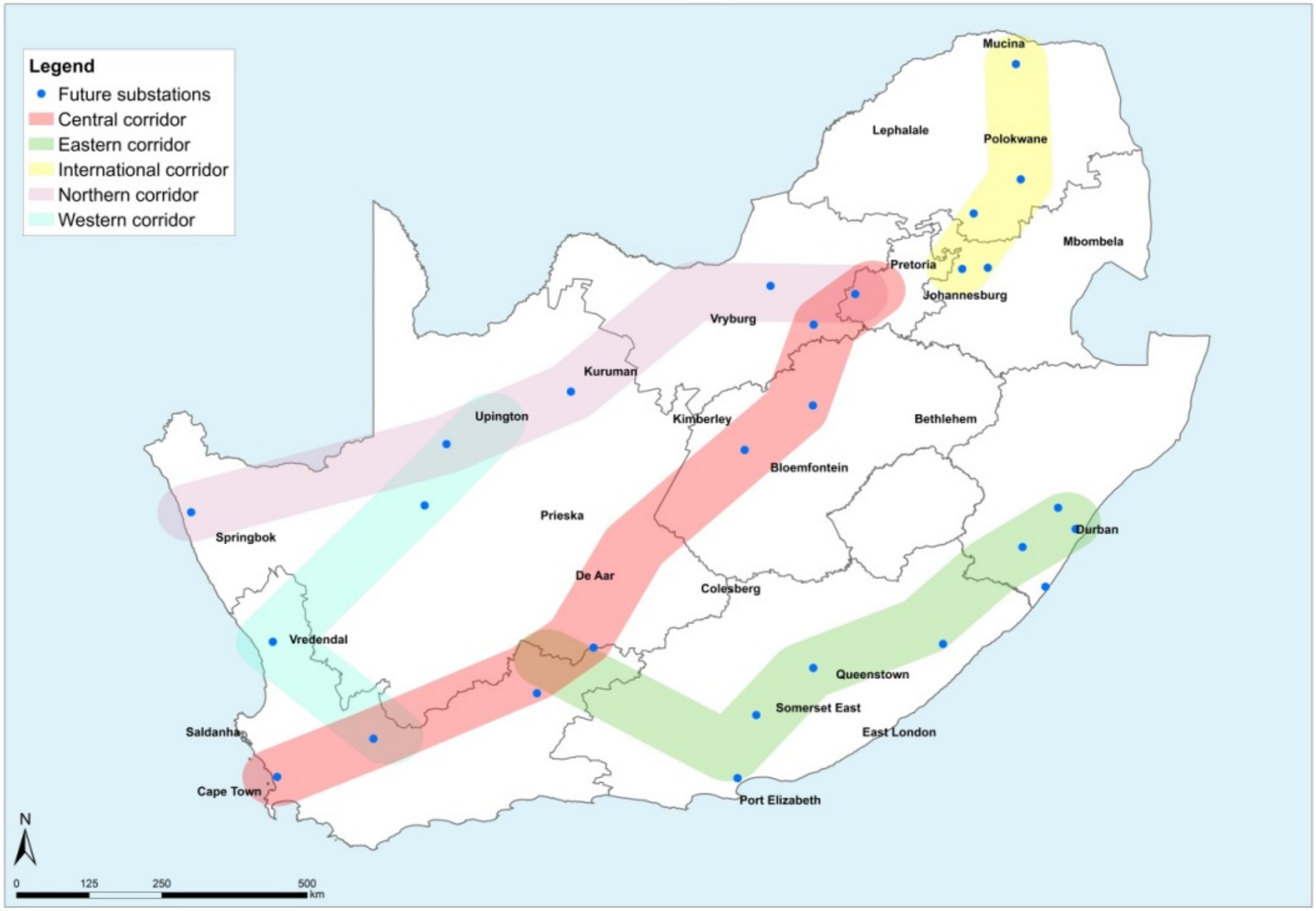
2.3.2 Engineering Constraints

Engineering constraints in the context of the SEA refers to technical challenges posed by the landscape and surrounding environment to the construction and operation of electricity grid infrastructure. The mapping exercise was undertaken for the entire country and based on the best available data at a national scale. The identification of features and delineation of constraint level (sensitivity) for each engineering feature was done in consultation with the Eskom Line Engineering team. Typical engineering related features include steep slopes, coastal areas and pivot agriculture. The level of engineering constraint attributed to each engineering constraint feature (f_n) was determined according to a crude cost assessment. The cost assessment considered the impact of each feature on an optimal cost effective Baseline Scenario (BS) (x). The BS in this instance was the construction and maintenance of a 1 X km 400 kV power line in optimal conditions for construction. Therefore by introducing each engineering feature into the BS individually, the impact of each feature on the BS was determined.

Level of constraint (c) associated with a feature in the context of the BS (x) was therefore represented as $(c) = (x)*(f_n)$.

2.3.3 Constraints Criteria

The list of features, buffers and associated level of constraint (Very High, High, Medium and Low) as well as the originating datasets used to map environmental and engineering constraints at a national scale are detailed in Table 1.



Map 1: Preliminary Corridors and substations

Table 1: Features and datasets used to prepare high level environmental and engineering constraints map

Feature Category	Feature	Dataset	Extent	Environmental Constraint	Engineering Constraint	Buffer	Buffer Constraint
Terrestrial Features							
Protected Areas DEA	Forest Act Protected Areas	DEAs protected area/ conservation areas data set 2014	National	Very High	Not Applicable	5 km	Medium
	Local Nature Reserves			Very High	Not Applicable	1 km	Medium
	Marine Protected Areas			Very High	Not Applicable	None	Not Applicable
	Mountain Catchment Areas			Medium	Not Applicable	None	Not Applicable
	National Botanical Gardens			Very High	Not Applicable	1 km	Medium
	Protected Environment			Medium	Not Applicable	None	Not Applicable
	Provincial Nature Reserves			Very High	Not Applicable	5 km	Medium
	Special Nature Reserves			Very High	Not Applicable	1 km	Medium
	National Parks			Very High	Not Applicable	10 km	Medium
Protected Areas Expansion	National protected areas (focus areas) for possible expansion	(NPAES) focus areas	National	Medium	Not Applicable	None	Not Applicable
Ramsar sites	All	RAMSAR, 2013	National	Very High	Not Applicable	5 km	Medium
Critical Biodiversity Areas (CBAs)	All	SANBI/Provinces2014	National	High	Not Applicable	None	Not Applicable
Listed Threatened Terrestrial Ecosystems	Critically Endangered and Endangered Ecosystems (Criterion A, C and F only)	SANBI Listed Threatened Ecosystems 2011	National	High	Not Applicable	None	Not Applicable
Natural Forest	All	DAFF Forest types	National	Very High	Not Applicable	1 km	Medium
Thicket	All	Albany Thicket, SANBI vegetation map, 2006	National	Very High	High	None	Not Applicable
Biosphere Reserve DEA	Core	DEAs protected area/ conservation areas data set 2014	National	Very High	Not Applicable	Non-core areas	Medium
Aquatic Features							
Wetlands	Wetland FEPAs	NFEPA wetlands data 2010	National	Very High	Very High	None	Not Applicable
	Wetland non-FEPAs			Very High	Very High	None	Not Applicable
Major Dams	All	DWA dams data	National	Medium	Very High	None	Not Applicable
Estuaries	Estuaries- Priority and non-Priority estuaries	NBA 2012 Estuaries layer	National	Very High	Very High	None	Not Applicable
Birds	Important Bird Areas	BirdlifeSA - March 2013	National	Very High	Not Applicable	None	Not Applicable
Bats	Major Bat Roosts (> 500 bats)	EWT – July 2014	National	Very High	Not Applicable	3 km	Very High
Heritage Features							
World Heritage Sites	None	SAHRA	National	Very High	Not Applicable	5 km	Very High
Battlefields	None`	SAHRA	National	Very High	Not Applicable	5 km	Very High
Other Heritage Sites	None	SAHRA	National	Very High	Not Applicable	1 km	Very High
Land Use Features							
Field Crop Boundaries	Pivot agriculture (pivots >500 m radius)	Agriculture Field Crop boundary data 2013	National		Very High	None	Not Applicable
	Vineyards and orchards	Agriculture Field Crop boundary data 2013	National	Very High	Very High	None	Not Applicable
	Sugar Cane	KZN land cover 2011 sugar cane farming and emerging farming data	KZN	Not Applicable	High	None	Not Applicable
Commercial Forestry	All (private and state owned)	Data on commercial forestry provided by DAFF in June 2014	National	Not Applicable	High	None	Not Applicable
	Forestry potential	EC Parks and Tourism Agency 2014	EC	Not Applicable	Medium	None	Not Applicable
Private Reserves, Game farming and	All	Provincial game farm data.	All provinces	High	Not Applicable	None	Not Applicable

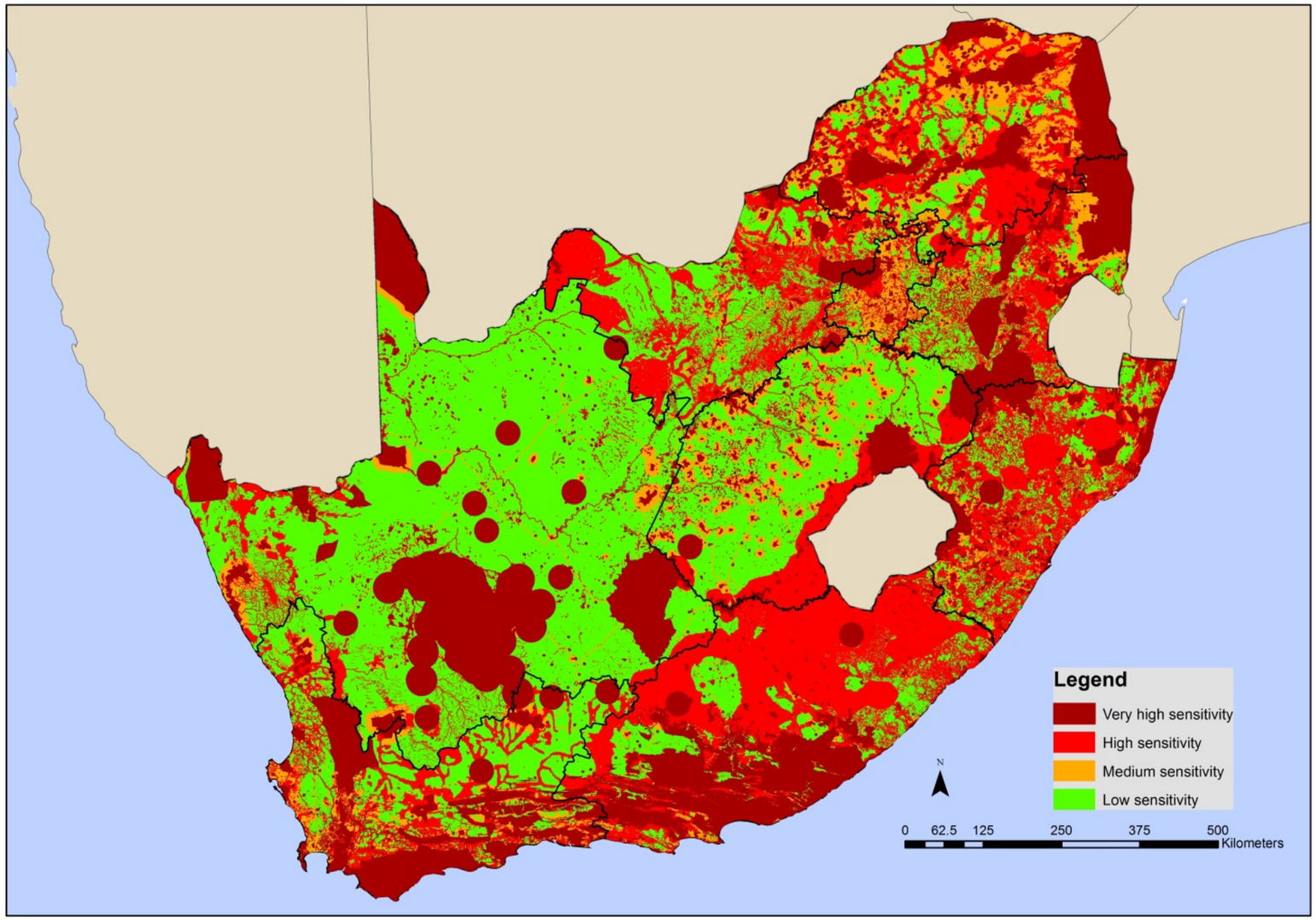
Feature Category	Feature	Dataset	Extent	Environmental Constraint	Engineering Constraint	Buffer	Buffer Constraint
hunting areas			excl. G + L				
Square Kilometer Array	Telescope Sites	SKA	National	Very High	Not Applicable	20 km	Very High
Urban areas and high density rural settlements	Grid cells containing ≥ 3 dwellings.	Eskom SPOT Building Count, 2013 (100 m x 100 m grid cell resolution).	National	Not Applicable	Very High	None	Not Applicable
Railway	All	DRDLR Topo, 2006	National	Not Applicable	Medium	800 m	Not Applicable
Water use licence agreements	Rivers and wetlands buffered by 500 m	NFEPA river and wetland data	National	Not Applicable	High	None	Not Applicable
Airports	Major Airports	DRDLR 50k Topo, 2006	National	Very High	Not Applicable	8 km	Very High
	Landing Strips			Very High	Not Applicable	2 km	Very High
Defence	Airforce Bases	SANDF 2015	National	Very High	Not Applicable	8 km	Very High
	High Sites	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Military Bases	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Military Facilities	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Shooting Ranges	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Military Training Areas	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Ammunition Depots	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
	Naval Bases	SANDF 2015	National	Very High	Not Applicable	1 km	Very High
Mining Rights DEA	Active or historical mines	DEA 2012 via CGS	National	Not Applicable	Very High	None	Not Applicable
Technical Features							
High incidence for lightning strikes	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	Medium	None	Not Applicable
High incidence for fire	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	Medium	None	Not Applicable
High incidence for wind	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	Medium	None	Not Applicable
High incidence for flooding	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	Medium)	None	Not Applicable
High incidence for snow conditions	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	High	None	Not Applicable
High incidence for pollution	Highest 10% risk areas	Eskom, July 2014	National	Not Applicable	High	None	Not Applicable
Coast (including estuaries)	Coastline & Estuaries	SANBI 2004	National	Not Applicable	Very High	10 km	Very High
Slope	(>45◦)	RSA 30m ASTER DEM, 2014, from USGS	National	Not Applicable	Very High	None	Not Applicable
Access	(nearest mapped road >2 km from site)	Eskom	National	Not Applicable	High	None	Not Applicable
Geology and Soils	Dolomite	CGS, 1997	National	Not Applicable	Very High	None	Not Applicable
	Gully Erosion	DAFF gully erosion data sets where erosion/ gully footprint is bigger than 500 m^2	National	High	High	None	Not Applicable
	Soil Erodibility	DAFF soil erosion hazard classes South Africa and Lesotho, 2010	National	High	High	None	Not Applicable

2.3.4 Constraints Maps

The constraints mapping outputs were developed at a national scale for both environmental and engineering constraints. The four tiered environmental constraints map and the interpretation of each tier of constraint is illustrated in Map 2 and Table 2, respectively.

Table 2: Environmental constraints interpretation

Environmental Constraints	
Constraint	**Description**
Very High	The area is rated as extremely sensitive to the negative impact of electricity grid infrastructure development. As a result the area will either have very high conservation value, very high existing/ potential socio-economic value or hold legal protection status.
High	The area is rated as being of high sensitivity to the negative impact of electricity grid infrastructure development. As a result the area will either have high conservation value and or existing/potential socio-economic value.
Medium	The area is rated as being of medium sensitivity to the negative impact of electricity grid infrastructure development. As a result the area will either have medium levels of conservation value and/or medium levels of existing/potential socio-economic value.
Low	Area is considered to have low levels of sensitivity in the context of electricity grid infrastructure development.

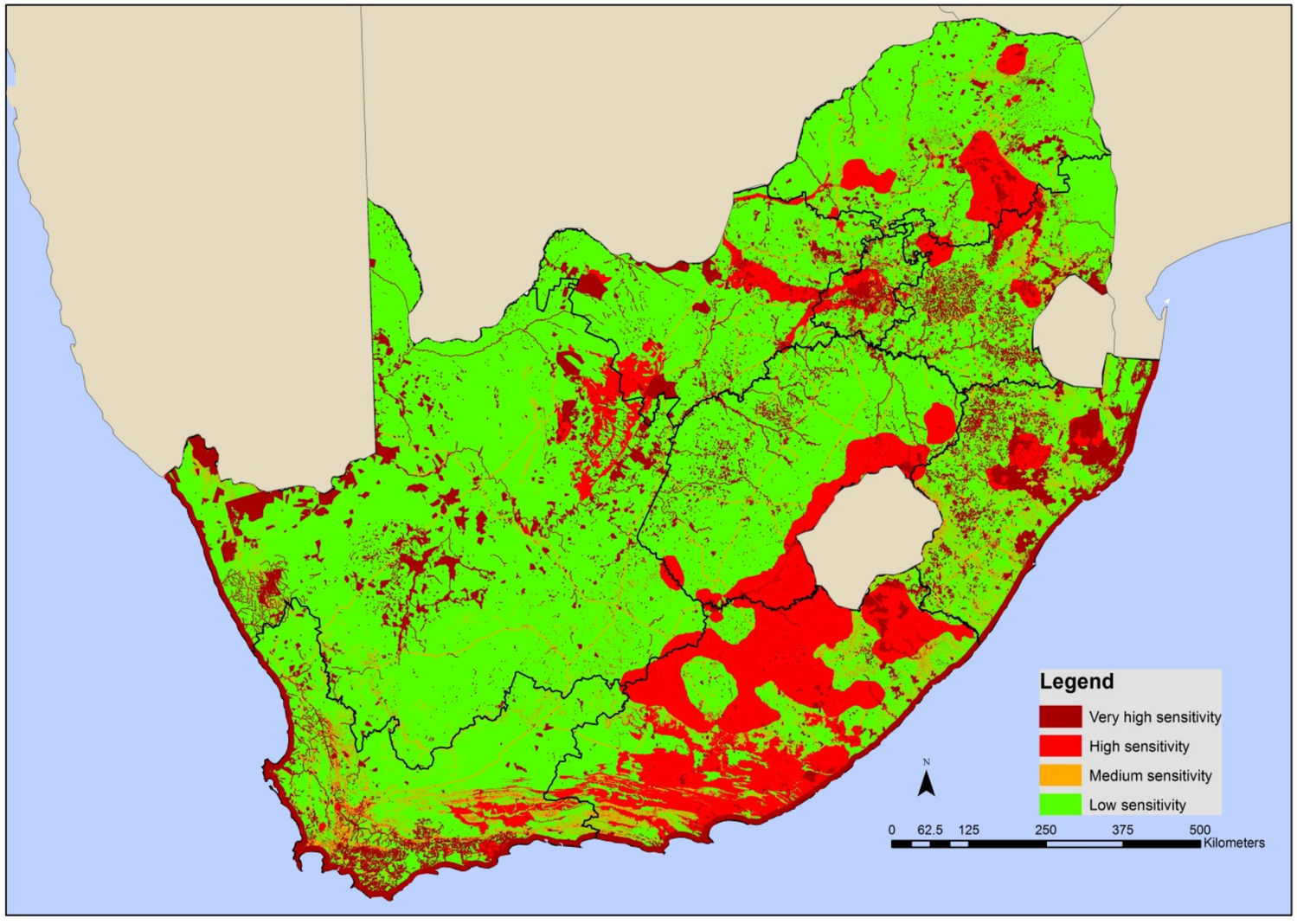


Map 2: Environmental constraints map

The four tiered engineering constraints map and the interpretation of each tier of constraint is illustrated in Map 3 and Table 3, respectively.

Table 3: Engineering constraints interpretation

Engineering Constraints		
Constraint	**Description**	**Feature Cost**
Very High	The lifetime cost associated with development in this area is greater than 175% the baseline lifetime cost index.	c=>1.75x
High	The lifetime cost associated with development in this area is between 150% and 175% the baseline lifetime cost index.	c=>1.5x and ≤1.75x
Medium	The lifetime cost associated with development in this area is between 120% and 150% the baseline lifetime cost index.	c=1.2x and ≤ 1.5x
Low	The lifetime costs associated with development in this area is less than 120% times the baseline lifetime cost index.	c =<1.2x



Map 3: Engineering constraints map

2.3.5 Provincial Government Consultation

Following the delineation of the engineering and environmental constraints map, a dedicated consultation process with provincial authorities was undertaken to discuss the proposed corridors and their alignment with provincial and regional planning. The opportunity was also used to identify additional information and potential concerns from provincial departments that needed to be taken into consideration going forward. Six workshops were hosted at the relevant department's provincial offices and were undertaken from May to June 2014. The outcomes of these workshops are discussed in Appendix B: *Consultation Process*.

2.4 Phase II – Utilisation Mapping

Phase III involved quantifying and mapping grid utilisation potential both inside and immediately adjacent to the Preliminary Corridors. The aim of this process was to determine where investment into the expansion and reinforcement of transmission infrastructure might be best utilised. Utilisation in the context of this study refers to the productive 'use' of transmission infrastructure. Transmission infrastructure supports the evacuation of electricity away from where it is generated and the delivery of electricity to where it is needed. Therefore in order to understand where transmission infrastructure might be best utilised it was important to consider the future energy generation potential and electricity demand requirements of areas in the context of the Preliminary Corridors. The spatial mapping of future energy generation and electricity demand potential was based primarily on the future development plans of government and industry. The separate mapping outputs for energy generation potential and electricity demand were then synthesised to create a composite map illustrating electricity grid infrastructure utilisation potential. The spatial mapping of energy generation potential and electricity demand was undertaken at a 10 km x 10 km grid cell resolution and measured according to 50 MW increments.

The focus area for the utilisation mapping process was the Preliminary Corridors plus a 25km area either side of the corridor boundaries. The focus area is referred to as the Buffered Corridors (Refer to Map 4). Spatial data gathering on generation and electricity demand potential within the Buffered Corridors was undertaken. Additional spatial information on key strategic development areas outside of the Buffered Corridors was also captured[2]. Based on data gathered, the Preliminary Corridors were refined to overlay areas of highest utilisation potential.

2.4.1 Spatial Energy Generation Layer

Data for the energy generation layer mapping process was obtained from three sources including industry consultation, active renewable energy environmental impact assessment applications and the REDZs.

2.4.1.1 Industry Consultation Layer

Due to the competitive nature of the renewable energy industry in South Africa, much data and knowledge exist in the private sector that cannot be made available for public studies such as this SEA. In order to afford the industry an opportunity to provide inputs, without having to actually disclose such information publically, an appropriate consultation process was designed.

The consultation process consisted of a survey including a map of the Buffered Corridors represented at a 10 km x 10 km grid cell resolution. A questionnaire was distributed to the members of the South African Wind Energy Association (SAWEA), the South African Photovoltaic Industry Association (SAPVIA), South African Solar Thermal and Electricity Association (SASTELA) and any other renewable energy developers registered as stakeholders in the SEA process. A commitment was made that all individual submissions by developers would be treated as confidential while the aggregated results would be used for the study. Eskom Holdings Limited was also given the opportunity to provide inputs.

Each developer was requested to select up to 15 grid cells where grid expansion should be prioritised inside the Buffered Corridors to support plans for renewable energy development in these areas. Developers were afforded the opportunity to select an additional five grid cells outside of the Buffered Corridors as well. Upon selection of each grid cell developers were required to indicate the generation potential of the selected cell in MW. In total eight developers from the wind industry, seven developers from the solar photovoltaic (PV) industry and two developers for the concentrated solar power industry submitted questionnaire responses for inclusion in the analysis.

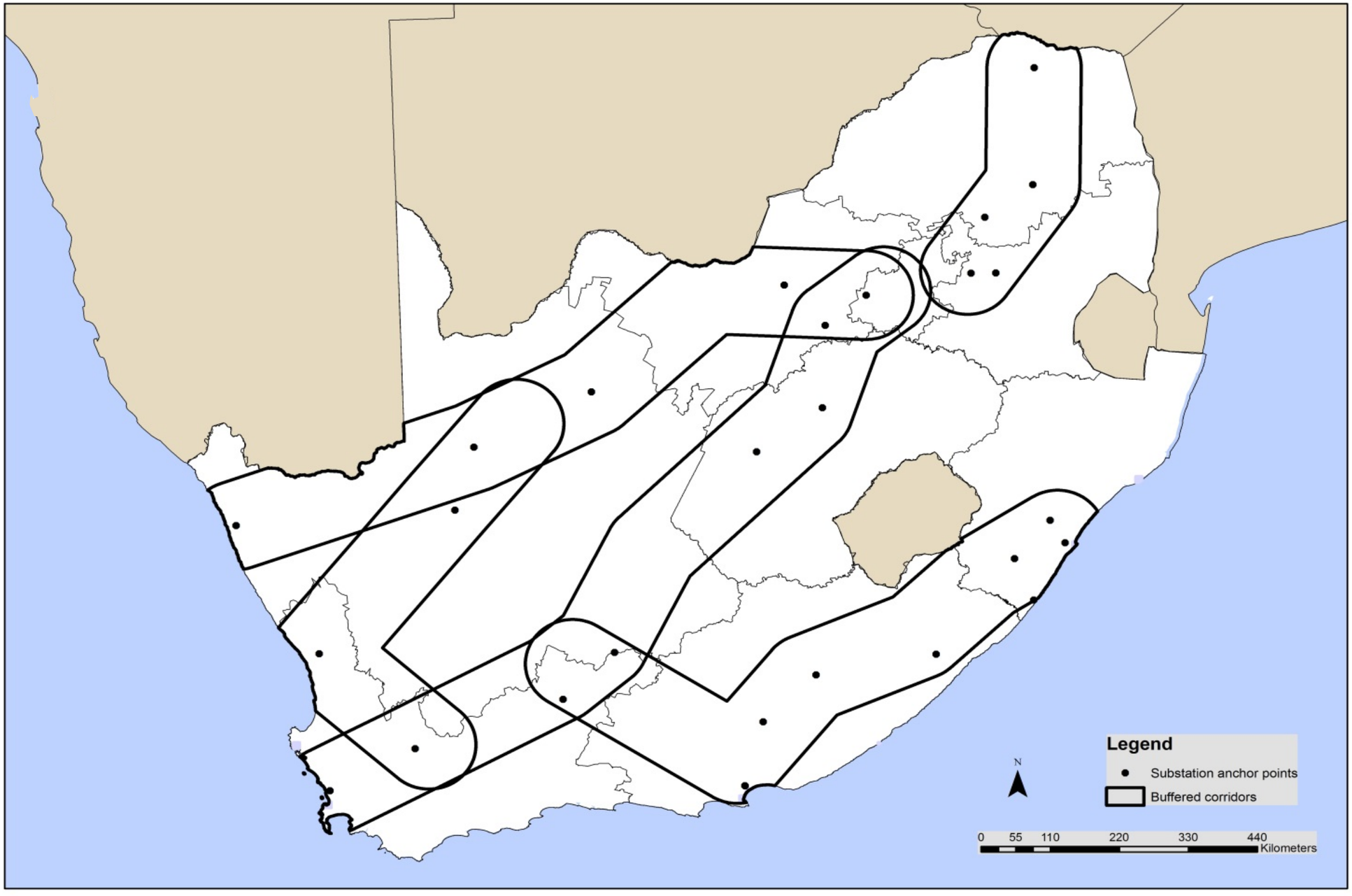
2.4.1.2 Renewable Energy Environmental Impact Assessment Applications Layer

Data captured through the consultation process was supplemented with information on developer project plans made available through renewable energy environmental impact assessment applications. In total 680 active applications were considered for all types of renewable energy technologies where applications for environmental authorisations had been submitted. Information on the spatial location, technology type and generation capacity (in MW) of each application, was recorded. This was, in turn, represented at a 10 km x 10 km grid cell level.

2.4.1.3 Renewable Energy Development Zones Layer

The overall evacuation capacity in MW for wind and solar PV development within each REDZ was calculated using the recommended wind and solar PV development density limits proposed by the landscape specialist study as a guideline for development inside the REDZ. The estimation of the wind and solar PV development capacity assumed that the same land is available for both types of development. In order to avoid double counting when estimating the overall combined development capacity for each proposed REDZ it was necessary to make assumptions with regard to what portion of the available land potentially could be used for each technology. The estimated development capacities for wind and solar PV were then adjusted accordingly before estimating the overall combined development capacity for each REDZ. Assuming a uniform development capacity at all positions within each REDZ, it was possible to calculate and map evacuation capacity for each REDZ at a 10 km x 10 km spatial resolution.

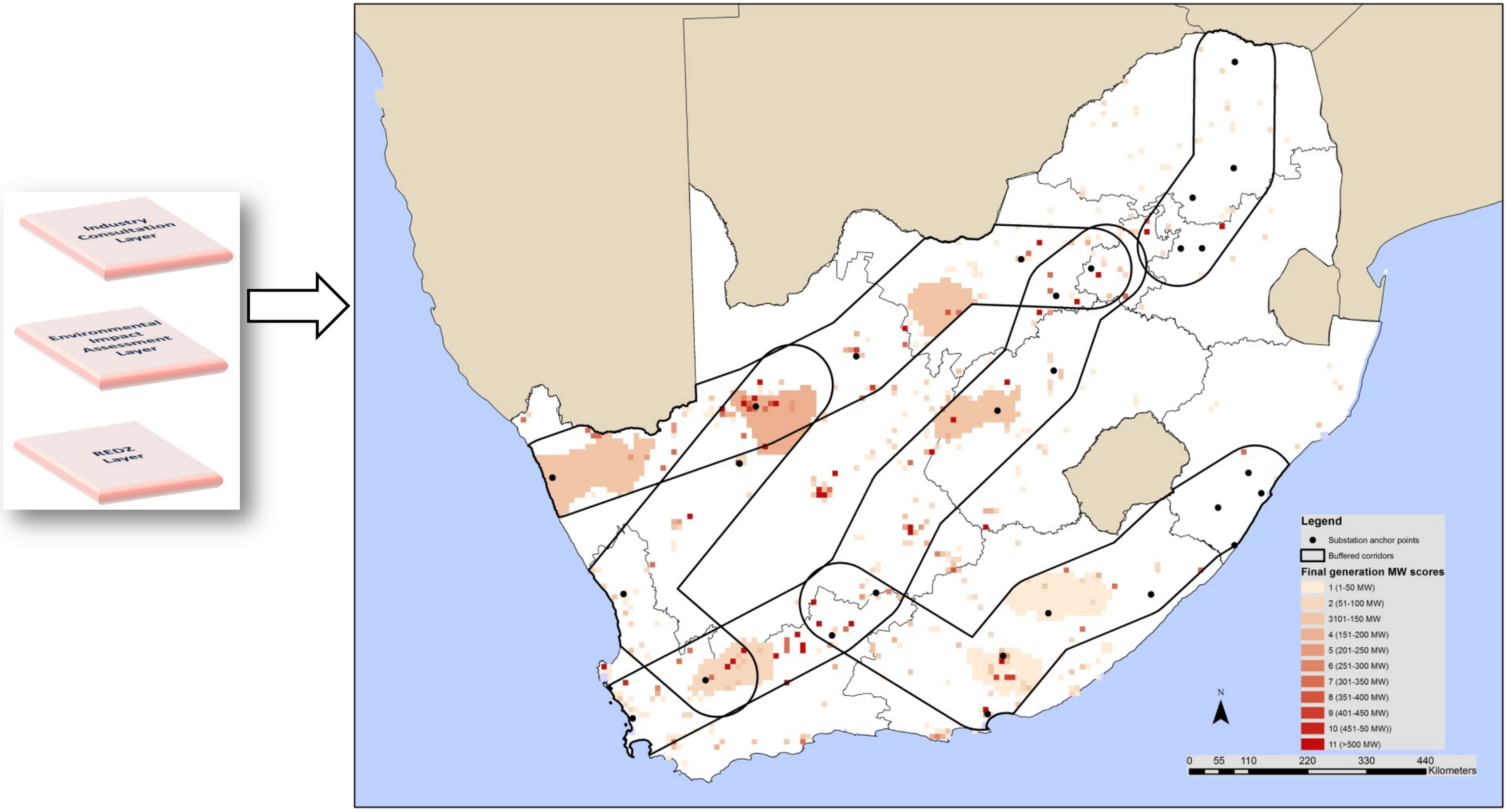
[2] See 'Corridor Validation" for details on how information on areas outside of the Buffered Corridors was considered in the corridor refinement process.



Map 4: Preliminary Corridors expanded by 25 km either side of original corridor alignment (referred to as Buffered Corridors)

2.4.1.4 Consolidation of Generation Layers

The layers were consolidated to produce a single generation mapping output representing generation potential in MW at a 10 km x 10 km cell resolution (see Map 5 below). The aggregation of the different datasets was done using a number of assumptions to reduce the risk of double counting. A description of the aggregation process and underlying assumptions is provided in Appendix A: *Utilisation Assumptions*.



Map 5: Spatial Energy Generation layer

2.4.2 Spatial Electricity Demand Layer

Data for the electricity demand mapping process were obtained from three sources including industry consultation, provincial and local government spatial development plans and national scale strategic development plans. All mapping was undertaken at a 10km by 10km scale.

2.4.2.1 Industry Consultation Layer

The same consultation process as was used in Section 1.3 was followed for energy intensive users, including member of the Energy Intensive User Group (EIUG), Business Unity South Africa (BUSA), Chamber of Mines (CoM) and other institutions such as Transnet, Industrial Development Corporation and Eskom. Inputs were provided on the location and electricity demand of planned bulk electricity consuming projects. Respondents were requested to identify the position of such planned projects through the selection of grid cells. Respondents were required to indicate the power requirements of projects in MW. In total three questionnaire responses were received from private industry and parastatals.

2.4.2.2 Spatial Development Framework Layer

A detailed review of the Spatial Development Frameworks (SDF) of provincial, district and local municipalities located inside of the focus areas was undertaken. The review involved mapping areas illustrated within relevant SDFs as being set aside either for future mining related activity or for industrial expansion. In total, 148 local municipalities and seven metropolitan municipalities are located totally or partially (>5% of the municipality area) inside the Buffered Corridors. Of these municipalities, 124 had SDFs considered suitable[3] for the purposes of this exercise. In the absence of a suitable local municipal SDF, and where available, the relevant district municipality SDF or provincial SDF was reviewed instead. Where required the relevant Integrated Development Plans (IDPs) of municipalities were also considered. Municipalities and provinces were provided with an opportunity to update the mapping outputs from this review exercise based on most recent plans and local knowledge through a dedicated consultation process. Further detail on the consultation process presented in Section 1.7 and Appendix B: *Consultation Process*.

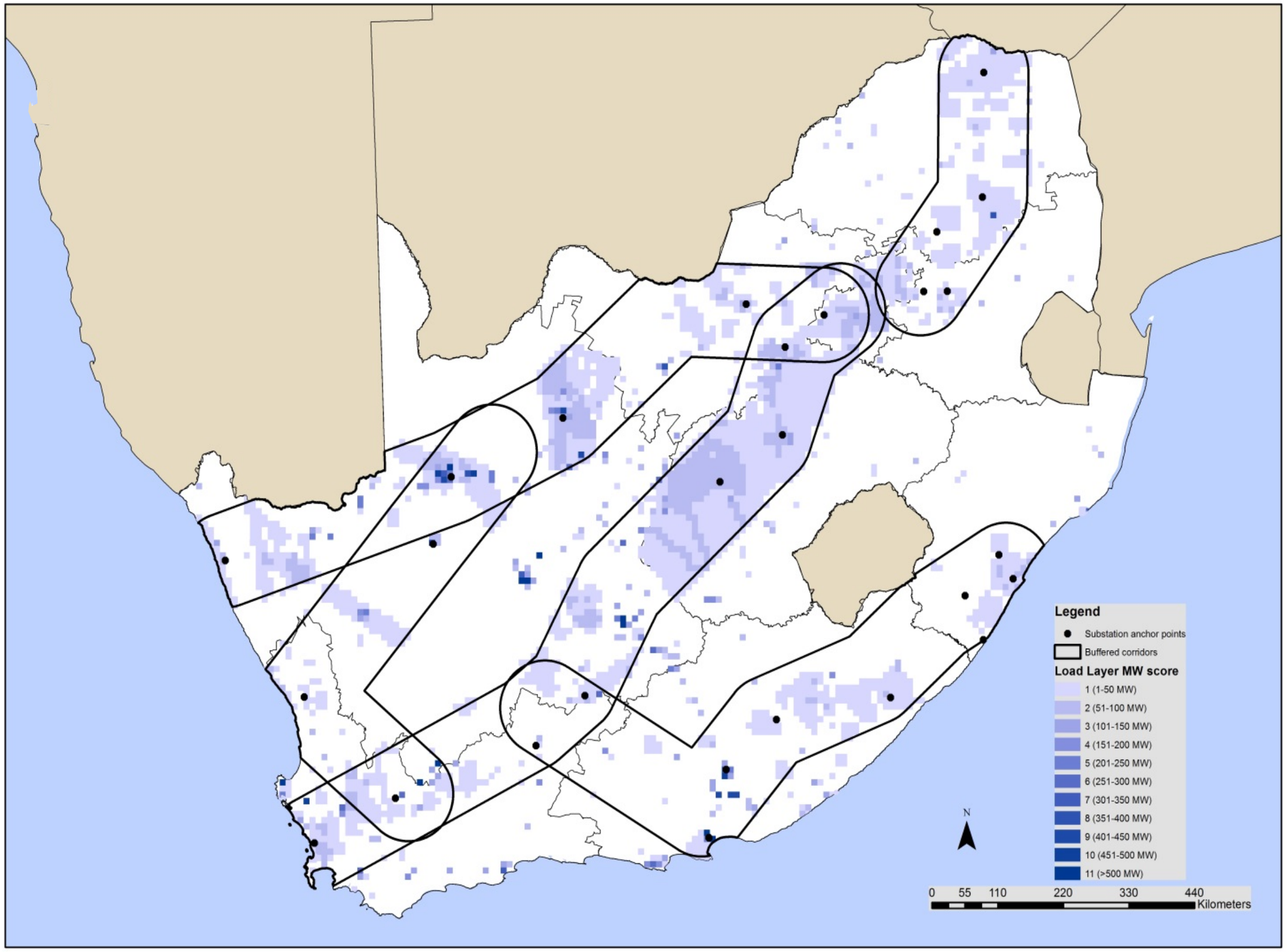
2.4.2.3 National Strategic Development Plans Layer

The electricity demand mapping exercise also considered key strategic geographical areas set aside for specifically targeted economic activities through national policy, plans and programmes. In particular, the mapping exercise considered 15 Special Economic Zones (SEZs) identified by the Department of Trade and Industry (DTI) as incentivised sector-specific industrial development areas under the Special Economic Zones Act (2012). Consideration was also given to existing Industrial Development Zones (IDZ) and the spatial distribution of the 18 SIPs recognised under the IDP. The location of each strategic area was represented spatially at a 10 km by 10 km scale together with the anticipated energy requirements (in MW) of each strategic area represented. Energy requirements were informed through consultation with Eskom and based on the sector of the industry planned for each area.

2.4.2.4 Consolidation of Generation Layers

The above were consolidated to produce a single electricity demand mapping output representing load potential in MW at a 10km by 10km cell resolution (see Map 6 below). The aggregation of the spatial datasets was done using a number of assumptions to reduce the risk of double counting. A description of aggregation process and underlying assumptions is provided in Appendix A: *Utilisation Assumptions*.

[3] Suitable refers to plans that are available, < five years old and contain spatial information concerning plans for industrial expansion and or mining.



Map 6: Spatial Energy Generation layer

2.4.3 Development of Utilisation Corridors

The energy generation and electricity demand mapping layers from Section 1.3 and Section 1.4 were then synthesised to produce a map layer representative of utilisation potential i.e. illustrating areas where investment in grid infrastructure development might be best utilised. Utilisation potential is scored in MW and represented both inside and outside of the Buffered Corridors (see Map 7). The aim of this section was to reduce the Buffered Corridor extent to its original 100 km width whilst ensuring maximum overlap with areas of highest utilisation potential inside the Buffered Corridors. The process was undertaken in two stages; Corridor Optimisation and Corridor Validation.

2.4.3.1 Stage I: Corridor Optimisation

The Buffered Corridors underwent computational optimisation analysis using a Geographical Information Systems (GIS) maximum cost path process to determine the optimal position of 100 km wide corridors inside each of the five Buffered Corridors. Each grid cell was allocated a score of 1 to 11 based on the underlying utilisation value measured in 50 MW increments i.e. 0 – 50 MW (Score = 1), >500 MW (Score = 11). The optimisation process centred upon maximising the utilisation value within a 100 km wide area at all points along the lengths of each of the five Buffered Corridors, whilst ensuring intersection with the anchor points. The output of this process is a set of Optimised Corridors which support areas of highest utilisation potential (see Map 8).

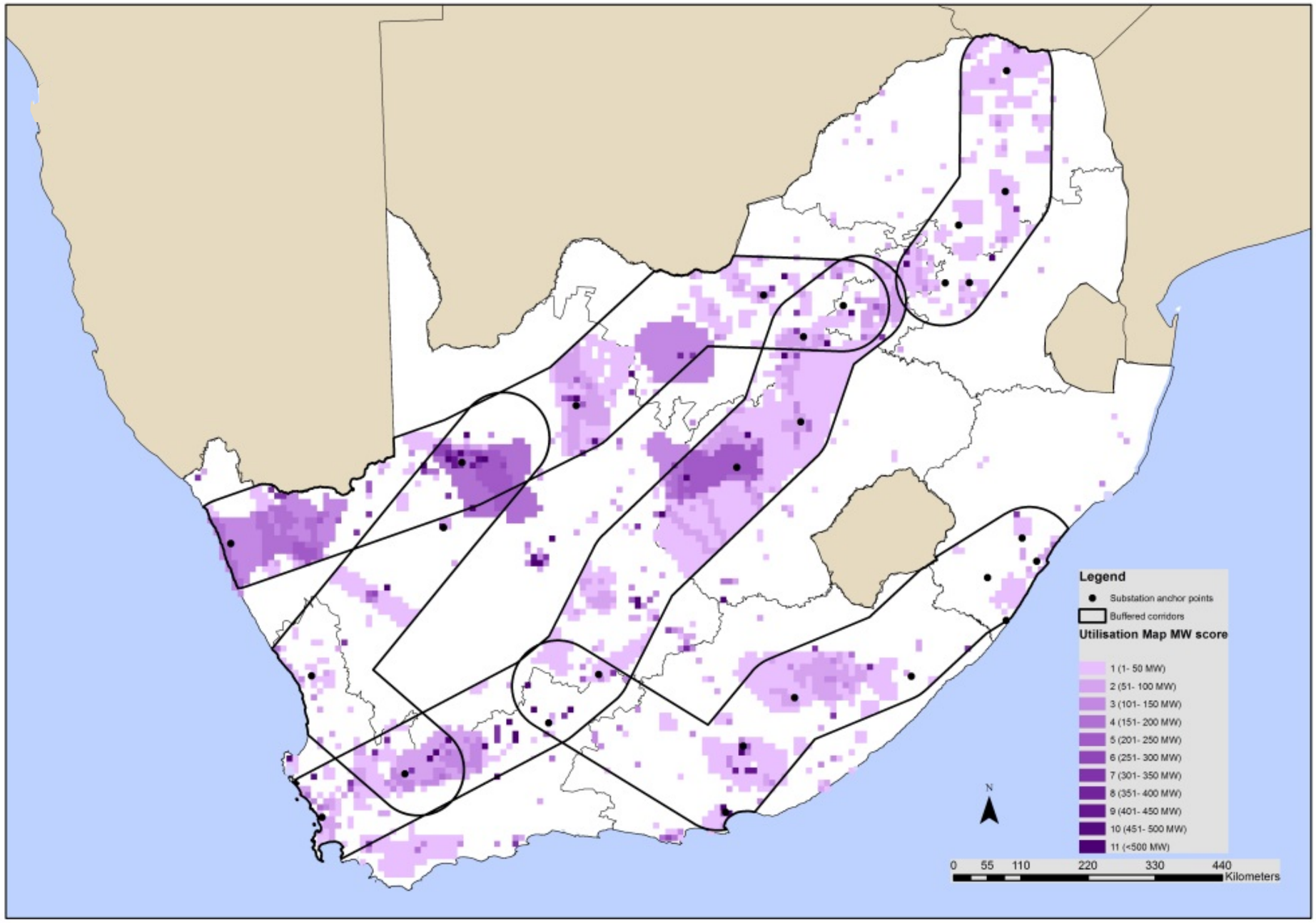
2.4.3.2 Stage 2: Corridor Validation

The optimised corridors then underwent review by a team of Eskom transmission planners. The aim of this review was to determine whether manual modifications to the Optimised Corridor position could be justified based on utilisation data falling outside of the extent of the Buffered Corridor (and therefore not considered in Stage I) and the Eskom team's knowledge of the existing grid network.

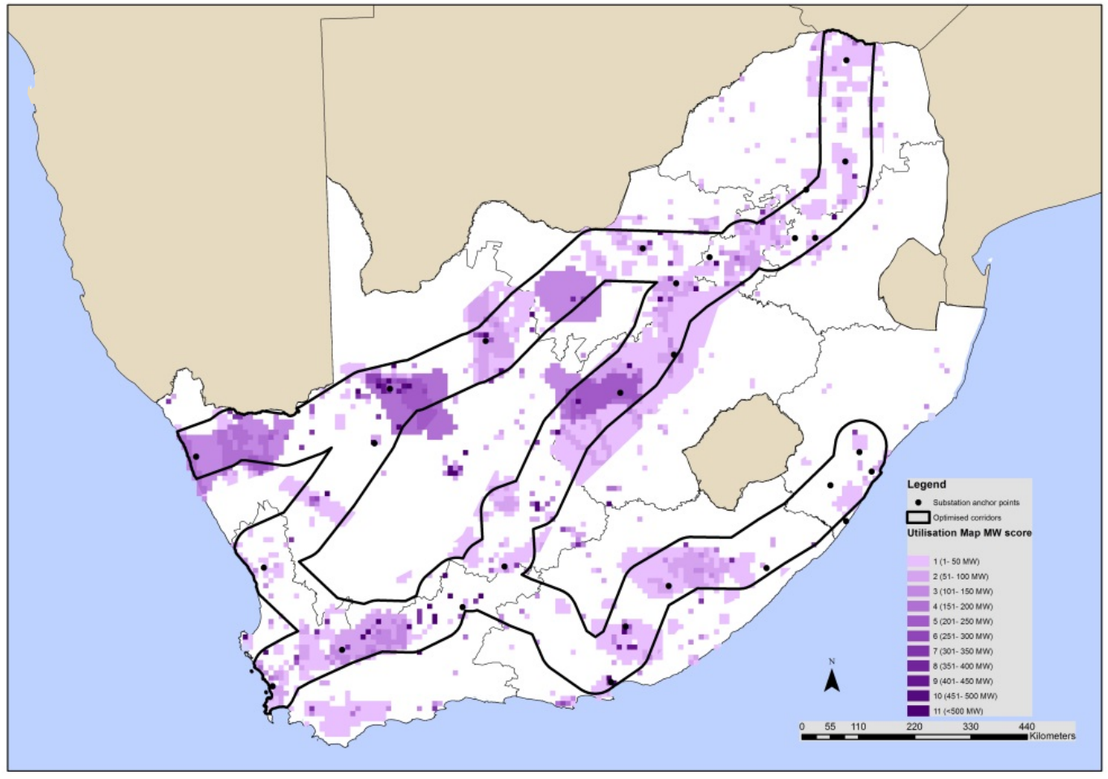
The Eskom review team concluded that an adjustment to the Western Corridor was justified in support of the growing bulk electricity demand requirements of the Saldanha Bay region, with specific reference to the Saldanha Bay IDZ, as well as the overall high utility scale wind generating potential of the region (supported by the high number of active environmental impact assessment applications for wind energy development). The adjustment to the Western Corridor as a result of the validation step is illustrated in Map 9 below. The final output of Stage 2 is the Utilisation Corridors (see Map 10).

2.4.4 Local Government Consultation

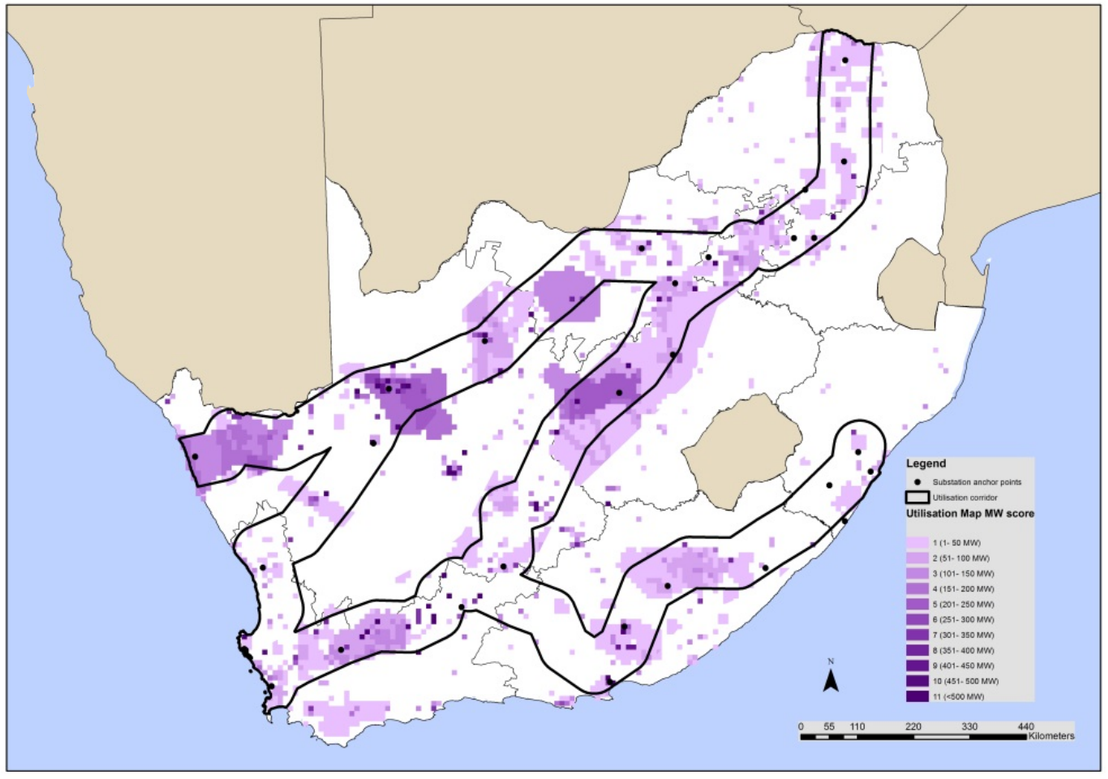
During November 2014 a second round of government consultation was undertaken in collaboration with provincial governments and with all district and local municipalities with jurisdictions in the Buffered Corridors. A total of nine workshops were hosted at the relevant departments' provincial offices. The main objectives of the workshop series was to inform local government of the SEA process and also provide provinces and municipalities with the opportunity to actively engage with the mapping outputs from the SDF review process as described in Section 1.5. A dedicated consultation exercise was designed which enabled provinces and municipalities to provide feedback and request updates to the SDF mapping outputs based on more recent and unpublished draft SDFs as well as local and regional knowledge. Furthermore the consultation process allowed for discussion on the potential obstacles and benefits of the Power Corridors and ultimate inclusion of Power Corridors, once adopted, into municipal Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs). More detail on these workshops is provided in Appendix B: *Consultation Process*.



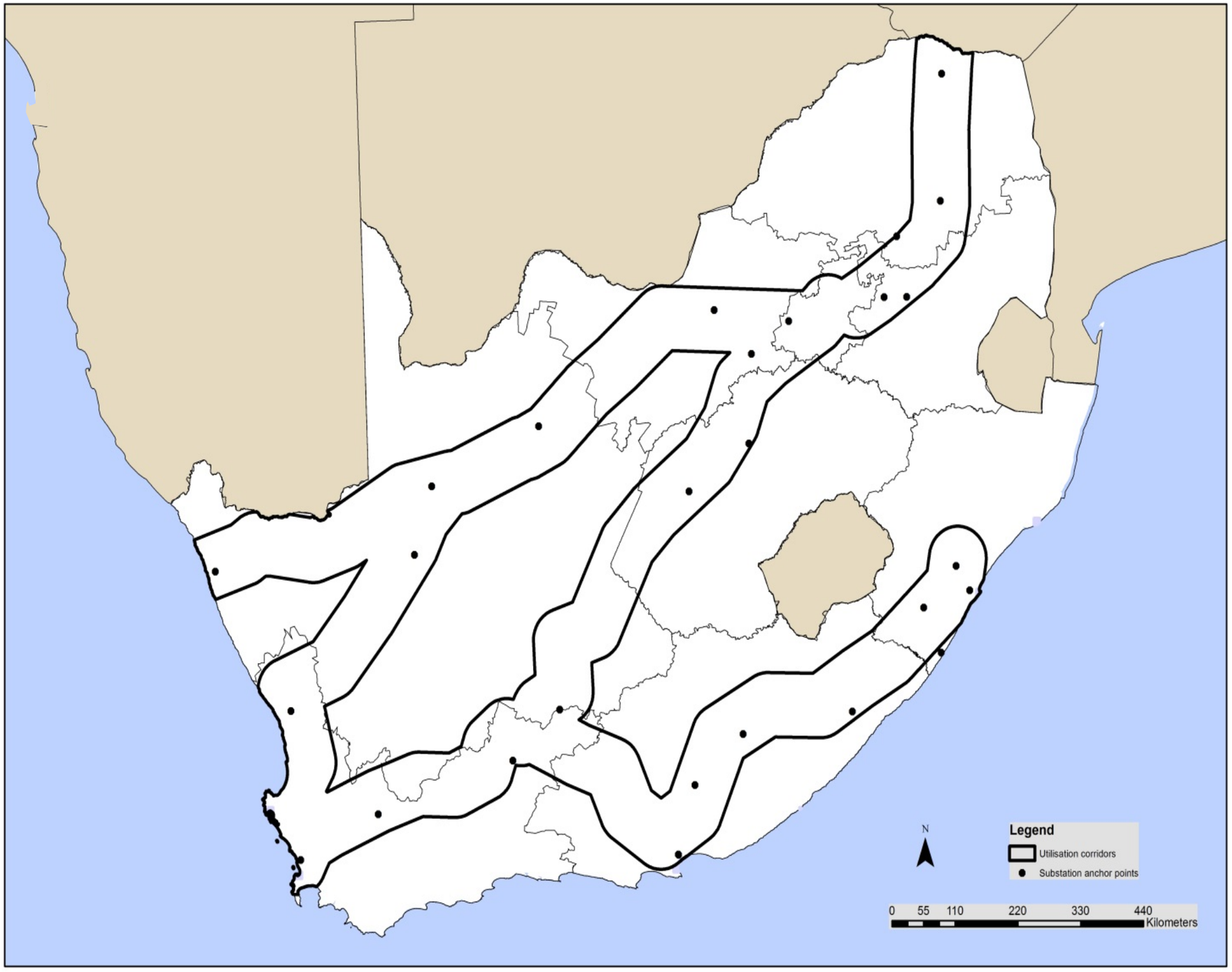
Map 7: Spatial Utilisation layer



Map 8: Optimised Corridors



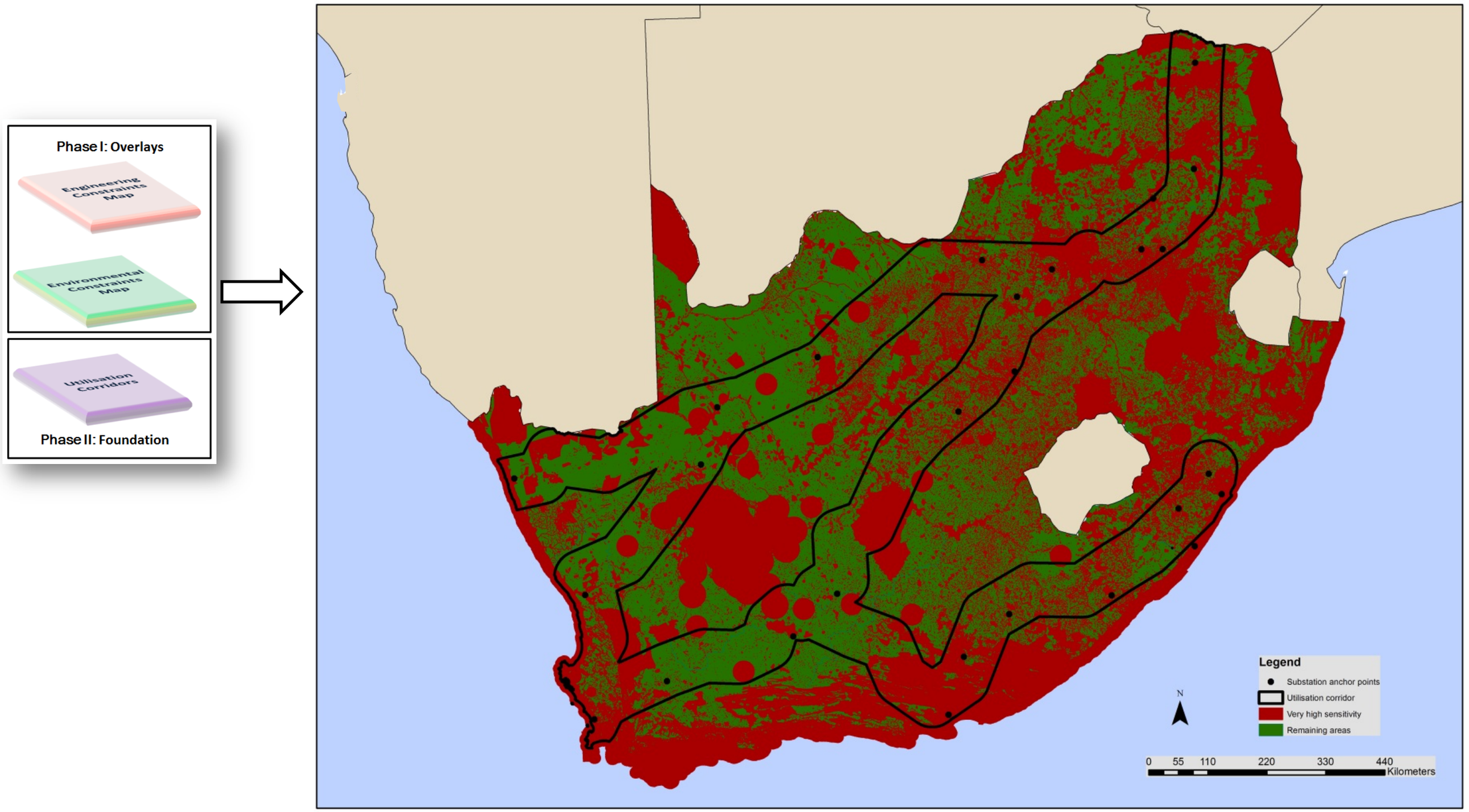
Map 9: Corridor validation step



Map 10: Utilisation Corridors

2.5 Phase III – Pinch Point Analysis

Phase III involved synthesising and overlaying the environmental and engineering constraints mapping outputs from Phase 1 on the Utilisation Corridors to determine whether available routing options exists end to end for each of the five corridors. Only Very High sensitivity areas were considered in the analysis. The remaining sensitivity layers were consolidated and referred to as available routing space in the analysis. Map 11 illustrates the consolidated constraints maps in the context of the Utilisation Corridors.



Map 11: Consolidated constraints map with utilisation corridor overlay

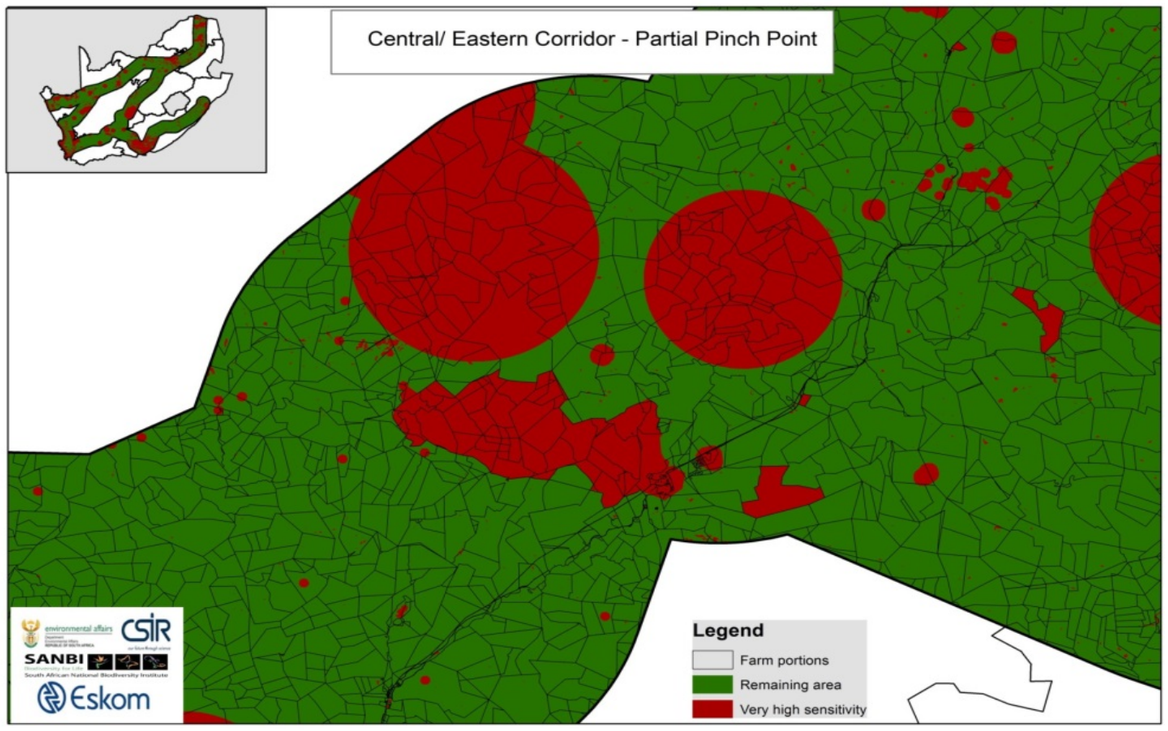
The pinch point analysis was undertaken using GIS least cost path analysis to identify the occurrence, if any, of complete pinch points and partial pinch points along the full length of each Utilisation Corridor. A partial poinch point is defined as a point where less than five but greater than 1 unique routing option[4] exists at all points along the length of a corridor without having to traverse an area delineated as Very High sensitivity. A complete pinch point is defined as a point where no routing options exist across the length of a corridor without having to traverse an area defined as Very High sensitivity. To enable the identification of unique routes, a land parcel GIS layer was overlaid on the constraints map. Multiple unique routing options, outside of Very High sensitivity areas and at all points along each of the corridors, are desirable in the context of this study as this allows developers a degree of flexibility when negotiating without having to consider development in a very sensitive area.

In the event of a complete or partial pinch point, the area immediately adjacent to that point and outside the corridor was considered from an environmental and engineering constraints perspective. Where relief outside of the corridors was shown to be present, the corridor boundary was shifted in the direction of relief to allow for a minimum of five unique routing options. Any adjustment to the position of the corridor was again undertaken within the allowable limits of the fixed anchor points.

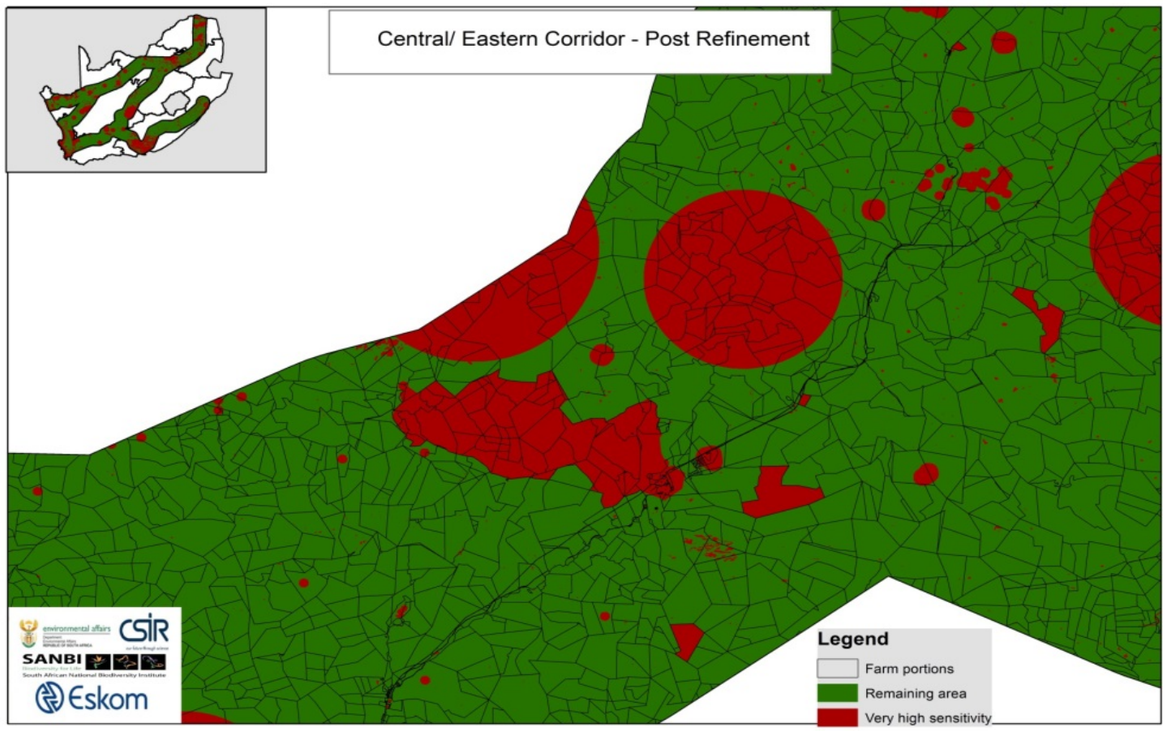
An example of a partial pinch point at the confluence of the Eastern and Central corridor due to the occurrence of both environmental (Karoo National Park and SKA sites) and engineering (mining area) related constraints is illustrated in Map 12. An assessment of areas outside the corridor boundary and in line with the pinch points indicated relief towards the south of the pinch point area. Consequently the Central Corridor was shifted approximately 30km in a southerly direction to a point where five or more unique routing options became available. The result of the corridor shift is illustrated in Map 13.

An example of complete pinch points within the International Corridor due to the occurrence of mostly environmental constraints (including important bird areas, Square Kilometer Array site and core biosphere reserve areas) is illustrated in Map 14. Adjustments were made to the corridor in a westerly direction which enabled routing opportunities along the length of the corridor. The adjusted corridor is illustrated in Map 15, which also illustrates how the adjustments were made within the context of the fixed substation positions.

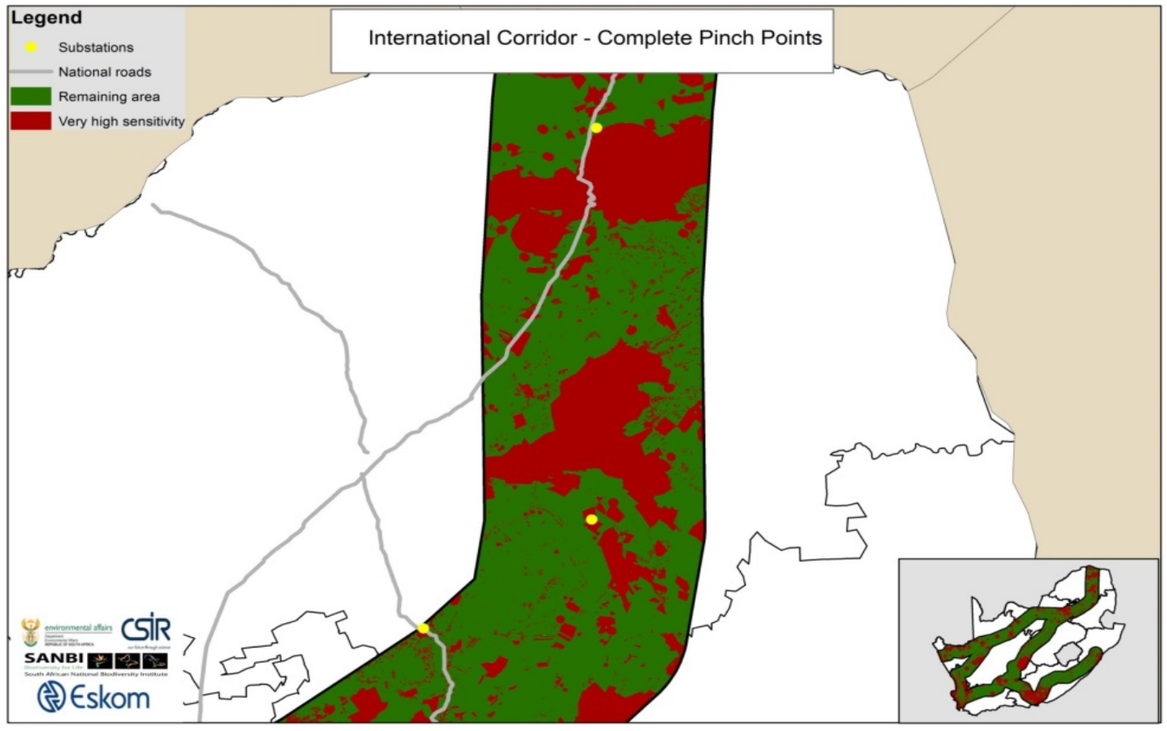
[4] A unique route in the context of the analysis refers to a route which passes through different land parcels at all points along the course of the route when compared with an alternative routing option.



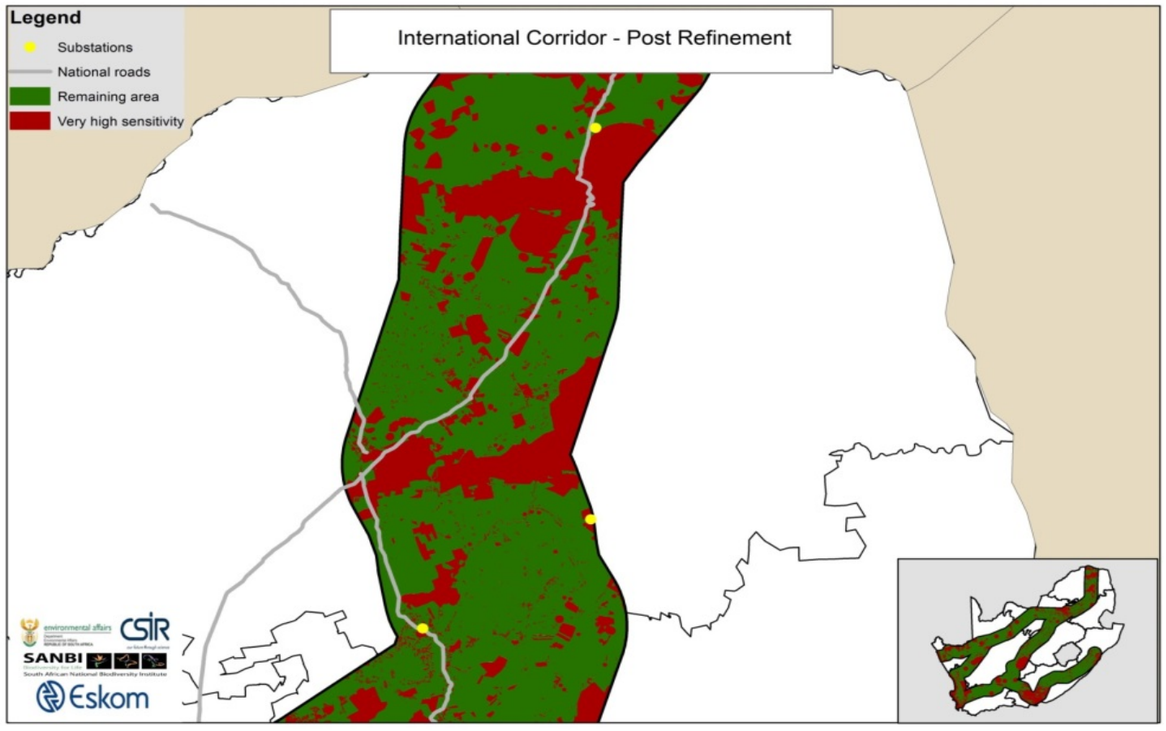
Map 12: Central and Easter Corridor partial pinch point



Map 13: Central and Eastern Corridor adjustment



Map 14: International Corridor pinch points

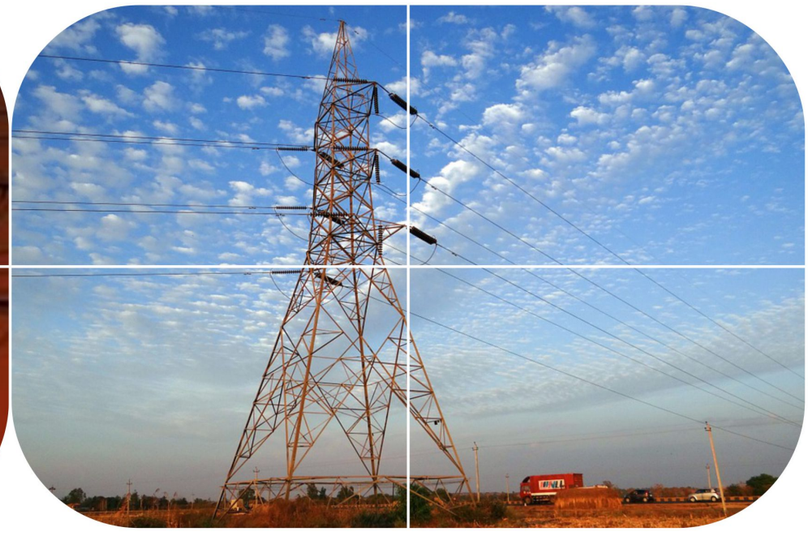


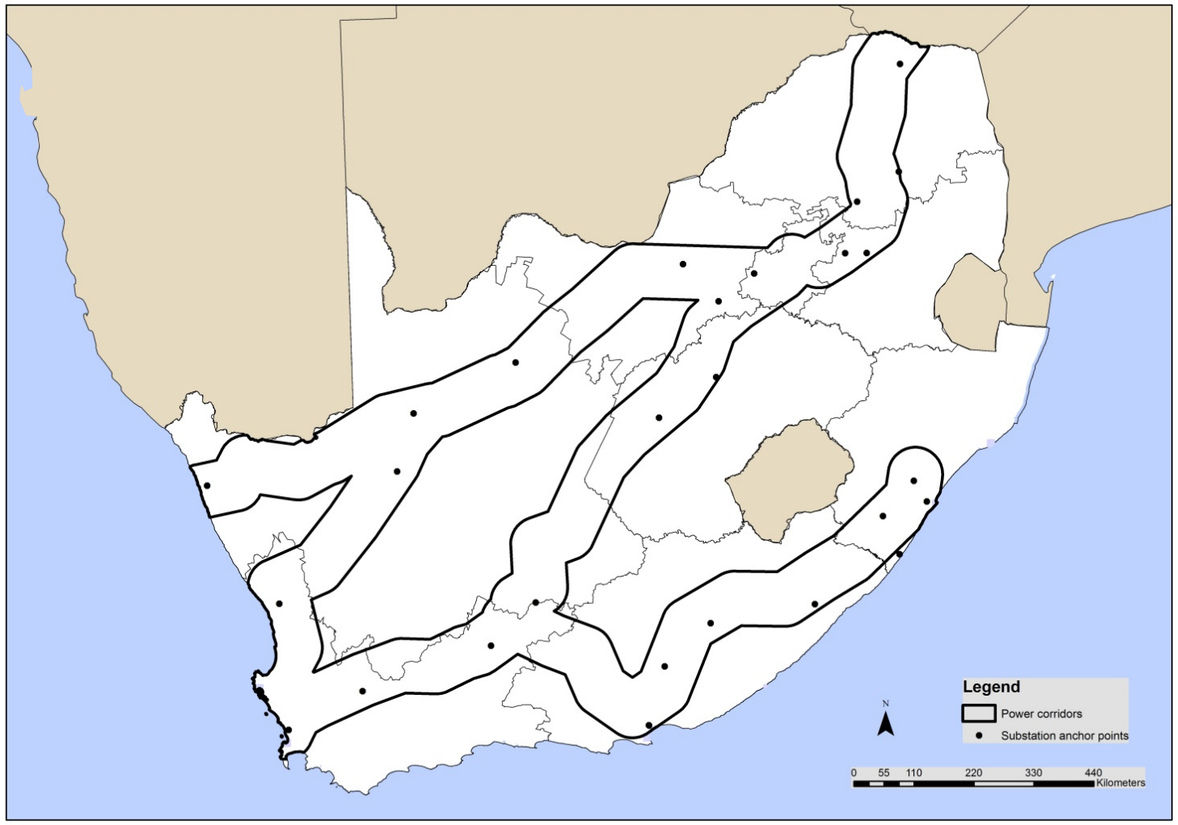
Map 15: International Corridor adjustment

Where no obvious relief was found, the position of the corridor remained unchanged. The output of the pinch point analysis was a final set of refined corridors i.e. the Power Corridors. The pinch point analysis ensured that the final position of the corridors as a result of the SEA process not only support areas of potential for grid development but also reduce the risk of significant impact to the environment. The Power Corridors are illustrated in Map 16. The final Power Corridors in comparison to the initial Preliminary Corridors (the starting point of the SEA process) are illustrated in Map 17.

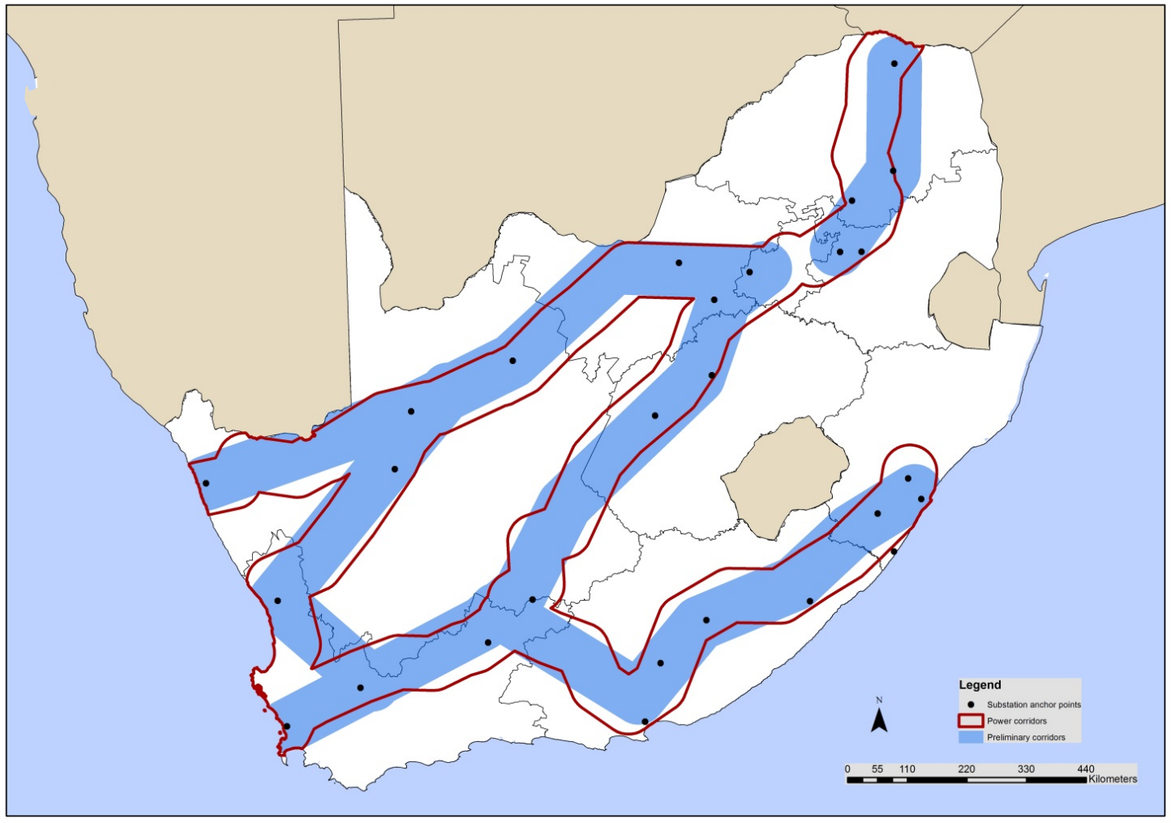
2.6 Public consultation

In addition to consulting key stakeholder groups through the Expert Reference Group , public consultation was conducted throughout the duration of the SEA through the exchange of information and data via a dedicated online platform (project website: https://egi.csir.co.za/). Additional public engagement was undertaken through newspaper advertisement at key stages of project delivery. A dedicated nationwide newspaper advertisement campaign was undertaken in September 2015 to make public the positions of the Power Corridors. As part of the Power Corridor publishing campaign, the public could submit comments on the SEA process and the position of the Power Corridors. The comments trail is presented in Appendix B: *Consultation Process*.

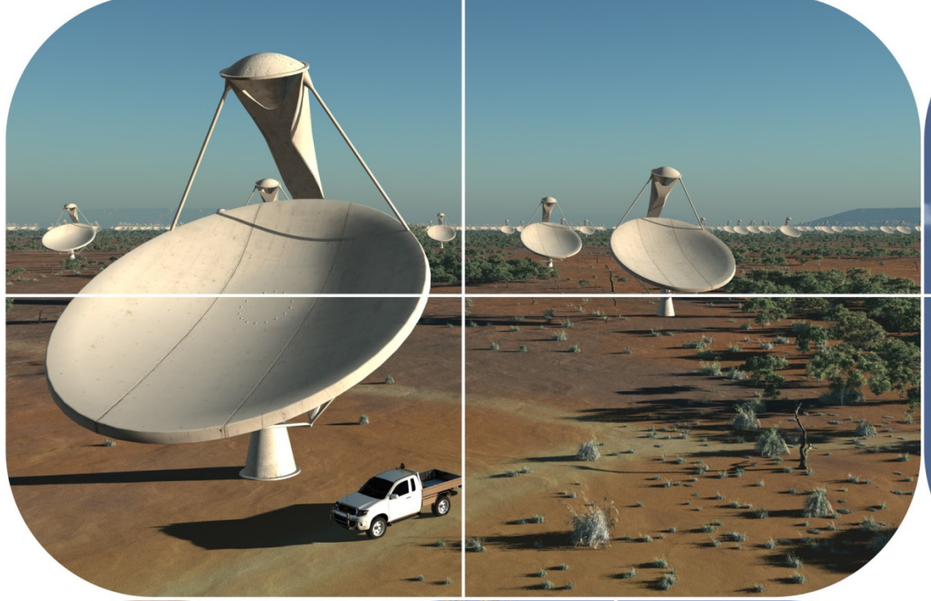
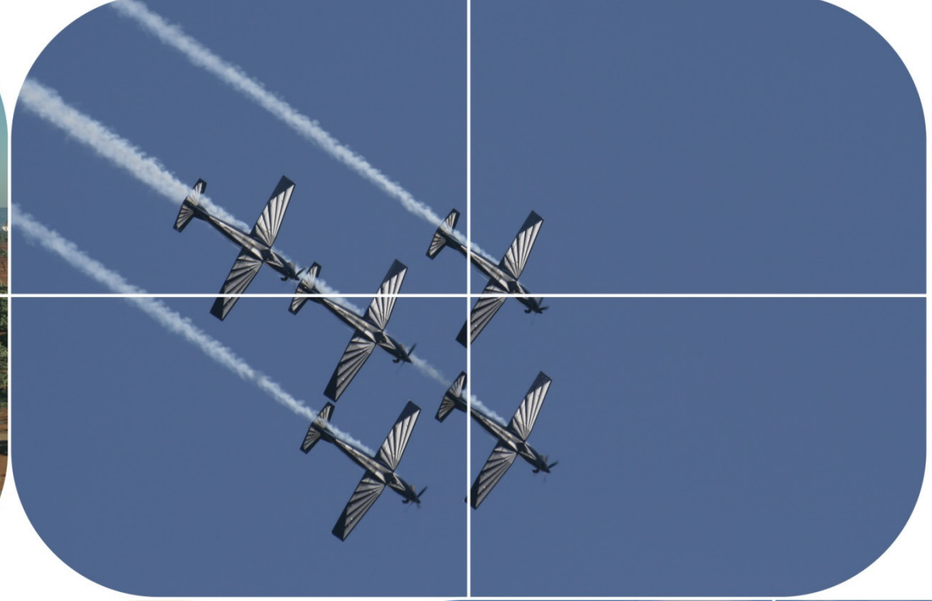




Map 16: Power Corridors

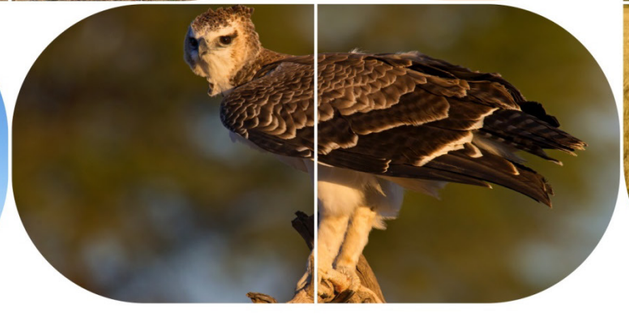


Map 17: Power Corridors compared to Preliminary Corridors





PART 3

Scoping Assessments & Development Protocols

PART 3

Scoping Assessments & Development Protocols

CONTENTS

1. PART 3: SCOPING ASSESSMENTS AND DEVELOPMENT PROTOCOLS

Having identified the five Power Corridors as areas of strategic importance for electricity grid infrastructure development, the following part of the report has been prepared in consultation with relevant authorities and key stakeholders with the aim of determining indicative spatial sensitivities for electricity grid infrastructure development in each Power Corridor. The identified sensitivities will be used to inform and streamline the project level environmental assessment process. In instances where the required data were available at a national scale, the indicative sensitivities are provided for the entire country.

The assessments informing this part of the report were conducted at a level equivalent to the scoping phase of an Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998). The results are thus not sufficient for project level decision making in terms of NEMA, and further project level impact assessment is still necessary.

These assessments are, however, sufficient to meet the requirements of the scoping phase of an EIA process and to focus project level impact assessments on those potential impacts that are of significance. With the scoping requirements being met, all electricity grid infrastructure developments, with their associated infrastructure, that require environmental authorisation will follow an accelerated project level environmental assessment process in the form of a streamlined Basic Assessment (BA). The scope of the project level BA process in Power Corridors will be informed by the Development Protocols contained in the following sections, and will be undertaken in accordance with the relevant regulations current at the time. The project level BA process will also include the associated public participation process.

The criteria (e.g. buffer distances) used to determine different levels of sensitivity in the following sections can be considered as national guidelines, but there may be data inaccuracies and site specific considerations that will influence the suitability of each individual proposed project. In some instances projects proposed in areas of low sensitivity can be found to be unsuitable, and in other instances projects proposed in highly sensitive areas can be found to be acceptable based on the project's specific merit and/or the fact that it is not possible to avoid all impacts. Appropriate mitigation measures can also be implemented to address or reduce the identified sensitivities.

1.1 Objectives

The sensitivity maps and associated Development Protocols have been developed to serve the following objectives:

1.1.1 Integration

A number of Competent Authorities have environmental authorising and licensing responsibilities with respect to electricity grid infrastructure development. The assessment and authorising processes run by each authority are independent from one another and often take place in a successional manner with limited or no integration. The SEA process provides a platform for authorities to communicate assessment requirements in advance, seek consensus on assessment requirements and process, and finally document these requirements in the form of a Development Protocol. This will ensure that, where possible, the requirements of a multiplicity of Competent Authorities can be met through a single process, probably a Basic Assessment, enabling multiple authorisations to be issued by various competent authorities simultaneously.

1.1.2 Standardisation

Currently there is no standard environmental assessment method for determining scoping level sensitivity for electricity grid infrastructure development. Concomitantly there are inconsistencies in the level of specialist involvement to determine impact significance between individual assessments. This often results in variation in the quality and value of environmental assessment reporting outputs. The SEA aims to standardise the environmental assessment methodology for electricity grid infrastructure developments inside the Power Corridors. The standardised assessment approach will set the criteria for delineating scoping level sensitivity as well as the appropriate level of additional assessment required to determine impact significance. This will enable greater consistency between reports and ultimately facilitate improved environmental decision making.

1.1.3 Focus

Scoping level pre-assessment of the Power Corridors will enable development planners to include environmental intelligence at the earliest stage of planning. In doing so, this will reduce the risk of project delays, escalating costs and ultimately project rejection on environmental grounds. Furthermore it allows environmental practitioners to identify important issues and discount others so that the impact assessment process is focussed on key issues and areas of significance only, thereby limiting wasted time or expenditure on unnecessary investigations. Most importantly the pre-assessment of environmental sensitivity will allow project developers to submit a pre-negotiated route for consideration for environmental authorisation. Pre-negotiated routes will reduce the risk of encountering dissatisfied landowners after environmental authorisation where servitudes access is necessary. This will in turn reduce the need to undertake route realignment and consequently amendments to the EIA.

1.1.4 Consolidation

All spatial sensitivity data for the Power Corridors produced through the SEA process will be captured and stored on the Department of Environmental Affairs national web based environmental Screening Tool. In instances where the required data used in the SEA analysis is available at a national scale, the indicative sensitivities for that particular environmental aspect will be made available via the tool for the entire country as well. Furthermore, as and when new and improved datasets become available, the sensitivity maps will be updated accordingly. Therefore the SEA seeks to align itself with the objectives the Department of Environmental Affairs Screening Tool by ensuring that all outputs are consolidated and contained within this centralised repository for ease of use and implementation.

1.2 Guiding Principles

The following principles are important for the correct interpretation and implementation of the sensitivity maps and Development Protocols.

1.2.1 Environmental Assessment Process

The assessments informing this part of the report were conducted at a level equivalent to the scoping phase of an Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (NEMA) (Act 107 of 1998). The results are thus not sufficient for project level decision making in terms of NEMA, and further project level impact assessment is still necessary. These assessments are, however, sufficient to meet the requirements of the scoping phase of an EIA process and to focus project level impact assessments on those potential impacts that are of significance.

With the scoping requirements being met, all proposed electricity grid infrastructure developments requiring environmental authorisation in terms of Activity 11 Listing Notice 1 or Activity 9 Listing Notice 2 of the Environmental Impact Assessment Regulations, 2014, and located entirely inside of the Power Corridors, will follow a streamlined project level environmental assessment process in the form of a BA.

Projects that trigger Activity 9 of Listing Notice 2 where the development footprint does not fall entirely within the corridor area will still be required to follow a full Environmental Impact Assessment process.

1.2.2 Competent and Commenting Authorities:

The primary objective of the SEA is to streamline the environmental assessment process in terms of NEMA and facilitate integration of the EIA process with the permitting/licensing processes of other legislation applicable to electricity grid infrastructure development inside the Power Corridors.

The *Competent Authority* referred to in the context of this report is the Competent Authority in terms of NEMA, and is likely to be either the national or provincial department responsible for environmental affairs. Competent authorities responsible for other licensing/permitting processes directed by additional legislation e.g. Water Use Authorisation undertaken by DWS or a Catchment Management Agency in terms of the National Water Act No. 36 of 1998 are referred to as *commenting authorities*.

As far as practically possible, the information requirements to inform decision making by the Competent Authority and Commenting Authorities on authorisation/licensing/permitting applications are addressed in the Development Protocols in Chapters 1-9.

To facilitate integration between the environmental assessment process in terms of NEMA and the assessment requirements of additional legislation, on the basis of environmental pre-assessment of the Power Corridors, the SEA proposes that environmental assessment process in terms of NEMA and any additional legislation is undertaken within the framework of a Basic Assessment process. To enable this, the commenting authorities will be required to provide comment to the Competent Authority in terms of NEMA (in the form of a legally binding decision) within the timeframe of the streamlined Basic Assessment process. This will ensure that, where applicable, the necessary project approvals falling under the mandates of numerous competent authorities are awarded simultaneously.

For further details on how the commenting and approval process for Commenting Authorities will be coordinated in the context the environmental assessment process inside of the Power Corridors, refer to Part 5 of the report.

1.2.3 Competent Specialists and EAPs:

It is important to ensure that specialists as well as Environmental Assessment Practitioners (EAPs) are competent to provide studies and inputs that are adequate for decision making by the competent and Commenting Authority.

The competent specialist referred to in the following sections is one of the following:

- A natural science specialist who is registered with the South African Council for Natural Scientific Professionals (SACNASP) in his/her field of expertise;
- A non-natural science specialist who has accreditation or registration applicable to his/her field of expertise; or
- Where registration does not exist, a specialist who has at least 5 years of experience in undertaking impact assessments or similar studies. In this instance an independent referee will be required to provide assurance of the candidate's level of competence.

The EAP referred to in the following sections is a practitioner who is registered with the Environmental Assessment Practitioners Association of South Africa (EAPASA) or has the relevant registration with SACNASP. Where registration is not available (i.e. until EAPASA is officially operational) a competent EAP should have at least 5 years' experience in managing EIAs.

1.2.4 Data Scale and Data Accuracy

The scale at which the data can be interpreted varies between environmental aspects and between datasets. The confidence level attributed to the different datasets is representative of the associated sensitivity level. Therefore the study adopted a conservative approach by delineating areas as being of low sensitivity only where the underlying dataset confidence levels are high enough. Therefore it is recommended that the sensitivity mapping outputs of this SEA be used for a broad, landscape level planning step, in which the gazetted sensitivity maps are used for a desktop identification of suitable sub-corridor options within the Power Corridors. It is recommended that sub-corridors no less than 500 m in width are identified on the basis of the sensitivity maps alone. Finer scale route selection within the sub-corridor should be informed by additional desk top analysis and field assessment (where required and as directed by the Development Protocols or at the discretion of the EAP/specialist involved).

It is recommended that the best way to assist with the selection of optimal sub-corridors is to interpret the sensitivity maps as cost surfaces and identify the most appropriate sub-corridor using GIS-based least-cost path analysis. This approach can explicitly trade off financial costs and reduce the overall cumulative impact on sensitive features when planning routing options, as well as provide a quantifiable comparison of impacts for assessing route alternatives.

1.2.5 Specialist Studies

The specialist study requirements set out in the sensitivity maps and associated Development Protocols apply over and above the information required in terms of Appendix 6 of the EIA regulations and the various sections of the Environmental Impact Assessment Regulations 2014.

1.2.5.1 Project level specialist assessment requirements in the context of the entire development footprint

Where a proposed power line route traverses areas of varying levels of sensitivity, the specialist must undertake the assessment in accordance with the specific underlying sensitivity requirements at each point along the route. Therefore, where a high sensitivity feature is located at point A along a proposed power line route and a medium sensitivity feature at point B, the specialist must undertake the necessary assessment requirements for high sensitivity features at point A and the necessary assessment requirements for the medium sensitivity features at point B, as described by the Development Protocol for that particular environmental aspect (e.g. avifauna).

Where a proposed substation is positioned on two or more features of varying levels of sensitivity for a particular environmental aspect, the specialist must undertake the assessment for the entire site in accordance with the requirements for the feature with the highest level of sensitivity.

1.2.5.2 Project level specialist assessment requirements in context of specific points within development footprint

Where a proposed power line or substation project is located on multiple features of different sensitivity for the same environmental aspect, the specialist must undertake the assessment in accordance with the requirements of the feature with the highest sensitivity rating at that particular point.

1.2.6 Physical Project Footprint, Construction Footprint and Development Envelope

In order to allow for minor changes to the project footprint (i.e. proposed project layout plan, route including servitude, associated infrastructure etc.) following authorisation, as is often found being a technical requirement, it is necessary for the Competent Authority to approve a development envelope rather than only the physical project footprint. The area that needs to be assessed in detail during the project level impact assessment thus needs to include a buffer, proposed 50 m, from the edge of the project footprint (servitude boundary in the instance of a power line project) of all infrastructures associated with the development. The assessment and approval of such a development envelope will allow for minor changes in the project layout without having to seek amendment or re-authorisation, provided that such a change in layout does not impinge on any additional sensitive areas identified in the development envelope, or result in any increase in the significance ratings of impacts. It must be noted that the assessment of impacts related to a particular project is not limited to the development envelope; rather this area is assessed in more detail based on the assumption that the final physical footprint has the potential to be moved within this envelope.

A construction footprint is where construction activity actually results in a physical disturbance on the ground. Therefore the overhanging lines between two towers would not be considered part of the construction footprint unless the lines created some form of construction related physical disturbance.

1.2.7 Applications inside and outside the Power Corridors

The criteria for determining environmental sensitivity inside the Power Corridors, as specified in the Development Protocols, will be applicable to projects outside of the Power Corridors as well. Therefore projects inside of the Power Corridors will apply the sensitivity maps developed as part of the SEA whereas for projects proposed outside of the corridors, the EAP/specialist will be required to produce representative maps utilising sensitivity criteria defined within the relevant Development Protocols. Where datasets or information utilised for the Power Corridors as part of the SEA process are not available, the EAP/specialist will be required to identify these features manually using additional desktop or on-site investigation.

PART 3

Chapter 1. AGRICULTURE

CONTENTS

TABLES

MAPS

CHAPTER 1. AGRICULTURE

1.1 Introduction

The following chapter is informed by the scoping level specialist agricultural pre-assessment of the five Power Corridors for which the complete agriculture report is provided as Appendix C: *Agriculture Specialist Report*. Due to the integrated and strategic nature of this Strategic Environmental Assessment (SEA), and based on consultation with relevant government departments and wider stakeholders, the final views and requirements presented in this section may vary from those contained and recommended in the agriculture specialist report. The Land Capability data on which this assessment is predominantly based are currently being updated by the national Department of Agriculture, Fisheries and Forestry (DAFF). The sensitivity mapping outputs put forward in this chapter must be updated with the new data as soon as they become available.

1.1.1 Electricity Grid Infrastructure and Agricultural Impact

Agricultural impact is understood, for the purposes of this study, as any impact that translates into reduced agricultural production (including forestry). This may occur by way of a degradation of the agricultural resource base or by way of a direct disturbance to agricultural activities. Electricity grid infrastructure has a relatively low impact on agriculture, because in most cases, agriculture can continue largely undisturbed below power lines and the actual footprint of impact is confined to pylon bases and substations and involves an extremely small proportion of the land surface.

Three factors determine the significance of the agricultural impacts of electricity grid infrastructure developments. The first is the reduction of the agricultural productivity of the affected land, the second is the proportion of available land that is affected, and the third is the degree of disturbance that will occur. The significance of the impacts increases as the scale of any or all of these factors increase.

1.1.2 Electricity Grid Infrastructure and Agricultural Consent

Grid developers are currently exempt from agricultural consent for power line servitudes. Developers do however have to apply for authorisation in terms of the Subdivision of Agricultural Land Act (Act No. 70 of 1970) for substations. The new Draft Preservation and Development of Agricultural Land Framework Bill, as it is currently proposed, will change this and authorisation of all power line servitudes will be required in terms of the Bill. Authorisation will require ministerial approval and a comprehensive process if it involves any cultivated land, and a slightly less rigorous process if it only involves grazing land. The registration of the servitude needs to be done per farm portion. Long power lines will more often than not traverse many portions, each of which would need a separate agricultural authorisation. This is likely to complicate and significantly lengthen the time required for power line servitude approval.

The new Bill requires a fairly high minimum level of assessment for all levels of risk to agricultural land. Based on the information contained within the draft Bill, Due to the relatively low impact of electricity grid infrastructure development on agriculture, the SEA proposes a simpler process to that described within the Bill. The risk of significant agricultural impacts within the Power Corridors is predominantly low because they have already been routed to avoid agriculturally important areas. Furthermore much of the corridor land is in areas of extremely low agricultural potential, such as the Karoo and Northern Cape, where there is negligible risk to agriculture from electricity grid infrastructure developments. Where there is significant risk, the proposed protocol addresses it adequately.

With the foregoing in mind, this section of the report recommends for electricity grid infrastructure development an alternative process for agricultural assessment to that proposed in the Draft Preservation and Development of Agricultural Land Framework Bill. The report recommends that the process of agricultural authorisation for electricity grid infrastructure development inside the Power Corridors triggering either a Basic Assessment or Environmental Impact Assessment process in terms of NEMA is done in terms of an exemption from the requirements stipulated in the Bill, and according to the set protocol that is recommended in this study. The aim of this protocol is to ensure preservation of agriculturally important land for agricultural production, while streamlining the authorisation process. It is recommended that the assessment of agricultural impacts and application for agricultural authorisation should be by way of a report compiled and signed off by a SACNASP registered agricultural scientist. Such a report should focus on and clearly highlight, only the essential aspects that are important for the preservation of agriculturally productive land within electricity grid infrastructure developments rather than insist, as the Bill does, on a detailed agro-ecosystem report, much of which might be irrelevant under conditions of low agricultural productivity. These essential aspects making up the recommended protocol are identified and listed in this study (Refer to Section 1.2.3).

Further details on the recommended alternative assessment process to be followed through the interpretation of agricultural sensitivity maps and Development Protocol are presented in following sections.

1.2 Sensitivity Mapping Criteria

1.2.1 Data Sources

In order to generate sensitivity maps, the data layers relevant to agricultural sensitivity for each Power Corridor were collected and conditioned where required. Only data of adequate confidence and spatial precision relative to site-scale land-use planning was used. A full list of data sources used for the generation of the sensitivity maps is detailed in the Table 1 below.

Table 1: Summary of agricultural data used in the study, indicating their source, description and use

Dataset	Source and Date of publication	Data Description
Field crop boundaries	Department of Agriculture, Forestry and Fisheries, 2013.	Delineates the boundaries of all cultivated land, based on satellite and aerial imagery. Seven different categories of cultivated land are distinguished. These are pivot agriculture; horticulture/viticulture; shadenet; annual crop cultivation/planted pastures rotation; old fields; subsistence farming; small holdings.
Commercial forestry plantations	Department of Agriculture, Forestry and Fisheries, 2014.	Delineates all state owned and private commercial forestry plantations
Land cover (sugar cane farming)	Western Cape Department of Environmental Affairs and Development Planning, 2011.	Delineates all sugar cane fields, including emerging farmers in Kwazulu-Natal.
Mapping of agricultural commodity production in Limpopo	Limpopo Department of Agriculture, 2010	Distinguishes a number of different crop types using the same field crop boundaries as the field crop boundary data, but with some additional areas added.
Land cover (viticulture)	Western Cape Department of Environmental Affairs and Development Planning, 2014.	Raster data indicating viticulture as a land cover category.
Land capability	Department of Agriculture, Forestry and Fisheries, 2002.	Categorises all land nationally into eight different classes of agricultural land capability. The classification is based on soil, terrain and climate parameters. Soil data originates from the land type survey that was conducted from the 1970s until 2002.

1.2.2 Processing of Data

The analysis of the five corridors was done by way of a desktop exercise using existing data on agricultural land use and land capability. Data sources listed in Table 1 underwent the following preparation.

Table 2: Summary of sensitive agricultural features, datasets and process of preparing data

Sensitivity Feature	Data Source + Date of Publications	Data Preparation and Processing
Pivots	Field crop boundaries, DAFF, 2013. Mapping of Agricultural Commodity Production in Limpopo, Limpopo Department of Agriculture, 2010.	Union process between field crop data and Limpopo data for International corridor only.
Horticulture >400 m (line traverse length)	Field crop boundaries, DAFF, 2013. Mapping of Agricultural Commodity Production in Limpopo, Limpopo Department of Agriculture, 2010	Union process between field crop data and Limpopo data for International corridor only. Surface area >16 hectares.
Vines >400 m (line traverse length)	Field crop boundaries, DAFF, 2013. Land cover (viticulture), DEADP, 2014.	Union process between field crop data and Land cover (viticulture) data. Surface area >16 hectares.
Land capability Class I	Land capability, DAFF, 2002	
Horticulture >400 m (line traverse length)	Field crop boundaries, DAFF, 2013. Mapping of Agricultural Commodity Production in Limpopo, Limpopo Department of Agriculture, 2010	Union process between field crop data and Limpopo data for International corridor only. Surface area <16 hectares.
Vines >400 m (line traverse length)	Field crop boundaries, DAFF, 2013. Land cover (viticulture), DEADP, 2014.	Union process between filed crop data and Land cover (viticulture) data. Surface area >16 hectares.
Land capability Class II	Land capability, DAFF, 2002	
Timber plantations	Commercial forestry plantations, DAFF, 2014.	Areas of overlap with field crop boundaries and sugar cane were categorised as the latter because of the greater accuracy of those data sets compared to the forestry data set.
Sugar cane	Land cover – sugar cane farming, DEADP, 2011.	
All other cultivated fields	Field crop boundaries, DAFF, 2013. mapping of agricultural commodity production in Limpopo, Limpopo Department of Agriculture, 2010	Union process between field crop data and Limpopo data for International corridor only.
Land capability Class III	Land capability, DAFF, 2002	

1.2.3 Sensitivity Delineation

Agricultural features at risk of impact by electricity grid infrastructure development are listed in Table 3. These are listed in their order of sensitivity. The highest sensitivity features are centre pivot irrigated lands. Pivot irrigation, irrespective of its size, is incompatible with power lines because of the danger of an electrical short between the lines and the overhead water pipes. Pivot lands have high agricultural productivity; the entire pivot field is impacted; and the disturbance is Very High given the exclusion of the possibility of irrigation, therefore impact of power lines in these areas is significant.

Horticulture and vineyards with a potential electricity line traverse length of greater than 400 metres are distinguished, in terms of their sensitivity, from those with a traverse length of less than 400 metres. This is because a span of greater than 400 metres will result in a tower having to be erected within an orchard or vineyard, leading to greater agricultural impacts. For horticulture and vineyards, agricultural productivity is high, but less surface area is impacted (only pylon footprint if >400 m) with less disturbance – agricultural activity can continue. There is disturbance in terms of restrictions on windbreak heights underneath the power line. Lands that require windbreaks would be impacted more severely than lands that do not require windbreaks. The need for windbreaks is a function of the crop type (some crops are more sensitive to wind than others) and of the prevailing wind conditions of an area and particular site. In general all orchards require windbreaks with citrus being the most sensitive and therefore requiring the most closely spaced windbreaks. Vines do not generally require windbreaks. If the use of windbreaks is restricted around an orchard it will have the impact of reducing yield and fruit quality.

Timber plantations are lower productivity enterprises than the vineyards, but larger areas are impacted with a greater level of disturbance in that trees are excluded from the entire servitude width below the power lines. Relative to the Very High sensitivity category, timber plantations are classified as High sensitivity because of their lower productivity. In all other agriculture, servitudes are not cleared and crops can be grown throughout the servitude width.

Land Capability Classes I and II have been included in the Very High and High sensitivity categories respectively because, within the context of South Africa's very limited arable/ cultivated agricultural land resources, the entirety of these high potential lands should be preserved for agricultural production as far as possible. Land Capability Class III should also be preserved for agricultural production where possible, but is less preservation-worthy than the higher classes and so is categorised as Medium sensitivity.

The impacts of electricity grid infrastructure on all other land, is very low. The actual footprint of the impact is very small and agricultural can continue largely undisturbed beneath power lines. However there are some differences between various agricultural features and for this reason certain features have been identified as being of Medium sensitivity.

Sugar cane fields have an impact on electricity grid infrastructure in that increased cable height is required to permit the burning of the sugar cane crop residues, otherwise an alternative practice of crop burning before harvesting is required in lands crossed by power lines.

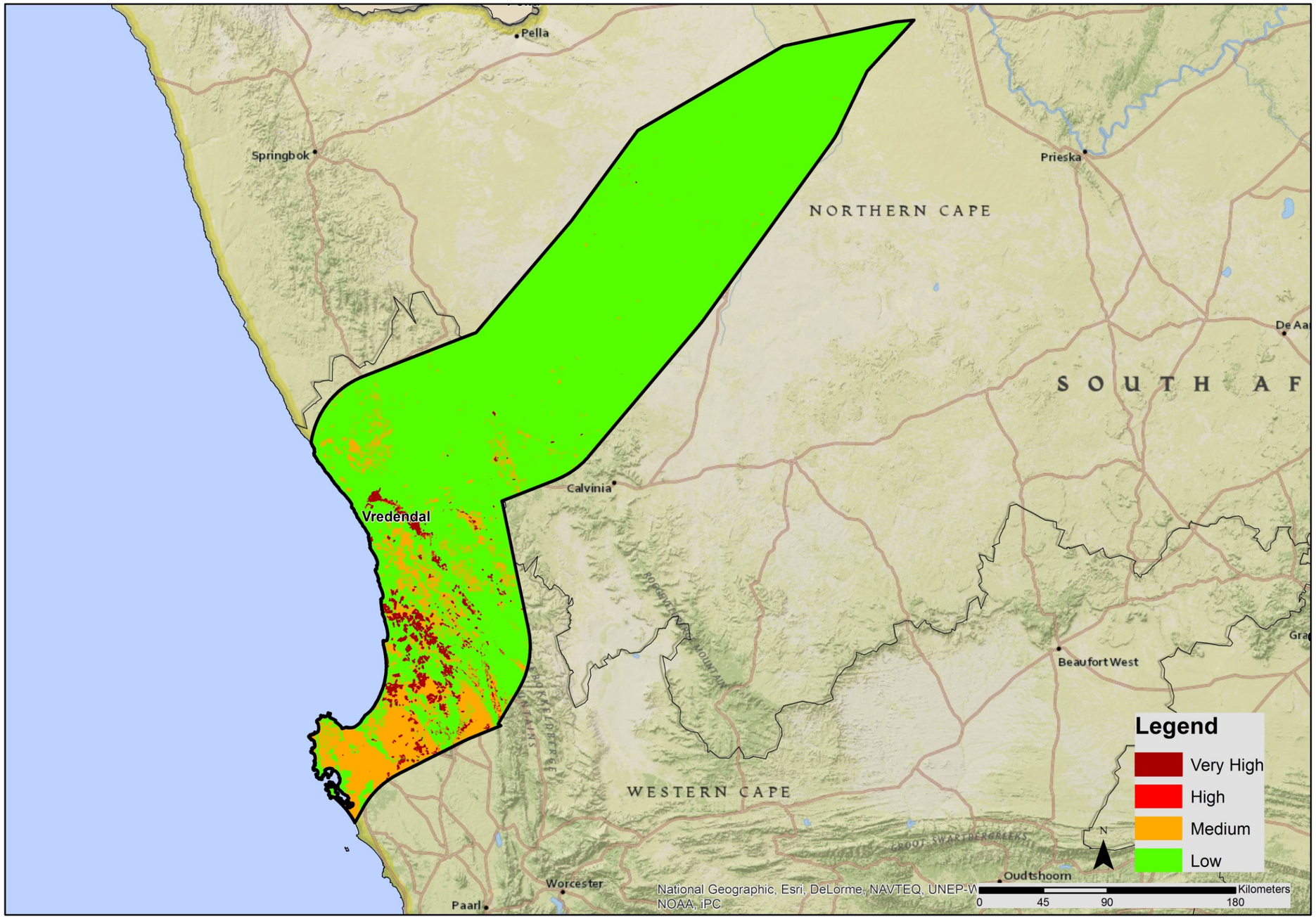
In all other cultivated fields, the limited disturbance and loss of land caused by pylon bases, substations and supporting infrastructure is still more significant than on uncultivated land, thus all cultivated areas have been categorised as being of Medium sensitivity. All agricultural land not included in the categories above is classified as having low sensitivity.

1.3 Sensitivity Maps

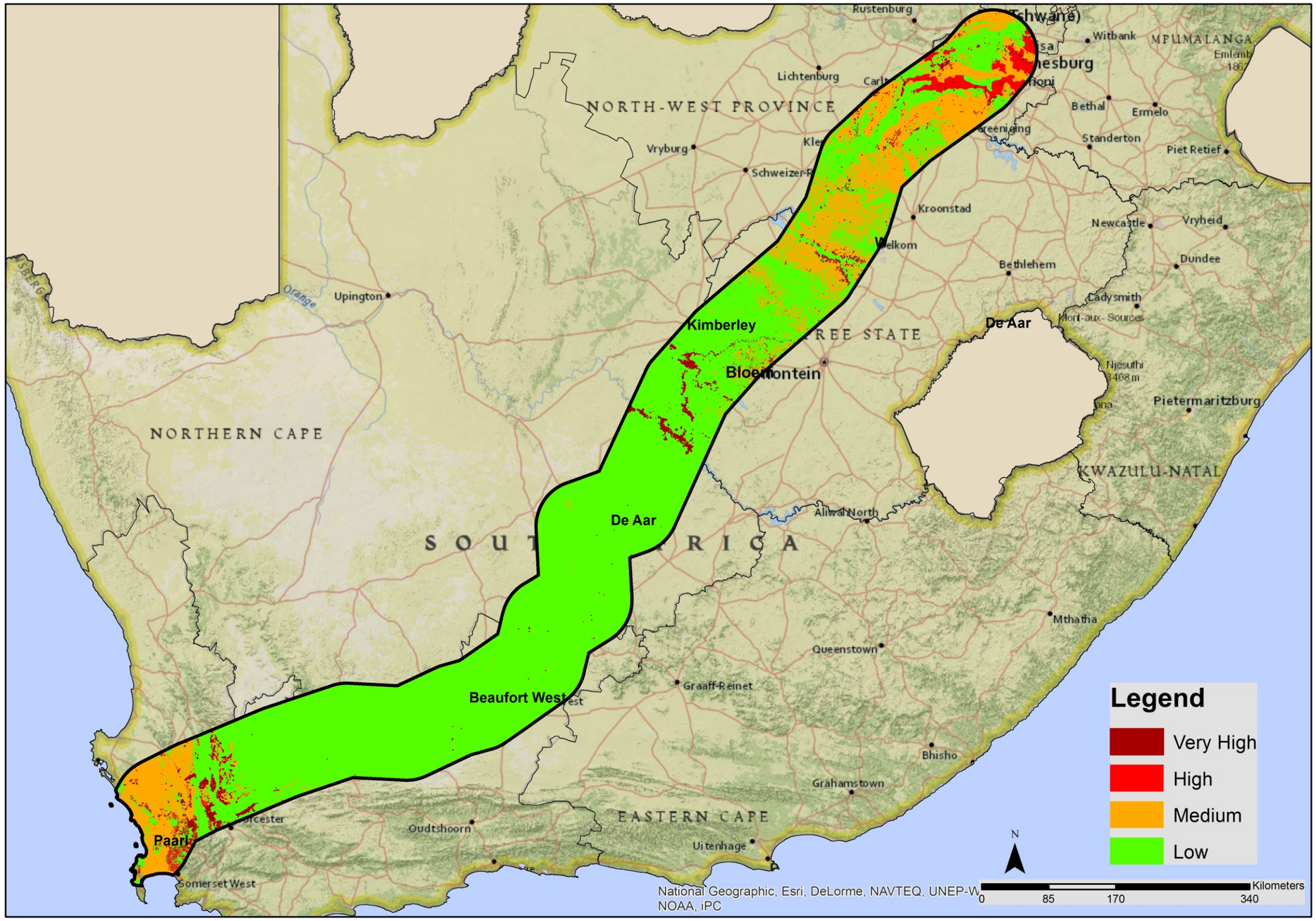
Electricity grid infrastructure sensitivity maps were produced for each of the five power corridors according to the criteria set out in Table 3 to classify agricultural sensitivity spatially into four tiers namely, Very High, High, Medium and Low.

Table 3: Sensitivity delineation of sensitive agricultural features

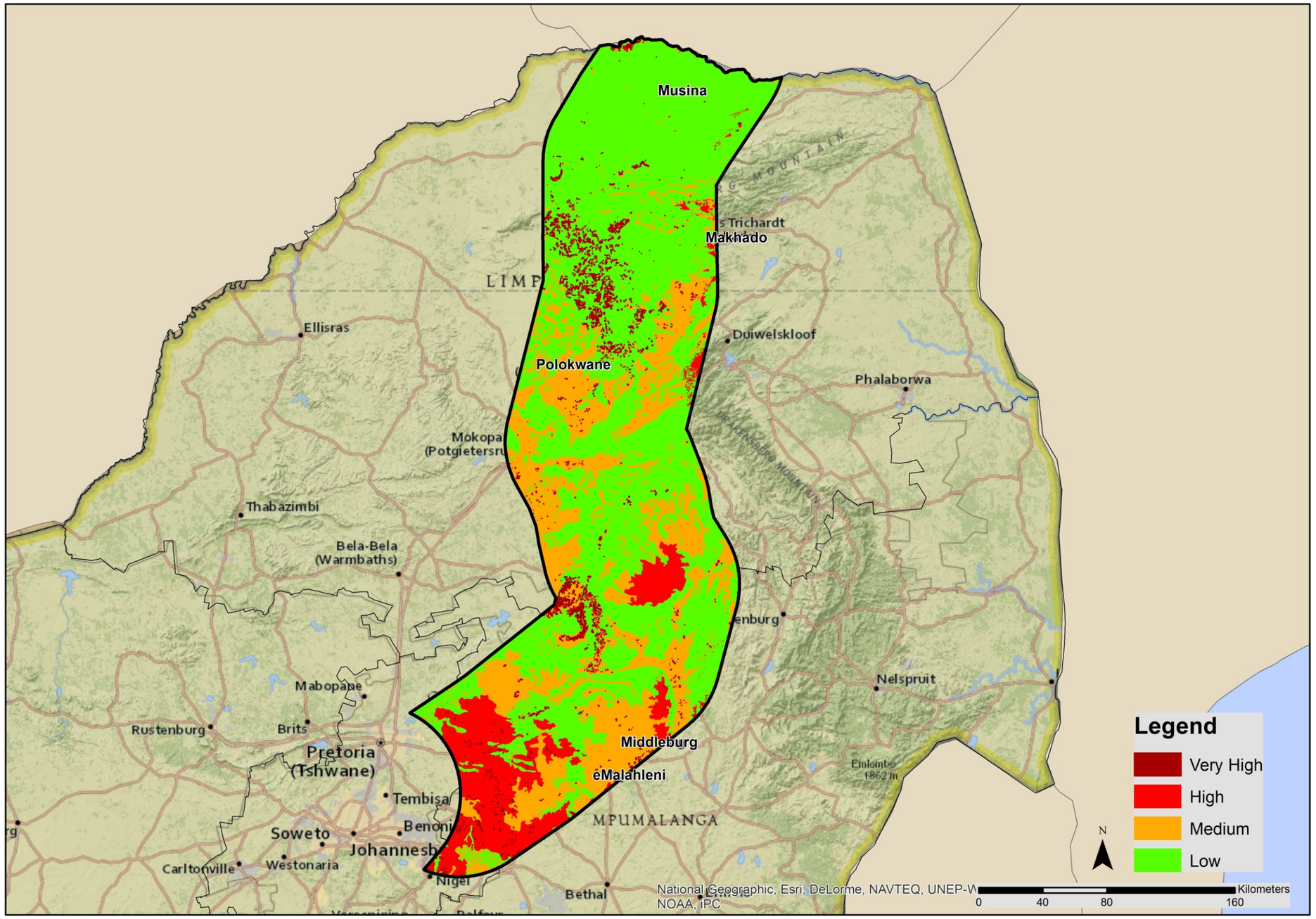
Sensitivity Feature Class	Sensitivity
Pivots	**Very high**
Horticulture >400m	**Very high**
Vines >400m	**Very high**
Land capability Class I	**Very high**
Horticulture <400m	**High**
Vines <400m	**High**
Land capability Class II	**High**
Timber plantations	**High**
Sugar cane	**Medium**
All other cultivated fields	**Medium**
Land capability Class III	**Medium**
All other	**Low**



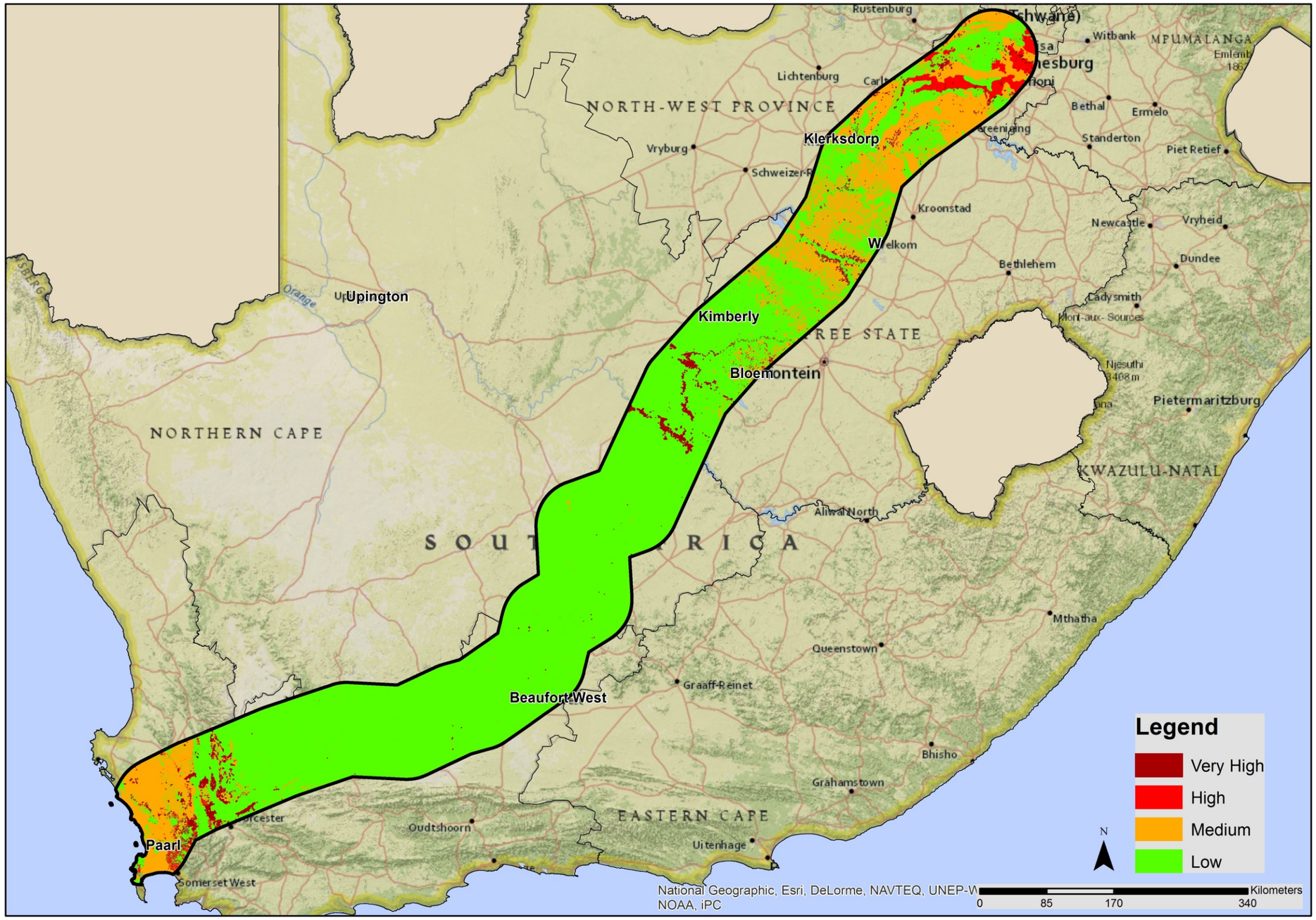
Map 1: Agricultural sensitivity map for Electricity Grid Infrastructure Development in the Western Corridor



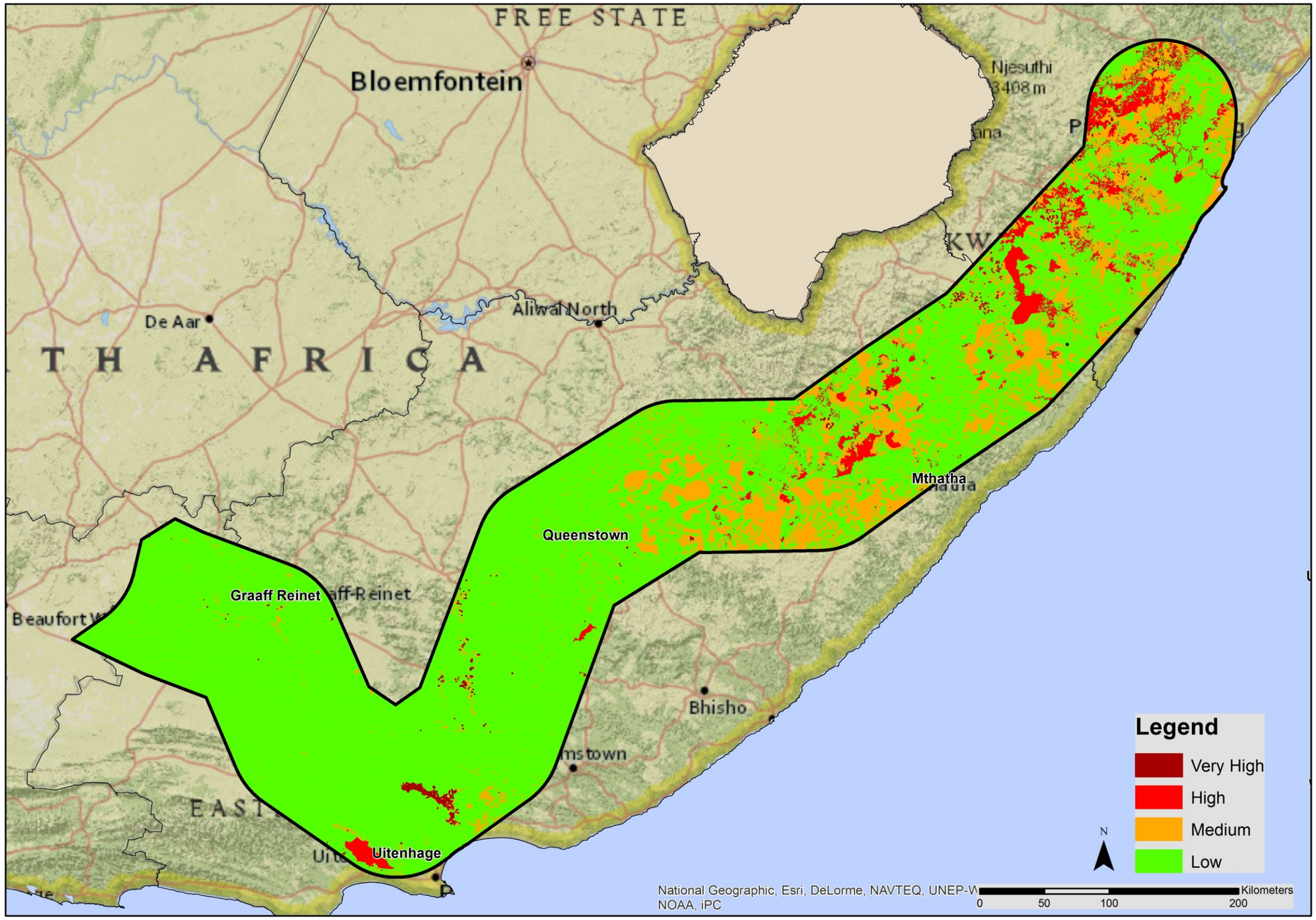
Map 2: Agricultural sensitivity map for Electricity Grid Infrastructure Development in the Northern Corridor



Map 3: Agricultural sensitivity map for Electricity Grid Infrastructure Development in the International Corridor



Map 4: Agricultural sensitivity map for Electricity Grid Infrastructure Development in the Central Corridor



Map 5: Agricultural sensitivity map for Electricity Grid Infrastructure Development in the Eastern Corridor

1.4 Development Protocol

The aim of this Development Protocol is to preserve agriculturally important land for agricultural production, while streamlining the authorisation process, particularly in areas of low agriculture potential. To achieve this, such a protocol needs to focus on what is of importance without including unnecessary detail that will potentially cloud and complicate efficient decision making around authorisation. Such a protocol needs to be clear and unequivocal, and acceptable to both the authorising authority (in terms of NEMA) and to the developer.

The authorisation process proposed in the Draft Preservation and Development of Agricultural Land Framework Bill is considered to be unnecessarily complex and time consuming for efficient electricity grid infrastructure authorisation[1]. A simplified process can be justified because of the relatively low impact of electricity grid infrastructure developments on agriculture, particularly within the corridors that have already been routed to avoid agriculturally important areas. Such a simplified process would, however, not be appropriate for other types of development that involve more significant agricultural impacts.

It is recommended that the process of agricultural authorisation for electricity grid infrastructure developments within the five corridors is done by way of a different process to that stipulated in the Bill. The Bill may therefore need to make provision for such a process for electricity grid infrastructure development. The current situation does recognise such a difference for power line servitudes, for which developers are exempt from agricultural authorisation in terms of the existing Sub-Division of Agricultural Land Act (Act No. 70 of 1970).

The protocol presented in Table 4 is recommended. The assessment of agricultural impacts and application for agricultural authorisation by way of the protocol in Table 4 should consist of a report compiled and signed off by a SACNASP registered agricultural scientist.

[1] It is noted that a formal public participation of the Bill is to unfold in 2016 and changes to the Bill may occur as a result of this process.

Proposed Agricultural Assessment Procedure
Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process must prove to the relevant Competent Authority in terms of NEMA that the proposed development will not have an unacceptable negative impact on agriculture. 1. *Screening* *Projects Located Inside the Power Corridors* A registered agricultural scientist shall be required to validate the agricultural sensitivity map produced by download from the DEA Screening Tool for the sub-corridor(s). Validation of the sensitivities can be undertaken at a desktop level or through field assessment by a competent agricultural scientist. The method for validating sensitivities will be at the discretion of the agricultural scientist. *Projects Located Outside the Power Corridors* A competent agricultural scientist will be required to create an agricultural sensitivity map for the identified sub-corridor(s) using the approach and criteria detailed in Section 1.2. Validation of the sensitivities by a competent agricultural specialist can be undertaken at a desktop level or through field assessment. The method for validating sensitivities shall be at the discretion of the agricultural scientist. 2. *Minimum Assessment Requirements* *All Projects* The minimum assessment requirements described in Table 4 shall be applied to the development envelope for proposed projects located both inside and outside the Power Corridors. The assessment requirements at different positions within the development envelope may differ depending on the underlying sensitivity, as determined by the validated sensitivity map. 3. *Commenting and Decision Making* The outcome of the assessments shall be submitted to the relevant agricultural Commenting Authority (DAFF) for comment. Such a comment, if received within the stipulated timeframes, will be considered by the relevant Competent Authority in terms of NEMA for decision making.

Table 4: Interpretation of agricultural sensitivity and associated assessment requirements inside of the Power Corridors

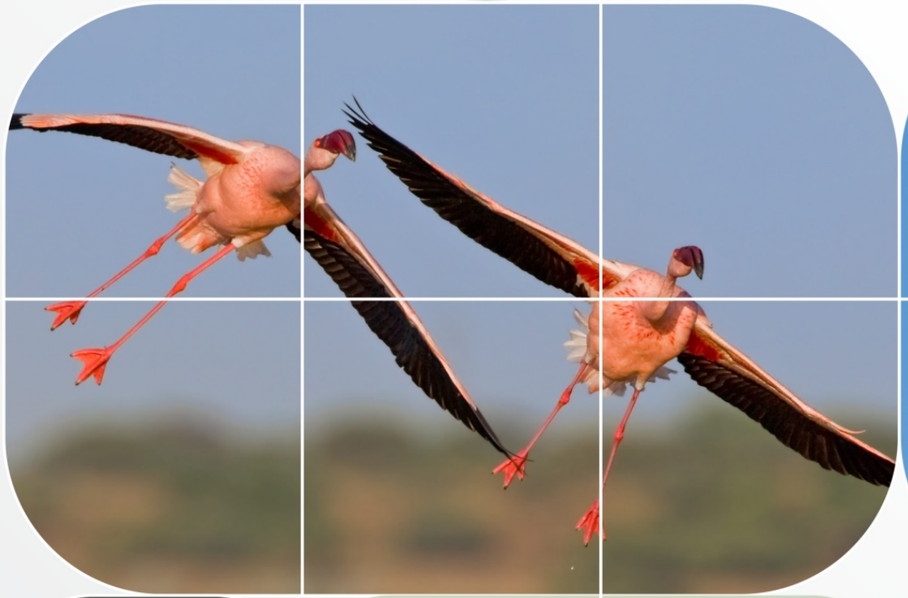
Sensitivity Class	Interpretation of Sensitivity	Further assessment requirements for electricity grid infrastructure developments
Very High	Potentially unsuited to development because it will lead to loss of some land with existing high agricultural productivity.	Should the development envelope be required to be located on areas identified as Very High or High sensitivity as determined through the sensitivity mapping process, a comprehensive Agricultural Impact Assessment shall be undertaken for such areas. The Agricultural Impact Assessment shall be undertaken by a competent agricultural scientist undertaken in accordance with the NEMA regulations pertaining to specialist reports and impact assessment. In addition to the NEMA requirements such a report must contain: • The development envelope (including supporting infrastructure) overlaid on a validated sensitivity map prepared in accordance with the sensitivity criteria set out in Section 1.2 and based on a field assessment of the cultivation status of the land rather than existing data sets[2]. The distinction between pylon placement being required within horticulture and /or vines and routing which does not, must be made in terms of the actual site specifics (power line direction; maximum possible span; viability of pylon placement outside the borders of the agricultural block). • Identify all possible alternatives that avoid Very High and High sensitivity features. Assess and confirm with the developer the viability or non-viability, or relative desirability of all these alternatives, stating clear and explicit reasons for the viability and desirability ratings that they have been assigned. In the case of centre pivots, the alternatives can include the off-set for moving the pivot[3]. • Assess whether the power line routes or associated infrastructure have any significant fragmenting effects on agricultural land parcels, and if they do, identify alternative placements. Assess and confirm with the developer the viability or non-viability, or relative desirability of all these alternatives, stating clear and explicit reasons for the viability and desirability ratings that they have been assigned. • A clear and justified opinion statement by the specialist recommending whether the project should from an agricultural perspective receive approval • Where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). The assessment of agricultural impacts and application for agricultural authorisation should be by way of a report compiled and signed off by a SACNASP-registered agricultural scientist.
High	Avoid where possible because it will lead to some disturbance and loss of existing or potential agricultural (or forestry) production.	
Medium	Re-route onto lower sensitivity agricultural land (where possible and where all other factors are equal) because it will lead to very minor disturbance and loss of existing or potential agricultural production.	Should the development envelope be required to be located on areas identified as Medium sensitivity as determined through the sensitivity mapping process, a comprehensive Agricultural Impact Assessment shall be undertaken for such areas. The Agricultural Impact Assessment shall be undertaken by a competent agricultural scientist undertaken in accordance with the NEMA regulations pertaining to specialist reports and impact assessment. In addition to the NEMA requirements such a report must contain: • The development envelope (including supporting infrastructure) overlaid on a validated sensitivity map prepared in accordance with the sensitivity criteria set out in Section 1.2 and which can be based on existing data sets that indicate the cultivation status of the land rather than a field assessment of this[1]. • Identify location of all possible power line route alternatives that allow re-routing from Medium agricultural sensitivity to low sensitivity. Assess and confirm with the developer the viability or non-viability, or relative desirability of these alternatives, stating clear and explicit reasons for the viability and desirability ratings that they have been assigned; • An assessment of whether the power line routes or associated infrastructure have any significant fragmenting effects on agricultural land parcels, and if they do, identify alternative placements. Assess and confirm with the developer the viability or non-viability, or relative desirability of all these alternatives, stating clear and explicit reasons for the viability and desirability ratings that they have been assigned; • A clear and justified opinion statement by the specialist recommending whether the project should from an agricultural perspective receive approval; • Where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). The assessment of agricultural impacts and application for agricultural authorisation should be in the form of a report compiled and signed off by a SACNASP registered agricultural scientist.
Low	Insignificant impact on agriculture.	Should the development envelope be required to be located on areas identified as Low sensitivity as determined through the sensitivity mapping process, a compliance statement by a competent agricultural scientist or Environmental Assessment Practitioner (EAP) is required. The minimum requirements for the compliance statement are: • The details and relevant expertise of the agriculture scientist/ EAP preparing the statement;

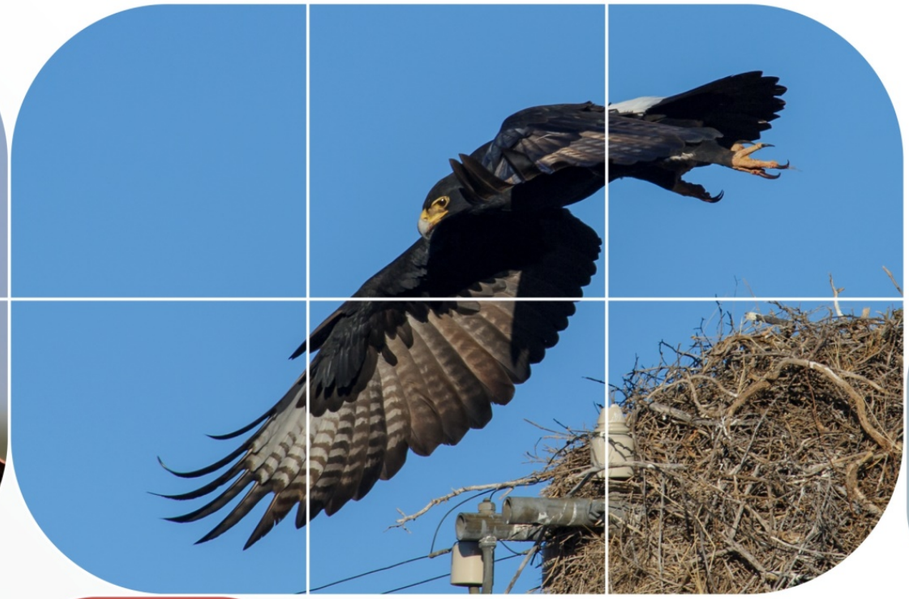
[2] The delineation of land capability classes should be done according to the latest land capability data that is available. When the new land capability data becomes available next year, it may require a re-classification of the sensitivity rating assigned to the different land capability classes by this study.
[3] Before this can be included as an alternative, the soil and landscape suitability of the new pivot site must be assessed in detail by way of a detailed soil survey and confirmed as suitable and consideration of the cost implications must also be given.

Sensitivity Class	Interpretation of Sensitivity	Further assessment requirements for electricity grid infrastructure developments
		• The development envelope (including supporting infrastructure) overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in Section 1.2. The sensitivity map can be based on existing data sets that indicate the cultivation status of the land rather than field assessment[1]. • Confirmation that all reasonable measures have been taken through micro-siting to minimise fragmentation and disturbance of agricultural activities; • A clear and justified opinion statement by the by the EAP/specialist recommending whether the project should from an agricultural perspective receive approval; • If this statement is subject to any conditions these must also be clearly stated; and where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).

PART 3

Chapter 2. AVIFAUNA





CONTENTS

TABLES

MAPS

CHAPTER 2. AVIFAUNA

2.1 Introduction

The following chapter has been informed by the scoping level specialist avifauna pre-assessment of the five corridors. Given the integrated nature of this policy level SEA, the recommendations made by the specialist(s) have in some instances been adapted based on inputs provided by government departments, in particular relevant competent authorities, and wider stakeholders. The complete specialist report is available in Appendix C: Avifauna Specialist Report.

2.1.1 Electricity Grid Infrastructure and Avifauna

Due to their size and prominence, the components of electrical infrastructure constitute an important interface between birds and man. Negative interactions between birds and electrical infrastructure can take a number of different forms. The three most significant problems presented to birds in southern Africa is the risk of electrocution, collision and habitat destruction during both the construction and maintenance of electrical infrastructure.

2.1.1.1 Electrocution

Electrocution refers to the scenario where a bird is perched or attempts to perch on the structure and causes an electrical short circuit by physically bridging the air gap between a live phase and an earth component (phase-earth electrocution) or between two live phases (phase-phase electrocutions). This type of impact is a function of line design and the dimensions of a bird's extremities (e.g. wing span).

The major transmission line structures (from 220kV to 765kV) usually do not pose an electrocution threat to large birds, because the pylons are designed in such a manner that the birds do not perch in close proximity to the conductors. Transmission level power lines have in some cases proved to be beneficial to birds such as Martial Eagles, Tawny Eagles, White-backed Vultures, and even occasionally Verreaux's Eagles by providing safe nesting and roosting sites in areas where suitable natural alternatives are scarce. Cape Vultures *Gyps coprotheres* have also taken to roosting on power lines in certain areas in large numbers, while Lappet-faced Vultures *Torgos tracheliotos* are increasingly using power lines as roosts, especially in the Northern Cape. Unfortunately the same cannot be said of the smaller sub-transmission and reticulation lines of 11kV to 132kV (Van Rooyen 1998; 2000) where the risk of electrocution is considered to be much higher.

2.1.1.2 Collision

Collision mortality is probably the biggest threat posed by transmission lines to birds in South Africa. The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors including biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with water birds, gamebirds, rails, cranes and bustards usually the most numerous reported victims.

The proliferation of man-made structures in the landscape is relatively recent, and birds have not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk. These birds must fly rapidly to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution and often restricted, forward vision that is useful to detect obstacles. Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision. Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide with electrical infrastructure more often. Juvenile birds have often been reported as being more collision-prone than adults.

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas or flyways) can be very dangerous. Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing. Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid.

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk. In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous. On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires.

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa. This list is far from comprehensive as only a fraction of mortalities is ever reported.

Power line collisions are generally accepted as a key threat to bustards. In a recent study[1], carcass surveys were performed under high voltage transmission power lines in the Karoo for two years, and low voltage distribution lines for one year. Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of the Karoo Korhaan species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines.

2.1.1.3 Habitat Destruction

During the construction and maintenance of power lines and substations, some habitat destruction and transformation inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimize the risk of fire under the line, which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in, or in close proximity to the servitude through transformation of habitat, which could result in temporary or permanent displacement.

[1] Shaw, J.M. 2013. Power line collisions in the Karoo: Conserving Ludwig's Bustard. Unpublished PhD thesis. Percy FitzPatrick Institute of African Ornithology, Department of Biological Sciences, Faculty of Science University of Cape Town May 2013

Apart from direct habitat destruction, the construction and maintenance activities also affect birds through disturbance, particularly during breeding. Disturbance of breeding individuals could lead to breeding failure through abandonment of the nest or through exposing the eggs and nestlings to predation when the adult birds temporarily leave the nest area.

2.2 Sensitivity Mapping Criteria

2.2.1 Data Sources

Avifaunal sensitivity was determined through the interpretation of existing information only. No ground truthing or on-site assessments were undertaken as part of the study. The datasets used to identify sensitive features and delineate sensitivity are listed below in Table 1.

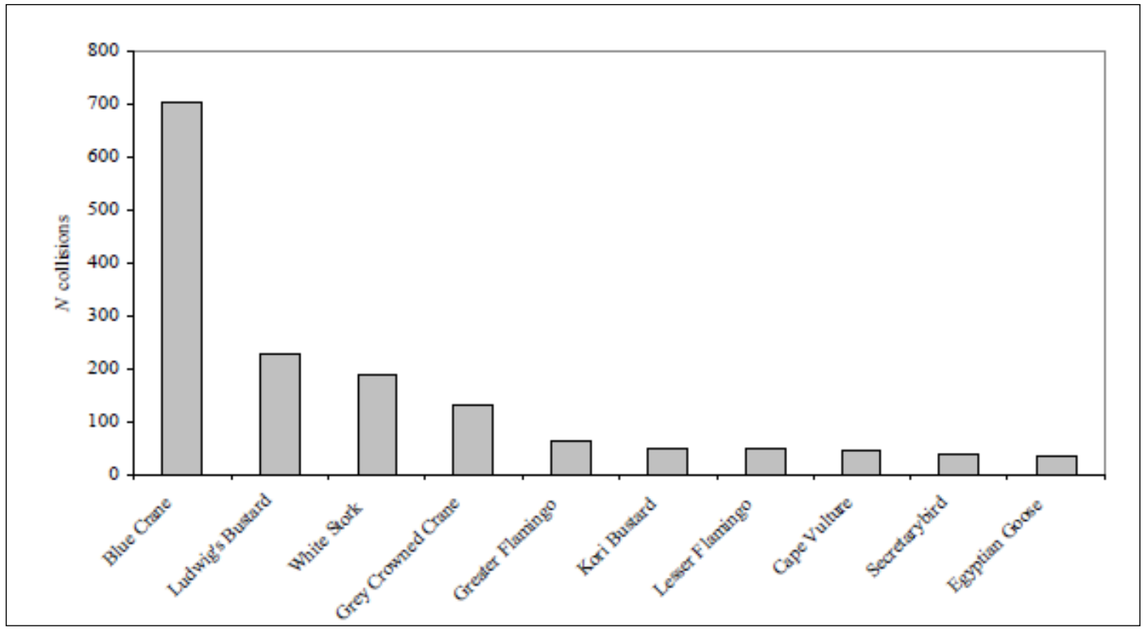


Figure 1: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 – 2008.

Table 1: Spatial data used for bird sensitivity mapping

Habitat Class	Data Source + Date of Publications	Data Description	Relevant Corridors
Water permanent	South African National Land-Cover Dataset, 2015	Areas of open, surface water, that are detectable on all image dates used in the Landsat 8 based water modelling processes. Permanent water extent typically refers to the minimum water extent, which occurs throughout the 2013-14 assessment period. Includes both natural and man-made water features.	All
Water seasonal	South African National Land-Cover Dataset, 2015	Areas of open, surface water, that are detectable on one or more, but not all image dates used in the Landsat 8 based water modelling processes. Seasonal water extent typically refers to the maximum water extent, which may only occur for a limited time within the 2013-14 assessment period. Includes both natural and man-made water features.	All
Wetlands	South African National Land-Cover Dataset, 2015	Wetland areas that are primarily vegetated on a seasonal or permanent basis. Defined on the basis of seasonal image identifiable surface vegetation patterns (not subsurface soil characteristics. The vegetation can be either rooted or floating. Wetlands may be either daily (i.e. coastal), temporarily, seasonal or permanently wet and/or saturated. Vegetation is predominately herbaceous. Includes but not limited to wetlands associated with seeps/springs, marshes, floodplains, lakes/pans, swamps, estuaries, and some riparian areas. Wetlands associated with riparian zones represent image identified vegetation along the edges of watercourses that show similar spectral characteristics to nearby wetland vegetation. Excludes mangrove swamps. Permanent or seasonal open water areas within the wetlands are classified separately. Seasonal wetland occurrences within commercially cultivated field boundaries are not shown, although they have been retained within subsistence level cultivation fields.	All
Indigenous Forest	South African National Land-Cover Dataset, 2015	Natural / semi-natural indigenous forest, dominated by tall trees, where tree canopy heights are typically > ca. 5 m and tree canopy densities are typically > ca. 75 %, often with multiple understory vegetation canopies.	All
Thicket/dense bush	South African National Land-Cover Dataset, 2015	Natural / semi-natural tree and / or bush dominated areas, where typically canopy heights are between 2 - 5 m, and canopy density is typically > ± 75%, but may include localised sparser areas down to ca. 60%. Includes dense bush, thicket, closed woodland, tall, dense shrubs, scrub forest and mangrove swamps. Can include self-seeded bush encroachment areas if sufficient canopy density.	All
Woodland/open bush	South African National Land-Cover Dataset, 2015	Natural / semi-natural tree and / or bush dominated areas, where typically canopy heights are between ± 2 - 5 m, and canopy densities typically between 40 - 75%, but may include localised sparser areas down to ca. 15 - 20 %. Includes sparse – open bushland and woodland, including transitional wooded grassland areas. Can include self-seeded bush encroachment areas if canopy density is within indicated range. In the arid western regions (i.e. Northern Cape), this cover class may be associated with a transitional bush / shrub cover that is lower than typical open bush / woodland cover but higher and/or more dense than typical low shrub cover.	All
Grassland	South African National Land-Cover Dataset, 2015	Natural / semi-natural grass dominated areas, where typically the tree and / or bush canopy densities are typically < ± 20 %, but may include localised denser areas up to ca. 40 %, (regardless of canopy heights). Includes open grassland, and sparse bushland and woodland areas, including transitional wooded grasslands. May include planted pasture (i.e. grazing) if not irrigated. Irrigated pastures will typically be classified as cultivated and urban parks and golf courses etc. are classified under urban.	All
Shrubland fynbos	South African National Land-Cover Dataset, 2015	Natural / semi-natural low shrub dominated areas, typically with < ± 2 m canopy height, specifically associated with the Fynbos Biome. Includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse covers may be associated with the bare ground class. Note that taller tree / bush / shrub communities within this vegetation type are typically classified separately as one of the other tree or bush dominated cover classes.	All
Low shrubland	South African National Land-Cover Dataset, 2015	Natural / semi-natural low shrub dominated areas, typically with ≤ 2 m canopy height. Includes a range of canopy densities encompassing sparse to dense canopy covers. Very sparse cover may be associated with the bare ground class. Typically associated with low, woody shrub, karoo-type vegetation communities, although can also represent locally degraded vegetation areas where there is a significantly reduced vegetation cover in comparison to surrounding, less impacted vegetation cover, including long-term wildfire scars in some mountainous areas in the western Cape. Note that taller tree / bush / shrub communities within this vegetation type are typically classified separately as one of the other tree or bush dominated cover classes.	All
Cultivated commercial fields rainfed	South African National Land-Cover Dataset, 2015	Cultivated lands used primarily for the production of rain fed, annual crops for commercial markets. Typically represented by large field units, often in dense local or regional clusters. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All
Commercial pivots	South African National Land-Cover Dataset, 2015	Cultivated lands used primarily for the production of centre pivot irrigated, annual crops for commercial markets. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All
Cultivated orchards and vines	South African National Land-Cover Dataset, 2015	Cultivated lands used primarily for the production of both rain fed and irrigated permanent crops for commercial markets. Includes both tree, shrub and non-woody crops, such as citrus, tea, coffee, grapes, lavender and pineapples etc. In most cases the defined cultivated extent represents the actual cultivated or potentially extent.	All
Cultivated subsistence	South African National Land-Cover Dataset, 2015	Cultivated lands used primarily for the production of rain-fed, annual crops for local markets and / or home use. Typically represented by small field units, often in dense local or regional clusters. The defined area may include intra-field areas of non-cultivated land, which may be degraded or use-impacted, if the individual field units are too small to be defined as separate features.	All
Cultivated sugar cane	South African National Land-Cover Dataset, 2015	Commercial, pivot irrigated fields that appear to be used continuously for growing sugarcane on the majority of multi-date Landsat images used in the 2013-14 analysis period. Also includes commercial and semi-commercial / emerging farmer status, non-pivot fields that appear to be used continuously for growing sugarcane on the majority of multi-date Landsat images used in the 2013-14 analysis period.	Eastern Corridor

Habitat Class	Data Source + Date of Publications	Data Description	Relevant Corridors
Plantations	South African National Land-Cover Dataset, 2015	Planted forestry plantations used for growing commercial timber tree species. The class represents mature tree stands which have approximately 70% or greater tree canopy closure (regardless of canopy height), on all the multi-date Landsat images in the 2013-14 analysis period. The class includes spatially smaller woodlots and windbreaks with the same cover characteristics. It also includes young tree stands that have approximately 40 - 70% tree canopy closure (regardless of canopy height), clear-felled stands and spatially smaller woodlots and windbreaks with the same cover characteristics.	All
Industrial	South African National Land-Cover Dataset, 2015	Mining activity footprint, based on non-vegetated and bare ground surfaces. Includes extraction pits, tailings, waste dumps and associated surface infrastructure such as roads and buildings (unless otherwise indicated), for both active and abandoned mining activities. This class may include open cast pits, sand mines, quarries and borrow pits etc. also includes mining activity footprint, based on semi-bare ground surfaces, which may be sparsely vegetated . Includes extraction pits, tailings, waste dumps and associated surface infrastructure such as roads and buildings (unless otherwise indicated) and surrounding dust-impacted areas, for both active and abandoned mining activities. Water bodies inside mining areas which represent permanent and non-permanent water bodies are also included. Areas containing buildings and large surface infrastructure associated with the extraction, processing or administration of the associated mining area are also included.	All
Bare	South African National Land-Cover Dataset, 2015	Non-vegetated donga and gully features, typically associated with significant natural or man-induced erosion activities along or in association with streams and flow lines. The mapped extent of the dongas and gullies is represented by bare ground conditions in all or the majority of the multi-date Landsat images used in the land-cover modelling. Note that these erosion features are significantly better represented both spatially and numerically in the wetter, more lush regions of the country where the non-vegetated erosion surface is significantly different from the surrounding vegetation cover (i.e. bushveld and grassland regions). In general, sparsely vegetated sheet eroded areas and degraded areas with significantly reduced local vegetation cover are not included in this class, but will be represented by local areas of low shrub or bare ground. Also included are bare, non-vegetated ground, with little or very sparse vegetation cover (i.e. typically < ca. 5 - 10 % vegetation cover), occurring as a result of either natural or man-induced processes. Includes but not limited to natural rock exposures, dry river beds, dry pans, coastal dunes and beaches, sand and rocky desert areas, very sparse low shrublands and grasslands, surface (sheet) erosion areas, severely degraded areas, and major road networks etc. May also include long-term wildfire scars in some mountainous areas in the Western Cape.	All
Urban	South African National Land-Cover Dataset, 2015	Areas containing the following: • high density buildings and other built structures associated with mainly non-residential, commercial, administrative, health, religious or transport (i.e. train station) activities; • buildings and other built-up structures mainly associated with non-residential, industrial and manufacturing activities, including power stations; • high density buildings and other built structures typically associated with informal, often non-regulated, residential housing; • buildings, other built structures and open sports areas typically • Areas associated with schools and school sports grounds. • Areas containing a low density mix of buildings, other built structures • Areas, which may or may not be cultivated, that are representative of both formally declared agricultural holdings, and similar small holdings / small farms, typically located on the periphery of urban areas. • Areas containing a low density mix of buildings and other built structures associated with golf courses. The class includes both residential golf estates and non-residential golf courses, and typically represents the broader extent of the entire estate or course. • Areas containing high density buildings and other built structures typically associated with formal, regulated, residential housing associated with townships and "RDP" type housing developments. • Areas containing a variable density of structures typically associated with rural villages, including both traditional and modern buildings. • Areas containing variable densities of buildings other built-up structures, or no structures at all, that are not clearly identifiable as one of the other Built-Up classes. May include runways, major infrastructure development sites, holiday chalets, roads, car parks, cemeteries etc.	All
Steep slopes with potential cliffs	U.S. Geological Survey: http://www.usgs.gov/ and http://wiki.gis.com/wiki/index.php/Grade_(slope)) 2015	• A 30 m digital elevation model was used to generate a slope map in ArcGIS Spatial Analyst. Areas with a slope angle of 45° or 100% rise were classified as steep slopes which potentially include cliffs.	All
Nest sites	• The crane and White-backed Vulture nest databases of the Endangered Wildlife Trust (EWT); 2015 • Tawny Eagle, Lappet-faced Vulture, White-backed Vulture, Martial Eagle and Bateleur nests identified by Abri Maritz in the Northern Cape during; 2009	• Nest sites of Martial Eagle, Verreaux's Eagle, Tawny Eagle, Bateleur. White-backed Vulture, Lappet-faced Vulture, Black Harrier, Lanner Falcon. • Blue Swallow breeding areas in KwaZulu-Natal • Nest sites of Blue Crane, Grey Crowned Cranes and Wattled Crane. • Potential nest sites of Southern Ground Hornbill.	All Eastern Corridor All corridors except Northern Corridor International and Eastern

Habitat Class	Data Source + Date of Publications	Data Description	Relevant Corridors
	• The Endangered Wildlife Trust's database of eagles nesting on transmission lines in the Karoo; 2006 • A map of Blue Swallow breeding areas obtained from Nick Theron at BLSA; 2015 • Information on the locations of various Red Data raptor nests in the Northern and Eastern Cape, as well as Cape Vulture colonies in the Eastern Cape. Received from Jon Smallie, WildSkies Ecological Services, 2015 • Information on potential nesting areas of Southern Ground Hornbills, Mabula Ground Hornbill Project, 2015. • Information on various Red Data species nests and vulture colonies obtained from the Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa. • Information on the locations of Southern Bald Ibis breeding colonies, Birdlife South Africa, 2015.	• Southern Bald Ibis breeding areas in KwaZulu-Natal.	Corridor Eastern Corridor
Vultures	• National vulture restaurant database obtained from Vulpro in May 2015 • The results of the 2013 aerial survey of Cape Vulture colonies conducted by Eskom, EWT and Birdlife South Africa (BLSA) in the former Transkei, Eastern Cape. • The national register of vulture Cape Vulture colonies obtained from Vulpro in May 2015 • Information on the locations of Cape Vulture colonies in the Eastern Cape. Received from Jon Smallie from WildSkies Ecological Services, 2015	• Cape Vulture breeding and roosting colonies • White-backed Vulture breeding areas • Known vulture restaurants, both active and inactive	All corridors except Western Corridor

2.3 Processing of Data

The point of departure for the definition of avifaunal sensitivity was the 2013 - 2014 South African National Land-Cover Dataset. This was supplemented with information on recognised avifaunal sensitive features, where available e.g. known nests sites and vulture restaurants. The step by step approach undertaken to attribute avifaunal feature sensitivity was:

- *The Southern African Bird Atlas 2 (SABAP2) data for each pentad in each corridor were obtained from the Animal Demography Unit at the University of Cape Town. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8km × 7.6 km.*

- *Due to the large number of pentads (n = 7974), the pentads were consolidated into Quarter Degree Grid Cells (QDGC). A QDGC is the equivalent of a 1:50 000 topographical map and covers an area of 15 minutes of latitude by 15 minutes of longitude (25km x 27.4km) or approximately 640 square kilometres. From this a consolidated species list was compiled for each biome in each corridor by pooling all the data for the QDGCs which overlapped with a specific biome within a corridor. The total number of QDGCs for all corridors amounted to 886.*

- *All bird species that potentially could be impacted by electricity infrastructure were identified for each biome within each corridor using the SABAP2 data as the main source of information. Where there were no SABAP2 data available (n = 37), data from the Southern African Bird Atlas 1 (SABAP1) was used.*

- *The list of bird species was refined to a list of power line sensitive Red Data priority species **(Spp)** for each biome within each corridor. The list was compiled by using the following criteria:*
  - *Electrocution and collision: Morphology, behaviour, habitat, historical records;*
  - *Displacement of breeding individuals: Habitat; and*
  - *SABAP2 reporting rate: A reporting rate of 5% or higher for the species in the biome.*

- *Bird habitat classes and key feature sensitivities were identified for each biome within each corridor.*

- *The potential negative impacts on avifauna by the electricity grid were identified as:*
  - *Electrocutions[2] **(E)**;*
  - *Collisions **(C)**; and*
  - *Displacement of breeding individuals **(D)**.*

- *The probability of the respective impacts occurring in a habitat class was rated for each priority species to arrive at a **species-specific probability score (SppP)** for each impact, within each habitat class, within each biome, within each corridor. Probability scores **(P)** for the occurrence of the respective impacts were rated according to the below:*
  - *0 = the impact is highly unlikely to occur*
  - *1 = the impact is unlikely to occur*
  - *2 = the impact could possibly occur*
  - *3 = the impact will most likely occur*

  SppP = (E*P) + (C*P) + (D*P)

- *The species-specific probability score was multiplied by a weighted Red Data status score **(RS)** for each priority species to arrive at a **species-specific habitat sensitivity score (SppHS)** for each species, for each habitat class. The Red Data status was assigned a weighted score according to the scales below:*
  - *Near threatened = 2*
  - *Vulnerable = 4*
  - *Endangered = 8*
  - *Critically endangered = 16*

  SppHS = (SppP)*(RS)

- *An **aggregated habitat sensitivity score (AHS)** for each habitat class within each biome, within each corridor was calculated by summing the species-specific probability scores for that particular habitat class.*

  AHS=Spp$_1$HS + Spp$_2$HS + Spp$_3$HS + etc

- *A four-tiered consolidated sensitivity map of all habitat classes indicating their spatial extent in each of the corridors was developed with GIS, using the aggregated habitat sensitivity scores of the various feature classes and according to the scoring system below.*
  - *0 - 10 =Low*
  - *11 – 80 =Medium*
  - *81 – 160 =High*
  - *161 – 240 =Very High*

- *The sensitivity ratings for each habitat class were then illustrated according to the following classification scheme: Dark Red/Very High, Red/High, Orange/Medium, Green/Low.*

- *Key sensitivity features (i.e. vulture breeding areas, Red Data raptor nests, vulture restaurants, crane nests, Southern Ground Hornbill nests, Southern Bald Ibis breeding colonies and Blue Swallow breeding areas) were buffered and allocated a default Dark Red/Very High sensitivity rating.*

- *Consistent buffering differences where applied for common habitat classes and sensitivity features across different biomes, as follows:*
  - *Spp Nest Sites = 2.5 km (excluding Lanner Falcon, Black Harrier, Southern Bald Ibis and Vultures)*
  - *Lanner Falcon Nest Sites= 500 m*
  - *Black Harrier Nest Site= 1 km*
  - *Southern Bald Ibis Nest Site= 1 km*
  - *Vulture Sites (colonies, nest sites and restaurants)= 5 km*
  - *Steep Slopes Habitat= 1 km*
  - *Urban Habitat= 500 m*
  - *Wetland and Waterbodies Habitat= 500 m*

2.4 Sensitivity Delineation

The habitat classes/ sensitivity features considered in the analysis and presented in Table 2. The sensitivity of each feature was scored and allocated a simple four-tier rating in accordance with the approach described in Section 2.2. The sensitivity rating given to each relevant habitat class/ sensitive feature for each of the five corridors is presented in Table 2.

[2] The Eskom Land and Biodiversity Standard (2012) states that "all designs of new power lines and supporting infrastructure for power generation must be evaluated for the risk it could pose to wildlife and no design which has a high risk, or a record of it causing mortalities to wildlife, shall be used." However, it was assumed that Eskom might not be the only entity building power lines in future; therefore it cannot automatically be assumed that all future distribution pole designs will be electrocution friendly.

Table 2: Sensitivity rating given to each habitat class/feature according to corridor

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
Western	Fynbos	Bare	Low	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Cultivated vines	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Shrubland fynbos	Medium	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated orchards	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	Medium	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Medium	
	Savanna	Bare	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Thicket /Dense bush	Low	
		Woodland/Open bush	Medium	
	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Cultivated vines	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	High	

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
Northern	Desert	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated orchards	Low	
		Cultivated vines	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Shrubland fynbos	Medium	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Low	
	Fynbos	Bare	Low	
		Grassland	Medium	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Woodland/Open bush	Low	
	Grassland	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Indigenous Forest	Low	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated vines	Low	
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Savanna	Bare	Low	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Cultivated vines	Low	
		Grassland	High	
		Indigenous Forest	Low	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	Lanner Falcon = 500 m Black Harrier = 1 km Others = 2.5 km
		Steep slopes incl cliffs	Medium	
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Low	
International	Forests	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated orchards	Low	
		Grassland	Low	
		Indigenous Forest	Medium	
		Low shrubland	Low	
		Plantations	Low	

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Steep slopes incl cliffs	Low	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Low	500 m
		Woodland/Open bush	Low	
	Grassland	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Low	
		Plantations	Low	
		Spp Nest sites	Very High	Southern Bald Ibis = 1 km Other = 2.5 km
		Steep slopes incl cliffs	High	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Very High	500 m
		Woodland/Open bush	Low	
	Savanna	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	Very High	500 m
		Woodland/Open bush	Low	
Central	Fynbos	Bare	Low	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated vines	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Shrubland fynbos	Medium	

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
	Grassland	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated vines	Low	
		Grassland	High	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
	Savanna	Bare	Low	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Indigenous Forest	Low	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Spp Nest sites	Very High	2.5 km

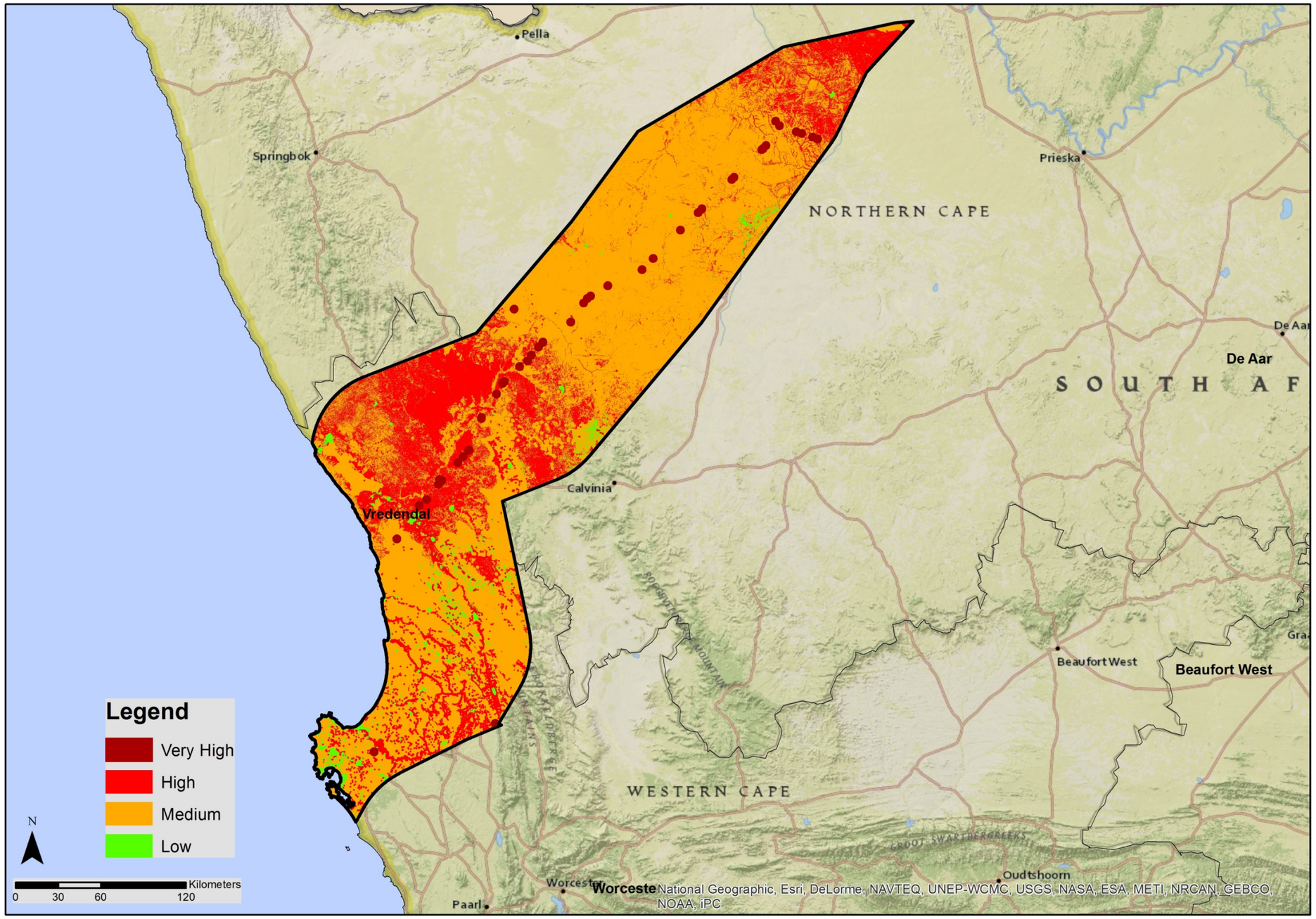
Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Low	
Eastern	Albany Thicket	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	High	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Medium	
	Fynbos	Bare	Medium	
		Cultivated commercial fields rain fed	Low	
		Cultivated commercial pivots	Low	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	Medium	
		Indigenous Forest	Low	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Shrubland fynbos	Medium	
		Spp Nest sites	Very High	2.5 km

Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Low	
	Grassland	Bare	Medium	
		Cultivated commercial fields rain fed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Low	
		Grassland	Very High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Spp Nest sites	Very High	Lanner Falcon-= 500m Southern Bald Ibis = 1 km Other = 2.5 km
		Steep slopes incl cliffs	Very High	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500m buffer)	Very High	500 m
		Woodland/Open bush	Medium	
	Indian Ocean Coastal Belt	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Cultivated sugar cane	Low	
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	High	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Nama-Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Low	
		Grassland	High	

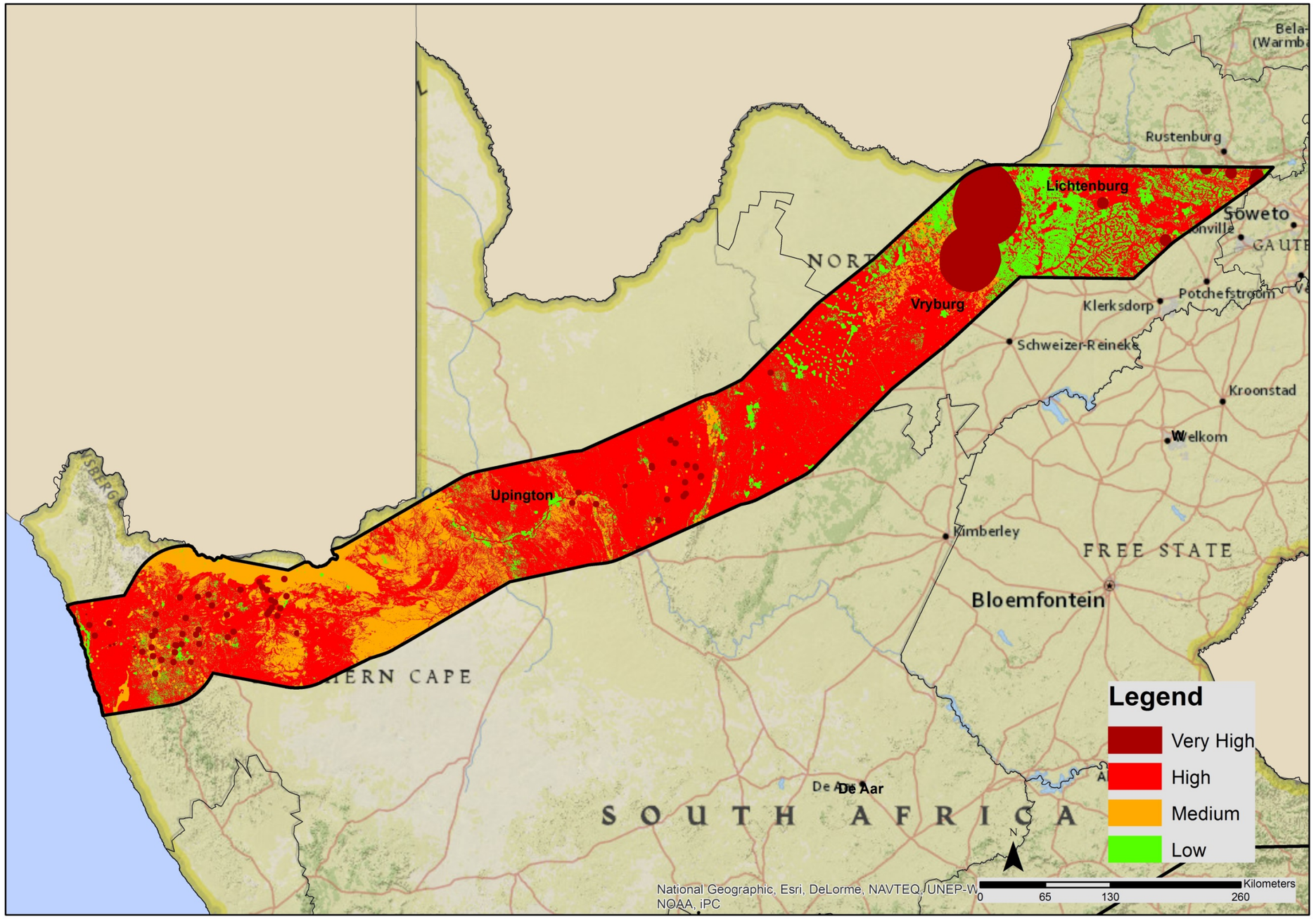
Corridor	Biome	Habitat Class/ Sensitive Feature	Sensitivity	Buffer
		Industrial	Low	
		Low shrubland	High	
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	Lanner Falcon = 500 m Other = 2.5 km
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	Medium	500 m
		Woodland/Open bush	Low	
	Savanna	Bare	Low	
		Cultivated commercial fields rainfed	Medium	
		Cultivated commercial pivots	Medium	
		Cultivated orchards	Low	
		Cultivated subsistence	Medium	
		Cultivated sugar cane	Low	
		Grassland	High	
		Indigenous Forest	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Plantations	Low	
		Shrubland fynbos	High	
		Spp Nest sites	Very High	2.5 km
		Steep slopes incl cliffs	High	1 km
		Thicket /Dense bush	Low	
		Urban (500 m buffer)	Low	500 m
		Vultures	Very High	5 km
		Wetlands and waterbodies (500 m buffer)	High	500 m
		Woodland/Open bush	Low	
	Succulent Karoo	Bare	Medium	
		Cultivated commercial fields rainfed	Medium	
		Grassland	Medium	
		Industrial	Low	
		Low shrubland	Medium	
		Shrubland fynbos	Medium	
		Steep slopes incl cliffs	Medium	1 km
		Thicket /Dense bush	Low	
		Urban (500m buffer)	Low	500m
		Wetlands and waterbodies (500m buffer)	Medium	500m
		Woodland/Open bush	Low	

2.5 Sensitivity Maps

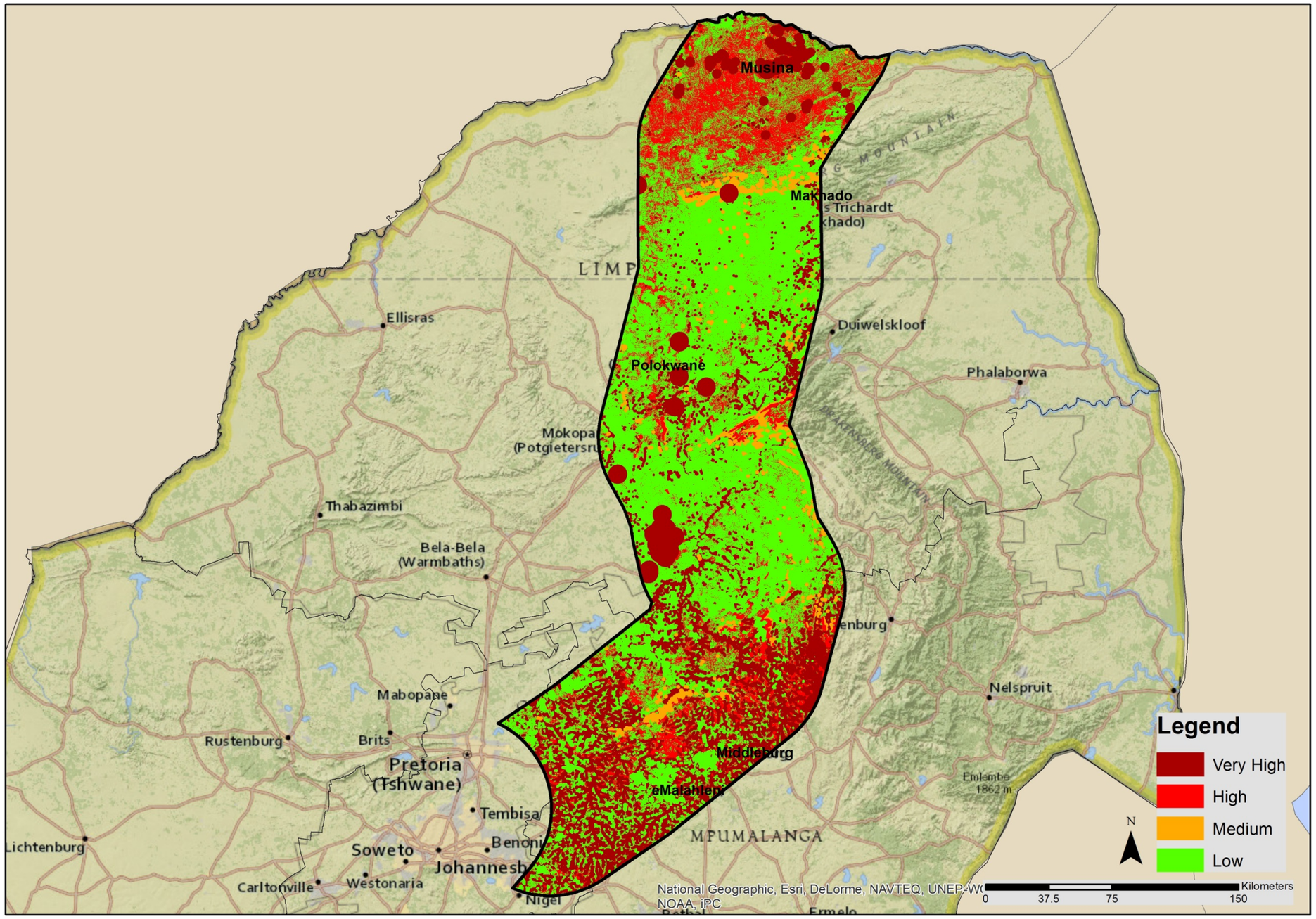
The following avifaunal sensitivity maps were produced for each Power Corridor according to the criteria in Section 2.4. Avifaunal sensitivity is delineated according to four tiers viz. Very High, High, Medium and Low (see Map 1 to Map 5).



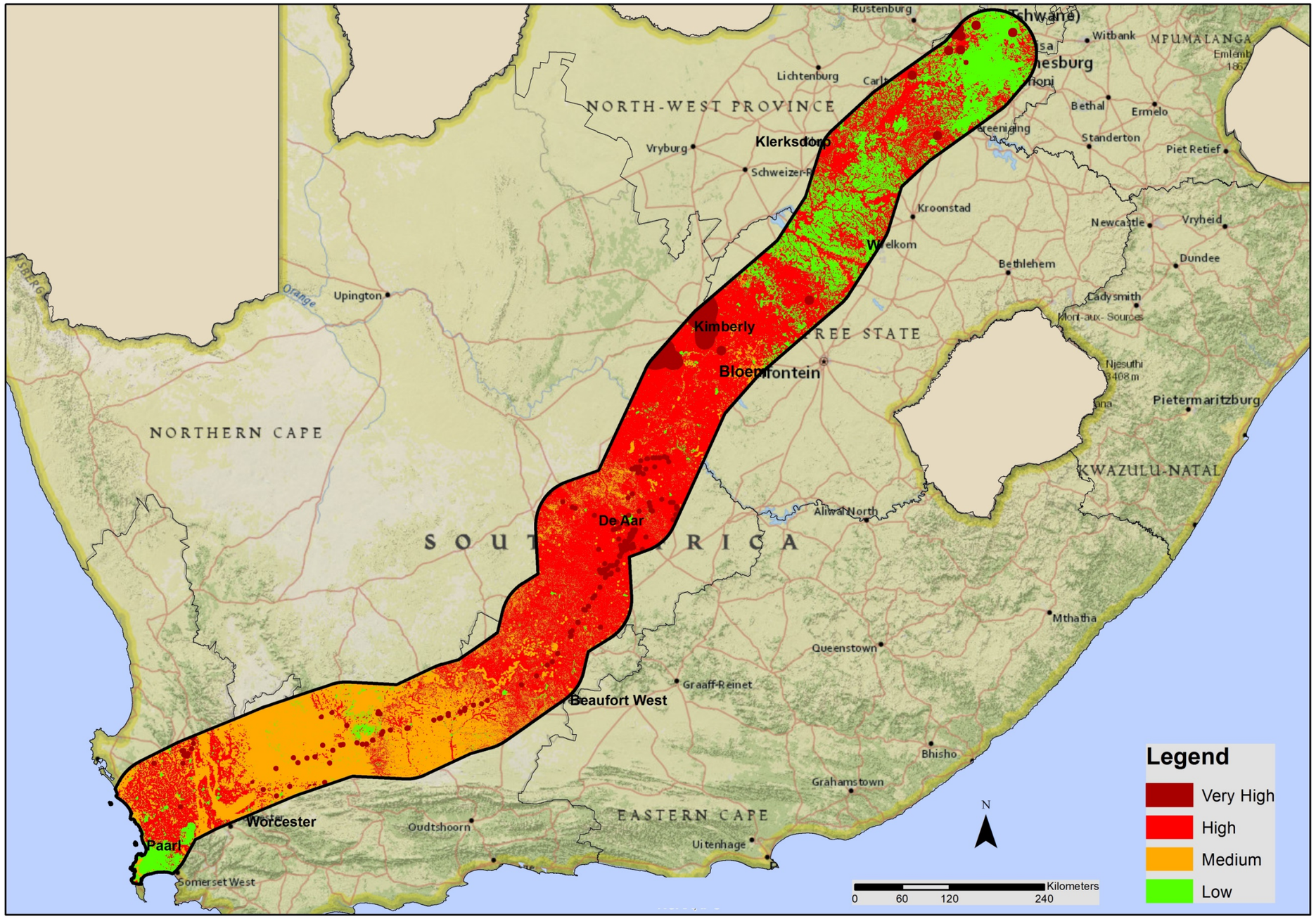
Map 1: Avifaunal sensitivity map for Electricity Grid Infrastructure Development in the Western Corridor



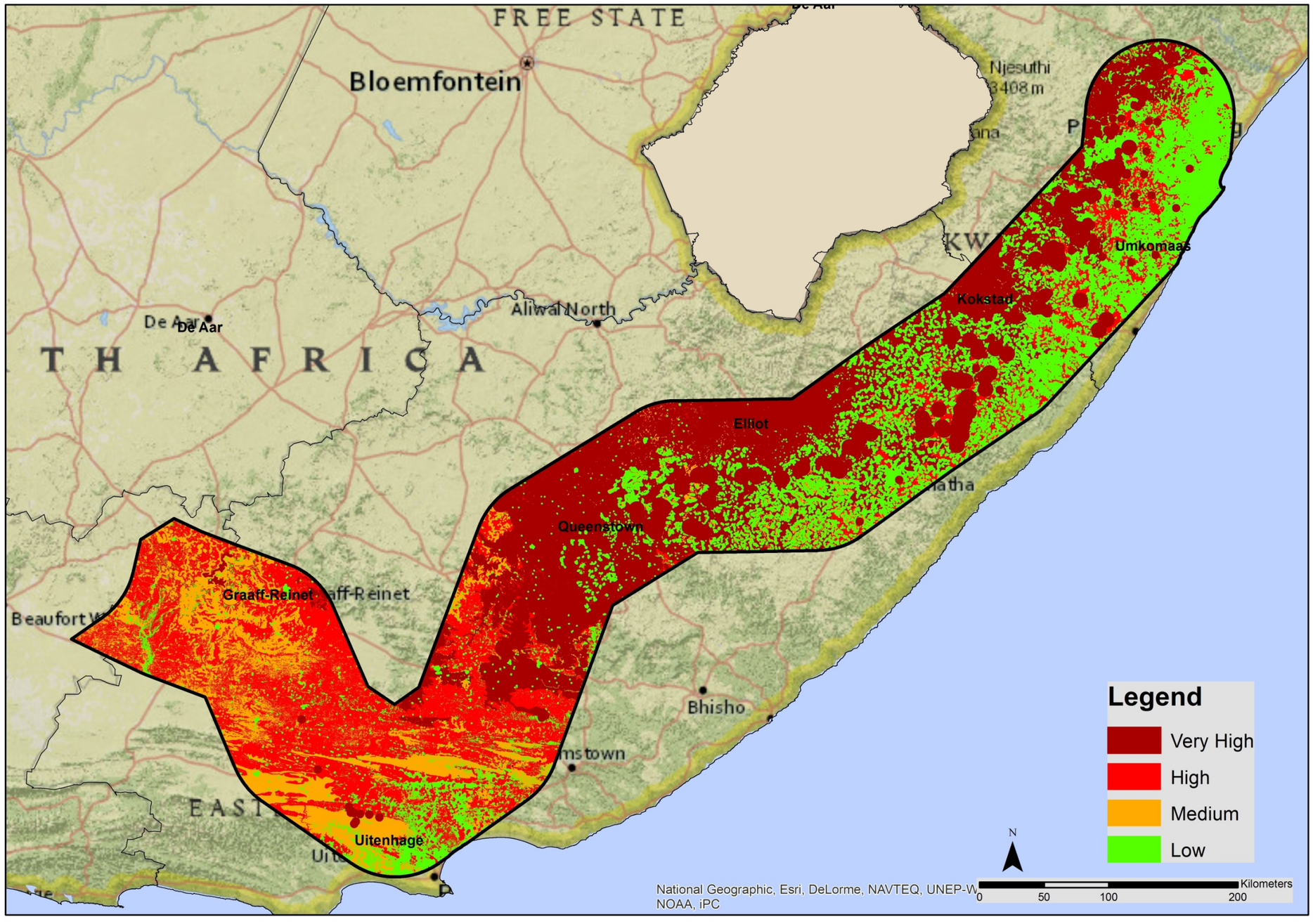
Map 2: Avifaunal sensitivity map for Electricity Grid Infrastructure Development in the Northern Corridor



Map 3: Avifaunal sensitivity map for Electricity Grid Infrastructure Development in the International Corridor



Map 4: Avifaunal sensitivity map for Electricity Grid Infrastructure Development in the Central Corridor



Map 5: Avifaunal sensitivity map for Electricity Grid Infrastructure Development in the Eastern Corridor

2.6 Development Protocol

The Development Protocol for avifauna in the context of the Power Corridors is separated into Table 3 and Table 4. The assessment process to be followed inside the Power Corridors for avifauna is presented in Table 3. The level of assessment to be undertaken in the different sensitivity areas in the context of the sensitivity maps in Section 2.5 is described in Table 4.

The main objective of the bird study was to examine and map avian impact sensitivities within the five corridors in order to reduce the scope of additional assessment requirements and where possible the need for field observation. This has been achieved in some instances, in particular, areas declared as medium and low sensitivity. However, with the study being based entirely on desk-top integration and the interpretation of existing data, the assessment was limited in its ability to exclude the need for field work in areas declared to be of High and Very High sensitivity.

Table 3: New avifaunal assessment procedure

New Avifaunal Assessment Procedure
Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process must prove to the relevant Competent Authority in terms of NEMA that the proposed development will not have an unacceptable negative impact on bird populations. 1. *Screening* *Projects Inside the Power Corridors* A competent avifaunal specialist will be required to validate the avifaunal sensitivity map produced by download from the DEA Screening Tool for sub-corridor. Validation of the sensitivities can be undertaken at a desktop level or through field assessment. Sensitivities must be confirmed by a competent bird specialist via further desktop review or a site visit. The approach used for validating sensitivities will be at the discretion of the avifaunal specialist. *Projects Inside the Power Corridors* A competent avifauna specialist will be required to create an avifaunal sensitivity map for the identified sub-corridor using the approach and criteria detailed in Section 2.2. The approach used for validating sensitivities will be at the discretion of the avifaunal specialist. 2. *Minimum Assessment Requirements* *All Projects* The minimum assessment requirements described in Table 4 shall be applied to the development envelope for proposed projects located both inside and outside the Power Corridors. The assessment requirements at different positions within the development envelope may differ depending on the underlying sensitivity, as determined by the validated sensitivity map. 3. *Commenting and Decision Making* The outcomes of the assessment shall be submitted to the relevant body or bird specialists (e.g. BirdLife South Africa and Endangered Wildlife Trust) for comment. Such comment, if provided within stipulated timeframes shall be considered by the relevant Competent Authority in terms of NEMA for decision making.

Table 4: Interpretation of sensitivity and associated assessment requirements inside the Power Corridors

Colour	Sensitivity	Interpretation of the sensitivity	Assessment requirements by sensitivity	Additional Requirements
Dark red	Very High	Very High sensitivity areas known to support important populations of threatened, impact susceptible species. Potentially unsuited to development owing to their high avifaunal importance.	A Bird Impact Assessment is required for Very High sensitivity areas within the development envelope. The Bird Impact Assessment shall be conducted by competent avifaunal specialist, and in accordance with NEMA regulations pertaining to specialist reports and impact assessment. In addition to the NEMA requirements a avifauna impact assessment report must contain: • project footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on a validated sensitivity map prepared in accordance with the sensitivity criteria set out in this study; • a clear and justified opinion statement by the specialist recommending whether the project should from a avifaunal perspective receive approval. If this statement is subject to any conditions these must also be clearly stated; and • where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). The Bird Impact Assessment shall consist of qualitative and quantitative field surveys including sample counts representative of high risk environmental conditions likely to occur within the development envelope. If need be, additional research by a competent avifaunal specialist is required to obtain a sufficient understanding of the avifaunal impacts and potential effectiveness of the proposed mitigation measures.	BirdLife South Africa and the Endangered Wildlife Trust should be notified of any development proposals.
Red	High	High sensitivity areas are likely to support important populations of threatened or impact susceptible species. These areas are potentially unsuited for development unless sensitivities are fully investigated and impacts can be sufficiently mitigated.	A Bird Impact Assessment is required for High sensitivity areas within the development envelope. The Bird Impact Assessment shall be conducted by competent avifaunal specialist, and in accordance with NEMA regulations pertaining to specialist reports and impact assessment. In addition to the NEMA requirements a avifauna impact assessment report must contain: • project footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on a validated sensitivity map prepared in accordance with the sensitivity criteria set out in this study; • a clear and justified opinion statement by the specialist recommending whether the project should from a avifaunal perspective receive approval. If this statement is subject to any conditions these must also be clearly stated; and • where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). The Bird Impact Assessment shall consist of Qualitative field surveys to obtain a sufficient understanding of the avifaunal impacts and potential effectiveness of the proposed mitigation.	
Orange	Medium[3]	Medium sensitivity areas that could support important populations of threatened, impact susceptible species. Possibly suitable for development, but potential sensitivities must be fully investigated and effective mitigation options clearly identified.	A Bird Impact Assessment is required for Medium sensitivity areas within the development envelope. The Bird Impact Assessment shall be conducted by competent avifaunal specialist, and in accordance with NEMA regulations pertaining to specialist reports and impact assessment. In addition to the NEMA requirements a avifauna impact assessment report must contain: • project footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on a validated sensitivity map prepared in accordance with the sensitivity criteria set out in this study; • a clear and justified opinion statement by the specialist recommending whether the project should from a avifaunal perspective receive approval. If this statement is subject to any conditions these must also be clearly stated; and • where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). Limited qualitative field surveys may be required as part of the Bird Impact Assessment, for power line developments in particular, to obtain a sufficient understanding of the avifaunal impacts and potential effectiveness of the proposed mitigation measures. In the case of a substation development, field surveys will not be required unless the desk top assessment indicate the need for an on-site survey. Conducting field surveys in medium sensitivity areas will be at the discretion of the avifaunal specialist.	If the development overlaps with an Important Bird Area, BirdLife South Africa and the Endangered Wildlife Trust should be notified of any development proposals.
Green	Low[3]	Low sensitivity areas possibly do not support important populations of threatened, impact susceptible species. These areas are probably	An impact statement by a competent avifaunal specialist is required for Low sensitivity areas within the development envelope.	BirdLife South Africa and the Endangered Wildlife Trust should be notified of any

[3] Field survey as part of an assessment is potentially not required in Medium (orange) and Low (green) sensitivity areas, and shall be undertaken at the discretion of the avifaunal specialist.

		suitable for development, but present levels of knowledge preclude confident predictions on the acceptability of impacts.	• The minimum requirements for the impact statement are: details and relevant expertise of the specialist preparing the statement; • project footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in this study; • a clear and justified opinion statement by the specialist recommending whether the project should from a avifaunal perspective receive approval. If this statement is subject to any conditions these must also be clearly stated; and • where required, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr). Field surveys are not required in Low sensitivity areas; however the decision to undertaken field surveys will be at the discretion of the avifaunal specialist.	development proposals

PART 3

Chapter 3. HERITAGE

CONTENTS

TABLES

MAPS

CHAPTER 3. HERITAGE

3.1 Introduction

This Chapter is informed by the scoping level specialist heritage pre-assessment of the five Power Corridors for which the complete reports is provided as Appendix C: *Heritage Specialist Study*. Due to the integrated and strategic nature of this Strategic Environmental Assessment (SEA), and based on consultation with relevant government departments and wider stakeholders, the final views and requirements presented in this Chapter may vary from those contained and recommended in the specialist report.

3.1.1 Electricity Grid Infrastructure and Heritage

South Africa abounds with a rich and wide variety of heritage resources dating back to some of the earliest human settlements in the world. Resources may be tangible, such as buildings and archaeological artefacts, or intangible, such as landscapes or sense of place. Their significance may be based on any range of values including (but not limited to) aesthetic, historical, scientific, spiritual, economic, architectural or rarity. These resources represent the variety of groups that make up South Africa's diverse cultural identity.

According to Section 27(18) of the National Heritage Resources Act (NHRA), (Act No. 25 of 1999), no person may destroy, damage, deface, excavate, alter, remove from its original position, subdivide or change the planning status of any heritage site without a permit issued by the Heritage Resources Authority responsible for the protection of such site. The integrity and significance of heritage resources can be jeopardized in two ways; by natural forces such as erosion or anthropogenic forces such as development activities. Electricity grid infrastructure developments have the potential to impact on heritage resources through physical disturbance during construction or by changing the wider landscape context.

Physical impacts to heritage resources in the context of electricity grid infrastructure development can take the form of excavations for pylons, substations or in some cases new roads. The potential physical impacts are greatly dependent on the micro-siting of the infrastructure. Although it is possible to identify and protect known and above ground heritage resources (e.g. cultural sites and historical structures), it is more challenging to assess the potential impacts on unknown and underground heritage resources (e.g. the potential presence of fossils or middens). Even at a project level it is difficult to identify and confirm such heritage resources prior to excavation.

The same holds for the wider landscape, in particular visual impact, where impact of development can only be truly determined once details regarding the specific project proposal are known e.g. infrastructure type, proposed position or viewing audience. Therefore, at a strategic level, the delineation of wider landscape sensitivity is limited to identifying recognised natural, scenic and cultural resources which have (or are likely to have) aesthetic and economic value to the local community, the region, and society as a whole.

For these reasons the focus of heritage resource assessment and management must be to protect any known heritage resources which hold value, while also ensuring that development in areas with unconfirmed sensitivities proceeds in a manner that would identify and preserve any heritage resources should they be identified at a site level.

3.2 Sensitivity Mapping Criteria

Given the diverse nature of impacts presented by electricity grid infrastructure to heritage resources, for the purposes of this assessment heritage sensitivity inside the Power Corridors was delineated according to two heritage categories, namely: 1) Palaeontological and 2) Non-Palaeontological (referring to archaeology and other heritage resources e.g. graves). Landscapes were assessed separately in terms of their susceptibility to change brought about by potential developments (See Part 3, Chapter 5). Palaeontological and Non-palaeontological sensitivity was assessed according to the potential for electricity grid infrastructure to have an effect on heritage resources through physical disturbance.

Palaeontological resource sensitivity was largely inferred through the use of geological maps depicting formations likely occurrence to contain fossils. The occurrence of Non-Palaeontological resources is much less predictable and cannot be discounted through desk top assessment alone, unless the area has already undergone a detailed Heritage Impact Assessment (HIA). For this reason, historical HIAs undertaken inside the Power Corridors were entirely relied upon to confirm the absence of Non-Palaeontological resources in a given area. Only in this instance was the study able to declare an area to be of Low sensitivity for Non-Palaeontological resources. In all other instances sensitivity for unknown Non-Palaeontological resources was either based upon the specialist's knowledge of the regions considered more likely to contain Non-Palaeontological resources (and therefore delineated as high sensitivity) or the occurrence of specific geographical features recognised to be more likely to reveal unknown Non-Palaeontological resources, such as coastal areas, pans and mountain ranges.

Heritage resources (Palaeontological and Non-Palaeontological resources) are protected under the National Heritage Resources Act (NHRA) (Act No. 25 of 1999). Any heritage site which is part of the national estate as defined in Section 3 of the NHRA should be graded according to its significance. In South Africa, grading has three associated components, namely the geographical range of a site's significance (international, national, provincial/regional or local), the level of significance (High, Medium or Low) and the heritage authority with the delegated powers to manage the site. As part of this study, known sites were assigned sensitivity ratings according to the heritage grade allocated to the site in line with Section 7 of the National Heritage Resources Act (NHRA) as follows:

I. Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
II. Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
III. Grade III: Other heritage resources worthy of conservation, and which prescribes heritage resources assessment criteria, consistent with the criteria set out in Section 3(3), which must be used by a heritage resources authority or a local authority to assess the intrinsic, comparative and contextual significance of a heritage resource and the relative benefits and costs of its protection, so that the appropriate level of grading of the resource and the consequent responsibility for its management may be allocated.

For ungraded sites identified through the Heritage Impact Assessment review the following criteria were used to assign a grading level:

- Burial Grounds and Graves: IIIa
- Rock Art: IIIa
- Monuments and Memorials: IIIa
- Shipwrecks: IIIa
- Settlements: IIIa
- Archaeological deposit: IIIb
- Palaeontological: IIIb
- Structures: IIIc
- Artefact scatters: IIIc

3.2.1 Combined Sensitivity

The Power Corridors were mapped separately for Palaeontological sensitivity and Non-Palaeontological sensitivity. The two mapping outputs were then integrated into a combined mapping output. This was done

retaining the highest sensitivity rating between the two sensitivity maps r all areas within the Power Corridors. The combined sensitivity map is symbolic of overall heritage sensitivity inside of each Power Corridor. However for the purpose of determining additional assessment requirements for a given area or route, the two heritage category maps must be viewed separately and interpreted alongside their corresponding Development Protocol in Section 3. 4.

3.2.2 Data Sources

In order to generate sensitivity maps, the data layers relevant to heritage sensitivity for each Power Corridor were collected. A list and description of data sources for each of the two heritage sensitivity categories are detailed in Table 1 and Table 2.

Table 1: Spatial data used for Palaeontology sensitivity mapping

Data title	Source and date of publication	Data Description
South African Heritage Resources Information System	2012 onwards with records dating back to the 19th century	Online South African national heritage management system. Very large archive of digitised Heritage Impact Assessments and other information.
Palaeosensitivity Map (PSM) / Fossil Heritage Layer Browser	SAHRA & The Council for Geoscience (CGS), October 2014, accessed on SAHRIS	Significance of geological formations based on the CGS 1:250 000 geological formations of South Africa
World Heritage Sites	World_heritage_Sites_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	World Heritage Sites

Table 2: Spatial data used for Non-palaeontological sensitivity mapping

Data title	Source and date of publication	Data Description
SAHRIS	2012 onwards with records dating back to the 19th century	Online South African national heritage information management system. Very large archive of digitised Heritage Impact Assessments and other data. Single references of each report taken from SAHRIS will be provided in the list of references at the end of each segment
eCRAG	Eastern Cederberg Rock Art Group, part of the Western Cape Branch of the South African Archaeological Society, 2007 onwards	Site records compiled by professional archaeologists and volunteers led by Dr Janette Deacon
KZN Museum	KwaZulu-Natal Museum sites database	Site records compiled by professional archaeologists working at the KZN Museum in Pietermaritzburg
UCT Spatial Archaeology Research Unit (SARU)	University of Cape Town, 1960 - 2015 accessed on SAHRIS	Site records compiled by students and staff of the Department of Archaeology at the University of Cape Town
Specialist general knowledge	ASHA Consulting and Jaco van der Walt, 2015	Specialist knowledge of regions considered more likely to contain Non-palaeontological resources
Koppies and mountainous areas	Cedar Tower Services, 2015	Koppies and mountainous areas
Rivers	Rivers_H.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Rivers
Wetlands	Wetlands_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Wetlands
Coastline	FinalLandmassCoastlineNatural_DWA_2011-01018.shp. DEADWA coastline 2011	South African coastline
World Heritage Sites	World_heritage_sires_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	World Heritage Sites

3.2.3 Processing of Data

In some instances the raw data were required to be further processed in order to isolate the relevant sensitivity features or improve the relative accuracy of the dataset. A description of data processing undertaken as part of this assessment for the two heritage categories is detailed in Table 3 and Table 4.

Table 3: Palaeontological sensitive features, data sources and data processing

Sensitivity Feature	Data Source and Date of Publications	Data Preparation and Processing	Relevant Corridors
Sites	Amafa's records uploaded to SAHRIS	Some of the sites related to buildings recorded by Amafa on SAHRIS are incorrectly mapped. All Grade I and II sites have been corrected but the total number of records is 3 526 sites. It was not possible to check the coordinates for every single site. When working in KwaZulu-Natal caution must be paid to the level of accuracy for certain Grade III sites.	Eastern
Sites	KZN Museum	Over 6 000 archaeological and palaeontological sites have been uploaded by the KZN Museum to SAHRIS. The RAMP (Rock Art Mapping Project) significantly improved the mapping of these sites in certain areas but some sites still require moderation.	Eastern
Sites	eCRAG	The sites captured by eCRAG are highly accurate as they have gone through various rounds of moderation by their members. They provide some of the most reliable records on SAHRIS.	Western
Sites	University of Cape Town	Most of the sites recorded by the Spatial Archaeology Unit are accurately mapped. However, some were mapped pre-GPS on 1:50 000 topographical maps. These sites are therefore not accurate to more than 50 m in some instances.	Western
Sites	SAHRIS HIAs	The HIAs are highly variable and span a period of over 25 years. The standards and methods of recording have been changed with time and this has to be taken into account when interpreting the data. Over 8 300 additional sites were extracted, mapped and moderated on SAHRIS by Cedar Tower Services.	All
Sites	Umlando Sites	Almost 2 000 sites uploaded to SAHRIS from CRM and research work carried out but do not have the associated documentation (HIAs) on SAHRIS. Cedar Tower Solutions has recently obtained copies of these reports so that they can be uploaded to SAHRIS. This helps to contextualize the sites recorded in various areas.	Eastern
Sites	Declared sites from SAHRA	About 3 600 sites have been declared as Provincial or National Heritage Sites. The majority of these were former National Monuments. SAHRA improved the mapping of these sites from 2012-2014 but inaccuracies are still found from time to time given the fact that the extraction and linking of the SAHRA registry is a long term project.	All
World Heritage Sites and related buffer zones	World_heritage_sites_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	World Heritage sites within the five corridors. The core and buffer zones areas were used.	All
Rivers	Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Rivers included in the shapefile provided by SANBI. A buffer zone of 100 m was added to each river.	All
Depressions (natural)	Wetlands_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Natural depressions included in the shapefile provided by SANBI. A buffer zone of 100 m was added to each wetland.	All
Flat (natural)	Wetlands_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Naturally flat areas included in the shapefile provided by SANBI. A buffer zone of 100 m was added to each wetland.	All
Koppies and mountainous areas	Cedar Tower Services, 2015	Koppies and mountainous areas included in the shapefiles provided by SANBI. A buffer zone of 1 km was added to these features.	All
Coastlines	Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	Coastline areas included in the shapefiles provided by SANBI. A buffer zone of 1 km was added to these features.	Western, Northern, Easter, Central

Table 4: Non-palaeontological sensitive features, data sources and data processing

Sensitivity Feature	Data Source and Date of Publications	Data Preparation and Processing	Relevant Corridors
Sites	Amafa's records uploaded to SAHRIS	Some of the sites related to buildings recorded by Amafa on SAHRIS are incorrectly mapped. All Grade I and II sites have been corrected but the total number of records is 3526 sites. It was not possible to check the coordinates for every single site. When working in KwaZulu-Natal caution must be paid to the level of accuracy for certain Grade III sites.	Eastern
Sites	KZN Museum	Over 6 000 archaeological and palaeontological sites have been uploaded by the KZN Museum to SAHRIS. The RAMP (Rock Art Mapping Project) significantly improved the mapping of these sites in certain areas but some sites still require moderation.	Eastern
Sites	SAHRIS HIAs (e.g. Archaeological Impact Assessments, Palaeontological Impact Assessments)	The HIAs are highly variable and span a period of over 25 years. The standards and methods of recording have been changed with time and this has to be taken into account when interpreting the data. Over 8 300 additional sites were extracted, mapped and moderated on SAHRIS by Cedar Tower Services.	All
Sites	Declared sites from SAHRA	About 3 600 sites have been declared as Provincial or National Heritage Sites. The majority of these were former National Monuments. SAHRA improved the mapping of these sites from 2012-2014 but inaccuracies are still found from time to time given the fact that the extraction and linking of the SAHRA registry is a long term project.	All
World Heritage Sites and related buffer zones	World_heritage_sites_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	World Heritage sites within the five corridors. The core and buffer zones areas were used.	All
Sites	Amafa's records uploaded to SAHRIS	Some of the sites related to buildings recorded by Amafa on SAHRIS are incorrectly mapped. All Grade I and II sites have been corrected but the total number of records is 3 526 sites. It was not possible to check the coordinates for every single site. When working in KwaZulu-Natal caution must be paid to the level of accuracy for certain Grade III sites.	Eastern
Sites	KZN Museum	Over 6 000 archaeological and palaeontological sites have been uploaded by the KZN Museum to SAHRIS. The RAMP (Rock Art Mapping Project) significantly improved the mapping of these sites in certain areas but some sites still require moderation.	Eastern
Sites	eCRAG	The sites captured by eCRAG are highly accurate as they have gone through various rounds of moderation by their members. They provide some of the most reliable records on SAHRIS.	Western, Central
Sites	University of Cape Town	Most of the sites recorded by the Spatial Archaeology Unit are accurately mapped. However, some were mapped pre-GPS on 1:50 000 topographical maps. These sites are therefore not accurate to more than 50 m in some instances.	Western, Central
Sites	SAHRIS HIAs (e.g. Archaeological Impact Assessments, Palaeontological Impact Assessments)	The HIAs are highly variable and span a period of over 25 years. The standards and methods of recording have shifted and this has to be taken into account when interpreting the data. Over 8300 additional sites were extracted, mapped and moderated on SAHRIS by Cedar Tower Services.	All
Sites	Umlando Sites	Almost 2 000 sites uploaded to SAHRIS from CRM and research work carried out by Gavin Anderson do not have the associated documentation (HIAs) on SAHRIS. CTS has recently obtained copies of these reports so that they can be uploaded to SAHRIS. This helps to contextualize the sites recorded in various areas.	Eastern
Sites	Declared sites from SAHRA	About 3 600 sites have been declared as Provincial or National Heritage Sites. The majority of these were former National Monuments. SAHRA improved the mapping of these sites from 2012-2014 but inaccuracies are still found from time to time given the fact that the extraction and linking of the SAHRA registry is a long term project.	All
World Heritage Sites and related buffer zones	World_heritage_sites_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	World Heritage sites within the corridors. The core and buffer zones areas were used.	Western, International, Eastern, Central
Rivers	Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	A buffer zone of 100 m was added to all rivers.	All
Depressions (natural)	Wetlands_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	A buffer zone of 100 m was added to features where the value for column "NATART" is 'Natural' and value for "NWCS_L4" is 'Depression'.	All
Flat (natural)	Wetlands_VH.shp. Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	A buffer zone of 100 m was added to features where the value for column "NATART" is 'Natural' and value for "NWCS_L4" is 'Flat'.	All
Koppies and mountainous areas	Cedar Tower Services, 2015	Koppies and mountainous areas were identified qualitatively using Google Earth. A buffer zone of 1 km was added to these features.	All
Coastline	Draft Corridor Environmental Constraints Map Datasets. CSIR 2015	A buffer zone of 1 km was added to the coastline.	Western, Northern, Eastern, Central

3.2.4 Sensitivity Delineation

A sensitivity rating was allocated to all heritage feature (and buffers, where applicable) occurring within each of the Power Corridors. The criteria for delineating sensitivity scores are detailed in Table 5 (Palaeontological) and Table 6 (Non-palaeontological).

Table 5: Palaeontological features and sensitivity ratings

Palaeontological Sensitive Feature	Layer Type	Sensitivity Criteria	Corridor
Sites graded I and II-Palaeontological	Site	Very High Sensitivity -within a 1 km buffer	Central, Northern, International, Western
World Heritage Sites with their defined buffer zones- Palaeontological	Site	Very High Sensitivity -within defined buffer zone	Central
Sites graded IIIa- Palaeontological	Site	High Sensitivity -within a 150 m buffer	Central, Eastern
SAHRIS PalaeoSensitivity map- Formations of very high sensitivity	Geology	High Sensitivity	All
Sites graded IIIb- Palaeontological	Site	Medium Sensitivity -within a 50 m buffer	All
SAHRIS PalaeoSensitivity map - Formations of high, moderate and unknown sensitivity	Geology	Medium Sensitivity	All
Areas previously undergone extensive assessment and no further palaeontological studies are required	Assessment	Low Sensitivity	All
SAHRIS PalaeoSensitivity map- Formations of low and insignificant sensitivity	Geology	Low Sensitivity	All

In terms of map layering, datasets should be layered from bottom to top in the following order:

1. Geology datasets
2. Site datasets
3. Assessment dataset

Table 6: Non-palaeontological features and sensitivity ratings

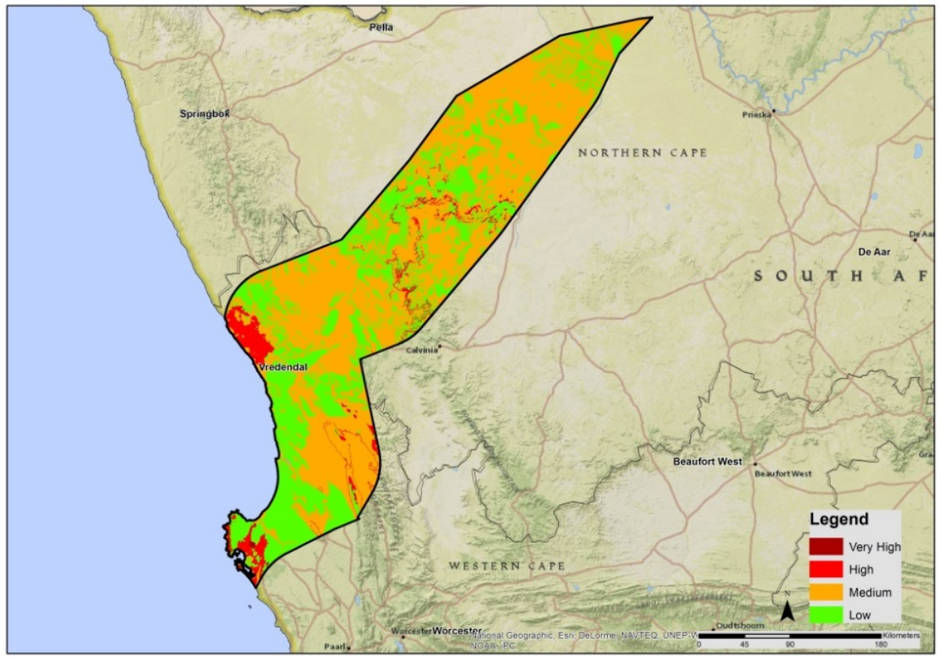
Non-palaeontological Resources	Layer Type	Sensitivity Criteria	Corridor
Sites graded I and II- Non-palaeontological	Site	Very High Sensitivity -within a 1 km buffer	All
World Heritage Sites (excluding palaeontological sites) with their defined buffer zone	Site	Very High Sensitivity -within defined buffer zone	Western, International, Eastern, Central
Sites graded IIIa- Non-palaeontological	Site	High Sensitivity -within a 150 m buffer	All
Coastline	Natural	High Sensitivity -within a 1 km buffer	Western, Northern, Eastern, Central
Areas identified by the specialist as having a high likelihood of containing material of high significance.	Knowledge	High Sensitivity	All
Sites graded IIIb- Non-palaeontological	Site	Medium Sensitivity -within a 50 m buffer	All
Natural Features • All mountainous areas, hills and koppies • All rivers • All wetlands	Natural	Medium Sensitivity -within 1 km buffer zone Medium Sensitivity -within 100 m buffer zone Medium Sensitivity -within 100 m buffer zone	All
Areas previously undergone extensive assessment and no further heritage studies are required	Assessment	Low Sensitivity	All
All remaining areas	Base	Medium Sensitivity	All

In terms of map layering, datasets should be layered from bottom to top in the following order:

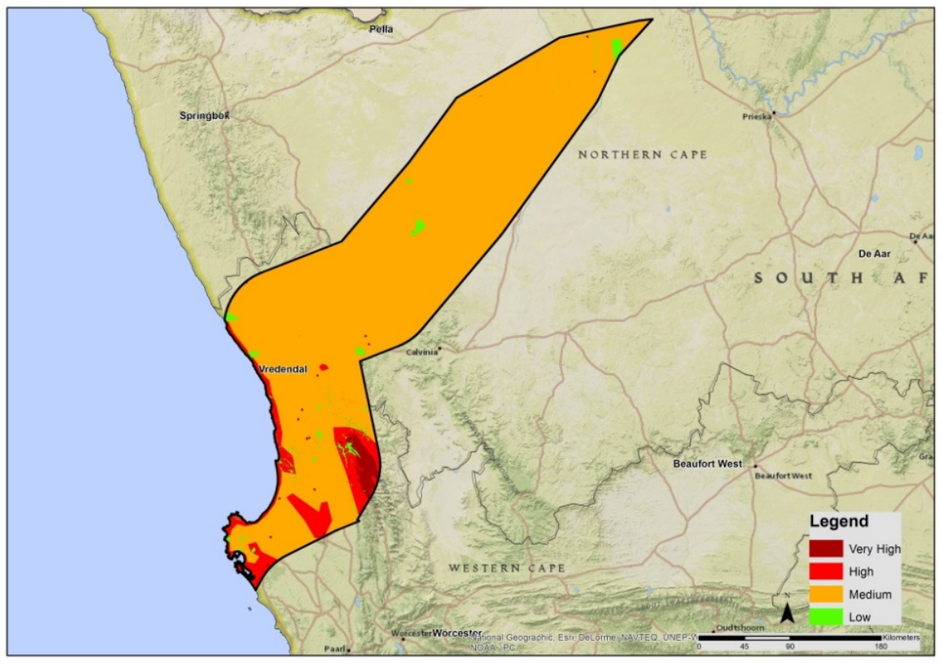
1. Base dataset
2. Natural areas datasets
3. Knowledge (high sensitivity only) dataset
4. Sites datasets
5. Assessment dataset

3.3 Sensitivity Maps

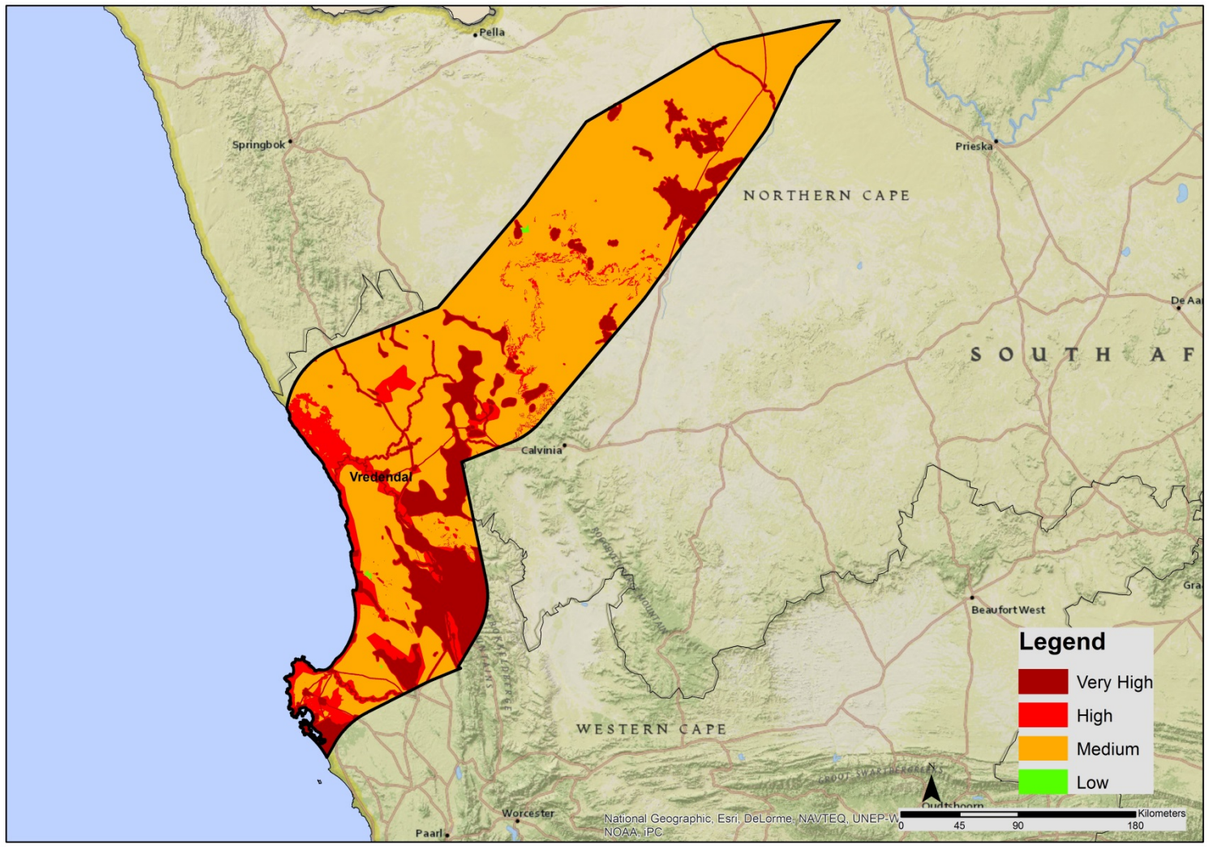
Palaeontological sensitivity, Non-palaeontological sensitivity and overall Heritage sensitivity in the context of electricity grid infrastructure for each of the Power Corridors is illustrated in Maps 1-15. Sensitivity is delineated according to four tiers including **Very High, High, Medium** and **Low** sensitivity.



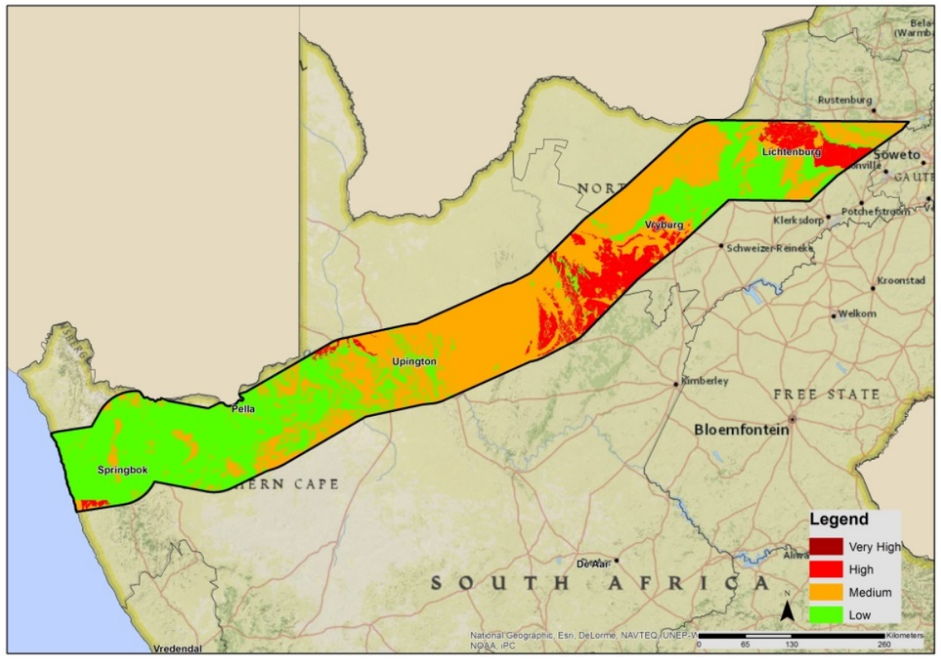
Map 1: Palaeontological sensitivity map for electricity grid infrastructure development in the Western Corridor



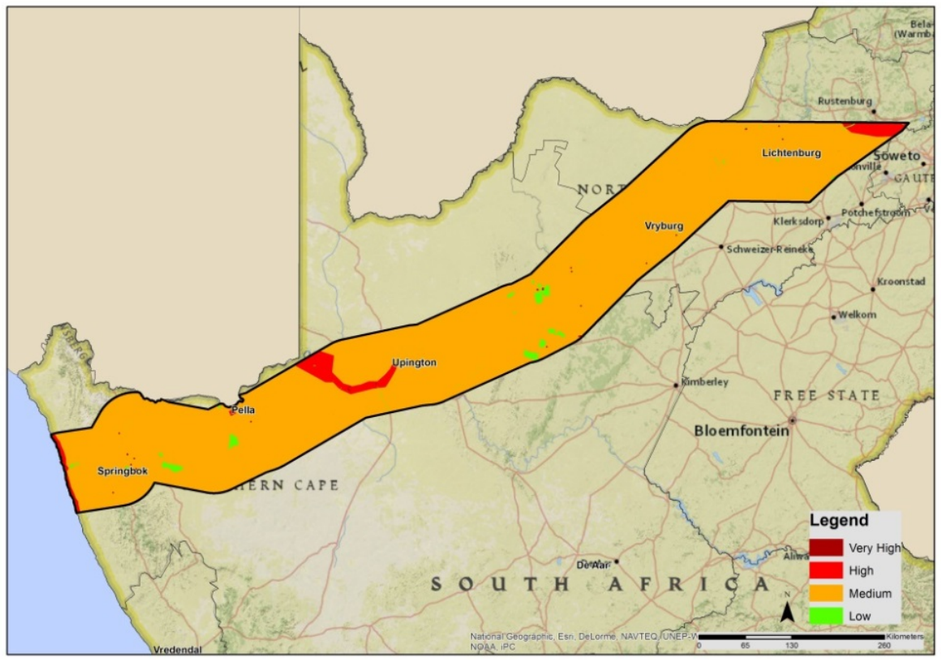
Map 2: Non-palaeontological sensitivity map for electricity grid infrastructure development in the Western Corridor



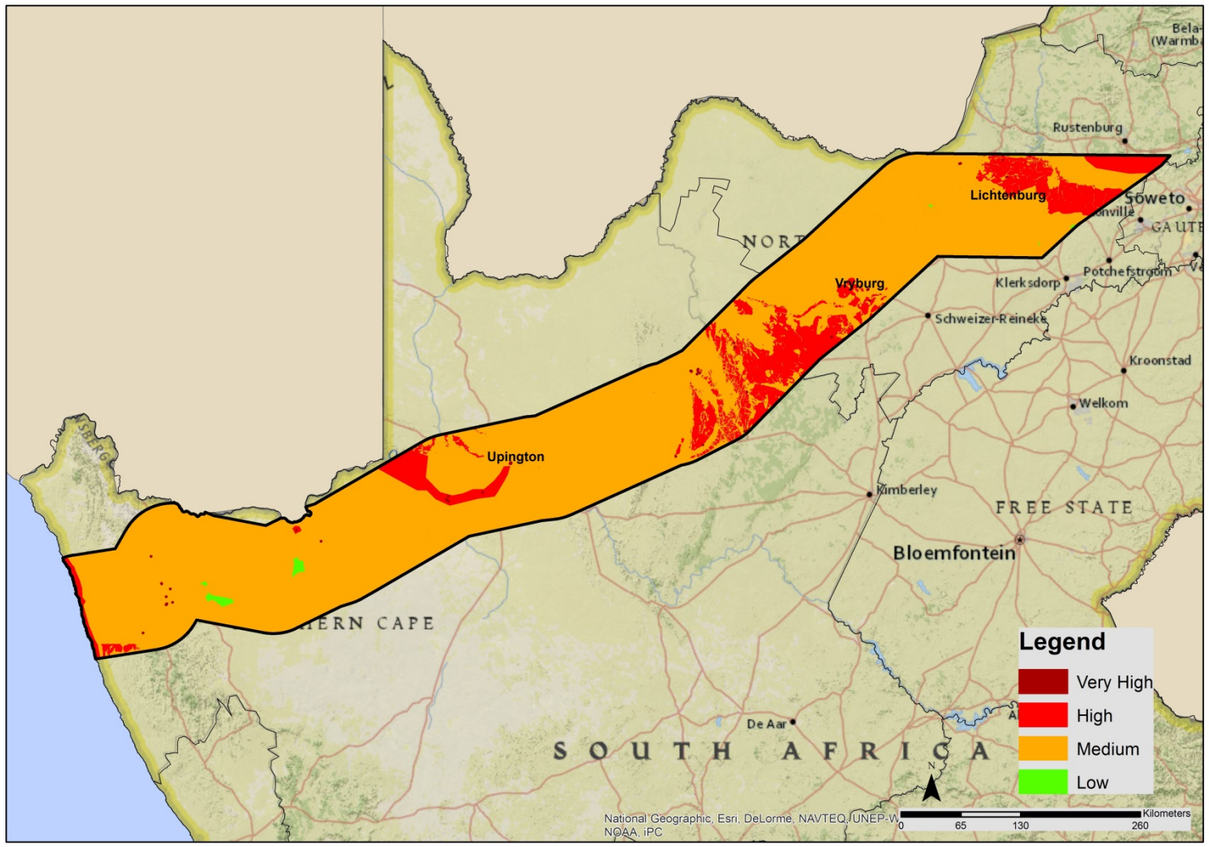
Map 3: Combined Heritage sensitivity map for electricity grid infrastructure development in the Western Corridor



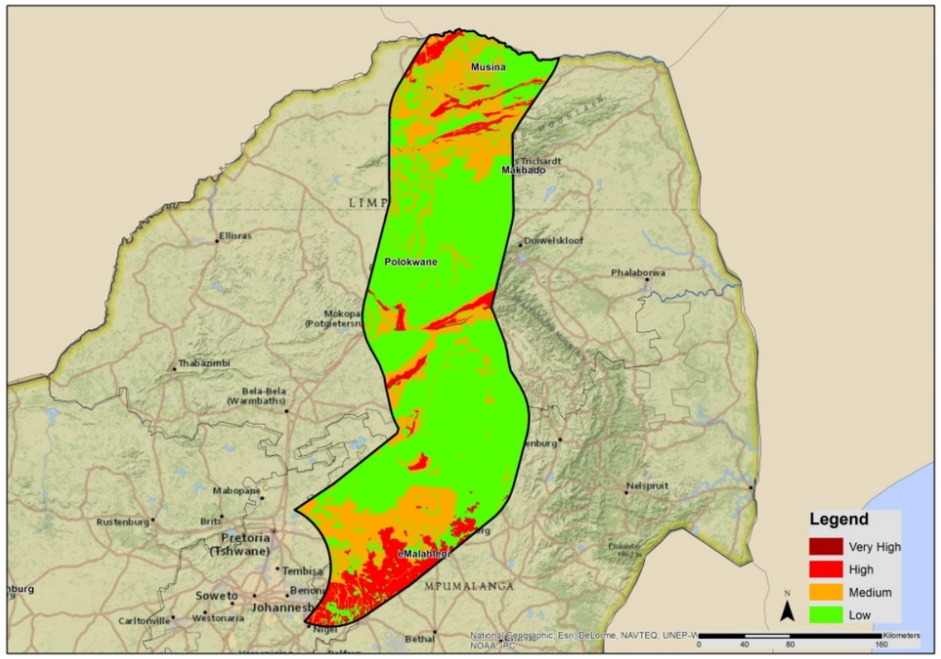
Map 4: Palaeontological sensitivity map for electricity grid infrastructure development in the Northern Corridor



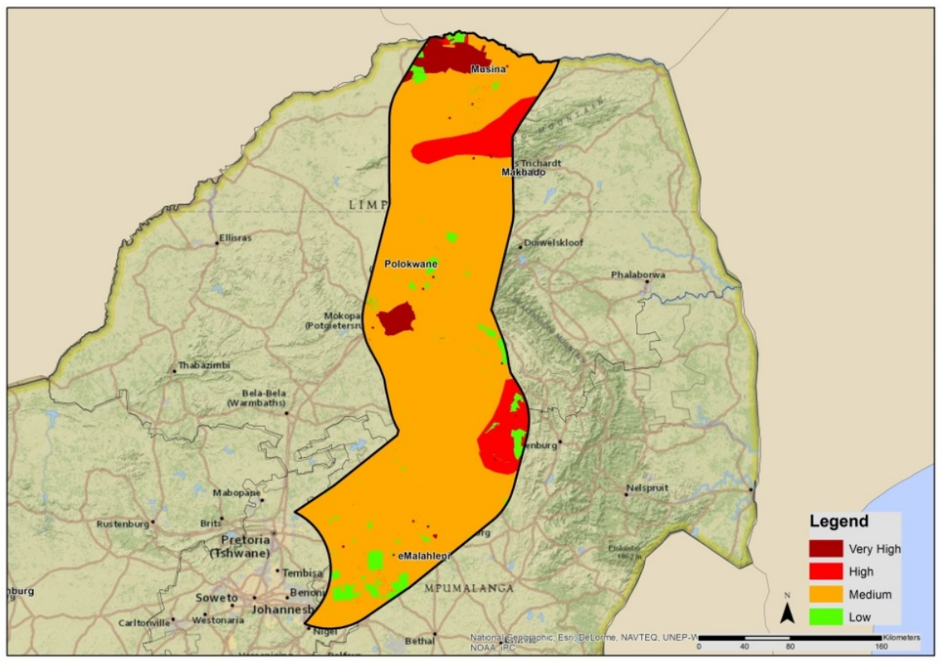
Map 5: Non-palaeontological sensitivity map for electricity grid infrastructure development in the Northern Corridor



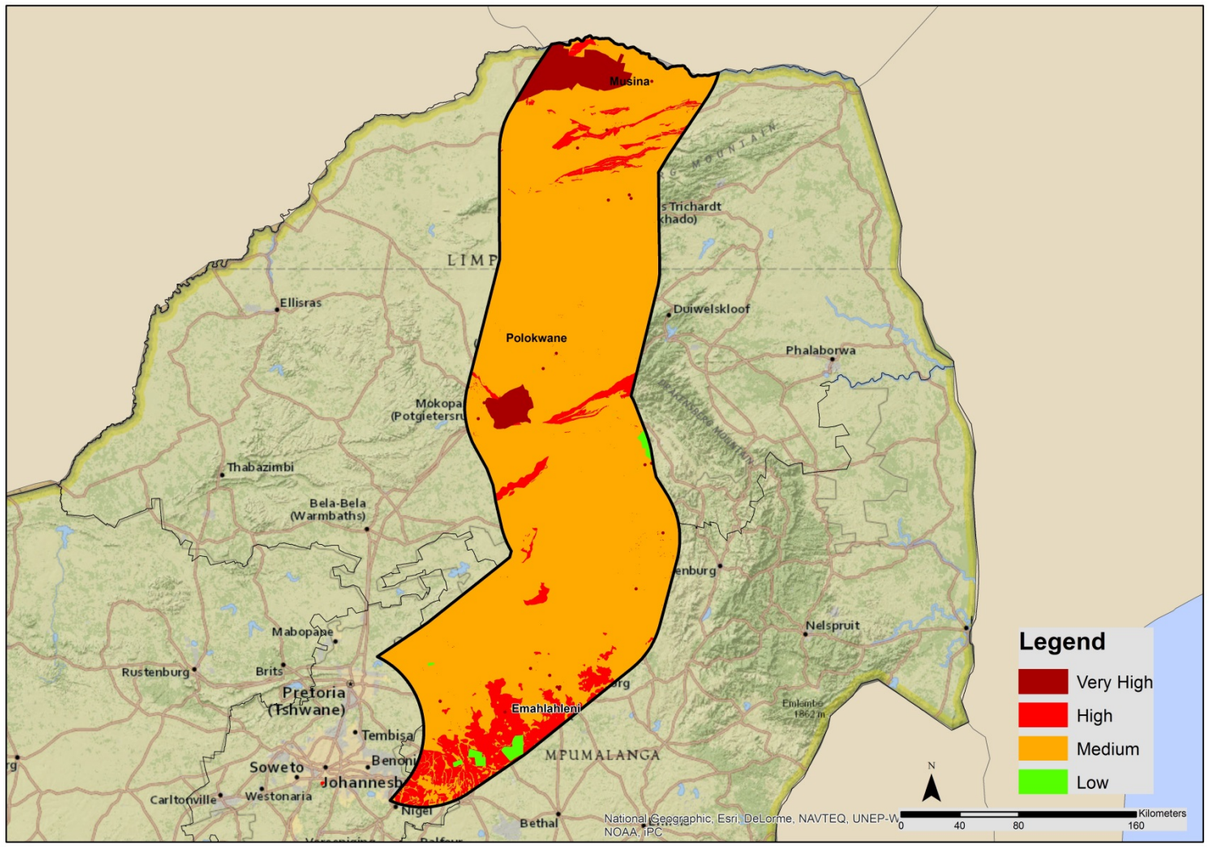
Map 6: Combined Heritage sensitivity map for electricity grid infrastructure development in the Northern Corridor



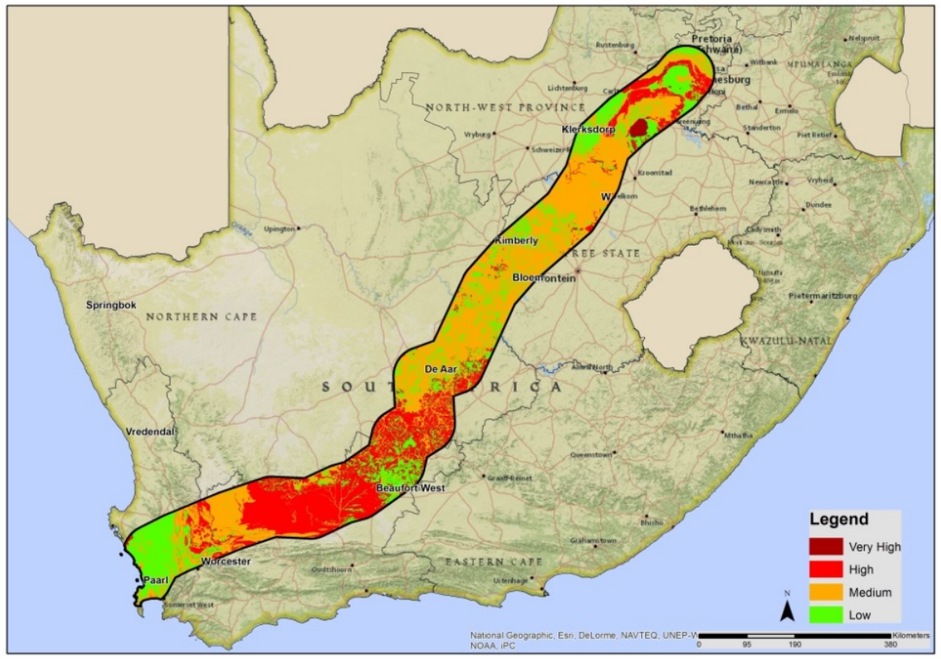
Map 7: Palaeontological sensitivity map for electricity grid infrastructure development in the International Corridor



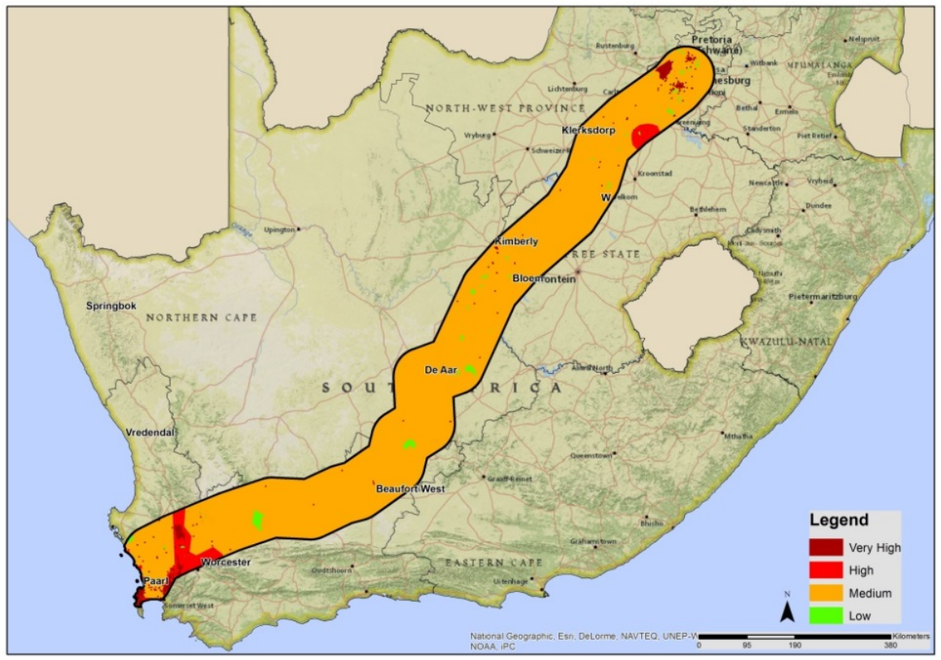
Map 8: Non-palaeontological sensitivity map for electricity grid infrastructure development in the International Corridor



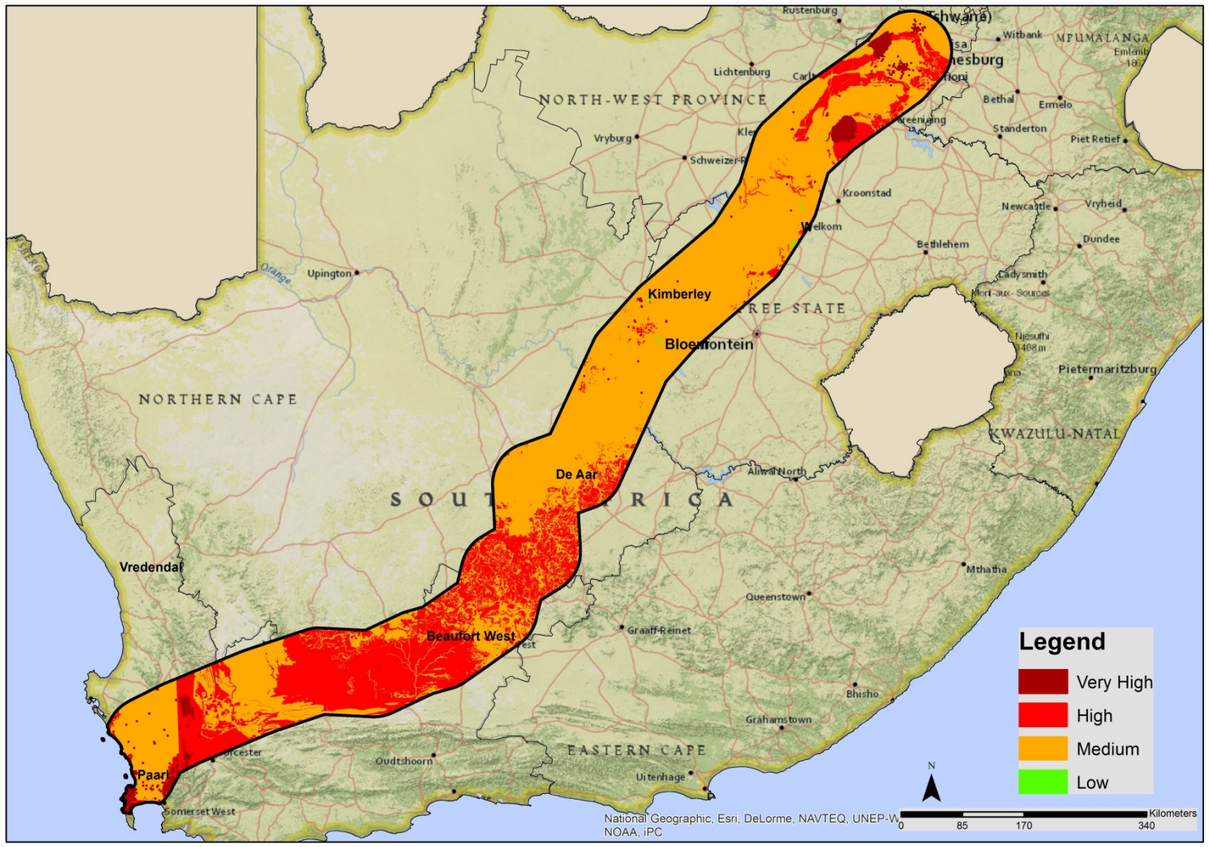
Map 9: Combined Heritage sensitivity map for electricity grid infrastructure development in the International Corridor



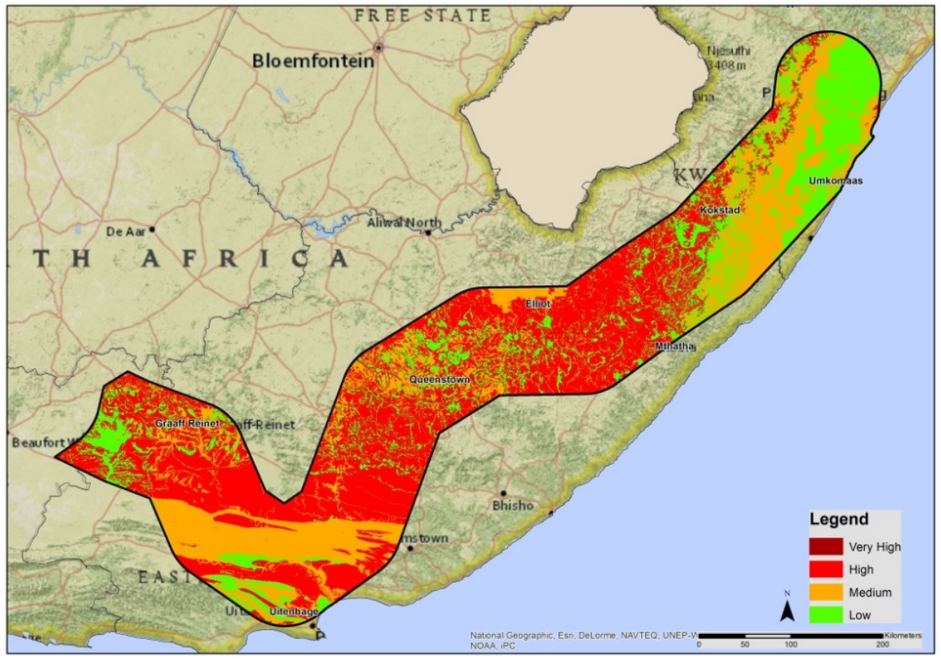
Map 10: Palaeontological sensitivity map for electricity grid infrastructure development in the Central Corridor



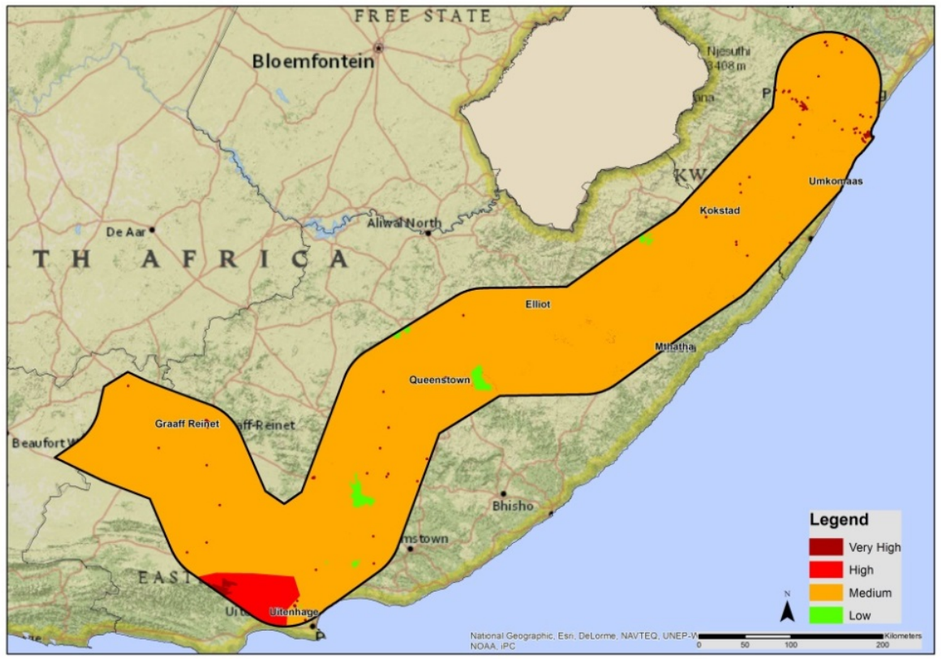
Map 11: Non-palaeontological sensitivity map for electricity grid infrastructure development in the Central Corridor



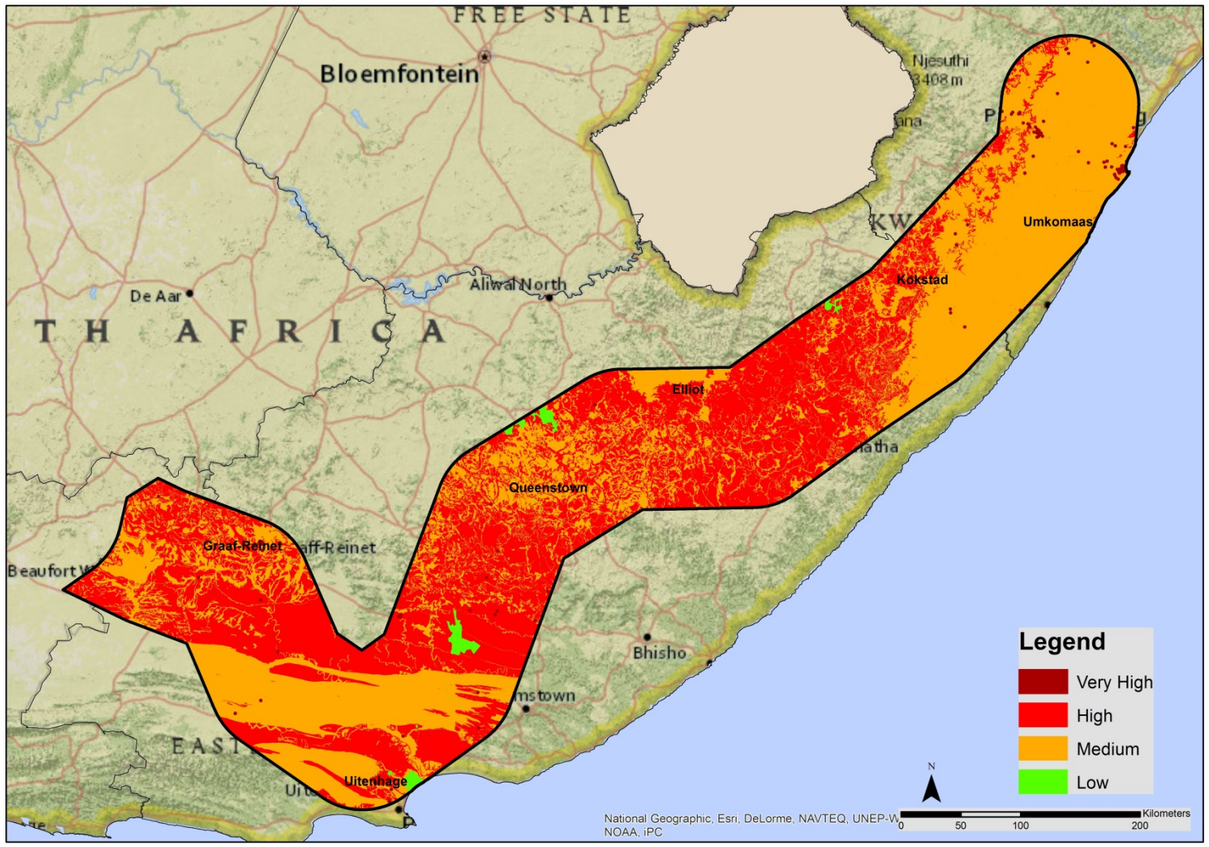
Map 12: Combined Heritage sensitivity map for electricity grid infrastructure development in the Central Corridor



Map 13: Palaeontological sensitivity map for electricity grid infrastructure development in the International Corridor



Map 14: Non-palaeontological sensitivity map for electricity grid infrastructure development in the Northern Corridor



Map 15: Combined Heritage sensitivity map for electricity grid infrastructure development in the Eastern Corridor

3.4 Development Protocol

The new heritage assessment procedure to be applied for electricity grid infrastructure projects is detailed in Table 7 and will be applicable upon formal adoption of the Power Corridors. The minimum assessment requirements for the different heritage components (Palaeontological, and Non-palaeontological resources) within different levels of sensitivity is described Table 8 and Table 9. The assessment requirements must be implemented in the context of the overarching assessment procedure in Table 7.

Table 7: New heritage assessment requirements

New Heritage Assessment Procedure
Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process must prove to the relevant Commenting Authority (i.e. the responsible heritage resources authority in terms of NHRA) and Competent Authority (i.e. Competent Authority in terms of NEMA) that the proposed development will not have an unacceptable negative impact on heritage resources. 1. *Screening* *Projects Inside the Power Corridors* A competent heritage specialist will be required to validate the palaeontology sensitivity map and non-palaeontology sensitivity map produced by download from the DEA Screening Tool for the sub-corridor. Validation of the sensitivities can be undertaken at a desktop level or through field assessment. The approach used to validate sensitivities will be at the discretion of the heritage specialist. *Projects Inside the Power Corridors* A competent heritage specialist will be required to create a palaeontology sensitivity map and non-palaeontology map for the sub-corridor using the approach and criteria detailed in Section 3.2. The approach used to validate sensitivities will be at the discretion of the heritage specialist. *All Projects* On completion of sensitivity validation, a notification prepared by a competent heritage specialist and containing the following information must be submitted to the relevant heritage resource authority before embarking on any further assessment: • The details and relevant expertise of the specialist preparing the notification; • The development envelope (including supporting infrastructure) overlaid on two validated sensitivity maps (Palaeontology and Non-palaeontology); • A clear and justified opinion statement by the specialist recommending whether further assessment in the form of an HIA is required; and • If, on the basis of the sensitivity maps, associated Development Protocol (Table 8 and Table 9) and the knowledge of the specialist preparing the notification, further assessment is deemed necessary, the proposed content (i.e. Palaeontological Impact Assessment and or Archaeological Impact Assessment) and scope of a the HIA must be specified. The competent heritage specialist will be able to motivate in the notification for an HIA not to be required in certain areas of the development envelope (see Table 8 and 9 for more details on the conditions for motivating for exception from an HIA). Based on the preliminary information received in the notification and in accordance with Section 38(2) of the NHRA, the responsible heritage resource authority will determine whether significant heritage resources could potentially be impacted, and accordingly notify the proponent whether a further assessment in the form of a HIA is required. Where further assessment is required, the Commenting Authority must either indicate support for the proposed content and scope of the assessment put forward in the notification or specify alternative assessment requirements. 2. Minimum Assessment Requirements The competent specialist shall carry out any additional assessment requirements in accordance with the notification response from the Commenting Authority. 3. *Commenting and Decision Making* The outcomes of the assessment shall be submitted to the Commenting Authority (relevant heritage resource authority) for comment. Such a comment, if received within the stipulated timeframes, will be considered by the relevant Competent Authority in terms of NEMA for decision making.

3.4.1 Palaeontology

Table 8: Interpretation of Palaeontological sensitivities and associated assessment requirements

Sensitivity Class	Interpretation	Assessments at project level	Motivating for exemption from an PIA	Permit requirements
Very High (dark red)	Very High sensitivity areas are formally protected areas under the National Heritage Resources Act and the World Heritage Convention Act (Act No. 49 of 1999).	Proposed electrical infrastructure should avoid these areas. If avoidance cannot be achieved, a Palaeontological Impact Assessment, involving a field assessment, will almost certainly be required. Known heritage resources will require avoidance. If this is not possible, a permit will be required (see permit requirements).	A PIA may not be required if such motivation was included in the initial notification prepared by a competent heritage specialist. In order to motivate for a PIA not to be required the inputs from a palaeontology specialist is required as part of the notification. Site visits to inform the notification may also be necessary to motivate for an HIA not to be required, and are up to the discretion of the specialist providing input to the notification. In most cases, it will be sufficient for only the heritage specialist preparing the notification to visit the site before an exemption from further assessment can be motivated. If exemption from further assessment is motivated, the notification must contain proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).	A permit under Section 27 of the NHRA will be required.
High (red)	High sensitivity represents areas which are or have the potential to be highly sensitive in terms of palaeontological heritage resources because either: Previous assessment of the area has identified palaeontological heritage resources which are classified as being of high significance. Or The proposed site is located on areas of Very High sensitivity as indicated by the SAHRIS palaeontological sensitivity map	These areas include, or have the potential to include, palaeontological heritage resources of conservation status. A Palaeontological Impact Assessment will almost certainly be required to determine the presence of potential resources and, where applicable, the potential impact to such resources in the context of the proposed development. Known heritage resources will require avoidance. If this is not possible, a permit will be required (see permit requirements).		A permit under Section 35 of the NHRA would normally[1] be required before impact and/or mitigation may occur to known heritage resources.
Medium (orange)	Medium sensitivity represents areas inside the Power Corridors which are, or have the potential to be, sensitive to development in terms of palaeontological heritage resources because either: Previous assessment of the area has identified heritage resources which are considered to be of medium significance. Or The proposed site is located on areas of high, moderate and unknown sensitivity in the SAHRIS palaeontological sensitivity map.	These areas include resources which may require mitigation (IIIb). A desktop Palaeontological Impact Assessment may be required to investigate the potential presence of these resources and, where applicable, the potential impact to such resources in the context of the proposed development. Known heritage resources will require mitigation under a Section 35 Permit (see next column Permit Requirements).		A permit under Section 35 of the NHRA would normally[1] be required before impact and/or mitigation may occur to known heritage resources.
Low (green)	Medium sensitivity represents areas inside the Power Corridors which are not likely to be sensitive to development in terms of heritage resources because either: Previous assessment has revealed the area to contain resources of low significance. Or The proposed site is located on formations of low or insignificant sensitivity in the SAHRIS palaeontological sensitivity map.	No further assessment is necessary for the proposed development in these areas. However, a palaeontological chance find procedure should be requested to be included in the Environmental Management Plan (EMPr).	A PIA is not required in Low sensitivity areas therefore applications for exemption do not apply.	No permit is required for development to proceed in these areas.

[1] Note that Heritage Western Cape currently does not require 'permits' for generally protected heritage resources under the NHRA when developments trigger Section 38 of the NHRA. Instead, a work plan is required which is very similar to a permitting process.

3.4.2 Non-palaeontological

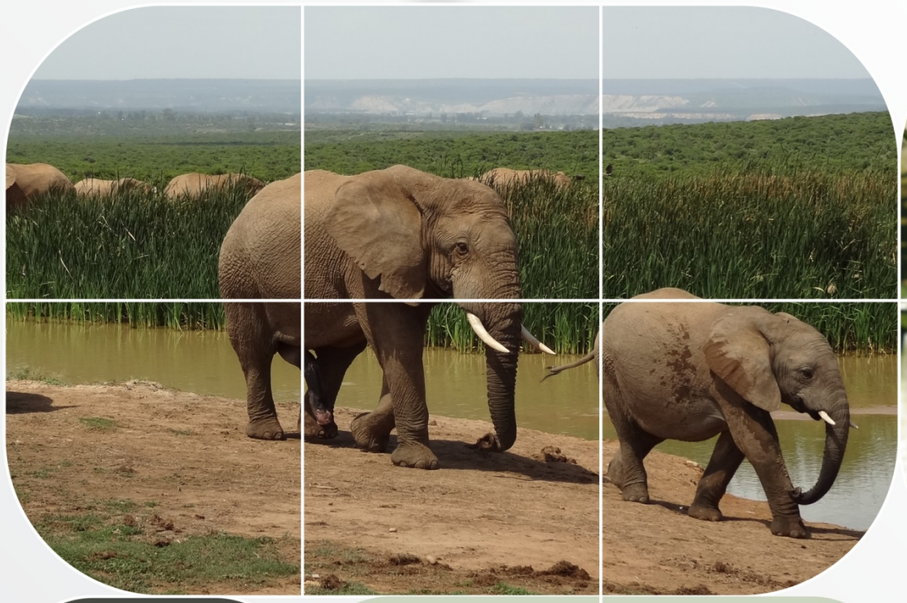
Table 9: Interpretation of Non- palaeontological and associated assessment requirements

Sensitivity Class	Interpretation	Assessments at project level	Motivating for exemption from an HIA	Permit requirements
Very High (dark red)	Very High sensitivity include all heritage sites (excluding palaeontological sites) graded I and II; all National and Provincial Heritage Sites (excluding palaeontological sites) with a 1 km buffer zone and all World Heritage Sites with their defined buffer zones.	Proposed electrical infrastructure should avoid these areas. If avoidance cannot be achieved, a Heritage Impact Assessment would almost certainly be required.	A HIA may not be required if such motivation was included in the initial notification prepared by a competent heritage specialist. In order to motivate for a HIA not to be required the inputs from an archaeology specialist is required as part of the notification. Site visits to inform the notification may also be necessary to motivate for an HIA not to be required, and are up to the discretion of the specialist providing input to the notification. In most cases, it will be sufficient for only the heritage specialist preparing the notification to visit the site before an exemption from further assessment can be motivated. If exemption from further assessment is motivated, the notification must contain proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).	A permit under Section 27 of the NHRA will be required
High (red)	High sensitivity includes all areas which are, or have the potential to be, highly sensitive in terms of Non-palaeontological resources because either: Previous assessment has identified heritage resources which are classified as being of high significance. Or There is a high probability of encountering a significant heritage resource.	These areas include or have the potential to include Non-palaeontological resources of conservation status (IIIa) or have the potential to include cultural heritage resources which will require conservation or lengthy mitigation. A Heritage Impact Assessment would almost certainly be required to investigate the potential presence of these resources and, where applicable, the potential impact to such resources in the context of the proposed development. Known heritage resources will require avoidance. If this is not possible, a permit will be required (see permit requirements).		If the development impacts on palaeontological resources of medium or high significance a permit under Section 35 of the NHRA would normally[2] be required before impact and/or mitigation may occur.
Medium (orange)	Medium sensitivity represents areas inside of the Power Corridors which are or have the potential to be sensitive to development in terms of heritage resources because either: Previous assessment of the area has identified heritage resources which are considered to be of medium significance. Or There is a medium probability of encountering significant heritage resources	These areas include resources which may require mitigation (IIIb) or have the potential to include cultural heritage resources which will require mitigation. A Heritage Impact Assessment is likely to be required to investigate the potential presence of these resources and, where applicable, the potential impact to such resources in the context of the proposed development. Known heritage resources will require mitigation under a Section 35 permit (see permit requirements).		
Low (green)	Low sensitivity represents areas not likely to be sensitive to development in terms of heritage resources because previous assessment has revealed the area to contain no resources or resources of low significance.	No further assessment is necessary for proposed development in these areas.	A HIA is not required in Low sensitivity areas therefore applications for exemption do not apply.	No permit is required for development to proceed in these areas.

[2] Note that Heritage Western Cape currently does not require 'permits' for generally protected heritage resources under the NHRA when developments trigger Section 38 of the NHRA. Instead, a work plan is required which is very similar to a permitting process.

PART 3

Chapter 4. TERRESTRIAL and AQUATIC BIODIVERSITY



CONTENTS

TABLES

MAPS

CHAPTER 4. TERRESTRIAL AND AQUATIC BIODIVERSITY

4.1 Introduction

This Chapter is informed by the scoping level specialist heritage pre-assessment of the five Power Corridors for which the complete reports is provided as Appendix C:: *Terrestrial and Aquatic Biodiversity Specialist Study*. Due to the integrated and strategic nature of this Strategic Environmental Assessment (SEA), and based on consultation with relevant government departments and wider stakeholders, the final views and requirements presented in this Chapter may vary from those contained and recommended in the specialist report.

4.1.1 Electricity Grid Infrastructure and Terrestrial and Aquatic Biodiversity

In order to understand the potential impacts of electricity grid infrastructure development on the aquatic and terrestrial environment, it is important to consider and characterise the nature and extent of impacts associated with this type of development. The most obvious feature of power line infrastructure is its linear nature. Allied to this is the limited ability of the line to be deviated in order to avoid potentially sensitive features. Given the long length of most power lines, it is inevitable that they will encounter sensitive features along their route(s). As such, detailed planning of power line alignment is a critical aspect of reducing power line impacts, as once the alignment has been decided; there is little scope for adjusting the route significantly. Due to their high construction cost as well as transmission losses, there is strong pressure on power line alignments to be as short and efficient as possible. The result of this is that they often traverse areas far from existing development and must frequently include rugged and mountainous terrain where potential impacts can be significantly higher than on open plains.

Potential impacts related to the construction and operation of grid infrastructure include the direct loss of biodiversity within the project footprint, loss of habitat, habitat degradation due to alien plant invasion or land degradation, impacts on broad–scale ecological processes due to habitat loss and fragmentation and loss of habitat within sensitive listed ecosystems which may impact future conservation options. Even if infrastructure footprints do not encroach into sensitive ecosystems, these habitats can be significantly transformed through hydrological and water quality changes, or topographical alteration (e.g. infilling, flattening) required to accommodate development in close proximity to, for instance, wetlands or rivers.

Besides the destruction of habitats or damage to sensitive ecosystems during construction, a number of construction-related activities can impact significantly on the integrity of these habitats through pollution of surface water and increased noise due to human presence and activities. Impacts associated with the operational phase of development are largely caused by maintenance activities that involve clearing or trimming of vegetation.
The components of electricity grid infrastructure and their relationship with impact generating activities can be characterised as follows:

- **Pylons:** Each pylon has a footprint of up 1 ha that is disturbed during construction. This is required in order to excavate and fill the foundations of the pylon as well as assemble and then raise the pylon on-site. This translates to a footprint of approximately 166 ha per 100 km of 765 kV power line.

- **Vegetation clearing and management in power line servitudes:** Vegetation management, or lack thereof, is one of the main impact sources associated with power lines. Although Eskom has a policy and guidelines in this regard[1], they do not provide an explicit framework for the need, method and widths to be cleared and the infield approaches are not consistent. As a result, it is impossible to quantify this impact here. Where trees are present[2] or where there is a risk that fire could cause shorting of lines, vegetation beneath the power lines may need to be cleared[3], however not without obtaining the necessary provincial vegetation clearning permits to do so. In practise, even trees may be tolerated beneath the power lines in places. But in actual practise, vegetation is regularly mowed or cleared to within as little as 20 cm of the ground, even in short vegetation and in ecosystems with no fire risk. Where alien vegetation is cleared from beneath the power line this can have beneficial impacts, but there are also situations where disturbance encourages alien plant invasion beneath the lines. As the extent of clearing can be up to 60 m wide for a 765 kV power line, this can potentially generate up to 600 ha of impact per 100 km of power line. The post-construction management of the power line footprint is potentially the major impact associated with power line infrastructure in general. Large areas may be unnecessarily cleared leading to a high cumulative habitat loss and impact along power line servitudes. The alternative, where appropriate evidence-based management is applied, and clearing is only undertaken where the vegetation genuinely poses a risk, would greatly reduce negative impact and could result in potentially positive effects in many areas.

- **Access Roads:** An access road is required for construction as well as maintenance of a power line. The road is generally around 4 m wide during construction and may become a simple two-track during operation of the power line. The initial disturbance footprint of such roads is approximately 40 ha per 100 km of power line, but is sensitive to the exact width of the road as well as the habitat as roads on steep or uneven terrain create more disturbances due to the cut and fill that is usually required in order to make the site accessible for heavy vehicles. Where roads are not subsequently managed or rehabilitated, especially where construction does not follow best practice for water and erosion management, serious ongoing erosion and associated incremental habitat degradation will result.

- **Substations**: Transmission and distribution substations are required. These may be long distances apart but can generate a relatively large local impact as they may be up to 70 ha in extent and usually also require borrow pits, construction camps, temporary lay down areas etc. during construction. As construction may take more than a year, a lot of vehicle traffic can be generated which can cause numerous ancillary impacts.

- **Construction Activities**: During construction there is a lot of noise generated by construction activities, which may deter some fauna from the affected areas. In addition, construction requires temporary lay-down areas, construction camps, quarries and batching plants, all of which increase the project footprint. In rugged terrain, cement is mixed on-site using smaller portable equipment brought in by road, while in extreme situations helicopters may also be used to bring materials to site. Construction proceeds relatively rapidly however and is usually completed within a specific area within a matter of weeks. Clearing of vegetation for construction can have long-term negative consequences of high significance when this occurs in sensitive habitats.

[1] Eskom Document number 32-247, revision date May 2007 *Environmental Procedure: Procedure for vegetation clearance and maintenance within overhead power line servitudes and on Eskom owned land*
[2] Section 2.1 a) "Trees growing to a height in excess of the horizontal distance of that tree from the nearest conductor which are identified as a risk to safe operation of the power line shall be treated and prevented from growing in such a manner as to endanger the line should they fall." See also Annex B of the same document.
[3] See Annex C: Vegetation clearing requirements for power lines.

4.1.2 Water Use Authorisation

The National Water Act (NWA) (Act No. 36 of 1998) regulates 11 water uses that require authorisation some of which are likely to be applicable to the construction and operation of electricity grid infrastructure. Section 21 of the NWA defines water use as:

a. Taking water from a water resource;
b. Storing water;
c. Impeding or diverting the flow of water in a watercourse;
d. Engaging in a stream flow reduction activity;
e. Engaging in a controlled activity identified and declared as such in terms of the Act;
f. Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
g. Disposing of waste in a manner which may detrimentally impact on a water resource;
h. Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
i. Altering the bed, banks, course or characteristics of a watercourse;
j. Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
k. Using water for recreational purposes.

Section 21 (a) and (b) thus apply to consumptive use of ground- or surface water (which includes both rivers and wetlands), while the remaining sub-sections refer to non-consumptive water uses. The construction and operation of electricity grid infrastructure is likely to result in the quantity of water consumption required to trigger the need for a water use authorisation or registration, including activities such as cement mixing, dust abatement, on-site sanitation etc. Electricity grid infrastructure activities do often constitute a non-consumptive water use, specifically Section 21 (c) and (i). Even these non-consumptive water uses may impact on the integrity and function of water resources and the overall quality of the resource and therefore must be authorised as a water use by the Department of Water and Sanitation (DWS) or Competent Authority (such as a Catchment Management Agency).
Entitlement or authorisation of water use is governed by:

- Schedule 1 of the Water Act (this covers reasonable domestic use and storage, gardening, watering of animals, and recreational use);
- Existing lawful use;
- Section 22 (3) of the Water Act, where DWS can dispense with authorisation requirements if satisfied that the purpose of the National Water Act will be met by other legislation, or another Competent Authority;
- General Authorisation (GA); or
- Licensing.

The process to be followed to obtain authorisation for these categories of water use are different, and is proportional to the risk associated with the water use. Lower risk water uses fall under General Authorisations (GA), which is a simpler, faster process than for licensing. For instance, the full Water Use Licence Application (WULA) process requires the determination of the "Reserve" for the relevant catchment, sub-catchment or resource unit. Furthermore, WULAs for groundwater abstraction can only be processed in catchments or resource units where the groundwater reserve determination has already been undertaken.

A GA permits the use of water in a specific area, or according to a set of conditions or limits. DWS or a Catchment Management Agency can also generally authorise specific groups of users in a catchment, so that they can make productive use of certain water resources, without having to apply for a licence. Individuals, groups or organisations who are using water under a GA must still register their water use if it exceeds the limits for registration. Currently, there are two GAs, one for consumptive and one for non-consumptive use, with each specifying areas of applicability and exclusion. As discussed previously, the non-consumptive water use GA is relevant here.

<u>Non-consumptive GA (GN 1199)</u>
Government Notice 1199 (18th December 2009) of Government Gazette No. 32805 provides guidance regarding impeding and diverting the flow in a watercourse (Section 21 (c)), or altering the bed and banks of a watercourse (Section 21 (i)), and is thus applicable to encroachment of a built footprint into an aquatic feature or its buffer, and the construction or widening of river or wetland crossings, which are likely to be required for some grid infrastructure applications. This GA replaces the need for the full WULA process if the specified requirements are met. This GA does, however, not apply to any activities occurring within a regulated areas described as, 500 m radius from the boundary of a wetland or where the quaternary catchments specified as being exclusions from this GA. Any non-consumptive water use in terms of Section 21 (c) and (i) encroaching within the regulated area will instead be subject to full Water Use License procedures.

<u>Amendment to Non-consumptive GA (GN 1199)</u>
GN 1199 is currently in the process of being amended. The amended GN 1999 proposes the use of a risk-based method for determining the water use registration process (either GA or WULA) for Section 21 (c) and (i) water uses within regulated areas. This is designed to facilitate the water use authorisation process by allowing the General Authorisation of certain water uses deemed to be of an acceptably low environmental and socio-economic risk. The blanket exclusion of GAs within a 500 m radius from the boundary of wetland will be removed as with other current exclusions to ensure that GAs are applicable to all low risk activities.
A watercourse in the context of the amended GN 1199 means:

- a river, spring or natural channel in which water flows regularly or intermittently "within the outer edge of the 1:100 year flood line or riparian habitat measured from the middle of the watercourse from both banks", and for
- wetlands and pans "within a 500 m radius from the boundary (temporary zone) of any wetland or pan" (when the temporary zone is not present then the seasonal zone is delineated as the wetland boundary), and for
- lakes and dams "purchase line plus a buffer of 50 m".

All persons using water or who intend to use water in a watercourse in terms of Section 21 (c) and (i) will be eligible for general authorisation on condition that the water use is deemed to be Low risk as determined through the Risk Matrix[4] and provided that proof is submitted to the relevant Catchment Management Agency (CMA) or regional office of the supporting technical documents used to determine low risk posed to the resource quality characteristics of the watercourse. Water uses deemed to be Medium or High risk as determined through the Risk Matrix will be subject to full Water Use Licence procedures.

The amended GN199 (Appendix D) also specifies activities that are considered Low risk automatically and are not required to undergo the Risk Matrix to demonstrate as such as part of the general authorisation process. Instead, for these activities, the person using water or intending to use water in a watercourse in terms of Section 21 (c) and (i) will need to demonstrate compliance through the submission of standardised technical documentation.

Transmission and distribution infrastructure and operation (including towers, pylons and stringing operations) are classified as Low risk activities and therefore where such an activity encroaches inside of a watercourse, the activity will be generally authorised on condition that the following supporting technical documentation[5] is made available to the relevant CMA or regional office of DWS:

- EMPr
- Method statement/s
- Engineering designs[6]
- Best practices
- Delineation of watercourses
- Proof of mitigation hierarchy
- Basic impacts/risks and mitigation measures

[4] The Risk Matrix allows for the scoring of severity, spatial scale (extent) and duration of an impact, as well as the likelihood of the impact occurring, in order to assess the significance of the impact, and consequently, the risk rating of each impact.
[5] Standardised technical reports and methods can be reviewed to fast track this Notice for self-regulation
[6] Must indicate 1 in 100 year flood line where affected and designs must cater for 1 in 100 year floods

Substation development is not classified as a low risk activity and therefore developments of this nature encroaching inside of a watercourse will be required to undergo the Risk Matrix to determine the requisite water use authorisation procedure.

4.2 Sensitivity Mapping Criteria

4.2.1 Data Sources

In order to generate sensitivity maps, the data layers relevant to terrestrial and aquatic sensitivities for each corridor were collected and adapted where required. Relevant national and regional biodiversity layers were sourced. National biodiversity datasets covering all corridors at the same level of detail were supplemented with higher confidence or more spatially accurate fine-scale or regional data wherever available, thus providing maps with a higher confidence level than the national cover. Only data of adequate confidence and spatial precision relative to site-scale land-use planning were used. A full list of data sources used for the generation of the sensitivity maps is detailed in the table below.

4.2.1.1 Aquatic

Table 1: Summary of aquatic data used ion the study, indicating their source and description

Data set	Source and date of publication	Data Description
Aquatic National Datasets		
NFEPA wetlands	Nel J.L., Driver A., Strydom W., Maherry A., Petersen C., Roux D.J., Nienaber S., van Deventer H, Smith-Adao LB and Hill L. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. WRC Report No. TT 500/11, Water Research Commission, Pretoria	This layer codes Wetland Freshwater Priority Areas (FEPAs), wetland ecosystem types and condition on a national scale. The delineations were based largely on remotely-sensed imagery and therefore did not include historic wetlands lost through drainage, ploughing and concreting.
NFEPA rivers	Nel J.L., Driver A., Strydom W., Maherry A., Petersen C., Roux D.J., Nienaber S., van Deventer H, Smith-Adao LB and Hill L. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. WRC Report No. TT 500/11, Water Research Commission, Pretoria	The layer provides river condition, river ecosystem types and free-flowing river information that were used in deriving Freshwater Ecosystem Priority Areas (FEPAs) for river ecosystems. It used the 1:500 000 river GIS layer available from DWS.
NFEPA sub-catchments	Nel J.L., Driver A., Strydom W., Maherry A., Petersen C., Roux D.J., Nienaber S., van Deventer H, Smith-Adao LB and Hill L. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. WRC Report No. TT 500/11, Water Research Commission, Pretoria	Sub-quaternary catchments classified according to the FEPA rivers they contain.
NFEPA groundwater recharge	Nel J.L., Driver A., Strydom W., Maherry A., Petersen C., Roux D.J., Nienaber S., van Deventer H, Smith-Adao LB and Hill L. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. WRC Report No. TT 500/11, Water Research Commission, Pretoria	High groundwater recharge areas are sub-quaternary catchments where groundwater recharge is three times higher than the average for the related primary catchment.
Strategic Water Source Areas	Jeanne Nel, Christine Colvin, David Le Maitre, Janis Smith and Imelda Haines (2013). South Africa's Strategic Water Source Areas. CSIR Report no. CSIR/NRE/ECOS/ER/2013/0031/A	Strategic Water Source Areas are those quaternary catchments that supply a disproportionate amount of runoff to geographical areas of interest. The data are expressed as the % contribution of runoff to the country's water supply. Those catchments contributing more than 50% of supply are considered to be strategic water source areas. This dataset was used for corridor descriptions.
Level 1 river ecoregions	Kleynhans *et al.* (2005) A level 1 river ecoregional classification system for South Africa, Lesotho and Swaziland. Department of Water Affairs and Forestry.	The country is divided into 31 Level 1 ecoregions, based on physiography, climate, rainfall, geology, natural vegetation. This dataset was used for corridor descriptions.
NFEPA wetveg groups	Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.	A GIS layer of wetland vegetation groups used to classify wetlands according to Level 2 of the national wetland classification system (SANBI 2010), which characterises the regional context within which wetlands occur. This dataset was used for corridor descriptions, and for determination of wetland types.
Ramsar sites	Ramsar Sites Information Services www.ramsar.wetlands.org (accessed June 2015)	Polygon data for the 22 Wetlands of International Importance in South Africa.
Aquatic Regional Datasets		
City of Cape Town wetlands map	Ewart-Smith, JL, Snaddon, K., Ractliffe, SG, Dallas, HF, Ollis, DJ and Ross-Gillespie, V. (2008) Revised wetland GIS cover for the city of cape town. Phase 4: Cape Peninsula, city centre, northern and eastern extremities and the complete city wetlands map	Wetlands mapped from aerial photography and using river and waterbody data as additional informants.
CAPE fine-scale wetland maps	Job, N., Snaddon, K., Day, L., Nel, J. and Smith-Adao, L. (2008) C.A.P.E. fine-scale planning project: aquatic ecosystems of the Sandveld-Saldanha planning domain. Job, N., Snaddon, K., Day, L., Nel, J. and Smith-Adao, L. (2008) C.A.P.E. fine-scale planning project: aquatic ecosystems of the Upper Breede planning domain.	Wetlands were mapped using SPOT5 satellite imagery and aerial photography imagery. A large proportion of wetlands were ground-truthed.

Data set	Source and date of publication	Data Description
KZN wetland map	Scott-Shaw, C.R. and Escott, B.J. (Eds) (2011) KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_1_11_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.	Wetland map was extracted from the KZN vegetation type map by Fahiema Daniels, SANBI.
Mpumulanga Highveld wetland map	SANBI, no publication, mapping done between August 2013 and September 2014	Wetland delineations were based on tracking wetlands on SPOT5 satellite imagery within the Mpumalanga Highveld boundary supported by Google Earth, 1:50 000 contour lines, 1:50 000 river lines, exigent data, and NFEPA wetlands. This focuses on updating previously mapped wetlands in three major steps: desktop digitizing, field ground-truthing and mapped data reviewing.
Free State wetland map	Collins, N.B. 2015 Provincial Biodiversity Plan Free State. Draft Ver. 1.2 March 2015. Unpublished project report. Department of Economic, Small Business Development, Tourism and Environmental Affairs Free State Province (DESTEA).	Compilation of wetland as input into Free State Provincial Biodiversity Plan provides additional mapped and modelled wetland areas cf. NFEPA wetlands. No indication of polygon source so all treated as lower confidence than NFEPA data.
Wind and Solar SEA wetlands data	CSIR, National Wind and Solar PV SEA Specialist Report -Terrestrial and Aquatic Biodiversity. Mapped in 2014 by Kate Snaddon, Justine Ewart-Smith and Nancy Job	NFEPA wetlands were edited, using SPOT5 satellite imagery and Google Earth imagery, and expert review.

4.2.1.2 Terrestrial

Table 2: Summary of terrestrial data used in this study, indicating their source and description

Data set	Source/s and date of publication	Data Description
Terrestrial: National / National Composited Datasets		
Protected Areas	SANBI Protected Area database beta version June 2015, based on 2013 DEA PA database. Supplemented with in-process of transfer and proclamation areas from major Dassenberg Conservation Corridor initiative in the Western Cape, data provided by CapeNature and City of Cape Town Dassenburg Coastal Catchment Partnership June 2015.	Protected Areas – formal and de-facto, used for all corridors
National Protected Areas Expansion Strategy (NPAES) 2010	NPAES focus areas 2010 data set downloaded May 2015 www.bgis.sanbi.org DEAT (2008) The National Protected Area Expansion Strategy 2008-2012: A framework for Implementation. South African National Biodiversity Institute, National Department of Environmental Affairs and Tourism.	NPAES focus areas layer indicates likely large future protected areas, where direct and visual impacts of EGI would compromise PA value.
Land cover / Extent of natural habitat	South African National Land Cover 2013-2014, 72 class data set www.geoterraimage.com, DEA open licence used to derive natural vs. not natural habitat classes. Updated with: Mpumalanga Biodiversity Sector Plan 2014 land cover National agricultural field boundaries 2007-2013 (DAFF), including old fields NFEPA 2011 artificial wetlands	Land cover for South Africa, classified and updated to show extent of remaining natural or near natural vegetation. Natural vegetation used to mask other data sets to show only remaining extent, e.g. of Threatened Ecosystems, Plant species records. Also used to derive additional areas of specific sensitive habitats: Forest areas Dense thicket areas within Albany Thicket Biome
South African Vegetation Map 2009	Mucina, L. & Rutherford, M.C. (eds) 2009. The Vegetation of South Africa, Lesotho and Swaziland (electronic version / shapefile). South African National Biodiversity Institute, Pretoria., Version date January 2012	South African National vegetation map used for all corridors for determining vegetation endemism, additional vegetation sensitivity and sensitive biomes.
Threatened Ecosystems of South Africa	Western Cape: Ecosystem status assessment of Western Cape units of Vegetation of SA 2009 using best available compilation of habitat condition data at August 2013, unpublished data G. Pence / CapeNature. Rest of SA (Excluding W Cape): Department of Environmental Affairs (2011). National list of ecosystems that are threatened and in need of protection. Government Gazette No. 34809, Notice No. 1002, 9 December 2011. Based on Vegetation of SA 2006. Criterion D1 listed ecosystems were excluded (discussed further in specialist report).	Gazetted or best current assessment of threatened ecosystems used in all corridors
DWAF Indigenous Forest Patches 2005	Systematic conservation planning for the forest biome of South Africa. Approach, methods and results of the selection of priority forests for conservation action. DWAF October 2005	Compilation and description of all forest patches in South Africa by D. Berliner. Used for all corridors where forest patches are present.
Terrestrial: Regional Datasets		
City of Cape Town Biodiversity Network 2015	City of Cape Town Biodiversity Branch. Version distributed 1 June 2015.	Mapping of fine scale ecosystem status and Critical Biodiversity Areas for the City of Cape Town Metro area.
Western Cape Biodiversity Framework 2014	Pence, G.Q. 2014 Western Cape Biodiversity Framework 2014 Status Update: Critical Biodiversity Areas of the Western Cape. Unpublished CapeNature Project Report.	Critical Biodiversity Area and Ecological Support Area maps covering Western Cape

Data set	Source/s and date of publication	Data Description
Hantam Municipality data, CAPE Fine Scale Planning 2010	Pence, G.Q. 2010 CAPE Fine Scale Plans Critical Biodiversity Areas of the Western Cape. Unpublished CapeNature Project data.	Critical Biodiversity Area maps for Hantam Municipality, Northern Cape
Namakwa District Biodiversity Sector Plan 2008	Desmet P. & Marsh A. (2008) Namakwa Biodiversity Sector Plan. Conservation International.	Critical Biodiversity Area maps Namakwa District Municipality Northern Cape
Gauteng Conservation Plan 2014	GDARD (2014): Technical Report for the Gauteng Conservation Plan (Gauteng C-Plan v3.3). Gauteng Department of Agriculture and Rural Development: Nature Conservation Directorate.	Critical Biodiversity Area maps for Gauteng Province
Mpumalanga Biodiversity Sector Plan 2014	MTPA. 2014. Mpumalanga Biodiversity Sector Plan Handbook. Compiled by Lötter M.C., Cadman, M.J. and Lechmere-Oertel R.G. Mpumalanga Tourism and Parks Agency, Mbombela (Nelspruit).	Land cover indicating natural habitat and Critical Biodiversity Maps for Mpumalanga
Free State Provincial Biodiversity Plan 2015	Collins, N.B. 2015 Provincial Biodiversity Plan Free State. Draft Ver. 1.2 March 2015. Unpublished project report. Department of economic, small business development, tourism and environmental affairs Free State Province (DESTEA).	Critical Biodiversity Area maps Free State Province
Limpopo Conservation Plan v2 2013	Desmet, P. G., Holness, S., Skowno, A. and Egan, V.T. (2013) Limpopo Conservation Plan v.2: Technical Report. Contract Number EDET/2216/2012. Report for Limpopo Department of Economic Development, Environment and Tourism (LEDET) by ECOSOL GIS	Critical Biodiversity Area maps Limpopo Province
North West Biodiversity Assessment 2008	Desmet, Skowno & Schaller (2008) Biodiversity Assessment of North West, NWDACE.	Critical Biodiversity Area maps North West Province
Eastern Cape Biodiversity Conservation Plan 2007	Berliner D. & Desmet P. (2007). Eastern Cape Biodiversity Conservation Plan: Technical Report. Department of Water Affairs and Forestry Project No 2005-012, Pretoria.	Critical Biodiversity Area maps for Eastern Cape Province NB: used with modified Critical Biodiversity Area classification cf. other plans due to age of plan, lack of systematic target based approach and resulting extensive CBA coverage.
Baviaanskloof Mega Reserve Project 2008	Skowno, A. (2008) Baviaanskloof Mega-Reserve Biodiversity Assessment Version 3 14 May 2008. Unpublished Wilderness Foundation Project Report.	Eastern Cape / Eastern Corridor - small portion. Delineates more focussed and target driven CBAs within study area than broader E Cape CBAs
Nelson Mandela Bay Conservation Assessment 2009	Stewart, W. 2009 Final Conservation Assessment and Plan for the Nelson Mandela Bay Municipality. SRK Project Number 367380/5.	Critical Biodiversity Area Maps for Nelson Mandela Bay Metro
Addo Mainstreaming Project CBA Map	Skowno, A.L. and Holness, S.D. (2012) Addo Mainstreaming Project - Updated CBA maps and technical report. SANParks.	Addo District Bioregional Plan in Eastern Cape Data reviewed but NOT used as it is derived from other Terrestrial and Aquatic datasets adequately represented in this EGI analysis, including the 2007 E Cape Conservation Plan, in which original CBA class categories were discarded.
KwaZulu Natal Terrestrial Systematic Conservation Plan 2010	Dr Boyd Escott, Tamsyn-Claire Livingstone, Bheka Nxele, Dr Jean Harris, Debbie Jewitt 2012 Draft Document describing the Conservation Planning Terms for the EKZNW Spatial Planning Products, Version 1.0. Ezemvelo KZN Wildlife.	Terrestrial and Aquatic CBA Maps for KwaZulu Natal Province
STEP thicket degradation map	Cowling, R.M., Lombard, A.T., Rouget, M., Kerley G.I.H., Wolf T., Sims-Castley, R., Knight, A., Vlok, J.H.J., Pierce, S.M., Boshoff, A.F. & Wilson, S.L. 2003. A conservation assessment for the Subtropical Thicket Biome. *Terrestrial Ecology Research Unit Report* No 43. 106 pp. Appendices 80 pp. University of Port Elizabeth, South Africa. (see www.bgis.sanbi.org)	Pristine sensitive Albany Thicket patches in Eastern Cape / Eastern Corridor
Eastern Cape Protected Areas Expansion Strategy	Skowno, A., Holness, S., Jackelman, J. and P. Desmet (2012) Eastern Cape Protected Area Expansion Strategy, Eastern Cape Parks and Tourism Agency, East London.	High scoring areas in the EPAES analysis was used to supplement the CBA information for the Eastern Corridor

4.2.1.3 Species

Table 3: Summary of species used in the study, indicating their source and description

Data	Source and date of publication	Data Description
Species Datasets		
Plants - SANBI Threatened Species Programme records	Unpublished SANBI TSP database at May 2015	Plant point records with IUCN threat status and spatial precision. Assessment criteria only available for Western Cape.
Reptiles	Unpublished SANBI database at May 2015.	Reptile point records with IUCN threat status and spatial precision. Only Geometric Tortoise data were used.
Bat roost localities	Bat roost point location GIS data with indication of roost size (<500 or >500) supplied by Endangered Wildlife Trust, dated July 2014	NOT used due to lack of spatial precision information and majority of points arranged in grid clearly indicating that majority of points are either quarter degree centroids or similar source not useable for any land use planning.
Butterflies	Unpublished SANBI database at May 2015.	NOT used due to poor spatial precision of data and unavailability of data to indicate any species with restricted enough area of occupancy such that EGI infrastructure would pose a risk to the global population. Species of concern were, however, extracted for each corridor section and are described in the Corridor Descriptions.

4.2.1.4 Topography (slope)

Table 4: Summary of topography data used in the study, indicating their source and description

Data	Source and date of publication	Data Description
Physical/Topography: National Datasets		
Digital Elevation Model SRTM	NASA and US National Geospatial-Intelligence Agency (NGA) Shuttle Radar Topography Mission (SRTM) 1 Arc-Second Global data set. See https://lta.cr.usgs.gov/SRTM1Arc. Downloaded from http://earthexplorer.usgs.gov/ 10 June 2015.	Approximately 25 m resolution Digital Elevation Model used to derive slope classes. Also used to derive hill shade overlay.

4.2.2 Processing of Data

4.2.2.1 Aquatic Data Processing

The key datasets used were the 2011 NFEPA rivers and wetlands datasets. The NFEPA rivers layer was not edited, as it is considered to be a good representation of the important river systems of South Africa. However, there are inaccuracies in the NFEPA wetlands layer, and significant under-mapping of isolated wetlands, such as depressions, seeps and flats, especially in the more arid parts of the country. The national dataset was thus supplemented by local fine-scale data where available. The occurrence of false positives in the NFEPA wetland layer is low, but for all fine-scale wetland mapping domains inspected (with the exception of the City of Cape Town) the NFEPA wetlands layer does map some apparently natural wetlands that are omitted from fine-scale datasets. In most cases, therefore, the various datasets were composited so that all features from underlying datasets are represented. Only in the City of Cape Town were the NFEPA wetlands entirely erased and replaced with the fine-scale wetland mapping. This was due to the high confidence placed in the mapping and ground-truthing of wetlands in the City of Cape Town Metropolitan area. The confidence level assigned to the rivers and wetlands maps are a guide to the extent to which aquatic features should be checked against satellite and/or aerial imagery, at the very least, or through in-field ground-truthing.

Processing steps using Arc GIS:

1. "Valleyhead seeps" were replaced by "Seeps" (valleyhead seeps are no longer a wetland type, as determined by the National Classification System for Wetlands (Ollis *et al.*, 2013));
2. Checked for self-overlapping polygons using topology rules to ensure that the buffering step would provide expected results;
3. Unionise wetlands map with Level 1 Aquatic Ecoregions (Kleynhans *et al.* 2005) to provide additional contextual information for specialists and data summary (ecoregions do not influence sensitivity rating or buffer sizes);
4. Data were extracted from the national dataset within the Power corridors; this was not done using a Clip operation, but rather through selecting all polygons within EGI corridors plus a 500 m buffer to allow for inclusion of buffers of features just outside corridors and to address the regulatory zone specified for water use authorisation.
5. Original classification of wetland types in the original NFEPA dataset was done using Digital Elevation Model (DEM)-derived slope/type classes, which were not cleaned and so included individual grid cell pixels and associated slivers. These spurious small wetland subdivisions were removed by use of the Eliminate tool, which was run multiple times in two stages – once with features selected of less than 5000 m² to dissolve spurious wetland polygons into larger adjoining polygons (with longest shared boundary), and again to dissolve adjacent slivers associated with dams and artificial wetlands into the adjoining dam polygon (selection rule:

"WETCON" = 'Z2' AND "MAJWETCON" = 'Z3'). Only 9 Z2/Z3 polygons that were not contiguous with other dams remained and were reclassified as artificial (field calculator: [NATART] 'Artificial').

6. Erased City of Cape Town fine-scale wetland mapping domain;
7. Added the following attributes to NFEPA (for consistency with fine-scale maps):
    - HGM_TYPE: this is the same as NWCS_L4 if not estuarine. For estuarine, look at WETTYPE;
    - FEPA_TYPE: this is the same as WETTYPE;
    - AQUA_SENS: all artificial wetlands become "low", all others "very high"
    - SOURCE: NFEPA wetlands layer (SANBI) 2011
    - CONF_MAP: all "low"
    - BUFF_ALLSZ: based on rules above
    - Ramsar: have NOT updated to be consistent with fine-scale by adding name of Ramsar site as existing Ramsar attribute is adequate for sensitivity rating and buffering ([Ramsar] = 1 denotes a Ramsar site).

All fine-scale datasets were edited to some extent, as follows:

- City of Cape Town wetlands: Checked for no internally overlapping polygons using topology rules – no cleaning required.
- CAPE Fine-scale planning: Checked for no internally overlapping polygons using topology rules – multiple overlap areas merged, these included duplicate identical polygons, and unresolved overlaps between adjacent polygons.

Artificial wetlands were retained but not buffered.

4.2.2.2 Terrestrial Data Processing

The biodiversity sector has a consistent and accepted land-use planning framework and key data sets that provide a complete national coverage that can inform appropriate land-use. The National Vegetation map series provide an excellent surrogate for habitat units for which habitat retention thresholds have been set. Many areas have excellent fine-scale (approx. 1:10 000 or better) Critical Biodiversity Area (CBA) maps, derived from target-driven, systematic conservation planning exercises, and linked to appropriate land-use recommendations (see e.g. *Government Gazette* No. 32006 16 March 2009 Guideline regarding the Determination of Bioregions and the Preparation and Publication of Bioregional Plans).

Fortunately, areas where vegetation and biodiversity feature mapping and Critical Biodiversity Area planning tend to be extremely poor, most notably for the Nama-Karoo biome and large parts of the Northern and Eastern Cape Provinces, are also areas where habitats are relatively intact, such that impacts of the type and scale contemplated in this study are unlikely to impact unknown very high or high sensitivity habitat types.

Significant data processing was undertaken on many of the datasets in an effort to improve the overall accuracy and confidence levels. Processing steps undertaken for these datasets are detailed in the specialist study in Appendix C: *Terrestrial and Aquatic Biodiversity Specialist Study*.

4.2.3 Sensitivity Delineation

All spatial data sets (GIS maps) containing biophysical features relevant to the corridors were compiled and each unique feature scored on the same simple four-tier system to indicate its sensitivity to impacts associated with electrical grid infrastructure construction, operation and maintenance: Low, Medium, High, and Very High.

4.2.3.1 Aquatic Features

Primary regulation governing development in proximity to a watercourse includes the NEMA 107 of 1998 Environmental Impact Assessment Regulations and the National Water Act (No. 36 of 1998).

In the context of the NEMA EIA regulations 544 2014 Activity 11, a development will require environmental authorisation prior to development going ahead if infrastructure or structure with a physical footprint of 100 square meter or more is proposed to occur within 32 m of a watercourse. The Competent Authority responsible for deliberating on applications for environmental authorisation is the national Department of Environmental Affairs or relevant provincial department.

In the context of Section 40 of the National Water Act, non-consumptive water use registration (either GA or full WULA) will be necessary prior to development going ahead where the proposed development encroaches within a regulated area in the context of a watercourse, as determined by the GN 1199. The Competent Authority responsible for deliberating on applications for water use registration is the national Department of Water and Sanitation or relevant Catchment Management Agency.

Therefore sensitivity in the context of aquatic features differs between the NEMA EIA regulations and NWA regulations. Also the competent authorities mandated to deliberate on applications in terms of the two regulations are different. As such, sensitivity in the context of the SEA for aquatic features are delineated and discussed separately.

❖ *Environmental Authorisation in terms of NEMA*

Buffering distances and sensitivity delineation was consistently applied in the context of infrastructure type (power lines or substations) and watercourse type (rivers/streams and wetlands). A buffering of 32 m measured from the edge of a watercourse was applied. A sensitivity rating of Very High was defined for all areas inside of the 32 m buffer, including the aquatic feature itself.

Table 5: Sensitivity delineation for rivers/stream features in the context of environmental authorisation

Infrastructure	Wetland and Buffer Sensitivity	Buffer Description
Substation and Power line	**Very High**	<32m from the edge of a watercourse

❖ *Water Use Registration in terms of the NWA*

Separate sensitivity ratings have been attributed to aquatic features in the context of a power line development and substation development in terms of registering for a non-consumptive water use. Furthermore, buffering distances around watercourses varies between categories of watercourses (rivers/streams vs wetlands). For rivers and streams the buffering distance from the feature also varies depending on the characteristics of the specific river/stream. Therefore, only for wetlands is the buffering distance around all wetland features consistent.

Both the National Environmental Management Act and National Water Act were considered when delineating buffer distances for aquatic features. With this in mind, the following buffering and sensitivity delineation system was developed for rivers/streams and wetlands in the context of both power lines and substations.

<u>Wetlands</u>

In the context of wetlands, the buffered area surrounding a wetland includes an area 500 m in width from the boundary (temporary zone) of the wetland for both power line and substation infrastructure developments. However, the level of sensitivity attributed to the buffered area differs for the different types of development. The following categorisation applies and is summarised in Table 6.

Substations

Given that substation infrastructure is not listed as a low risk activity in terms of amended GN 1199 and therefore more likely to be subject to a full Water Use License procedure when encroaching upon a watercourse, the wetland feature and surrounding buffered area has been delineated Very High sensitivity status in the context of substation infrastructure.

Power lines

Given that power line infrastructure is listed as a generally authorised Low risk activity in terms of the amended GN 1199, the wetland and surrounding buffered has been delineated Medium sensitivity status in the context of power line infrastructure.

Table 6: Sensitivity delineation for wetland features and associated buffers for both power line and substation infrastructure

Infrastructure	Wetland and Buffer Sensitivity	Buffer Description
Substation	**Very High**	500 m radius from the boundary (temporary zone) of the wetland and all catchments listed in Section 6 Table 1 of amended GN 1199.
Power line	**Medium**	500 m radius from the boundary (temporary zone) of the wetland

❖ *Rivers*

Where already delineated, the buffered area for rivers/streams includes the area within the outer edge of the 1:100 year flood line or riparian habitat measured from the middle of the watercourse from both banks. Where the 1:100 year \flood line or riparian habitat has not already been delineated for a river system, the buffered area can be determined by the classification system in Table 7. The classification system considers three characteristics of the river/stream including the FEPA status, river ecosystem threat status and river type. As a time and cost saving measure, practitioners are encouraged to use the classification system below for determining the buffer of a river/stream where the 1:100 year flood line or riparian habitat has not been delineated.

Table 7: Criteria for identifying the regulatory zone for rivers where the flood line and riparian zone has not been identified (distances are measured in metres from the bank of the river/stream)

River/Stream Buffer Distance Classification System									
River type:	**FEPA status and river type threat status:**								
	River or Fish FEPA, Fish Support Area, Fish Corridor			**Phase 2 FEPA, Upstream Management Area**			**None**		
	CR, EN	**VU**	**LT**	**CR, EN**	**VU**	**LT**	**CR, EN**	**VU**	**LT**
Free-flowing rivers	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m
Foreign (i.e. trans-boundary rivers)	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m	200 m
Mountain	100 m	100 m	100 m	100 m	100 m	50 m	100 m	50 m	50 m
Upper foothill	100 m	100 m	100 m	100 m	100 m	50 m	100 m	50 m	50 m
Lower foothill	200 m	200 m	200 m	200 m	200 m	50 m	100 m	50 m	50 m
Lowland river	200 m	200 m	200 m	200 m	200 m	100 m	200 m	100 m	100 m

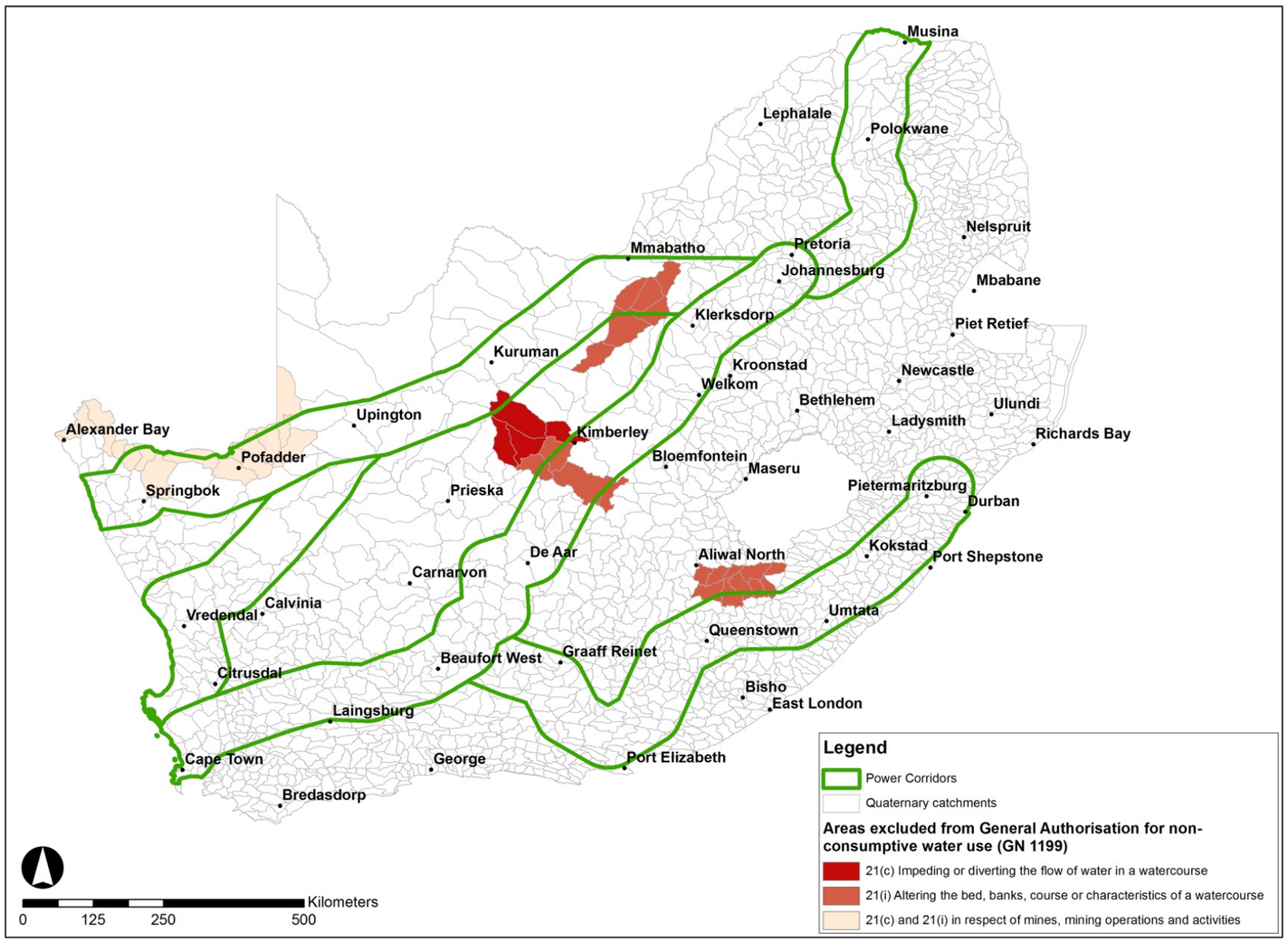
As with wetland features, the level of sensitivity attributed to the river/stream feature and buffered area is different for substation and power line infrastructure.

<u>Substation</u>

Given that substation infrastructure is not listed as a Low risk activity in terms of amended GN 1199, and is therefore more likely to be subject to a Full Water Use License procedure when encroaching upon a watercourse, the river/stream feature and adjacent buffered area has been delineated Very High sensitivity in the context of substation infrastructure. Furthermore, quaternary catchment areas excluded from GN 1199 (refer to Table 8) and therefore requiring a Full Water Use Authorisation procedure, have been delineated Very High sensitivity status.

Table 8: Catchment Areas excluded from amended GN 1199 with the exception of activities generally authorised

Primary Drainage Region	Area
C (for Section 21*(c)* of the Act)	Vaal River downstream of the Kimberley waterworks to the confluence with the Orange River
C (for Section 21*(i)* of the Act)	Riet River downstream of Kalkfontein Dam to Vaal River confluence
D (for Section 21*(i)* of the Act)	The whole of the Kraai River
D (for Section 21*(c)* and *(i)* of the Act)	Lower Orange River downstream of the Augrabies Falls in respect of mines, mining operations and activities
C (for Section 21*(i)* of the Act)	Harts River upstream of the Taung Dam in the Middle Vaal WMA



Map 1: Catchment Areas excluded from amended GN 1199 with the exception of activities generally authorised

Power lines

Given that power line infrastructure is listed as a generally authorised Low risk activity in terms of the amended GN 1199, the river/stream and surrounding buffered has been delineated Medium sensitivity status in the context of power line infrastructure.

Table 9: Sensitivity delineation for river/stream features and associated buffers for both power line and substation infrastructure

Infrastructure	River/Stream and Buffer Sensitivity	Buffer Description
Substation	**Very High**	Within the outer edge of the 1:100 year flood line or riparian habitat measured from the middle of the watercourse; Or Within the outer edge of the buffer distance (as determined by the River/Stream Buffer Distance Classification System) measure from the bank of the river/stream; And All catchment areas listed in Section 6 Table 1 of GN 1199.
Power line	**Medium**	Within the outer edge of the 1:100 year flood line or riparian habitat measured from the middle of the watercourse; Or Within the outer edge of the buffer distance (as determined by the River/Stream Buffer Distance Classification System) measured from the bank of the river/stream.

❖ *Terrestrial Features*

The terrestrial biodiversity features detailed in Table 10 were identified as sensitive to the negative impacts of grid development. Each feature and associated buffer (where applicable) has been allocated a sensitivity rating. The associated buffer and sensitivity rating applies to both power line and substation infrastructure.

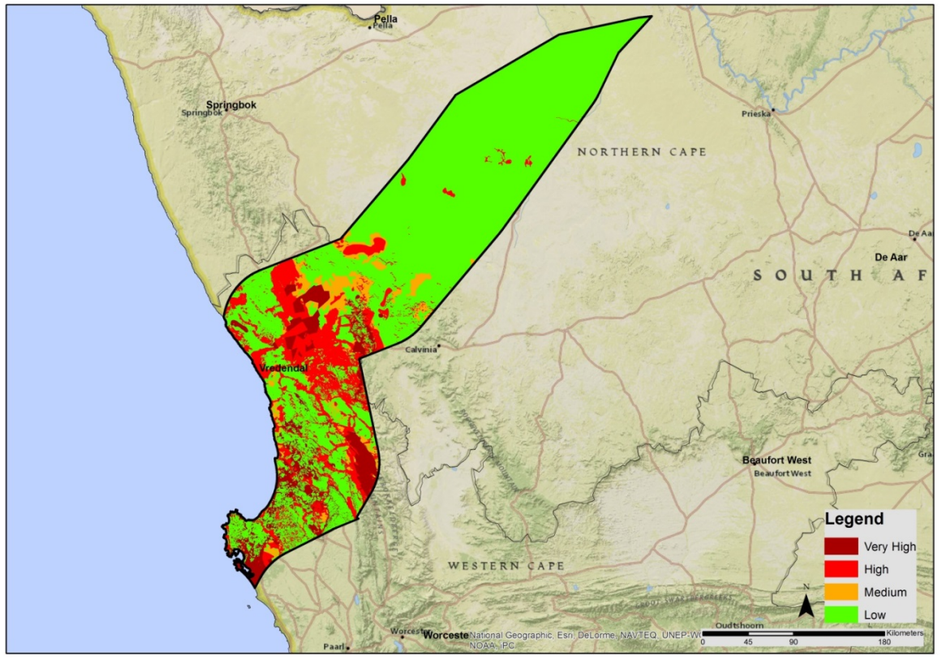
Table 10: Sensitive terrestrial features and associated sensitivity level

Category	Data class	Dataset/Layer	Feature	Sensitivity
Terrestrial Habitat	Protected Areas	SANBI PAES Layer ver. 01042015	Forest Act Protected Area	Very High (No Buffer)
		Fine Scale Conservation Plans Pas	Local Nature Reserve	Very High (No Buffer)
			Marine Protected Area	Very High (No Buffer)
			Mountain Catchment	High (No Buffer)
			National Botanical Gardens	Very High (No Buffer)
			Protected Environment	High (No Buffer)
			Provincial Nature Reserve	Very High (No Buffer)
			Special Nature Reserve	Very High (No Buffer)
			National Parks	Very High (No Buffer)
			Private Nature Reserves (dcl post 2008)	High (No Buffer)
			Private Nature Reserves (dcl re 2008)	Medium (No Buffer)
		SANBI PAES layer ver 01042015 + CapeNature/CoCT DCCP info in-process or de facto Pas	NPAES 2010 focal areas	Medium (No Buffer)
	Habitat Veg Unit Conservation Status	Best available Cons status (excluding Criterion D1)	Natural habitat: Critically Endangered	Very High (No Buffer)
			Natural habitat: Endangered	Very High (No Buffer)
			Natural habitat: Vulnerable	Medium (No Buffer)
			Natural habitat: Least Threatened	Low (No Buffer)

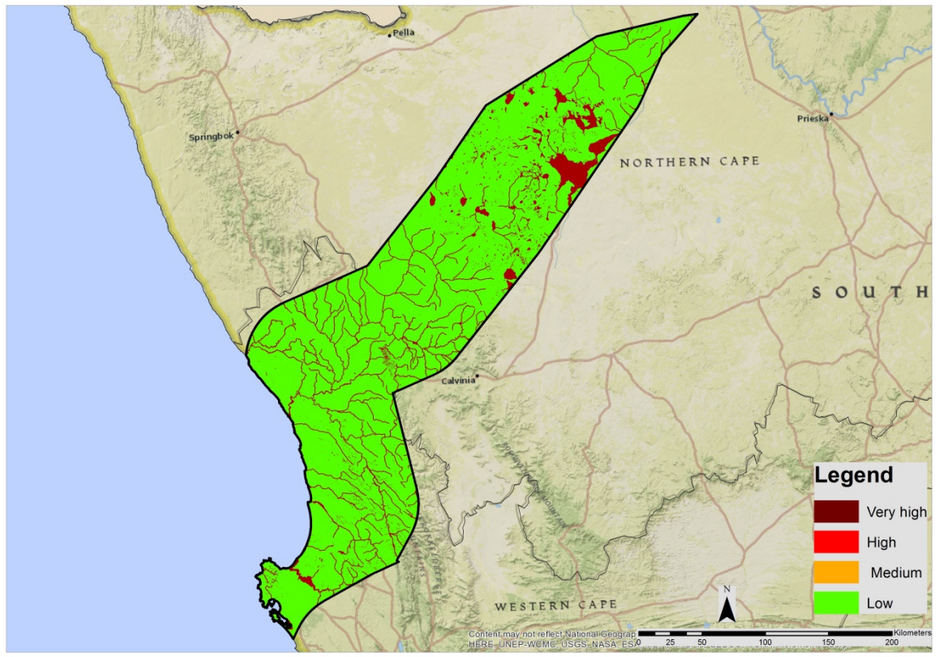
Category	Data class	Dataset/Layer	Feature	Sensitivity
			Degraded and Not Natural: All	Low (No Buffer)
	Critical Biodiversity Areas	Provinces, fine scale plan, various	Critical Biodiversity Area Irreplaceable	Very High (No Buffer)
			Critical Biodiversity Area best design (excl. CBA best design E Cape) Critical Biodiversity Area unknown subtype (note that natural Critical and Endangered habitats will still get Very High rating from ecosystem status)	High (No Buffer)
			ESA / E.Cape Critical Biodiversity Area best design Critical Biodiversity Areas / other natural	Low (No Buffer)
	Natural Forest	SANBI Veg Map 2006 – forests	All	Very High (No Buffer)
		DAFF Forest types	All	Very High (No Buffer)
		Land cover 2013-14 GTI DEA open licence	Class - forest	Very High (No Buffer)
	Thicket	STEP 2002 Vegetation Mapping: Albany Thicket	Pristine Thicket habitat condition class	Very High (No Buffer)
		Land cover 2013-14 GTI DEA open licence	Thicket / Dense Bush land cover class	High (No Buffer)
Species	Threatened Plants	SANBI TSP data	All records Cr, EN & D2 with better than 250m accuracy	Very High (250m)
			High density areas, including records worse than 250 m but > 1000 m accuracy	High (No Buffer)
	Bats	Bat roost exclusion areas EWT July 2014	Major Bat Roosts (>500 bats)	Very High (2000m)
	Reptiles	Reptiles point records SANBI	Geometric Tortoise only: SA Veg 2009 polygons with >3 post 1995 records or known localities with PLUS 2.5 km buffer of all these records/localities	Very High (2500m)
Physical/Topography	Slope	Slope from SRTM 1arc second DEM	Slopes of 0° - 10° (0 - 18%)	Low (No Buffer)
			Slopes of 10° - 20° (18 - 36%)	Medium (No Buffer)
			Slopes of 20° - 30° (36 - 58%)	High (No Buffer)
			Slopes of >30° (>58%)	Very High (2500m)

4.3 Sensitivity Maps

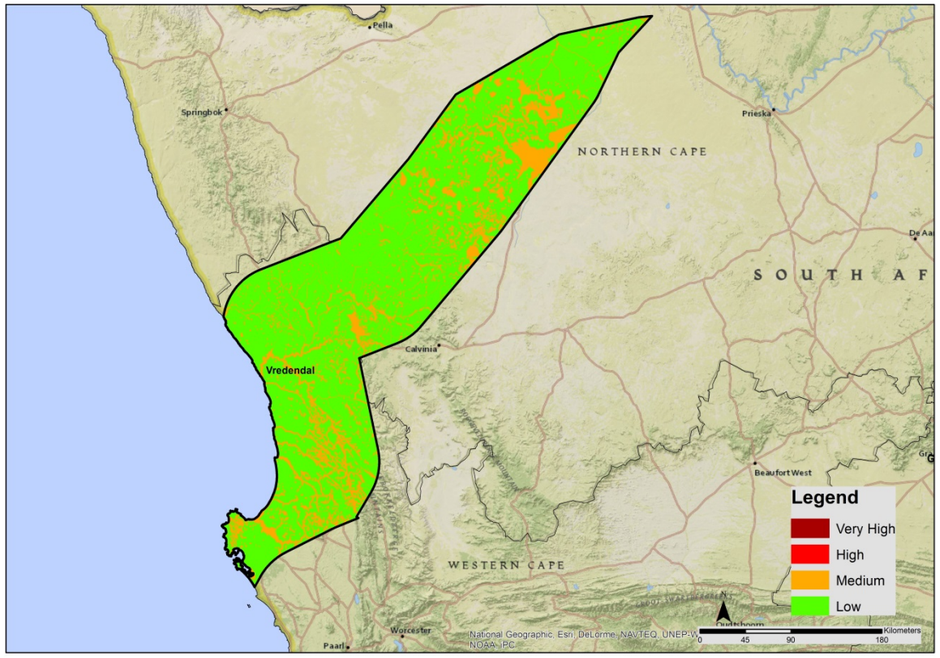
Electricity grid infrastructure sensitivity maps were produced for each of the five Power Corridors illustrating areas of Very High, High, Medium and Low sensitivity for terrestrial biodiversity and aquatic separately (refer to Maps 2-16). The criteria used to delineate aquatic feature sensitivity each of the corridors was sourced from Table 6 (wetlands) and Table 9 (rivers and streams). The criteria used to delineate sensitivity for terrestrial biodiversity features was sourced from Table 10.



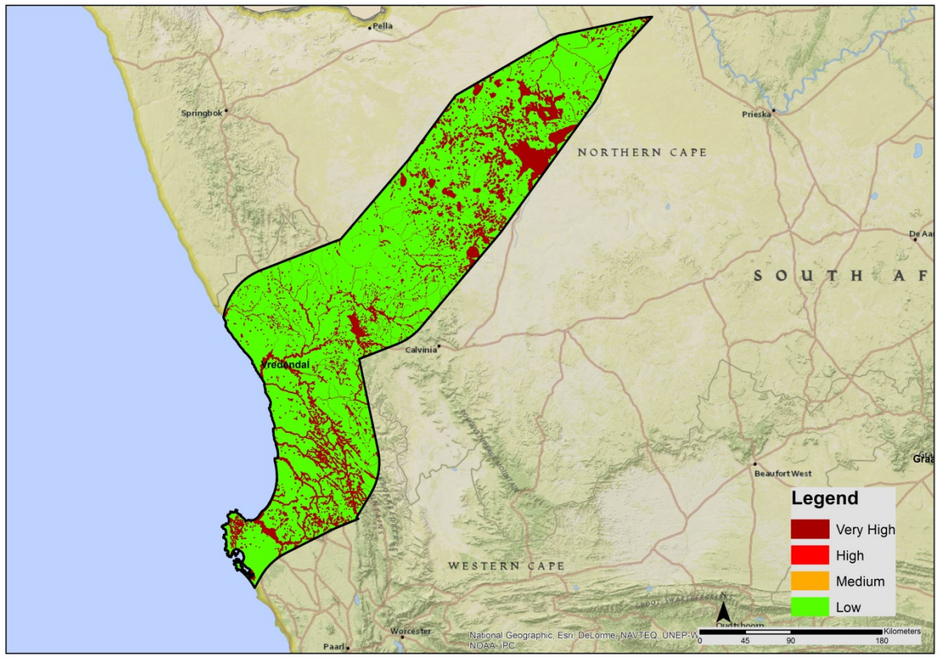
Map 2: Terrestrial biodiversity sensitivity map for electricity grid infrastructure development in the Western Corridor



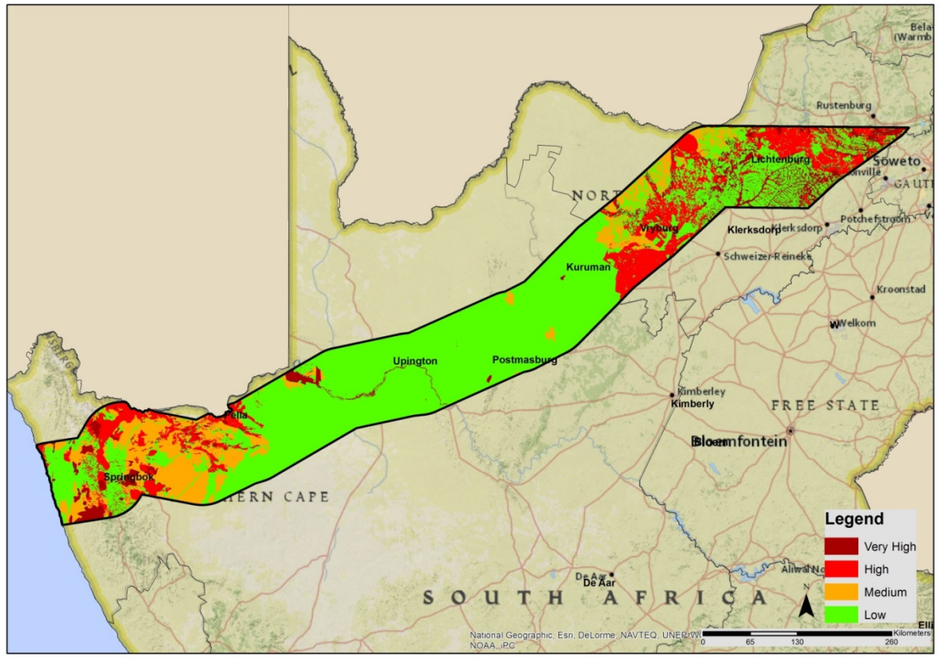
Map 3: Aquatic sensitivity Map in terms of NEMA for electrcity grid infrastructure development in the Western Corridor



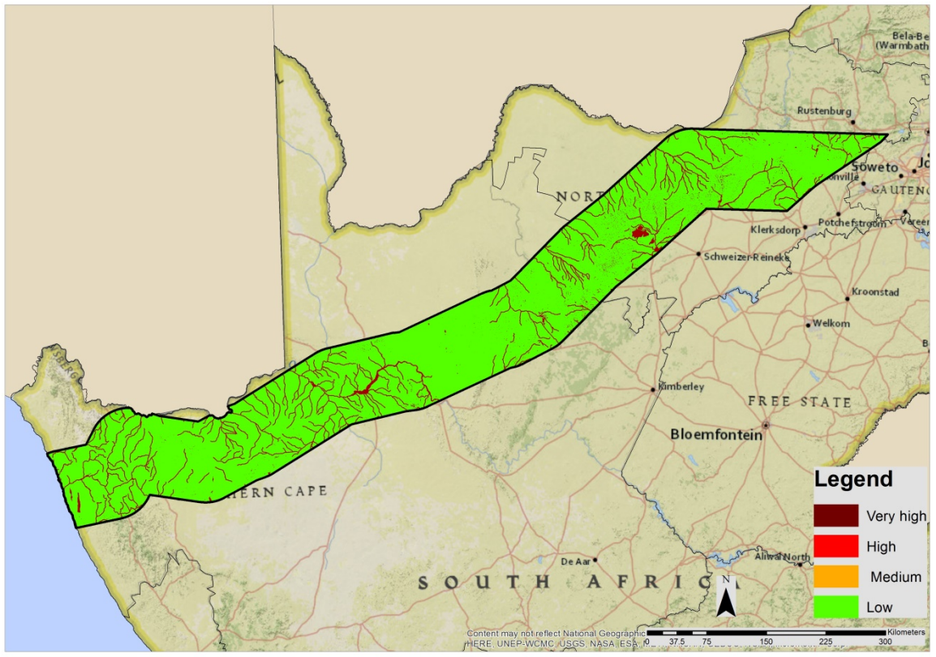
Map 4: Aquatic sensitivity map in terms of NWA for power line development in the Western Corridor



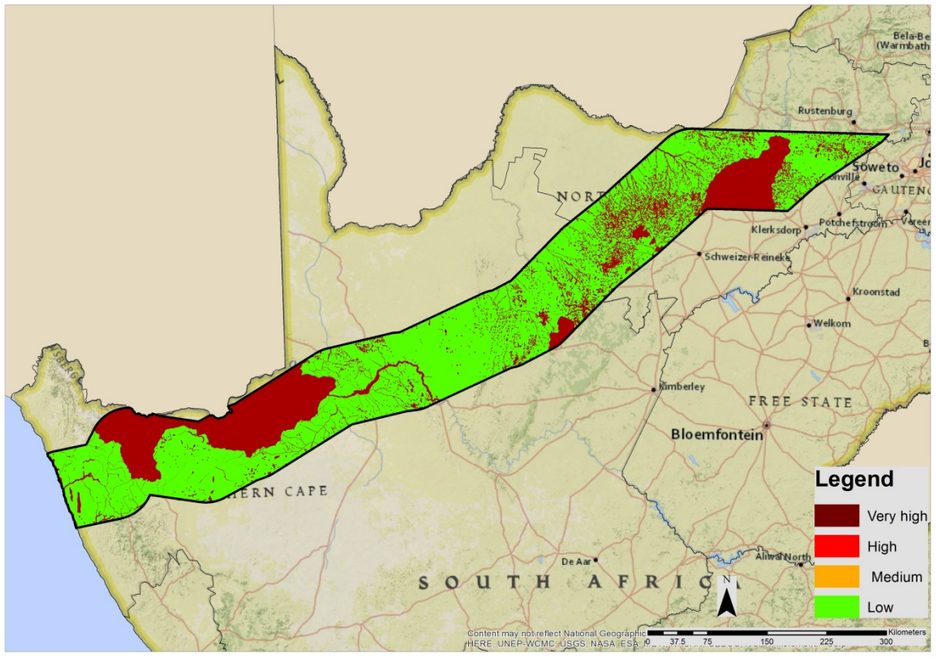
Map 5: Aquatic sensitivity map in terms of NWA for substation development in the Western Corridor



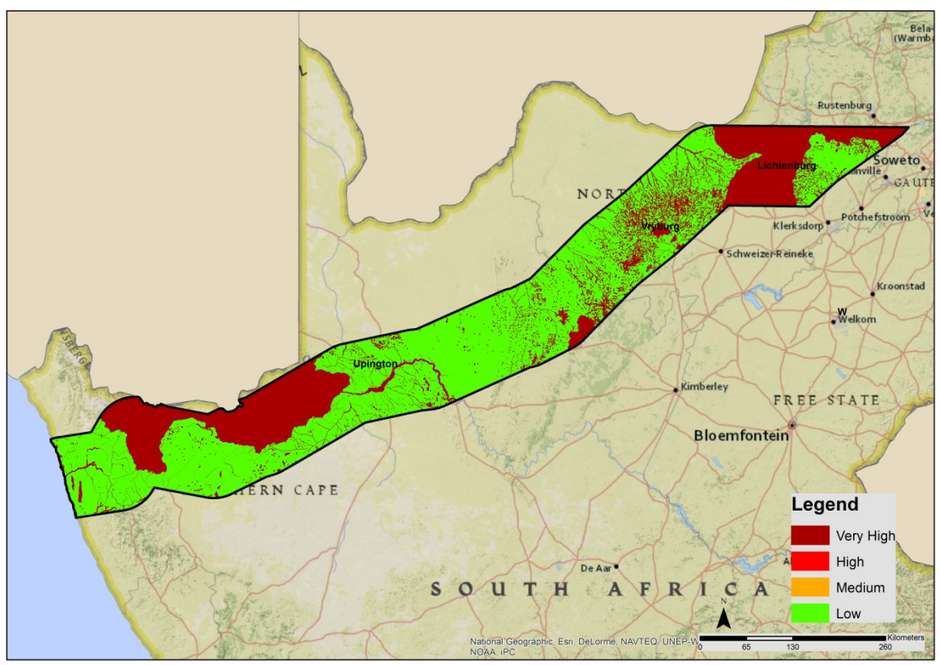
Map 6: Terrestrial biodiversity sensitivity map for electricity grid infrastructure development in the Northern Corridor



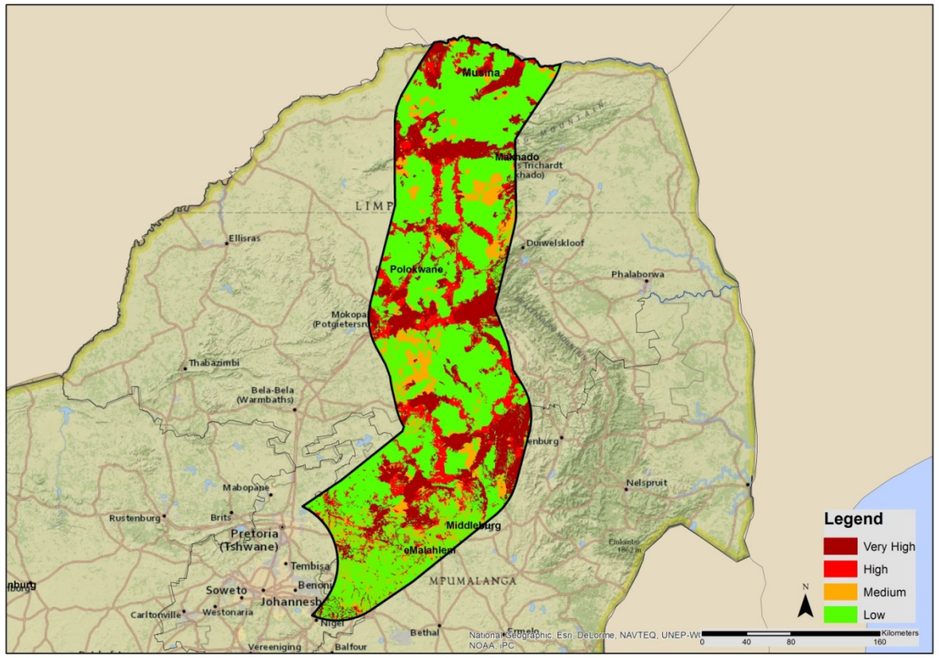
Map 7: Aquatic sensitivity Map in terms of NEMA for electrcity grid infrastructure development in the Northern Corridor



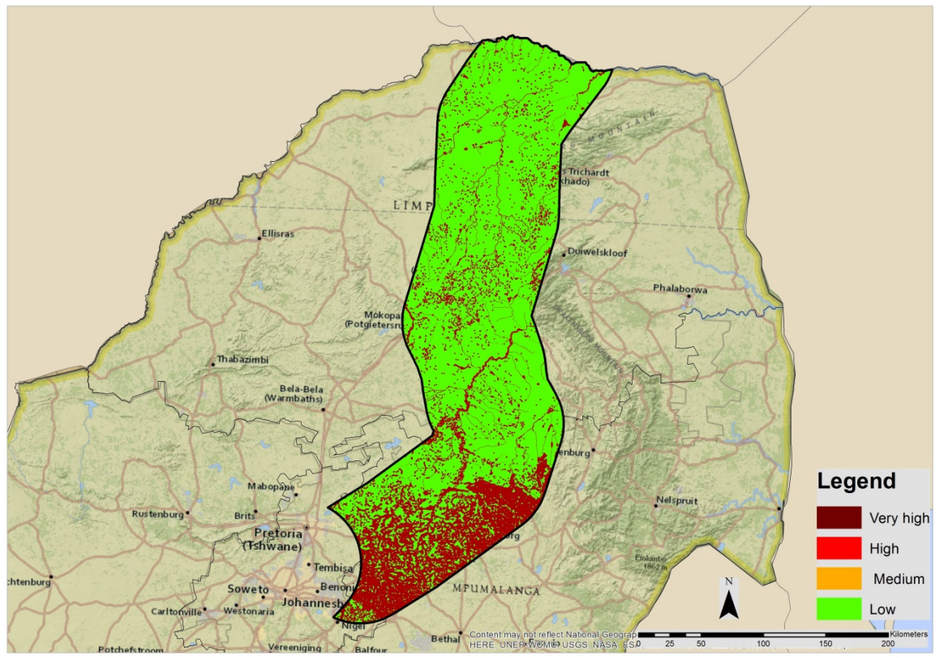
Map 8: Aquatic sensitivity map in terms of NWA for power line development in the Northern Corridor



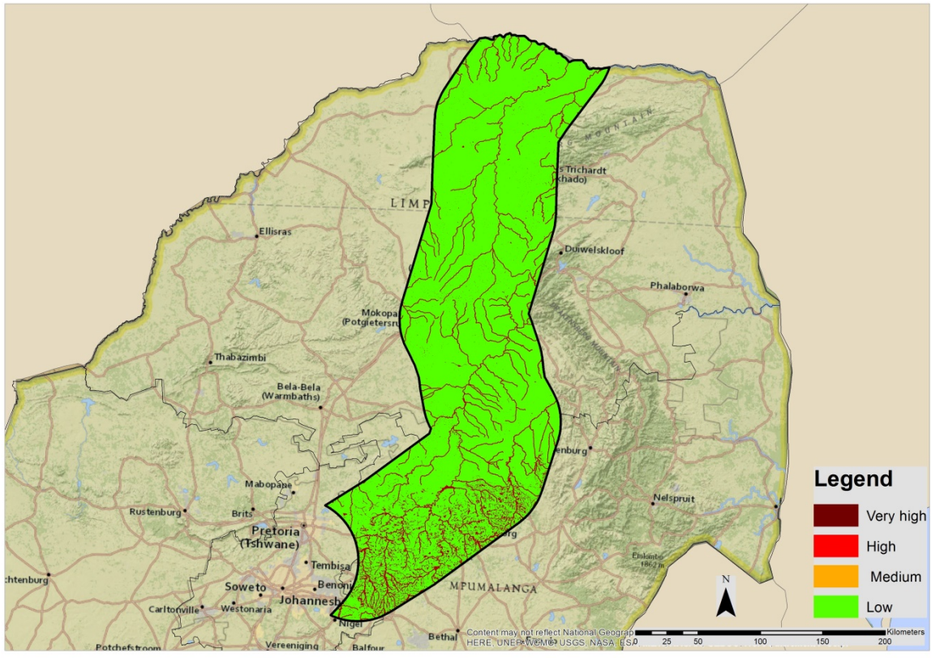
Map 9: Aquatic sensitivity map in terms of NWA for substation development in the Northern Corridor



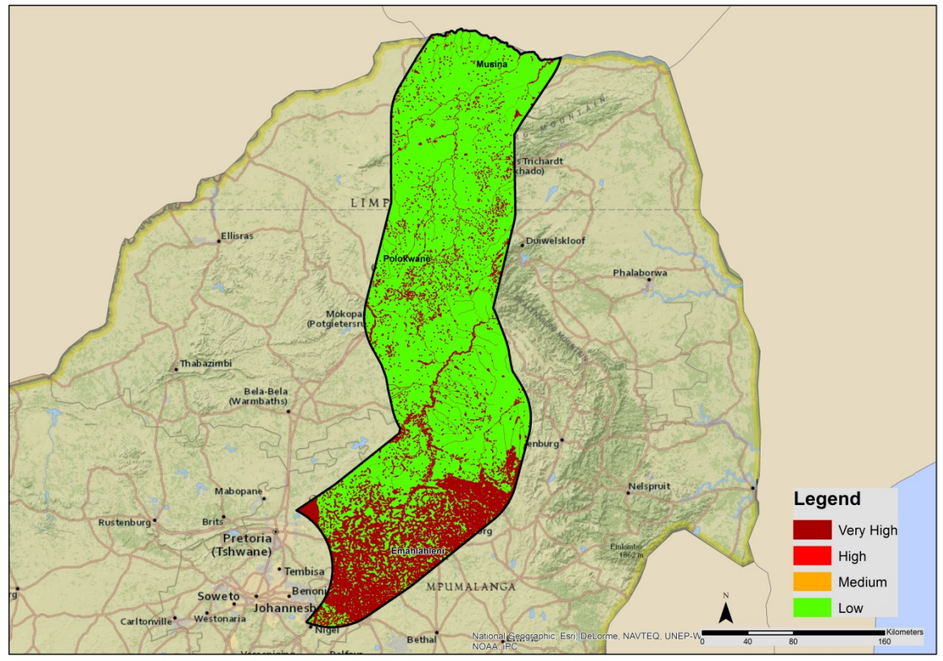
Map 10: Terrestrial biodiversity sensitivity map for electricity grid infrastructure development in the International Corridor



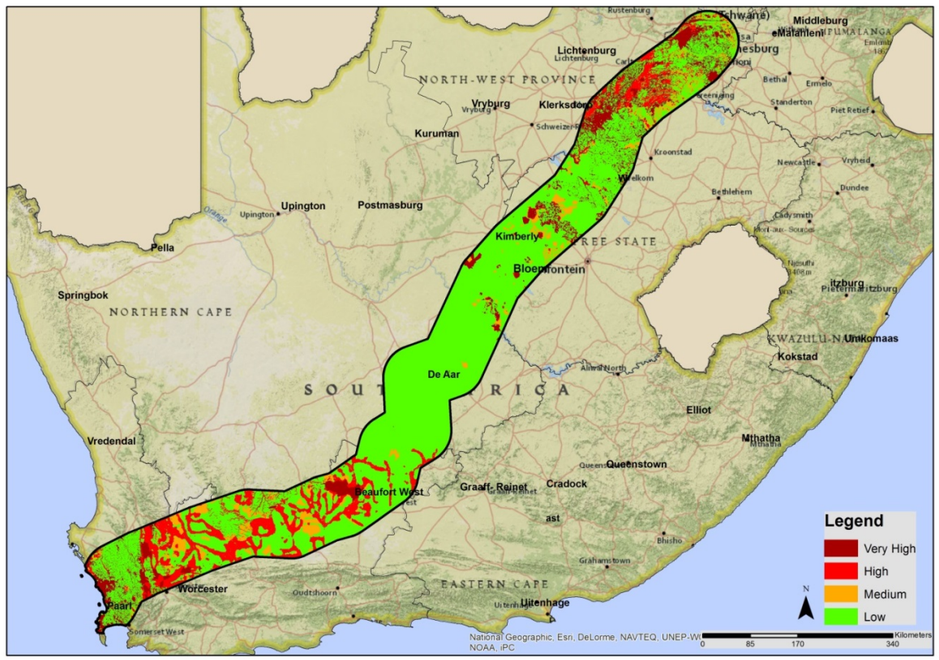
Map 12: Aquatic sensitivity map in terms of NWA for power line development in the International Corridor



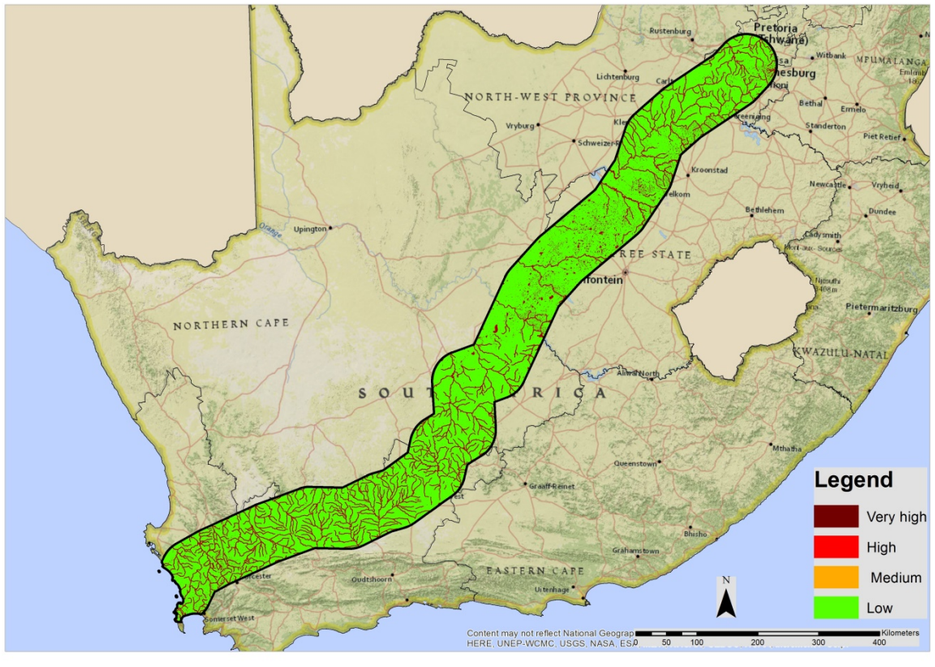
Map 11: Aquatic sensitivity Map in terms of NEMA for electrcity grid infrastructure development in the International Corridor



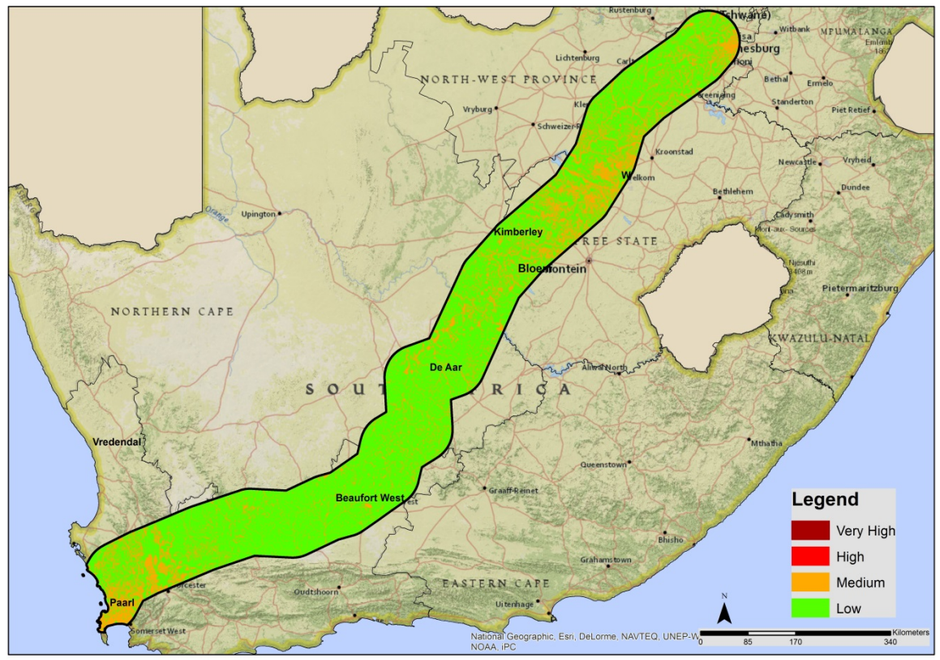
Map 13: Aquatic sensitivity map in terms of NWA for substation development in the International Corridor



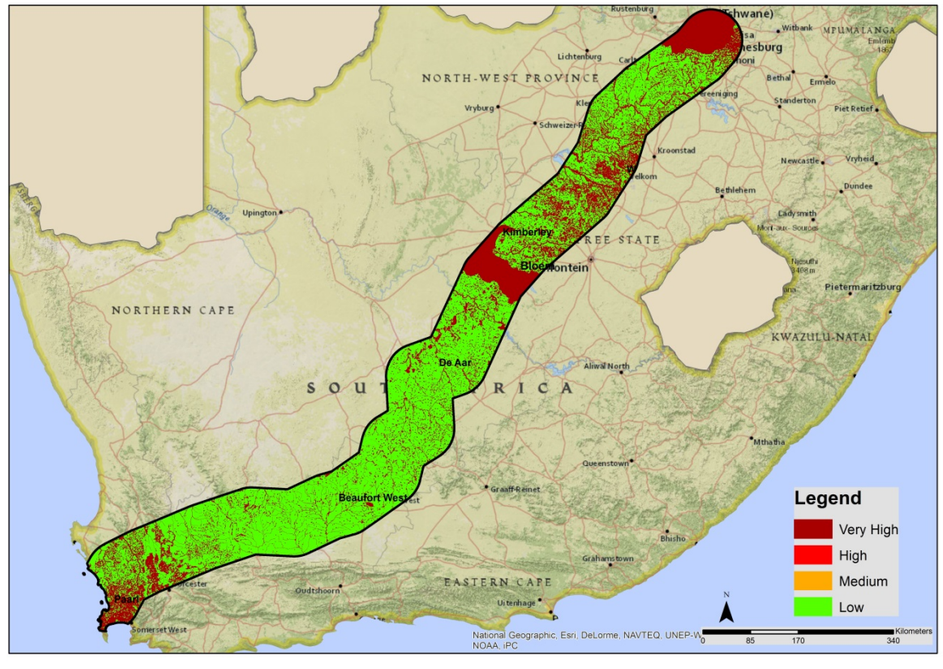
Map 14: Terrestrial biodiversity sensitivity map for electricity grid infrastructure development in the Central Corridor



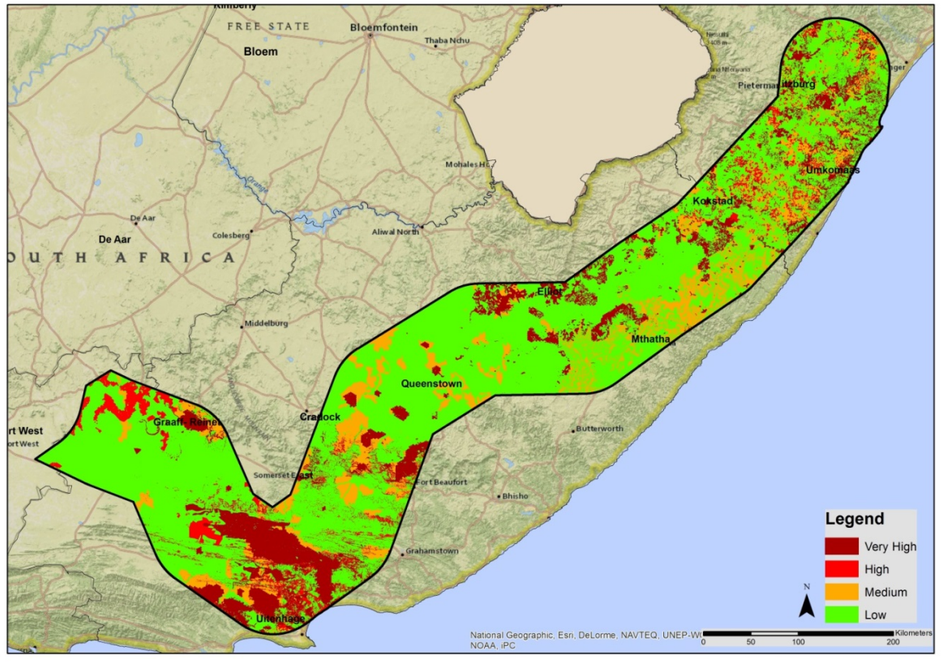
Map 15: Aquatic sensitivity Map in terms of NEMA for electrcity grid infrastructure development in the Central Corridors



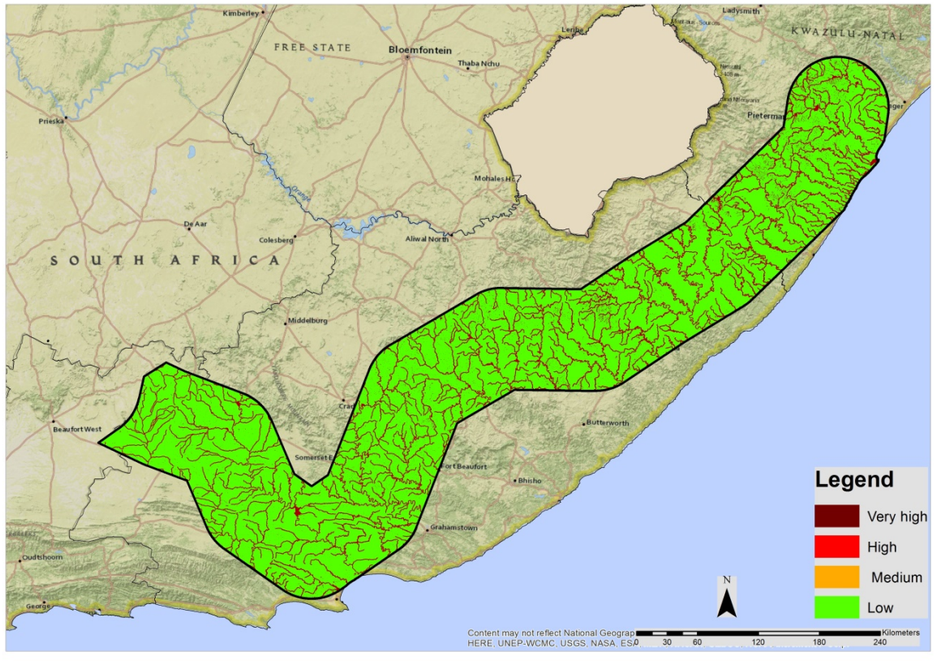
Map 16: Aquatic sensitivity map in terms of NWA for power line development in the Central Corridor



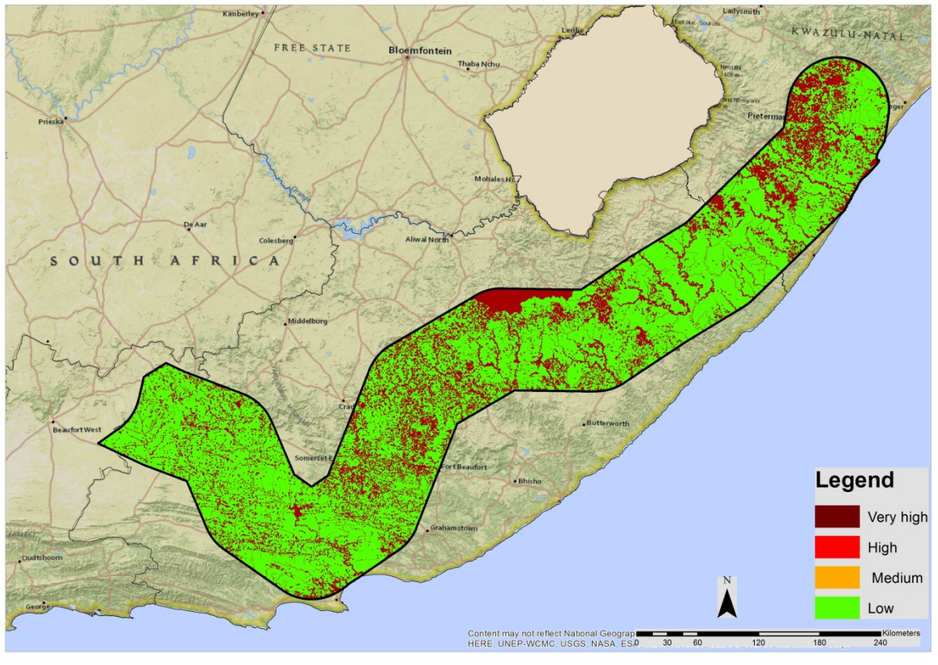
Map 17: Aquatic sensitivity map in terms of NWA for substation development in the Central Corridor



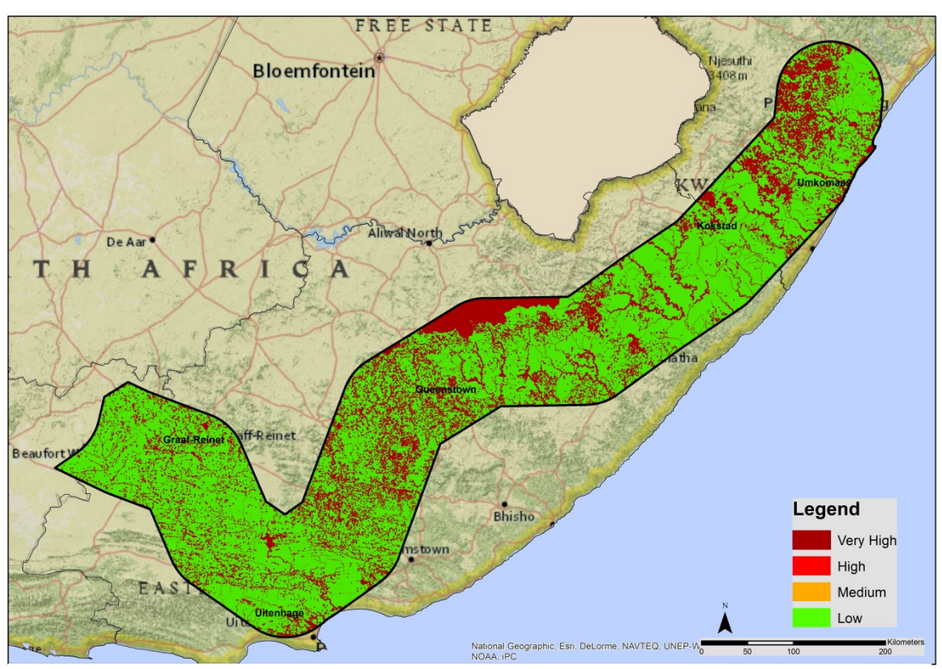
Map 18: Terrestrial biodiversity sensitivity map for electricity grid infrastructure development in the Eastern Corridor



Map 19: Aquatic sensitivity Map in terms of NEMA for electrcity grid infrastructure development in the Eastern Corridor



Map 20: Aquatic sensitivity map in terms of NWA for power line development in the Eastern Corridor



Map 21: Aquatic sensitivity map in terms of NWA for substation development in the Eastern Corridor

4.4 Development Protocols

4.4.1 Terrestrial and Aquatic Specialist Study Requirements

The terrestrial and aquatic biodiversity development protocol indicates the level of detail and input that is required by specialists at different levels of sensitivity within the Power Corridors in order to satisfy the impact assessment requirements in terms of NEMA. The information detailed within the protocol should form part of the Terms of Reference along with standard best practice for specialist studies of electricity grid infrastructure applications.

4.4.1.1 Terrestrial Requirements

The recommended requirements for ecological specialist studies within the different tiers of the sensitivity maps are detailed in the Terrestrial and Aquatic Biodiversity Protocol (Refer to Section 4.4.2). At the highest level, specialist input requirements correspond to the current best-practice guidelines for specialist studies within EIAs. Subsequent levels are less onerous with the aim of minimising cost to the developer, shortening assessment timeframes and risk to the environment. It is also important to note that it is incumbent upon the specialist, upon an initial site visit to recommend, where warranted, a higher level of study where potential impacts justify such a study. These recommendations are thus considered the minimum requirements for specialist studies within each tier of sensitivity but do not preclude or limit the possibility that a higher level of detail may be required.

The nature and extent of input required by terrestrial and aquatic specialists within each of the four tiers of sensitivity has been separated according to three possible levels of study. A Level 1 study represents the highest level of involvement by the specialist. Level 2 and 3 studies require progressively less involvement by specialists in order to assess impact significance. A detailed description of the information requirements for the different levels of specialist study is described below in Tables 11-13. The rules explaining under which sensitivity conditions the different levels of specialist study must be undertaken is detailed in Terrestrial and Aquatic Biodiversity Development Protocol (see Section 4.4.2).

4.4.1.2 Aquatic Requirements

Given the low level of confidence attributed to many of the mapped aquatic features within the Power Corridors, there is the possibility that features not currently identified on the maps are subsequently identified through further assessment. Any aquatic feature encountered during further assessment must be allocated a sensitivity rating and buffer in accordance with the criteria in Section 4.2.3.1.

Considering the limited confidence associated with the available maps of freshwater ecosystems, especially wetlands, all applications for grid developments, regardless of the level of sensitivity, will always require desktop verification (using any additional information not included in this analysis and aerial imagery) or, where necessary, field level verification to determine the presence and extent of aquatic features. This must be done by a competent aquatic specialist.

- *Environmental Authorisation in terms of National Environmental Management Act (NEMA)*

Should the proposed construction footprint[7] of the electricity grid infrastructure development (regardless of infrastructure type i.e. power line or substation) encroach upon the buffered area in terms of the EIA regulations; an aquatic specialist assessment by a competent aquatic specialist will be required. Details on the requirements of the aquatic specialist assessment are described in Table 14.

- *Water Use Registration in terms of the National Water Act (NWA)*

Should the proposed construction footprint of the electricity grid infrastructure development (regardless of infrastructure type i.e. power line or substation) encroach upon a buffered area in terms of NWA, the proponent will be required to register for a non-consumptive water use authorisation. Inputs from an aquatic specialist will be needed in all such instances. The level of information/assessment required to inform a water use authorisation application is dependent upon the infrastructure type. More detail on this is described in Section 4.4.3.

Where the inputs of a competent aquatic specialist are triggered in terms of environmental authorisation and water use registration for an electricity grid infrastructure project, the assessment requirements are to be satisfied simultaneously as part of a single assessment within the framework of the environmental assessment process in terms of NEMA.

[7] This refers to the areas where construction activity results in a physical disturbance to the environment.

Table 11: Level 1 terrestrial and aquatic specialist study requirements

Level 1 Specialist Study
These are areas identified as having known or probably have features of Very High potential concern which may be impacted by electricity grid infrastructure. This includes Critically Endangered vegetation types or species as well as key habitats or environments where transmission infrastructure could generate large negative impacts. In general the presence of such features within the development envelope should be considered a potential fatal flaw and all possible measures should be taken to avoid impact to these areas. It is important to note that the presence of these features within a corridor does not trigger these activities, only when such features are in fact within the proposed development envelope and cannot be avoided. For these areas, the level of specialist input should include the following items in the **Specialist Assessment Report**: *Terrestrial Biodiversity Minimum Assessment and Reporting Requirements* • The extent and condition of any listed ecosystems along the route in terms of NEMA. • The presence of any Critical Biodiversity Areas along the route. • The presence of any formal conservation areas along the route. • The potential presence of listed fauna or associated habitats along the route, including their extent and potential impact of the development on these areas. • The known or potential presence of any listed or protected plant species along the route and the likely impact of the development on the affected populations. • A fine-scale and validated sensitivity map which depicts the proposed project footprint in the context of the development envelope.. • Provides an explanation of why any Very High sensitivity areas along the preferred route cannot be avoided. • An assessment of the likely impacts associated with each of the development alternatives. • If there are any specific mitigation or avoidance measures that should be implemented along the route in order to reduce and ameliorate the potential impacts of the development, including any specific post-construction management. • The size and local significance of any populations of Critically Endangered species or habitats. • The potential impact of the development on these populations including the probable level of population or habitat reduction where an impact is likely to occur and the extent to which this may affect the viability or long-term security of the local population. • Provides a detailed explanation of why the Very High Sensitivity feature cannot be avoided and what measures were taken at the planning stage to try and avoid impact to such features. • A statement declaring whether the development should be allowed to proceed in the face of an apparent potential fatal flaw. If yes, an explanation of why it should be allowed to proceed shall be provided. • An outline of additional studies that should be conducted to try and avoid or ameliorate impacts to such features. • Any potential offset or local conservation actions that could be used to offset the likely impact of the development. *Aquatic Biodiversity Minimum Assessment and Reporting Requirements* Where the development envelope encroaches upon a the buffer of a Very High sensitivity aquatic feature in terms of NEMA, a competent aquatic specialist will be required to apply the Department of Water Affairs and Sanitation Risk Matrix to assess whether the proposed development envelope poses a High, Medium or Low risk to adversely impacting on the characteristics of the watercourse. Where the risk matrix declares the development envelope to present a High risk, the competent aquatic specialist will be required to include within the Specialist Assessment Report: • A fine-scale and validated sensitivity map which depicts the proposed project footprint in the context of the development envelope. • Provides an explanation of why any Very High sensitivity areas along the preferred route cannot be avoided. • Specific mitigation or avoidance measures that should be implemented along the route in order to reduce and ameliorate the potential impacts of the development, including any specific post-construction management; • A statement declaring whether the development should be allowed to proceed in the face of an apparent potential fatal flaw. If yes, an explanation of why it should be allowed to proceed shall be provided. • An outline of additional studies that should be conducted to try and avoid or ameliorate impacts to such features. Where the outcome of the applying the Risk Matrix indicates a Medium or Low risk adversely impacting on the characteristics of the watercourse, the competent aquatic specialist will be required to include within the Specialist Assessment Report: • A fine-scale and validated sensitivity map which depicts the proposed project footprint in the context of the development envelope. • Provides an explanation of why any Very High sensitivity areas along the preferred route cannot be avoided. • Specific mitigation or avoidance measures that should be implemented along the route in order to reduce and ameliorate the potential impacts of the development, including any specific post-construction management.

Additional Requirements:
• A site walk-through post authorisation and pre construction shall include:
  ○ The number of individuals of listed or protected plant species that are likely to be affected along the route. For trees this should include all individuals within the area to be cleared beneath the power line.
  ○ The identification and mapping of any specialised faunal habitats or active burrows which may be affected by the pylons, roads or other infrastructure.
  ○ Any species suitable for search and rescue which should be moved prior to construction.
  ○ A count or delineation of the sensitive feature that may be affected
  ○ Any species suitable for search and rescue which should be moved prior to construction.

Resource Allocation: • Resource allocation should be similar to that for medium and high sensitive areas, but with additional time allocated for the assessment of the species or habitats of conservation concern. • Fieldwork would need to be adapted to the specific situation and extent of the area within the Very High sensitivity class and the exact requirements of the study in terms of the delineation and evaluation of the affected Very High sensitivity features.

Table 12: Level 2 terrestrial specialist study requirements

Level 2 Specialist Study

These are areas identified as having known or probably have features of potential concern which may be impacted by grid infrastructure. As some level of impact is highly likely, specialist input in order to assess and provide recommendations to reduce these impacts is required. The following basic outputs should form the basis of specialist contribution in these areas:
 	
The specialist should provide a **Specialist Assessment Report** equivalent to that of a Basic Assessment identifying or providing the following:
 	
Terrestrial Biodiversity Minimum Assessment and Reporting Requirements
 	
• The extent and condition of any listed ecosystems along the route in terms of NEMA.
• The presence of any Critical Biodiversity Areas along the route.
• The presence of any formal conservation areas along the route.
• The potential presence of listed fauna or associated habitats along the route, including their extent and potential impact of the development on these areas.
• The known or potential presence of any listed or protected plant species along the route and the likely impact of the development on the affected populations.
• A fine-scale sensitivity map which:
  ○ Depicts features at a significantly finer scale than the maps contained here.
  ○ Uses the same four tier system used here and which provides a reasoned motivation for allocating units to the different sensitivity classes.
• Provides a summary of the extent of the different sensitivity classes along the options being considered.
• Provides an explanation of why any High sensitivity areas along the preferred route cannot be avoided.
• An assessment of the likely impacts associated with each of the development alternatives.
• If there are any specific mitigation or avoidance measures that should be implemented along the route in order to reduce and ameliorate the potential impacts of the development, including any specific post-construction management.
 	
Aquatic Biodiversity Minimum Assessment and Reporting Requirements
 	
Where the proposed development envelope does not encroach on verified aquatic features or their associated buffers in terms of NEMA, only a map of verified aquatic features with appropriate buffers and a statement prepared by a competent aquatic specialist confirming no encroachment, is required as an input to the Level 2 study. The verification of aquatic features can be undertaken either at a desktop or on-the-ground level. The level of verification is at the discretion of the aquatic specialist and may depend on the overall sensitivity of the area, existing knowledge that the aquatic specialist has of that area, as well as the quality of available data and aerial imagery. The need to undertake additional assessment to better understand the potential risk the development envelope presents to aquatic biodiversity will also be at the discretion of competent aquatic specialist.

Additional Recommendations: • A preconstruction walk-though of the intact sections of the route should be a condition of authorisation. • The Walk-through report documenting: ○ The number of individuals of listed or protected plant species that are likely to be affected along the route. For trees this should include all individuals within the area to be cleared beneath the power line.

○ The identification and mapping of any specialised faunal habitats or active burrows which may be affected by the pylons, roads or other infrastructure. ○ Any species suitable for search and rescue which should be moved prior to construction.
Resource Allocation: • This should be done as a desktop assessment in the initial stages, followed up with a field verification of sensitive features along the selected routes, once these have been finalised following initial input from specialists. This can be done at a rate of approximately 200 km/day of specialist input for a 500 m wide corridor, for the reporting and desktop component of the study. • Fieldwork and sensitive feature verification should be allocated at a rate of approximately 100 km/day for a 500 m wide corridor, but with potential reductions in allocation where there are high levels of transformation present.

Table 13: Level 3 specialist study requirements

Level 3 Specialist Study
These are areas identified as having few features of concern, where the development of electricity grid infrastructure is not likely to generate significant ecological impact. As such, detailed ecological or aquatic input from specialists is not likely to be warranted, however it is possible that there may some locally significant features present that were not mapped here. In order to avoid such potential impacts the proposed development envelope is to be inspected using aerial or satellite imagery by a specialist with local knowledge to confirm that they do not affect any features of significance. The specialist should provide a **Specialist Statement** confirming the following: *Terrestrial Biodiversity Minimum Assessment and Reporting Requirements* • That there are no listed ecosystems (mapped or not) or CBAs along the route. • That there are no significant features along the route that have not been identified in this study. • That the development of the route would not impact adjacent sensitive areas through erosion or other impacts. • If there are any specific mitigation or avoidance measures that should be implemented along the route in order to ensure that it does not generate impacts beyond the development envelope area. *Aquatic Biodiversity Minimum Assessment and Reporting Requirements* Where the proposed development envelope does not encroach on verified aquatic features or their associated buffers in terms of NEMA, only a map of verified aquatic features with appropriate buffers and a statement prepared by a competent aquatic specialist confirming no encroachment, is required as an input to the Level 3 study. The verification of aquatic features can be undertaken either at a desktop or on-the-ground level. The level of verification discretion of the aquatic specialist and may depend on the overall sensitivity of the area, existing knowledge that the aquatic specialist has of that area, as well as the quality of available data and aerial imagery. The need to undertake additional assessment to better understand the potential risk the development envelope presents to aquatic biodiversity will also be at the discretion of competent aquatic specialist.
Additional Recommendations: • If there is any intact vegetation along the route, a preconstruction walk-though of these sections of the route should be a condition of authorisation.
Resource Allocation: • This should be done as a desktop assessment except where features of potential concern have been identified and require field validation. • Fieldwork and sensitive feature verification should be allocated at a rate of approximately 100km/day for a 500 m wide corridor, but with potential reductions in allocation where there are high levels of transformation present

4.4.2 Terrestrial and Aquatic Biodiversity Development Protocol in terms of NEMA

Terrestrial and Aquatic Assessment Procedure
Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process must prove to the relevant Competent Authority in terms of NEMA that the proposed development will not have an unacceptable negative impact on terrestrial or aquatic biodiversity. 1. *Screening* *Projects Inside the Power Corridors* A competent terrestrial and aquatic specialist will be required to validate the terrestrial and aquatic sensitivity map produced by download from the DEA Screening Tool for sub-corridor. The level of validation (i.e. desktop or on-the-ground) will be at the discretion of the specialist and may depend on the overall sensitivity of the area, existing knowledge that the specialist has of that area, as well as the quality of available data and aerial imagery. The validation of aquatic features and sensitivity buffers in terms of NEMA is to be undertaken simultaneously with the validation of aquatic features and sensitivity features for water use authorisation in terms of the National Water Act (Act No. 36 of 1998) (refer to Section 4.4.3).

Projects outside the Power Corridors

A competent terrestrial and aquatic specialist will be required to create terrestrial and aquatic sensitivity maps for the identified sub-corridor using the approach and criteria detailed in Section 4.2.3. Validation of the features and associated sensitivity will also be required. The validation of features and associated sensitivity can be undertaken either at a desktop or on-the-ground level. The level of validation (i.e. desktop or on-the-ground) will be at the discretion of the specialist and may depend on the overall sensitivity of the area, existing knowledge that the specialist has of that area, as well as the quality of available data and aerial imagery. The validation of aquatic features and sensitivity buffers in terms of NEMA is to be undertaken simultaneously with the validation of aquatic features and sensitivity features for water use authorisation in terms of the National Water Act (Act No. 36 of 1998)) (refer to Section 4.4.3).

2. *Minimum Assessment Requirements*

All Projects

The minimum assessment requirements described in Table 14 shall be applied to the development envelope for proposed projects located both inside and outside the Power Corridors. The assessment requirements at different positions within the development envelope may differ depending on the underlying sensitivity, as determined by the validated sensitivity maps. The aquatic assessment requirements in terms of NEMA are to be undertaken by the competent aquatic specialist simultaneously with the assessment requirements for water use authorisation in terms of the National Water Act (Act No. 36 of 1998) (refer to Section 4.4.3).

3. *Commenting and Decision Making*

The outcomes of the aquatic biodiversity assessment in terms of NEMA are to be submitted to the relevant water authority for comment. Such a comment, if received within the stipulated timeframes, will be considered by the relevant Competent Authority in terms of NEMA for decision making.

Table 14: Interpretation of terrestrial and aquatic biodiversity sensitivity maps and associated new assessment requirements inside the Power Corridors

Colour	Sensitivity	Interpretation of Sensitivity	Further Assessment Requirements
Dark Red	**Very High**	Very High sensitivity areas are potentially unsuited for development owing to their high ecological importance. The features identified to make these areas very highly sensitive must be thoroughly assessed and effective mitigation developed before development can be considered in these areas.	Where the development envelope encroaches into a Very High sensitivity terrestrial feature, a Level 1 terrestrial assessment conducted by competent terrestrial ecologist is required. Where the development envelope encroaches into a Very High sensitivity aquatic feature in terms of NEMA, a Level 1 aquatic assessment conducted by a competent aquatic specialist is required.
Red	**High**	High sensitivity areas are likely to contain some sensitive ecological features or processes that need to be addressed before development can be considered.	Where the development envelope encroaches into a Medium or High sensitivity terrestrial feature, a Level 2 terrestrial assessment conducted by competent terrestrial ecologist is required. Where the development envelope encroaches into a Medium or High sensitivity aquatic feature in terms of NEMA, a Level 2 aquatic assessment conducted by a competent aquatic specialist is required.
Yellow	**Medium**	Medium sensitivity areas are likely to contain natural vegetation without any known highly sensitive features. Sensitivities need to be assessed before development can be considered.	
Green	**Low**	Low sensitivity areas are likely to be transformed with the risk of significant ecological impact being very low. The absence of sensitivities must be confirmed before development can be considered	Where the development envelope encroaches into a Low sensitivity terrestrial feature, a Level 2 terrestrial assessment conducted by competent terrestrial ecologist is required. Where the development envelope encroaches into a Low sensitivity aquatic feature in terms of NEMA, a Level 3 aquatic assessment conducted by a competent aquatic specialist is required

4.4.3 Water Use Authorisation Development Protocol in terms of NWA

One of the main objectives for undertaking the aquatic biodiversity assessment was to design an integrated assessment process that would fulfil the aquatic information requirements for decision making for environmental impact assessment and water use authorisation at the same time. The Level 1 Specialist Study requirements described in Table 10 are specific to meeting the aquatic information requirements for environmental impact assessment in terms of NEMA. The development protocol below describes the information requirements for water use in terms of the National Water Act. The protocol must be applied in the context of the aquatic sensitivity maps in Section 4.3 to determine the relevant assessment requirements to inform water use authorisation within regulated areas. These assessment requirements must be completed as part of the Level 1 aquatic specialist assessment. The water use assessment requirements detailed below apply to State-Owned Companies as well as private entities and individuals.

Water Use Registration Assessment Procedure

Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process may be required to register for non-consumptive water use with the Competent Authority in terms of water under the National Water Act (Act No. 36 of 1988). The process to followed by a competent aquatic specialist to determine need and process for water use registration in the context of a Basic Assessment or Environmental Impact Assessment, is as follows:

1. *Screening*

Projects Inside the Power Corridors

A competent aquatic specialist will be required to validate the NWA aquatic sensitivity map in terms of water use produced by download from the DEA Screening Tool for the sub-corridor. The level of validation (i.e. desktop or on-the-ground) will be at the discretion of the specialist and may depend on the overall sensitivity of the area, existing knowledge that the specialist has of that area, as well as the quality of available data and aerial imagery.

Projects outside the Power Corridors

A competent terrestrial and aquatic specialist will be required to create an NWA aquatic sensitivity maps in terms of NWA for the identified sub corridor using the approach and criteria detailed in Section 4.2.3. Validation of the features and associated sensitivity will also be required and can be undertaken either at a desktop or on-the-ground level. The level of validation will be at the discretion of the specialist and may depend on the overall sensitivity of the area, existing knowledge that the specialist has of that area, as well as the quality of available data and aerial imagery.

2. *Minimum Assessment Requirements*

All Projects

The assessment requirements to be followed by an aquatic specialist will be determined by the project construction footprint in the context of the validated NWA aquatic sensitivity map. These requirements shall be applied to projects located both inside and outside of the Power Corridors. Should the project construction footprint encroach upon the sensitivity buffer of an aquatic feature, the proponent will be required to register for a water use in terms of Section 21 of the National Water Act (Act No. 36 of 1998) . The process to be followed by the competent aquatic specialist in preparing an application for water use registration will depend on the nature of the infrastructure (power line or substation) and the underlying sensitivity, as described in Table 15 below.

3. *Commenting and Decision Making*

Applications for water use registration (together with any supporting documentation requirements specified in Table 15) shall be submitted to the Competent Authority in terms of water for decision making at the same time as submitting an application for environmental authorisation to the Competent Authority in terms of NEMA.

Table 15: Interpretation of aquatic sensitivity maps and associated new water use authorisation assessment requirements inside the Power Corridors

Colour	Sensitivity	Infrastructure Type	Further Assessment
Dark red	Very High	Substations	Proponents intending to develop a substation development for which the proposed project footprint encroaches into a Very High sensitivity area will be required to register for a non-consumptive water use authorisation. Depending on the level of risk posed by the project to the water course, a General Authorisation or Full Water Use Licensing process will be applicable[8]. Level of risk is to be determined by a suitably qualified aquatic specialist through the completion of a Risk Matrix in terms of the amended GN 1199. Developments seen to present a 'Low' risk to the water course on the basis of the Risk Matrix will qualify for a General Authorisation. Developments presenting a 'Medium' or 'High' risk will be subject to a detailed Water Use Licensing Application process. The outcomes of the Risk Matrix shall be submitted to the relevant CMA or regional office together with the application for water use registration.
Orange	Medium	Distribution and Transmission Lines	Proponents intending to develop a transmission or distribution infrastructure development for which the project footprint encroaches into a 'Medium' sensitivity will be required to register for a non-consumptive water use authorisation. Transmission and distribution (including towers, pylons and stringing operations) are classified as Low risk activities and therefore where such an activity encroaches inside of a watercourse, the activity will be generally authorised on condition that the following supporting technical documentation is made available to the relevant CMA or regional office together with an application for water use registration: • EMPr • Method statement(s) • Engineering designs[9] • Best practices • Delineation of watercourses
Green	Low	Distribution and Transmission Lines	Proponents intending to develop an electricity grid infrastructure development for which the proposed project footprint is limited to areas defined as 'Low' sensitivity will not be required to register for a water use.
		Substations	

[8] GA will not apply to developments of this nature where the footprint encroaches upon a catchments areas listed in Table 1 Section 6 of the amended GN 1199 notice and will instead be subject to a Full Water Use Authorisation process.
[9] Must indicate 1 in 100 year floodline where affected and designs must cater for 1 in 100 year floods

PART 3

Chapter 5. VISUAL

CONTENTS

TABLES

MAPS

CHAPTER 5. VISUAL

5.1 Introduction

This Chapter is informed by the scoping level specialist visual pre-assessment of the five Power Corridors for which the complete report is provided as Appendix C: *Visual Specialist Study*. Due to the integrated and strategic nature of this Strategic Environmental Assessment (SEA), and based on consultation with relevant government departments and wider stakeholders, the final views and requirements presented in this Chapter may vary from those contained and recommended in the specialist report.

5.1.1 The Basis of Visual Assessments

A visual assessment broadly includes visual, scenic, aesthetic and amenity values, which contribute to an area's overall 'sense of place', and which encompass both natural and cultural landscape characteristics[1].

Sense of place is determined by the regional characteristics of the place including, but not restricted to, landscape features, geological structure, vegetation patterns, agricultural activities, settlement forms and vernacular architecture, as well as more intangible characteristics, such as traditions and language. Seen as a whole these qualities constitute the essential '*genius loci*' or spirit of the place.

Often great value is attached to those landscapes where visual, scenic, cultural and heritage characteristics are intact, also described as the level of 'landscape integrity'. This concept is useful in providing a baseline for visual impact assessments.

No standardised scenic resource mapping exists for the country as whole, nor the rating of scenic resources in terms of their value or sensitivity, although some work on this has been done for the Western Cape. This is seen as a major drawback in establishing a common baseline for visual impact assessments.

5.1.2 Visual impact assessment and electricity grid infrastructure

The landscape qualities have important economic value in the form of tourism for most regions, particularly those in the Western, Southern and Eastern Cape, which are not endowed with mineral resources.

Power lines and related infrastructure, such as substations, tend to have an industrial connotation and potentially could compromise the value of scenic resources, particularly in pristine or protected environments, while they tend to be less of an issue in industrial or mining landscapes.

Transmission lines could, in addition, detract from the amenity value of recreation or resort areas, and certainly affect property values in many cases, all of which could affect the economy of a region. On the other hand, transmission lines in the right location are necessary for the regional economy.

5.1.2.1 Perceptions relating to Transmission Lines

Although large sections of the population see transmission lines as a major visual detraction or eye-sore, there are others, who may regard them as a sign of progress and service delivery.

Habituation is another consideration, where transmission lines have been in place over a length of time and are hardly noticed any longer. This appears to have been the case with communication masts, which initially caused visual concern, but to which to which people have grown accustomed.

The implication of these considerations is that the 'context' of both the landscape (the receiving environment) and the community (the receptor) is important in the siting of transmission infrastructure.

5.2 Sensitivity Mapping Criteria

The primary goal of the visual assessment was to identify areas or features of scenic value and sensitive receptors within each of the Power Corridors, and to use this information to inform landscape sensitivity in the context of electricity grid infrastructure. The resources considered included features of topographic, geological or cultural interest, together with landscape grain or complexity. Protected landscapes, such as national parks, nature reserves, game parks or game farms, as well as heritage sites, add to the cultural value of an area and were thus considered as essential criteria in the determination of landscape sensitivities. Landscape sensitivity was further determined by taking into account existing receptors in the area including settlements, national roads, arterial roads, scenic routes, and tourist destinations such as guest farms and resorts. The list of visually sensitive features and data used to identify the features is included in Table 2.

The potential visual impact of a proposed development can only be fully assessed and understood once details regarding the specific project proposal are known e.g. infrastructure type, proposed position and viewing audience. Additional project scale visual assessment will therefore be necessary when proposing a development inside the Power Corridors, where consideration must be given to the viewshed, viewing distances, visual absorption capacity of the landscape and other criteria, when attempting to quantify potential visual impacts. The project level assessment requirements in the context of the sensitivity maps is described in the Development Protocol in Section 5.4.

5.2.1 Data Sources

In order to generate sensitivity maps, the data layers relevant to visual sensitivity for each Power Corridor were collected. A list and description of data sources for each of the three heritage sensitivity categories is described in Table 1.

[1] Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes. CSIR Report No. ENV-S-C 2005 053. Provincial Government of the Western Cape, DEADP.

Table 1: Spatial data used for landscape sensitivity mapping

Data title	Source and date of publication	Data Description
1:1 000 000 Geological Map of SA	Geological Survey, 1984. 4 sheets.	Geological information.
1:500 000 topographical maps of South Africa	Surveys and Mapping (several sheets with various dates).	Topographical and cadastral information.
South African Protected Areas	Dept. Environmental Affairs, 2014.	National Parks and Protected Areas.
Heritage and Scenic Resources: Inventory and Policy Framework for the Western Cape	S. Winter and B. Oberholzer, May 2013. For DEADP, Provincial Government of the Western Cape.	Survey and rating of heritage and scenic resources in Western Cape.

5.2.2 Processing of Data

In some instances the raw data were required to be processed further in order to isolate the relevant sensitivity features or improve the relative accuracy of the dataset. A description of data processing undertaken as part of this assessment for the three heritage categories is described in the Table 2.

Table 2: Landscape sensitive features, data sources and data processing

Sensitivity Feature	Data Source and Date of Publications	Data Preparation and Processing	Relevant Corridors
Ridgelines, scarps, prominent elevations and geological features	1: 500 000 topographic map series; Google Maps with terrain (2015); and steep slopes data.	Topographic maps for prominent elevations, ridgelines, scarps, ravines and geological features, particularly where these occur in combination with steep slopes to create complex landscapes.	All
Steep slopes	SRTM DEM v4.1, 2009.	Two categories of slopes used: steeper than 1:5 and 1:5 - 1:10.	All
Major rivers and water bodies	1: 500 000 topographic map series, and National Freshwater Ecosystem Priority Areas (NFEPA)	Mainly perennial rivers are included, except where a seasonal river is a major feature. Water bodies include lagoons, lakes, wetlands, pans and dams where these constitute a potential scenic resource.	All
Ramsar sites	National Department of Environmental Affairs South African Protected Areas Database 2014.	Mapped as indicated in the data base.	All
Coastal zone	1: 500 000 topographic map series, and National Geospatial Information shapefiles.	A 1 km strip of coastline is mapped. Sections of coastlines are differentiated where these are distinct.	Western, Central, Eastern and Northern
National Parks	National Department of Environmental Affairs SAPAD 2014.	Mapped according to current boundaries, plus buffers as indicated.	All
Protected Areas	National Department of Environmental Affairs SAPAD, 2014. SANBI Protected Areas Database, 2011.	Includes proclaimed / protected nature reserves, game reserves and wilderness areas, plus buffers as indicated.	All
Private reserves and game farms.	National Department of Environmental Affairs SAPAD, 2014. Google Maps 2015.	Where known these include guest farms, resorts and tourism destinations.	All
Cultural/ rural landscapes	Google Earth 2015.	Includes historically or socially important agricultural areas, such as the vineyards of the W. Cape.	All
Heritage sites	Heritage specialists	Includes archaeological sites, battle sites, cemeteries, etc. where these have heritage significance.	All
Historical towns and villages	AfriGIS Towns, 2013 Discovering Southern Africa, TV Bulpin, 2001.	Lists of towns and villages for each corridor. General information and dates for listed towns and villages, (where available).	All
National Roads	National Geospatial Information (NGI) and Open Street Maps (OSM).	As marked on maps, plus buffers as indicated.	All
Provincial Roads	NGI and OSM	Includes main arterial routes. As marked on maps, plus buffers as indicated.	All
Scenic routes	1: 500 000 topographic map series; Google Maps with terrain (2015).	Includes mountain passes and poorts, and coastal routes with intact landscapes.	All
Passenger rail lines	NGI and OSM	Actively used passenger rail lines. (Historic abandoned rail line in the case of the Northern Corridor).	All (excl Western)
South African Large Telescope (SALT)	1:500 000 topographical map	Mapped with a 5 km radius.	Central

5.2.3 Sensitivity Delineation

A visual sensitivity rating has been attributed to each feature type and associated buffer identified as being sensitive to the visual impact of electricity grid infrastructure. The scale of the buffer for features identified as being high or medium sensitivity varies depending on the size of the proposed infrastructure type i.e. > or < 20m for power lines and > or < 1000 m² for substations.

Table 3: Landscape sensitivity ratings and buffering criteria

Landscape Sensitive Feature	Feature and Buffer[2] Sensitivity (Power line structures > 20m and substations> 10 000m²)	Feature and Buffer[2] Sensitivity (Power line structures < 20m and substations < 10 000m²)	Relevant Corridors
Ridgelines, scarps, prominent elevations and geological features as identified by landscape specialist	Very High (feature) High -within 500 m of feature Medium -between 500 m and 1 km	Very High (feature) High -within 250 m of feature Medium -between 250 m and 500 m of feature	All
Major rivers	Very High -within 500 m of feature High -between 500 m and 1 km Medium -between 1 km and 2 km	Very High -within 250 m of feature High -between 250m and 500 m of feature Medium -between 500 m and 1 km	All
Water bodies, dams, wetlands, pans	Very High -within 500 m buffer of feature High -between 500 m and 1 km Medium -between 1 km and 2 km	Very High -within 250 m of feature High -between 250 m and 500 m Medium -between 500 m and 1 km	All
Ramsar Sites	Very High -within 1 km of feature High -between 1 k m and 2 km Medium -between 2 km and 3 km	Very High -within 500 m of feature High -between 500 m and 1 km Medium -between 1 km and 1.5 km	All
Coastal zone	Very High -within 1 km buffer of feature High -between 1 km and 2 km	Very High -within 1 km buffer of feature High -between 1 km and 1.5 km	Western, Central, Eastern

[2] Buffers are in response to potential visibility of the proposed transmission infrastructure. Degrees of visibility in relation to distance are indicated below based on field observations. Visibility would be increased by the location of transmission infrastructure on ridges or skylines:

High visibility: Clearly noticeable within the observer's viewframe 0 to 0.5 km.
Moderate visibility: Noticeable feature within observer's viewframe 0.5 to 1 km.
Marginal visibility: Partially noticeable within observer's viewframe 1 to 2 km.
Low visibility: Hardly visible unless pointed out to the observer 2 to 4km+

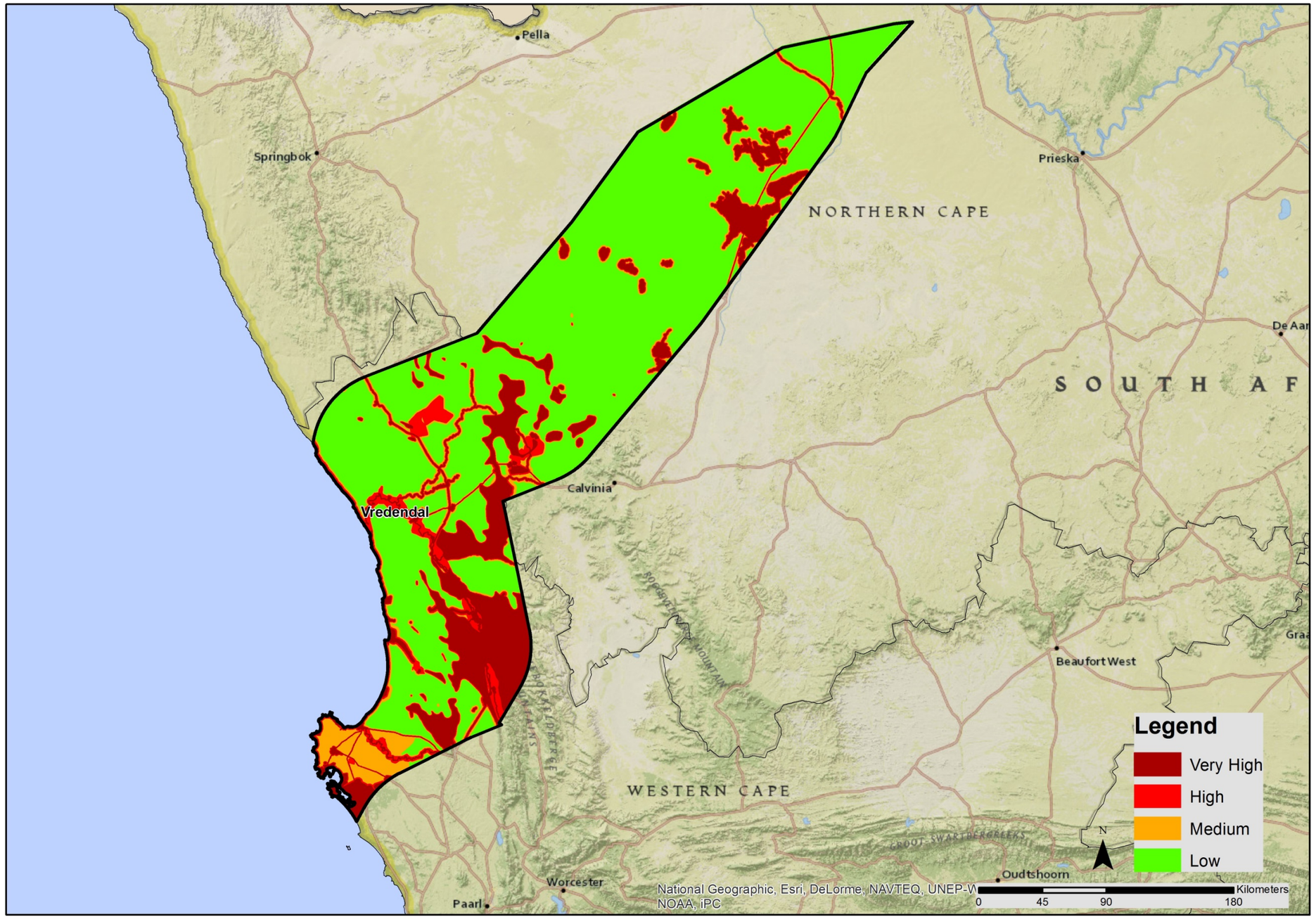
Landscape Sensitive Feature	Feature and Buffer[2] Sensitivity (Power line structures > 20m and substations> 10 000m[2])	Feature and Buffer[2] Sensitivity (Power line structures < 20m and substations < 10 000m[2])	Relevant Corridors
	Medium -between 2 km and 3 km	Medium -between 1.5 km and 2 km	
National Parks	Very High -within 2 km of feature High[3] -between 2 km and 3 km Medium[3] -between 3 km and 4 km	Very High -within 1 km feature High[3] -between 1 km and 1.5 km Medium[3] -between 1.5 km and 2 km	All
Nature Reserves / biosphere core	Very High- -within 1 km of feature High[3] -between 1 km and 2 km Medium[3] -between 2 km and 4 km	Very High- -within 500 m feature High[3] -between 500 m and 1 km Medium[3] -between 1 km and 2 km	All
Mountain Catchments / biosphere buffer	Medium- -within 1 km of feature	Medium- -within 500 m of feature	All
Private reserves and game farms	High[3] -within 1 km of feature Medium[3] -between 1 km and 2 km	High[3] -within 500 m of feature Medium[3] -between 500 m and 1 km	All
Cultural landscapes	Very High (feature) High[3] -within 500 m of feature Medium[3] -between 500 m and 1 km	Very High (feature) High[3] -within 250 m of feature Medium[3] -between 250 m and 500 m	All
Heritage sites	Very High (feature) High[3] -within 500m of feature Medium[3] -between 500m and 1km	Very High (feature) High[3] -within 250m of feature Medium[3] -between 250m and 500m	All
Historical towns / villages	Very High- -within 500m of feature High- -between 500m and 1km	Very High- -within 250m of feature High- -between 250m and 500m	All

[3] Viewsheds to be taken into account at the project scale. Buffers could be reduced if proposed transmission infrastructure is outside the viewshed or in a view shadow. This does not apply to ridges, steep slopes, and rivers etc. which need buffers. Buffers can however be eliminated when outside the viewshed of receptors such as settlements, roads etc. National Parks, nature reserves, Ramsar sites etc. need to be dealt with on an individual merit basis. In such instances these areas can be declared low sensitivity.

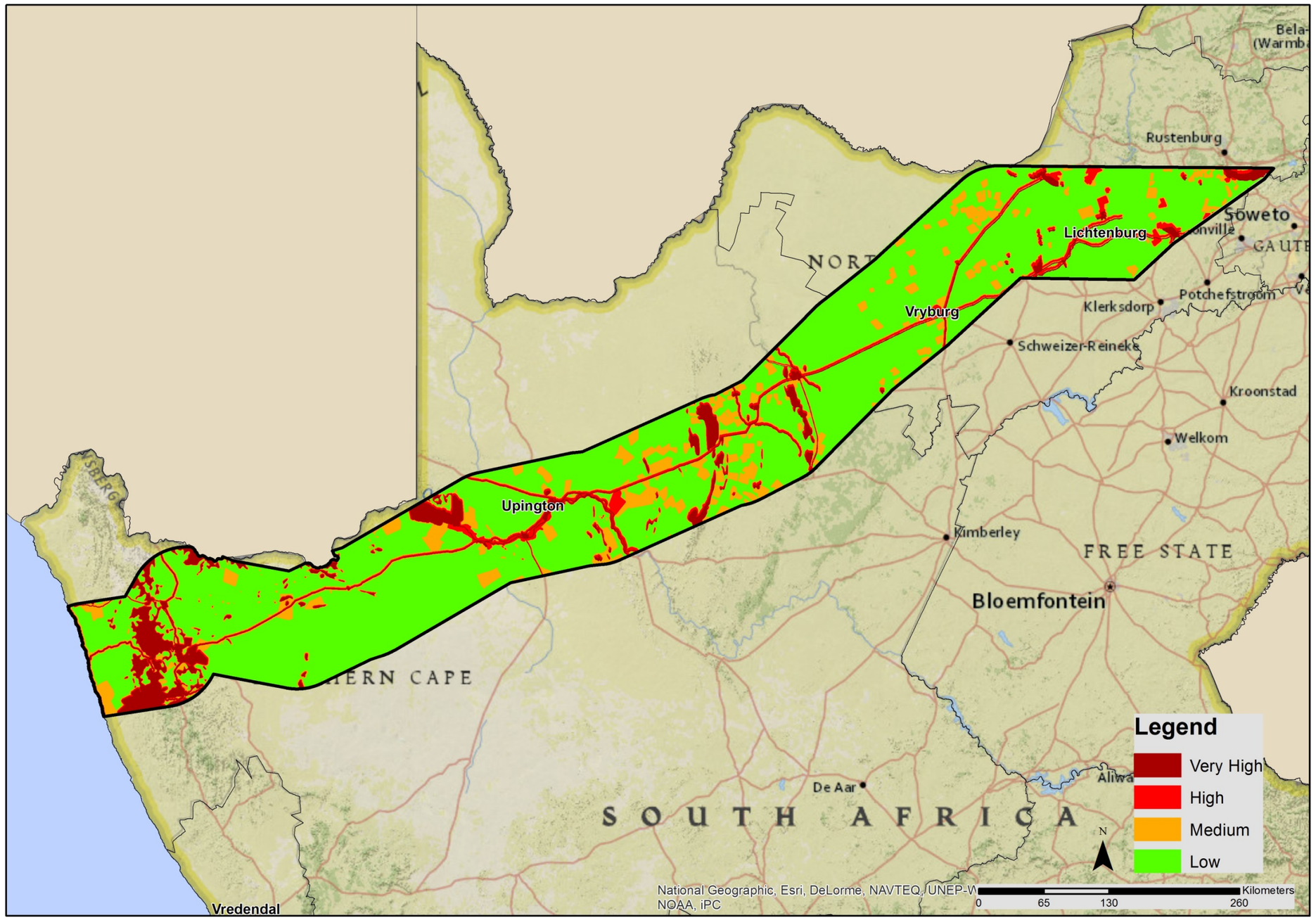
Landscape Sensitive Feature	Feature and Buffer[2] Sensitivity (Power line structures > 20m and substations> 10 000m[2])	Feature and Buffer[2] Sensitivity (Power line structures < 20m and substations < 10 000m[2])	Relevant Corridors
	Medium- -between 1 km and 2 km	Medium- -between 500 m and 1 km	
Other towns / settlements	Very High- -within 250 m of feature High- -between 250 m and 500 m Medium- -between 500 m and 1 km	Very High- -within 250 m of feature High- -between 250 m and 500 m Medium- -between 500 m and 1 km	All
National roads	Very High- -within 500 m of feature High[3] -between 500 m and 1 km Medium[3] -between 1 km and 2 km	Very High- -within 250 m of feature High[3] -between 250 m and 500 m Medium[3] -between 500 m and 1 km	All
Provincial routes	Very High- -within 250 m of feature High- -between 250 m and 500 m Medium- -between 500 m and 1 km	Very High- -within 250 m buffer of feature High- -between 250 m and 500 m Medium- -between 500 m and 1 km	All
Scenic Routes	Very High- -within 1 km of feature High[3] -between 1 km and 2 km Medium[3] -between 2 km and 3 km	Very High- -within 1 km of feature High[3] -between 1 km and 1.5 km Medium[3] -between 1.5 km and 2 km	All
Passenger Rail Lines	Very High- -within 250 m of feature High[3] -between 25 m and 500 m Medium[3] -between 500 m and 1 km	Very High- -within 250 m of feature High[3] -between 250 m and 500 m Medium[3] -between 500 m and 1 km	All except Western Corridor
SA Large telescope (SALT)	Very High- -within 5 km of feature	Very High- -within 5 km of feature	Central Corridor

5.3 Sensitivity Maps

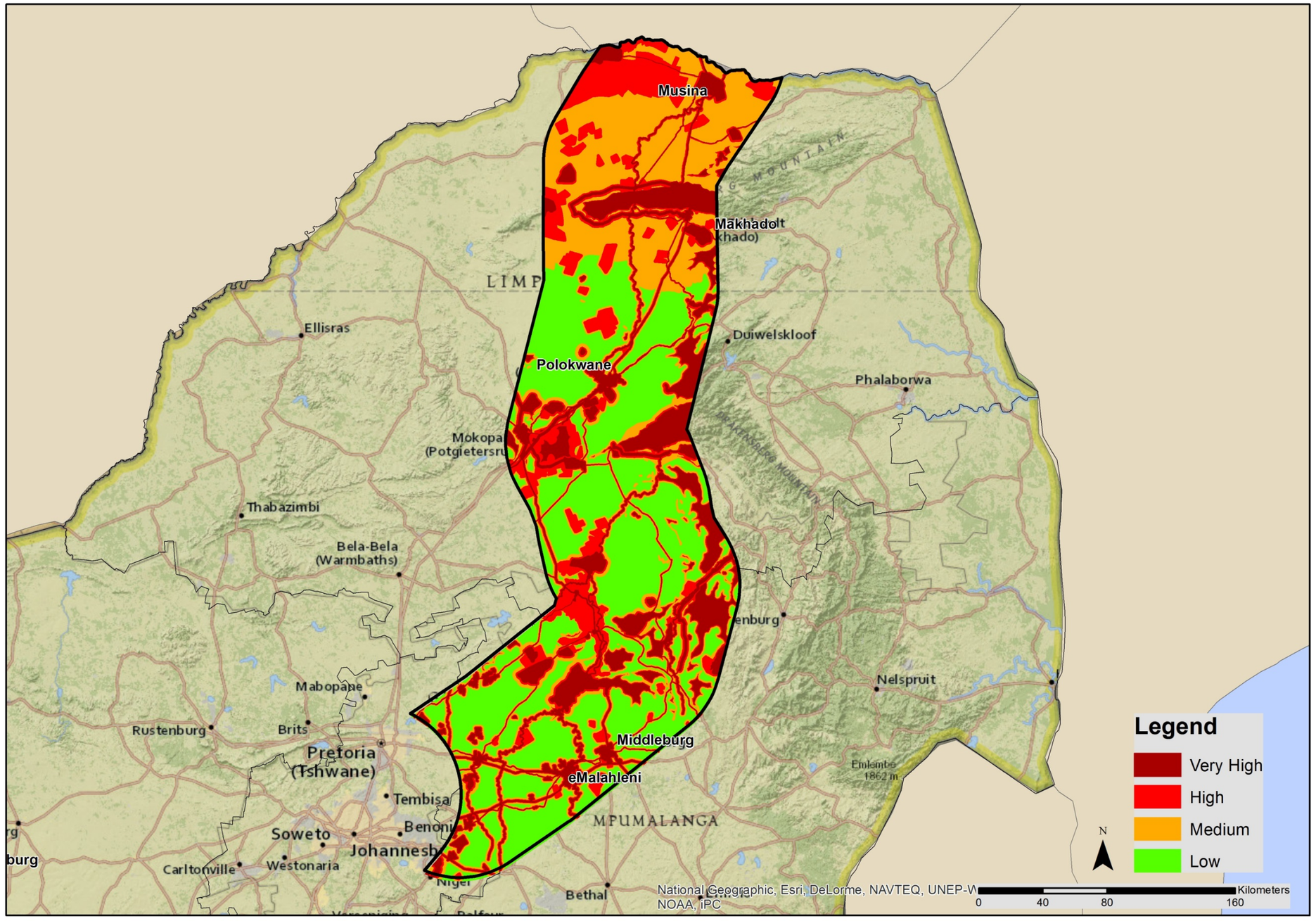
Visual sensitivity maps indicating areas of very high, high medium and low sensitivity in the context of electricity grid infrastructure and for each of the Power Corridors are presented as Maps 1 - 5.



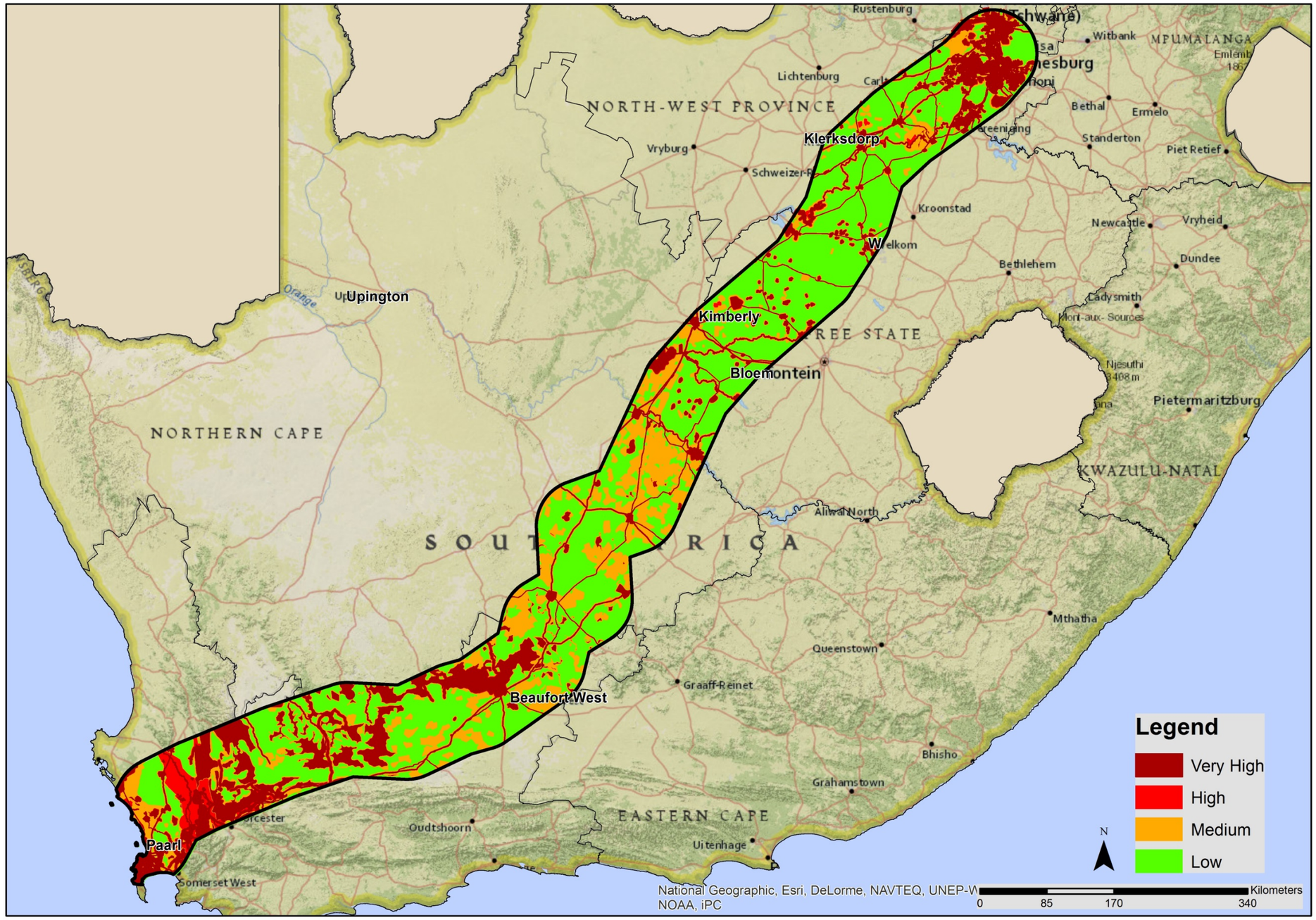
Map 1: Visual sensitivity map for electricity grid infrastructure development in the Western Corridor



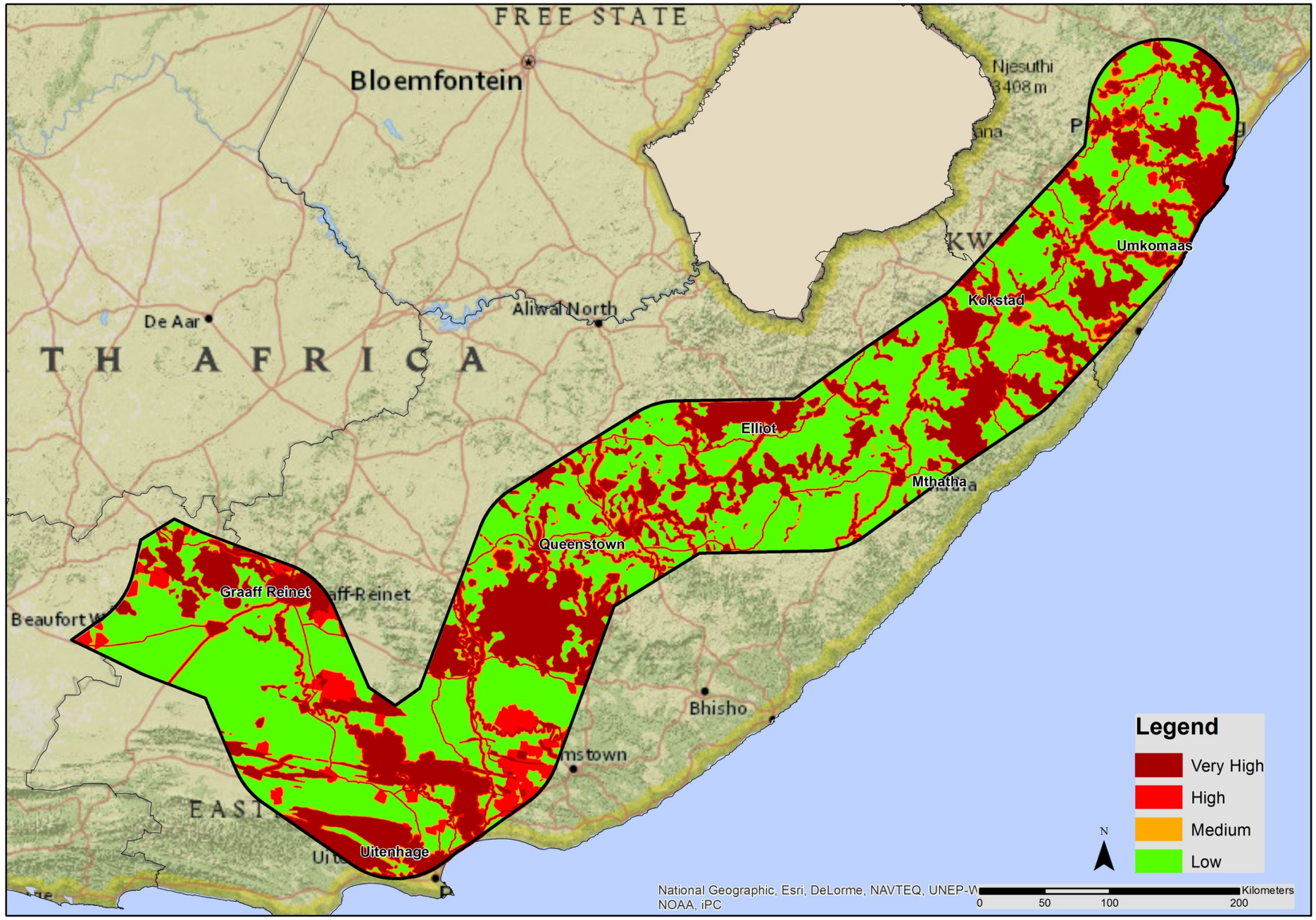
Map 2: Visual sensitivity map for electricity grid infrastructure development in the Northern Corridor



Map 3: Visual sensitivity map for electricity grid infrastructure development in the International Corridor



Map 4: Visual sensitivity map for electricity grid infrastructure development in the Central Corridor



Map 5: Visual sensitivity map for electricity grid infrastructure development in the Eastern Corridor

5.4 Development Protocol

Visual assessment becomes more critical where the receiving landscape is sensitive, for example when wilderness protected landscapes or scenic resources are involved. Furthermore, the need for visual assessments grows as the scale of the development and associated infrastructure increases. All these factors were considered in determining landscape sensitivity within the Power Corridors. The Development Protocol below describes the recommended level of visual assessment to be undertaken in different areas within the Power Corridors on the basis of landscape sensitivity. Four levels of visual assessment have been developed and are described in Tables 4 to 7. The assessment requirements for each level of assessment are adapted from the Guideline for Involving Visual and Aesthetic Specialists in EIA Processes CSIR Report No. ENV-S-C 2005 053, (Oberholzer, B. 2005).

Table 4: Level 4 visual assessment specialist study requirements

Level 4 Specialist Study
Approach: Visual impact assessment by visual specialist[4] which includes 3D modelling with and without mitigation. Report to be reviewed by an independent visual specialist (if necessary).
Method: • Site visit; • Development envelope (including supporting infrastructure) overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in this study. Sensitivity map also to include any additional information on sensitive features identified during site visit, consultation and additional assessment, • Description of the receiving environment and the proposed project; • Establishment of view catchment area, view corridors, viewpoints and receptors; • Inclusion of potential lighting impacts at night; • Indication of potential visual impacts using established criteria • Description of alternatives • Confirmation that all reasonable measures have been taken through project layout to minimise visual impacts; • Justified opinion statement by the specialist recommending whether the project, should from a landscape perspective, receive approval. If this statement is subject to any conditions these must also be stated clearly; • Proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr)

Table 5: Level 3 visual assessment specialist study requirements

Level 3 Specialist Study
Approach: Visual impact assessment by visual specialist[4].
Method: • Site visit; • Development envelope (including supporting infrastructure) overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in this study. Sensitivity map also to include any additional information on sensitive features identified during site visit, consultation and additional assessment, • Description of the receiving environment and the proposed project; • Establishment of view catchment area, view corridors, viewpoints and receptors; • Inclusion of potential lighting impacts at night; • Indication of potential visual impacts using established criteria; • Description of alternatives; • Confirmation that all reasonable measures have been taken through project layout to minimise visual impacts; • Justified opinion statement by the specialist recommending whether the project should from a landscape perspective receive approval. If this statement is subject to any conditions these must also be stated clearly; • Proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).

[4] A visual specialist would preferably have qualifications in landscape architecture or environmental planning, or alternatively, recognised expertise and experience in the field of visual assessments

Table 6: Level 2 visual assessment specialist study requirements

Level 2 Specialist Study
Approach: Basic visual assessment by visual specialist[4].
Method: • Site visit; • Development envelope (including supporting infrastructure) overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in this study. Sensitivity map also to include any additional information on sensitive features identified during site visit, consultation and additional assessment; • Description of the receiving environment and the proposed project; • Establishment of view catchment area and receptors; • Brief description of possible impacts; • Confirmation that all reasonable measures have been taken through project layout to minimise visual impacts; • Justified opinion statement by the specialist recommending whether the project should from a landscape perspective receive approval. If this statement is subject to any conditions these must also be stated clearly; • Proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).

Table 7: Level 1 visual assessment specialist study requirements

Level 1 Specialist Study
Approach: Specialist statement by visual specialist*
Method: • Site visit, if considered necessary; • Development envelope (including supporting infrastructure) overlaid on a sensitivity map prepared in accordance with the sensitivity criteria set out in this study. Sensitivity map to also include any additional information on sensitive features identified during site visit, consultation and additional assessment; • Brief comment on visual influence of project and assessment of expected impacts; • Confirmation that all reasonable measures have been taken through project layout to minimise visual impacts; • Clear and justified opinion statement by the specialist recommending whether the project should from a landscape perspective receive approval. If this statement is subject to any conditions these must also be clearly stated; and • Where applicable, proposed mitigation measures for inclusion in the Environmental Management Programme (EMPr).

Table 8: New visual impact assessment procedure

New Visual Impact Assessment Procedure
Proponents intending to develop electricity grid infrastructure that triggers either a Basic Assessment or Environmental Impact Assessment process must prove to the relevant Commenting Authority (i.e. the responsible heritage resources authority in terms of NHRA) and Competent Authority (i.e. Competent Authority in terms of NEMA) that the proposed development will not have an unacceptable negative impact on heritage resources. 1. *Screening* *Projects Inside the Power Corridors* A competent visual specialist will be required to validate the visual sensitivity map produced by download from the DEA Screening Tool for the sub-corridor(s). Validation of the sensitivities can be undertaken at a desktop level or through field assessment. The approach used to validate sensitivities will be at the discretion of the visual specialist. *Projects Inside the Power Corridors* A competent visual specialist will be required to create a visual sensitivity map for the sub-corridor using the approach and criteria detailed in Section 5.2. The approach used to validate sensitivities will be at the discretion of the heritage specialist.

2. *Minimum Assessment Requirements*

The minimum assessment requirements described in Table 4 shall be applied to the development envelope for proposed projects located both inside and outside the Power Corridors. The assessment requirements at different positions within the development envelope may differ depending on the underlying sensitivity, as determined by the validated sensitivity map.

3. *Commenting and Decision Making*

The outcomes of the assessment shall be submitted to the relevant heritage authority for comment. Such a comment, if received within the stipulated timeframes, will be considered by the relevant Competent Authority in terms of NEMA for decision making.

Sensitivity Class	Interpretation	Assessments at project level	Permit requirements
Very High (dark red)	Visually sensitive resources with major visual constraints including protected areas, heritage sites, scenic routes and others sensitive receptors. Development in this area carries a very high risk of negatively impacting sensitive landscape features. As such, development in these areas is strongly discouraged and viable alternatives should be investigated, where feasible to do so.	A comprehensive **Level 4** Specialist Study undertaken by a competent visual specialist and in accordance with NEMA regulations pertaining to specialist reports and impact assessment is required.	Permit from SAHRA or appropriate provincial heritage agency if heritage features are affected. Approval by Competent Authority in terms of NEMA.
High (red)	High sensitivity areas are characterised by complex terrain with high topographic diversity and landscape, high level of landscape and scenic constraints and close proximity to game reserves and other sensitive receptors. Development in this area carries a high risk of impacting sensitive landscape features. As such, development in these areas is discouraged and viable alternatives should be investigated, where feasible to do so. Mitigation measures may also be available to reduce the magnitude of the potential impact.	A comprehensive **Level 3** Specialist Study undertaken by a competent visual specialist and in accordance with NEMA regulations pertaining to specialist reports and impact assessment is required.	Permit from SAHRA or appropriate provincial heritage agency if heritage features are affected. Approval by Competent Authority in terms of NEMA.
Medium (orange)	Medium sensitivity areas are characterised by, moderately complex terrain with some topographic diversity and landscape dissection, medium landscape scale and texture, moderate level of landscape and scenic constraints, and intermediate proximity of protected areas and sensitive receptors. Development in this area carries a moderate risk of impacting sensitive landscape features. As such, development in these areas may be limited or mitigation measures may be necessary.	A comprehensive **Level 2** Specialist Study undertaken by a competent visual specialist and in accordance with NEMA regulations pertaining to specialist reports and impact assessment is required.	Comment from SAHRA or appropriate provincial heritage agency if heritage features are affected. Comment by competent or delegated authority in terms of NEMA.
Low (green)	Low sensitivity areas are characterised by, relatively even terrain, flat to gently rolling topography and slopes, large expansive landscape scale and coarse-grain texture, few landscape and scenic constraints, absence of protected areas and few sensitive receptors and transformed or degraded land. Development in this area carries a moderate risk of impacting sensitive landscapes and features. As a result, this type of landscape is considered the best suited for development.	A comprehensive **Level 1** Specialist Study undertaken by a competent visual specialist and in accordance with NEMA regulations pertaining to specialist reports and impact assessment is required.	No permit is required for development to proceed in these areas. Comment by local or delegated authority.

PART 3

Chapter 6. CIVIL AVIATION

CONTENTS

TABLES

MAPS

CHAPTER 6. CIVIL AVIATION

6.1 Introduction

Civil aviation in South Africa is governed by the Civil Aviation Act (Act 13 of 2009). This Act provides for the establishment of an autonomous authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. This mandate is fulfilled by the South African Civil Aviation Authority (SACAA) as an agency of the Department of Transport (DoT). The SACAA achieves the objectives set out in the Act by complying with the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organisation (ICAO), while considering the local context when issuing the South African Civil Aviation Regulations (SACARs). All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the SACARs and South African Civil Aviation Technical Standards (SACATS) in order to ensure aviation safety. The Obstacle Evaluation Committee (OEC) which consists of members from both the SACAA and South African Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approval of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and electricity grid infrastructure development, without compromising aviation safety. This Chapter focuses only on potential impacts of electricity grid infrastructure development on civil aviation. Chapter 7: Defence deals with military aviation and areas of interest.

1.1 Electricity Grid Infrastructure and Civil aviation

In South Africa all structures taller than 15 metres above ground level must be assessed and registered as potential obstacles to aviation in the Electronic Terrain and Obstacle Database (eTOD). With power lines reaching heights of beyond 60 m above ground level in some instances, they present a real danger to aviation, especially if sited in close proximity to aerodromes. It is for this reason that the safeguarding of the areas around aerodromes is important and that specific safety requirements (e.g. lighting and markings) are applicable to power lines considered a danger to aviation.

The main potential impact of electricity grid infrastructure would be the height and routing of power lines in the vicinity of aerodromes, especially where these may cross through the approach or departure paths.

6.2 Sensitivity Mapping Criteria

6.2.1 Sensitivity Delineation

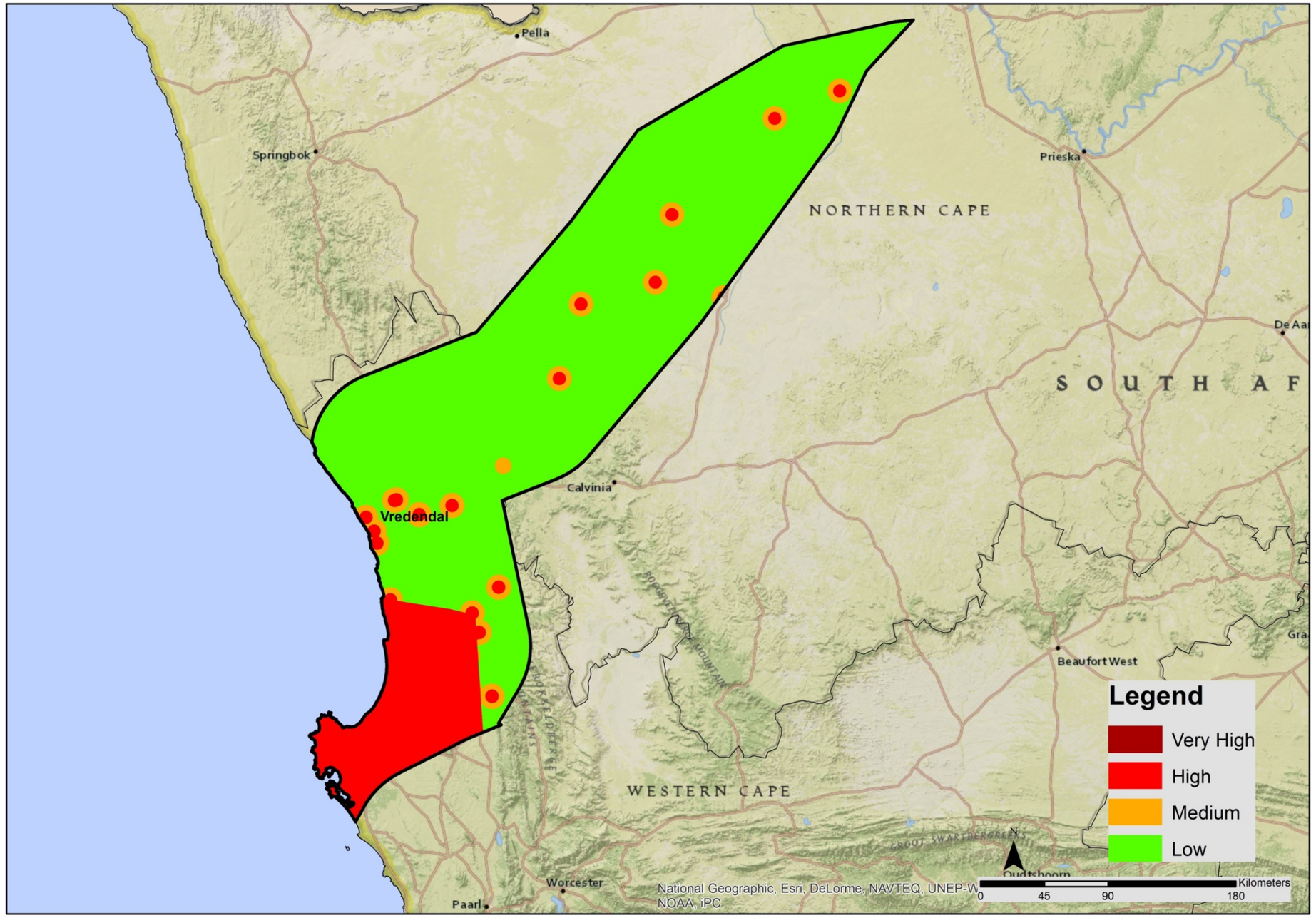
In accordance with submissions by the SACAA and the Air Traffic and Navigation Control Services (ATNS), civil aviation sensitivities with appropriate buffers were mapped for the Power Corridors as per Table 1.

Table 1: Civil aviation sensitivity criteria.

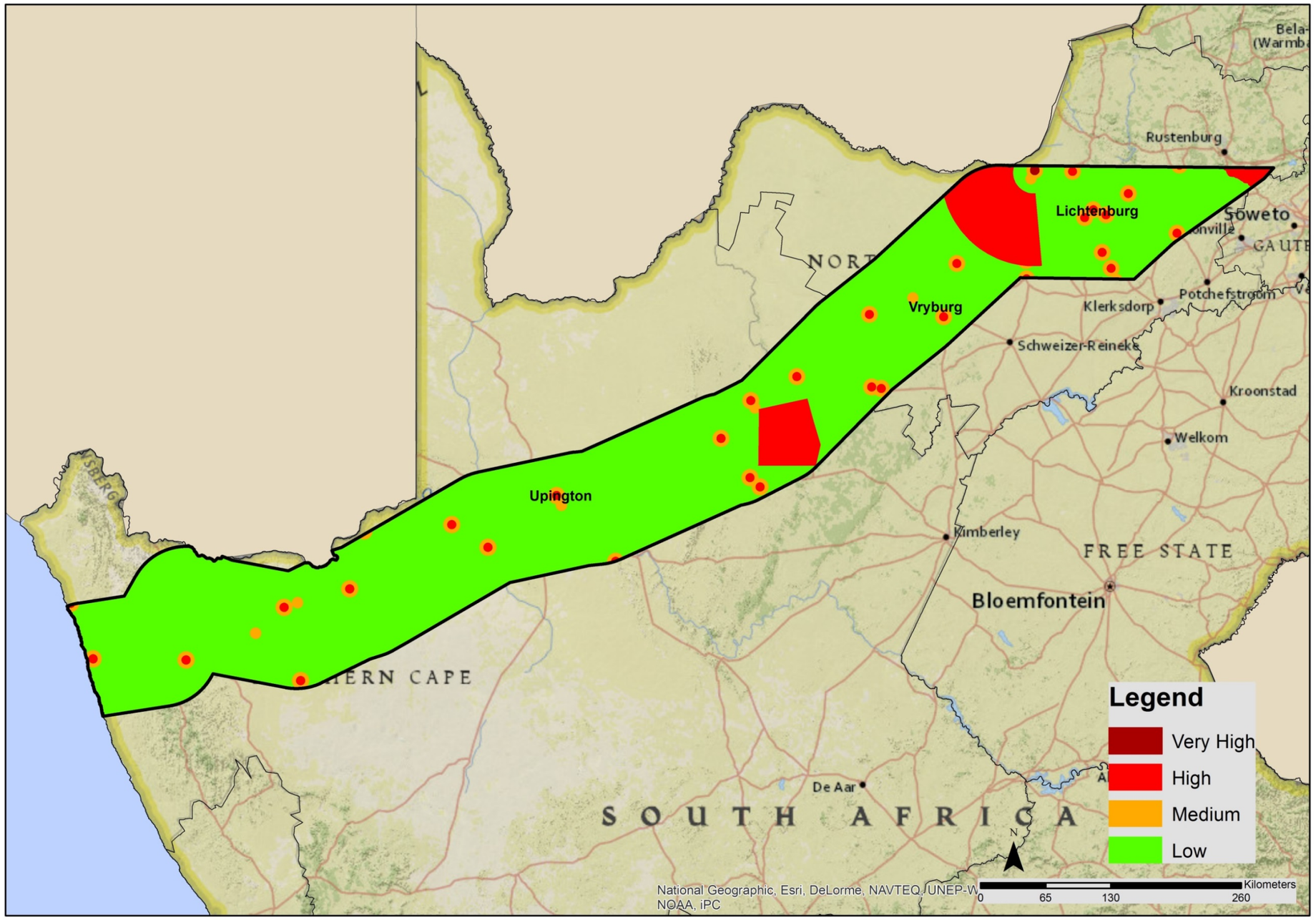
Sensitivity Feature	Data Source	Sensitivity Mapping Application
Major Civil Aviation Aerodromes	SACAA	**Very High sensitivity** - within 8 km **Medium sensitivity** - between 8 and 15 km
Other Civil Aviation Aerodromes	SACAA	**High sensitivity** - within 8 km **Medium sensitivity** - between 8 and 15 km
Civil Aviation Radars	SACAA	**High sensitivity** - within 4 600 m **Medium sensitivity** - between 4 600 m and 15 km
Air Traffic Control and Navigation Sites	ATNS	**Medium sensitivity** - within 5 km
Danger and Restricted Airspace	SACAA	**High sensitivity** - as demarcated and show on the sensitivity maps

6.3 Sensitivity Maps

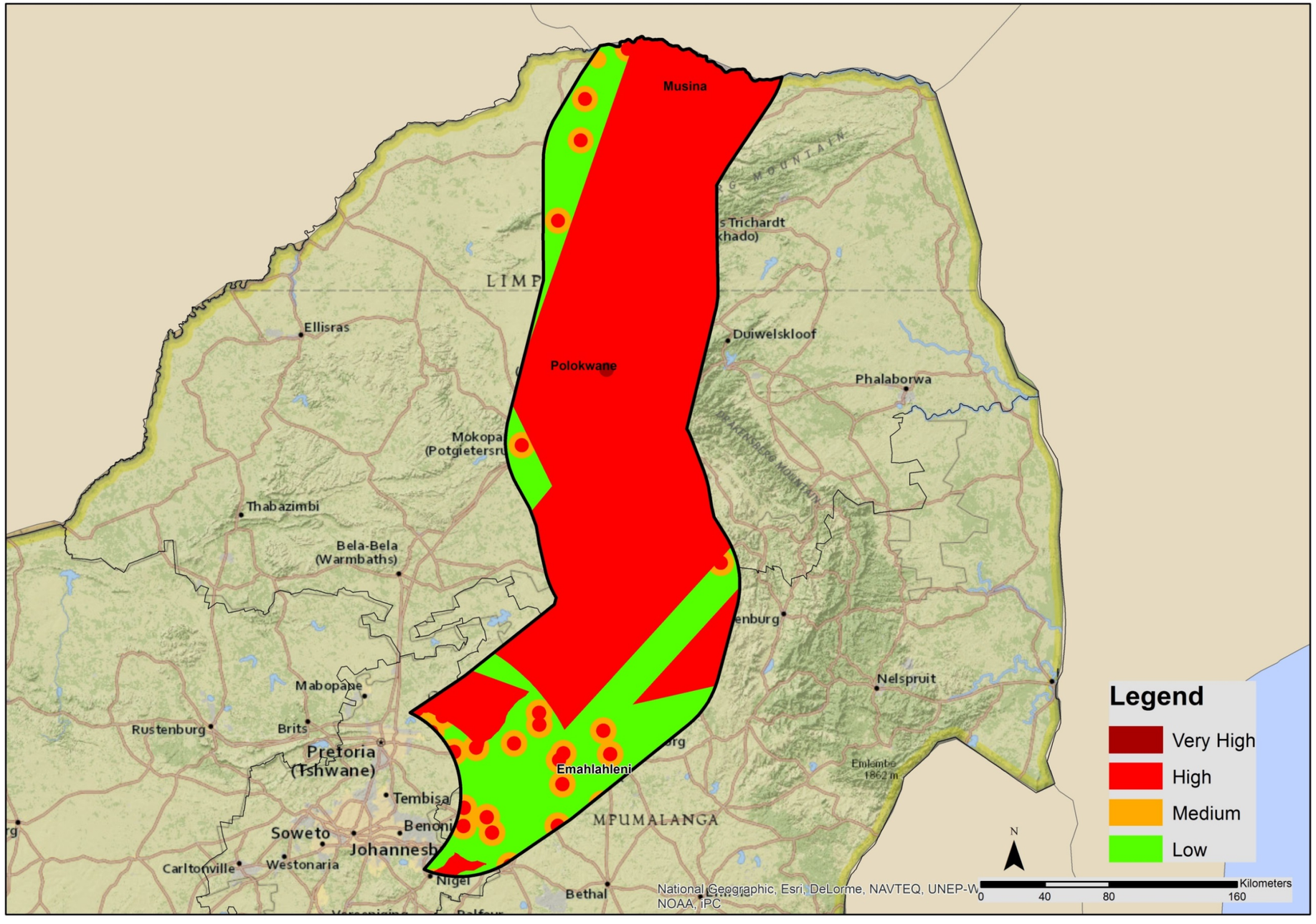
Civil aviation feature sensitivity in the context of electricity grid infrastructure for each of the Power Corridors is illustrated in Maps 1-5. Sensitivity is delineated according to four tiers including Very High, High, Medium and Low sensitivity.



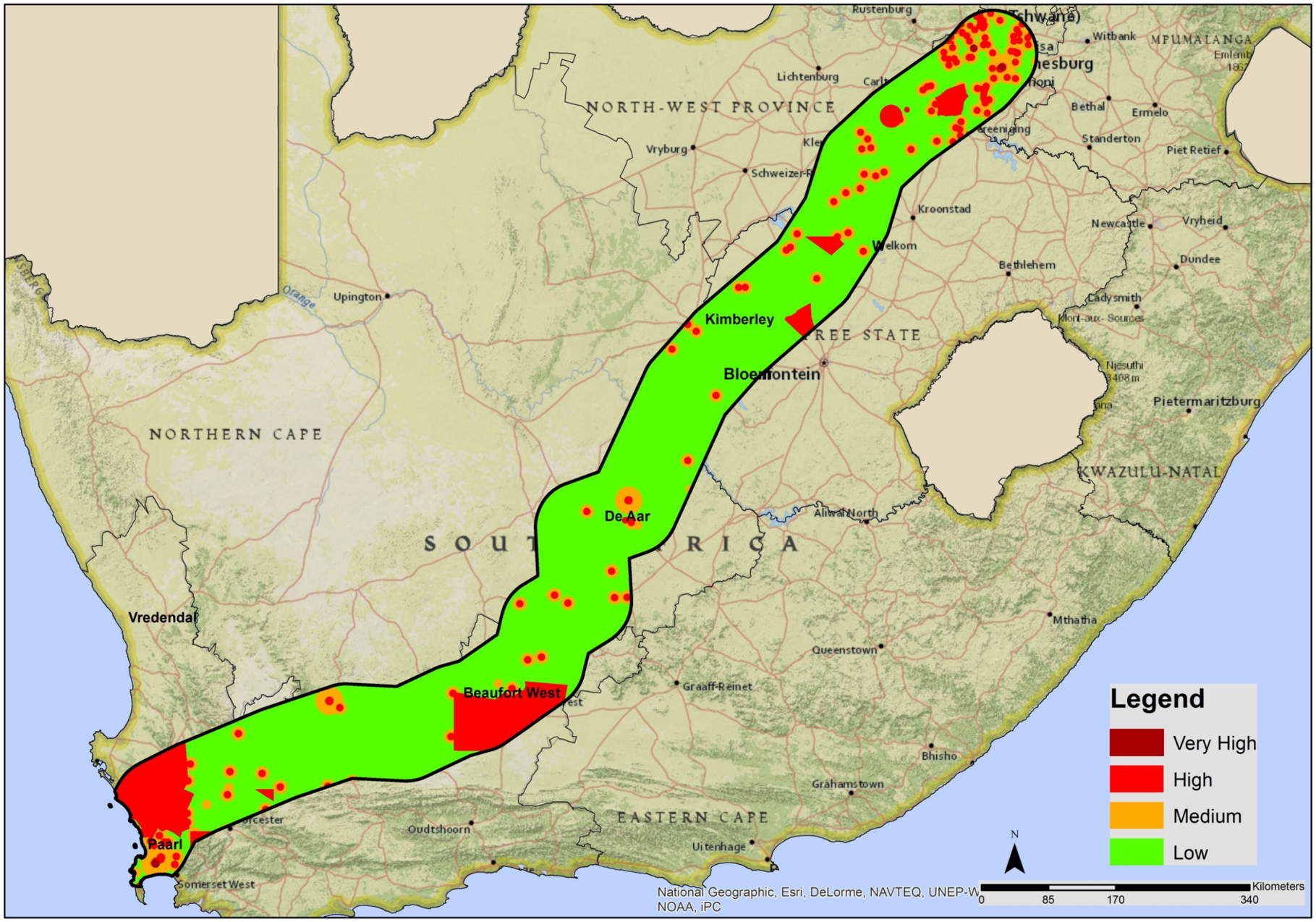
Map 1: Civil aviation sensitivity map for Electricity Grid Infrastructure Development in the Northern Corridor



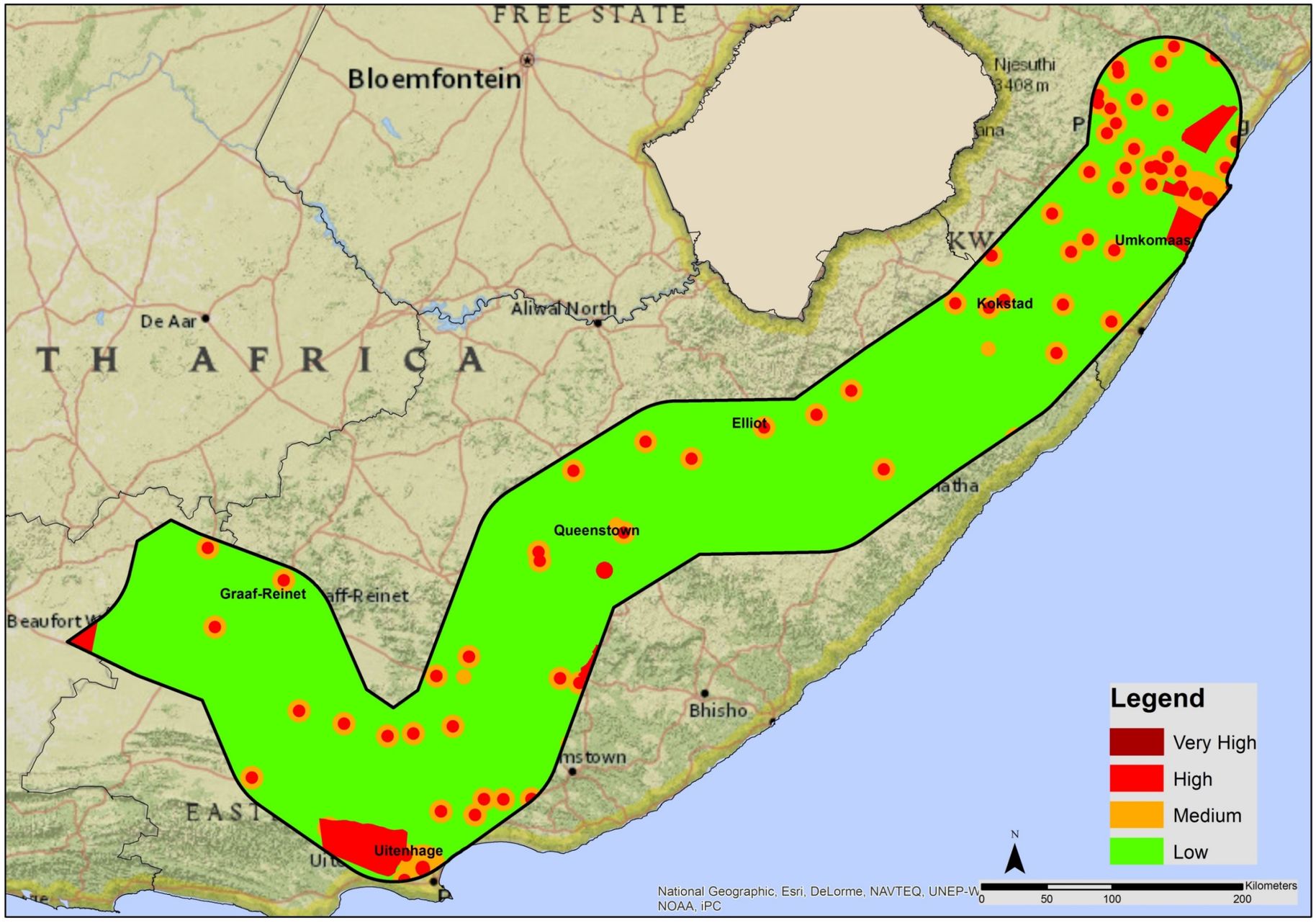
Map 2: Civil aviation sensitivity map for Electricity Grid Infrastructure Development in the Northern Corridor



Map 3: Civil aviation sensitivity map for Electricity Grid Infrastructure Development in the International Corridor



Map 4: Civil aviation sensitivity map for Electricity Grid Infrastructure Development in the Central Corridor



Map 5: Civil aviation sensitivity map for Electricity Grid Infrastructure Development in the Eastern Corridor

6.4 Development Protocol

Due to the complexity of impacts potentially posed by obstacles to aviation, surveillance, communication, and other civil aviation activities, any communications structure, building or other structure, whether temporary or permanent, which has the potential to endanger aviation in navigable airspace, or has the potential to interfere with the operation of navigation or surveillance systems or Instrument Landing Systems, including meteorological systems for aeronautical purposes, is considered an obstacle and shall be submitted to the Commissioner for Civil Aviation for evaluation. Even in the case where the distance from the nearest areas of aviation interest may seem to be sufficient to prevent any impact, there is still potential for electromagnetic interference with aviation services.

Therefore without being able to guarantee that any development will not be found to have an unacceptable impact on civil aviation without confirmation by the Commissioner for Civil Aviation, the sensitivity maps[1] illustrated in this Chapter do not indicate where development can or cannot proceed. Instead, the main objective of this Chapter is to identify high risk areas for development in the context of civil aviation features. This way, developers are able to plan to avoid sensitive civil aviation features at the earliest stage of planning, and in so doing, minimise the risk of a negative decision, project delays or increased project costs as a result of sensitive civil aviation features.

Therefore the initial assessment requirements for electricity grid infrastructure projects located anywhere within the country are the same, as specified in Table 2 below, regardless of the sensitivity. However developers are encouraged to plan development in low sensitivity areas to reduce the risk of encountering a civil aviation issue when seeking approval from the Civil Aviation Authority.

[1] Sensitivity maps were delineated according to the criteria in Table 1

Table 2: Interpretation civil aviation sensitivity maps and associated assessment requirements inside the Power Corridors

Sensitivity Class	Interpretation	Assessments at project level
Very High (dark red)	In Very High sensitivity areas there is a high likelihood of significant negative impacts that cannot be mitigated. In-depth assessment of the potential impacts and mitigation measures will be required before development can be considered in these areas.	Proponents intending to develop electricity grid infrastructure anywhere in South Africa that triggers the need for an Environmental Assessment process must prove to the relevant Competent Authority that the proposed development will not have an unacceptable negative impact on civil aviation activities. In order to do so, the proponent must request approval from the Civil Aviation Authority in terms of the Civil Aviation Regulations of 1997. The proposed route of the power line / position of substation, the co-ordinates (*latitude and longitude in degree, minute, seconds and tenth of seconds format*) of turning points in the line, the maximum height of the structures above ground level and the name of the power line shall be submitted to the Commissioner of Civil Aviation for evaluation. The Commissioner shall evaluate the proposed development and require those sections of the line (if any), which is considered a danger to aviation to be marked or rerouted. Proponents must receive authorisation for the proposed development from the South African Civil Aviation Authority (SACAA) before submitting an application for environmental authorisation in terms of NEMA and evidence of SACAA approval shall be submitted together with the application for environmental authorisation.
High (red)	In High sensitivity areas there is potential for negative impacts that can potentially be mitigated. Further assessment may be required to investigate potential impacts and mitigation measures.	
Medium (orange)	In Medium sensitivity areas there is a low to medium potential for negative impacts, and if there are impacts there is a high likelihood of mitigation. Further assessment of the potential impacts may not be required.	
Low (green)	No significant impacts are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.	

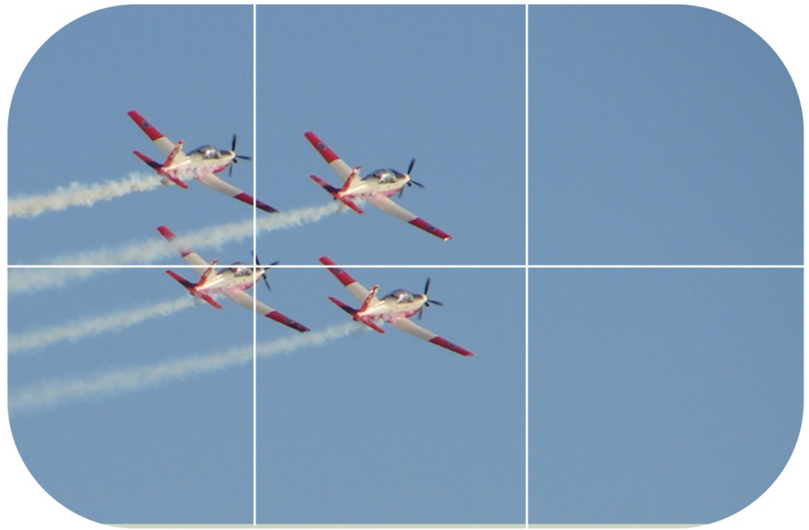
PART 3

Chapter 7. DEFENCE

CONTENTS

TABLES

MAPS



CHAPTER 7. DEFENCE

7.1 Introduction

The South African National Defence Force (SANDF) uses an extensive system of military airspace and land assets in order to prepare and train combat-ready forces. Furthermore, the SANDF also operates radar systems designed to protect the sovereignty of the national borders and to detect threats to national security. The SANDF falls under the Department of Defence (DoD) and comprises four armed services, namely: Army, Air Force, Navy and Military Health Service.

7.1.1 Electricity Grid Infrastructure and Defence

Impacts of electricity grid infrastructure on defence activities could result from interference with surveillance radars and communication systems, or if any structures associated with the electricity grid constitute potential obstacles for military aviation or ground activities. The size of power line infrastructure, sometimes protruding greater than 60 m above ground level, poses a physical obstacle risk for aviation, especially in the Air Force's low flying areas. The size and nature of power line infrastructure may furthermore lead to the blocking and cluttering of surveillance and communication signals. Any interference with SANDF surveillance radar would compromise the safeguarding of coastlines, national borders, military airspace or other militarily sensitive areas.

7.2 Sensitivity Mapping Criteria

7.2.1 Sensitivity Delineation

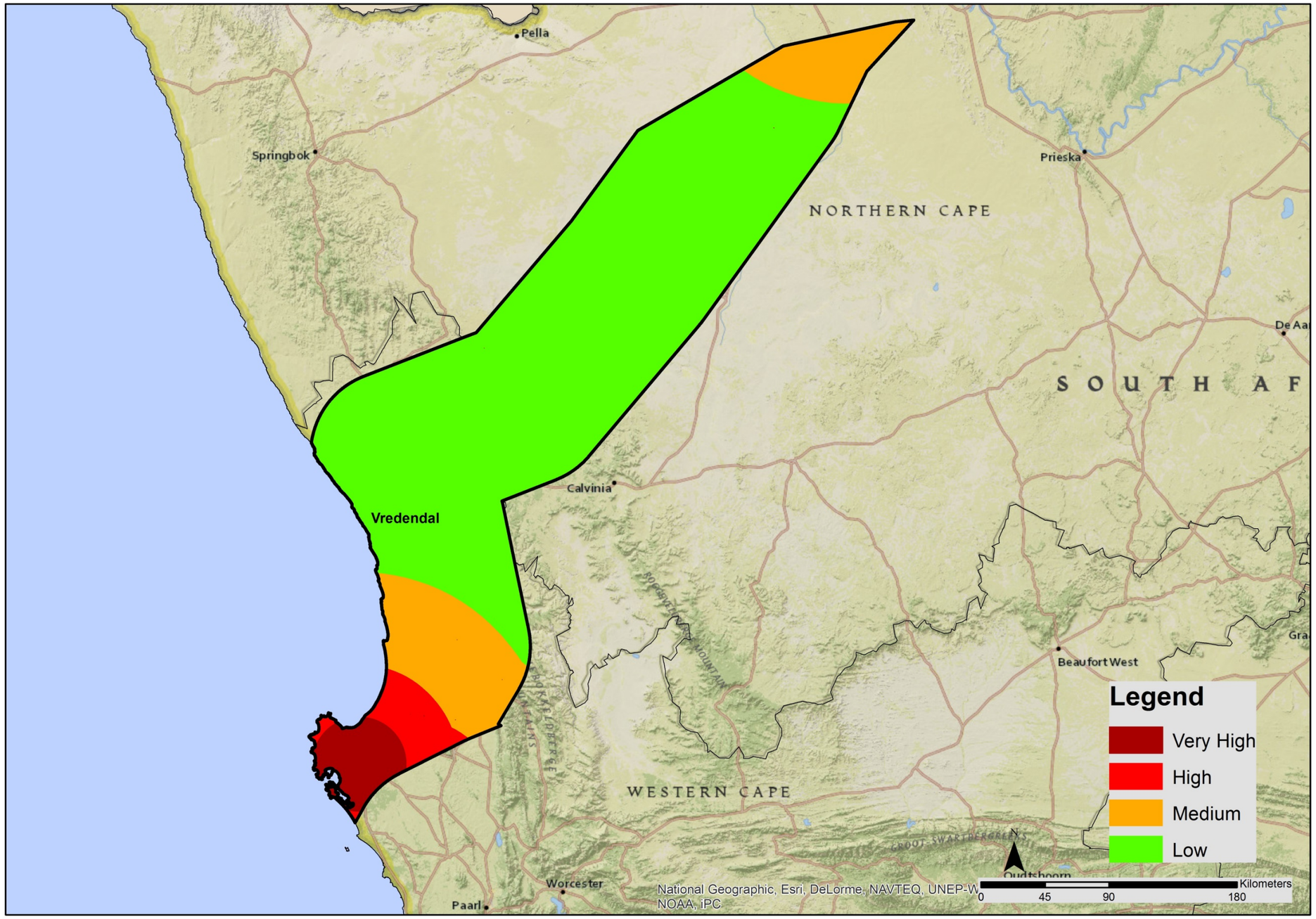
In accordance with submissions by the military, areas of interest were mapped and appropriately buffered as shown in Table 1.

Table 1: Defence sensitivity criteria

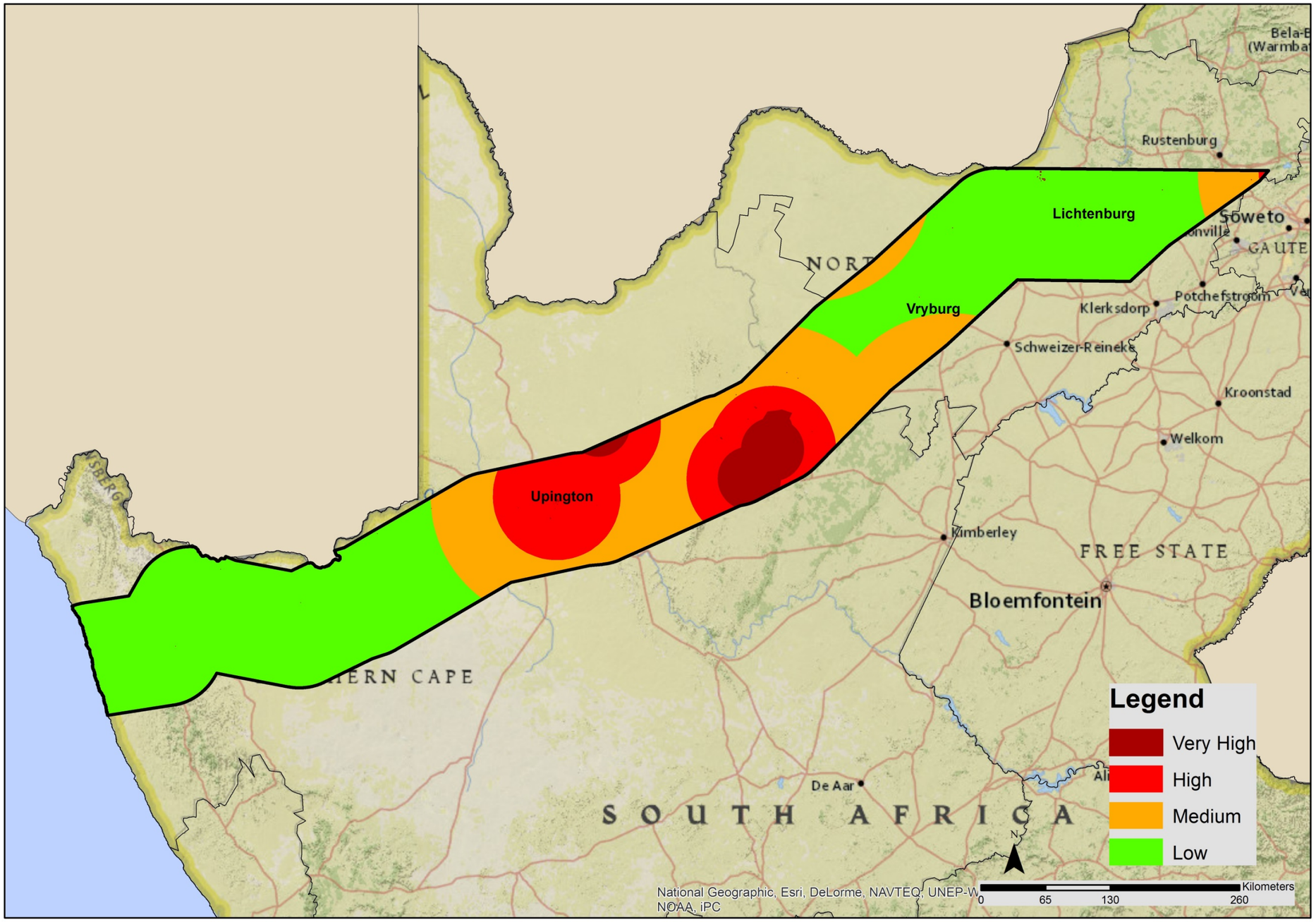
Sensitivity Feature	Data Source	Sensitivity Mapping Application
Air Force Bases -including air force training ranges and forward airfields	DoD	**Very High sensitivity** - within 28 km **High sensitivity** - between 28 km and 56 km **Medium sensitivity** - between 56 km and 111 km
Bombing Ranges	DoD	**Very High sensitivity** - within 28 km **High sensitivity** - between 28 km and 56 km **Medium sensitivity** - between 56 km and 111 km
Shooting Ranges	DoD	**Very High sensitivity** - 0 km or 1 km (depending on the site)
Military Bases	DoD	**Very High sensitivity** - 0 km or 1 km (depending on the site)
Border Posts	DoD	**Very high sensitivity** - within 1 km
Ammunition Depot	DoD	**Very High sensitivity** - between 0 km and 10 km
High Sites	DoD	**Feature** - feature extent i.e. the area covered by the feature itself
All Other DoD features (including Naval Bases, Housing, Offices etc)	DoD	**Feature** - feature extent i.e. the area covered by the feature itself

7.3 Sensitivity Maps

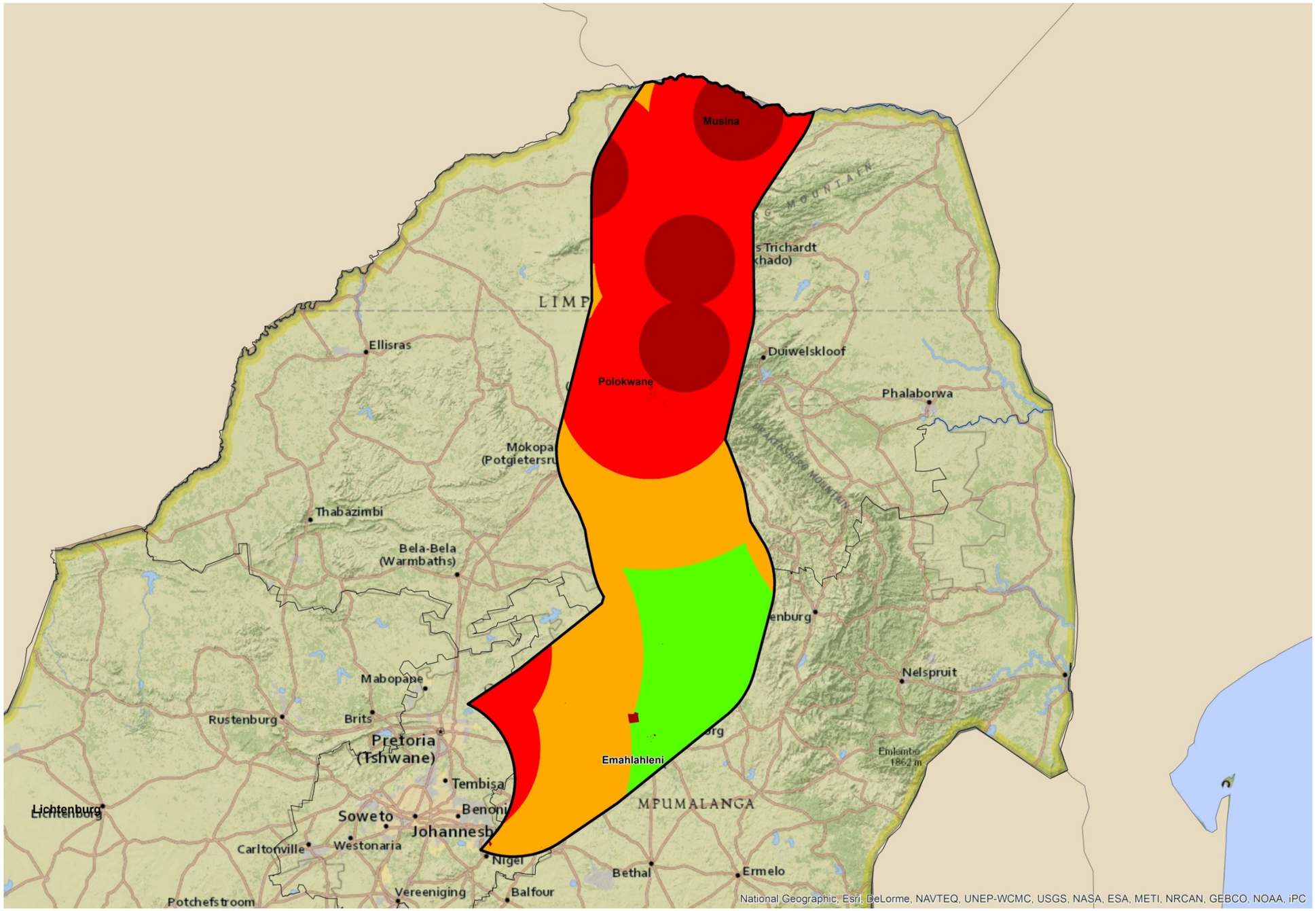
All sensitivity features were combined to create sensitivity maps for each Power Corridor (see Maps 1 to 5).



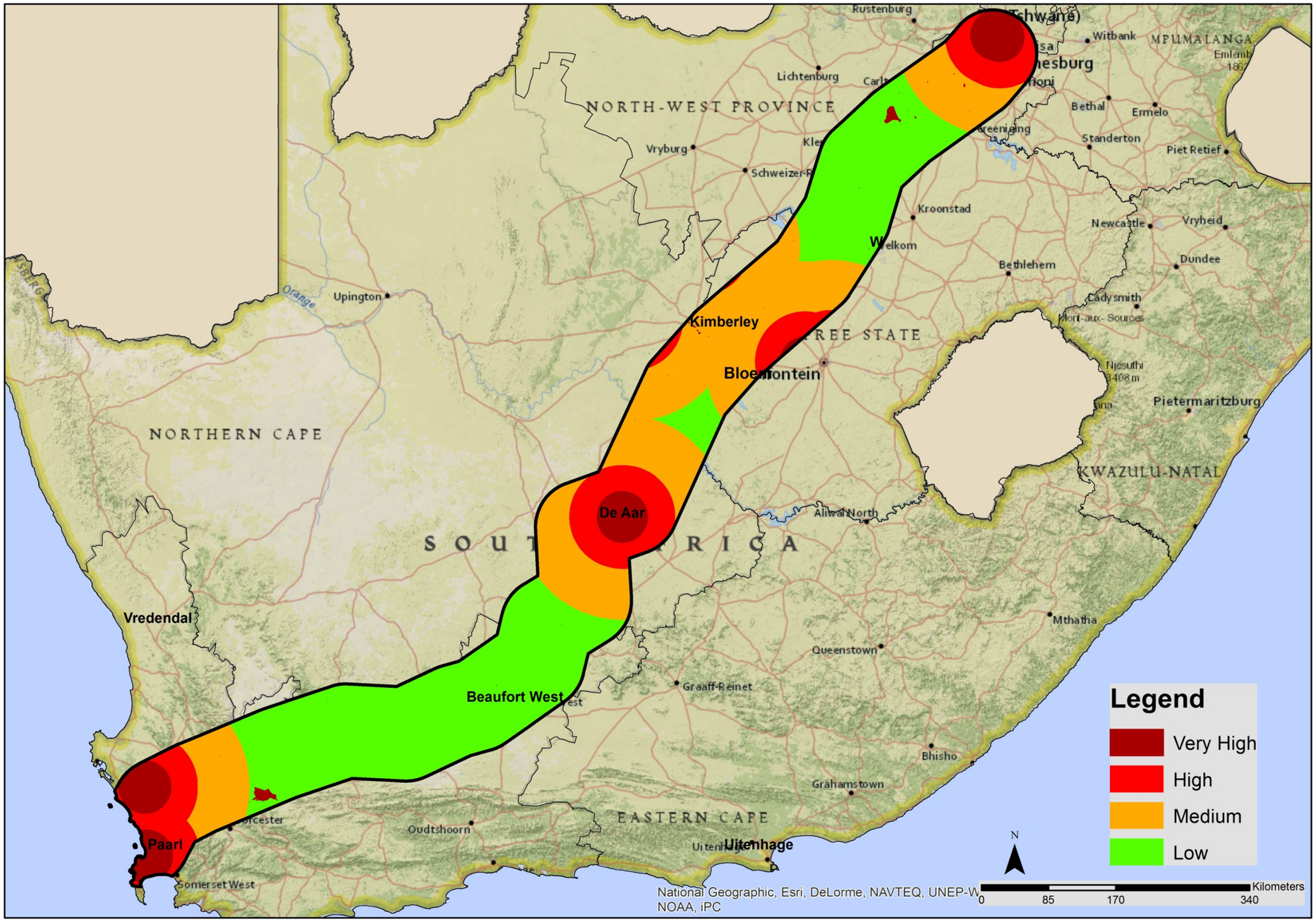
Map 1: Defence sensitivity map for electricity grid infrastructure development in the Western Corridor



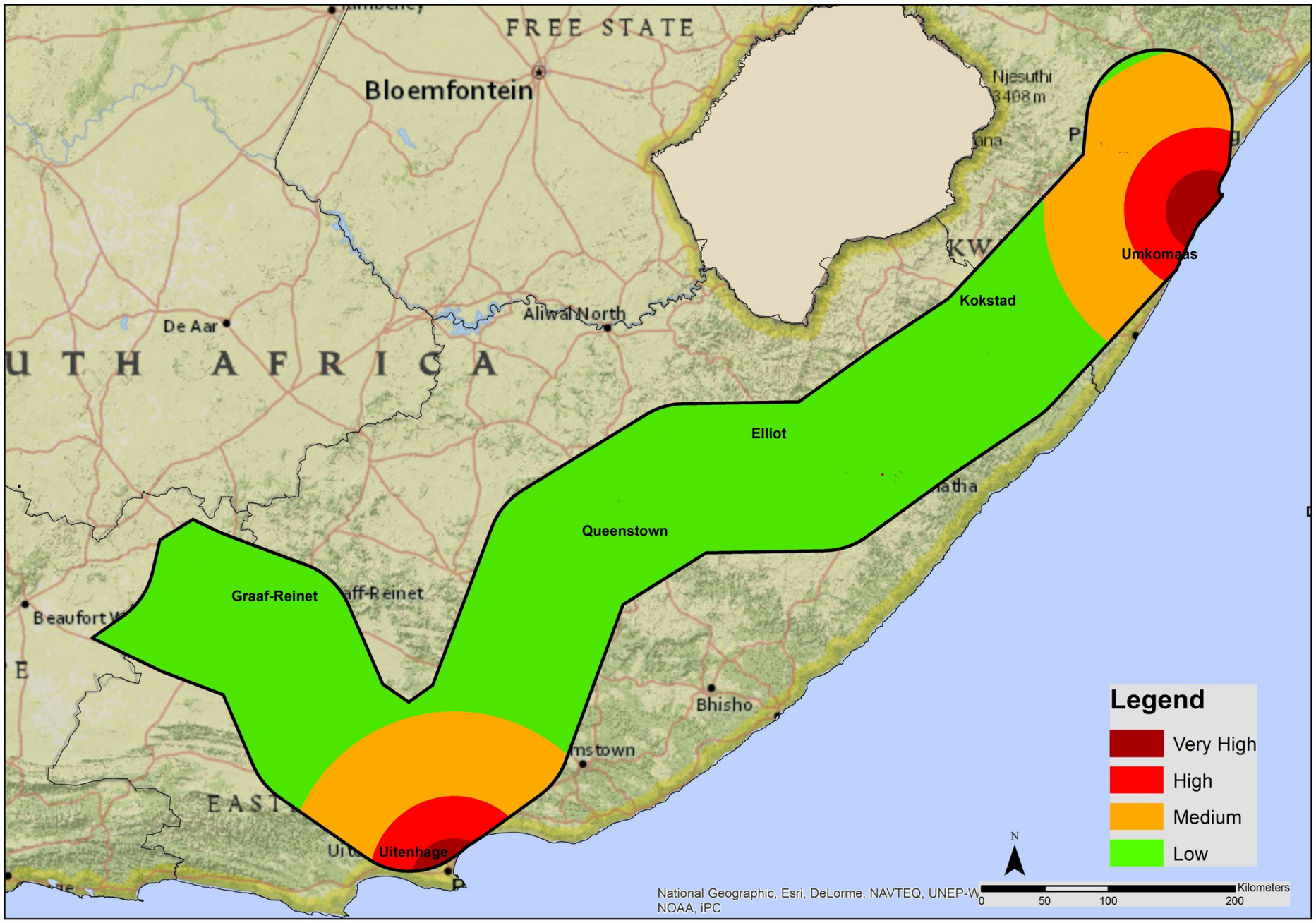
Map 2: Defence sensitivity map for electricity grid infrastructure development in the Northern Corridor



Map 3: Defence sensitivity map for electricity grid infrastructure development in the International Corridor



Map 4: Defence sensitivity map for electricity grid infrastructure development in the Central Corridor



Map 5: Defence sensitivity map for electricity grid infrastructure development in the Eastern Corridor

7.4 Development Protocol

The Obstacle Evaluation Committee (OEC), under the chairmanship of the Senior Staff Officer Air Traffic Management of the Air Force, is responsible for streamlining and coordinating the approvals for the construction of potential aviation obstacles in the vicinity of military areas of interest. The OEC consists of members from both the Air Force and the South African Civil Aviation Authority (SACAA), and is mandated to make final recommendations to the Deputy Chief of the Air Force regarding the approval of obstacles that might affect Air Force activities. Due to the complexity of impacts potentially posed by obstacles on aviation, surveillance, communication, and other military activities, all proposed electricity grid infrastructure facilities must be evaluated by this committee. Even in instances where the distance from the nearest area of military interest may seem far enough for it not to have an impact, there is still potential for electromagnetic interference with communication, surveillance, or other military services.

Therefore without being able to guarantee that any development will not be found to have an unacceptable impact on military features without confirmation by OEC, the sensitivity maps[1] illustrated in this Chapter do not indicate where development can or cannot proceed. Instead, the main objective of this Chapter is to identify high risk areas for development in the context of defence features. This way, developers are able to plan to avoid sensitive defence related features at the earliest stage of development planning, and in so doing, minimise the risk of a negative decision, project delays or increased project costs as a result of the potential interference of the proposed development with defence services.

Therefore the initial assessment requirements for electricity grid infrastructure projects located anywhere within the country are the same, as specified in Table 2 below, regardless of the sensitivity. However developers are encouraged to plan development in low sensitivity areas to reduce the risk of encountering a defence related issue when seeking approval from the OEC.

Table 2: Interpretation of defence sensitivity maps and associated assessment requirements inside the Power Corridors

Sensitivity Class	Interpretation	Assessments at project level
Very High (dark red)	In Very High sensitivity areas there is a high likelihood for significant negative impacts that cannot be mitigated. In-depth assessment of the potential impacts and mitigation measures is likely to be required before development can be considered in these areas.	Proponents intending to develop electricity grid infrastructure anywhere in South Africa that triggers the need for an environmental assessment process must prove to the relevant Competent Authority that the proposed development will not have an unacceptable negative impact on defence activities. In order to do so, the proponent must request a decision from the OEC in terms of their act confirming no unacceptable impact on military areas of interest. The applicant will need to appoint a registered Geomatics Professional to produce a geospatial map (in KMZ or shapefile format) illustrating the final power line route or substation site location and associated coordinates. The geospatial maps together with information on the electricity grid infrastructure, including tower height and tower design, shall be submitted to OEC for comment. Proponents must receive authorisation for the proposed development from the OEC before submitting an application for environmental authorisation in terms of NEMA. Evidence of OEC approval shall be submitted together with the application for environmental authorisation.
High (red)	In High sensitivity areas there is potential for negative impacts that can potentially be mitigated. Further assessment may be required to investigate potential impacts and mitigation measures.	
Medium (orange)	In Medium sensitivity areas there is a low potential for negative impacts, and if there are impacts there is a high likelihood of mitigation. Further assessment of the potential impacts may not be required.	
Low (green)	No significant impacts are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.	

[1] Sensitivity maps were delineated according to the criteria in Table 1

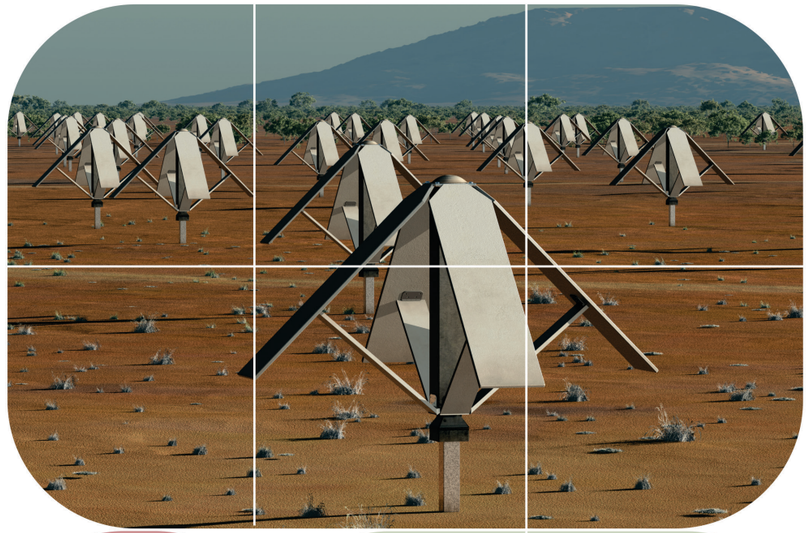
PART 3

Chapter 8. SQUARE KILOMETRE ARRAY

CONTENTS

TABLES

MAPS



CHAPTER 8. SQUARE KILOMETRE ARRAY PROJECT

8.1 Introduction

The Square Kilometre Array (SKA) project is an international project to build the world's largest radio telescope, with a square kilometre of collecting area. The telescope will be used to study space in order to improve the understanding of the universe and the laws of physics. The SKA operates across a wide frequency range, and so requires multiple receptor technologies to conduct astronomical observations. The use of multiple receptor types enables the SKA facility to be split between Africa and Australia. The South African component of the SKA will consist of approximately 3 000 receptors comprising dish antennas, each with a diameter of 15 m, and radio receptors known as dense aperture-arrays.

The majority of the receptors (approximately 50%) will be located in a dense core region in the Northern Cape Province, while the remaining receptors will be grouped in radio stations arranged in arms spiralling out from the central core area. The outer stations in the spiral arms will extend beyond the borders of South Africa and at least 3 000 km from the core area. About 80% of the receptors, including the dense core and up to 5 spiral arms, will be located in the Karoo Central Astronomy Advantage Area (KCAAA). The KCAAA which is located between Brandvlei, Van Wyksvlei, Carnarvon and Williston in the Northern Cape Province was in early 2014 officially declared by the Minister of Science and Technology in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) for the purposes of protection from Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI). The declaration of the KCAAA ensures the long term viability of the area to be used for astronomical installations. The KCAAA has since also been identified for the construction of other astronomy projects such as PAPER (Precision Array for Probing the Epoch of Re-ionisation), C-BASS (C-Band All Sky Survey) and MeerKAT, with the latter being a pathfinder for SKA.

The key characteristics of the area, making it particularly suitable for astronomical installations, are:

- Having a very low population density, which results in a low presence of RFI and EMI which can interfere with celestial signals that the telescope aims to detect;
- Having a landscape with flat-topped escarpments and hills provide additional natural shielding from RFI and EMI;
- Having low economic activity which reduces the potential impact of future development on the SKA, and the impact of the SKA on the area by limiting the development opportunities in order to limit RFI and EMI, while still being near enough to bulk infrastructure such as roads and power lines
- Being in reasonable proximity to small towns that can provide services;
- Having a dry climate and favourable construction terrain; and
- Having an elevation of 1 000 m or higher that reduces the atmospheric opacity (i.e. the amount of absorption and scattering of incoming signals by the atmosphere).

8.1.1 Electricity Grid Infrastructure and SKA

Any large scale development with its associated human activities, including power lines and substations, result in RFI and EMI, which have the potential to degrade the performance of the SKA if such development is sited in close proximity to the radio sites. In extreme cases, strong sources of RFI and EMI have the potential to render the SKA dysfunctional or even to permanently damage the SKA receivers.

8.2 Sensitivity Mapping Criteria

8.2.1 Sensitivity Delineation

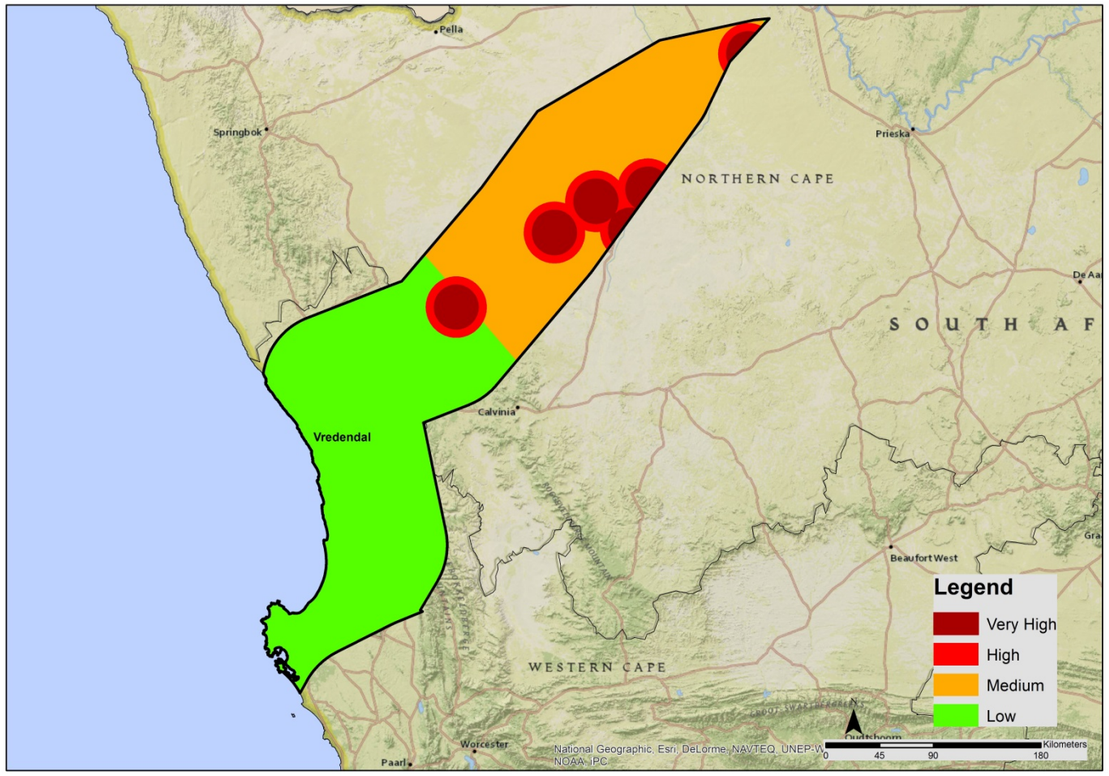
Based on the potential RFI and EMI impacts of electricity grid infrastructure on SKA receptors, sensitivity buffers as presented in Table 1 were determined and applied to the preliminary SKA radio sites to produce individual sensitivity maps for the Power Corridors.

Table 1: SKA sensitivity distance guidelines for electricity grid infrastructure

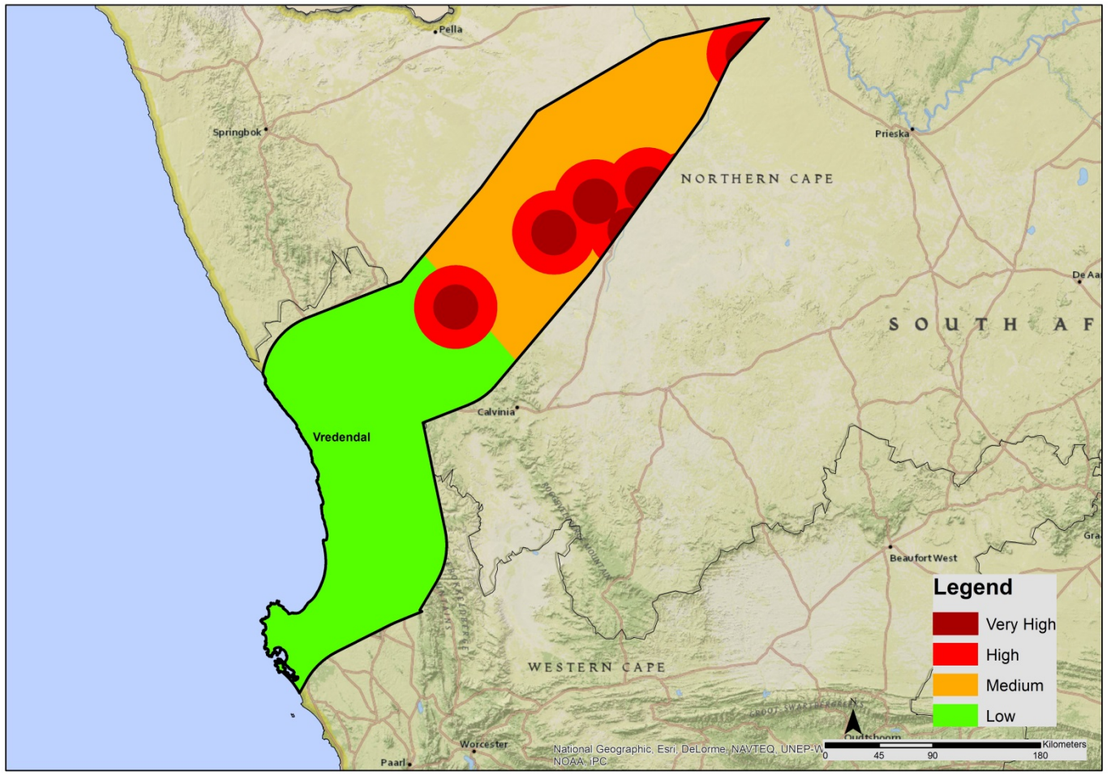
Colour	Sensitivity	Buffered area	
		Power line	Substation
Dark Red	Very High	Less than 16 km from SKA facility	Less than 16 km from SKA facility
Red	High	Between 16 km and 22 km from SKA facility	Between 16 km and 30 km from SKA facility
Orange	Medium	Within Karoo Central Astronomy Advantage Areas 1	Within Karoo Central Astronomy Advantage Areas 1
Green	Low	Greater than 22 km from SKA facility and outside Karoo Central Astronomy Advantage Areas 1	Greater than 30 km and outside Karoo Central Astronomy Advantage Areas 1

8.3 Sensitivity Maps

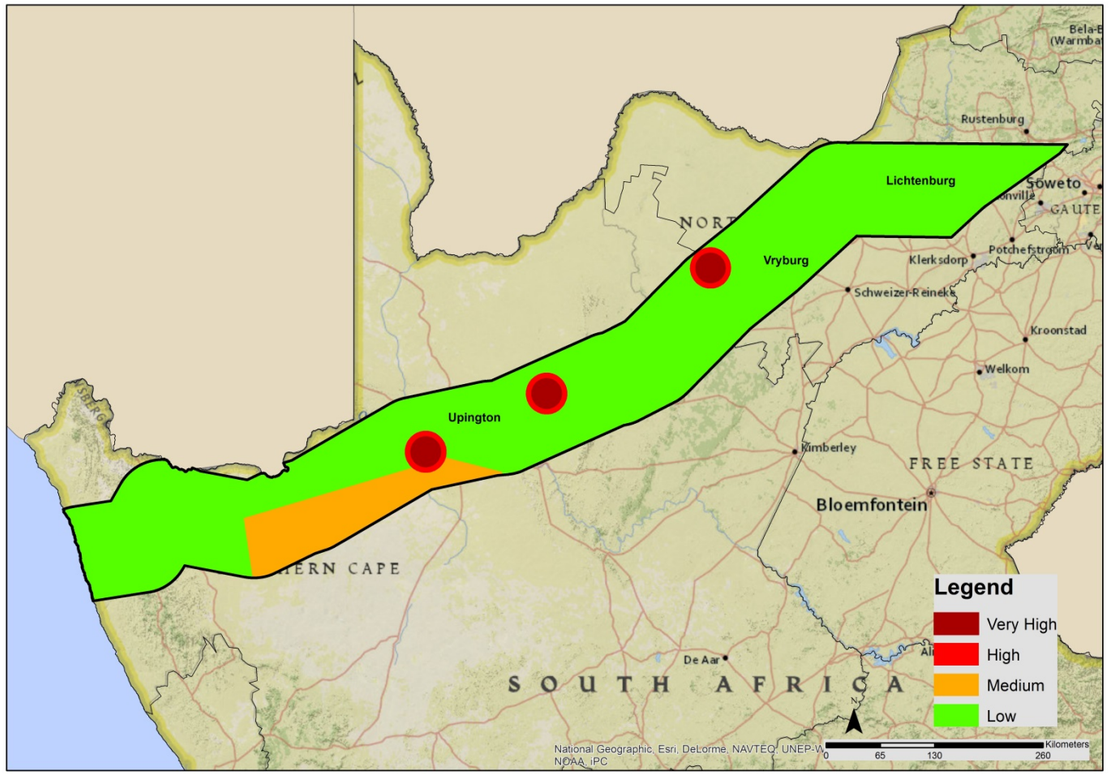
The sensitivity criteria described in Section 8.2 are illustrated for each of the Power Corridors for both power lines and substation in Maps 1- 10.



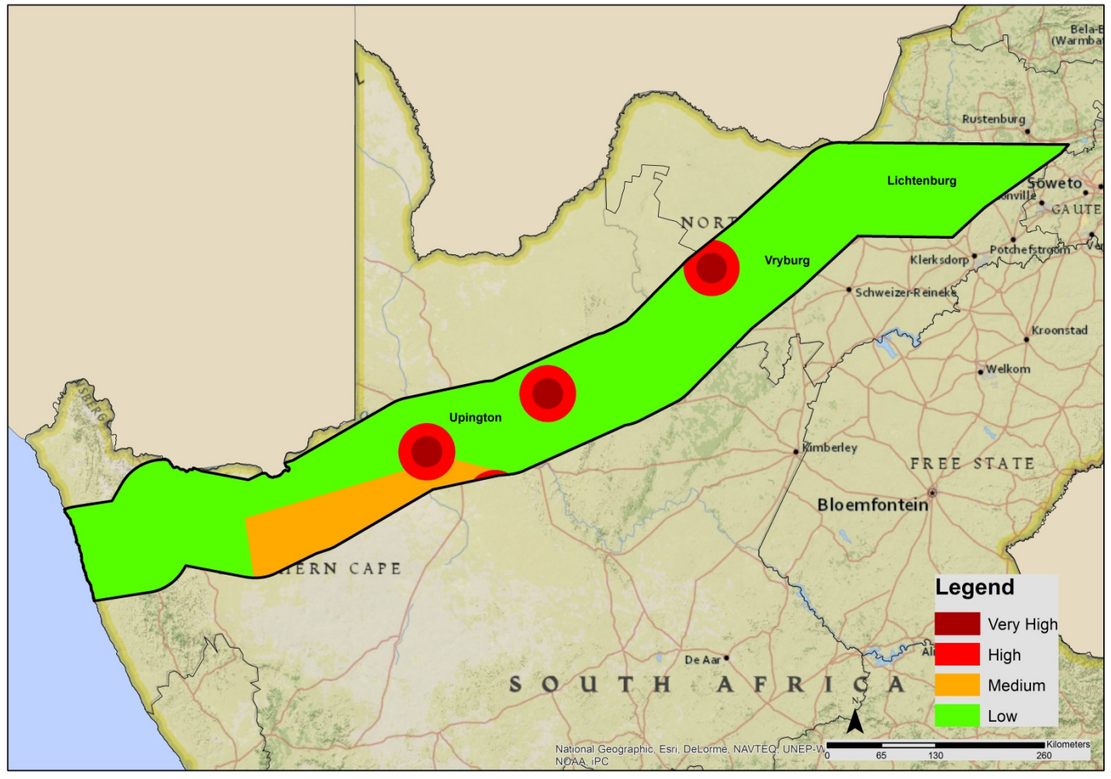
Map 1: SKA sensitivity map for power line infrastructure development in the Western Corridor



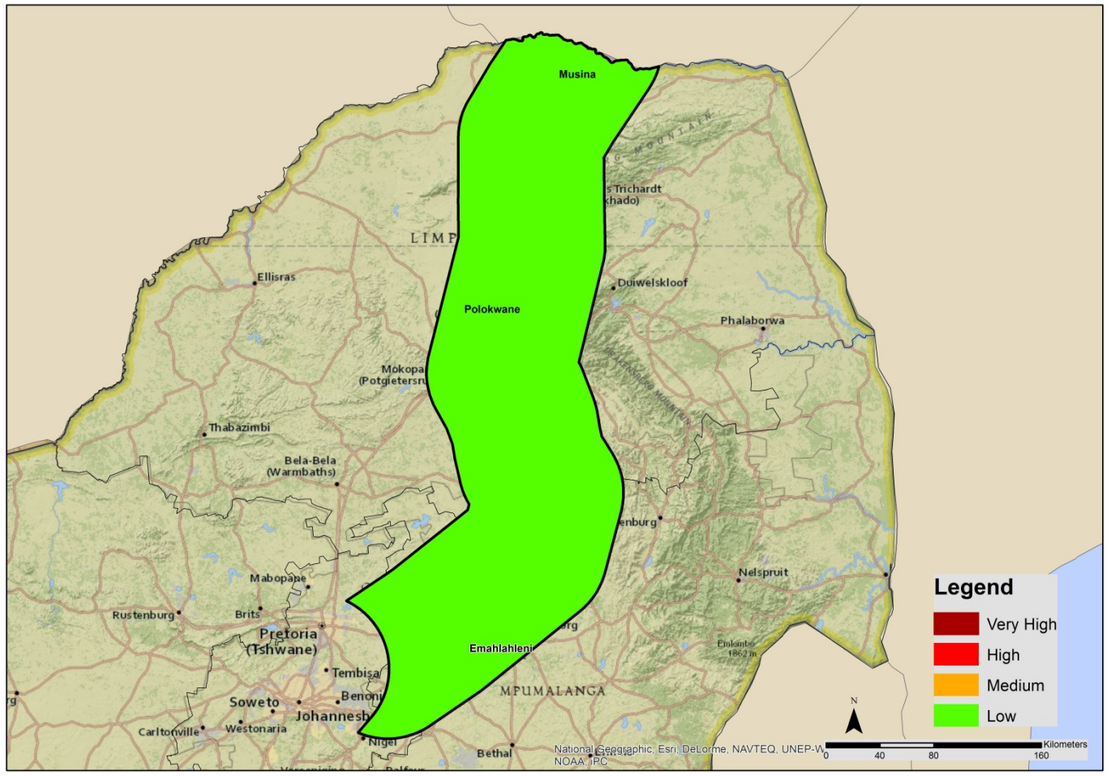
Map 2: SKA sensitivity map for substation infrastructure development in the Western Corridor



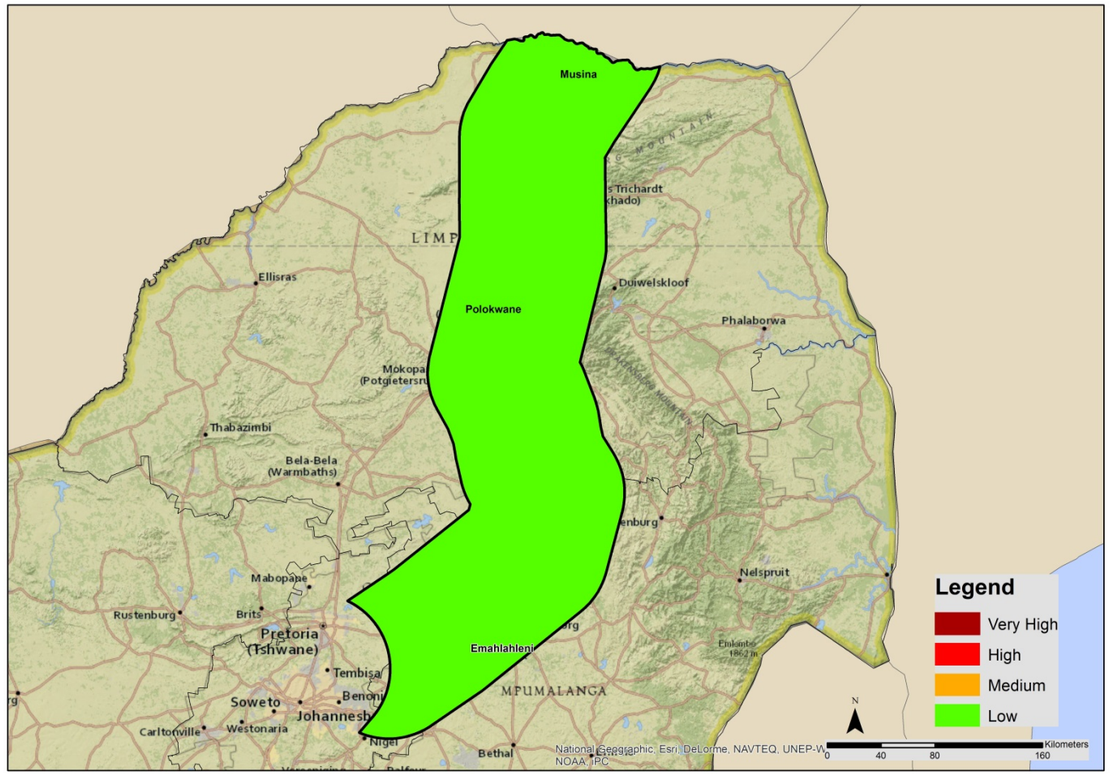
Map 3: SKA sensitivity map for power line infrastructure development in the Northern Corridor



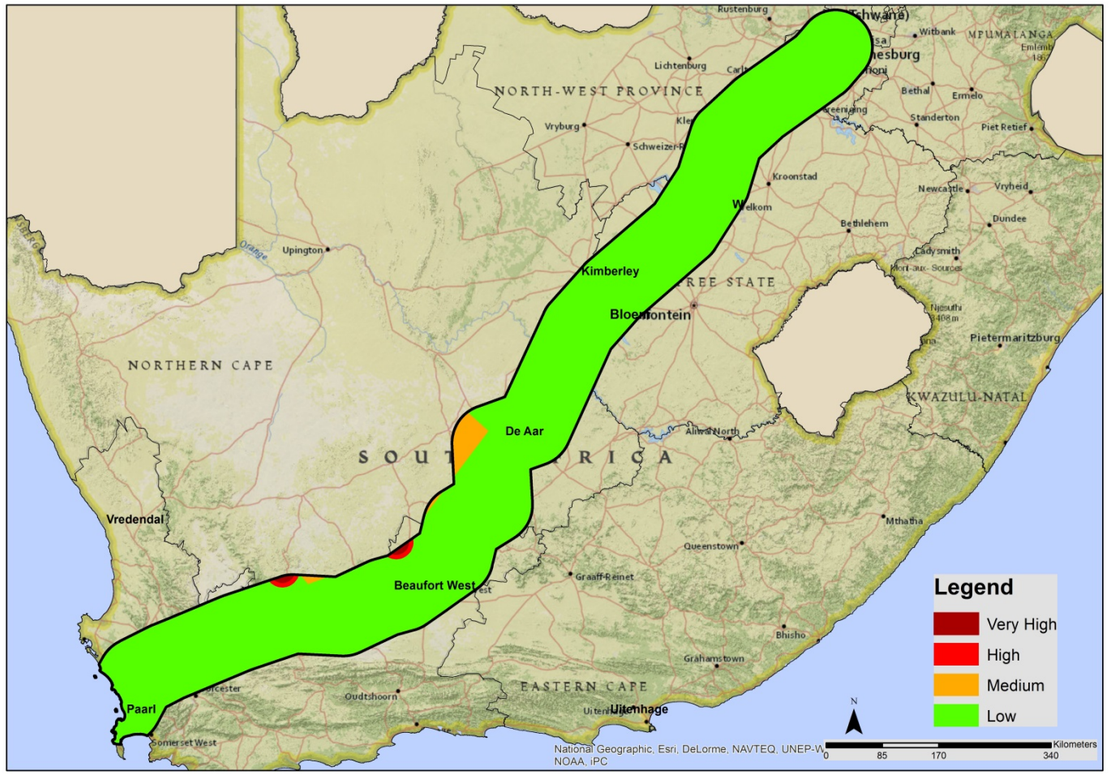
Map 4: SKA sensitivity map for substation infrastructure development in the Northern Corridor



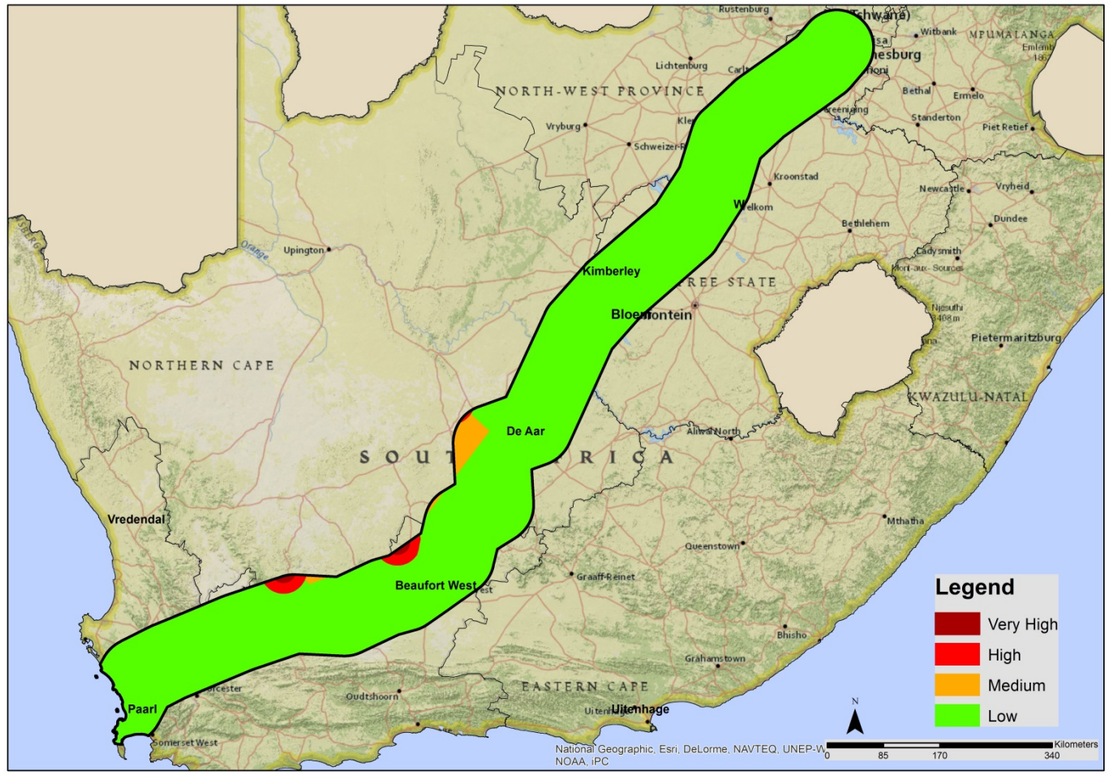
Map 5: SKA sensitivity map for power line infrastructure development in the International Corridor



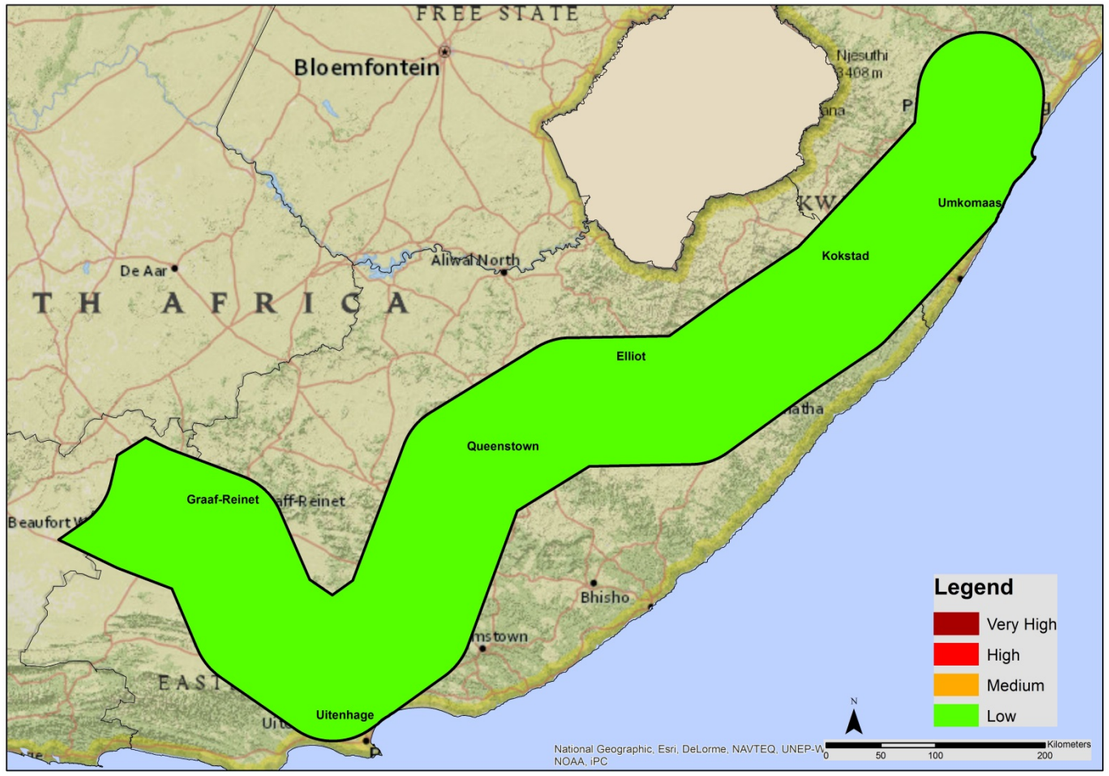
Map 6: SKA sensitivity map for substation infrastructure development in the International Corridor



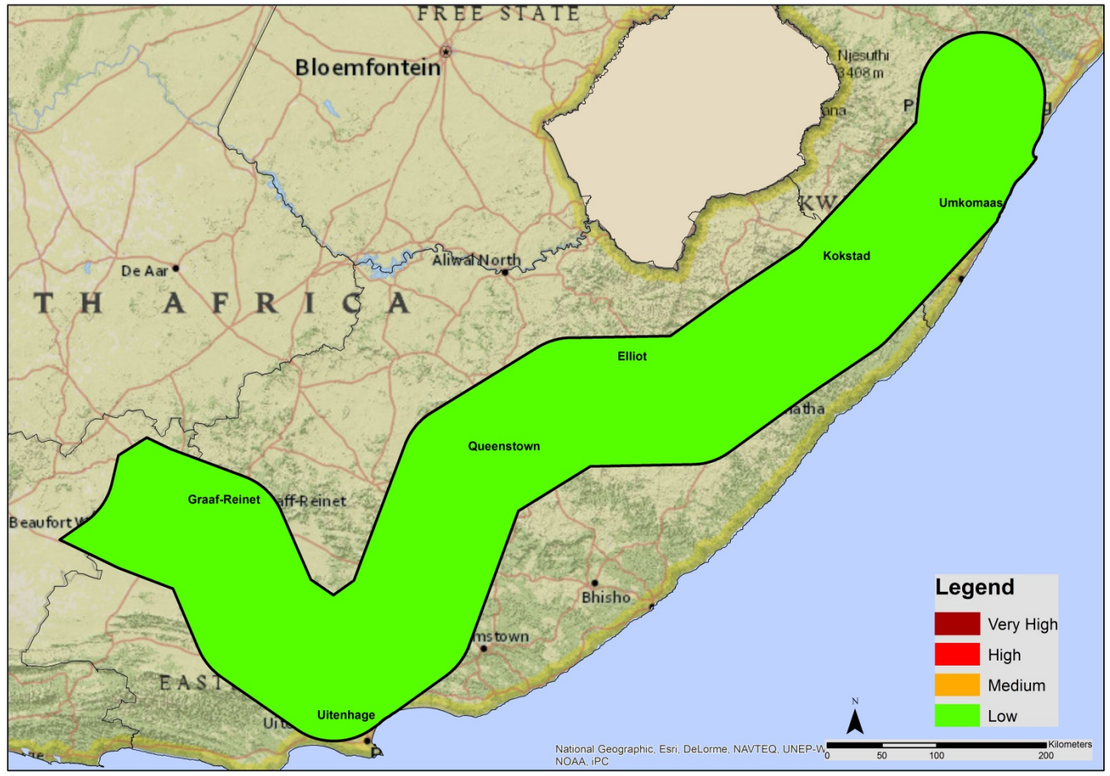
Map 7: SKA sensitivity map for power line infrastructure development in the Central Corridor



Map 8: SKA sensitivity map for substation infrastructure development in the Central Corridor



Map 9: SKA sensitivity map for power line infrastructure development in the Eastern Corridor



Map 10: SKA sensitivity map for substation infrastructure development in the Eastern Corridor

8.4 Development Protocol

The main objective of this Section is to clarify the different levels of sensitivity with respect to the potential impact of electricity grid infrastructure on the SKA project, and prescribe relevant assessment requirements. Sensitivity classes are interpreted and assessment requirements prescribed in Table 2. These requirements are specific to the sensitivity classes and are therefore related to the sensitivity maps in Section 8.3. These requirements will be applicable to developments proposed both inside and outside the Power Corridors as soon as these areas have been adopted.

Table 2: Interpretation SKA sensitivity maps and associated assessment requirements inside the Power Corridors

Sensitivity Class	Interpretation	Assessments at project level
Very High (dark red)	In very sensitive areas there is a high likelihood of significant negative impacts that cannot be mitigated. In-depth assessment of the potential impacts, and proof of efficacy of proposed mitigation measures, will be required before development can be considered in these areas. Following construction, proof of compliance with mitigation requirements will be required should the proposed development be considered favourably.	Proponents intending to develop and electricity grid infrastructure development that triggers an environmental assessment process in Very High to Medium sensitivity areas must prove to the relevant Competent Authority that the proposed development will not have an unacceptable negative impact on the SKA project. In order to do so, the proponent must request a comment from SKA South Africa confirming no unacceptable impact on components of the array. SKA South Africa will conduct a high level risk assessment on the proposed development, and will consider the following: • The potential Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) emitted by the electricity grid infrastructure development; • The size of the electricity grid infrastructure development; • The distance of the electricity grid infrastructure development from the radio site; • The elevation of electricity grid infrastructure development relevant to the radio site; and • Whether the electricity grid infrastructure development will be in line of sight of the receptors, or whether topographical shielding exists. Should SKA South Africa determine that an in-depth assessment is required, the proponent will be required to undertake, at own cost, the relevant assessments. These can be sub-contracted to relevant experts in the field, and will include: • Radio frequency measurements of operational facilities of equivalent electrical and structural design, to determine the RFI and EMI characteristic emissions profile; • Radio frequency propagation modelling between the proposed facility and the nearest SKA stations at risk; and • Any other studies that may be required and will be determined in consultation between the SKA project and the relevant proponent. The results of such an in-depth assessment shall be provided to the SKA South African for consideration. Based on the results of high level risk assessment and in-depth assessment (where required), SKA South African shall issue a comment in the form of a 'letter of objection' or 'letter of no objection' on whether the proposed development can proceed and whether any specific mitigation is required. Proponents must receive a 'letter of no objection' from SKA South Africa before submitting an application for environmental authorisation in terms of NEMA. The 'letter of no objection' shall be submitted together with the application for environmental authorisation. Any mitigation requirements stipulated by SKA South Africa in its comment will be included as a condition on the Environmental Authorisation (EA). Any mitigation measures recommended will be tested by SKA South Africa to ensure compliance following implementation, and the Environmental Authority responsible for the EA will be notified of the results of these tests.
High (red)	In high sensitivity areas there is potential for negative impacts that can potentially be mitigated. In-depth assessment of the potential impacts and proven mitigation measures will be required before development can be considered in these areas. Following construction, proof of compliance with mitigation requirements will be required, should the proposed development be considered favourably.	
Medium (orange)	In medium sensitivity areas there is a low potential for negative impacts, and if there are impacts there is a high likelihood of mitigation. Further high level risk assessment of the potential impacts is required. An in-depth assessment may be required, if found necessary through the high level risk assessment.	
Low (green)	No expected impacts.	No assessment or authorisation for electricity grid infrastructure development in terms of the SKA project is required if the proposed development is not within the sensitive distances from radio sites. SKA South Africa must, however, be notified as an Interest and Affected Party if the development is located within the Northern Cape Province.

PART 3

Chapter 9. SOCIO-ECONOMICS

CONTENTS

TABLES

MAPS

CHAPTER 9. SOCIO-ECONOMICS

9.1 Introduction

The following section is informed by the scoping level socio-economic specialist pre-assessment of the five Power Corridors for which the complete report is provided in Appendix C. Due to the integrated and strategic nature of this strategic environmental assessment (SEA), and based on consultation with relevant government departments and other stakeholders, the final views presented in this section may differ from those contained in the specialist report.

Given the size of the assessment area, the objective of the socio-economic study was not to undertake extensive analysis of the social and economic environment but rather focus the assessment on examining a number of key issues concerning the adoption of the Power Corridors. In particular, the socio economic study concentrated on answering the following questions:

- What opportunities or challenges does the formal adoption of the Power Corridors, and associated regulatory changes to environmental processes with these areas, present to government and industry?
- What potential impact will the formal adoption of the Power Corridors have on land values in these areas?
- What potential impact will the formal adoption of the Power Corridors have on communities, in particular resettlement or displacement, to health and well-being?
- What public participation process should be followed and what key sectors of society should be consulted in advance of adopting the Power Corridors?

9.2 Socio economic characteristics of the Power Corridors

This section provides a brief description of socio-economic conditions in each of the five corridors. The purpose is a high level overview of the socio-economic characteristics of each Power Corridor in the context of electricity grid infrastructure. For each corridor, the following data and information are provided focusing on the local municipal scale and drawing primarily on the 2011 Census:

- Population numbers;
- Population growth (2001 to 2011);
- Population density;
- Unemployment levels;
- Electricity service provision levels; and
- Key towns and broad land uses.

Provincial averages for these data are also provided for comparative purposes.

9.2.1 Western Corridor

Summary census data and a list of key towns/cities in the Western Corridor moving from west to east are presented in Table 1. The corridor originates in the Saldanha area which is increasingly characterised by large scale industrial development associated with the Saldanha Industrial Development Zone. There is also significant interest in wind farm development in this area and along the West Coast. The corridor then moves through primarily agricultural areas interspersed with protected areas in the Ceres Valley, Sandveld and Cederberg before reaching Namaqualand known for its flower-based tourism. In the Northern Cape it moves through sparsely populated areas supporting agriculture focused on grazing with limited cultivation given the limited availability of water. Increasingly this area is also characterised by the development of solar photovoltaic energy generation facilities taking advantage of high levels or solar radiation.

Table 1: Summary of census data in the Western Corridor

Western Corridor - west to east						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percentage of households with electricity (2011)**	**Main towns/cities in the Western Corridor**
Western Cape	**5 822 734**	**2.5%**	**45.0**	**21.6%**	**93.4%**	
Saldanha Bay	**99 193**	3.5%	49.0	23.4%	97.0%	Saldanha
Bergrivier	61 897	2.9%	14.0	6.8%	94.9%	Velddrif
Cederberg	49 768	2.3%	6.0	10.5%	88.8%	Clanwilliam
Matzikama	67 147	2.1%	5.0	14.0%	88.7%	Vredendal
Northern Cape	**1 145 861**	**1.4%**	**3.1**	**27.4%**	**85.4%**	
Hantam	21 578	0.6%	1.0	11.8%	76.9%	Nieuwoudtville
Khai-Ma	12 465	0.8%	1.0	22.1%	89.6%	Pofadder
Kai !Garib	65 869	1.2%	2.0	10.0%	87.4%	Kenhardt
!Kheis	16 637	0.1%	1.0	28.0%	64.0%	Groblershoop

9.2.2 Northern Corridor

Census data and a list of key towns/cities in the Northern Corridor moving from west to east are summarised in Table 2. The corridor originates in the Northern Cape on the coast to the south of Port Nolloth, an area characterised by mining mostly for diamonds and some agriculture. It then moves through primarily agricultural areas interspersed with mining operations and increasingly solar photovoltaic power generation facilities particularly near Pofadder and Upington. It passes through the major iron ore mining areas around Sishen/Kathu before crossing into the agricultural areas of North-West province centred in and around Vryburg. Thereafter it reaches the wider Rustenburg area platinum belt and on to Gauteng.

Table 2: Summary of census data in the Northern Corridor

Northern Corridor - west to east						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percentage of households with electricity (2011)**	**Main towns/cities in the Northern Corridor**
Northern Cape	**1 145 861**	**1.4%**	**3.1**	**27.4%**	**85.4%**	
Richtersveld	11 982	1.7%	1.0	18.6%	96.0%	Port Nolloth
Nama Khoi	47 041	0.5%	3.0	22.9%	93.7%	Springbok
Khai-Ma	12 465	0.8%	1.0	22.1%	89.6%	Pofadder
Kai !Garib	65 869	1.2%	2.0	10.0%	87.4%	Kakamas
//Khara Hais	93 494	1.8%	4.0	22.1%	91.1%	Upington
!Kheis	16 637	0.1%	1.0	28.0%	64.0%	
Tsantsabane	35 093	2.6%	2.0	26.1%	83.5%	Postmasburg
Siyancuma	37 076	-0.6%	2.0	28.2%	82.2%	
Gamagara	41 617	5.8%	16.0	17.7%	87.9%	Dibeng
Ga-Segonyana	93 651	2.9%	21.0	33.7%	91.2%	Kuruman
Joe Morolong	89 530	-0.9%	4.0	38.6%	81.8%	
Kgatelopele	18 687	2.4%	8.0	22.3%	91.7%	Danielskuil
Dikgatlong	46 841	2.0%	6.0	39.7%	75.9%	
North West	**3 509 953**	**1.6%**	**33.5**	**31.5%**	**84.0%**	
Kagisano/Molopo	105 789	0.5%	4.0	30.2%	73.8%	
Greater Taung	177 642	-0.3%	32.0	49.8%	88.5%	Reivilo
Naledi	66 781	1.7%	10.0	26.1%	76.7%	Vryburg
Ratlou	107 339	0.1%	22.0	43.9%	83.7%	
Tswaing	124 218	0.8%	21.0	28.7%	73.7%	Ottosdal
Mafikeng	291 527	1.2%	79.0	35.7%	84.5%	Mmabatho
Ditsobotla	168 902	1.4%	26.0	28.3%	74.0%	Lichtenburg
City of Matlosana	398 676	1.0%	112.0	32.7%	90.3%	Hartbeesfontein
Ventersdorp	56 702	2.8%	15.0	27.0%	76.1%	Ventersdorp
Kgetlengrivier	51 049	3.4%	13.0	20.5%	78.0%	Koster
Rustenburg	549 575	3.5%	161.0	26.4%	83.0%	
Gauteng	**12 272 263**	**2.7%**	**675.1**	**26.3%**	**87.4%**	
Mogale City	362 422	2.0%	270.0	24.6%	85.9%	

9.2.3 International Corridor

Summary census data and a list of key towns/cities in the International Corridor moving from south to north are summarised on Table 3. The corridor originates in Gauteng going through areas of north east Mpumalanga dominated by maize production and other cultivation along with extensive coal mining centred around the Witbank area. Crossing into Limpopo, agriculture is the dominant land use with mining increasingly taking place. Particularly towards northern Limpopo, game farming and protected areas such as the Nzehelele Nature Reserve are more prevalent.

Table 3: Summary of census data in the International Corridor

International Corridor - North to South						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percentage of households with electricity (2011)**	**Main towns/cities in the International Corridor**
Gauteng	**12 272 263**	**2.7%**	**675.1**	**26.3%**	**87.4%**	
City of Tshwane	2 921 488	3.1%	464.0	24.2%	88.6%	Pretoria
Lesedi	99 520	3.3%	67.0	25.9%	89.9%	
Mpumalanga	**4 039 939**	**1.8%**	**52.8**	**31.6%**	**86.4%**	
Victor Khanye	75 452	2.9%	48.0	28.2%	84.9%	Delmas
Emalahleni	395 466	3.6%	148.0	27.3%	73.4%	Witbank
Thembisile	310 458	1.9%	130.0	37.0%	92.3%	Tweenfontein
Steve Tshwete	229 831	4.8%	58.0	19.7%	90.8%	Middleburg
Emakhazeni	47 216	0.9%	10.0	25.9%	83.6%	Stoffberg
Thaba Chweu	98 387	1.9%	17.0	20.5%	84.3%	
Limpopo	**5 404 868**	**0.8%**	**43.0**	**38.9%**	**87.3%**	
Elias Motsoaledi	249 363	1.2%	67.0	42.9%	91.1%	Groblersdal
Ephraim Mogale	123 648	0.2%	61.0	41.4%	89.6%	Marble Hall
Makhuduthamaga	274 358	0.5%	131.0	62.7%	90.4%	Ga-Marishane
Greater Tubatse	335 676	2.2%	73.0	50.3%	75.7%	
Fetakgomo	93 795	0.1%	85.0	58.9%	91.5%	
Lepele-Nkumpi	230 350	0.1%	67.0	48.1%	91.9%	Zebediela
Mookgopong	35 640	0.3%	6.0	23.5%	85.3%	Roedtan
Mogalakwena	307 682	0.3%	50.0	40.2%	91.8%	Mokopane
Aganang	131 164	-1.1%	70.0	50.4%	94.6%	
Polokwane	628 999	2.1%	167.0	32.4%	83.0%	Polokwane
Greater Tzaneen	390 095	0.4%	120.0	36.7%	86.2%	
Greater Letaba	212 701	-0.3%	112.0	40.3%	90.8%	
Molemole	108 321	-0.1%	32.0	42.7%	95.7%	Soekmekaar
Makhado	516 031	0.4%	62.0	36.7%	89.4%	Louis Trichardt
Blouberg	162 629	-0.5%	18.0	39.2%	88.0%	
Musina	68 359	5.5%	9.0	18.7%	76.4%	Musina

9.2.4 Central Corridor

Summary census data and a list of key towns/cities in the Central Corridor moving from south to north are summarised in Table 4. With respect to land use, the corridor originates in the City of Cape Town moving through the mixed high-value agriculture and protected areas of Stellenbosch and Drakenstein and on to the Karoo characterised by small livestock farming and increasingly solar photovoltaic power generation centred around towns such as De Aar. Crossing into the western Free State and passing through Kimberley it goes through agricultural, game farming and diamond mining areas. It also goes through agricultural and mining areas such as Klerksdorp in the North-West Province before entering Gauteng.

Table 4: Summary of census data in the Central Corridor

Central Corridor - south to north						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percnetage of households with electricity (2011)**	**Main towns/cities in the Central Corridor**
Western Cape	**5 822 734**	**2.5%**	**45**	**21.6%**	**93.4%**	
City of Cape Town	3 740 026	2.6%	1 530	23.9%	94.0%	Cape Town
Stellenbosch	155 733	2.7%	187	15.2%	92.9%	Franschhoek
Drakenstein	251 262	2.6%	163	17.6%	95.0%	Mbekweni
Swartland	113 762	4.6%	31	12.7%	97.8%	Moorreesburg
Saldanha Bay	99 193	3.5%	49	23.4%	97.0%	Saldanha
Bergrivier	61 897	2.9%	14	6.8%	94.9%	Porterville
Drakenstein	251 262	2.6%	163	17.6%	95.0%	Mbekweni
Breede Valley	166 825	1.3%	44	14.4%	88.3%	Worcester
Witzenberg	115 946	2.6%	11	7.6%	93.4%	Prince Alfred Hamlet
Langeberg	97 724	1.8%	22	11.3%	94.2%	
Prince Albert	13 136	2.2%	2	19.4%	86.4%	
Beaufort West	49 586	1.4%	2	25.5%	92.0%	Beaufort West
Northern Cape	**1 145 861**	**1.4%**	**3**	**27.4%**	**85.4%**	
Karoo Hoogland	12 588	1.8%	-	14.6%	64.9%	Sutherland
Ubuntu	18 601	1.3%	1	29.1%	84.8%	Ubuntu
Emthanjeni	42 356	1.7%	3	28.0%	92.6%	Britstown
Renosterberg	10 978	1.9%	2	26.8%	88.1%	Phillipstown
Thembelihle	15 701	0.8%	2	28.4%	75.2%	Hopetown
Siyancuma	37 076	-0.6%	2	28.2%	82.2%	
Sol Plaatjie	248 041	2.0%	79	31.9%	84.9%	Kimberley
Free State	**2 745 590**	**0.1%**	**21**	**32.6%**	**89.9%**	
Letsemeng	38 628	-1.0%	4	22.3%	92.8%	Jacobsdal
Tokologo	28 986	-1.1%	3	27.5%	84.2%	Boshof
Tswelopele	47 625	-1.2%	7	34.8%	91.9%	Bultfontein
Masilonyana	63 334	-0.2%	9	38.8%	93.2%	Masilonyana
Matjhabeng	406 461	0.0%	79	37.0%	91.1%	Welkom
Nala	81 220	-1.9%	20	35.9%	90.3%	Wesselsbron
Moqhaka	160 532	-0.5%	20	35.2%	93.3%	Vierfontein
Ngwathe	120 520	0.1%	17	35.2%	92.0%	Parys
Metsimaholo	149 108	2.5%	87	32.1%	86.4%	Vaalprk
North West	**3 509 953**	**1.6%**	**34**	**31.5%**	**84.0%**	
Maquassi Hills	77 794	1.2%	17	33.4%	82.8%	Maquassi
City of Matlosana	398 676	1.0%	112	32.7%	90.3%	Hartebeesfontein
Tlokwe City Council	162 762	2.4%	61	21.6%	90.5%	Potchefstroom
Ventersdorp	56 702	2.8%	15	27.0%	76.1%	Ventersdorp
Rustenburg	549 575	3.5%	161	26.4%	83.0%	

Central Corridor - south to north						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percnetage of households with electricity (2011)**	**Main towns/cities in the Central Corridor**
Madibeng	477 381	3.2%	124	30.4%	81.0%	Hartbeespoort
Gauteng	**12 272 263**	**2.7%**	**675**	**26.3%**	**87.4%**	
Merafong City	197 520	-0.6%	121	27.2%	82.8%	
Randfontein	149 286	1.5%	314	27.1%	84.5%	
Westonaria	111 767	0.2%	175	29.5%	64.3%	
Emfuleni	721 663	0.9%	747	34.7%	92.2%	
Midvaal	95 301	3.9%	55	18.8%	79.3%	
City of Johannesburg	4 434 827	3.2%	2 696	25.0%	90.8%	Johannesburg
Mogale City	362 422	2.0%	270	24.6%	85.9%	
City of Tshwane	2 921 488	3.1%	464	24.2%	88.6%	Pretoria
Ekurhuleni	3 178 470	2.5%	1 609	28.8%	82.2%	

9.2.5 Eastern Corridor

Summary census data and a list of key towns/cities in the Eastern Corridor moving from west to east are presented in Table 5. The corridor originates in the Beaufort West Municipality moving into the Karoo region of the Eastern Cape characterised by small livestock faming. It passes through towns such Graff-Reinet and Jansenville on its way to Nelson Mandela Bay. The area north of this towards Cradock is of particular importance for wind energy projects along with other parts of the Eastern Cape where wind potential is significant. The corridor includes protected areas such as the Greater Addo Elephant National Park and agricultural areas such as the Sunday's River Valley. Game farming and associated tourism are also relatively prominent in this wider area stretching roughly from north of Port Elizabeth to Queenstown. The corridor then moves through to the Transkei region of the Eastern Cape. The majority of the land in this area is communally owned and population densities are higher than other rural areas within the Eastern Cape Province. The land uses along the majority of the corridor in this area is communal farming, involving livestock and mostly dryland crops. The eastern section of the corridor is located in Kwa-Zulu Natal where land uses along the majority of the route are linked to commercial farming, specifically sugar cane and fruit farming. The south coast of Kwa-Zulu Natal is also an important tourist destination.

Table 5: Summary of census data in the Eastern Corridor

Eastern Corridor - west to east						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percnetage of households with electricity (2011)**	**Main towns/cities in the Eastern Corridor**
Western Cape	**5 822 734**	**2.5%**	**45.0**	**21.6%**	**93.4%**	
Beaufort West	49 586	1.4%	2.0	25.5%	92.0%	Murraysburg
Easten Cape	**6 562 053**	**0.0%**	**38.8**	**37.4%**	**75.0%**	
Camdeboo	50 993	1.1%	4.0	30.1%	94.1%	Graaf-Reinet
Blue Crane Route	36 002	0.2%	3.0	30.7%	86.9%	Somerset East
Ikwezi	10 537	0.2%	2.0	18.3%	88.5%	Jansenville
Baviaans	17 761	0.5%	2.0	29.4%	89.2%	Steytlerville
Sundays River Valley	54 504	2.2%	9.0	15.0%	79.8%	Kirkwood
Kouga	98 558	3.2%	37.0	21.5%	86.9%	Patensie
Nelson Mandela Bay	1 152 115	1.4%	588.0	36.6%	90.5%	Bethelsdorp
Makana	80 390	0.7%	18.0	32.5%	89.5%	Riebeeck East
Nkonkobe	127 115	-0.2%	35.0	48.1%	88.4%	Fort Beaufort
Nxuba	24 264	-0.2%	9.0	42.0%	92.2%	Bedford
Inxuba Yethemba	65 560	0.8%	6.0	25.7%	95.6%	Cradock
Tsolwana	33 281	0.2%	5.0	38.2%	88.0%	Tarkastad
Inkwanca	21 971	0.8%	6.0	39.3%	91.7%	Sterkstroom
Lukanji	190 723	0.5%	50.0	36.8%	90.9%	Queenstown
Intsika Yethu	145 372	-0.6%	54.0	46.6%	71.0%	Confimvaba
Emalahleni	119 460	-0.2%	35.0	46.3%	78.5%	Lady Frere
Maletswai	43 800	1.6%	10.0	26.7%	84.2%	
Senqu	134 150	-0.1%	18.0	35.5%	81.1%	Barkly East
Sakhisizwe	63 582	-0.4%	27.0	38.8%	79.1%	Elliot
Engcobo	155 513	-0.4%	63.0	45.7%	50.9%	
Mbhashe	254 909	-0.4%	80.0	42.4%	49.7%	
King Sabata Dalindyebo	451 710	0.8%	149.0	38.3%	73.3%	Umtata
Nyandeni	290 390	0.6%	117.0	44.8%	71.0%	Libonde
Mhlontlo	188 226	-0.8%	67.0	48.9%	72.6%	
Elundini	138 141	0.1%	27.0	44.4%	46.3%	Maclear
Umzimvubu	191 620	-0.6%	74.0	45.9%	45.2%	Mount Ayliff
Ntabankulu	123 976	-0.6%	90.0	50.6%	23.3%	Tabankulu
Ngquza Hill	72 190	-1.5%	32.0	52.8%	91.4%	Flagstaff
Mbizana	281 905	1.4%	117.0	43.6%	60.0%	Bizana
KwaZulu-Natal	**10 267 300**	**0.7%**	**108.8**	**33.0%**	**77.9%**	
Greater Kokstad	65 981	1.6%	25.0	28.9%	80.7%	Kokstad
UMuziwabantu	96 556	0.5%	89.0	33.0%	80.3%	Harding

Eastern Corridor - west to east						
Province / local Municipality	**Total population (2011)**	**Annual population growth rate (2001 to 2011)**	**Population density 2011 (people /km^2)**	**Unemployment rate (2011)**	**Percnetage of households with electricity (2011)**	**Main towns/cities in the Eastern Corridor**
Ezingoleni	52 540	-0.4%	81.0	41.6%	79.9%	Kwamshiwa
Umzumbe	160 975	-1.9%	128.0	51.9%	49.0%	
Umzimkhulu	180 302	0.3%	74.0	46.6%	64.5%	Umzimkhulu
Ingwe	100 548	-0.7%	51.0	39.3%	49.9%	Donnybrook
Ubuhlebezwe	101 691	0.0%	63.0	34.0%	53.9%	Ixopo
Vulamehlo	77 403	-0.7%	81.0	52.6%	36.9%	
Umdoni	78 875	2.4%	314.0	33.3%	76.3%	Umzinto
Ethekwini	3 442 361	1.1%	1 502.0	30.2%	89.9%	Durban
Mkhambathini	63 142	0.7%	71.0	26.8%	65.2%	Camperdown
Richmond	65 793	0.4%	52.0	26.3%	81.5%	Richmond
The Msunduzi	618 536	1.1%	976.0	33.0%	91.9%	Pietermaritzburg
uMngeni	92 710	2.3%	59.0	23.9%	85.5%	Howick
Mpofana	38 103	0.3%	21.0	23.9%	71.9%	
uMshwathi	106 374	-0.2%	59.0	24.9%	72.7%	Mpoleni
Ethekwini	3 442 361	1.1%	1 502.0	30.2%	89.9%	Durban
Ndwedwe	140 820	-0.3%	129.0	48.7%	37.3%	
Maphumulo	96 724	-2.2%	108.0	49.0%	33.7%	
Umvoti	103 093	1.1%	41.0	30.4%	58.3%	Greytown

9.3 Assessment of impacts

This section focuses on the assessment of the key potential socio-economic impacts resulting from the declaration of Power Corridors including:

1. Strategic development considerations;
2. Impacts on key economic sectors including:[1]
    a. Electricity generators (incl. Independent Power Producers);
    b. Industry with a focus on energy intensive industries;
    c. Agriculture;
    d. Tourism and eco-tourism in particular;
3. Impacts on property values;
4. Resettlement and relocation impacts;
5. Impacts associated with the presence of electricity grid development project workers and operations; and
6. Health impacts focusing on those associated with electro-magnetic fields (EMFs).

[1] Note that impacts on agriculture are dealt with in the agricultural specialist assessment.

Each assessment section starts by briefly considering the potential impacts associated with electricity grid infrastructure in general (i.e. what kinds of socio-economic impacts are generally to be found when assessing electricity grid infrastructure projects such as transmission lines). The focus then shifts to the key purpose of the study, namely the assessment of impacts that are specific to the declaration of corridors and ways to mitigate these impacts.

9.3.1 Strategic development considerations

The declaration of Power Corridors and associated changes to the environmental authorisation process will hold key advantages at a strategic level focused on: (1) streamlining; and (2) the provision of greater certainty or clarity regarding the future roll-out of electricity grid development:

9.3.1.1 Streamlining

The streamlining of the environmental assessment procedure in the Power Corridors should bring significant economic advantages. For example, the majority of developments driving the economy (e.g. new industrial plants or generation facilities) are planned and executed within three to four years. This timeframe is incompatible with the seven to ten year timeframe for major power line projects to achieve all the necessary authorisations and necessary negotiation before construction can commence. By reducing the environmental authorisation process and by enabling pre-negotiations of servitudes on the basis of the SEA mapping outputs, it will be possible to substantially reduce the timeframes for grid development in the Power Corridors. This would introduce significant efficiencies such as:

- Reducing the risk of projects delays due to extended grid connection timeframes
- Enabling the system to bring new power into the grid efficiently and as soon as this power is available;
- Shortening the authorisation processes and, importantly, making the process predictably shorter allows for substantially more efficient budgeting and associated financing. This, in turn, will reduce the overall costs of electricity provision; and
- Assist with the more accurate projection of probable revenue flows from electricity sales

9.3.1.2 Enhanced certainty

It is important to bear in mind that the corridor are those areas where there is a high likelihood that transmission lines will be necessary in the future regardless of whether corridors are declared or not. This is due to their position relative to future electricity generation and demand areas. The declaration of the corridors therefore provides greater certainty and forewarning of an outcome that is most likely to happen anyway.

Land use and sector planners would benefit from knowing that certain areas are more likely to be locations for grid development. Greater certainty will be provided from an environmental perspective thereby enabling grid developers to start making strategic upfront investment within the Power Corridors, particularly in low sensitivity areas. Enhanced certainty will be provided to electricity generators and large scale users of energy in particular with respect to how grid developers and the government intends unlocking the Power Corridors and areas surrounding them. The declaration of the Power Corridors will demonstrate a commitment to prioritising grid expansion in these areas and therefore facilitate/accommodate investment. Gazetting the corridors will also provide comfort to grid developers regarding the government's commitment to unlocking these areas in accordance with Strategic Integrated Project 10. This in turn should allow grid developers to present a stronger business case to the National Energy Regulator of South Africa (NERSA) when applying for funding for grid expansion inside of the Power Corridors.

Greater certainty should also foster enhanced electricity market development. For example, if an electricity generator/grid developer has power available and needs transmission infrastructure to conclude a deal for delivery of electricity by a specific date, they need to be sure that they can indeed deliver by this date. Currently such deals are hampered as power developers are essentially not often in a position to make firm commitments. Aside from being detrimental to the achievement of development goals, this puts power developers at a disadvantage in terms of financing. For instance, in such a situation, grid developers cannot explore options such as raising finance for grid expansion from consumers thereby essentially pre-financing projects and reducing its own need to raise capital.

9.3.2 Impacts on key economic sectors

The strategic benefits of streamlining and greater certainty would differ between economic sectors. This section focuses on impacts on electricity generators (incl. IPPs), industry and mining and tourism.

9.3.2.1 Electricity generators and energy consuming industry

Electricity grid infrastructure is required to provide grid access to electricity generators so that the energy they generate can reach users. For this reason, planning around the likely probable location of these generators is a key input to Eskom's transmission network planning processes. This includes planning for generation plants of all types and sizes. It also encompasses independent power producers (IPPs) which have rapidly become a key source of demand for grid access particularly for renewable energy projects. As noted in the latest Eskom Transmission Development Plan, the establishment of large-scale renewable energy generation is becoming a primary driver of network development particularly in the Western, Eastern and Northern Cape provinces (Eskom, 2014).

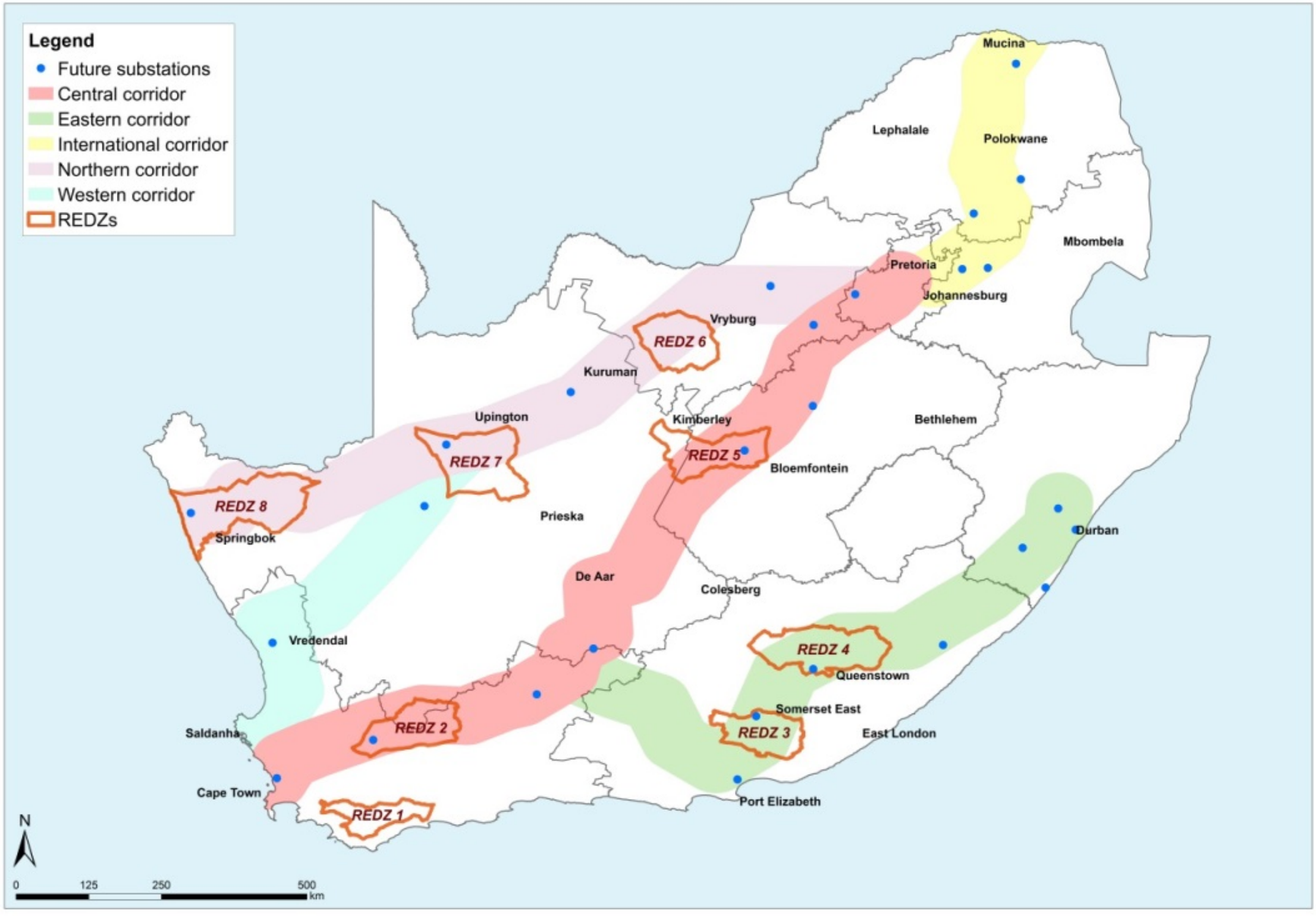
The installation of electricity grid infrastructure is a basic requirement in being able to supply industry and mining with the power needed to run their operations. This is true of practically all industries and all the more so for large energy-intensive users. Current national industrial policy, for example, places significant emphasis on the beneficiation of minerals. In most instances, this requires significant quantities of electricity often in relatively remote mining areas. Electricity grid infrastructure is thus essentially a pre-condition to the development of industry and mining.

The establishment and promotion of Special Economic Zones (SEZs) are at the centre of national industrial policy. These Zones include the existing Industrial Development Zones (IDZs) at Coega, East London, Richard's Bay and Saldanha along with ten proposed SEZs. The SEZs are spread throughout the country and would be well-served and facilitated by the planned Power Corridors which generally run through or nearby them.

The key benefits to both generators and bulk energy consuming industries from the declaration of Power Corridors would come in the form of: (1) authorisation process streamlining; and associated with this, (2) the provision of greater certainty or clarity regarding the future roll-out of electricity grid infrastructure. For power generators and consumers this would hold advantages in terms of:

- Facilitating improved planning which includes better information on the broad areas where future electricity grid development is likely to be located. This information should play a key role in informing future investments and allowing them to be made with a greater degree of confidence.
- Enhanced dealings with Eskom which will be able to respond to grid access requests in a more timely and predictable manner.
- Streamlining of environmental authorization processes for the IPPs themselves who may also opt to build their own transmission infrastructure to connect to the established Eskom infrastructure.

These advantages will result in time and associated cost savings for generators and industry which can then be passed on to users thereby benefiting the economy. They should also hold advantages for the overall development of the IPP market through the creation of greater certainty and predictability regarding grid access. Note that the rapid development of renewable energy generation over the last few years has led to miss-matches between where developers wanted to establish generation projects and grid access opportunities. While there are still challenges in this regard, the imminent establishment of Renewable Energy Development Zones (REDZs) should result in improved predictability. The location of the REDZs has been a key informant of the drawing up of the Power Corridor (Refer to Map 1). The Power Corridors should thus facilitate improved grid access for them. Furthermore, the location of the corridors has been informed by industrial policy such as the location of the SEZs along with key mining areas. This should ensure that their facilitating role in encouraging the expansion of industry and mining is maximised.



Map 1: Power corridors overlapping the proposed Renewable Energy Development Zones (REDZs)

9.3.2.2 Tourism

Electricity provision and all elements required to deliver electricity, play a pivotal role in overall socio-economic development. This includes the development of the tourism sector where a reliable supply of on-grid electricity is arguably a prerequisite for the establishment of most lodges and other tourism facilities and services. The provision of grid infrastructure therefore has a significant overall positive impact on the sector. This needs to be borne in mind, but is not elaborated on further here as the focus of the SEA process is the limitation of risks from electricity grid development particularly at a local scale.

Grid infrastructure has been found to entail risks for tourism where visual quality and natural landscapes with minimal signs of man-made structures are a key attraction. This tends to be the case in relatively unspoilt areas and particularly those containing land uses such as protected areas and game farms.[2] Such areas can be found in all of the five Power corridors. There are, however, certain areas where tourism is relatively more prominent and potentially sensitive. Such areas are broadly identified in the table below for each corridor.

The declaration of corridors would provide some level of increased certainty to the tourism sector regarding the broad areas (i.e. 100 km corridors) where future major transmission lines and other electricity grid development are likely to be constructed. Importantly, it would also provide guidance regarding particularly sensitive areas within the corridors which are likely to be avoided by future electricity grid development projects making them potentially more suitable for tourism. This should facilitate better informed planning by those in the sector when compared to the status quo (bearing in mind that transmission lines would have probably been established in the corridor areas anyway just without the benefit of the forewarning provided by corridor declaration). Tourism establishments inside the corridors wishing to expand should be in a better position to understand where risks may be introduced by transmission lines. Similarly, those wishing to invest in new tourism ventures would be able to consider their options with a fuller set of information.

Enhanced information for planning should be positive for the tourism sector as a whole. However, at a local scale, the reaction of those in the tourism industry to this information may be an avoidance of expansion or new investment in corridor areas. It stands to reason that risk-averse investors in particular may try to avoid corridor areas where possible. The probable level of this risk is difficult to anticipate. Generous corridor widths of 100 km should limit risks. Nevertheless, there are likely to be instances where the risk of investor avoidance of areas could be higher.

9.3.3 Impact on property values

Grid infrastructure has the potential to impact negatively on property values primarily through the visual impacts that are often associated with sub-stations and transmission lines. Health concerns and disruption of activities such as farming or recreation can also play a role. With this in mind, the international literature on this topic was reviewed. References to the literature can be found on the full socio-economic assessment specialist report in Appendix C: *Socio-economic assessment.*

In summary, property value risks associated with transmission lines have been found to be highly case specific and variable. In general, they tend to be higher in residential and rural areas where visual quality and natural landscapes with minimal signs of man-made structures are a key attraction.[3] Such areas tend to be more remote and tend to contain higher concentrations of land uses, such as protected areas and game farms. They can be found in all of the five Power corridors and are consequently not singled out here.

The declaration of corridors in areas which are the mostly probable locations for transmission lines, as with the tourism industry, would essentially assist the property market to function more efficiently by providing information to market participants that is pertinent to their property purchasing decisions. Without the declaration of corridors, it is likely that the majority of buyers would not have the benefit of the enhanced or fuller information that the declaration would offer.

While a better functioning property market is a positive, declaration is also likely to result in risks to existing property owners in the corridors. In particular, buyers looking for properties with high visual aesthetic values may seek to avoid the corridor areas if possible. The most obvious buyer categories among this group would be those involved in eco-tourism or those who place a premium on the leisure or lifestyle offering associated with properties. Those seeking properties for purely agricultural purposes may place less emphasis on aesthetic values. However, they are unlikely to totally ignore aesthetic considerations entirely even if this is not their focus as they will be aware that future buyers may be looking for aesthetic values. In addition, they may want to avoid the risks of potential disruptions of agricultural activities even if these may be relatively minor particularly on larger properties.

Having established that there may be risks, it is extremely difficult to come to an overall conclusion regarding the actual level of risk. The width of the corridors should, however, ensure that risks are kept low. At 100 km wide, they provide significant scope to accommodate alternative transmission line routes which would mean that it would be difficult to see significant concern being associated with corridor properties in general. Nevertheless, there are likely to be instances where risks could be higher. This would include parts of the corridors where sensitivity mapping leaves a substantially smaller area through which transmission lines could possibly go (i.e. 'pinch-points' and similar areas). Particularly in the eyes of buyers, this would mean that the likelihood of transmission lines going through properties in these narrow areas would increase, perhaps significantly. Buyers are then likely to be particularly careful when considering such areas.

9.3.3.1 Management and mitigation

As in the case of tourism impacts, mitigating property value impacts should focus on the limitation of visual and ecological impacts along with other potentially relevant impacts such as those of a social or heritage nature which may play a role in affecting property values. The relevant specialist inputs provide more details in this regard.

The servitude negotiation process and, in particular, the amounts paid to property owners also plays a key role in mitigation. If these are fair and truly reflect all value losses and risks associated with accommodating grid infrastructure, then one would expect less opposition to projects of this nature from land owners including those owning land adjacent to the site. Here, the contrast with the situation for renewable energy is instructive. Properties with potential for the establishment of future renewable energy projects tend to increase in value (aside from areas with particularly high aesthetic quality or with significant ecotourism that would derive higher value from excluding renewable energy projects). These increases can be linked to anticipation of the potentially generous payments offered by Independent Power Producers (IPPs).[4] Transmission line servitude payments, on the other hand, are seldom viewed as generous and seem significantly more likely to be viewed as inadequate by land owners.[5] Anticipation of low payments can then contribute to property value risks. Better servitude payments are therefore a potential mitigation measure if the goal is to reduce value losses specifically for owners of sites. They do not, however, currently offer a remedy for those owning land adjacent to or nearby a site. Under South African law, those acquiring servitudes such as Eskom, SANRAL, Transnet and others are

[2] In this sense, transmission lines entail similar tourism risks to those that are associated with other structures that can have high visual impacts such as wind turbines (see GCU, 2008).

[3] In this sense, transmission lines entail similar property value risks to those that are associated with other structures that can have high visual impacts such as wind turbines (see Hoen *et al*., 2013; Gibbons, 2014; CEBR, 2014 and Lang & Opaluch, 2013 for recent research on this topic).

[4] The potential for increases in property values within the proposed Renewable Energy Development Zones (REDZs) points to this anticipation of potential offers from IPPs in these areas as discussed in DEA (2015).

[5] Note that this situation where renewable energy producers are generally welcomed by land owner while transmission line developers are not also seem to prevail in the United States for similar reasons (see Fahey, 2010).

not required to compensate neighbouring property owners for potential value losses. This essentially places a limit on achieving full compensation for property value decreases for a number of different infrastructure project types including electricity grid development, roads, railways, wind farms, etc.

With regard to the corridor declaration process, a key need of property owners and property market participants will be access to timely and accurate information about potential development within the corridors and how the declaration of corridors will affect them. A fine balance will need to be struck between the provision of information that is accurate and useful to property market participants and providing information that misinforms and has the potential to raise unnecessary alarm. Eskom should therefore engage with the relevant representative bodies with a view to drawing up an appropriate and clearly understandable information package and dissemination plan in this regard. Engagement can start with the South African Property Owners Association (SAPOA) who may suggest other bodies which would constitute interested and affected parties.

9.3.4 Resettlement and relocation/displacement impacts

The establishment of transmission lines has the potential to result in involuntary resettlement or relocation. If the resettlement is not properly planned or managed, it can impact on people's lives and result in long-term hardships. Resettlement in rural areas and small villages is usually as a result of the loss of houses and farmland. The loss of access to farmland and other resources, such as rivers, springs and forests, can also impact on communities that rely on these natural resources for their livelihoods. One of the key challenges facing resettlement in rural areas is linked to the restoration of livelihoods based on land and access to resources

Given the width of the Power Corridors (100 km) it is likely that a suitable sub-corridor (500 m wide) can be identified that avoids and/or minimises the impacts associated with involuntary resettlement. The potential impacts are likely to be limited to directly affected households as opposed to villages and/or larger communities. The need to relocate entire villages or communities is therefore highly unlikely. This applies to each of the five corridors. This will in turn influence the scale and level of detail required in preparing the Resettlement Action Plan.

9.3.5 Impacts associated with project workers/workforce

The potential impacts associated with the presence of project workers apply to both the construction and operational phases of transmission lines. The impacts associated with the operational phase are linked to activities of repair and maintenance crews and firefighters.

Given the nature of the work associated with the establishment of linear transmission lines, the construction activities will not be confined to a single area. In addition, the size of the work force is likely to be relatively small compared with large civil engineering construction projects. The potential social impacts associated with the presence of construction workers is therefore likely to be limited and can be managed through the implementation of effective management and mitigation measures and a well-constructed EMPr. This applies to each of the five corridors.

The potential social impacts associated with the influx of job seekers are not regarded as a key social issue, and as such are not discussed further.

9.3.6 Health impacts focused on electro-magnetic fields

The findings of the WHO study indicate that, based on the available evidence, there are no health consequences associated with the exposure to low level electromagnetic fields. However, the study did find that gaps in knowledge about biological effects exist and need further research. The study also found that the exposure of people living in the vicinity of high voltage power lines differs very little from the average exposure in the population. The potential health related risks associated with the establishment of high voltage transmission lines is therefore not regarded as a key social issue. Despite this, efforts should be made to ensure that transmission lines are not located within close proximity to dwellings and settlements.

Given the width of the Power Corridors (100 km), it is likely that a suitable sub-corridor (500 m wide) can be identified that enables adequate buffer zones to be established between the servitude and potentially affected dwellings and settlements. The buffer distances should be informed by internationally accepted guidelines for buffers.

While the potential health related risks associated with the establishment of high voltage transmission lines are not regarded as a key social issue, additional care will need to be taken when siting transmission lines in the more densely developed and urbanised sections of the each of the five corridors.

9.3.7 Public Participation

A key consideration in terms of the SEA process is how to inform the public of the process and findings, specifically with regard to the identification and gazetting of the Power Corridors. The importance of public participation to the environmental assessment process is highlighted in the Public Participation Guideline, Public Participation in the Environmental Impact Assessment Process (Guideline 7), developed as part of the Integrated Environmental Management Guideline, published in terms of NEMA in *Government Gazette* No. 35769, 10 October, 2012.

The Guideline notes that public participation is the most important process in the environmental impact assessment, and one of the most important aspects of the environmental authorisation process (Section 2, The Importance of the Public Participation Process. It is considered so important that it is the only requirement for which exemption cannot be given. This is because people have a right to be informed about potential decisions that may affect them and to be afforded an opportunity to influence those decisions. Effective public participation also facilitates informed decision-making by the competent authority and may result in better decisions as the views of all parties are considered.

9.3.7.1 Public Participation: Declaration of the Power Corridors

The majority of people are not aware of and/or are not familiar with the gazetting process. In addition, the majority of people do not have access to and/or provided with information on what is being gazetted and how they can comment as part of the process. Given the importance of the Power Corridors and the public participation process, it is therefore critical that the public be made aware of the SEA and its objectives before the Power Corridors are gazetted. This will enable them to comment more effectively as part of the gazetting process. It will also support the public participation as set out in the Guideline for Public Participation in the Environmental Impact Assessment Process as listed above.

It is therefore recommended that the CSIR and Eskom develop and implement a public awareness programme aimed at informing the public and key stakeholders in advance of the gazetting process. The awareness programme should aim to inform the broader South African public and key stakeholders of the importance of expanding the country's electricity grid development and establishing the five identified Power Corridors. It should outline the following:

- The process followed by Eskom and the CSIR in identifying and selecting the five Power Corridors;
- The location, size (100 km wide) and extent of the five Power Corridors and the areas of South Africa that will be affected;
- The objectives of the SEA, specifically with reference to the Infrastructure Development Act No, 23 of 2014 and the streamlining of the Environmental Assessment Process (Basic Assessments versus Environmental Impact Assessments);
- The proposed Assessment Process that will be undertaken to identify suitable sub-corridors within each of the five Power Corridors;
- The gazetting process. This includes information on when the proposed Power Corridors will be gazetted, how the public can obtain copies of the *Government Gazette* and how the public can comment on the information contained in the Gazette;

- The public awareness programme should be implemented well in advance of the proposed date for gazetting.

The approach to the public awareness programme should include:

- Preparation of a Background Information Document (BID) that provides information on the Power Corridors (location etc.) and their strategic importance; the SEA process and key findings; the gazetting process and implications of gazetting the five Power Corridors in terms of the environmental authorisation process; and the proposed Assessment Process that will be undertaken to identify suitable sub-corridors within each of the five Power Corridors;
- Online access to the BID and submission of comments online.
- Placing advertisements in selected newspapers, including key local and national daily and weekly newspapers. The advertisements should include a map showing the location of the proposed Power Corridors, information on SEA and gazetting process and contact details for further information (website to download BID and related project information etc.). The newspaper advertisements should be run more than once to ensure that public and key stakeholders are afforded an opportunity to be made aware of the project and establishment of Power Corridors;
- Use of commercial and community radio stations to inform the public of the SEA and the Gazetting Process, key contact people and contact numbers etc. Large numbers of rural populations rely on local radio as a key source of information. This information is also provided in local languages which makes if more accessible. A list of South African stations can be found on: https://en.wikipedia.org/wiki/List_of_radio_stations_in_South_Africa
- Contacting Relevant Provincial, District and Local Municipalities. Copies of the BID should be sent to Relevant Provincial, District and Local Municipalities and they should be requested to inform local residents of the SEA and establishment of the Power Corridors;
- Identification of key stakeholders to be contacted and sent copies of the BID and other relevant project information. Due to the linear nature of the corridors it will not be possible to contact and or notify all of the affected landowners. The focus should therefore be on organisations and institutions that represent the interests of potentially affected landowners and affected stakeholders, such as:

  - Local Farmers Associations and Unions in each of the five Power Corridors;
  - Provincial Departments, such as Agriculture, Nature Conservation, Economic Development and Planning etc., in the Provinces affected by the five Power Corridors;
  - District and Local Municipalities located within the five Power Corridors. The information should be sent to the Municipal Manager and key departments, including Integrated Development Planning, Local Economic Development, Spatial Planning, etc.;
  - Tourism, Eco-Tourism and Heritage Organisations in the areas affected by the five Power Corridors;
  - Hunting Organisations in the areas affected by the five Power Corridors;
  - Conservation Organisations (Government and Private) in the areas affected by the five Power Corridors;
  - Non-Government Organisations, including WWF, WESSA, etc.

As indicated above, it is critical that the public awareness programme be implemented well in advance of the proposed date for Gazetting.

9.4 Conclusions and Recommendations

Given its critical importance to socio-economic development, it makes sense to plan ahead for electricity grid development and ensure that it can be delivered within a reasonable and predictable timeframe. The declaration of the proposed Power Corridors and associated changes to the environment authorisation process requirements would hold **key advantages at a strategic level** focused on (1) streamlining and (2) the provision of greater certainty or clarity regarding the future roll-out of electricity grid development. These advantages would facilitate improved planning and enhanced dealings with Eskom for the **power generation, industrial and mining sectors** in particular, resulting in cost savings and other efficiencies with economic benefits. The key requirements of these sectors will be access to timely and accurate information about intended development within the corridors and how the declaration of the corridors will affect them. Eskom should thus engage with the relevant representative bodies for these sectors with a view to drawing up an appropriate and clearly understandable information package and dissemination plan.

The declaration of corridors will provide some level of increased certainty to the **tourism sector** regarding the broad areas (i.e. 100 km corridors) where future major transmission lines and other electricity grid infrastructure are likely to be constructed. Importantly, it would also importantly provide guidance regarding particularly sensitive areas within the corridors which should be avoided by future electricity grid development projects making them potentially more suitable for tourism on balance. This should facilitate better informed planning by those in the sector. At a local scale, the reaction of those in the tourism industry may be to avoid expansion or new investment in corridor areas. Generous corridor widths of 100 km should limit risks. There may, however, be instances where the risk of investor avoidance of areas could be higher particularly in parts of the corridors where sensitivity mapping leaves a substantially smaller area through which transmission lines could possibly go (i.e. 'pinch-points' and similar areas). The avoidance of protected areas (including buffers and expansion areas), game farms, private nature reserves, visually sensitive areas and areas of high heritage and ecological value as per the sensitivity mapping exercise should assist with limiting tourism risks. Assessments of corridor areas as part of environmental authorisation processes for individual electricity grid development projects should, however, conduct more detailed assessments including ground truthing.

The declaration of corridors in areas which are the mostly likely locations for transmission lines in any event would essentially assist the **property market** to function more efficiently by providing information to market participants that is pertinent to their property purchasing and sale decisions. While a better functioning property market is a positive, the declaration is also likely to result in risks to existing property owners in the corridors. In particular, buyers looking for properties with high aesthetic values may seek to avoid the corridor areas if possible. The width of the corridors should, however, ensure that risk are kept low. At 100 km wide they provide significant scope to accommodate alternative transmission line routes which would mean that it would be difficult to see significant negative value being associated with corridor properties in general. Nevertheless, there are likely to be instances where risks could be higher including parts of the corridors where sensitivity mapping leaves a substantially smaller area through which transmission lines could possibly go (i.e. 'pinch-points' and similar areas). The potential for speculative buying to drive up demand for these parts cannot be entirely ruled out (i.e. people buying with the sole purpose of extracting a higher price from Eskom given their weaker bargaining position). However, such a strategy would entail significant risks with potentially limited rewards which most speculators should be aware of. Increased powers of land expropriation for strategically important projects as envisaged by the Land Expropriation Bill are also likely to discourage speculation.

The avoidance of protected areas, game farms, private nature reserves, visually sensitive areas, areas of high heritage and ecological value and areas of particularly high agricultural value as identified by the sensitivity mapping exercise should assist with limiting property value. In essence, better servitude payments for electricity grid development are also a key potential mitigation measure if the goal is to reduce property value losses for directly affected land owners, although this currently excludes neighbouring land owners. With regard to the corridor declaration process, the key need of property owners and property market participants will be access to timely and accurate information about potential development within the corridors and how the declaration of corridors will affect them. A fine balance will need to be struck between the provision of information that is accurate and useful to property market participants, and providing information that misinforms and has the potential to raise unnecessary alarm.

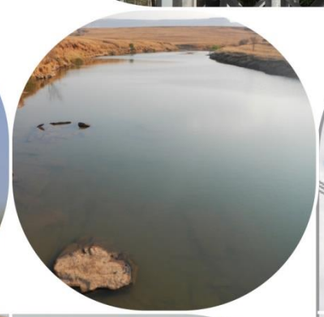
Accepted international best practice requires that **relocation and involuntary resettlement** in particular be avoided wherever possible or at least minimised. Given the width of the Power Corridors it is likely that suitable sub-corridors can be identified that avoid and or minimise the impacts associated with involuntary resettlement. The potential impacts are thus likely to be limited to directly affected households as opposed to villages and/or larger communities. The key mitigation measure therefore involves siting of transmission pylons so as avoid the need for resettlement. Where involuntary resettlement cannot be avoided, the relocation of affected households and/or compensation for economic displacement should be guided by international best practice which was used as the departure point for the formulation of Eskom's Procedure for the Management of Involuntary Resettlement and Relocation of Legal Occupiers on Affected Eskom Land.

The potential impacts associated with the **presence of project workers** apply to both the construction and operation phases of electricity grid development. While the presence of workers and job seekers does not in itself constitute a social impact, the manner in which construction workers conduct themselves can impact on local communities. The potential risk posed by the presence of workers will be linked to the size of the work force, the duration that they are on site and where they are accommodated. Given the nature of the work associated with the establishment of linear transmission lines, the construction activities will not be confined to a single area, as would be the case with the establishment of, for example, a new mine. In addition, the size of the work force is likely to be relatively small compared to those associated with large civil engineering construction projects. The potential social impacts associated with the presence of construction workers, are therefore likely to be limited and can be managed through the implementation of the management and mitigation measures listed in the report full specialist report in Appendix C.

Electro-magnetic fields (EMFs) are created with the generation and use of electricity. They are particularly strong beneath high voltage transmission lines sometimes resulting in health concerns among the public. However, based on a comprehensive World Health Organisation (WHO) study and other sources, no health consequences associated with the exposure to EMFs from transmission lines have been found. The potential health related risks associated with the establishment of high voltage transmission lines is therefore not regarded as a key social issue. Nevertheless, efforts should be made to ensure that transmission lines are not located within close proximity of dwellings and settlements and that people are discouraged from living underneath them, as is current Eskom practice.

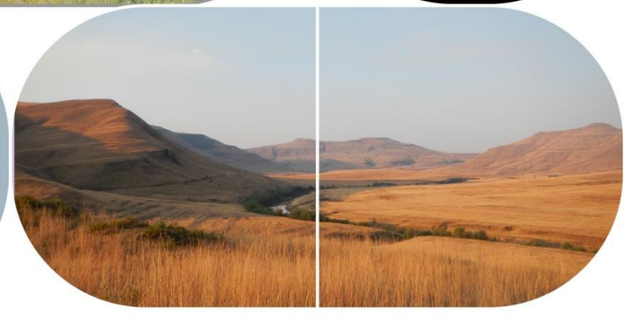
Given the importance of the Power Corridors and the need for **public participation**, it is critical that the public be made aware of the SEA and its objectives before the corridors are gazetted. It is therefore recommended that the CSIR and Eskom develop and implement a public awareness programme aimed at informing the public and key stakeholders in advance of the gazetting process. The approach to this programme should include:

- Preparation of a Background Information Document (BID) that provides information on the corridors and their strategic importance, the SEA process and key findings, the Gazetting Process and implications of gazetting the corridors in terms of the environmental authorisation process, and the proposed assessment process that will be undertaken to identify suitable sub-corridors within each of the five Power Corridors;
- Allowing for online access to the BID and placing advertisements in selected newspapers;
- Copies of the BID should be sent to Relevant Provincial, District and Local Municipalities and they should be requested to inform local residents of the SEA and establishment of the Power Corridors;
- Identification of key stakeholders to be contacted and sent copies of the BID and other relevant project information. Due to the linear nature of the corridors it will not be possible to contact and or notify all of the affected landowners. The focus should therefore be on the organisations and institutions listed in the report that represent the interests of potentially affected landowners and affected stakeholders.



PART 4

Procedure for Electricity Grid Infrastructure Environmental Assessment Applications Inside the Power Corridors



CONTENTS

FIGURES

MAPS

PART 4. PROCEDURE FOR ELECTRICITY GRID INFRASTRUCTURE ENVIRONMENTAL ASSESSMENT APPLICATIONS INSIDE THE POWER CORRIDORS

4.1 Introduction

The following part of the report describes how the work undertaken by the SEA intends to reduce the timeframes of the Environmental Impact Assessment process in terms of NEMA and facilitate alignment with the assessment processes of supporting legislation for electricity grid infrastructure projects. This includes an explanation of the roles of key stakeholders in streamlining and better coordinating environmental assessment procedures, whilst at the same time ensuring the maximum level of environmental protection is maintained through quality assessment processes and informed decision making.

4.2 Streamlined Basic Assessment Process

On the basis of the pre-assessment work undertaken for the SEA, listed activities linked to electricity grid infrastructure development inside the Power Corridors will require a Basic Assessment (BA) rather than an Environmental Impact Assessment (EIA). This will result in a reduced environmental assessment timeframe of 300 days to 197 days[1]. Furthermore, proposed electricity grid infrastructure inside of the Power Corridors will benefit from a reduced decision making timeframe of 50 days[2], further streamlining the Basic Assessment process to a maximum timeframe of 147 days. The timings of the existing EIA process and the proposed streamlined Basic Assessment process are illustrated in Figure 1 and Figure 2, respectively.

[1] Refers to total elapsed days rather than working days
[2] The Competent Authority in terms of NEMA is required to make a decision on an basic assessment application for environmental authorisation within 107 days of receipt of the basic assessment report and EMPR. In terms of Schedule 2 of the Infrastructure Development Act (Act No. 23 of 2014). Authorities are required to make a regulatory decision within 57 days for Strategic Integrated Projects. The Power Corridors will be gazetted under Strategic Integrated Project 10: *transmission and distribution for all*; and therefore all proposed electricity grid infrastructure projects located entirely within the adopted Power Corridors will be considered Strategic Integrated Projects and therefore benefit from a reduced authority decision making timeframe.

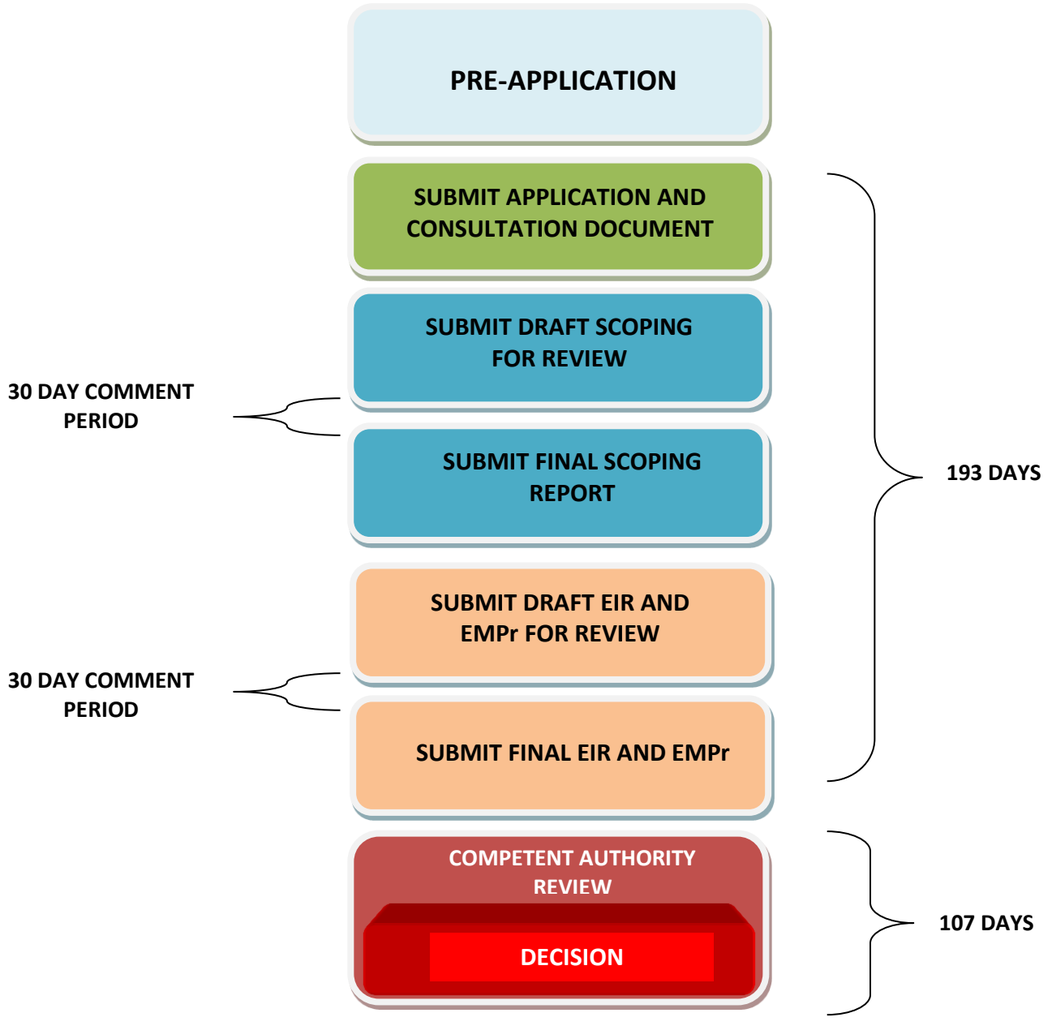


Figure 1: Current Environmental Impact Assessment process

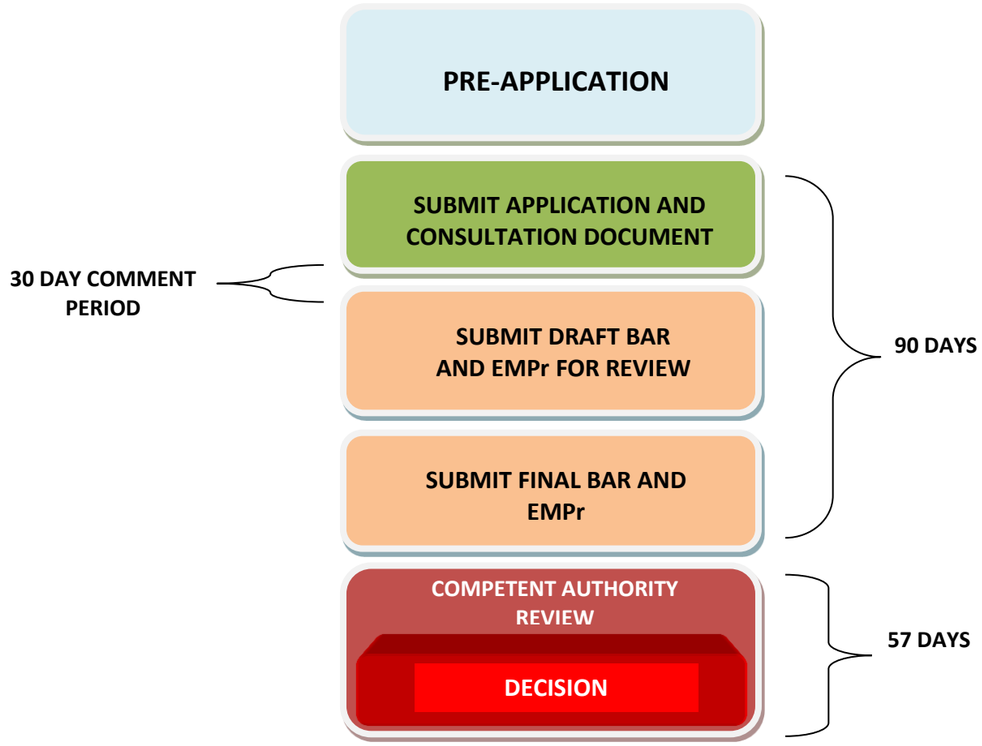


Figure 2: Streamlined Basic Assessment process

Further to the shortening of the Basic Assessment process, it is proposed that electricity grid infrastructure projects located inside the Power Corridors benefit from integrated assessment and decision making procedures. The integration of assessment procedures will enable, as far as practically possible, synchronisation between the Basic Assessment process in terms of NEMA and the authorisation requirements of other legislation applicable to electricity grid infrastructure projects. The Development Protocols introduced in Part 3 were developed in consultation with Commenting Authorities[3] and therefore reflect the assessment requirements needed to inform decision making by these authorities.

Compliance with these requirements will therefore ensure that, where relevant, the Commenting Authorities are provided with the necessary information in the required circumstances to make informed decisions regarding proposed electricity grid. infrastructure projects inside the Power Corridors. A simple description depicting how the streamlined Basic Assessment process is expected to serve as a framework for integrating the assessment requirements of other authorities is illustrated in Figure 3 below.

Proposed Power line Route within Power Corridor			
Legislation	EIA regulations specify the need for Environmental Authorisation in terms of NEMA	Other permitting, licensing and authorisation requirements mandated in terms of other legislation e.g. Water Use Authorisation in terms of the NWA	**Basic Assessment Process**
Assessment Requirements	Sensitivity maps and Development Protocols describe the specific assessment requirements of relevant competent authorities in terms of all relevant legislation		
Assessment	Assessment undertaken according to specific assessment requirements described in Development Protocols		
Outputs	Basic Assessment Report and EMPR submitted to competent authorities in terms of NEMA	Information requirements of all relevant Commenting Authorities submitted to relevant Commenting Authority for comment	
Decision Making	Environmental Authorisation (where appropriate) in terms of NEMA by Competent Authority	Comment (in the form of a legally binding decision) provided by all relevant Commenting Authorities within the timeframe of the Basic Assessment process	
Outcome	Integrated authorisation for multiple authorisations/licences and permits provided by Competent Authority in terms of NEMA		

Figure 3: Integration of assessment and decision making procedures of multiple authorities

[3] The *Competent Authority* referred to in the context of this report is the Competent Authority in terms of NEMA, and is likely to be either the national or provincial department responsible for environmental affairs. Competent Authorities responsible for other licensing/permitting processes directed by additional legislation e.g. Water Use Authorisation undertaken by DWS or a Catchment Management Agency in terms of the National Water Act No. 36 of 1998 is referred to as *Commenting Authorities*.

The shortened timeframe for assessment for projects of this nature means that a significant amount of work by the Environmental Assessment Practitioner (EAP) and project proponent will need to be undertaken in advance of submitting an application for environmental authorisation. The effective use of time at pre-application will therefore be critical to ensuring that adequate assessment of potential impacts as well as suitable opportunity for public comment is possible.

The following section outlines the proposed sequence of steps to be followed by key project stakeholders (including the developer, EAP, Competent Authority, Commenting Authorities) to ensure compliance with the timeframes of the streamlined Basic Assessment process.

4.3 Possible Procedure for Adapted Basic Assessment Applications

In order for an application for Environmental Authorisation to qualify for a streamlined Basic Assessment process, the electricity grid infrastructure project will need to satisfy all the following criteria in advance of submitting the application:

1. The proposed project (power line or substation) Development Envelope (explained further in Section 4.3.1) will need to be located entirely inside one or more Power Corridors;

2. Validated sensitivity maps will need to have been used to determine a preferred route for the power line or preferred location of the substation;

3. Approval from the relevant Competent Authorities or bodies mandated to deliberate on development proposals in the context of civil aviation, defence and Square Kilometer Array shall have been received by the proponent;

4. In the instance of a power line route, the preferred route will need to have been pre-negotiated with all landowners.

It will not be possible for an applicant to accomplish the above steps as well as fulfil the assessment requirements within the timeframe of the streamlined process. Therefore a significant amount of planning by the developer and pre-application work by the EAP will be necessary in advance of submitting the application for environmental authorisation. The assessment procedure proposed consists of four stages including two pre-application stages, namely 'Screening' phase and 'Specialist Inputs' phase and two post application stages, namely 'Basic Assessment' phase and 'Post Authorisation' phase.

The required steps to be completed by key stakeholders for a proposed power line project in the context of the four stages is described below.

4.3.1 Screening

The objective of this phase is to identify a pre-negotiated route which minimises impact to the environment through early consideration of the scoping level sensitivity maps (and additional validation where required) as well as satisfying the necessary technical and budgetary requirements of the developer.

1. The Developer shall access the sensitivity maps for the Power Corridors via the Department of Environmental Affairs on-line Screening Tool.

2. The Developer shall use the sensitivity maps to identify alternative (more than two) feasible sub-corridors[4] between the predefined start and end points of the proposed power line project. When identifying the alternative feasible sub-corridors, consideration should also be given to ensuring suitable flexibility within the sub-corridors to negotiate with landowners at all points along the length of the sub-corridors. A feasible corridor must meet the technical and budgetary requirements of the developers whilst seeking to minimise impact to the environment.

3. The Developer shall appoint an Environmental Assessment Practitioner (EAP). With the assistance of relevant competent specialists, the EAP shall validate the environmental sensitivities for all sub-corridor alternatives to confirm the presence, absence and level of sensitivity of attributed to environmental features. The level of validation for each environmental feature and aspect (i.e. avifauna, agriculture etc.) will be at the discretion of the various competent specialists involved.

4. Upon successful validation of the sub-corridors, the EAP shall run a public consultation process targeting, in particular, landowners located inside of the sub-corridors and immediately adjacent landowners.

5. On the basis of the validated environmental sensitivity maps and inputs received through the public consultation process, the EAP shall select the most feasible sub-corridor alternative.

6. The EAP and developer shall identify an optimally feasible route[5] (project footprint) considering environmental sensitivities and any project specific technical criteria as well as inputs provided through the consultation process.

7. The developer shall negotiate servitudes with landowners along the preferred route and obtain 'in principle agreements' on condition of environmental authorisation.

8. On successful negotiation of the route, the EAP is to produce a line or substation profile illustrating the project footprint in the context of the Development Envelope[6] and overlaid on a validated environmental sensitivity map.

9. The EAP/developer is to obtain the necessary development approvals from relevant Competent Authorities responsible for aspects falling outside of the mandate of the Competent Authority in terms of NEMA.

[4] A sub-corridor is a smaller corridor within the larger Power Corridor(s) within which the route will be located. Given the resolution of the datasets used to develop the sensitivity maps, the width of a sub-corridor shall be >500 m in width at all points along the sub-corridor for infrastructure <132 kV and >1 km for infrastructure >132 kV. When selecting the width of the –sub-corridor, the developer and EAP must ensure flexibility to negotiate with multiple landowners exists along the stretch of the sub-corridor. Furthermore, the developer and EAP shall avoid, where possible, the occurrence of Very High or High sensitivity pinch points at all sections along length of the sub-corridor.

[5] Project footprint in the context of power lines refers to the power line infrastructure and underlying servitude. In the context of substations it refers to the area occupied by the substation itself.

[6] In order to allow for minor changes to the project footprint (i.e. proposed project layout plan, route etc.) following authorisation, as is often found to be a technical requirement, it is necessary for the Competent Authority to approve a Development Envelope rather than only the physical project footprint. The area that needs to be assessed in detail during the project level impact assessment thus needs to include a 50 m buffer from the edge the project footprint. The assessment and approval of such a Development Envelope will allow for minor changes in the project layout without having to seek amendment or re-authorisation, provided that such a change in layout does not impinge on any additional sensitive areas identified in the envelope, or result in any increase in the significance ratings of impacts. It must be noted that the assessment of impacts related to a particular project is not limited to the development envelope; rather this area is assessed in more detail based on the assumption that the final physical footprint has the potential to be moved within this envelope

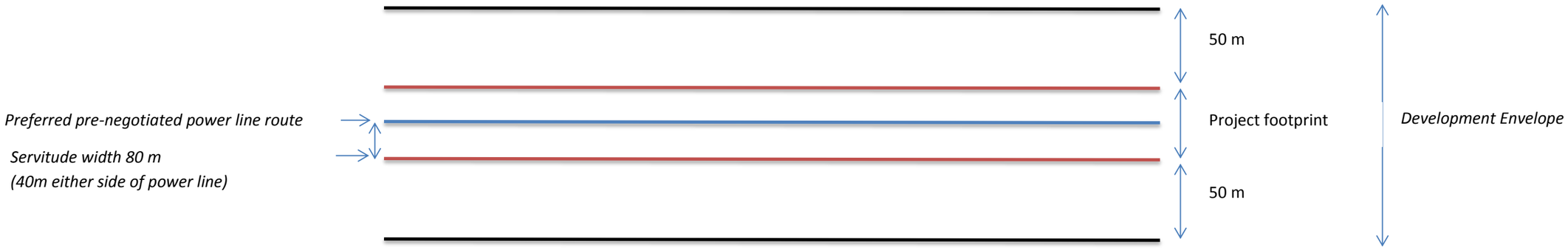


Figure 4: Route profile in in context of servitude and Development Envelope for typical 765kV power line

4.3.2 Specialist Inputs

The objective of this phase is for specialists to assess the development envelopment and determine potential impact and associated mitigation measures in accordance with the Development Protocols.

1. The EAP is to produce specialist Terms of Reference (ToR) for the Development Envelope based on the assessment requirements described in the Development Protocols and any additional inputs provided by the Commenting Authority.
2. The EAP is to commission specialist studies for the Development Envelope in line with the ToR.
3. Specialist to conduct specialist studies.
4. The EAP is to produce a Commenting Report (Draft BAR) and Draft EMPr[7].

4.3.3 Basic Assessment

This phase reflects the point from which an application for environmental authorisation is made by the proponent to the point at which a decision on the application is made by the Competent Authority in terms of NEMA.

1. The EAP shall submit an electricity gird infrastructure application for environmental authorisation via the Department of Environmental Affairs online application portal.
2. The following documentation shall be submitted by the EAP together with the application:
   - Commenting Report (draft BAR and draft EMPr)
   - Relevant authorisations from Commenting Authorities
   - Evidence of route pre-negotiation.
3. The Commenting Report and draft EMPr will thereafter be subject to a 30 day commenting period involving the public and all Organs of State. Any comments from Commenting Authorities shall be submitted during this period.
4. At the completion of the 30 day comment period, the EAP must consolidate comments and submit the Final BAR and EMPr to the Competent Authority in terms of NEMA.
5. The EAP shall update the Commenting report and draft EMPr and produce a Final Basic Assessment Report and EMPr.
6. Thereafter, the Competent Authority will be required to make a decision within 57 days from the end of the 90 day period on whether to award an environmental authorisation in terms of NEMA
7. In the instance where an environmental authorisation is issued, the authorisation will be awarded for the Development Envelope.

4.3.4 Post Authorisation

The objective of this phase is to assist with the micro-siting of tower positions and the identification of site specific mitigation measures to minimise impact during construction. Inputs from this phase will be used to update the construction EMPr.

1. The EAP and competent specialists shall walk the length of the proposed route and demarcate site specific sensitivities identified during the assessment e.g. 'no-go' areas for construction or sensitive vegetation requiring avoidance or transplanting. This information shall be used by the developer to inform micro siting of tower positions and final route profile.
2. Specialist are also required to determine site specific mitigation requirements in the context of the power line profile based on site walk through.
3. Developer to conduct geotechnical investigations to confirm suitability of subsurface for tower positions and excavation.
4. Developer to mark final tower positions.
5. EAP to update construction EMPr document with final route profile and site specific information (i.e. 'no go' areas, mitigation etc.) in the context of the route profile captured by specialists during the site walk through.
6. Requirements specified in construction EMPr shall be implemented by developer and contractors during the construction phase.

[7] The draft EMPr template in Part 5 of this report shall be utilised when developing the EMPr.

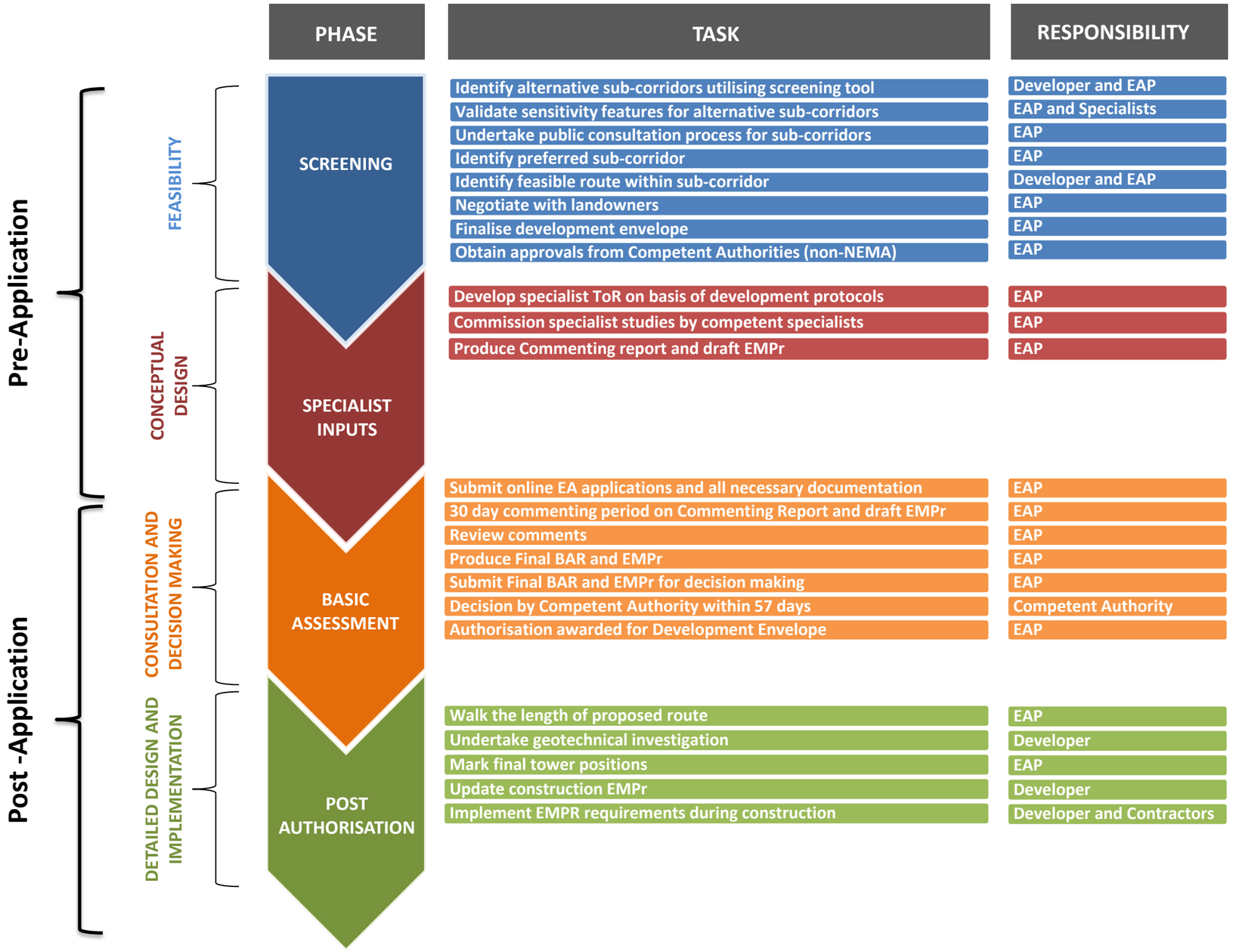


Figure 5: Process to be followed by developer, EAP and decision making authorities for a typical power line project in the Power Corridors in context of BA process

4.4 Key Learnings

- The ability to streamline assessment processes at a national scale on the basis of sensitivity mapping at a desktop level is dependent on the quality and availability of high resolution data. Appropriate consultation and agreement with a wide-range of stakeholders is required to source the required data. An evaluation of the confidence limits attributed to each dataset is also required. Where confidence limits for a particular aspect or area are low, the ability to inform decision making without the need to undertake validation (usually in the form of on-the-ground assessment) is therefore also low. Poor quality data or data voids is thus a significant limitation to streamlining assessment procedures.

- Key stakeholder agreement to the Development Protocols related to matters of water, agriculture, defence, heritage, etc. leads to some level of integration in the environmental assessment processes. However, the ability to create an integrative decision-making and authorisation framework involving the legislative mandates of other government bodies is limited unless a 'one-stop-approach' involving a centralised Competent Authority is adopted. This approach is challenging and difficult to implement as it requires government bodies to relinquish their mandates. Therefore, above anything, the mapping outputs and Development Protocols developed through the SEA for aspects not mandated by the Department of Environmental Affairs serve as an effective planning tool for proponents by enabling them to consider these aspects at the earliest stages of project planning and therefore avoid later problems in project development and implementation.

- Linear developments such as power lines may have a low impact on the environment at an individual point along the route, however accumulatively the power line can have a very high impact on the environment. Cost accounting in the form of least cost path analysis is therefore considered the most effective and accurate way to determine the individual impact of a line. It is recommended that the best way to assist with the selection of optimal sub-corridors, as described in Section 4.3.1, is to interpret the sensitivity maps as cost surfaces and identify the most appropriate sub-corridor using GIS-based least-cost path analysis. This approach can explicitly trade off financial costs and reduce the overall cumulative impact on sensitive features when planning sub-corridor options, as well as provide a quantifiable comparison of impacts for assessing alternatives. Recognising that the selection of an optimal sub-corridor cannot be based on the consideration of environmental sensitivities alone, it is proposed that the least cost path approach also caters for the technical requirements of the developer.

4.5 Way Forward

In February 2016, the Cabinet of the South African government made a decision to gazette the outcomes of the SEA for streamlining electricity grid infrastructure in the Power Corridors.

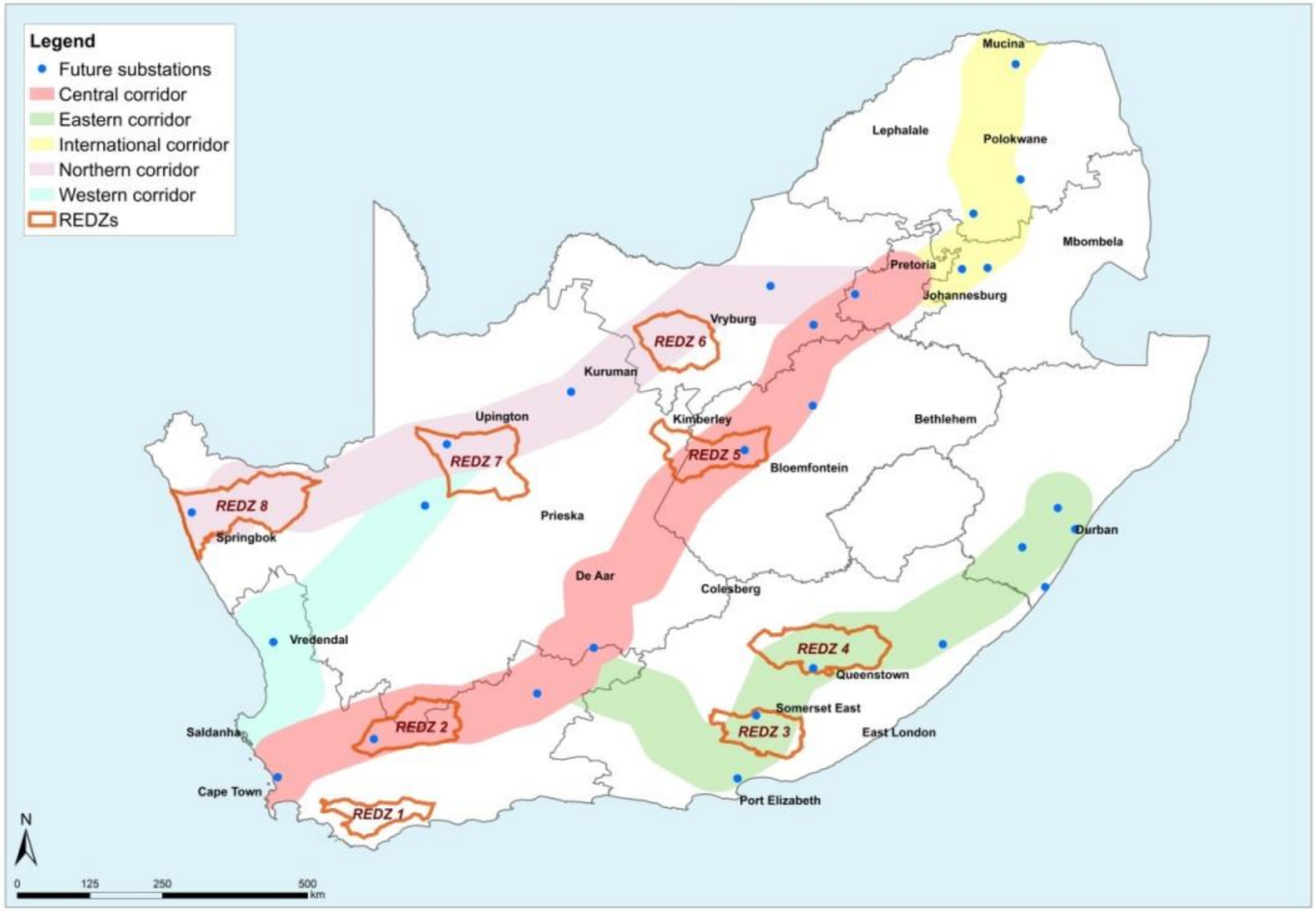
The outputs of the SEA in the form of maps and Development Protocols will be put forward for adoption and released for public comments through publication in the *Government Gazette*. The gazetting process is envisaged to take place in 2016 and will also constitute the formal public consultation process on the outcomes of the SEA process.

The formal adoption of the Power Corridors and their associated Development Protocols will result in a streamlined environmental assessment process in the form of a Basic Assessment, and its associated public participation process, being applicable to electricity grid infrastructure development in the Power Corridors. The gazetting process will also constitute the official adoption of the Power Corridors as geographical areas associated with SIP 10 and give effect to Sections 7 and 8 the Infrastructure Development (Act no. 23 of 2014), as well as Chapter 8 of the draft 2014 Regulations under the Spatial Planning and Land Use Management Act (SPLUMA) (Act no. 16 of 2013). Under this legislation, the Presidential Infrastructure Coordination Committee (PICC) will be mandated to give priority to the planning, approval and implementation of electricity grid infrastructure development in the Power Corridors. Local municipalities will further be mandated to consider the Power Corridors for local planning purposes (e.g. including Power Corridors into Spatial Development Frameworks).

The formal adoption of the Power Corridors as geographical areas associated with SIP 10 based on their strategic importance for priority grid expansion will provide the required justification for proactive investment to be made into these areas by Eskom and as well as by independent power producers and energy intensive consumers.

The SEA process is also intended to be iterative with new data and learning to be taken into consideration to revise and identify additional Power Corridors, where required, in parts of the country that have not yet been assessed. In order to integrate the planning for large scale strategic infrastructure development at a national level, as intended by the SIP programme, the outputs of this SEA will be taken into consideration when undertaking strategic planning for other SIPs. The proposed Solar Photovoltaic (PV) Extension SEA to identify additional Renewable Energy Development Zones for utility scale solar PV power generation for example will take into consideration the Power Corridors when determining optimal positioning of the additional REDZ. The overlap between the proposed Power Corridors and the proposed REDZ identified in the Wind and Solar PV SEA is illustrated in Map 1 below.

The proposed Power Corridors and proposed REDZ, in combination, have a valuable role to play in contributing to the long term objectives of the National Development Plan but can also assist with alleviating the country's current energy shortages. The proposed reduced timeframe to achieve environmental authorisation as well as the commitment at a strategic level shown by government through the gazetting of the pre-assessed Power Corridors and REDZ should serve to provide greater certainty to the power generation and electricity consuming industry of governments commitment to unlock these areas, and in so doing, enable proactive and coordinated investment to these areas.



Map 1: Proposed Power Corridors and proposed wind and solar PV Renewable Energy Development Zones[8]

[8] Note the Overberg REDZ is considered to have sufficient existing network capacity in relation to its development potential therefore no Power Corridor has been committed to this area.

PART 5a

Generic Environmental Management Programme (EMPr) for Overhead Powerline Construction

CONTENTS

TABLES

FIGURES

PART A: BACKGROUND AND CONTEXT

5A.1 Introduction

5A.1.1 Need

The National Environmental Management Act 107 of 1998 (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment must be utilised as the basis for a decision on an application for environmental authorisation.

There is a reliance on the EMPr to ensure that a project's actual environmental impacts are consistent with those evaluated in the (EIA) process. The EMPr is therefore fundamental to the EIA process and should ensure that commitments given at a project's planning and assessment stage are carried through the construction and/ or operation stage.

This Generic EMPr provides a pre-approved template that is to be used by a developer when preparing an EMPr for overhead power lines. This document describes the information requirements to enable the Department of Environmental Affairs (DEA) to make an informed and defensible decision on an EIA. This document therefore establishes a framework according to which an EMPr must be prepared when the project relates to energy transmission and distribution in South Africa.

The EMPr, as contemplated in Chapter 5 Section 24 N (1A) of NEMA, plays a vital role in the implementation of consistent and continued environmental management for the duration of a project life cycle.

5A.1.2 Scope, purpose and objectives

The *scope* of this Generic EMPr is as follows:

- Spatial extent - This generic EMPr is an output from the Strategic Environmental Assessment for Electricity Grid Infrastructure in South Africa (DEA, 2016), referred to as the EGI SEA. This SEA identified corridors that have been subjected to a scoping-level pre-assessment of environmental sensitivity. For new power lines within these corridors, referred to as "Power Corridors", a Basic Assessment is adequate provided specified conditions are satisfied. For power lines outside of the Power Corridors, a full EIA process is required. This generic EMPr can be applied to projects both inside and outside of these corridors.
- Power line scale – This generic EMPr applies to transmission and distribution overhead power lines with a capacity of 33 kilovolts or more.
- Applicants / developers – This generic EMPr applies to Eskom and other potential power line developers.
- Project lifecycle – This generic EMPr applies to construction related activities only, and is referred to an Environmental Management Programme (EMPr) in this report.

The *purpose* of this document is to provide an EMPr that captures learning and best practice in managing the planning and construction of power lines in sufficient detail to enable the relevant authorities to pre-approve this EMPr template, or provide approvals, general authorisations or letters of no objection under specified conditions where applicable, and thereby provide a more pro-active, responsive and efficient approval process for such projects.

The EMPr contains a general environmental controls section which describes environmental requirements relevant to all overhead power line projects. The EMPr also contains a project specific section which describes mitigation measures and environmental control requirements specific to the particular project. These requirements will be based on the findings from the BA/EIA, site walk through and any conditions attached to Environmental Authorisation (EA).

The project specific section of the EMPr identifies where project specific information from the EIA or BA will need to be included in to the EMPr. This includes:

- Environmental sensitivity mapping including "No Go" areas
- Line routing
- Project information including landowner details and specific access requirements.

The *overall objectives* of the generic EMPr are to realise the following:

- Ensure that impact avoidance and mitigation measures associated with power line construction are identified and that practical recommendations are provided to implement and monitor these actions.
- Ensure environmental protection
- Create a positive relationship with land owners

5A.2 Generic EMPr Framework

The structure of the generic EMPr is illustrated in Figure 1. Part A of the document provides background context to the generic EMPr. Included in this section are general national level legal requirements for a typical power line project, the description of the roles and responsibilities of key persons involved in the construction stage of a power line project and associated responsibilities in the context of the EMPr. This section also describes the various phases and activities in the lifecycle of a power line EMPr. Part B details environmental controls. Section 1 of Part B describes general environmental controls to be implemented for construction activities relevant to the project. Controls in this section reflect minimum and general requirements for managing and mitigating impacts for specific construction related power line activities. Section 2 of Part B describes project specific environmental control requirements. These controls are based on findings of the BA/EIA and are *in addition* to the general controls described in Section 1. Part C (Appendices) of the document contains specifications for carrying out certain environmental controls described in Part B Section. The contractor shall also include all approved method statements in Part C of the document.

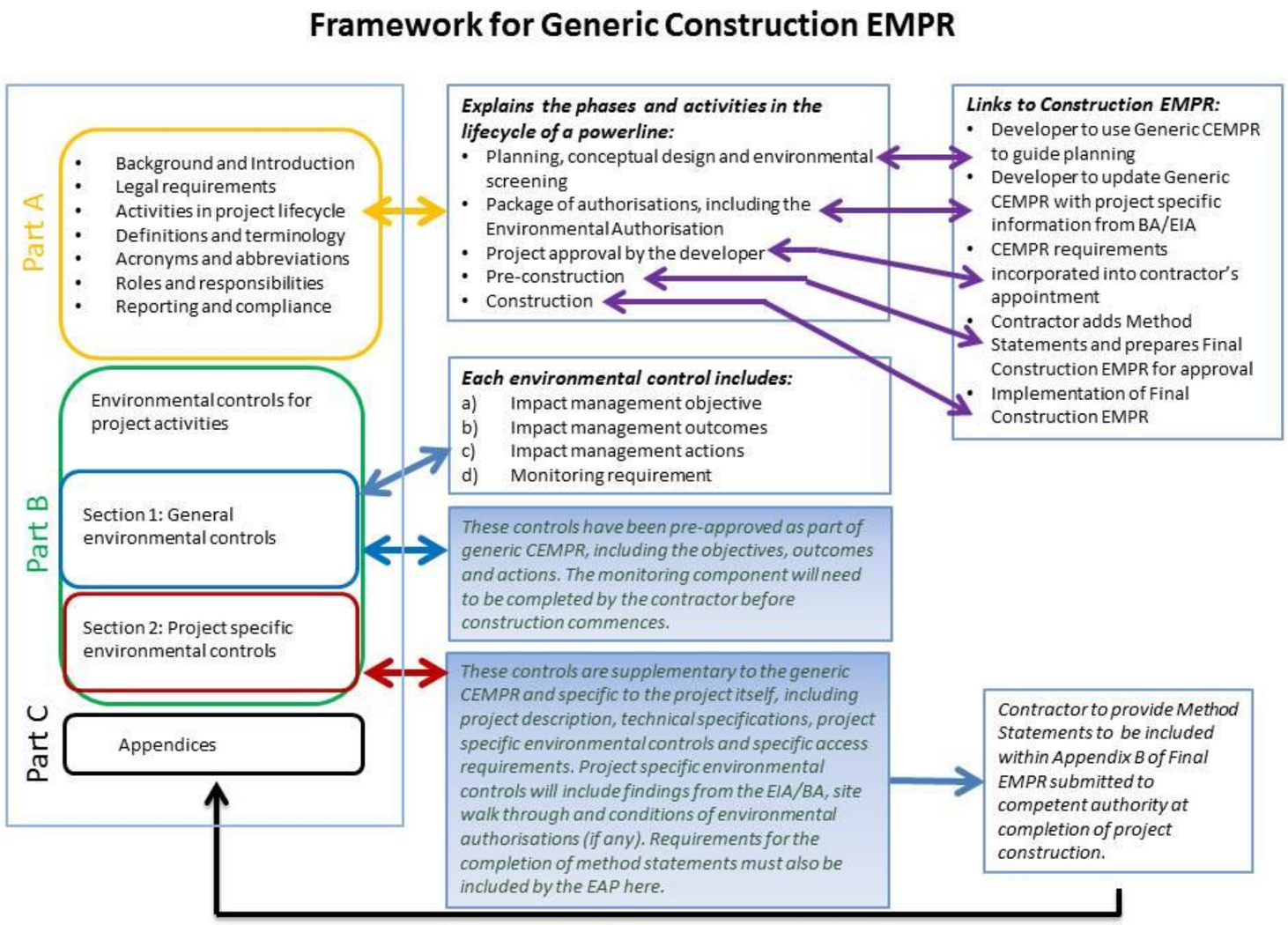


Figure 1: Framework for generic EMPr

5A.3 Legal Requirements

5A.3.1 Key environmental legislation and policies that are applicable to a typical power line project

In terms of legal requirements, a crucial objective of the EMPr is to satisfy the requirements of Section 24N of the NEMA regulations and regulation 19 of the NEMA EIA Regulation of 2014. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities.

In addition to satisfying these requirements, the content of the EMPr has been compiled in accordance with the requirements of legislation of other authorising authorities responsible for providing approvals, general authorisations or letters of no objections for power line projects. The following additional legislation was considered in this regard:

- General Authorisation of water use in terms of the amended GN 1199 of the National Water Act (No. 36 of 1998);
- National Heritage Resource Act (No. 25 of 1999.

The Contractor shall identify and comply with all South African environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation at the time of this EMPr being in effect applicable to the construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:

- **General**

The Constitution of South Africa Act of 1996 (Act No. 108 of 1996);
National Environmental Management Act of 1998 (Act No. 107 of 1998);
Environment Conservation Act of 1989 (Act No. 73 of 1989) and the Environmental Impact Assessment Regulations, 2014.

- **Land, Soil and Plants**

The Conservation of Agricultural Resources Act of 1983 (Act No. 43 of 1983);
National Forests Act of 1998 (Act No. 84 of 1998);
National Environmental Management Biodiversity Act of 2004 (Act No. 10 of 2004);
National Veld and Forest Fire Act of 1998 (Act No. 101 of 1998).

- **Protected Areas**

National Environmental Management: Protected Areas Act of 2003 (Act No. 57 of 2003);
The Protected Areas Amendment Act of 2004 (Act 31 of 2004).

- **Inland Water Resources**

National Water Act of 1998 (Act No. 36 of 1998);
Water Service Act of 1997 (Act No. 108 of 1997).

- **Cultural Resources**

Natural Heritage Resources Act of 1999 (Act No. 25 of 1999).

- **Animals and Wildlife**

Animals Protection Act of 1962 (Act No. 71 of 1962);
Game Theft Act of 1991 (Act No. 105 of 1991);
The National Environmental Management: Biodiversity Act of 2004 (Act No. 10 of 2004) and the regulations and lists regarding threatened and protected species

- **Pollution Control and Waste Management**

National Environmental Management: Waste Act, 2008;
Environment Conservation Act of 1989 (Act No. 73 of 1989);
National Environmental Management: Waste Act 2008 (Act Bo. 58 of 2008);
Minimum requirements for waste disposal by landfill, Department of Water Affairs and Forestry, 2nd addition, 1998.

- **Hazardous and Toxic Substances**

Hazardous Substances Act of 1973 (Act No. 15 of 1973);
Minimum requirements for the handling, classification and disposal of hazardous waste (Department of Water Affairs and Sanitation);
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947 (Act No. 36 of 1947).

- **Air Pollution**

Atmospheric Pollution Prevention Act of 1965 (Act No. 45 of 1965);
National Environmental Management: Air Quality Act of 2004 (Act No. 39 of 2004).

- **Minerals, Energy and Mining**

Mineral & Petroleum Resources Development Act of 2002 (Act No. 28 of 2002)
Minerals and Petroleum Resources Development Act 28 of 2002

- **Other**

Road Traffic Act of 1989 (Act No. 29 of 1989)
Explosives Act of 2003 (Act No. 15 of 2003)
Advertising on Roads and Ribbon Development Act of 1940 (Act No. 21 of 1940)

Depending on the location of the project, applicable provincial legislation will also apply.

5A.3.2 Potential Permits/Authorisations/Licences required

Activities that could require a permit, licence, authorisation or consent use from various governmental bodies are listed in Table 1. The contractor is to ensure that any activity performed complies with the relevant legislation and the necessary permits are in place before commencement of the specific activity triggering the need for the relevant license or approval.

Table 1: Power line activities that could require either a permit, licence authorisation or consent use

Activity	Type of permit/ license/consent required	Issuing Authority
Taking water from a water resource	Licence	DWS
Storing water	Licence	DWS
Impeding or diverting the flow of water in a watercourse	Licence	DWS
Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.	Licence	DWS
Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	Licence	DWS
Disposing of waste in a manner which may detrimentally impact on a water resource	Licence	DWS
Use of treated wastewater (dust suppression)	Approval	DWS and DOH
Applying for a licence regarding activities in state forest.	Licence	DWS
Compliance with the Veld and Forest Fire Act	Requirement for a fire management plan	DAFF
To impact on archaeological and paleontological sites and meteorites	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
To destroy, damage, deface, alter, remove from its original position, subdivide or change the planning status of a National Heritage Site	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
To impact on or disturb burial grounds and graves	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
Way leave applications for accesses to provincial roads	Approval	DOT
Design of the main access road to the site camp.	Approval (Environmental Authorisation)	DEA and Relevant Provincial Roads Dept.
Application for health permits for hostels and sanitation	Permit	DOH
Blasting	Permit	DEA/SAPS
Commencement of construction activities	Notify one week before commencement	DEA
Application for Radio Equipment Licence	Site radio submission	ICSS
Outdoor advertising of Activities	South African Manual for Outdoor Advertising Control specifications	SAMOAC
Site establishment sewage disposal	Approval	Local Municipality
Site Establishment storm water & pollution control	Separate report	Local Municipality
Fuel storage	Approval-as part of BA/EIA authorisation	DEA or the relevant provincial environmental Affairs
Hazardous material route	Approval	DOT
Other hazardous substances	Permit	DOH/DEA (in certain cases)
Use of borrow pits	Approval	DMR
Project commencement	Notify	DOL
Land use outside Work Area	Special consent approval	Local Municipality
Detail design (water, waste water, roads design)	Approval	Local Municipality
Way leave applications – design	Approval	SANRAL
Waste storage, transportation, treatment, recycling and / or disposal (including hazardous waste)	Approval – permit under Section 20(1) of ECA, linked to an environmental authorisation	NEMA Competent Authority
Listed activities triggered in terms of the National Environmental Management Act 107 of 1998	Approval – Environmental Authorisation	DEA or relevant provincial department
National Environmental Management: Air Quality Act of 2004 in approximately September 2009)	Permit – registration certificate (this will become an atmospheric emission licence under AQA)	DEA – Chief Air Pollution Control Officer (to become the air quality officer in provincial or local government under AQA)

5A.4 Activities in the lifecycle of a typical power line project

There are 34 major activities involved in a typical power line project. The required status of each activity in the context of submitting the application for environmental authorisation, both inside and outside the Power Corridors is described in Table 2.

Table 2: Typical activities in power line construction lifecycle in context of submitting an application for environmental authorisation

Number	Activity
1	Power Corridor sensitivity maps used to determine alternative sub-corridors
2	Sub-corridor sensitivity maps undergo validation
3	Undertake public consultation process for sub-corridors
4	Identify feasible route within sub-corridor
5	Negotiate servitudes with landowners
6	Identify development envelope for negotiated route
7	Obtain necessary approvals from Competent Authorities not mandated by NEMA e.g. Civil Aviation Authority
8	Determine specialist terms of reference for development envelope based on Development Protocols
9	Commission specialist studies
10	Produce commenting report and draft EMPr
11	Submit online application for environmental authorisation
12	30 day commenting period
13	Update report
14	Submit Final BAR/EIA
15	Decision by Competent Authority in terms of NEMA on EA application
16	Walk through with specialists
17	Geotechnical studies
18	Finalise project footprint
19	On basis of walk through update EMPr any additional requirements and final project footprint (Part B Section 2)
20	Erection of camp sites for the Contractor's workforce.
21	Servitude gate installation to facilitate access to the servitude.
22	Vegetation clearing to facilitate access, construction and the safe operation of the line.
23	Establishing of access roads on the servitude where required as per design parameters in Appendix A
24	Pegging of tower positions for construction
25	Transportation of equipment, materials and personnel to site and stores.
26	Installation of foundations for the towers.
27	Tower assembly and erection.
28	Conductor stringing and regulation.
29	Taking over the line from the Contractor for commissioning.
30	Final inspection of the line, commissioning and hand over to the Grid Line and Servitude Manager for operation.
31	Rehabilitation of disturbed areas.
32	Signing off of all Landowners upon completion of the construction and rehabilitation.
33	Handing over and taking over of the servitude by the Grid Environmental Manager.
34	Operation and maintenance of the line

5A.5 Working area

Construction activities shall be limited to the area for which EA is applied for/issued. Any area outside the servitude area required to facilitate access, construction activities, construction camps or material storage areas, shall be negotiated with the affected Landowner and written agreements shall be obtained. Location of construction camps must be carefully considered and approved by the ECOs and this involves determining whether any further approvals would be required in terms of the relevant environmental and health legislation.

All construction areas shall be cleared in accordance with the requirements of this EMPr Any extra space to be cleared outside the servitude shall be negotiated with the relevant Landowner and approved by the ECOs and the Developer Project Manager. All areas marked as "No Go" areas inside and outside the servitude shall be treated with the utmost care and responsibility and in accordance with the requirements of the EMPr.

Should water be required from sources other than from those provided by the Developer's supply, a written agreement shall be reached between the Contractor and the Landowner. Should the Contractor be required to use water from a water resource, the Contractor shall supply a method statement to that effect and first obtain the required licences from DWS. Strict control shall be maintained and the ECOs shall regularly inspect the abstraction point and methods used. Refer to Table 1 for permitting requirements.

5A.6 Definitions and terminology

For the purposes of this EMPr, the following definitions shall apply:

Assembly area means any area used for the assembly of transmission infrastructure prior to its erection. Such assembly areas may be within the construction camp or elsewhere within the Working Area.

Biophysical aspects are the naturally occurring objects and processes of an area on the assumption that all naturally occurring things can be classified as being either living (i.e. biotic) or non-living (physical or abiotic).

Botanical specialist, for the purposes of this Specification, means a competent botanist as identified by the Project Manager. Scientific should be Pr.Sci.Nat registered and other specialists should have appropriate professional accreditation.

cEO is a Contractor's Environmental Officer and means a qualified senior staff member and registered EHS practitioner employed full time on site by the Contractor, who shall be responsible for environmental monitoring and control.

Clearing means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified.

Construction camp is the area designated for key construction infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management.

Contaminated water means water contaminated by the Contractor's activities, e.g. concrete water and runoff from equipment, camp sites, ablution facilities and personnel wash areas.

dEO is a An individual employed by the developer who will be present on site at all times and who will ensure implementation of the EMPr, integrated Environmental Authorisation and Waste Management Licence and Water Use Licence conditions stipulated by the authorities.

ECO means an independent and EHS registered Environmental Control Officer (ECO) appointed full time by the Employer to monitor compliance by the Contractor and his staff with the environmental requirements of the environmental authorisation and EMPr.

Endemic is the natural distribution of an organism (plant or animal) restricted to the local environmental conditions within an area

Environment means the surroundings within which humans exist. It comprises:

i) The land, water and atmosphere of the earth;
ii) Micro-organisms, plant and animal life;
iii) Any part or combination of i) and ii) and the interrelationships among and between them; and
iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being (*i.e.* the social environment).

This is a definition that encompasses many different facets, including biological, physical, social, economic, cultural, historical and political components.

Heritage resource, as per the provisions of the National Heritage Resources Act (No 25 of 1999), means all those heritage resources that are of cultural significance or other special value for present and future generations, and which are accordingly considered part of the National Estate. In this regard, the National Estate includes those items identified in terms of Section 2 of National Heritage Resources Act No. 25 of 1999.

Heritage specialist, for the purposes of this EMPr, means a specialist suitably qualified to deal with the type of heritage resource discovered. For example where the resource is an archaeological artefact or site, the heritage specialist would be an archaeologist and where it is a fossil the specialist would be a palaeontologist.

Maintenance period means the period after the establishment period up to and until the end of the defects liability period, during which the contractor shall be responsible for maintaining the vegetation.

Method Statement means a written submission by the Contractor to the Project Manager in response to this EMPr or a request by the Project Manager and ECO. The Method Statement must set out the equipment, materials, labour and method(s) the Contractor proposes using to carry out an activity identified by the Project Manager when requesting the Method Statement. This must be done in such detail that the Project Manager and ECO is able to assess whether the Contractor's proposal is in accordance with this specification and/or will produce results in accordance with this specification.

The Method Statement shall cover applicable details with regard to:

i) Construction procedures;
ii) Plant, materials and equipment to be used;
iii) Transporting the equipment to and from site;
iv) How the plant/ material/ equipment will be moved while on site;
v) How and where the plant/ material/ equipment will be stored;
vi) The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
vii) Timing and location of activities;
viii) Compliance/ non-compliance; and
ix) Any other information deemed necessary by the Project Manager.

Indigenous vegetation means all existing species of trees, shrubs, groundcover, grasses and all other plants native to the site.

Pollution Incident means any incident that may cause or has caused damage to or the contamination of the natural environment.

Hazardous Substances is a substance governed by the Hazardous Substances Act, 1973 (Act No. 15 of 1973) as well as the Hazardous Chemical and Substances Regulations, 1995.

Sensitive area means any area that is denoted as sensitive by the BA/EIA, Environmental Authorisation, and EMPr, ECO or Project Manager due to its particular attributes, which could include the presence of rare or endangered vegetation, the presence of heritage resources (*e.g.* archaeological artefacts or graves), the presence of a unique natural feature, the presence of a watercourse or water body, the presence of steep slopes (in excess of 1:4) *etc*.

Slope means the inclination of a surface expressed as one unit of rise or fall for so many horizontal units.

Solid waste means all solid waste, including construction debris, hazardous waste, excess cement/ concrete, wrapping materials, timber, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Spoil means excavated material which is unsuitable for use as material in the construction works or is material which is surplus to the requirements of the construction works.

Topsoil means a varying depth (up to 300 mm) of the soil profile irrespective of the fertility, appearance, structure, agricultural potential, fertility and composition of the soil.

Watercourse means any river, stream and natural drainage channel whether carrying water or not.

Water body means a body containing water and includes dams and wetlands, whether ephemeral or permanent.

Wetland means any area that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or

the area is covered by shallow water. Specifically, an area is classified as a "wetland" if it meets at least one of the following criteria:

i) The area predominantly supports **hydrophytes**, at least periodically;
ii) The substrate(soil) is predominantly undrained hydric soil; and/ or
iii) The substrate is non-soil, and is saturated with water or covered by shallow water at some time during the growing season.

Works means the Works to be executed in terms of the Contract.

Working Area means the land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpile and laydown areas, assembly areas, batching areas, the construction corridor, all access routes and any additional areas to which the Project Manager permits access.

5A.7 Acronyms and abbreviations

BA Basic Assessment

CARA Conservation of Agricultural Resources Act No. 43 of 1983

cEO Contractors Environmental Officer

dEO Developer Environmental Officer

DEA Department of Environmental Affairs

DPM Developer Project Manager

DSS Developer Site Supervisor

DMR Department of Mineral Resources

DOH Department of Health

DOT Department of Transport

DWS Department of Water and Sanitation

ECA Environmental Conservation Act No. 73 of 1989

ECO Environmental Control Officer

EIA Environmental Impact Assessment

EIR Environmental Impact Report

EMS Environmental Management System

EMPr Environmental Management Programme Report

EAP Environmental Assessment Practitioner

FPA Fire Protection Association

FPO Fire Protection Officer

HWC Heritage Western Cape

HNC Heritage Northern Cape

I&AP's Interested and affected parties

MSDS Material Safety Data Sheet

NGL Natural Ground Level

5A.8 Roles and responsibility

The effective implementation of the EMPr is dependent on established and clear roles, responsibilities and reporting lines within an institutional framework. This section of the EMPr identifies the various environmental roles and reporting lines and defines responsibilities for each role within the institutional framework. This institutional structure will be maintained throughout the construction phase until such time as the final construction phase Environmental Report has been prepared and accepted.

The Environmental Responsibilities and Reporting Structure are represented in Figure 2:

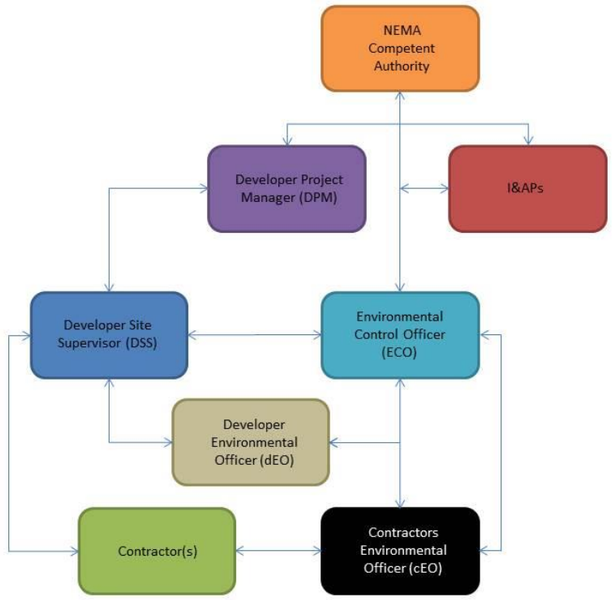


Figure 2: EMPr roles and responsibilities

Table 3: EMPr roles and responsibilities

Function	Role and Responsibilities
Environmental Assessment Practitioner (EAP)	Responsibility The EAP is to be appointed by the Developer. The responsibility of the EAP is to supplement the pre-approved generic EMPr requirements with project specific information and requirements from the authorised Basic Assessment or Environmental Impact Assessment Report. Details of the EAP appointed by the developer including the Curriculum Vitae of the EAP shall be included in the EMPr.
Developer's Project Manager (DPM)	Role The holder of the EA to which this EMPr relates holds legal responsibility for compliance with this EMPr and any other arrangements must be entered into between such holder and such other party. The Developer's Project Manager will have overall responsibility for the management of the project and the implementation of the EMPr. Responsibilities • Be fully conversant with the conditions of the EA; • Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s); • Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; • Ensure that periodic environmental performance audits are undertaken on the project implementation; and • Ensure all permits, authorisations and licences are obtained, monitored and adhered to.
Developer Site Supervisor (DSS)	Role The Developer Site Supervisor reports directly to the Developer Project Manager, oversees site works, liaises with the contractor(s) and the ECO. The Developer Site Supervisor is responsible for the day to day implementation of the EMPr and for ensuring the compliance of all contractors with the conditions and requirements stipulated in the EMPr. Responsibilities • Ensure that all contractors identify a contractor's Environmental Officer (cEO); • Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO; • Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO; • Will issue all non-compliances to contractors; and • Ratify the Monthly Environmental Report.
Environmental Control Office (ECO)	Role and Qualifications The ECO should be employed by the developer for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the Environmental Control Officer is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise..The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the Developer Site Supervisor and Project Manager regarding all environmental matters. The Contractor, cEO and dEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the environmental authorisation and EMP. The Environmental Control Officer provides feedback to the Developer Site Supervisor and Project Manager, who in turn reports back to the Implementing Agent and I&AP's, as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the Environmental Authorisation, report to the Government authorizing department as and when required. Responsibilities The responsibilities of the ECO will include the following: • Be aware of the findings and conclusions of the Environmental Impact Assessment and Water Use Licensing process (where applicable) and the conditions stated within the environmental licenses; • Be familiar with the recommendations and mitigation measures of this EMPr; • Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; • Undertake regular and comprehensive site inspections / audits of the construction site according to the EMPr and applicable licenses in order to monitor compliance with the EMPr; • Educate the construction team about the management measures contained in the EMPr and environmental licenses; • Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective; • Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements; • In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses;

Function	Role and Responsibilities
	• Liaison between the Developer Project Manager, Contractors, authorities and other lead stakeholders on all environmental concerns; • Issuing of site instructions to the Contractor for corrective actions required; • Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; • Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO); • Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken; • Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken; • Assisting in the resolution of conflicts; • Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor and/or sub-contractors; • In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; • Maintenance, update and review of the EMPr; • Communication of all modifications to the EMPr to the relevant stakeholders. Further note, the ECO function is not limited to the construction phase alone, but is also an active role during the operational and later phases of the project.
developer Environmental Officer (dEO)	<u>Role and Qualifications</u> The dEOs will report to the Project Manager and are responsible for implementation of the EMPr, environmental monitoring and reporting, providing environmental input to the Project Manager and Contractor's Manager, liaising with contractors and the landowners as well as a range of environmental coordination responsibilities. The Developer shall appoint a dEO. The dEOs will, as a minimum, have the following qualifications and experience: • Degree or diploma in environmental management, nature conservation or related discipline; • Knowledge of relevant environmental legislation; • At least two years previous experience in environmental control, environmental monitoring or environmental management. <u>Responsibilities</u> • Be fully conversant with the EMPr; • Be fully conversant with the conditions of the Integrated Environmental Authorisation and Waste Management License and Water Use License; • Be fully conversant with all relevant environmental legislation; • Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures; • Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) and its sub-contractor(s); • Confine the construction site to the demarcated area; • Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO); • Assist the contractors in addressing environmental challenges on site; • Assist in incident management: • Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared; • Assist the contractor in investigating environmental incidents and compile investigation reports; • Follow-up on pre-warnings, defects, non-conformance reports; • Measure and communicate environmental performance to the Contractor; • Conduct environmental awareness training on site together with ECO and cEO; • Ensure that the necessary legal permits and / or licenses are in place and up to date; • Acting as Developer's Environmental Representative on site and work together with the ECO and contractor; • Audit carried out by an independent auditor/consultant.
Contractor (C)	<u>Role</u> The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. <u>Responsibilities</u> • Implementation and compliance with recommendations and conditions of the EA and EMPr, including providing the Contractor's Environmental Protection Policy and the specific Method Statements for the project; • Appoints dedicated and qualified contractor Environmental Officer (cEO) to work with the ECO; and • Ensure all site staff are trained and kept updated in terms of the EA, EMPr and other legal requirements.

Function	Role and Responsibilities
contractor Environmental Officer (cEO)	<u>Role and Qualifications</u> Each Contractor affected by the EMPr should appoint a contractor Environmental Officer, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. As a minimum the cEO shall meet the following criteria: • Have a degree or diploma in an appropriate environmental field; • Have demonstrated environmental experience in the construction industry; and • Be a senior person within the Contractor's staff with authority over all the contractors' staff working on-site. The cEO ensures that all Sub-contractors working under the Contractor abide by the requirements of the EMPr. The Contractor is answerable to the Project Manager for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria Their primary role is to coordinate the environmental management activities of the Contractor on site. <u>Responsibilities</u> • Be on site throughout the duration of the project and be dedicated to the project; • Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site; • Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements; • Attend the Environmental Site Meeting; • Undertaking corrective actions where non-compliances are registered within the stipulated timeframes; • Report back formally on the completion of corrective actions; • Environmental monitoring as required by applicable legislation; • Assist the ECO in maintaining all the site documentation; • Prepare the site inspection reports and corrective action reports for submission to the ECO; • Assist the ECO with the preparing of the monthly report; and • Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.

5A.9 Environmental Documentation Reporting and Compliance

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms shall be in place for all substation projects as a minimum requirement. This section of the report details each of these and how they shall be used throughout the project EMPr.

5A.9.1 Document control/Filing system

The approved filing system (in accordance with ISO 9000) shall be established at the outset of the construction phase and shall be maintained throughout the lifespan of the project. The ECOs are solely responsible for the upkeep and management of the EMPr file. At a minimum, all documentation detailed below will be stored in the EMPr file. A hardcopy of all documentation shall be filed, while an electronic copy may be kept where relevant. A duplicate file will be maintained in the office of the Developer's Site Supervisor (where applicable). This duplicate file will be the responsibility of the ECOs and must remain current and up-to-date. The filing system must be updated and relevant documents added as required. The EMPr file must be made available at all times on request by the Competent Authority (in terms of NEMA) or other relevant authorities. The EMPr file will form part of any Environmental Audits undertaken.

5A.9.2 Documentation to be available

At the outset of the project the following documents shall be placed in the filing system and be accessible at all times:

- Full copy of the signed Environmental Authorisation from the Competent Authority in terms of NEMA granting approval for the activity;
- Records of acknowledgement and acceptance of the EMPr from the Competent Authority in terms of NEMA;
- Complete copy of the Environmental Impact/ Basic Assessment Report;
- Complete copy of the EMPr;
- All signed copies of the Contractor's Environmental Agreement;
- All the Contractor's Method Statements;
- Completed Weekly Environmental Checklists;
- Copies of the accepted Monthly Environmental Reports;
- Minutes and attendance register of Environmental Site meetings;
- An up-to-date Environmental Incident Log;
- A copy of all non-compliances issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record;
- Copies of the following relevant legislation:
  i. National Environmental Management Act;
  ii. Environmental Conservation Act;
  iii. Occupational Health and Safety Act;
  iv. National Water Act;
  v. National Environmental Mismanagement: Air Quality Act;
  vi. Conservation of Agricultural Resources Act;
  vii. National Heritage Resources Act.

5A.9.3 Weekly Environmental Checklists

The ECOs are required to complete a Weekly Environmental Checklist which meets the requirements of the EMPr. The ECOs are required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the Developer's Site Supervisor on a weekly basis.

The checklists will form the basis for the Monthly Environmental Reports. Copies of all competed checklists will be attached as Annexures to the

Final Environmental Audit Report. The ECOs will report on the week's "highs and lows" to the Senior Site Representative on a weekly basis.

5A.9.4 Environmental Audit Reports

The ECOs shall prepare a monthly Environmental Audit Report. The Report will be tabled as the key point on the agenda of the Environmental Site Meeting. The Report is submitted for acceptance at the meeting and the final report will be circulated to the Project Manager and filed in the EMPr file. At a frequency determined by the environmental authorisation, the ECOs shall submit the monthly reports to the Competent Authority in terms of NEMA. At a minimum the Monthly report is to cover the following:

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- General environmental findings and actions; and
- Minutes of the Bi-monthly Environmental Site Meetings.

5A.9.5 Environmental Site meetings

An Environmental Site Meeting will take place at least bi-monthly (i.e. every two weeks). The meeting will be chaired by the Project Manager or the Developer's Site Supervisor and cEOs will be required to attend. All environmental issues shall be tabled at the meeting for discussion and resolution.

Minutes of the Environmental Site Meetings shall be kept. The Minutes must include an attendance register and will be attached to the Monthly Report that is distributed to attendees. Each set of Minutes must clearly record **Matters for Attention** that will be reviewed at the next meeting.

5A.9.6 Required Method Statements

A Method Statement is a written submission by the contractor to the Developer's Project Manager, Developer's Site Supervisor or ECO in response to the EMPr, setting out the plant, materials, labour and method the contractor proposes using to carry out an activity. The Method Statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.

The Method Statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from site;
- how the equipment/ material will be moved while on site;
- how and where material will be stored;
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- timing and location of activities;
- compliance/ non-compliance with the EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following Method Statements to the Project Manager no less than 14 days prior to the programmed Commencement Date of the subject Works or activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise;
- Balsting required for construction;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management.

The ECOs shall ensure that the contractors perform in accordance with these Method Statements. Completed and authorised Method Statements shall be captured in Appendix A.

5A.9.7 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary).

The Environmental Incident Log is a means to record all environmental incidents for which a non-compliance notice would **not** be issued. An environmental incident is defined as:

- Any deviation from the listed environmental mitigation measures (listed in this EMPr) that may be addressed immediately by the ECOs. (For example a contractor's staff member littering or a drip tray that has not been emptied);
- any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the Environmental Audit Report .

5A.9.8 Non-compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the Developer's Site Supervisor or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.

The Contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority (DAFF, DEA, DWS) for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, inter alia:

- Deviates from the environmental conditions and requirements as set out in the EMPr that has, or may cause, an environmental impact; OR
- Contravenes environmental legislation; OR
- Results in an unforeseen environmental impact. This may be caused by direct or indirect actions or activities on site. Significance will be determined by the ECOs, but will be informed by geographic extent, duration, lasting effects of the impact and extent of remediation to rectify the impact.

5A.9.9 Corrective Action records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the Developer's Site Supervisor, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report signed off by the ECOs.

5A.9.10 Contractor Environmental Agreements

Each contractor working on site is required to sign the Contractor Environmental Agreement. This agreement provides for:

- Signed acknowledgement by the Contractor of the EMPr and the environmental controls and stipulations therein;

The signed copies of the Contractor Environmental Agreements are to be filed in the EMPr file. No contractor will be allowed to start work without having signed the Contractor Environmental Agreement.

5A.9.11 Photographic Record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.

The Contractor shall:

1. Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

1. Pictures of all areas designated as work areas, camp areas, construction sites and storage areas taken before these areas are set up;
2. All bunding and fencing;
3. Road conditions and road verges;
4. Condition of all farm fences;
5. Topsoil storage areas;
6. Waste management sites;
7. Ablution facilities (inside and out);
8. Any non-conformances deemed to be "significant";
9. All completed corrective actions for non-compliances;
10. All required signage; and
11. All areas before, during and post rehabilitation.

Include relevant photographs in the Final Environmental Audit Report

5A.9.12 Complaints Register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of **all** complaints received from communities, stakeholders and individuals. The Complaints Record shall:

1. Record the name and contact details of the complainant;
2. Record the time and date of the complaint;
3. Contain a detailed description of the complaint;
4. Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
5. Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in (9.13) below.

5A.9.13 Claims for Damages

In the event that a Claim for Damages is submitted by a community, landowner or individual, the ECOs shall:

1. Record the full detail of the complaint as described in (9.12) above;
2. The ECOs will evaluate the claim and associated damage and submit the evaluation to the Senior Site Representative for approval;
3. Following consideration by the Developer's Project Manager, the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant. Should the claimant not accept this, the ECO shall, in writing report the incident to the Developer's negotiator and legal department; and
4. A formal record of the response by the ECOs to the claimant as well as the rectification and/or payment will be recorded in the EMPr file.

5A.9.14 Interaction with affected parties

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts. The Contractor shall ensure that:

1. All negotiations with affected parties are done with the affected parties, Developer's Site Supervisor and ECO present;
2. No oral agreements between the above parties shall be entered into. All agreements will be recorded in writing, signed by all parties and filed in the EMPr file;
3. Affected parties will be informed by the cEO of any changes to the construction programme;
4. The Contractor's contact telephone numbers are made available to all I&APs;
5. Contact with all affected parties will be courteous at all times; and

The ECOs shall:

1. Ensure that all queries, complaints and claims are dealt with immediately;
2. Ensure that any or all negotiations take place with the affected parties, Senior Site Representative and Contractor present;
3. Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file;
4. Ensure that his/her contact telephone numbers are made available to all landowners and affected parties;
5. Ensure that a current and up-to-date list of affected parties and their contact details are available at all times in the EMPr file;
6. Ensure that contact with affected parties is courteous at all times; and
7. Attach all documented agreements, settlements and claims to the Final Environmental Audit Report.

5A.9.15 Environmental Audits

Environmental Audits of the construction phase and implementation of the EMPr will be undertaken by the ECO and are a legal requirement in terms of NEMA once an EA is issued and as long as the EMPr is valid. The findings and outcomes of these audits will be recorded in the EMPr file. The environmental audits and associated reports must be conducted and submitted to the Competent Authority at intervals as indicated in the environmental authorisation.

5A.9.16 Final Environmental Audit Report

On final completion of the Construction Phase, the ECOs are required to prepare a Final Environmental Audit Reports. The Report is to be

submitted to the Competent Authority for acceptance and approval. The Environmental Report shall contain the following in accordance with Appendix 7 of National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental impact Assessment Regulations, 2014.

- Details of the independent person who prepared the report;
- Details of the expertise of independent person that compiled the report;
- A declaration that the independent auditor is independent in a form as may be specified by the Competent Authority;
- An indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- A description of the methodology adopted in preparing the environmental audit report;
- An indication of the ability of the EMPr, and where applicable, the closure plan to-
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
    - Ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- A description of any assumptions made, and any uncertainties or gaps in knowledge;
- A description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- A summary and copies of any comments that were received during any consultation process; and
- Any other information requested by the Competent Authority.

Acceptance and approval of the Final Environmental Audit Report by the Competent Authority will end the construction phase EMPr as successful and completed.

PART B: ENVIRONMENTAL CONTROLS

The Environmental Controls are described in two sections:

1. Section 1: General environmental controls

This section refers to construction related activities that are common to most power line projects. For each activity a set of prescribed environmental controls and associated management actions have been identified. Contractors shall implement these controls for all projects as a minimum requirement for mitigating the impact of particular construction related activities.

The format of a general environmental control is illustrated below. The boxes shaded in green are predefined and represent minimum standards for the management of that particular aspect. The contractor will be required to adhere to all impact management actions (where applicable to the construction related activity) for all power line projects. The boxes shaded in red assign responsibility for the implementation and monitoring of the impact management actions. This information is project specific and shall be completed by the contractor prior to commencement of construction.

Figure 2: Format of a general environmental control illustrating aspects which are predefined vs those which still need to be completed by the contractor

Management Objective:	**PREDEFINED AS PART OF GENERIC EMPr**				
Management Outcome:	**PREDEFINED AS PART OF GENERIC EMPr**				
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
PREDEFINED AS PART OF GENERIC EMPr	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**

2. Section 2: Project specific environmental controls

This section refers to project specific environmental controls. These are specific actions or mitigation measures related to the project itself and based on findings from the BA/EIA, site walk through or conditions attached to the environmental authorisation. They are more specific than the environmental controls included in Section 1 and refer to sensitive features or sections of power line where additional or specific controls are needed to manage impacts. Controls in these sections shall be referenced spatially in the context of the final power line profile.

The EAP is therefore required to complete this section by producing an environmental sensitivity map of the working area in the context of the final power line route. Specific environmental controls and measures are to be referenced in the context of specific tower positions e.g. bird diverters are required between towers 25 and 125 to mitigate potential impact of the new power line on existing raptor nesting sites.

Additional project specific information included in this section shall include landowner contact information and any specific requirements regarding access to land and specific tower positions.

5A.10 Section 1: General Environmental Controls

5A.10.1 Environmental awareness training

Management Objective: Environmental training of construction staff minimises the occurrence of environmental impact to the work area.

Management Outcome: Environmental impact as a result of construction activities is minimised through the development of effective environmental awareness training material and execution of environmental awareness training all staff

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All staff receive environmental awareness training; 2. The Contractor shall allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course; 3. All new staff coming onto site shall receive environmental awareness training; 4. Refresher environmental awareness training is available as and when required; 5. All staff are aware of the conditions and controls linked to the Environmental Authorisation and within the EMPr; 6. All staff are made aware of their individual roles and responsibilities in achieving compliance with the environmental authorisation and EMPr; 7. The Contractor shall erect and maintain information posters at key locations on site; 8. Environmental awareness training should include as a minimum the following: a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities; c) Emergency preparedness and response procedures; d) Emergency procedures; e) Procedures to be followed when working near or within sensitive areas; f) Wastewater management procedures; g) Water usage and conservation; h) Solid waste management procedures; i) Sanitation procedures; j) Disease prevention; and k) Chance find procedure for archaeological/paleontological/historical sites unearthed during construction. 9. A record of all environmental awareness training courses undertaken as part of the EMPr must be available; 10. A staff attendance register of all staff to have received environmental awareness training must be available. 11. Course material must be available and presented in all appropriate languages.					

5A.10.2 Construction Site Establishment

Management Objectives: Ensure that environmental issues are taken into consideration in the planning and construction of site establishment

Management Outcome: Impact to the environment during site establishment is minimised.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. A Method Statement shall be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management; 2. Location of construction camps must be carefully considered and approved by the ECOs to ensure that the site does not impact on sensitive areas identified in the EIA or site walk through; 3. Sites should be located where possible on previously disturbed areas; 4. The construction camp shall be fenced in accordance with Section 5A.10.5: *Fencing and gate installation*; and 5. The use of existing accommodation for contractor staff, where possible, is encouraged.					

5A.10.3 No-Go areas

Management Objectives: Construction related activity inside No-Go areas is prevented in an effort to avoid environmental impacts to such areas.					
Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Identification of No-Go areas is to be informed by the BA/EIA, site walk through and any additional areas identified during construction; 2. Erect, demarcate and maintain a temporary fence around the perimeter of any No-Go area; 3. Fencing of No-Go areas is to be undertaken in accordance with Section 5A.10.5: *Fencing and gate installation*; and 4. Unauthorised access and construction related activity inside No-Go areas is prohibited.					

5A.10.4 Access Roads

Management Objective: Minimise impact to the environment through the planned and controlled movement of vehicles on site.					
Management Outcomes: Vehicle movement to adhere to agreed access plan.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Access to the servitude and tower positions shall be negotiated with the relevant landowner 2. An access agreement shall be formalised and signed by the Development Project Manager, Contractor and landowner before commencing with construction activities; 3. The access roads to tower positions shall be signposted after access has been negotiated and before the commencement of construction activities; 4. Any access route deviation from that in the written agreement shall be closed and re-vegetated immediately, at the contractor's expense; 5. Maximum use of both existing servitudes and existing roads shall be made; 6. In circumstances where private roads must be used, the condition of the said roads shall be recorded prior to use and the condition thereof agreed by the landowner, the Development Project Manager, landowner and the contractor; 7. All private roads used for access to the servitude shall be maintained and upon completion of the works, be left in at least the original condition. As far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes; 8. Access is to be established by vehicles passing over the same track on natural ground, multiple tracks are not permitted. Access roads shall only be constructed where necessary at watercourses, on steep slopes or where boulders prohibit vehicular traffic (refer to Appendix A for requirements when constructing a new access road and Section 5A.10.9 *Protection of watercourses and water bodies* for controls when seeking access in proximity to a water course or water body); 9. Upon completion of construction, only roads as indicated by the Development Project Manager shall be closed. Road closure shall be undertaken in accordance with the requirements specified in Appendix A.					

5A.10.5 Fencing and Gate installation

Management Objective: To minimise impact to the environment and ensure safe and controlled access to the site through the erection of fencing and gates where required

Management Outcomes: The erection of fencing and management of fencing is to be undertaken in accordance with the Fencing Act No 31 of 1963

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Fencing Act No 31 of 1963 shall be adhered to at all times with regards to the leaving open of gates and the dropping of fences for crossing, purposes, climbing and wilful damage or removal of gates; 2. Use existing gates provided to gain access to all parts of the defined Working Area, where possible; 3. All gates shall be fitted with locks and be kept locked at all times during the construction phase, unless otherwise agreed with the landowner; 4. At points where the line crosses a fence in which there is no suitable gate within the extent of the line servitude, on the instruction of the Development Project Manager, a gate shall be installed; 5. Care shall be taken that the gates shall be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground; 6. Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill shall be provided beneath the gate; 7. Original tension shall be maintained in the fence wires; 8. All gates installed in electrified fencing must be re-electrified; 9. All demarcation fencing and barriers shall be maintained in good working order for the duration of construction activities; 10. Fencing shall be erected around the construction camp, batching plants, hazardous storage areas, and all designated no-go areas, where applicable; 11. All fencing shall be constructed of high quality material bearing the SABS mark; 12. The use of razor wire as fencing shall be avoided; 13. Fenced areas with gate access will remain locked after hours, during weekends and on holidays if staff are away from site. Site security will be required at all times; 14. On completion of the project all temporary fences are to be removed and where possible re-used by the contractor at new projects; 15. The contractor will ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.					

5A.10.6 Water supply management

Management Objectives: Undertake responsible water usage during construction

Management Outcome: Water use during construction is compliant with the requirements of the National Water Act (No 36 of 1998)

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on a daily basis; 2. Should water abstraction be required and the necessary authorisation from DWS and permission from the landowner has been received, the Contractor shall ensure the following: a. The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river; b. No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and c. All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented. 3. Ensure water conservation is being practiced by: a. Minimising water use during cleaning of equipment; b. Undertaking regular audits of water systems; and c. Including a discussion on water usage and conservation during environmental awareness training.					

5A.10.7 Waste water management

Management Objectives: To avoid, manage and mitigate potential impacts to the environment caused by waste water discharge during construction.					
Management Outcomes: Waste water management is undertaken in accordance with relevant national and provincial legislation and local by-laws.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into watercourses or water bodies shall be designed and implemented; 2. Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Project Manager; 3. All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility; 4. Natural storm water runoff not contaminated by construction operations and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; 5. Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment shall be subject to the Project Manager's approval and support by the ECO.					

5A.10.8 Solid waste management

Management Objectives: To avoid, manage and mitigate potential impacts to the environment caused by the incorrect storage, handling and disposal of general and hazardous solid waste.					
Management Outcomes: Solid waste management is undertaken in accordance with relevant national and provincial legislation and local by-laws.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. All measures regarding waste management shall be undertaken using an integrated waste management approach; 2. Sufficient, covered waste collection bins (scavenger and weatherproof) shall be provided; 3. A suitably positioned and clearly demarcated waste collection site shall be identified and provided; 4. The waste collection site shall be maintained in a clean and orderly fashion; 5. Waste shall be segregated into separate bins and clearly marked for each waste type; 6. Staff shall be trained in waste segregation; 7. Recycling of waste types shall be maximised; 8. Bins shall be emptied regularly; 9. General waste shall be disposed of at recognised and registered waste disposal sites/ recycling company; 10. Hazardous waste shall be disposed of at a registered waste disposal site; 11. Certificates of disposal for general, hazardous and recycled waste shall be maintained; 12. Under no circumstances shall any waste be disposed of, burned or buried on site.					

5A.10.9 Protection of watercourses and water bodies

Management Objectives: Construction related activity is undertaken in a manner which prevents impacts to watercourses, water bodies and wetlands.

Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All watercourses and water bodies shall be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; 2. In the event of a spill, prompt action shall be taken to clear the polluted or affected areas; 3. Where possible, no construction equipment shall traverse any seasonal or permanent wetland. 4. No natural watercourse or water body shall be used for the purposes of swimming, personal washing and the washing of machinery or clothes; 5. Excavation or construction in a water course or wetland area shall be avoided unless exceptional circumstances require that excavation or construction cannot be avoided; 6. No roads must be cut through river, stream and watercourse or donga banks as this may lead to erosion causing siltation of downstream water resources and dams; 7. Construction of permanent watercourse crossing must only be undertaken where no alternative access to tower position is available; 8. Construction shall take place only once the necessary written approvals from the landowner, developer and DWS/Catchment management agency have been received; 9. Construction of watercourse crossings and water diversion berms shall take place in accordance with the construction of new roads specification in Appendix A; 10. No excavation or construction shall be permitted within the 1:100 year flood line or riparian zone (whichever is the greatest) of a watercourse or within 500 m from the boundary of a wetland area without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation; 11. When working in or near any watercourse or wetland, the following environmental controls and consideration shall be taken: a) River levels during the period of construction; b) Construction within flowing water is to be minimised. All diversions shall be in place, water diverted away from the Working Area and the area properly stabilised prior to excavations commencing; c) When working in flowing water, downstream sedimentation shall be controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geotextile silt curtains or sedimentation weirs constructed out of suitably secured straw bales. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities; d) During the execution of the Works, appropriate measures to prevent pollution and contamination of the riverine environment shall be implemented e.g. including ensuring that construction equipment is well maintained; e) Where earthwork is being undertaken in close proximity to any watercourse, slopes shall be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and f) Appropriate rehabilitation and re-vegetation measures for the river banks shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as construction allows.					

5A.10.10 Vegetation clearing

Management Objective: To ensure the safe mechanical and electrical construction and operation of the power line without causing unnecessary environmental damage.

Management Outcomes: Vegetation clearance is minimised through adherence to EMPr vegetation clearance requirements.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
<u>General</u> 1. Indigenous vegetation which does not interfere with the safe construction and operation of the power line shall be left undisturbed; 2. Protected or endangered species may occur on or near the construction site. Special care should be taken not to damage such species 3. Search, rescue and replanting of all protected and endangered species likely to be damaged during construction shall be identified by the Botanical Specialist and completed prior to any construction or clearing 4. Permits for removal must be obtained from the relevant Competent Authority prior to the cutting or clearing the affected species; 5. The Final Environmental Report shall confirm that all identified species have been rescued and replanted 6. Trees felled due to construction must be monitored and listed in the Final Audit Environmental Report 7. Debris through vegetation clearing shall not be burned under any circumstances; 8. Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and debris. Integrity of the riverbanks shall be maintained by only trimming parts of trees directly affecting the safe operation of the power line; 9. The use of herbicides shall be in compliance with the terms and conditions of The Fertilisers, Farm, Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947); 10. Only a registered pest control operator may apply herbicides on a commercial basis and commercial application shall be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained; 11. A daily register shall be kept of all relevant details of herbicide usage as stipulated in Act 36 of 1947; 12. Trees, shrubs, grass, natural features and topsoil which are not removed during vegetation clearance shall be protected from damage during operation of the power line. Disturbance of the surface of the earth shall be allowed for access purposes only; 13. All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off if required in accordance with No-Go procedure in Section 5A.10.3: *No-Go areas*. <u>Servitude</u> 14. Acceptable vegetation that does not grow high enough to cause interference with overhead power lines, or cause a fire hazard to any plantation, should not be cut or trimmed unless it is growing in the road access area, and then only at the discretion of the Project Manager; 15. Where clearing for access purposes is essential, the maximum width to be cleared within the servitude shall be in accordance the specifications in Table 4: *Maximum servitude clearance distances;* 16. Alien vegetation in servitudes shall be managed in terms of the GNR 1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983; 17. Alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility; 18. Vegetation should be trimmed where it is likely to intrude on the minimum vegetation clearance distance (MVCD) or will intrude on this distance before the next scheduled clearance. MVCD is determined from SANS 10280 (Refer to Table 5: *Minimum vegetation clearance distance*s) ; 19. Trees growing to a height in excess of the horizontal distance of that tree from the nearest conductor which are identified as being a risk to safe operation of the power line shall be treated and prevented from growing in a manner as to endanger the line should they fall; 20. Debris resulting from clearing and pruning shall be disposed of at a licenced waste disposal facility, unless the landowners wish to retain the cut vegetation; 21. Deep valleys and environmentally sensitive areas that restrict vehicle access, or legally protected areas, shall not be cleared of vegetation provided that the vegetation poses no threat to the safe operation and reliability of the power line. In the case of the construction of new power lines, a one metre “trace-line” may be cut through the vegetation for stringing purposes only and no vehicle access shall be cleared along the ”trace-line”. Alternative methods of stringing which limit impact to the environment shall always be considered.					

Table 4: Maximum servitude clearance distances

Nominal voltage	Servitude building restriction widths (measured from the centre line of the power line) *	Maximum Vegetation Clearance
11 kV	9 m	4m on either side of the centre line will be cleared.
22 kV	11 m	4m on either side of the centre line will be cleared.
88 kV	11 m	5 m on either side of the centre line will be cleared.
132 kV	15,5 m	8 m on either side of the centre line will be cleared.
220 to 765 kV	22 m to 40 m	Clear from the centre of the power line up to the outer conductor, plus an additional 10 metres on either side.
533 kV DC	15 m	8 m either side of the centre line will be cleared.

Table 5: Minimum vegetation clearance distances

System nominal r.m.s. voltage kV	Minimum vertical clearances (m)	Minimum horizontal Clearances (m)
>1 up to and including 44	3	3
66	3.2	3
88	3.4	3
132	3.8	3
220	4.4	3
275	4.9	3
400	5.6	3.2
765	8.5	5.5

5A.10.11 Protection of Fauna

Management Objective: Ensure care is taken to minimise disturbance to fauna during construction and potential future impact during the operation of the line					
Management Outcomes: Impact to fauna is avoided during construction and mitigated during operation of the line					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Construction activities shall not interfere or cause fatalities to animals (both wild and farm animals) as stipulated by Environmental Conservation Act 73 of 1989; 2. No interference with livestock shall occur without the landowner's written consent and with the landowner or a person representing the landowner being present; 3. The breeding sites of raptors and other wild birds species must be taken into consideration during the planning of the construction programme; 4. Breeding sites shall be kept intact and disturbance to breeding birds shall be avoided. Special care shall be taken where nestlings or fledglings are present; 5. Nesting sites on existing parallel lines must be noted; 6. Special recommendations of the avian specialist must be adhered to at all times to prevent unnecessary disturbance of birds; 7. Bird guards and diverters must be installed on the new line as per the recommendations of the specialist; 8. No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as No-Go areas.					

5A.10.12 Protection of heritage resources

Management Objective: Prevent damage and destruction to fossils, artefacts and materials of heritage significance

Management Outcomes: Impact to heritage resources is avoided

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in Section 5A.11.3: *No-Go areas;* 2. Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; 3. All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to remove/collect such material before construction recommences.					

5A.10.13 Safety of the public

Management Objective: Reasonable measures are taken to ensure the safety of the public at all times during construction

Management Outcomes: All precautions are taken where possible to minimise the risk of injury, harm or complaints

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; 2. All unattended open excavations shall be adequately fenced or demarcated; 3. Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; 4. Ensure structures vulnerable to high winds are secured; 5. Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.					

5A.10.14 Sanitation

Management Objective: An abundant supply of suitably located, clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment.

Management Outcomes: No pollution or disease arises on-site as a result of sanitation facilities or lack thereof.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Mobile chemical toilets are installed onsite if no other ablution facilities are available; 2. The use of ablution facilities and or mobile toilets shall be used at all times and no indiscriminate use of the veld for the purposes of ablutions shall be permitted under any circumstances; 3. Ablution facilities shall be located within 100 m of any work place and shall be numerous enough to accommodate the workforce (minimum requirement of 1:15 workers on site) 4. Where mobile chemical toilets are required, the following shall be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body;					

b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr; d) Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; e) Toilets are emptied before long weekends and workers holidays, and shall be locked after working hours; f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards; 5. A copy of the waste disposal certificates shall be maintained.					

5A.10.15 Prevention of disease

Management Objective: All necessary precautions linked to the spread of disease during construction, especially to livestock, are taken.

Management Outcomes: The risk of the occurrence and spread of disease is minimised through the effective implementation of EMPr actions.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Undertake environmentally-friendly pest control in the camp area; 2. Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS; 3. The Contractor shall ensure that information posters on AIDS are displayed in the Contractor Camp area; 4. Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable; 5. Free condoms will be made available to all staff on site at central points; 6. Medical support shall be made available; 7. Provide access to Voluntary HIV Testing and Counselling Services.					

5A.10.16 Emergency Procedures

Management Objective: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.

Management Outcomes: All emergency situations are managed in accordance with the emergency procedures.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; 2. The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; 3. All staff shall be made aware of emergency procedures as part of environmental awareness training; 4. The relevant local authority shall be made aware of a fire as soon as it starts; 5. In the event of emergency necessary mitigation measures to contain the spill or leak shall be implemented (see Hazardous Substances Section 5A.10.17).					

5A.10.17 Hazardous substances

Management Objective: To minimise the risk of impact to the environment through the safe storage, handling, use and disposal of hazardous substances.

Management Outcomes: The management of hazardous substances is undertaken in accordance with the Hazardous Substances Act of 1973 (Act No. 15 of 1973), the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 1998) and Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947 (Act No. 36 of 1947) and National Environmental Management: Waste Act of 2008.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Occupational Health and Safety Act No 85 of 1993 to be complied with at all times; 2. The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; 3. All hazardous substances will be stored in suitable containers as defined in the Method Statement; 4. Containers will be clearly marked to indicate contents, quantities and safety requirements. 5. All storage areas will be bunded. The bunded area will be of sufficient capacity to contain a spill / leak from the stored containers; 6. An Alphabetical Hazardous Chemical Substance (HCS) control sheet will be drawn up and kept up to date on a continuous basis. All hazardous chemicals that will be used on site will have Material Safety Data Sheets; 7. All employees working with HCS will be trained in the safe use of the substance and according to the safety data sheet; 8. Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment (PPE) must be made available; 9. The Contractor shall ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; 10. The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); 11. The floor of the bund shall be sloped, draining to an oil separator; 12. Provision shall be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray shall be used to ensure small spills are contained; 13. All empty externally dirty drums shall be stored on a drip tray or within a bunded area; 14. No unauthorised access into the hazardous substances storage areas shall be permitted; 15. No smoking shall be allowed within the vicinity of the hazardous storage areas; 16. Adequate fire-fighting equipment shall be made available at all hazardous storage areas; 17. Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit shall be used. Appropriate ground protection such as drip trays shall be used as well; 18. An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance shall be available at all times; 19. The responsible operator shall have the required training to make use of the spill kit in emergency situations; 20. In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Section 5A.10.7 for procedures concerning waste water management and 5A. 10.8 for solid waste management.					

5A.10.18 Workshop, equipment maintenance and storage

Management Objective: The control operation, maintenance and storage of equipment prevents soil, surface water and groundwater contamination

Management Outcomes: Soil, surface water and groundwater contamination is prevented as due to adherence of EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area; 2. During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil					

3. Leaking equipment must be repaired immediately or be removed from site to facilitate repair; 4. Workshop areas must be monitored for oil and fuel spills and such spills; 5. Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place shall be available; 6. The responsible operator of equipment must have the required training to make use of the spill kit in emergency situations; 7. The workshop area shall have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; 8. Water drainage from the workshop shall be contained and managed in accordance Section 5A.10.7: *Waste water management.*					

5A.10.19 Batching plants

Management Objective: To control concrete and cement batching activities in order to prevent spillages and concomitant contamination of soil, surface water and groundwater environment.

Management Outcome: The management, handling and storage of sand, stone and cement is undertake in accordance with the EMPr

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Concrete mixing shall be carried out on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface); 2. Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination; 3. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains; 4. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted; 5. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility; 6. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site; 7. Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer to Section 5A.10.20: *Dust emissions*) 8. Any excess sand, stone and cement must be removed from site on completion of construction period and disposed at a registered disposal facility; 9. Temporary fencing shall be erected around batching plants in accordance with Section 5A.10.5: *Fencing and gate installation*.					

5A.10.20 Dust emissions

Management Objective: To reduce dust emissions during construction activities.

Management Outcome: Minimal occurrence of dust due the adherence of EMPr requirements.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO; 2. Removal of vegetation shall be avoided until such time as soil stripping is required and similarly exposed surfaces shall be re-vegetated or stabilised as soon as is practically possible; 3. Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present; 4. During high wind conditions, the ECO will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; 5. Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind; Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ECO; 6. Vehicle speeds shall not exceed 40km/h along dust roads or 20km/h when traversing unconsolidated and non-vegetated areas.					

7. Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. dampening with water; particularly during prolonged periods of dry weather in summer. Such measures shall also include the use of temporary stabilising measures (e.g. chemical soil binders, straw, brush packs, chipping); 8. Straw stabilisation shall be applied at a rate of one bale/10m^2 and harrowed into the top 100 mm of top material, for all completed earthworks; 9. Any blasting to be done after informing local public; 10. Any blasting activity shall be conducted by a suitably licensed blasting contractor; 11. For significant areas of excavation or exposed ground, spray water or wet areas using trucks to minimise the spread of dust.					

5A.10.21 Noise

Management Objective: To prevent unnecessary noise to the environment by ensuring that noise from construction activity is mitigated					
Management Outcomes: Noise management is undertaken in accordance with SANS 10103 and requirements of the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Construction shall be limited to daylight hours unless stated otherwise within the environmental authorisation; 2. Conduct noise monitoring tests, as required by the ECO or environmental authorisation; 3. Noise levels are to comply with ECA's 7dB rule i.e. cannot generate noise that increases the noise levels to 7db above the current ambient.					

5A.10.22 Fire Prevention

Management Objective: To minimise the risk of fire during construction					
Management Outcomes: Fire prevention measures are carried out in accordance with the National Veld and Forest Fire Act, 101 of 1998					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Designate smoking areas where the fire hazard could be regarded as insignificant; 2. Educate workers on the dangers of open and/or unattended fires; 3. No open fires shall be allowed on site under any circumstances; 4. Firefighting equipment shall be available on all vehicles located on site; 5. The local Fire Protection Agency (FPA) must be informed of construction activities; 6. Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site; 7. Two way swop of contact details between ECO and FPA.					

5A.10.23 Stockpiling and stockpile areas

Management Objective: To reduce potential erosion and sedimentation as a result of stockpiling of materials					
Management Outcomes: Stockpiling management is undertaken in accordance with the requirements of the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. All material that is excavated during the construction phase (either during piling (if required) or earthworks) shall be stored appropriately on site in order to minimise impacts to watercourses, wetlands and water bodies; 2. Stockpiles must be located at least 10 m away from storm water channels and drains, and at least 32 m away from any watercourse, water body or wetland, and on flat areas where runoff will be minimise; 3. All stockpiled material shall be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; 4. Stockpiles shall not exceed 2 m in height; 5. During periods of strong winds and heavy rain, the stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin etc.); 6. Where possible, sandbags (or similar) should be placed at the bases of the stockpiled material in order to prevent erosion of the material.					

5A.10.24 Finalising Tower Positions

Management Objective: Impact to the environment is minimised during finalisation of tower positions					
Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. No vegetation clearing shall occur during survey and pegging operations; 2. No new access roads shall be constructed to facilitate access for survey and pegging purposes; 3. Project manager, botanical specialist and contractor to agree on final tower positions based on survey; 4. The surveyor is to demarcate (peg) access roads/tracks in consultation with ECO. No deviations will be allowed without the prior written consent from the ECO.					

5A.10.25 Installation of foundations

Management Objective: Impact to the environment to be minimised during the installation of foundations					
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Batching of cement to be undertaken in accordance with Section 5A.10.19: *Batching*; 2. Residual cement shall be disposed of in accordance with Section 5A.10.8: *Solid Waste Management.*					

5A.10.26 Assembly and erecting Towers

Management Objective: Impact to the environment to be minimised during the erection of towers

Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Prior to erection, assembled towers and tower sections shall be stored on elevated surface (suggest wooden blocks) to minimise damage to the underlying vegetation; 2. In sensitive areas, tower assembly shall take place off-site or away from sensitive positions; 3. The crane used for tower assembly shall be operated in a manner which minimises impact to the environment; 4. The number of crane trips to each site shall be minimised; 5. Wheeled cranes shall be utilised in preference to tracked cranes; 6. Consideration shall be given to erecting towers by helicopter or by hand where it is warranted to limit the extent of environmental impact; 7. Access to tower positions to be undertaken in accordance with access requirements in specified in Section 5A.10.4: *Access Roads*; 8. Vegetation clearance to be undertaken in accordance with general vegetation clearance requirements specified in Section 5A.10.10: *Vegetation clearing*; 9. No levelling at tower sites shall be permitted unless approved by the Development Project Manager or Developer Site Supervisor; 10. Topsoil shall be removed separately and stored for later use during rehabilitation of such tower sites; 11. Topsoil shall be stored in heaps not higher than 1m to prevent destruction of the seed bank within the topsoil; 12. Excavated slopes shall be no greater that 1:3, but where this is unavoidable, appropriate measures shall be undertaken to stabilise the slopes; 13. Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site; 14. Fly rock from blasting activity shall be minimised and any pieces greater than 150 mm falling beyond the Working Area, shall be collected and removed; 15. Only existing disturbed areas are utilised as spoil areas; 16. Drainage is provided to control groundwater exit gradient with the spill areas such that migration of fines is kept to a minimum; 17. Surface water runoff is appropriately channelled through or around spoil areas; 18. During backfilling operations, care shall be taken not to dump the topsoil at the bottom of the foundation and then put spoil on top of that; 19. The surface of the spoil is appropriately rehabilitated in accordance with the requirements specified in Section 5A.10.29: *Landscaping and rehabilitation*; 20. The retained topsoil must be spread evenly over areas to be rehabilitated and suitably compacted to effect re-vegetation of such areas to prevent erosion as soon as construction activities on the site is complete. Spreading of topsoil must not be undertaken at the beginning of the dry season.					

5A.10.27 Stringing

Management Objective: Impact to the environment to be minimised during stringing operations

Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Where possible, previously disturbed areas shall be used for the siting of winch and tensioner stations. In all other instances, the siting of the winch and tensioner shall avoid No-Go areas and other sensitive areas; 2. The winch and tensioner station shall be equipped with drip trays in order to contain any fuel, hydraulic fuel or oil spills and leaks; 3. Refuelling of the winch and tensioner stations shall be undertaken in accordance with Section 5A.10.17: *Hazardous substances*;					

4. In the case of the construction of new power lines, a one metre "trace-line" may be cut through the vegetation for stringing purposes only and no vehicle access shall be cleared along "trace-lines". Vegetation clearing shall be undertaken by hand, using chainsaws and hand held implements, with vegetation being cut off at ground level. No tracked or wheeled mechanised equipment shall be used; 5. Alternative methods of stringing which limit impact to the environment shall always be considered e.g. by hand or by using a helicopter; 6. Where the stringing operation crosses a public or private road or railway line, the necessary authorisations shall have been received from the relevant authorities (e.g. Transnet, SANRAL, Department of Transport) prior to the commencement of the stringing operations; 7. Where the stringing operation crosses a public or private road or railway line, the necessary scaffolding/ protection measures shall be installed to facilitate access. If, for any reason, such access has to be closed for any period(s) during construction, the persons affected shall be given reasonable notice, in writing; 8. No services (electrical distribution lines, telephone lines, roads, railways lines, pipelines fences etc.) shall be damaged because of stringing operations. Where disruption to services is unavoidable, persons affected shall be given reasonable notice, in writing; 9. Where stringing operations cross cultivated land, damage to crops is restricted to the minimum required to conduct stringing operations, and reasonable notice (10 work days minimum), in writing, shall be provided to the landowner; 10. Necessary scaffolding protection measures shall be installed to prevent damage to the structures supporting certain high value agricultural areas such as vineyards, orchards, nurseries.					

5A.10.28 Temporary site closure

Management Objective: Minimise the risk of environmental impact during periods of site closure greater than five days					
Management Outcomes: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Bunds shall be emptied (where applicable); 2. Hazardous storage areas shall be well ventilated; 3. Fire extinguishers shall be serviced and accessible; 4. Emergency and contact details displayed shall be displayed; 5. Fencing and barriers shall be in place as per the Occupational Health and Safety Act (No 85 of 1993); 6. Security personnel shall be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel; 7. Night hazards such as reflectors, lighting, traffic signage etc. shall have been checked; 8. Fire hazards identified and the local authority shall have been notified of any potential threats e.g. large brush stockpiles, fuels etc.; 9. Stockpiles shall be appropriately secured; 10. Structures vulnerable to high winds shall be secured; 11. Wind and dust mitigation shall be implemented; 12. Cement and materials stores shall have been secured; 13. Toilets shall have been emptied and secured; 14. Refuse bins shall have been emptied and secured; 15. Drip trays shall have been emptied and secured.					

5A.10.29 Landscaping and rehabilitation

Management Objectives: Areas disturbed during construction are returned to a state that approximates the state which they were before disruption

Management Outcomes: Landscaping and rehabilitation is in undertaken in accordance with the approved rehabilitation plan/specification

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All areas disturbed by construction activities shall be subject to landscaping and rehabilitation; 2. All spoil and waste will be remove to a registered waste site and certificates of disposal provided; 3. All slopes in excess of 2% (1:50) must be contoured in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 4. All slopes in excess of 12% (1:8.3) must be terraced in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 5. Berms that have been created should have a slope of 1:4 and be replanted with indigenous species and grasses; 6. Where new access roads have crossed cultivated farmlands, that lands shall be rehabilitated by ripping to a minimum depth of 600 mm; 7. Rehabilitation of tower sites and access roads outside of farmland shall be undertaken in accordance with the specification in Appendix A; 8. Indigenous species will be used for replanting; 9. Stockpiled topsoil shall be used for rehabilitation (refer to Section 5A.10.23: *Stockpiling and stockpiled areas*); 10. Stockpiled topsoil will be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion; 11. Before placing topsoil, all visible weeds from the placement area and from the topsoil shall be removed; 12. Subsoil shall be ripped before topsoil is placed; 13. The project shall be timed so that rehabilitation can take place at the optimal time for vegetation establishment; 14. Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled as per the instruction from the ECO; 15. Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; 16. Where required, re-vegetation can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial plants are chosen; b) Pioneer species are included; c) Species chosen must grow in the area without any problems; d) Root systems must have a binding effect on the soil; e) The final product should not cause an ecological imbalance in the area.					

5A.11 Section 2: Project Specific Environmental Controls

5A.11.1 Description of project [TO BE COMPLETED BY EAP]

- Location
- Anticipated construction duration
- Anticipated number of staff (permanent and temporary)

5A.11.2 Technical specification of the line [TO BE COMPLETED BY EAP]

- Length
- Construction area
- Tower parameters
  - Number and types of towers
  - Tower spacing (mean and maximum)
  - Tower height (lowest, mean and height)
  - Conductor attachment height (mean)
  - Minimum ground clearance

5A.11.3 Power line profile and project specific information and mitigation requirements [TO BE COMPLETED BY EAP]

A full profile of the power line overlaying an environmental sensitivity map shall be included in this section. All tower positions are to be numbered. The environmental sensitivity map shall indicate areas/features of sensitivity based on the findings of the BA/EIA and illustrated according to four tiers, Very High, High, Medium or Low. The sensitivity map shall also identify the nature of each sensitive feature e.g. raptor nest, threatened plant species, archaeological site etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features in the surrounding landscape. The map shall also illustrate farm portion names and gate access points. The power line profile shall be illustrated at an appropriate resolution to enable fine scale interrogation. It is recommended that <20 km of power line length is illustrated per page in A3 landscape format. Underlying each power line profile map landowner contact details and any specific requirements regarding each land parcels as required by the landowner shall be defined. Furthermore, specific mitigation measures as determined by the BA/EIA findings, site walk-through and conditions of Environmental Authorisation with reference to specific tower positions shall be identified. Where considered appropriate, photographs of sensitive features in the context of tower positions shall be used.

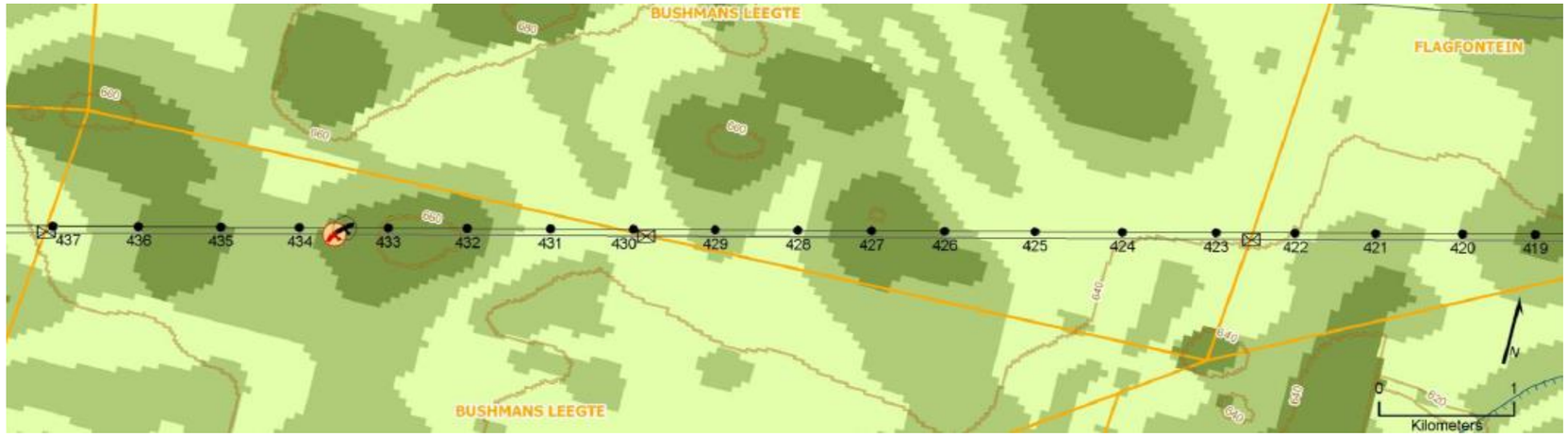


Figure 3: Example of an environmental sensitivity map in the context of a final power line profile

Table 6: Example template for landowner details and specific access requirements

Land Owner and Access Details			
Tower No.	419-422	423-429	430-437
Farm Name			
Farm Owner			
Contact Name			
Contact Number			
Special request by landowner			
Access requirements			

Table 7: Example template for project specific environmental controls

Project Specific Environmental Controls		
Tower No.	Environmental Aspect	Site Specific Mitigation
419-422		
423-429		
430-437		

PART C: APPENDICES

5A.12 Appendix A: New road construction specification

5A.12.1 Access roads

Roads should be planned according to principles of water runoff and should ideally be positioned on a watershed or ridge, and along contours. The overall slope of a road should not exceed 7% and may over short distances be increased but should never exceed 18%. Sensitive soils may cause a change in route.
All access routes are to be flagged to enable visitors and suppliers to reach specific tower locations on the accepted access route.

5A.12.2 Positioning and Construction of Water Diversion Berms

Berms are to be constructed with the primary purpose of preventing erosion of access roads, however the profile of the berm is to be shaped with due consideration to the resulting ride quality of the access track.
The contractor may elect to delay the construction of berms to the end of the contract in areas where a moderate erosion potential exists, provided that erosion developing along the access road during the construction activities is rehabilitated promptly, and that existing drainage systems is not be blocked or altered in any way by construction activity.
A lower average berm spacing is suggested by this specification: Berms spacing (in metres) = 300 m / Slope of the road (%). See Figure 4.
In very flat areas with a low erosion potential, this implies that berms may not be required at all.
The inclusion of erosion control measures and berm spacing may be adjusted as directed by the Employer's environmental control officer.

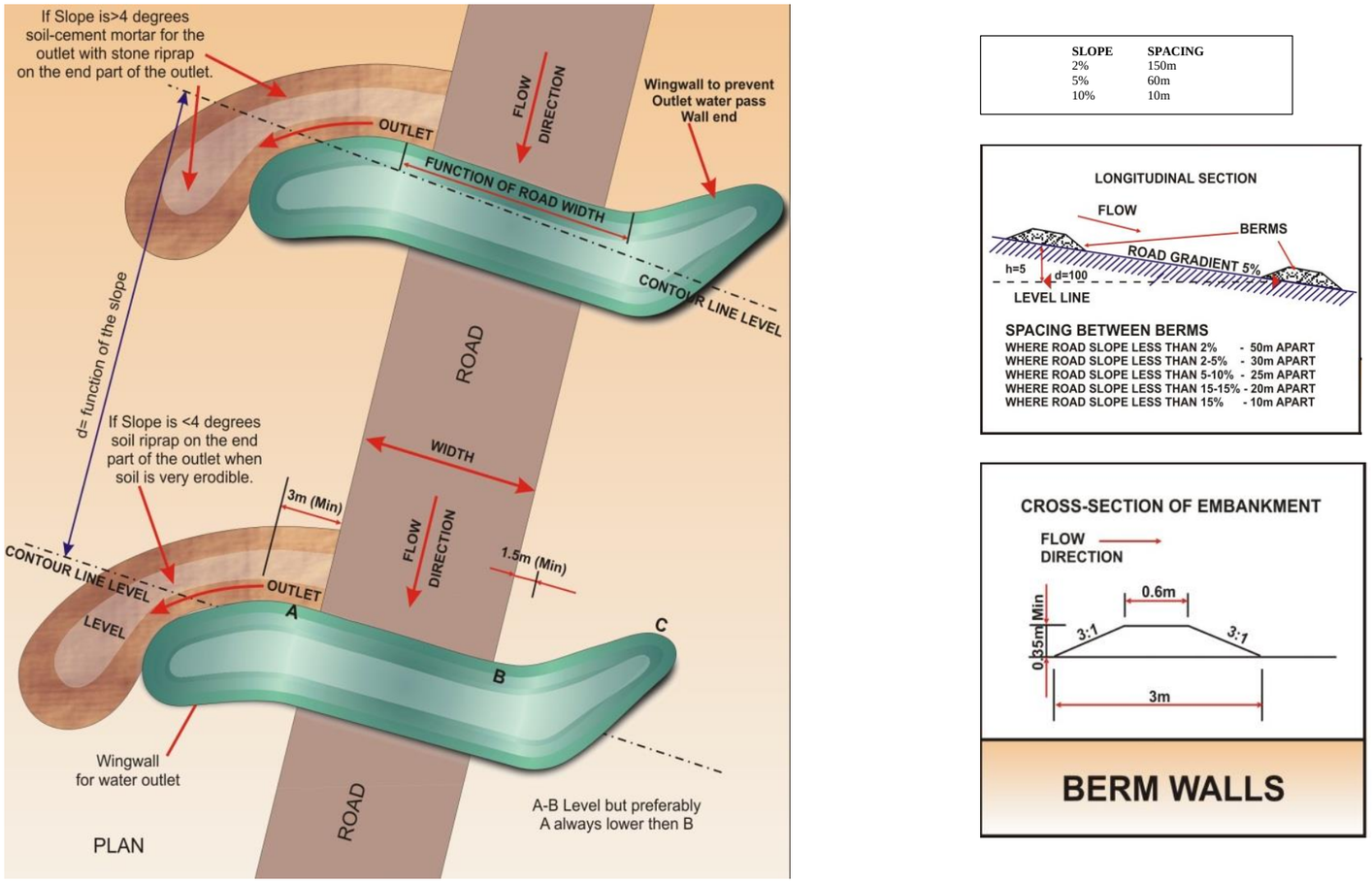


Figure 4: Alignment of water diversion berms

5A.12.3 Construction of new roads in sloping terrain

The maximum riding surface width for newly constructed roads is 3.5 m, provided that road widening may be required to enable passing of vehicles at appropriate intervals.
The cross fall slope of roads requiring cut to fill shall be 1-2%, against the natural ground slope to avoid erosion of filled material. Fill material must be compacted by vibrating roller in 150 mm layers.
Runoff is drained via a 300 mm deep channel (Refer to Figure 5) and directed off the riding surface at regular intervals via diagonal berms sloped downhill at 10-40 m spacing (lined with stone or precast strips). Such berms may require soil stabilisation in steep access roads (Refer to Figure 4 and Figure 6).

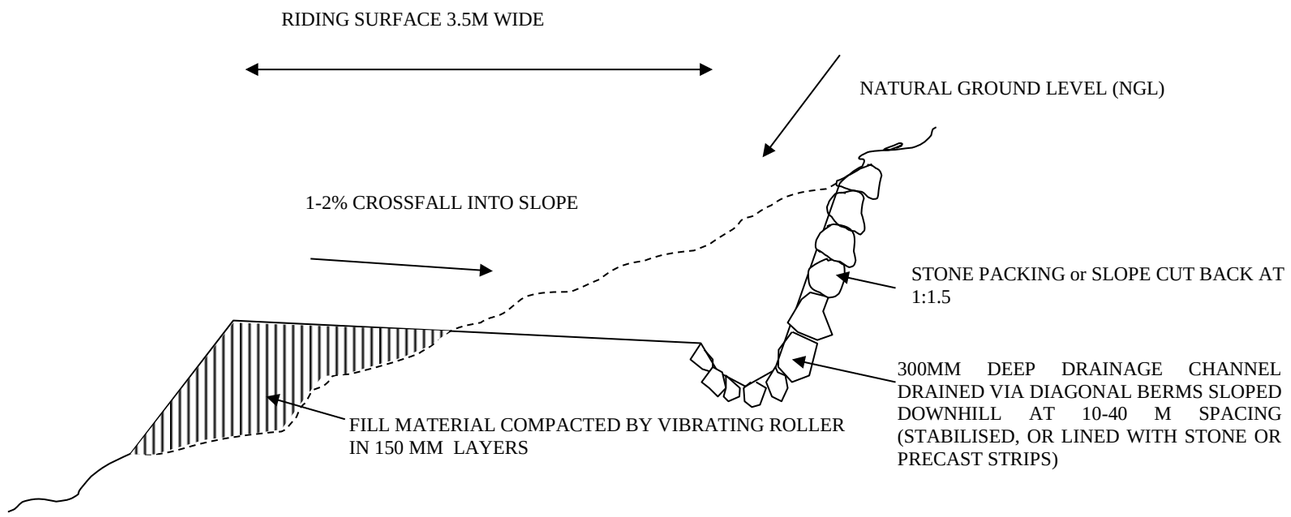


Figure 5: Typical cross-section of access road requiring cut and fill

5A.12.4 Drainage on Roads in Sloping Terrain

- **Stabilised Outlet Berms**

Where significant erosion potential exists on sloping roads constructed with cut and fill, additional erosion protection will be required on the berm itself, and the outlet of the berm.
In moderately sloping areas, the berm may be stabilised and compacted with 1:8 cement soil mixture. For stabilisation to be effective, it is imperative to mix and moisten the stabilised soil before compacting the berm with a mechanical hand operated compacting roller. Failure to effect proper stabilisation as per the preceding method will result in the gradual disintegration of the berm.
In areas with steeper slopes, berms may be lined with stone pitching (Figure 6) or an "Amorflex" type interlocking system (Figure 8).
Alternatively, the approaches to berms may be strengthened by the casting of 600 mm x 175 mm deep concrete strips.

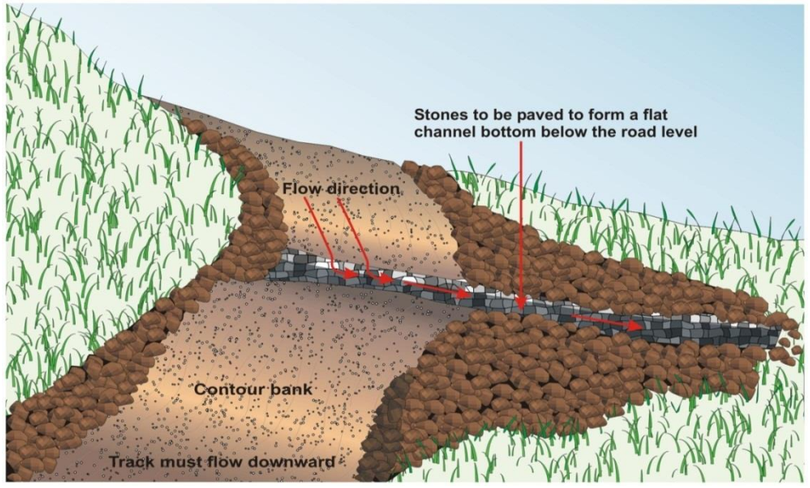


Figure 6: Stone pitched outlet berm

- **Gabion Outlet Drains**

Where there is a risk that water run-off from berms on sloping roads could erode the fill material or outlet area, it is preferable to construct a protected outlet area with stone rip – rap as illustrated in Figure 6. However, in steeper terrains, a gabion outlet drain may be specified, based on the erosion potential at the outlet.

Outlet drains refer to positions where the road forms a dip, water then accumulates and floods the road surface causing the water to flow out at the shoulder of the road (or lowest point on road shoulder) causing erosion of the road shoulder.

These drains consist of 600 mm high, 1 m long and 600 mm wide gabion walls with a reno mattress outlet. The gabions are set 300 mm deep at the road surface. Measurements may be adjusted by the supervisor depending on the road condition. (See Figure 7).

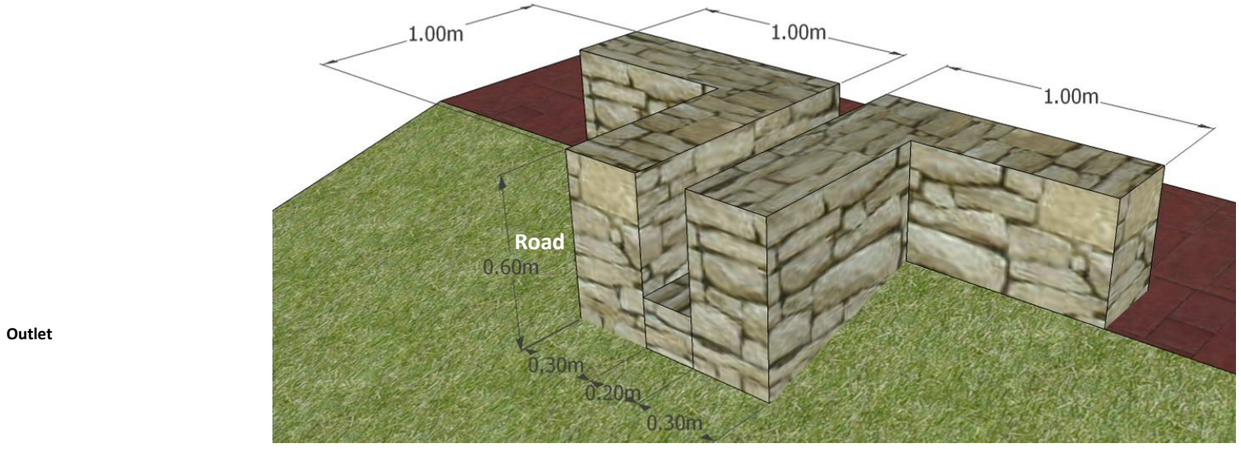


Figure 7: Gabion outlet drain

5A.12.5 Armorflex Strip Roads

The maximum longitudinal slope for a road ascending sloping terrain shall not average more than 1:10, with a maximum for short lengths being 1:16, provided such lengths are constructed with Armorflex or similar approved continuous precast erosion protection, as shown in Figure 8 or with concrete strip roads as specified in Figure 9.

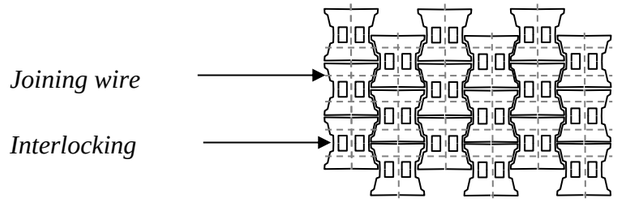


Figure 8: “Armorflex” type interlocking system for steep access of up to 1:1

5A.12.6 Concrete Strip Roads

Strip roads are constructed on the steep sections of the access road only. Concrete strips will be cast 600 mm wide and 900 mm apart, centre to centre. Minimum thickness of the concrete will be 175 mm.
Grooved joints are used where the strips are placed in a continuous operation in lengths considerably greater than 1.5 m. Keyed joints are to be used in the so called alternate-panel method of construction, i.e. the first, third and fifth panels, etc. are placed on the first day, and the in-fill second, fourth and sixth panels on the second day, etc (Figure 8). Where continuous placing with grooved joints is interrupted for more than an hour, a keyed joint is required. Each strip must be divided into panels by transverse grooved or keyed joints. For very steep slopes it is preferable to use keyed joints.
The water content of the concrete must be reduced to prevent the concrete from flowing downhill during compaction. The target slump for strip road concrete is 60 mm.
Panel anchor blocks must be incorporated at the bottom end of the slope in the construction of the concrete strips.

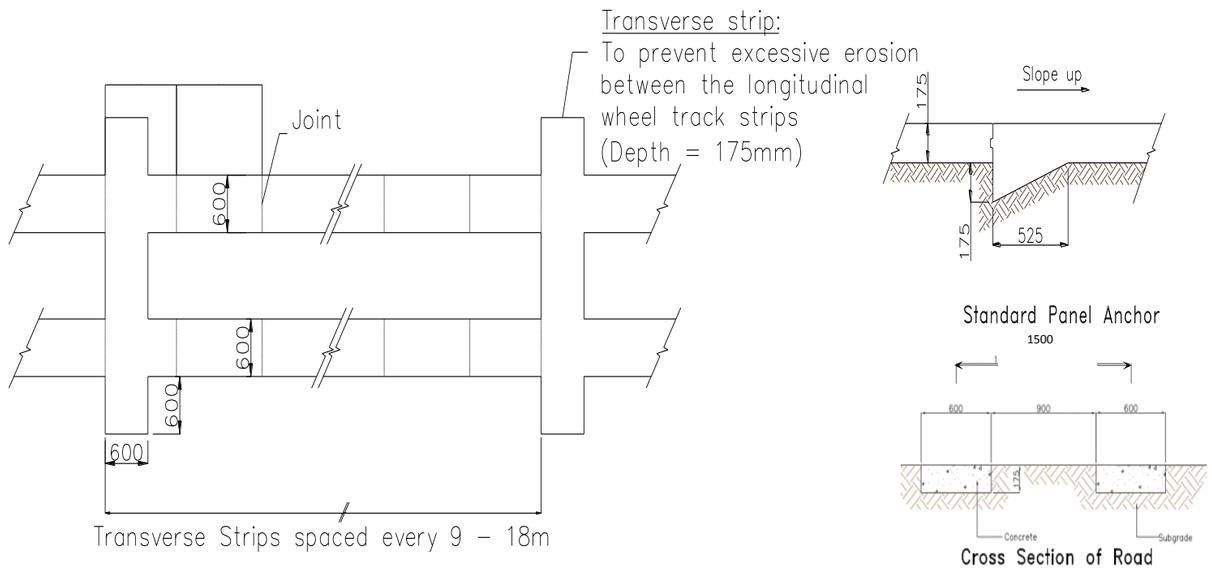


Figure 9: Concrete strip road for steep access of up to 1:16

5A.12.7 Closure of Roads for Erosion Control

While the utility should attempt to maintain access to all tower sites on the servitude, there are situations where road closures will be required. These locations are usually in environmentally sensitive sites and should be identified for closure in the EMP. The closure of a road may also be specifically requested by the landowner.
In areas of 30 % slope and less, the fill of the road should be placed back into the roadway, to restore the natural ground slope as shown in Figure 10. Here it is important to use equipment that does not work outside of the road it is closing. (For example a Tractor Loader Back-hoe may be used and should operate from the cut portion of the road, working backwards and closing the road as it retreats.)
On steeper slopes (greater than 30 % slope), the equipment should break the road shoulder down, so that the slope nearly approximates to the original slope of the ground. The cut banks should be pushed down into the road, and a terraced side slope should be re-established with an erosion control system and re-vegetated.

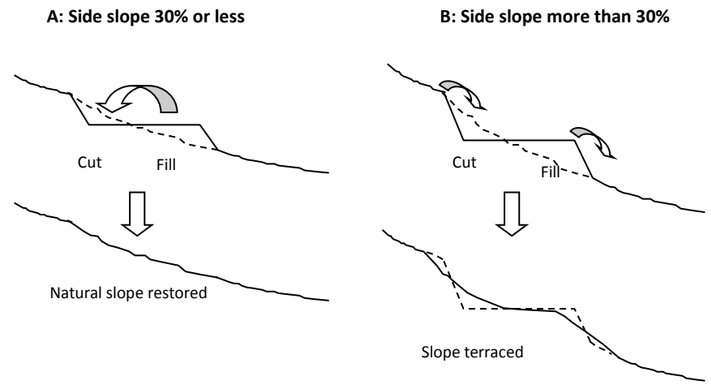


Figure 10: Road Closure in steep terrain

Replacement of earth should be at a slope less than the normal angle of repose (the natural angle of soil spill) for the soil type involved.
Rehabilitation can be done by using Geo grids (Geotex) or Geo cells (Hyson or Multi cells) with topsoil and re-seeding. Note that Hyson cells and similar grids merely contain topsoil on a temporary basis to allow the re-growth of natural vegetation, and are not suitable for carrying traffic or for use in the presence of large amounts of flowing water.
Where towers are placed on steep slopes resulting in disturbed surfaces, or loose ground, the slopes should be rehabilitated or refurbished by one of the following methods:
Steep slopes: use retaining systems such as Gabion basket systems, retaining blocks or stone masonry.
Moderate slopes: use Geo grids (Geotex) or Geo cells (Hyson or Multi cells) with topsoil and re-seeding.
Where access roads have crossed cultivated farmlands, the lands should be rehabilitated by ripping to a minimum depth of 600 mm

5A.13 Water crossing

The construction of permanent stream crossings will only be undertaken where no alternative access to a tower position is possible.
The construction of temporary accesses for the purposes of construction is subject to the approval of the Contractor's environmental representative and environmental restrictions.

5A.13.1 Watercourses and Small River Crossings

If access is to be constructed across running water, precautions should be taken not to impede the natural flow of water.
The banks of small rivers and watercourses upstream and downstream of crossings are environmentally sensitive areas which need to be protected from erosion. When cutting through the embankments of watercourses and small rivers, the road cuttings should likewise be protected to prevent erosion from spreading in the direction of the servitude road.
No soil should be pushed into the watercourse, as this will impede the natural flow of water. Rather, the banks of the watercourse should be cut as illustrated in Figure 11. Watercourse crossings should be designed and maintained to withstand a 1 in 20 year flood.

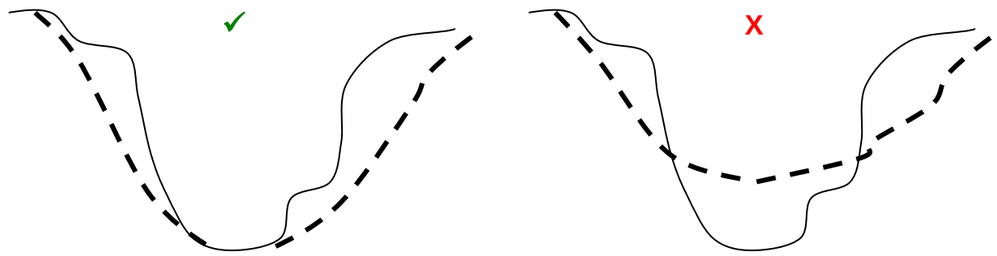


Figure 11: Correct and incorrect methods of cutting stream crossings

The correct method ensures that no fill material impedes water flow. The incorrect method places fill material in the river channel thereby impeding flow and resulting in potentially adverse environmental effects.

5A.13.2 Temporary Dry Bed / Marsh Crossings

Where sandy river beds, moderately marshy or soft soil areas are to be crossed which cannot support construction vehicles, a temporary crossing surface may be constructed using a 300mm layer of primary crusher run (150 mm stone), topped with 26.5 mm stone and crusher dust.
Alternatively, Cellular Confinement Systems (CCS, also known as geocells), may be used in conjunction with a graded stone mix (5-19 mm) or gravel. Refer to Figure 12 below.

Figure 12: Increasing load bearing capacity using a Cellular Confinement System

(Sources: Elmich.com and Geoproducts.org)

5A.13.3 Drift Water Course Crossings

The Construction of drifts must be aligned with stream bottoms as shown in Figure 11. Experience has shown that failure to execute this will result in the tilting or breakup of the drift.
Drifts may be constructed on Reno mattresses, as shown in Figure 13.
For higher water velocities (>2 ms^{-1}), "Armorflex" type paving (illustrated in Figure 8) should be used.

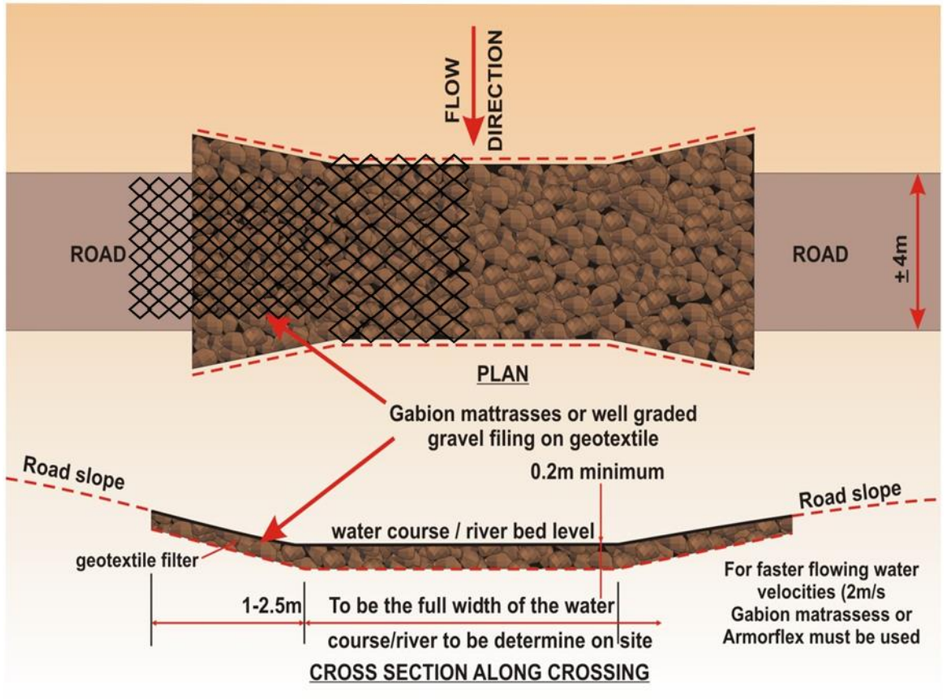


Figure 13: Water course crossing, with gabion mattresses or rock /gravel filling on geotextile filter material

5A.13.4 Low Level Bridge or Culvert Crossing (Pipes With Concrete Slabs)

Low level bridge or culvert crossings (Figure 14) should be constructed and maintained bearing in mind the following:

- The combined diameters of the pipes in the bed stream should be equal to the width of the water course, that is, the distance from one embankment to the opposite embankment, and have a diameter of approximately the depth of the 1 in 5 to10 year flood level.
- The pipes should be laid with a cross-fall of 2 to 5 % on a ≥150 mm thick concrete blinding layer. They should be built-in at the ends with rock mortar walls (or gabions) and an in-between fill of rock or gravel mortar should be used. The rock mortar walls and fill should extend well into the embankments (1to 2 m).
- For higher water flow volumes and velocities, the top layer over the pipes should be a reinforced concrete slab of ± 350 mm thick.
- Embankments should be built up with stone and mortar (or cells with gravel and mortar or other means for example, gabions etc.) to about ± 0.3 m above the 5-year flood levels.
- The riverbed should be protected for about ±1 m upstream and ± 2 to 3 m down-stream with mortar stone rip rap or Hyson cells with stone. Refer to Figure 14 for the design layout.

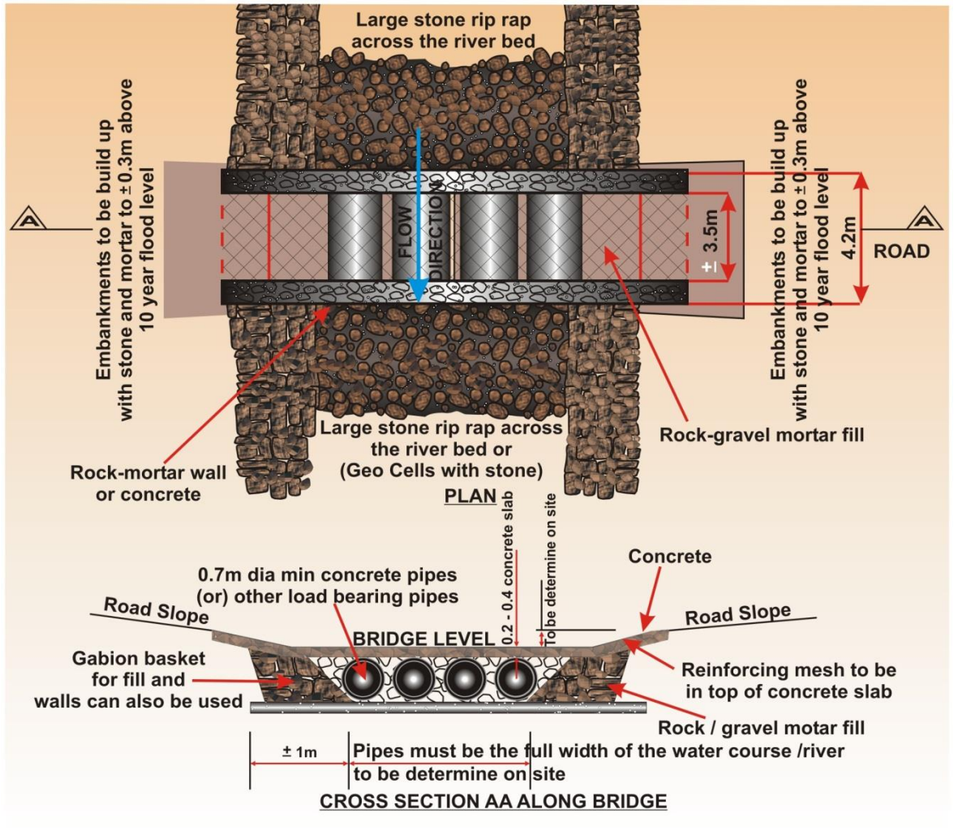


Figure 14: River/water course crossing with pipes, rock /gravel mortar filling and concrete slab

5A.14 Tower sites in sloping terrain

The majority of tower sites should be positioned such that access is possible with the minimum of effort. While due care should be undertaken in the finalisation of tower locations, the presence of more suitable tower positions may be made possible by minor adjustments in tower locations during construction. Where relevant, this option is considered preferable over the construction of special access roads and platforms.

5A.14.1 Alignment of Access to Tower Sites

The alignment of access roads to towers in sloping terrain must be planned by all relevant parties.
The alignment must suit access requirements for foundation construction and tower erection. Unless precluded by environmental restrictions, the alignment must aim to provide access for a rough terrain crane, rough terrain trucks, and 6-wheel drive concrete trucks.
The access alignment must also be suited to the tower footprint, as shown below. For guyed structures, access may be aligned within the footprint of tower legs, while self-supporting towers may be suited to the construction of access roads around the tower legs.

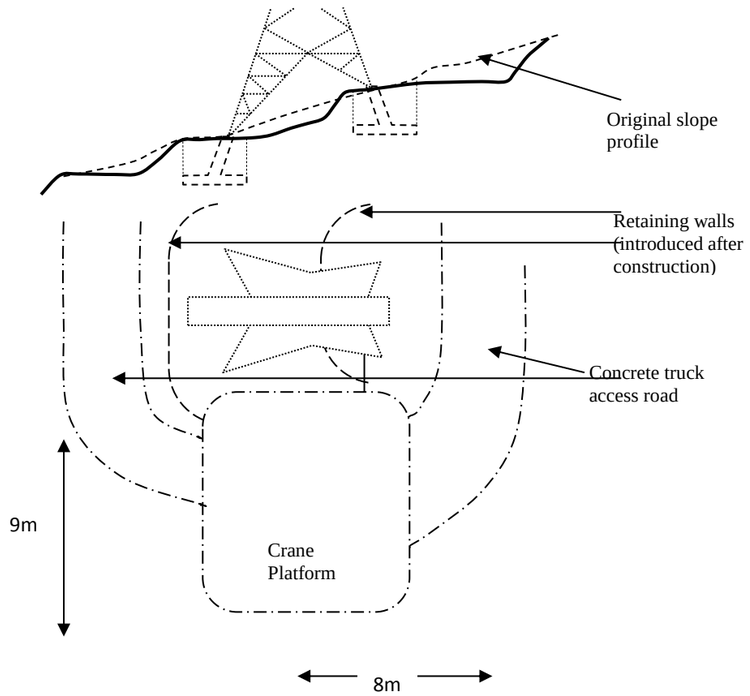


Figure 15: Typical access to a self-supporting lattice tower

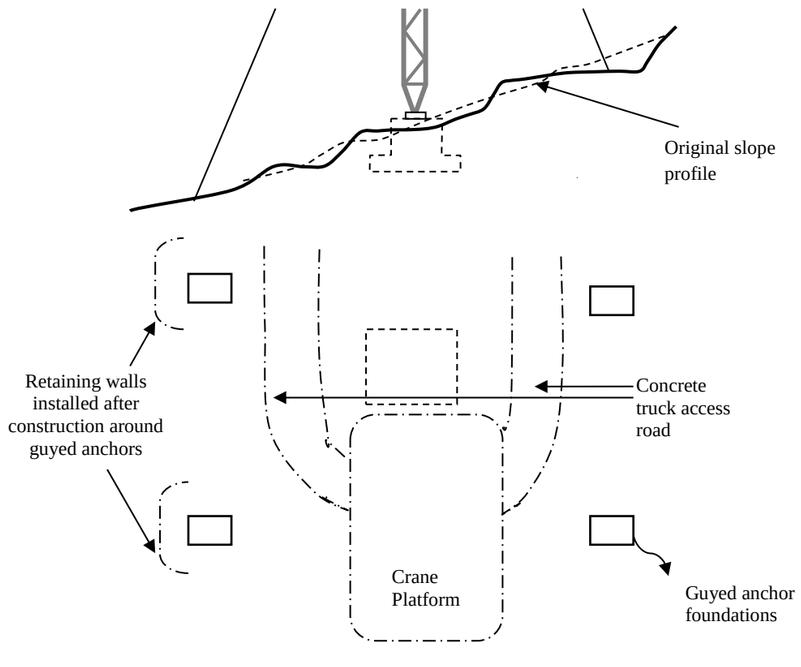


Figure 16: Typical access to a guyed tower

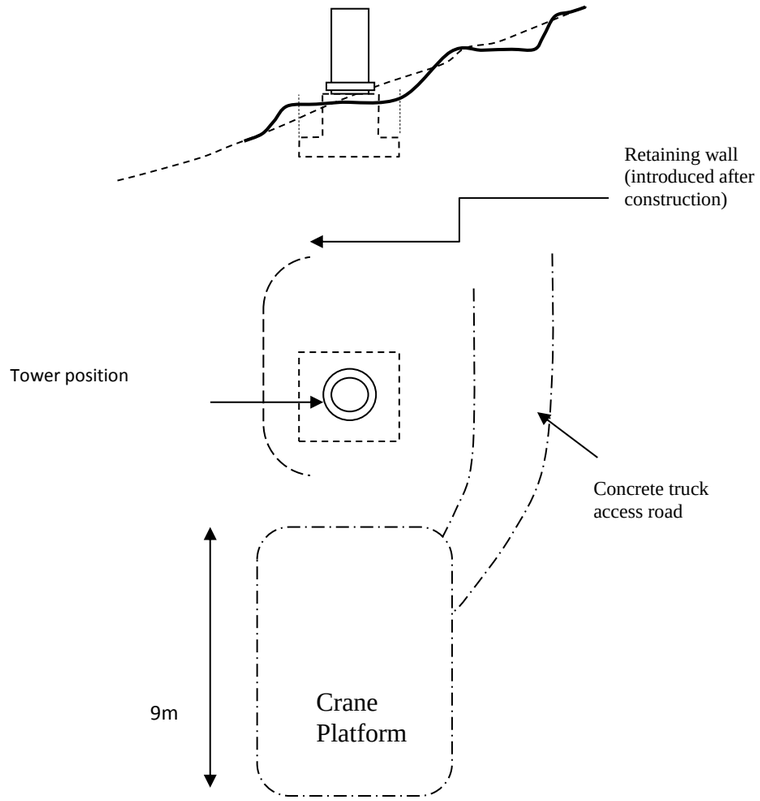


Figure 17: Typical access to a self-supporting pole

5A.14.2 Access for Cranes

The footprint for outriggers of a typical 80 ton crane is about 8 x 9m, however the outriggers need not be placed on a completely level platform. The maximum crossfall slope for a rough terrain crane suited to overhead line construction is about 5% or 1:20. Outrigger shoring, using railway sleepers or thick timber boarding will usually be required in areas with significant crossfall.

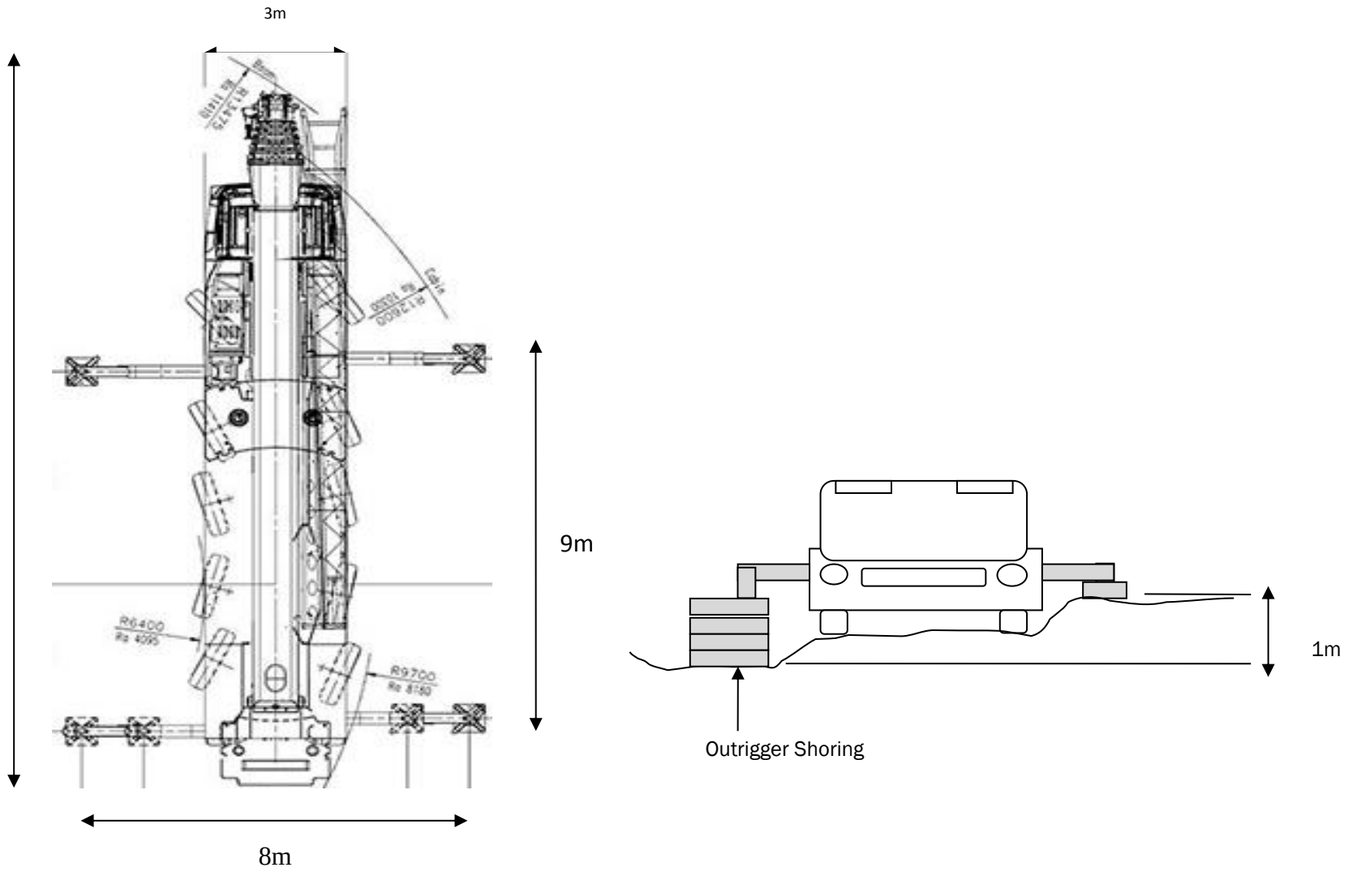


Figure 18: Typical 80 tonne crane plan dimensions

5A.15 Rehabilitation of Tower Sites and Access Roads

At the completion of construction, repairs may be required to access roads to restore them to their original condition.
Where berms have been eroded or worn away because they were constructed using unsuitable locally-sourced material, alternative material for refurbishment and maintenance should be used. The following methods may be considered:
Where the local material has a high clay content or consists of a sandy soil with little variation in particle size, the soil needs to be improved. The properties of the soil can be improved by the addition of stabilising agents such as slaked lime in the case of clayey soils or cement in the case of sandy soils. The berm material stabilised in this way should be mixed in the ratio of one part cement or lime to eight or ten parts of soil. This material should be properly mixed, moistened, placed and compacted.
Borrow pits may be utilised to source more suitable material. The location of borrow pits, and their rehabilitation should be specified in the EMPr.
Under normal circumstances, the majority of tower sites, being located on relatively even terrain, will not require extensive rehabilitation or mitigatory measures. If the top-soil is replaced in the final layer of backfill, natural ground cover vegetation will usually grow back in spite of extensive removal of surface vegetation during construction.
Any soil removed by erosion, must be back-filled evenly and, graded to conform to the surrounding terrain. During foundation excavation, care must be taken to replace top-soil on the final uppermost layer of foundation backfill. Failure to replace topsoil in the final layer will leave infertile subsoil on the surface, thus impeding re-growth. The EMPr may in certain instances also call for the re-planting or re-seeding of certain sites. All tower sites should be rehabilitated (slope areas to be stabilized) and maintained by methods applicable to the situation. Maintenance should be in accordance with the requirements of the EMP.
The following environments however, can constitute sensitive sites:

5A.15.1 Arid Environments or Sparse Vegetation

These sites are typically located in the Karoo and Namib Desert. The vegetation, when disturbed, can take years to recuperate, and there is not sufficient natural moisture to permit re-planting of natural flora.
The principle mitigatory measure is to limit the destruction of vegetation, by strict adherence to minimizing the extent of damage. This includes limiting the available working area and avoiding the creation of numerous tracks.

5A.15.2 Sloping Terrain

These tower sites require various forms of terracing. This not only ensures that erosion is limited but aids in maintaining the uplift capacity of foundations, which is invariably compromised in sloping terrain.
The terraced soil requires the construction of soil retaining systems, which include the use of:

- Stone walls, consisting of natural stone which are either loosely packed (adequate in mildly sloping terrain), or laid using mortar.
- Stone pitching, entailing the use of natural stone which is overlaid on the side slopes of terraces and then cemented by mortar.
- Pre-cast-retaining systems, generally consisting of interlocking pre-cast concrete blocks.
- Gabion mattresses, consisting of wire baskets which are filled with natural stone

The use of natural materials is favoured not only from an aesthetic, but also from a cost efficiency point of view, and should be utilised where availability permits.

5A.15.3 Proximity to Flowing or Still Water

Erosion of river banks has resulted in compromised tower foundations in a number of instances. In these cases, it is preferable to utilise resilient systems, such as gabion mattresses. Gabion mattresses have the added benefit that they are flexible, and continue to provide protection even after surrounding material has been eroded (in contrast to other retaining systems, which can topple after heavy flooding).

5A.16 Post Construction Inspections

The first post construction inspection should be conducted upon hand-over, and should be conducted jointly by regional staff, project manager's environmental officer and engineers responsible for design.
The second (and most important) should take place 11 months after hand over, in order to asses:

- the extent to which natural re-growth is possible;
- the erosion resulting from the preceding season, taking into consideration the amount of rainfall; and
- the need for additional erosion protection or re-vegetation.
-

5A.17 Erosion prevention structures

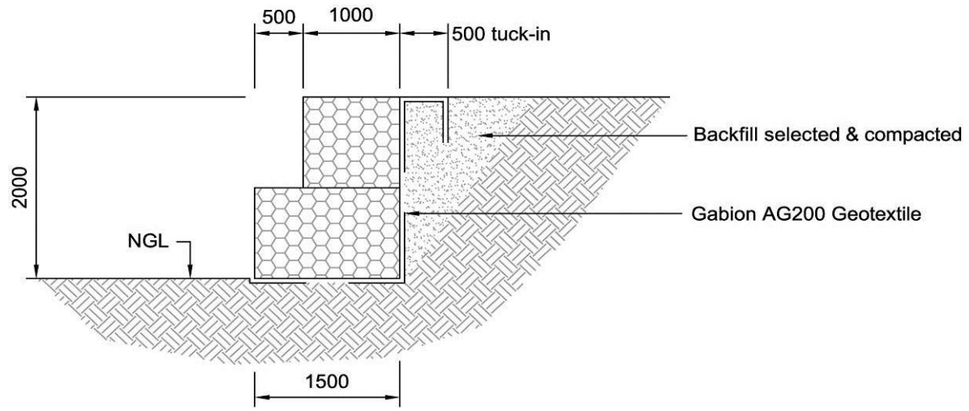
These structures or systems are used in eroded areas and aim to control the flow of water, halt active erosion and re-establish vegetation. Three categories of solutions are suggested by Suthers (2002). They are:

5A.17.1 Heavy Systems

These solutions include concrete or brick structures and gabions and reno mattresses, etc.

5A.17.2 Gabion Mattress Walls

Soils or up slope embankments which are subjected to dynamic or static loading must be stabilised to ensure equilibrium of the surrounding environment. When soils is confined or loaded, distributing forces are set up that may give rise to sliding, overturning and bearing failures as a result of the weight of the structure. To counteract these effects slope reinforcements may be required.
The specifications as referred to in **SANS 1200DK** should be taken in consideration when building Gabion Mattress Retaining Walls.
The specifications and sketches in this document refer to the protection of service roads against up-slope rock and soil sliding which might damage the access / service road or prevent access along the service road.
The following schematic sketch illustrates the layout of a Gabion wall. Dimensions will need to be calculated according to the slope gradient, erosion risk and composition of the soil.



Note: No single gabion cage will be longer than 4 m.
Use double twist hexagonal woven mesh according to **SANS 1580** specifications: use galvanised mild steel wire.
Stone filling can be rock from the surrounding environment, primary crusher run, or obtained from an approved source as indicated by the Contractor or *Technical Specification* related to the specific project.
Backfill material behind structures and below structures shall be compacted to a minimum of 98% MOD American Association State Highway and Transportation Officials (AASHTO) A G200 geotextile to be used at all mesh / soil interfaces.

5A.17.3 Light Systems

These systems include Silt screens (van Heerden 2000) erosion control blankets, turf reinforcement mats and geocells. The re-establishment of vegetation is also encouraged by using soil reclamation rolls (SRR), EcoLogs or seeded coir mats.

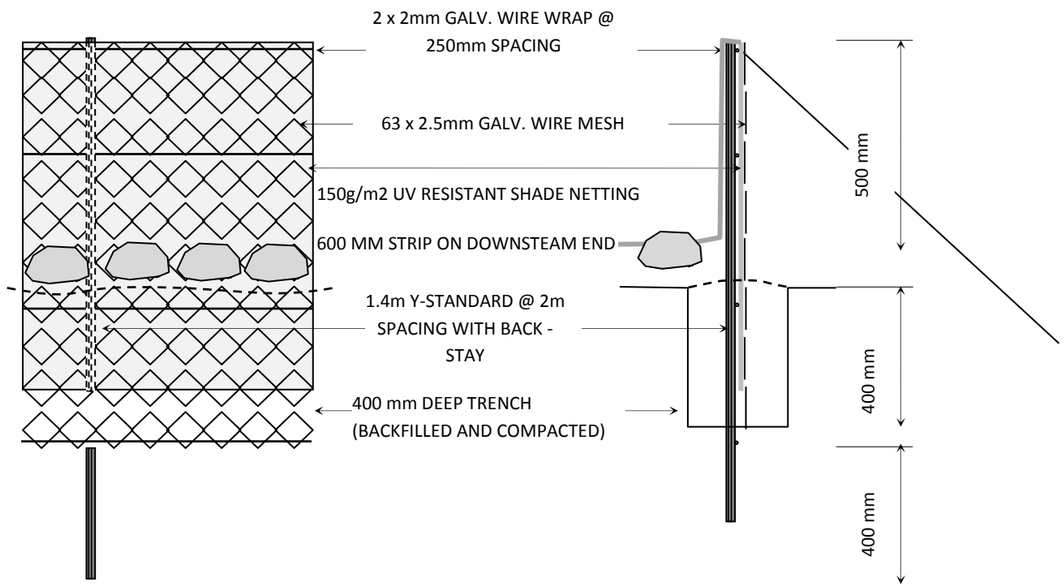


Figure 19: Silt Screen used for rehabilitation of eroded areas

5A.18 Appendix B: Method statements

[TO BE COMPLETED AND UPDATED BY CONTRACTOR ON A PROJECT BY PROJECT BASIS]

PART 5b

Generic Environmental Management Programme (EMPr) for Substation Construction

CONTENTS

TABLES

FIGURES

5B GENERIC ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR SUBSTATION CONSTRUCTION

PART A: BACKGROUND AND CONTEXT

5B.1 Introduction

5B.1.1 Need

The National Environmental Management Act 107 of 1998 (NEMA) requires that an environmental management programme (EMPr) be submitted where an environmental impact assessment must be utilised as the basis for a decision on an application for environmental authorisation.

There is a reliance on the EMPr to ensure that a project's actual environmental impacts are consistent with those evaluated in the (EIA) process. The EMPr is therefore fundamental to the EIA process and should ensure that commitments given at a project's planning and assessment stage are carried through the construction and/ or operation stage.

This Generic EMPr provides a pre-approved template that is to be used by a developer when preparing an EMPr for substations. This document describes the information requirements to enable the Department of Environmental Affairs (DEA) to make an informed and defensible decision on an EIA. This document therefore establishes a framework according to which an EMPr must be prepared when the project relates to energy transmission and distribution in South Africa.

The EMPr, as contemplated in Chapter 5 Section 24 N (1A) of NEMA, plays a vital role in the implementation of consistent and continued environmental management for the duration of a project life cycle.

5B.1.2 Scope, purpose and objectives

The *scope* of this Generic EMPr is as follows:

- Spatial extent - This generic EMPr is an output from the Strategic Environmental Assessment for Electricity Grid Infrastructure in South Africa (DEA, 2016). This SEA identified corridors that have been subjected to a scoping-level pre-assessment of environmental sensitivity. For new power lines and substations within these corridors, referred to as "Power Corridors", a Basic Assessment is adequate provided specified conditions are satisfied. For power lines and substations triggering Listing Notice 2 of EIA regulations outside of the Power Corridors, a full EIA process is required. This generic EMPr can be applied to projects both inside and outside of these corridors.
- Substation scale – This generic EMPr applies to substations which trigger an environmental authorisation in terms of National Environmental Management Act (Act No. 107 of 1998);
- Applicants / developers – This generic EMPr applies to Eskom and other potential substation developers.
- Project lifecycle – This generic EMPr applies to construction related activities only and is referred to as an Environmental Management Programme (EMPr) in this report.

The *purpose* of this document is to provide an EMPr that captures learning and best practice in managing the planning and construction of substations in sufficient detail to enable the relevant authorities to pre-approve this EMPr template, or provide approvals, general authorisations or letters of no objection under specified conditions where applicable, and thereby provide a more pro-active, responsive and efficient approval process for such projects.

The EMPr contains a general environmental controls section which describes environmental requirements relevant to all substation projects. The EMPr also contains a project specific section which describes mitigation measures and environmental control requirements specific to the particular project. These requirements will be based on the findings from the BA/EIA and any conditions attached to Environmental Authorisation (EA).

The project specific section of the EMPr identifies where project specific information from the EIA or BA will need to be included in to the EMPr. This includes:

- Environmental sensitivity mapping including "No Go" areas
- Final project footprint
- Project information including landowner details and specific access requirements.

The *overall objectives* of the generic EMPr are to realise the following:

- Ensure that impact avoidance and mitigation measures associated with substation construction are identified and that practical recommendations are provided to implement and monitor these actions.
- Ensure environmental protection
- Create a positive relationship with land owners

5B.2 Generic EMPr Framework

The structure of the generic EMPr is illustrated in Figure 1. Part A of the document provides background context to the generic EMPr. Included in this section are general national level legal requirements for a typical substation project, the description of the roles and responsibilities of key persons involved in the construction stage of a substation project and associated responsibilities in the context of the EMPr. This section also describes the various phases and activities in the lifecycle of a substation EMPr. Part B details environmental controls. Section 1 of Part B describes general environmental controls to be implemented for construction activities relevant to the project. Controls in this section reflect minimum and general requirements for managing and mitigating impacts for specific construction related substation activities. Section 2 of Part B describes project specific environmental control requirements. These controls are based on findings of the BA/EIA and are *in addition* to the general controls described in Section 1. Part C (Appendices) of the document contains specifications for carrying out certain environmental controls described in Part B Section. The contractor shall also include all approved method statements in Part C of the document.

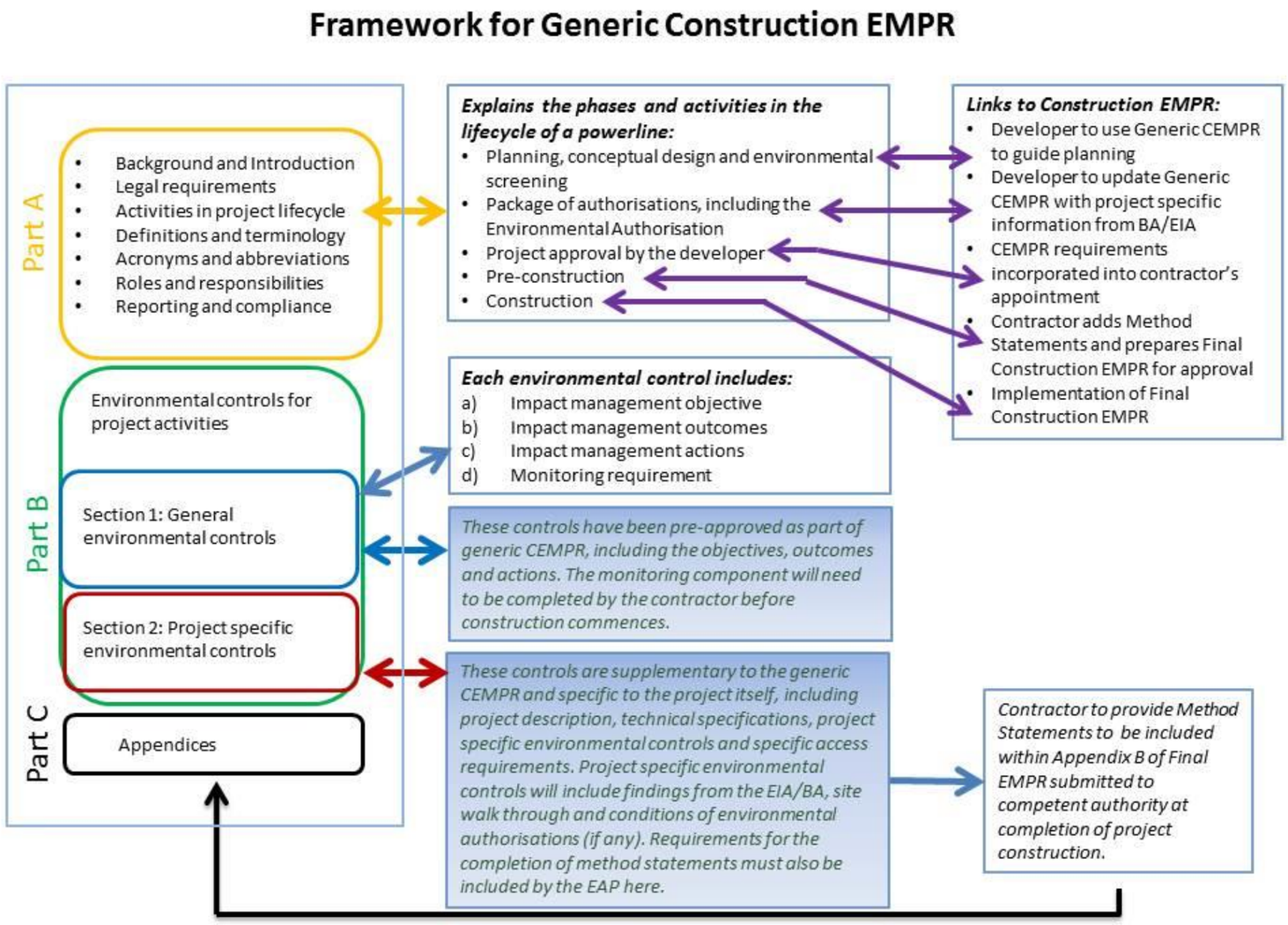


Figure 1: Framework for generic EMPr

5B.3 Legal Requirements

5B.3.1 Key environmental legislation and policies that are applicable to a typical substation project

In terms of legal requirements, a crucial objective of the EMPr is to satisfy the requirements of Section 24N of the NEMA regulations and regulation 19 of the NEMA EIA Regulation of 2014. These regulations regulate and prescribe the content of the EMPr and specify the type of supporting information that must accompany the submission of the report to the authorities.

In addition to satisfying these requirements, the content of the EMPr has been compiled in accordance with the requirements of legislation of other authorising authorities responsible for providing approvals, general authorisations or letters of no objections for substation projects. The following additional legislation was considered in this regard:

- General Authorisation of water use in terms of the amended GN 1199 of the National Water Act (No. 36 of 1998);
- National Heritage Resource Act (No. 25 of 1999.

The Contractor shall identify and comply with all South African environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation at the time of this EMPr being in effect applicable to the construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:

- **General**

The Constitution of South Africa Act of 1996 (Act No. 108 of 1996);
National Environmental Management Act of 1998 (Act No. 107 of 1998);
Environment Conservation Act of 1989 (Act No. 73 of 1989) and the Environmental Impact Assessment Regulations, 2014.

- **Land, Soil and Plants**

The Conservation of Agricultural Resources Act of 1983 (Act No. 43 of 1983);
National Forests Act of 1998 (Act No. 84 of 1998);
National Environmental Management Biodiversity Act of 2004 (Act No. 10 of 2004);
National Veld and Forest Fire Act of 1998 (Act No. 101 of 1998).

- **Protected Areas**

National Environmental Management: Protected Areas Act of 2003 (Act No. 57 of 2003);
The Protected Areas Amendment Act of 2004 (Act 31 of 2004).

- **Inland Water Resources**

National Water Act of 1998 (Act No. 36 of 1998);
Water Service Act of 1997 (Act No. 108 of 1997).

- **Cultural Resources**

Natural Heritage Resources Act of 1999 (Act No. 25 of 1999).

- **Animals and Wildlife**

Animals Protection Act of 1962 (Act No. 71 of 1962);
Game Theft Act of 1991 (Act No. 105 of 1991);
The National Environmental Management: Biodiversity Act of 2004 (Act No. 10 of 2004) and the regulations and lists regarding threatened and protected species

- **Pollution Control and Waste Management**

National Environmental Management: Waste Act, 2008;
Environment Conservation Act of 1989 (Act No. 73 of 1989);
National Environmental Management: Waste Act 2008 (Act Bo. 58 of 2008);
Minimum requirements for waste disposal by landfill, Department of Water Affairs and Forestry, 2nd addition, 1998.

- **Hazardous and Toxic Substances**

Hazardous Substances Act of 1973 (Act No. 15 of 1973);
Minimum requirements for the handling, classification and disposal of hazardous waste (Department of Water Affairs and Sanitation);
Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947 (Act No. 36 of 1947).

- **Air Pollution**

Atmospheric Pollution Prevention Act of 1965 (Act No. 45 of 1965);
National Environmental Management: Air Quality Act of 2004 (Act No. 39 of 2004).

- **Minerals, Energy and Mining**

Mineral & Petroleum Resources Development Act of 2002 (Act No. 28 of 2002)
Minerals and Petroleum Resources Development Act 28 of 2002

- **Other**

Road Traffic Act of 1989 (Act No. 29 of 1989)
Explosives Act of 2003 (Act No. 15 of 2003)
Advertising on Roads and Ribbon Development Act of 1940 (Act No. 21 of 1940)

Depending on the location of the project, applicable provincial legislation will also apply.

5B.3.2 Potential Permits/Authorisations/Licences required

Activities that could require a permit, licence, authorisation or consent use from various governmental bodies are listed in Table 1. The contractor is to ensure that any activity performed complies with the relevant legislation and the necessary permits are in place before commencement of the specific activity triggering the need for the relevant license or approval.

Table 1: Substation activities that could require either a permit, licence authorisation or consent use

Activity	Type of permit/ license/consent required	Issuing Authority
Taking water from a water resource	Licence	DWS
Storing water	Licence	DWS
Impeding or diverting the flow of water in a watercourse	Licence	DWS
Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.	Licence	DWS
Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	Licence	DWS
Disposing of waste in a manner which may detrimentally impact on a water resource	Licence	DWS
Use of treated wastewater (dust suppression)	Approval	DWS and DOH
Applying for a licence regarding activities in state forest.	Licence	DWS
Compliance with the Veld and Forest Fire Act	Requirement for a fire management plan	DAFF
To impact on archaeological and paleontological sites and meteorites	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
To destroy, damage, deface, alter, remove from its original position, subdivide or change the planning status of a National Heritage Site	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
To impact on or disturb burial grounds and graves	Permit	SAHRA (or HWC if in W Cape or HNC if in Northern Cape)
Way leave applications for accesses to provincial roads	Approval	DOT
Design of the main access road to the site camp.	Approval (Environmental Authorisation)	DEA and Relevant Provincial Roads Dept.
Application for health permits for hostels and sanitation	Permit	DOH
Blasting	Permit	DEA/SAPS
Commencement of construction activities	Notify one week before commencement	DEA
Application for Radio Equipment Licence	Site radio submission	ICSS
Outdoor advertising of Activities	South African Manual for Outdoor Advertising Control specifications	SAMOAC
Site establishment sewage disposal	Approval	Local Municipality
Site Establishment storm water & pollution control	Separate report	Local Municipality
Fuel storage	Approval-as part of BA/EIA authorisation	DEA or the relevant provincial environmental Affairs
Hazardous material route	Approval	DOT
Other hazardous substances	Permit	DOH/DEA (in certain cases)
Use of borrow pits	Approval	DMR
Project commencement	Notify	DOL
Land use outside Work Area	Special consent approval	Local Municipality
Detail design (water, waste water, roads design)	Approval	Local Municipality
Way leave applications – design	Approval	SANRAL
Waste storage, transportation, treatment, recycling and / or disposal (including hazardous waste)	Approval – permit under Section 20(1) of ECA, linked to an environmental authorisation	NEMA Competent Authority
Listed activities triggered in terms of the National Environmental Management Act 107 of 1998	Approval – Environmental Authorisation	DEA or relevant provincial department
National Environmental Management: Air Quality Act of 2004 in approximately September 2009)	Permit – registration certificate (this will become an atmospheric emission licence under AQA)	DEA – Chief Air Pollution Control Officer (to become the air quality officer in provincial or local government under AQA)

5B.4 Activities in the lifecycle of a typical substation project

There are 30 major activities involved in a typical substation project. The required status of each activity in the context of submitting the application for environmental authorisation, both inside and outside the Power Corridors is described in Table 2.

Table 2: Typical activities in substation construction lifecycle in context of submitting an application for environmental authorisation

Number	Activity
1	Select land parcel for proposed development
2	Negotiate site with landowner
3	Download electricity grid infrastructure sensitivity maps for land parcel from DEA Screening Tool
4	Specialists to validate sensitivity maps for land parcel
5	Specialist to select preferred location for project footprint
6	EAP to determine preferred location of project footprint based on specialist recommendations
7	EAP to develop specialist terms of reference for development envelope based on Development Protocols
8	Commission specialist studies
9	Produce commenting report and draft EMPr
10	Submit online application for environmental authorisation
11	30 day commenting period
12	Update report
13	Submit Final BAR/EIA
14	Decision by Competent Authority in terms of NEMA on EA application
16	Geotechnical studies
17	Finalise project footprint (specialists to determine sensitive features and relocation plan)
18	Transportation of equipment, materials and personnel to site and stores (ongoing)
19	Vegetation clearing to facilitate access, construction and the safe operation of the substation.
18	Site establishment
20	Level substation area and excavate for cut and fill requirements (terracing)
21	Gate and fence installation
22	Construction of access roads
23	Foundation excavation
24	Steelwork assembly and erection.
25	Equipment installation
26	Stringing operations
27	Dismantling and removal of old equipment (where required)
28	Testing and commissioning
29	Rehabilitation of disturbed areas
30	Handing over of works

5B.5 Working area

Construction activities shall be limited to the area for which EA is applied for/issued. Any area outside the development envelope required to facilitate access, construction activities, construction camps or material storage areas, shall be negotiated with the affected Landowner and written agreements shall be obtained. Location of construction camps must be carefully considered and approved by the ECOs and this involves determining whether any further approvals would be required in terms of the relevant environmental and health legislation.

All construction areas shall be cleared in accordance with the requirements of this EMPr Any extra space to be cleared outside the development envelope shall be negotiated with the relevant Landowner and approved by the ECOs and the Developer Project Manager. All areas marked as “No Go” areas shall be treated with the utmost care and responsibility and in accordance with the requirements of the EMPr.

Should water be required from sources other than from those provided by the Developer’s supply, a written agreement shall be reached between the Contractor and the Landowner. Should the Contractor be required to use water from a water resource, the Contractor shall supply a method statement to that effect and first obtain the required licences from DWS.

Strict control shall be maintained and the ECOs shall regularly inspect the abstraction point and methods used. Refer to Table 1 for permitting requirements.

5B.6 Definitions and terminology

For the purposes of this EMPr, the following definitions shall apply:

Assembly area means any area used for the assembly of transmission infrastructure prior to its erection. Such assembly areas may be within the construction camp or elsewhere within the Working Area.

Biophysical aspects are the naturally occurring objects and processes of an area on the assumption that all naturally occurring things can be classified as being either living (i.e. biotic) or non-living (physical or abiotic).

Botanical specialist, for the purposes of this Specification, means a competent botanist as identified by the Project Manager. Scientific should be Pr.Sci.Nat registered and other specialists should have appropriate professional accreditation.

cEO is a contractor Environmental Officer and means a qualified senior staff member and registered EHS practitioner employed full time on site by the Contractor, who shall be responsible for environmental monitoring and control.

Clearing means the clearing and removal of vegetation, whether partially or in whole, including trees and shrubs, as specified.

Construction camp is the area designated for key construction infrastructure and services, including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management.

Contaminated water means water contaminated by the Contractor's activities, e.g. concrete water and runoff from equipment, camp sites, ablution facilities and personnel wash areas.

dEO is a An individual employed by the developer who will be present on site at all times and who will ensure implementation of the EMPr, integrated Environmental Authorisation and Waste Management Licence and Water Use Licence conditions stipulated by the authorities.

ECO means an independent and EHS registered Environmental Control Officer (ECO) appointed full time by the Employer to monitor compliance by the Contractor and his staff with the environmental requirements of the environmental authorisation and EMPr.

Endemic is the natural distribution of an organism (plant or animal) restricted to the local environmental conditions within an area

Environment means the surroundings within which humans exist. It comprises:

i) The land, water and atmosphere of the earth;
ii) Micro-organisms, plant and animal life;
iii) Any part or combination of i) and ii) and the interrelationships among and between them; and
iv) The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being (*i.e.* the social environment).

This is a definition that encompasses many different facets, including biological, physical, social, economic, cultural, historical and political components.

Heritage resource, as per the provisions of the National Heritage Resources Act (No 25 of 1999), means all those heritage resources that are of cultural significance or other special value for present and future generations, and which are accordingly considered part of the National Estate. In this regard, the National Estate includes those items identified in terms of Section 2 of National Heritage Resources Act No. 25 of 1999.

Heritage specialist, for the purposes of this EMPr, means a specialist suitably qualified to deal with the type of heritage resource discovered. For example where the resource is an archaeological artefact or site, the heritage specialist would be an archaeologist and where it is a fossil the specialist would be a palaeontologist.

Maintenance period means the period after the establishment period up to and until the end of the defects liability period, during which the contractor shall be responsible for maintaining the vegetation.

Method Statement means a written submission by the Contractor to the Project Manager in response to this EMPr or a request by the Project Manager and ECO. The Method Statement must set out the equipment, materials, labour and method(s) the Contractor proposes using to carry out an activity identified by the Project Manager when requesting the Method Statement. This must be done in such detail that the Project Manager and ECO is able to assess whether the Contractor's proposal is in accordance with this specification and/or will produce results in accordance with this specification.

The Method Statement shall cover applicable details with regard to:

i) Construction procedures;
ii) Plant, materials and equipment to be used;
iii) Transporting the equipment to and from site;
iv) How the plant/ material/ equipment will be moved while on site;
v) How and where the plant/ material/ equipment will be stored;
vi) The containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
vii) Timing and location of activities;
viii) Compliance/ non-compliance; and
ix) Any other information deemed necessary by the Project Manager.

Indigenous vegetation means all existing species of trees, shrubs, groundcover, grasses and all other plants native to the site.

Pollution Incident means any incident that may cause or has caused damage to or the contamination of the natural environment.

Hazardous Substances is a substance governed by the Hazardous Substances Act, 1973 (Act No. 15 of 1973) as well as the Hazardous Chemical and Substances Regulations, 1995.

Sensitive area means any area that is denoted as sensitive by the BA/EIA, Environmental Authorisation, and EMPr, ECO or Project Manager due to its particular attributes, which could include the presence of rare or endangered vegetation, the presence of heritage resources (*e.g.* archaeological artefacts or graves), the presence of a unique natural feature, the presence of a watercourse or water body, the presence of steep slopes (in excess of 1:4) *etc*.

Slope means the inclination of a surface expressed as one unit of rise or fall for so many horizontal units.

Solid waste means all solid waste, including construction debris, hazardous waste, excess cement/ concrete, wrapping materials, timber, cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Spoil means excavated material which is unsuitable for use as material in the construction works or is material which is surplus to the requirements of the construction works.

Topsoil means a varying depth (up to 300 mm) of the soil profile irrespective of the fertility, appearance, structure, agricultural potential, fertility and composition of the soil.

Watercourse means any river, stream and natural drainage channel whether carrying water or not.

Water body means a body containing water and includes dams and wetlands, whether ephemeral or permanent.

Wetland means any area that is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the area is covered by shallow water. Specifically, an area is classified as a "wetland" if it meets at least one of the following criteria:

i) The area predominantly supports **hydrophytes**, at least periodically;
ii) The substrate(soil) is predominantly undrained hydric soil; and/ or

iii) The substrate is non-soil, and is saturated with water or covered by shallow water at some time during the growing season.

Works means the Works to be executed in terms of the Contract.

Working Area means the land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpile and laydown areas, assembly areas, batching areas, the construction corridor, all access routes and any additional areas to which the Project Manager permits access.

5B.7 Acronyms and abbreviations

BA Basic Assessment

CARA Conservation of Agricultural Resources Act No. 43 of 1983

EMPr Environmental Management Programme Report

cEO Contractor Environmental Officer

dEO Developer Environmental Officer

DEA Department of Environmental Affairs

DPM Developer Project Manager

DSS Developer Site Supervisor

DMR Department of Mineral Resources

DOH Department of Health

DOT Department of Transport

DWS Department of Water and Sanitation

ECA Environmental Conservation Act No. 73 of 1989

ECO Environmental Control Officer

EIA Environmental Impact Assessment

EIR Environmental Impact Report

EMS Environmental Management System

EMPr Environmental Management Programme Report

EAP Environmental Assessment Practitioner

FPA Fire Protection Association

FPO Fire Protection Officer

HWC Heritage Western Cape

HNC Heritage Northern Cape

I&AP's Interested and affected parties

MSDS Material Safety Data Sheet

NGL Natural Ground Level

5B.8 Roles and responsibility

The effective implementation of the EMPr is dependent on established and clear roles, responsibilities and reporting lines within an institutional framework. This section of the EMPr identifies the various environmental roles and reporting lines and defines responsibilities for each role within the institutional framework. This institutional structure will be maintained throughout the construction phase until such time as the final construction phase Environmental Audit Report has been prepared and accepted.

The Environmental Responsibilities and Reporting Structure are represented in Figure 2:

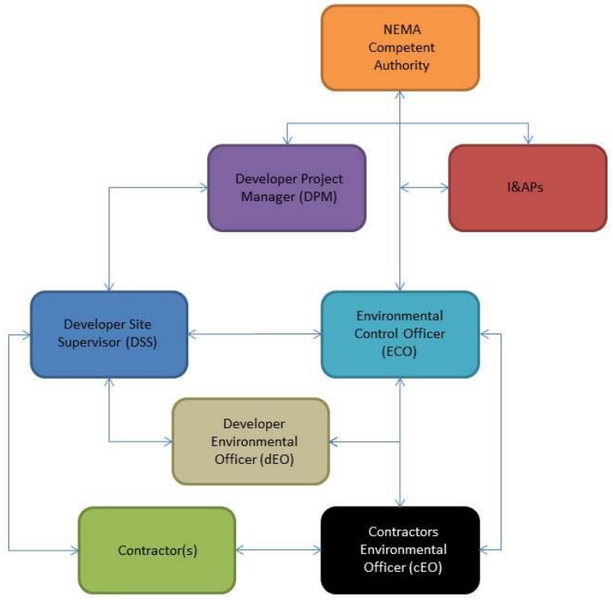


Figure 2: EMPr roles and responsibilities

Table 3: EMPr roles and responsibilities

Function	Role and Responsibilities
Environmental Assessment Practitioner (EAP)	Responsibility The EAP is to be appointed by the Developer. The responsibility of the EAP is to supplement the pre-approved generic EMPr requirements with project specific information and requirements from the authorised Basic Assessment or Environmental Impact Assessment Report. Details of the EAP appointed by the developer including the Curriculum Vitae of the EAP shall be included in the EMPr.
Developer's Project Manager (DPM)	Role The holder of the EA to which this EMPr relates holds legal responsibility for compliance with this EMPr and any other arrangements must be entered into between such holder and such other party. The Developer's Project Manager will have overall responsibility for the management of the project and the implementation of the EMPr. Responsibilities • Be fully conversant with the conditions of the EA; • Ensure that all stipulations within the EMPr are communicated and adhered to by the Developer and its Contractor(s); • Monitor the implementation of the EMPr throughout the project by means of site inspections and meetings. Overall management of the project and EMPr implementation; • Ensure that periodic environmental performance audits are undertaken on the project implementation; and • Ensure all permits, authorisations and licences are obtained, monitored and adhered to.
Developer Site Supervisor (DSS)	Role The Developer Site Supervisor reports directly to the Developer Project Manager, oversees site works, liaises with the contractor(s) and the ECO. The Developer Site Supervisor is responsible for the day to day implementation of the EMPr and for ensuring the compliance of all contractors with the conditions and requirements stipulated in the EMPr. Responsibilities • Ensure that all contractors identify a contractor's Environmental Officer (cEO); • Must be fully conversant with the conditions of the EA. Oversees site works, liaison with Contractor, DPM and ECO; • Must ensure that all landowners have the relevant contact details of the site staff, ECO and cEO; • Will issue all non-compliances to contractors; and • Ratify the Monthly Environmental Report.
Environmental Control Office (ECO)	Role and Qualifications The ECO should be employed by the developer for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The primary role of the Environmental Control Officer is to act as an independent quality controller and monitoring agent regarding all environmental concerns and associated environmental impacts. In this respect, the ECO is to conduct periodic site inspections, attend regular site meetings, pre-empt problems and suggest mitigation and be available to advise on incidental issues that arise. The ECO is also required to conduct compliance audits, verifying the monitoring reports submitted by the cEO. The ECO provides feedback to the Developer Site Supervisor and Project Manager regarding all environmental matters. The Contractor, cEO and dEO are answerable to the Environmental Control Officer for non-compliance with the Performance Specifications as set out in the environmental authorisation and EMP. The Environmental Control Officer provides feedback to the Developer Site Supervisor and Project Manager, who in turn reports back to the Implementing Agent and I&AP's, as required. Issues of non-compliance raised by the ECO must be taken up by the Project Manager, and resolved with the Contractor as per the conditions of his contract. Decisions regarding environmental procedures, specifications and requirements which have a cost implication (i.e. those that are deemed to be a variation, not allowed for in the Performance Specification) must be endorsed by the Project Manager. The ECO must also, as specified by the Environmental Authorisation, report to the Government authorizing department as and when required. Responsibilities The responsibilities of the ECO will include the following: • Be aware of the findings and conclusions of the Environmental Impact Assessment and Water Use Licensing process (where applicable) and the conditions stated within the environmental licenses; • Be familiar with the recommendations and mitigation measures of this EMPr; • Be conversant with relevant environmental legislation, policies and procedures, and ensure compliance with them; • Undertake regular and comprehensive site inspections / audits of the construction site according to the EMPr and applicable licenses in order to monitor compliance with the EMPr; • Educate the construction team about the management measures contained in the EMPr and environmental licenses; • Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective; • Monitoring the performance of the Contractors and ensuring compliance with the EMPr and associated Method Statements;

Function	Role and Responsibilities
	• In consultation with the Developer Site Supervisor order the removal of person(s) and/or equipment which are in contravention of the specifications of the EMPr and/or environmental licenses; • Liaison between the Developer Project Manager, Contractors, authorities and other lead stakeholders on all environmental concerns; • Issuing of site instructions to the Contractor for corrective actions required; • Compile a regular environmental audit report highlighting any non-compliance issues as well as satisfactory or exceptional compliance with the EMPr; • Validating the regular site inspection reports, which are to be prepared by the contractor Environmental Officer (cEO); • Checking the cEO's record of environmental incidents (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken; • Checking the cEO's public complaints register in which all complaints are recorded, as well as action taken; • Assisting in the resolution of conflicts; • Facilitate training for all personnel on the site – this may range from carrying out the training, to reviewing the training programmes of the Contractor and/or sub-contractors; • In case of non-compliances, the ECO must first communicate this to the Senior Site Supervisor, who has the power to ensure this matter is addressed. Should no action or insufficient action be taken, the ECO may report this matter to the authorities as non-compliance; • Maintenance, update and review of the EMPr; • Communication of all modifications to the EMPr to the relevant stakeholders. Further note, the ECO function is not limited to the construction phase alone, but is also an active role during the operational and later phases of the project.
developer Environmental Officer (dEO)	<u>Role and Qualifications</u> The dEOs will report to the Project Manager and are responsible for implementation of the EMPr, environmental monitoring and reporting, providing environmental input to the Project Manager and Contractor's Manager, liaising with contractors and the landowners as well as a range of environmental coordination responsibilities. The Developer shall appoint a dEO. The dEOs will, as a minimum, have the following qualifications and experience: • Degree or diploma in environmental management, nature conservation or related discipline; • Knowledge of relevant environmental legislation; • At least two years previous experience in environmental control, environmental monitoring or environmental management. <u>Responsibilities</u> • Be fully conversant with the EMPr; • Be fully conversant with the conditions of the Integrated Environmental Authorisation and Waste Management License and Water Use License; • Be fully conversant with all relevant environmental legislation; • Be familiar with the recommendations and mitigation measures of this EMPr, and implement these measures; • Ensure that all stipulations within the EMPr are communicated and adhered to by the Employees, Contractor(s) and its sub-contractor(s); • Confine the construction site to the demarcated area; • Conduct environmental internal audits with regards to EMPr and authorisation compliance (on cEO); • Assist the contractors in addressing environmental challenges on site; • Assist in incident management; • Reporting environmental incidents to developer and ensuring that corrective action is taken, and lessons learnt shared; • Assist the contractor in investigating environmental incidents and compile investigation reports; • Follow-up on pre-warnings, defects, Non-conformance reports; • Measure and communicate environmental performance to the Contractor; • Conduct environmental awareness training on site together with ECO and cEO; • Ensure that the necessary legal permits and / or licenses are in place and up to date; • Acting as Developer's Environmental Representative on site and work together with the ECO and contractor; • Audit carried out by an independent auditor/consultant.
Contractor (C)	<u>Role</u> The Contractor appoints the cEO and has overall responsibility for ensuring that all work, activities, and actions linked to the delivery of the contract are in line with the EMPr and that Method Statements are implemented as described. <u>Responsibilities</u> • Implementation and compliance with recommendations and conditions of the EA and EMPr, including providing the Contractor's Environmental Protection Policy and the specific Method Statements for the project; • Appoints dedicated and qualified contractor Environmental Officer (cEO) to work with the ECO; and • Ensure all site staff are trained and kept updated in terms of the EA, EMPr and other legal requirements.

Function	Role and Responsibilities
contractor Environmental Officer (cEO)	<u>Role and Qualifications</u> Each Contractor affected by the EMPr should appoint a contractor Environmental Officer, who is responsible for the on-site implementation of the EMPr (or relevant sections of the EMPr). The Contractor's representative can be the site agent; site engineer; a dedicated environmental officer; or an independent consultant. The Contractor must ensure that the Contractor's Representative is suitably qualified to perform the necessary tasks and is appointed at a level such that she/he can interact effectively with other site Contractors, labourers, the Environmental Control Officer and the public. As a minimum the cEO shall meet the following criteria: • Have a degree or diploma in an appropriate environmental field; • Have demonstrated environmental experience in the construction industry; and • Be a senior person within the Contractor's staff with authority over all the contractors' staff working on-site. The cEO ensures that all Sub-contractors working under the Contractor abide by the requirements of the EMPr. The Contractor is answerable to the Project Manager for all environmental issues associated with the project. Contractor performance will, amongst others, be assessed on health, safety and environmental management criteria Their primary role is to coordinate the environmental management activities of the Contractor on site. <u>Responsibilities</u> • Be on site throughout the duration of the project and be dedicated to the project; • Ensure all their staff are aware of the environmental requirements, conditions and constraints with respect to all of their activities on site; • Implementing the environmental conditions, guidelines and requirements as stipulated within the EA, EMPr and Method Statements; • Attend the Environmental Site Meeting; • Undertaking corrective actions where non-compliances are registered within the stipulated timeframes; • Report back formally on the completion of corrective actions; • Environmental monitoring as required by applicable legislation; • Assist the ECO in maintaining all the site documentation; • Prepare the site inspection reports and corrective action reports for submission to the ECO; • Assist the ECO with the preparing of the monthly report; and • Where more than one Contractor is undertaking work on site, each company appointed as a Contractor will appoint a cEO representing that company.

5B.9 Environmental Documentation Reporting and Compliance

To ensure accountable and demonstrated implementation of the EMPr, a number of reporting systems, documentation controls and compliance mechanisms shall be in place for all substation projects as a minimum requirement. This section of the report details each of these and how they shall be used throughout the project EMPr.

5B.9.1 Document control/Filing system

The approved filing system (in accordance with ISO 9000) shall be established at the outset of the construction phase and shall be maintained throughout the lifespan of the project. The ECOs are solely responsible for the upkeep and management of the EMPr file. At a minimum, all documentation detailed below will be stored in the EMPr file. A hardcopy of all documentation shall be filed, while an electronic copy may be kept where relevant. A duplicate file will be maintained in the office of the Developer's Site Supervisor (where applicable). This duplicate file will be the responsibility of the ECOs and must remain current and up-to-date. The filing system must be updated and relevant documents added as required. The EMPr file must be made available at all times on request by the Competent Authority (in terms of NEMA) or other relevant authorities. The EMPr file will form part of any Environmental Audits undertaken.

5B.9.2 Documentation to be available

At the outset of the project the following documents shall be placed in the filing system and be accessible at all times:

- Full copy of the signed Environmental Authorisation from the Competent Authority in terms of NEMA granting approval for the activity;
- Records of acknowledgement and acceptance of the EMPr from the Competent Authority in terms of NEMA;
- Complete copy of the Environmental Impact/ Basic Assessment Report;
- Complete copy of the EMPr;
- All signed copies of the Contractor's Environmental Agreement;
- All the Contractor's Method Statements;
- Completed Weekly Environmental Checklists;
- Copies of the accepted Monthly Environmental Reports;
- Minutes and attendance register of Environmental Site meetings;
- An up-to-date Environmental Incident Log;
- A copy of all non-compliances issued;
- A copy of all corrective actions signed off. The corrective actions must be filed in such a way that a clear reference is made to the non-compliance record;
- Copies of the following relevant legislation:
  i. National Environmental Management Act;
  ii. Environmental Conservation Act;
  iii. Occupational Health and Safety Act;
  iv. National Water Act;
  v. National Environmental Mismanagement: Air Quality Act;
  vi. Conservation of Agricultural Resources Act;
  vii. National Heritage Resources Act.

5B.9.3 Weekly Environmental Checklists

The ECOs are required to complete a Weekly Environmental Checklist which meets the requirements of the EMPr. The ECOs are required to sign and date the checklist, retain a copy in the EMPr file and submit a copy of the completed checklist to the Developer's Site Supervisor on a weekly basis.
The checklists will form the basis for the Monthly Environmental Reports. Copies of all competed checklists will be attached as Annexures to the

Final Environmental Audit Report. The ECOs will report on the week's "highs and lows" to the Senior Site Representative on a weekly basis.

5B.9.4 Environmental Audit Reports

The ECOs shall prepare a monthly Environmental Audit Report. The Report will be tabled as the key point on the agenda of the Environmental Site Meeting. The Report is submitted for acceptance at the meeting and the final report will be circulated to the Project Manager and filed in the EMPr file. At a frequency determined by the environmental authorisation, the ECOs shall submit the monthly reports to the Competent Authority in terms of NEMA. At a minimum the Monthly report is to cover the following:

- Weekly Environmental Checklists;
- Deviations and non-compliances with the checklists;
- Non-compliances issued;
- Completed and reported corrective actions;
- Environmental Monitoring;
- General environmental findings and actions; and
- Minutes of the Bi-monthly Environmental Site Meetings.

5B.9.5 Environmental Site meetings

An Environmental Site Meeting will take place at least bi-monthly (i.e. every two weeks). The meeting will be chaired by the Project Manager or the Developer's Site Supervisor and cEOs will be required to attend. All environmental issues shall be tabled at the meeting for discussion and resolution.

Minutes of the Environmental Site Meetings shall be kept. The Minutes must include an attendance register and will be attached to the Monthly Report that is distributed to attendees. Each set of Minutes must clearly record **Matters for Attention** that will be reviewed at the next meeting.

5B.9.6 Required Method Statements

A Method Statement is a written submission by the contractor to the Developer's Project Manager, Developer's Site Supervisor or ECO in response to the EMPr, setting out the plant, materials, labour and method the contractor proposes using to carry out an activity. The Method Statement will be done in such detail that the ECOs are enabled to assess whether the contractor's proposal is in accordance with the EMPr.

The Method Statement shall cover applicable details with regard to:

- construction procedures;
- materials and equipment to be used;
- getting the equipment to and from site;
- how the equipment/ material will be moved while on site;
- how and where material will be stored;
- the containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur;
- timing and location of activities;
- compliance/ non-compliance with the EMPr; and
- any other information deemed necessary by the ECOs.

Unless indicated otherwise by the Project Manager, the Contractor shall provide the following Method Statements to the Project Manager no less than 14 days prior to the programmed Commencement Date of the subject Works or activity:

- Site establishment – Camps, Lay-down or storage areas, satellite camps, infrastructure;
- Batch plants;
- Workshop or plant servicing;
- Handling, transport and storage of Hazardous Chemical Substance's;
- Vegetation management – Protected, clearing, aliens, felling;
- Access management – Roads, gates, crossings etc.;
- Fire plan;
- Waste management – transport, storage, segregation, classification, disposal (all waste streams);
- Social interaction – complaints management, compensation claims, access to properties etc.;
- Water – use (source, abstraction and disposal), access and all related information, crossings and mitigation;
- Emergency preparedness – Spills, training, other environmental emergencies;
- Dust and noise;
- Blasting for construction purposes;
- Fauna interaction and risk management – only if the risk was identified – wildlife interaction especially on game farms; and
- Heritage and palaeontology management.

The ECOs shall ensure that the contractors perform in accordance with these Method Statements. Completed and authorised Method Statements shall be captured in Appendix A.

5B.9.7 Environmental Incident Log (Diary)

The ECOs are required to maintain an up-to-date and current Environmental Incident Log (environmental diary).

The Environmental Incident Log is a means to record all environmental incidents for which a non-compliance notice would **not** be issued. An environmental incident is defined as:

- Any deviation from the listed environmental mitigation measures (listed in this EMPr) that may be addressed immediately by the ECOs. (For example a contractor's staff member littering or a drip tray that has not been emptied);
- any environmental impact resulting from an action or activity by a contractor in contravention of the environmental stipulations and guidelines listed in the EMPr which as a single event would have a minor impact but which if cumulative and continuous would have a significant effect (for example no toilet paper available in the ablutions for an afternoon); and
- General environmental information such as road kills or injured wildlife.

The ECOs are to record all environmental incidents in the Environmental Incident Log. All incidents regardless of severity must be reported to the Developer. The Log is to be kept in the EMPr file and at a minimum the following will be recorded for each environmental incident:

- The date and time of the incident;
- Description of the incident;
- The name of the Contractor responsible;
- The incident must be listed as significant or minor;
- If the incident is listed as significant, a non-compliance notice must be issued, and recorded in the log;
- Remedial or corrective action taken to mitigate the incident; and
- Record of repeat minor offences by the same contractor or staff member.

The Environmental Incident Log will be captured in the Environmental Audit Report .

5B.9.8 Non-compliance

A non-compliance notice will be issued to the responsible contractor by the ECOs via the Developer's Site Supervisor or Project Manager. The non-compliance notice will be issued in writing; a copy filed in the EMPr file and will at a minimum include the following:

- Time and date of the non-compliance;
- Name of the contractor responsible;
- Nature and description of the non-compliance;
- Recommended / required corrective action; and
- Date by which the corrective action to be completed.

The Contractors shall act immediately when a notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints. Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority (DAFF, DEA, DWS) for them to deal with the transgression, as it deems fit. The Contractor is deemed not to have complied with the EMPr if, inter alia:

- Deviates from the environmental conditions and requirements as set out in the EMPr that has, or may cause, an environmental impact; OR
- Contravenes environmental legislation; OR
- Results in an unforeseen environmental impact. This may be caused by direct or indirect actions or activities on site. Significance will be determined by the ECOs, but will be informed by geographic extent, duration, lasting effects of the impact and extent of remediation to rectify the impact.

5B.9.9 Corrective Action records

For each non-compliance notice issued, a documented corrective action must be recorded. On receiving a non-compliance notice from the Developer's Site Supervisor, the contractor's cEO will ensure that the corrective actions required take place within the stipulated timeframe. On completion of the corrective action the cEO is to issue a Corrective Action Report in writing to the ECOs. If satisfied that the corrective action has been completed, the ECOs are to sign-off on the Corrective Action Report, and attach the report to the non-compliance notice in the EMPr file. A corrective action is considered complete once the report signed off by the ECOs.

5B.9.10 Contractor Environmental Agreements

Each contractor working on site is required to sign the Contractor Environmental Agreement. This agreement provides for:

- Signed acknowledgement by the Contractor of the EMPr and the environmental controls and stipulations therein;

The signed copies of the Contractor Environmental Agreements are to be filed in the EMPr file. No contractor will be allowed to start work without having signed the Contractor Environmental Agreement.

5B.9.11 Photographic Record

A digital photographic record will be kept. The photographic record will be used to show before, during and post rehabilitation evidence of the project as well used in cases of damages claims if they arise. Each image must be dated and a brief description note attached.

The Contractor shall:

1. Allow the ECOs access to take photographs of all areas, activities and actions.

The ECOs shall keep an electronic database of photographic records which will include:

1. Pictures of all areas designated as work areas, camp areas, construction sites and storage areas taken before these areas are set up;
2. All bunding and fencing;
3. Road conditions and road verges;
4. Condition of all farm fences;
5. Topsoil storage areas;
6. Waste management sites;
7. Ablution facilities (inside and out);
8. Any non-conformances deemed to be "significant";
9. All completed corrective actions for non-compliances;
10. All required signage; and
11. All areas before, during and post rehabilitation.

Include relevant photographs in the Final Environmental Audit Report

5B.9.12 Complaints Register

The ECOs shall keep a current and up-to-date complaints register. The complaints register is to be a record of **all** complaints received from communities, stakeholders and individuals. The Complaints Record shall:

1. Record the name and contact details of the complainant;
2. Record the time and date of the complaint;
3. Contain a detailed description of the complaint;
4. Where relevant and appropriate, contain photographic evidence of the complaint or damage (ECOs to take relevant photographs); and
5. Contain a copy of the ECOs written response to each complaint received and keep a record of any further correspondence with the complainant. The ECO's written response will include a description of any corrective action to be taken and must be signed by the Contractor, ECO and affected party. Where a damage claim is issued by the complainant, the ECOs shall respond as described in (9.13) below.

5B.9.13 Claims for Damages

In the event that a Claim for Damages is submitted by a community, landowner or individual, the ECOs shall:

1. Record the full detail of the complaint as described in (9.12) above;
2. The ECOs will evaluate the claim and associated damage and submit the evaluation to the Senior Site Representative for approval;
3. Following consideration by the Developer's Project Manager, the claim is to be resolved and settled immediately, or the reason for not accepting the claim communicated in writing to the claimant. Should the claimant not accept this, the ECO shall, in writing report the incident to the Developer's negotiator and legal department; and
4. A formal record of the response by the ECOs to the claimant as well as the rectification and/or payment will be recorded in the EMPr file.

5B.9.14 Interaction with affected parties

Open, transparent and good relations with affected landowners, communities and regional staff are an essential aspect to the successful management and mitigation of environmental impacts. The Contractor shall ensure that:

1. All negotiations with affected parties are done with the affected parties, Developer's Site Supervisor and ECO present;
2. No oral agreements between the above parties shall be entered into. All agreements will be recorded in writing, signed by all parties and filed in the EMPr file;
3. Affected parties will be informed by the cEO of any changes to the construction programme;
4. The Contractor's contact telephone numbers are made available to all I&APs;
5. Contact with all affected parties will be courteous at all times; and

The ECOs shall:

1. Ensure that all queries, complaints and claims are dealt with immediately;
2. Ensure that any or all negotiations take place with the affected parties, Senior Site Representative and Contractor present;
3. Ensure that any or all agreements are documented, signed by all parties and a record of the agreement kept in the EMPr file;
4. Ensure that his/her contact telephone numbers are made available to all landowners and affected parties;
5. Ensure that a current and up-to-date list of affected parties and their contact details are available at all times in the EMPr file;
6. Ensure that contact with affected parties is courteous at all times; and
7. Attach all documented agreements, settlements and claims to the Final Environmental Audit Report.

5B.9.15 Environmental Audits

Environmental Audits of the construction phase and implementation of the EMPr will be undertaken by the ECO and are a legal requirement in terms of NEMA once an EA is issued and as long as the EMPr is valid. The findings and outcomes of these audits will be recorded in the EMPr file. The environmental audits and associated reports must be conducted and submitted to the Competent Authority at intervals as indicated in the environmental authorisation.

5B.9.16 Final Environmental Audit Report

On final completion of the Construction Phase, the ECOs are required to prepare a Final Environmental Audit Reports. The Report is to be submitted to the Competent Authority for acceptance and approval. The Environmental Report shall contain the following in accordance with Appendix 7 of National Environmental Management Act, 1998 (Act No. 107 of 1998) Environmental impact Assessment Regulations, 2014.

- Details of the independent person who prepared the report;
- Details of the expertise of independent person that compiled the report;
- A declaration that the independent auditor is independent in a form as may be specified by the Competent Authority;
- An indication of the scope of, and the purpose for which, the environmental audit report was prepared;
- A description of the methodology adopted in preparing the environmental audit report;
- An indication of the ability of the EMPr, and where applicable, the closure plan to-
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an on-going basis;
    - Sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the closure of the facility; and
    - Ensure compliance with the provisions of environmental authorisation, EMPr, and where applicable, the closure plan;
- A description of any assumptions made, and any uncertainties or gaps in knowledge;
- A description of any consultation process that was undertaken during the course of carrying out the environmental audit report;
- A summary and copies of any comments that were received during any consultation process; and
- Any other information requested by the Competent Authority.

Acceptance and approval of the Final Environmental Audit Report by the Competent Authority will end the construction phase EMPr as successful and completed.

PART B: ENVIRONMENTAL CONTROLS

The Environmental Controls are described in two sections:

1. Section 1: General environmental controls

This section refers to construction related activities that are common to most substation projects. For each activity a set of prescribed environmental controls and associated management actions have been identified. Contractors shall implement these controls for all projects as a minimum requirement for mitigating the impact of particular construction related activities.

The format of a general environmental control is illustrated below. The boxes shaded in green are predefined and represent minimum standards for the management of that particular aspect. The contractor will be required to adhere to all impact management actions (where applicable to the construction related activity) for all substation projects. The boxes shaded in red assign responsibility for the implementation and monitoring of the impact management actions. This information is project specific and shall be completed by the contractor prior to commencement of construction.

Figure 2: Format of a general environmental control illustrating aspects which are predefined vs those which still need to be completed by the contractor

Management Objective:	**PREDEFINED AS PART OF GENERIC EMPr**				
Management Outcome:	**PREDEFINED AS PART OF GENERIC EMPr**				
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
PREDEFINED AS PART OF GENERIC EMPr	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**	**TO BE COMPLETED BY CONTRACTOR**

2. Section 2: Project specific environmental controls

This section refers to project specific environmental controls. These are specific actions or mitigation measures related to the project itself and based on findings from the BA/EIA or conditions attached to the environmental authorisation. They are more specific than the environmental controls included in Section 1 and refer to sensitive features where additional or specific controls are needed to manage impacts. Controls in these sections shall be referenced spatially in the context of the final substation project footprint.

The EAP is therefore required to complete this section by producing an environmental sensitivity of the final substation footprint and any site specific mitigation measures are required.

Additional project specific information included in this section shall include landowner contact information and any specific requirements regarding access to land.

5B.10 Section 1: General Environmental Controls

5B.10.1 Environmental awareness training

Management Objective: Environmental training of construction staff minimises the occurrence of environmental impact to the work area.

Management Outcome: Environmental impact as a result of construction activities is minimised through the development of effective environmental awareness training material and execution of environmental awareness training all staff

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All staff receive environmental awareness training; 2. The Contractor shall allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course; 3. All new staff coming onto site shall receive environmental awareness training; 4. Refresher environmental awareness training is available as and when required; 5. All staff are aware of the conditions and controls linked to the Environmental Authorisation and within the EMPr; 6. All staff are made aware of their individual roles and responsibilities in achieving compliance with the environmental authorisation and EMPr; 7. The Contractor shall erect and maintain information posters at key locations on site; 8. Environmental awareness training should include as a minimum the following: a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities; c) Emergency preparedness and response procedures; d) Emergency procedures; e) Procedures to be followed when working near or within sensitive areas; f) Wastewater management procedures; g) Water usage and conservation; h) Solid waste management procedures; i) Sanitation procedures; j) Disease prevention; and k) Chance find procedure for archaeological/paleontological/historical sites unearthed during construction; 9. A record of all environmental awareness training courses undertaken as part of the EMPr must be available; 10. A staff attendance register of all staff to have received environmental awareness training must be available; 11. Course material must be available and presented in all appropriate languages.					

5B.10.2 Construction site establishment

Management Objectives: Ensure that environmental issues are taken into consideration in the planning and construction of site establishment

Management Outcome: Impact to the environment during site establishment is minimised.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. A Method Statement shall be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, the workshop, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas and the placement of staff accommodation, cooking and ablution facilities, waste and wastewater management; 2. Location of construction camps must be carefully considered and approved by the ECOs to ensure that the site does not impact on sensitive areas identified in the EIA or site walk through; 3. Sites should be located where possible on previously disturbed areas; 4. The construction camp shall be fenced in accordance with Section 5B.10.5: *Fencing and gate installation*; and 5. The use of existing accommodation for contractor staff, where possible, is encouraged.					

5B.10.3 No-Go areas

Management Objectives: Construction related activity inside No-Go areas is prevented in an effort to avoid environmental impacts to such areas.					
Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Identification of No-Go areas is to be informed by the BA/EIA and any additional areas identified during construction; 2. Erect, demarcate and maintain a temporary fence around the perimeter of any No-Go area; 3. Fencing of No-Go areas is to be undertaken in accordance with Section 5B.10.5: *Fencing and gate installation*; and 4. Unauthorised access and construction related activity inside No-Go areas is prohibited.					

5B.10.4 Access roads

Management Objective: Minimise impact to the environment through the planned and controlled movement of vehicles on site.					
Management Outcomes: Vehicle movement to adhere to agreed access plan.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Maximum use of both existing roads shall be made; 2. In circumstances where private roads must be used, the condition of the said roads shall be recorded prior to use and the condition thereof agreed by the landowner, the Development Project Manager and the contractor; 3. All private roads used for access to the site shall be maintained and upon completion of the works, be left in at least the original condition. As far as possible, access roads shall follow the contours in hilly areas, as opposed to winding down steep slopes; 4. Access roads shall be constructed in accordance with design standards (SANS 1200).					

5B.10.5 Fencing and gate installation

Management Objective: To minimise impact to the environment and ensure safe and controlled access to the site through the erection of fencing and gates where required

Management Outcomes: The erection of fencing and management of fencing is to be undertaken in accordance with the Fencing Act No 31 of 1963

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Fencing Act No 31 of 1963 shall be adhered to at all times with regards to the leaving open of gates and the dropping of fences for crossing, purposes, climbing and wilful damage or removal of gates; 2. Use existing gates provided to gain access to all parts of the defined Working Area, where possible; 3. All gates shall be fitted with locks and be kept locked at all times during the construction phase, unless otherwise agreed with the landowner; 4. Where there is no suitable gate for access to the site, on the instruction of the Development Project Manager, a gate shall be installed; 5. Care shall be taken that the gates shall be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground; 6. Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill shall be provided beneath the gate; 7. Original tension shall be maintained in the fence wires; 8. All gates installed in electrified fencing must be re-electrified; 9. All demarcation fencing and barriers shall be maintained in good working order for the duration of construction activities; 10. Fencing shall be erected around the construction camp, batching plants, hazardous storage areas, and all designated no-go areas, where applicable; 11. All fencing shall be constructed of high quality material bearing the SABS mark; 12. The use of razor wire as fencing shall be avoided; 13. Fenced areas with gate access will remain locked after hours, during weekends and on holidays if staff are away from site. Site security will be required at all times; 14. On completion of the project all temporary fences are to be removed and where possible re-used by the contractor at new projects; 15. The contractor will ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.					

5B.10.6 Water supply management

Management Objectives: Undertake responsible water usage during construction

Management Outcome: Water use during construction is compliant with the requirements of the National Water Act (No 36 of 1998)

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All abstraction points or bore holes must be registered with the DWS and suitable water meters installed to ensure that the abstracted volumes are measured on a daily basis; 2. Should water abstraction be required and the necessary authorisation from DWS and permission from the landowner has been received, the Contractor shall ensure the following: a. The vehicle abstracting water from a river does not enter or cross it and does not operate from within the river; b. No damage occurs to the river bed or banks and that the abstraction of water does not entail stream diversion activities; and c. All reasonable measures to limit pollution or sedimentation of the downstream watercourse are implemented. 3. Ensure water conservation is being practiced by: a. Minimising water use during cleaning of equipment; b. Undertaking regular audits of water systems; and c. Including a discussion on water usage and conservation during environmental awareness training.					

5B.10.7 Waste water management

Management Objectives: To avoid, manage and mitigate potential impacts to the environment caused by waste water discharge during construction.

Management Outcomes: Waste water management is undertaken in accordance with relevant national and provincial legislation and local by-laws.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Appropriate pollution control facilities necessary to prevent discharge of water containing polluting matter or visible suspended materials into watercourses or water bodies shall be designed and implemented; 2. Runoff from the cement/ concrete batching areas shall be strictly controlled, and contaminated water shall be collected, stored and either treated or disposed of off-site, at a location approved by the Project Manager; 3. All spillage of oil onto concrete surfaces shall be controlled by the use of an approved absorbent material and the used absorbent material disposed of at an appropriate waste disposal facility; 4. Natural storm water runoff not contaminated by construction operations and clean water can be discharged directly to watercourses and water bodies, subject to the Project Manager's approval and support by the ECO; 5. Water that has been contaminated with suspended solids, such as soils and silt, may be released into watercourses or water bodies only once all suspended solids have been removed from the water by settling out these solids in settlement ponds. The release of settled water back into the environment shall be subject to the Project Manager's approval and support by the ECO.					

5B.10.8 Solid waste management

Management Objectives: To avoid, manage and mitigate potential impacts to the environment caused by the incorrect storage, handling and disposal of general and hazardous solid waste.

Management Outcomes: Solid waste management is undertaken in accordance with relevant national and provincial legislation and local by-laws.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All measures regarding waste management shall be undertaken using an integrated waste management approach; 2. Sufficient, covered waste collection bins (scavenger and weatherproof) shall be provided; 3. A suitably positioned and clearly demarcated waste collection site shall be identified and provided; 4. The waste collection site shall be maintained in a clean and orderly fashion; 5. Waste shall be segregated into separate bins and clearly marked for each waste type; 6. Staff shall be trained in waste segregation; 7. Recycling of waste types shall be maximised; 8. Bins shall be emptied regularly; 9. General waste shall be disposed of at recognised and registered waste disposal sites/ recycling company; 10. Hazardous waste shall be disposed of at a registered waste disposal site; 11. Certificates of disposal for general, hazardous and recycled waste shall be maintained; 12. Under no circumstances shall any waste be disposed of, burned or buried on site.					

5B.10.9 Protection of watercourses and water bodies

Management Objectives: Construction related activity is undertaken in a manner which prevents impacts to watercourses, water bodies and wetlands.

Management Outcome: Impact to No-Go areas is avoided through the effective demarcation and management of these areas.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All watercourses and water bodies shall be protected from direct or indirect spills of pollutants such as solid waste, sewage, cement, oils, fuels, chemicals, aggregate tailings, wash and contaminated water or organic material resulting from the Contractor's activities; 2. In the event of a spill, prompt action shall be taken to clear the polluted or affected areas; 3. Where possible, no construction equipment shall traverse any seasonal or permanent wetland; 4. No natural watercourse or water body shall be used for the purposes of swimming, personal washing and the washing of machinery or clothes; 5. Excavation or construction in a water course or wetland area shall be avoided unless exceptional circumstances require that excavation or construction cannot be avoided 6. Road construction shall be in accordance with SANS 1200; 7. No excavation or construction shall be permitted within the 1:100 year flood line or riparian zone (whichever is the greatest) of a watercourse or within 500 m from the boundary of a wetland area without prior approval from the Competent Authority (DWS or Catchment Management Agency) in the form of a water use authorisation; 8. When working in or near any watercourse or wetland, the following environmental controls and consideration shall be taken: a) River levels during the period of construction; b) Construction within flowing water is to be minimised. All diversions shall be in place, water diverted away from the Working Area and the area properly stabilised prior to excavations commencing; c) When working in flowing water, downstream sedimentation shall be controlled by installing and maintaining the necessary temporary sedimentation barriers, e.g. geotextile silt curtains or sedimentation weirs constructed out of suitably secured straw bales. Sedimentation barriers shall be a maximum of 25 m downstream of the construction activities; d) During the execution of the Works, appropriate measures to prevent pollution and contamination of the riverine environment shall be implemented e.g. including ensuring that construction equipment is well maintained; e) Where earthwork is being undertaken in close proximity to any watercourse, slopes shall be stabilised using suitable materials, i.e. sandbags or geotextile fabric, to prevent sand and rock from entering the channel; and f) Appropriate rehabilitation and re-vegetation measures for the river banks shall be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as construction allows.					

5B.10.10 Vegetation clearing

Management Objective: To ensure the safe mechanical and electrical construction and operation of the substation without causing unnecessary environmental damage.

Management Outcomes: Vegetation clearance is minimised through adherence to EMPr vegetation clearance requirements.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Indigenous vegetation which does not interfere with the safe construction and operation of the substation shall be left undisturbed; 2. Protected or endangered species may occur on or near the construction site. Special care should be taken not to damage such species; 3. Search, rescue and replanting of all protected and endangered species likely to be damaged during construction shall be identified by the Botanical Specialist and completed prior to any construction or clearing; 4. Permits for removal must be obtained from the relevant Competent Authority prior to the cutting or clearing the affected species; 5. The Final Environmental Audit Report shall confirm that all identified species have been rescued and replanted; 6. Debris through vegetation clearing shall not be burned under any circumstances; 7. Rivers, watercourses and other water bodies shall be kept clear of felled trees, vegetation cuttings and debris; 8. The use of herbicides shall be in compliance with the terms and conditions of The Fertilisers, Farm, Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act 36 of 1947); 9. Only a registered pest control operator may apply herbicides on a commercial basis and commercial application shall be carried out under the supervision of a registered pest control operator, supervision of a registered pest control operator or is appropriately trained; 10. A register shall be kept of all relevant details of herbicide usage as stipulated in Act 36 of 1947; 11. Trees, shrubs, grass, natural features and topsoil which are not removed during vegetation clearance shall be protected from damage during operation of the substation; 12. All protected species and sensitive vegetation not removed must be clearly marked and such areas fenced off if required in accordance with No-Go procedure in Section 5B.10.3: *No-Go areas*. 13. Alien vegetation on-site shall be managed in terms of the GNR 1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983; 14. Alien invasive vegetation should be removed immediately (in line with relevant municipal and provincial procedures, guidelines and recommendations) and disposed of at a licenced waste disposal facility.					

5B.10.11 Protection of Fauna

Management Objective: Ensure care is taken to minimise disturbance to fauna during construction and potential future impact during the operation of the substation

Management Outcomes: Impact to fauna is avoided during construction and mitigated during operation of the line

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Construction activities shall not interfere or cause fatalities to animals (both wild and farm animals) as stipulated by Environmental Conservation Act 73 of 1989; 2. No interference with livestock shall occur without the landowner's written consent and with the landowner or a person representing the landowner being present; 3. The breeding sites of raptors and other wild birds species in close proximity to the site must be taken into consideration during the planning of the construction programme; 4. Breeding sites shall be kept intact and disturbance to breeding birds shall be avoided. Special care shall be taken where nestlings or fledglings are present; 5. Special recommendations of the faunal specialist must be adhered to at all times to prevent unnecessary disturbance of fauna; 6. No poaching must be tolerated under any circumstances. All animal dens in close proximity to the works areas must be marked as No-Go areas.					

5B.10.12 Protection of heritage resources

Management Objective: Prevent damage and destruction to fossils, artefacts and materials of heritage significance					
Management Outcomes: Impact to heritage resources is avoided					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Identify, demarcate and prevent impact to all known sensitive heritage features on site in accordance with the No-Go procedure in Section 5B.11.3: *No-Go areas;* 2. Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance; 3. All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to remove/collect such material before construction recommences.					

5B.10.13 Safety of the public

Management Objective: Reasonable measures are taken to ensure the safety of the public at all times during construction					
Management Outcomes: All precautions are taken where possible to minimise the risk of injury, harm or complaints					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Identify fire hazards, demarcate and restrict public access to these areas as well as notify the local authority of any potential threats e.g. large brush stockpiles, fuels etc.; 2. All unattended open excavations shall be adequately fenced or demarcated; 3. Adequate protective measures must be implemented to prevent unauthorised access to and climbing of partly constructed towers and protective scaffolding; 4. Ensure structures vulnerable to high winds are secured; 5. Maintain an incidents and complaints register in which all incidents or complaints involving the public are logged.					

5B.10.14 Sanitation

Management Objective: An abundant supply of suitably located, clean and well maintained toilet facilities are available to all staff in an effort to minimise the risk of disease and impact to the environment.					
Management Outcomes: No pollution or disease arises on-site as a result of sanitation facilities or lack thereof.					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Mobile chemical toilets are installed onsite if no other ablution facilities are available; 2. The use of ablution facilities and or mobile toilets shall be used at all times and no indiscriminate use of the veld for the purposes of ablutions shall be permitted under any circumstances; 3. Ablution facilities shall be located within 100 m of any work place and shall be numerous enough to accommodate the workforce (minimum requirement of 1:15 workers on site)					

4. Where mobile chemical toilets are required, the following shall be ensured: a) Toilets are located no closer than 100 m to any watercourse or water body; b) Toilets are secured to the ground to prevent them from toppling due to wind or any other cause; c) No spillage occurs when the toilets are cleaned or emptied and the contents are managed in accordance with the EMPr; d) Toilets have an external closing mechanism and are closed and secured from the outside when not in use to prevent toilet paper from being blown out; e) Toilets are emptied before long weekends and workers holidays, and shall be locked after working hours; f) Toilets are serviced regularly and the ECO must inspect toilets to ensure compliance to health standards; 5. A copy of the waste disposal certificates shall be maintained.					

5B.10.15 Prevention of disease

Management Objective: All necessary precautions linked to the spread of disease during construction, especially to livestock, are taken.

Management Outcomes: The risk of the occurrence and spread of disease is minimised through the effective implementation of EMPr actions.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Undertake environmentally-friendly pest control in the camp area; 2. Ensure that the workforce is sensitised to the effects of sexually transmitted diseases, especially HIV AIDS; 3. The Contractor shall ensure that information posters on AIDS are displayed in the Contractor Camp area; 4. Information and education relating to sexually transmitted diseases to be made available to both construction workers and local community, where applicable; 5. Free condoms will be made available to all staff on site at central points; 6. Medical support shall be made available; 7. Provide access to Voluntary HIV Testing and Counselling Services.					

5B.10.16 Emergency Procedures

Management Objective: Emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.

Management Outcomes: All emergency situations are managed in accordance with the emergency procedures.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Compile an Emergency Response Action Plan (ERAP) prior to the commencement of the proposed project; 2. The Emergency Plan must deal with accidents, potential spillages and fires in line with relevant legislation; 3. All staff shall be made aware of emergency procedures as part of environmental awareness training; 4. The relevant local authority shall be made aware of a fire as soon as it starts; 5. In the event of emergency necessary mitigation measures to contain the spill or leak shall be implemented (see Hazardous Substances section 5B.10.17).					

5B.10.17 Hazardous substances

Management Objective: To minimise the risk of impact to the environment through the safe storage, handling, use and disposal of hazardous substances.

Management Outcomes: The management of hazardous substances is undertaken in accordance with the Hazardous Substances Act of 1973 (Act No. 15 of 1973), the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Department of Water Affairs and Forestry, 1998) and Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1947 (Act No. 36 of 1947) and National Environmental Management: Waste Act of 2008.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. The Occupational Health and Safety Act No 85 of 1993 to be complied with at all times; 2. The use and storage of hazardous substances to be minimised and non-hazardous and non-toxic alternatives substituted where possible; 3. All hazardous substances will be stored in suitable containers as defined in the Method Statement; 4. Containers will be clearly marked to indicate contents, quantities and safety requirements. 5. All storage areas will be bunded. The bunded area will be of sufficient capacity to contain a spill / leak from the stored containers; 6. An Alphabetical Hazardous Chemical Substance (HCS) control sheet will be drawn up and kept up to date on a continuous basis. All hazardous chemicals that will be used on site will have Material Safety Data Sheets; 7. All employees working with HCS will be trained in the safe use of the substance and according to the safety data sheet; 8. Employees handling hazardous substances / materials must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment (PPE) must be made available; 9. The Contractor shall ensure that diesel and other liquid fuel, oil and hydraulic fluid is stored in appropriate storage tanks or in bowsers; 10. The tanks/ bowsers shall be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers (110% statutory requirement plus an allowance for rainfall); 11. The floor of the bund shall be sloped, draining to an oil separator; 12. Provision shall be made for refuelling at the storage area by protecting the soil with an impermeable groundcover. Where dispensing equipment is used, a drip tray shall be used to ensure small spills are contained; 13. All empty externally dirty drums shall be stored on a drip tray or within a bunded area; 14. No unauthorised access into the hazardous substances storage areas shall be permitted; 15. No smoking shall be allowed within the vicinity of the hazardous storage areas; 16. Adequate fire-fighting equipment shall be made available at all hazardous storage areas; 17. Where refuelling away from the dedicated refuelling station is required, a mobile refuelling unit shall be used. Appropriate ground protection such as drip trays shall be used as well; 18. An appropriately sized spill kit kept onsite relevant to the scale of the activity/s involving the use of hazardous substance shall be available at all times; 19. The responsible operator shall have the required training to make use of the spill kit in emergency situations; 20. In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act 59 of 2008. Refer to Section 5B.10.7 for procedures concerning waste water management and 5B.10.8 for solid waste management.					

5B.10.18 Workshop, equipment maintenance and storage

Management Objective: The control operation, maintenance and storage of equipment prevents soil, surface water and groundwater contamination

Management Outcomes: Soil, surface water and groundwater contamination is prevented as due to adherence of EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Where possible and practical all maintenance of vehicles and equipment must take place in the workshop area; 2. During servicing of vehicles or equipment, especially where emergency repairs are effected outside the workshop area, a suitable drip tray must be used to prevent spills onto the soil					

3. Leaking equipment must be repaired immediately or be removed from site to facilitate repair; 4. Workshop areas must be monitored for oil and fuel spills and such spills; 5. Appropriately sized spill kit kept onsite relevant to the scale of the activity taking place shall be available; 6. The responsible operator of equipment must have the required training to make use of the spill kit in emergency situations; 7. The workshop area shall have a bunded concrete slab that is sloped to facilitate runoff into a collection sump or suitable oil / water separator where maintenance work on vehicles and equipment can be performed; 8. Water drainage from the workshop are shall be contained and managed in accordance Section 5B.10.7: *Waste water management*					

5B.10.19 Batching plants

Management Objective: To control concrete and cement batching activities in order to prevent spillages and concomitant contamination of soil, surface water and groundwater environment.

Management Outcome: The management, handling and storage of sand, stone and cement is undertake in accordance with the EMPr

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Concrete mixing shall be carried out on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface); 2. Concrete mixing areas must be fitted with a containment facility for the collection of cement laden water. This facility must be impervious to prevent soil and groundwater contamination; 3. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains; 4. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted; 5. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licenced disposal facility; 6. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site in appropriate containers; 7. Sand and aggregates containing cement must be kept damp to prevent the generation of dust (Refer Section to 5B.10.20: *Dust emissions*) 8. Any excess sand, stone and cement must be removed from site on completion of construction period and disposed at a registered disposal facility if it cannot be reused; 9. Temporary fencing shall be erected around batching plants in accordance with Section 5B.10.5: *Fencing and gate installation*.					

5B.10.20 Dust emissions

Management Objective: To reduce dust emissions during construction activities.

Management Outcome: Minimal occurrence of dust due the adherence of EMPr requirements.

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Take all reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the ECO; 2. Removal of vegetation shall be avoided until such time as soil stripping is required and similarly exposed surfaces shall be re-vegetated or stabilised as soon as is practically possible; 3. Excavation, handling and transport of erodible materials shall be avoided under high wind conditions or when a visible dust plume is present; 4. During high wind conditions, the ECO will evaluate the situation and make recommendations as to whether dust-damping measures are adequate, or whether working will cease altogether until the wind speed drops to an acceptable level; 5. Where possible, soil stockpiles shall be located in sheltered areas where they are not exposed to the erosive effects of the wind.					

Where erosion of stockpiles becomes a problem, erosion control measures shall be implemented at the discretion of the ECO; 6. Vehicle speeds shall not exceed 40km/h along dust roads or 20km/h when traversing unconsolidated and non-vegetated areas; 7. Appropriate dust suppression measures shall be used when dust generation is unavoidable, e.g. dampening with water, particularly during prolonged periods of dry weather in summer. Such measures shall also include the use of temporary stabilising measures (e.g. chemical soil binders, straw, brush packs, chipping); 8. Any blasting to be done after informing local public; 9. Any blasting activity shall be conducted by a suitably licensed blasting contractor; 10. For significant areas of excavation or exposed ground, spray water or wet areas using trucks to minimise the spread of dust.					

5B.10.21 Noise

Management Objective: To prevent unnecessary noise to the environment by ensuring that noise from construction activity is mitigated					
Management Outcomes: Noise management is undertaken in accordance with SANS 10103 and requirements of the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Construction shall be limited to daylight hours unless stated otherwise within the environmental authorisation; 2. Conduct noise monitoring tests, as required by the ECO or environmental authorisation; 3. Noise levels are to comply with ECA's 7dB rule i.e. cannot generate noise that increases the noise levels to 7db above the current ambient.					

5B.10.22 Fire Prevention

Management Objective: To minimise the risk of fire during construction					
Management Outcomes: Fire prevention measures are carried out in accordance with the National Veld and Forest Fire Act, 101 of 1998					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Designate smoking areas where the fire hazard could be regarded as insignificant; 2. Educate workers on the dangers of open and/or unattended fires; 3. No open fires shall be allowed on site under any circumstances; 4. Firefighting equipment shall be available on all vehicles located on site; 5. The local Fire Protection Agency (FPA) must be informed of construction activities; 6. Contact numbers for the FPA and emergency services must be communicated in environmental awareness training and displayed at a central location on site; 7. Two way swop of contact details between ECO and FPA.					

5B.10.23 Stockpiling and stockpile areas

Management Objective: To reduce potential erosion and sedimentation as a result of stockpiling of materials					
Management Outcomes: Stockpiling management is undertaken in accordance with the requirements of the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. All material that is excavated during the construction phase (either during piling (if required) or earthworks) shall be stored appropriately on site in order to minimise impacts to watercourses, wetlands and water bodies; 2. Stockpiles must be located at least 10 m away from storm water channels and drains, and at least 32 m away from any watercourse, water body or wetland, and on flat areas where runoff will be minimise; 3. All stockpiled material shall be maintained and kept clear of weeds and alien vegetation growth by undertaking regular weeding and control methods; 4. Stockpiles shall not exceed 2 m in height; 5. During periods of strong winds and heavy rain, the stockpiles should be covered with appropriate material (e.g. cloth, tarpaulin etc.); 6. Where possible, sandbags (or similar) should be placed at the bases of the stockpiled material in order to prevent erosion of the material.					

5B.10.24 Civil Works

Management Objective: Impact to the environment to be minimised during civil works to create the substation terrace					
Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Where terracing is required, topsoil must be collected and retained for the purpose of re-use later to rehabilitate disturbed areas not covered by yard stone; 2. Areas to be rehabilitated include terrace embankments and areas outside the high voltage yards; 3. Where required, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled; 4. These areas can be stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly; 5. Rehabilitation of the disturbed areas shall be managed in accordance with Section 5B.10.33: *Landscaping and rehabilitation;* 6. Any blasting activities must be controlled and executed by a licensed person. Blasting activities must be well communicated with Landowners and nearby communities and all livestock must be moved from the area; 7. All excess spoil generated during terracing activities must be disposed of in an appropriate manner and at a legally operated landfill site; 8. Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes; 9. Under no circumstances may any illegal / hazardous substances or materials be dumped with topsoil and used during landscaping.					

5B.10.25 Excavation of foundation, cable trenching and drainage systems

Management Objective: Impact to the environment to be minimised during the excavation of foundations
Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. All excess spoil generated during foundation excavation must be disposed of in an appropriate manner and at a legally operated landfill site, if not used for backfilling purposes; 2. Spoil can however be used for landscaping purposes and must be covered with a layer of 150mm topsoil for rehabilitation purposes; 3. Management of equipment for excavation purposes shall be undertaken in accordance with Section 5B.10. 18: *Workshop equipment maintenance and storage;* 4. Hazardous substances spills from equipment shall be managed in accordance with Section 5B.10.17: *Hazardous substances.*					

5B.10.26 Installation of foundations, cable trenching and drainage systems

Management Objective: Impact to the environment to be minimised during the installation of foundations, cable trenching and drainage systems
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Batching of cement to be undertaken in accordance with Section 5B.10.19: *Batching;* 2. Residual solid waste shall be recycled or disposed of in accordance with Section 5B.10.8: *Solid Waste Management*.					

5B.10.27 Steelwork Assembly and Erection

Management Objective: Impact to the environment to be minimised during steelwork assembly and erection
Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. During assembly, care must be taken to ensure that no wasted/unused materials are left on site e.g. bolts and nuts 2. Emergency repairs due to breakages of equipment shall be managed in accordance with Section 5B.10. 18: *Workshop equipment maintenance and storage* and Section 5B.10.16: *Emergency procedures.*					

5B.10.28 Installation of equipment (circuit breakers, current Transformers, Isolators, Insulators, surge arresters, voltage transformers, earth switches)

Management Objective: Impact to the environment to be minimised during the installation of equipment
Management Outcome: Impact to the environment is minimised through adherence to EMPr requirements

Impact Management Actions	Implementation		Monitoring		
	Responsible person	Time Period	Method	Frequency	Mechanism for Monitoring Compliance
1. Management of dust shall be conducted in accordance with Section 5B.10. 20: *Dust emissions;* 2. Management of equipment used for installation shall be conducted in accordance with Section 5B.10.18: *Workshop equipment maintenance and storage;* 3. Management hazardous substances and any associated spills shall be conducted in accordance with Section 5B.10.17: *Hazardous substances;* 4. Residual solid waste shall be recycled or disposed of in accordance with Section 5B.10.8: *Solid Waste Management*					

5B.10.29 Cabling and Stringing

Management Objective: Impact to the environment to be minimised during cabling and stringing operations					
Management Outcomes: Impact to the environment is minimised through adherence to EMPr requirements					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with Section 5B.10.8: *Solid Waste Management;* 2. Management of dust shall be conducted in accordance with Section 5B.10. 20: *Dust emissions;* 3. Management of equipment used for installation shall be conducted in accordance with Section 5B.10.18: *Workshop equipment maintenance and storage;* 4. Management hazardous substances and any associated spills shall be conducted in accordance with Section 5B.10.17: *Hazardous substances.*					

5B.10.30 Testing and Commissioning ((all equipment testing, earthing system, system integration)

Management Objective: Minimise the risk of environmental impact during testing and commissioning					
Management Outcomes: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Residual solid waste (off cuts etc.) shall be recycled or disposed of in accordance with Section 5B.10.8: *Solid Waste Management.*					

5B.10.31 Temporary site closure

Management Objective: Minimise the risk of environmental impact during periods of site closure greater than five days					
Management Outcomes: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. Bunds shall be emptied (where applicable); 2. Hazardous storage areas shall be well ventilated; 3. Fire extinguishers shall be serviced and accessible; 4. Emergency and contact details displayed shall be displayed; 5. Fencing and barriers shall be in place as per the Occupational Health and Safety Act (No 85 of 1993); 6. Security personnel shall be briefed and have the facilities to contact or be contacted by relevant management and emergency personnel; 7. Night hazards such as reflectors, lighting, traffic signage etc. shall have been checked; 8. Fire hazards identified and the local authority shall have been notified of any potential threats e.g. large brush stockpiles, fuels etc.; 9. Stockpiles shall be appropriately secured; 10. Structures vulnerable to high winds shall be secured; 11. Wind and dust mitigation shall be implemented; 12. Cement and materials stores shall have been secured; 13. Toilets shall have been emptied and secured; 14. Refuse bins shall have been emptied and secured; 15. Drip trays shall have been emptied and secured.					

5B.10.32 Dismantling of old equipment

Management Objective: Impact to the environment to be minimised during the dismantling, storage and disposal of old equipment commissioning					
Management Outcomes: Site closure procedures are implemented in accordance with the EMPr					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. All old equipment removed during the project must be stored in such a way as to prevent pollution of the environment; 2. Oil containing equipment must be stored to prevent leaking or be stored on drip trays; 3. All scrap steel must be stacked neatly and any disused and broken insulators must be stored in containers; 4. Once material has been scrapped and the contract has been placed for removal, the disposal Contractor must ensure that any equipment containing pollution causing substances is dismantled and transported in such a way as to prevent spillage and pollution of the environment; 5. The Contractor must also be equipped to contain and clean up any pollution causing spills; 6. Disposal of unusable material must be at a registered waste disposal site and a certificate of disposal must be obtained and copied to the developer.					

5B.10.33 Landscaping and rehabilitation

Management Objectives: Areas disturbed during construction are returned to a state that approximates the state which they were before disruption					
Management Outcomes: Landscaping and rehabilitation is in undertaken in accordance with the approved rehabilitation plan/specification					
Impact Management Actions	**Implementation**		**Monitoring**		
	Responsible person	**Time Period**	**Method**	**Frequency**	**Mechanism for Monitoring Compliance**
1. All areas disturbed by construction activities shall be subject to landscaping and rehabilitation; 2. All spoil and waste will be removed to a registered waste site and certificates of disposal provided; 3. All slopes in excess of 2% (1:50) must be contoured in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 4. All slopes in excess of 12% (1:8.3) must be terraced in accordance with the Conservation of Agricultural Resources Act, No 43 of 1983; 5. Rehabilitation of substation sites shall be undertaken in accordance with civil designs; 6. Indigenous species will be used for replanting; 7. Stockpiled topsoil shall be used for rehabilitation (refer to Section 5B.10.23: *Stockpiling and stockpiled areas*) 8. Stockpiled topsoil will be evenly spread so as to facilitate seeding and minimise loss of soil due to erosion 9. Before placing topsoil, all visible weeds from the placement area and from the topsoil shall be removed. 10. Subsoil shall be ripped before topsoil is placed. 11. The project shall be timed so that rehabilitation can take place at the optimal time for vegetation establishment. 12. Where impacted through construction related activity, all sloped areas must be stabilised to ensure proper rehabilitation is effected and erosion is controlled as per the instruction from the ECO. 13. Sloped areas stabilised using design structures or vegetation as specified in the design to prevent erosion of embankments. The contract design specifications must be adhered to and implemented strictly 14. Where required, re-vegetation can be enhanced using a vegetation seed mixture as described below. A mixture of seed can be used provided the mixture is carefully selected to ensure the following: a) Annual and perennial plants are chosen. b) Pioneer species are included. c) Species chosen must grow in the area without any problems. d) Root systems must have a binding effect on the soil. e) The final product should not cause an ecological imbalance in the area.					

5B.11 Section 2: Project Specific Environmental Controls

5B.11.1 Description of project [TO BE COMPLETED BY EAP]

- Voltage of substation
- Location
- Anticipated construction duration
- Anticipated number of staff (permanent and temporary)
- Type of substation (GIS, open air, enclosed, tubular etc.)
- Construction area (surface area)
- Height of structures

5B.11.2 Substation design and project specific information and mitigation requirements [TO BE COMPLETED BY EAP]

The final project footprint overlaid on an environmental sensitivity map shall be included in this section. The environmental sensitivity map shall indicate areas/features of sensitivity based on the findings of the BA/EIA and illustrated according to four tiers, Very High, High, Medium or Low. The sensitivity map shall also identify the nature of each sensitive feature e.g. raptor nest, threatened plant species, archaeological site etc. Sensitivity maps shall identify features both within the planned working area and any known sensitive features in the surrounding landscape. The map shall also illustrate farm portion names and gate access points. Specific mitigation measures as determined by the BA/EIA findings and conditions of Environmental Authorisation with reference to the site shall be identified. Where considered appropriate, photographs of sensitive features in the context of the site shall be included.

PART C: APPENDICES

5B.12 Appendix A: Method statements

[TO BE COMPLETED AND UPDATED BY CONTRACTOR ON A PROJECT BY PROJECT BASIS]