MULILO
RENEWABLE PROJECT DEVELOPMENTS

Basic Assessment for the Proposed Development of the Supporting Electrical Infrastructure to the Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province

Draft Basic Assessment Report

September 2018

CSIR
our future through science

BASIC ASSESSMENT PROCESS

for the Proposed Development of the Supporting Electrical Infrastructure to the Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province

DRAFT BASIC ASSESSMENT REPORT

September 2018

Prepared for:
Mulilo Renewable Project Developments (Pty) Ltd

Prepared by:
CSIR
Council for Scientific and Industrial Research (CSIR)
PO Box 320
Stellenbosch
7599
Tel: +27 21 888 2495
Fax: +27 21 888 2693

Lead Author:
Surina Laurie

REPORT DETAILS

Title:	Basic Assessment for the Proposed Development of the Supporting Electrical Infrastructure to the Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province
Purpose of this report:	The purpose of this BA Report is to: • Present the proposed project and the need for the proposed project; • Describe the affected environment at a sufficient level of detail to facilitate informed decision-making; • Provide an overview of the BA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the proposed project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; and • Provide an Environmental Management Programme (EMPr) for the proposed project. This BA Report is being made available to all Interested and Affected Parties (I&APs), Organs of State and stakeholders for a 30-day review period. All comments submitted during the 30-day review of this BA Report will be incorporated into a finalised BA Report, as applicable and where necessary.
Prepared for:	Mulilo Renewable Project Developments (Pty) Ltd *Contact Person*: Karen Low
Prepared by:	CSIR, P. O. Box 320, Stellenbosch, 7599, South Africa Tel: +27 21 888 2400 Fax: +27 21 888 2693
Authors:	Surina Laurie
CSIR Report Number: CSIR Project Number:	TBC EMS0131
Date:	September 2018
To be cited as:	CSIR, 2018. Basic Assessment for the Proposed Development of the Supporting Electrical Infrastructure to the Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province

CONTENTS

SECTION F: APPENDICES

Appendix A	Maps
Appendix B	Specialist Reports (including Terms of Reference)
Appendix C	Public Participation
Appendix D	Environmental Management Programme (EMPr)
Appendix E	Details of EAP and Expertise

TABLES

FIGURES

EXECUTIVE SUMMARY

INTRODUCTION

Mulilo Renewable Project Developments (Pty) Ltd (hereafter, "Mulilo"), the Project Applicant, is proposing to construct two Wind Energy Facilities (WEFs), namely Kuruman Phase 1 WEF and Kuruman Phase 2 WEF and supporting infrastructure, in the Ga-Segonyana Local Municipality and the John Taolo Gaetsewe District Municipality, 8 km and 37 km south west from Kuruman and from Kathu, respectively, in the Northern Cape Province. The proposed WEF projects are being developed to generate electricity via wind energy which will feed into and supplement the national electricity grid. This report comprises the draft Basic Assessment (BA) for the development of **the supporting electrical infrastructure to the two WEFs, namely the "Kuruman Transmission Line" project**. The proposed project occurs within the Ga-Segonyana Local Municipality and the Gamagara Local Municipality and within the John Taolo Gaetsewe District Municipality

This assessment provides an assessment of three connectivity options that will enable the WEFs to evacuate the electricity generated by the WEFs into the National Grid. The connection options either entail the development of a 132 kV line to the existing Ferrum substation (located in Kathu) (Alternative 1) or to the Moffat substation (located in Kuruman) (Alternative 2 and 3) and two Eskom Switching (Metering) Stations. The two WEFs are considered as part of two separate Scoping and Environmental Impact Assessment (EIA) processes.

The preferred alternative connectivity option (Alternative 1) of the Kuruman Transmission Line project will be developed on the following land portions:

- Remainder of Farm Woodstock 441
- Portion 1 of Farm Bramcote 446
- Remainder of Farm Mansfield 445
- Portion 3 of Farm Newstead 449
- Portion 1 of Farm Newstead 449
- Portion 4 of Farm Thoresby 450
- Portion 3 of Farm Thoresby 450
- Remainder of Farm Hartnolls 458
- Remainder of Farm Demaneng 546
- Remainder of Farm Lylyveld 545
- Remainder of Farm Sekgame 461
- Portion 2 of Farm Sekgame 461

2014 NEMA Environmental Impact Assessment (EIA) Regulations (as amended), promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017, a BA process is required for the construction of the proposed Kuruman Transmission Line project.

Mulilo has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the EIA Process in order to determine the biophysical, social and economic impacts associated with undertaking the proposed activities. Given that this project is proposed to support the development of two WEFs, which are energy related projects, the application has been elevated to national strategic importance in terms of the EIA Process, and therefore requires authorisation from the

National Department of Environmental Affairs (DEA) as the Competent Authority (CA), acting in consultation with other spheres of government.

NEED FOR THE PROJECT

Mulilo is proposing to develop two Kuruman WEFs close to Kuruman, Phase 1 will have up to 47 turbines and Phase 2 will have up to 52 turbines. The proposed WEFs and associated infrastructure are considered as part of separate Scoping and EIA processes. To enable the evacuation of the electricity generated by the WEFs to the National Grid, a 132 kV transmission line and associated infrastructure is required. These components are presented below.

Project components	Dimensions
Two Eskom Switching Stations	Footprint: 2 ha Height: 15 m A new Eskom switching station will be constructed adjacent to each of the IPP Collector Substations (assessed as part of a separate EIA process). The Eskom switching station serves as the point of supply and metering point for the wind facility to connect to the Eskom Grid.
Transmissions line (	Height: 15m ▪ Alternative 1 (54 km): runs from the Kuruman Phase 1 substation to the Kuruman Phase 2 substation to the Ferrum substation (located in Kathu) (Preferred) ▪ Alternative 2 (14 km): runs from Kuruman Phase 1 substation to Moffat substation (located in Kuruman). ▪ Alternative 3 (21 km): runs from Kuruman Phase 2 substation to Kuruman Phase 1 substation to the Moffat substation (located in Kuruman). Steel monopole double circuit twin tern Width of service road below line(s): jeep track (up to 6 m wide)

NEED FOR A BASIC ASSESSMENT

Section 24(1) of the NEMA states: "In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization." The reference to "listed activities" in Section 24 of the NEMA relates to the regulations promulgated in GN R326, R327, R325 and R324, dated 7 April 2017. The relevant GN published in terms of the NEMA collectively comprise the NEMA EIA Regulations listed activities that require either a BA, or Scoping and EIA be conducted. Listed activities are triggered within GN 327 and 324 which requires that a BA process is undertaken to inform the Environmental Authorisation process.

PROJECT TEAM

The BA is being managed by the Environmental Assessment Practitioner (EAP), Surina Laurie. Surina has more than 7 years of experience in environmental assessment and management and is a Senior EAP in the Environmental Management Services (EMS) group of the CSIR with a Masters degree in Environmental Management from the University of Stellenbosch and a Certificate in Environmental Economics from the University of London. She is a Registered Professional Natural Scientist (Registration Number: 400033/15) with the South African Council for Natural Scientific Professions (SACNASP). Surina has experience in the management and integration of various types of environmental assessments in South Africa for various sectors, including renewable energy, industry and tourism. She has also been part of advisory teams advising on financing, real estate, corporate, construction, environmental and regulatory aspects for various sponsors, developers and lenders during the DOE's first and second bidding windows in 2012 and 2013. Surina has undertaken several Solar Photovoltaic (PV) and Wind Energy Environmental Assessments (i.e. EIAs, BAs, and Amendment and Appeal Processes) in the Northern Cape, Western Cape and Free State.

The project team is detailed below.

NAME	ORGANISATION	ROLE/SPECIALIST STUDY
Environmental Management Services (CSIR)		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	EAP (*Pr. Sci. Nat.)*
Specialists		
Simon Todd	3foxes Biodiversity Solutions	Ecology Impact Assessment (Terrestrial Ecology including fauna and flora)
Chris van Rooyen	Chris van Rooyen Consulting	Bird Impact Assessment
Kate MacEwan	Inkululeko Wild Services (Pty) Ltd	Bat Impact Assessment
Natasha van der Haar	Enviroswift (Pty) Ltd	Freshwater Impact Assessment
Julian Conrad	Geohydrological and Spatial Solutions International (Pty) Ltd	Geohydrological Impact Assessment
Stephan Jacobs	SiVEST SA (Pty) Ltd	Visual Impact Assessment
Nicholas Wiltshire	Cedar Tower Services (Pty) Ltd	Heritage Impact Assessment
Dr John Almond	Private, sub-contracted by Cedar Tower Services (Pty) Ltd	Palaeontological Impact Assessment
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Elena Broughton	Urban-Econ Development Economists	Socio-Economic Impact Assessment
Adrian Johnson	JG Afrika	Transportation Impact Assessment

OVERALL FINDINGS OF THE BA PROCESS

Based on the findings of the specialist studies, the proposed project is considered to have an overall low negative environmental impact and an overall low positive socio-economic impact (with the implementation of respective mitigation and enhancement measures). All of the specialists have recommended that the proposed project receive EA if the recommended mitigation measures are implemented. No negative impacts have been identified within this BA that, in the opinion of the EAP who have conducted this BA Process, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project. However, areas of high bat sensitivity, as discussed in Section D 1.2.10.2.1 of this Report will be developed in, which would mean that the impacts identified by the bat specialist will remain unmitigated (impacts prior to mitigation are rated Moderate to Low). Please refer to Section D of this BA Report for a summary of the specialist studies and their impact assessment ratings.

As noted in Section A of this report, the preferred activity on site is the development of a double circuit steel monopole 132 kV transmission line with associated Eskom switching stations. In terms of the connectivity options, three options were considered by the various specialists. These connectivity options were determined based on the location of the Kuruman WEFs, landowner willingness and the least cost path options. The preferred connectivity and associated routing of transmission line were informed by the outcomes of the specialist studies (discussed in Section D of this report). Based on these outcomes, it was determined that Alternative 1 is the preferred connectivity option. The preferred routing option is discussed in Section D1.2.12 of this report.

The following key conclusions were made within each specialist study:

- *Freshwater*

With the effective implementation of the mitigation measures as provided of the Freshwater Impact Assessment report, it is the opinion of the freshwater specialist that all impacts may be reduced to very low and low (negative) significances. **It is therefore the opinion of the freshwater specialist that authorisation may be granted for either of the three proposed transmission line alternatives.** It should however be noted that an application for an Environmental Authorisation in terms of the NEMA EIA Regulations (2014, amended in 2017) will be required as proposed development related activities will occur within 32m of a watercourse. Furthermore, the proposed development will require authorisation from the DWS in terms of Section 21 (c) and (i) of the NWA.

- *Avifauna*

The proposed Kuruman 132kV grid connection should have a low to very low impact on avifauna, provided the management recommendations listed in the Avifauna Impact Assessment report are strictly implemented. **No fatal flaws were identified from an avifaunal perspective – it is therefore recommended that the project is authorised to go ahead.**

- *Visual*

It is SiVEST's opinion that the visual impacts associated with the proposed electricity infrastructure development are of low significance. **From a visual perspective therefore, the project is deemed acceptable and the EA should be granted**. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels

provided the recommended mitigation measures are implemented. No fatal flaws were identified for any of the route alternatives was determined.

- *Heritage*

Overall, the proposed activity will not directly impact on significant archaeological, palaeontological or built environment heritage. The heritage impact significance is rated as being low. No mitigation is required prior to construction activities occurring. **There is no heritage objection to the proposed development proceeding.**

- *Soils and agriculture*

Due to the low agricultural potential of the site, and the important fact that transmission lines have such little impact on agriculture, the impact of the development is assessed as very low**. There are therefore no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised**. Because of the very low agricultural impact, there are no material differences between the agricultural impacts of any of the alternatives. Therefore, from an agricultural impact perspective, there is no preferred alternative and any of the alternatives is acceptable.

- *Geohydrology*

It is highly unlikely the proposed Kuruman Transmission Line construction for the Kuruman WEFs will impact on the groundwater resources of the site, especially if all safety and preventative measures are put in place. **From a groundwater impact perspective the Kuruman Transmission Line construction can proceed**.

- *Socio-economic*

From a socio-economic perspective therefore, no objections are made with regard to the proposed project. Furthermore, considering the nature of the alternatives either of the options could be developed to evacuate power from the operating wind farms, provided that the developer takes into account the concerns and preferences of the affected land owners during construction and servitude maintenance periods, as well as ensuring that an appropriate health risk prevention plan is devised to be implemented during construction and maintenance periods.

- *Transportation*

The construction and decommissioning phases are the only traffic generators and therefore noise and dust pollution will be higher during these phases. **The development is supported from a transport perspective provided that the recommendations and mitigations are adhered to**.

- *Terrestrial ecology*

Overall, the three alternatives for the Kuruman WEF Grid Connection are likely to generate low impacts on fauna and flora and no high residual impacts on any species or habitats is likely. **As a result, the**

development of either of the power line alternatives can be supported from a terrestrial ecology perspective and are not opposed.

- *Bats*

If all the mitigation and management measures described in the Bat Impact Assessment Report are implemented, the residual impacts will likely be low and IWS does not object to the project. There are greater cumulative threats to bats in the area due to proposed wind energy developments, large scale mining operations and general habitat degradation.

Provided that the specified mitigation measures are applied effectively, it is recommended that the proposed project receive EA in terms of the EIA Regulations promulgated under the NEMA.

PUBLIC PARTICIPATION

In order to notify and inform the public of the proposed project and invite I&APs to register on the project database, the project (along with the Kuruman WEFs and associated EIA process) were advertised in one local newspaper (i.e. "Kathu Gazette" dated 24 February 2018), proof of which can be seen in Appendix C of the report. The newspaper advertisement also provided the details of the project website (i.e. https://www.csir.co.za/environmental-impact-assessment) where information available on the project, could be downloaded from.

In addition to the newspaper advertisement, letters regarding the BA and Scoping and EIA Processes were mailed to all pre-identified key stakeholders on the database (see Appendix C for the database), allowing I&APs to register their interest on the project database and comment on the Background Information Document.

Regulation 41 (2) (a) of the 2014 EIA Regulations, as amended, requires that a notice board s fixed at a place that is conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of the site where the application will be undertaken or any alternative site. To this end, site notice boards were placed at the farm gates and at various locations in Kathu and Kuruman as reflected in Appendix D of this report.

This Draft BA Report and EIA Reports for the WEFs is being distributed for a 30 day commenting period commencing on 02 October 2018 until 02 November 2018.

Summary of where requirements of Appendix 1 of the 2014 NEMA EIA Regulations (as amended, GN R326) are provided in this BA Report

Appendix 1	YES / NO	SECTION IN BA REPORT
Objective of the basic assessment process 2) The objective of the basic assessment process is to, through a consultative process- a) determine the policy and legislative context within which the proposed activity is located and how the activity complies with and responds to the policy and legislative context; b) identify the alternatives considered, including the activity, location, and technology alternatives; c) describe the need and desirability of the proposed alternatives; d) through the undertaking of an impact and risk assessment process inclusive of cumulative impacts which focused on determining the geographical, physical, biological, social, economic, heritage, and cultural sensitivity of the sites and locations within sites and the risk of impact of the proposed activity and technology alternatives on these aspects to determine- (i) the nature, significance, consequence, extent, duration, and probability of the impacts occurring to; and (ii) the degree to which these impacts- (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; and e) through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to- (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.	**Yes**	**Section A of the report includes the Introduction, legislative review, alternatives assessment and needs and desirability** **Section D includes a summary of the specialist studies and associated impact assessments undertaken**
Scope of assessment and content of basic assessment reports 3) (1) A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include: (a) details of: (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	**Yes**	**Section A.2**
(b) the location of the activity, including: (i) the 21 digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm	**Yes**	**Section A.3**

Appendix 1	**YES / NO**	**SECTION IN BA REPORT**
name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;		
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	**Yes**	**Section A.3**
(d) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for; and a description of the activities to be undertaken including associated structures and infrastructure;	**Yes**	**Section A.6.4**
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	**Yes**	**Section A.6**
f) a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	**Yes**	**Section A.8**
(g) a motivation for the preferred site, activity and technology alternative;	**Yes**	**Section A.7**
(h) A full description of the process followed to reach the proposed preferred alternative within the site, including - (i) details of all the alternatives considered;	**Yes**	**Section A.7**
(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	**Yes**	**Section C**
(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	**Yes**	**Section C (to be updated following review of draft report)**
(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**Yes**	**Section A.7**
(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed;	**Yes**	**Section A.7 and Section D**

Appendix 1	YES / NO	SECTION IN BA REPORT
(bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;		
(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	**No**	
(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	**Yes**	
(viii) the possible mitigation measures that could be applied and level of residual risk;	**Yes**	
(ix) the outcome of the site selection matrix;	**No**	
(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	**Yes**	
(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	**Yes**	**Section A.7.6**
(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	**Yes**	**Section D**
(j) an assessment of each identified potentially significant impact and risk, including- (i) cumulative impacts; (ii) the nature, significance and consequences of the impact and risk; (iii) the extent and duration of the impact and risk; (iv) the probability of the impact and risk occurring; (v) the degree to which the impact and risk can be reversed; (vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) the degree to which the impact and risk can be avoided, managed or mitigated;	**Yes**	**Section D**
(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report;	**Yes**	**Section D**
(l) an environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (ii) a map at an appropriate scale which superimposes	**Yes**	**Section E**

Appendix 1	**YES / NO**	**SECTION IN BA REPORT**
the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;		
(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	**Yes**	**Section D and Appendix D**
(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;	**Yes**	**Section E**
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	**Yes**	**Please refer to each specialist study included in Appendix B**
(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;	**Yes**	**Section E**
(q) where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	**N/A**	
(r) an undertaking under oath or affirmation by the EAP in relation to - (i) the correctness of the information provided in the reports; (ii) the inclusion of comments and inputs from stakeholders and I&APs; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; and	**Yes**	**Appendix E**
(s) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	**X**	
(t) any specific information that may be required by the competent authority; and	**X**	
(u) any other matters required in terms of section 24(4)(a) and (b) of the Act.	**X**	
2) Where a government notice *gazetted* by the Minister provides for the basic assessment process to be followed, the requirements as indicated in such a notice will apply.	**X**	

SECTION A: INTRODUCTION, PROJECT DESCRIPTION AND LEGISLATIVE REVIEW

A.1 Introduction

Mulilo Renewable Project Developments (Pty) Ltd (hereafter, "Mulilo"), the Project Applicant, is proposing to construct two Wind Energy Facilities (WEFs), namely Kuruman Phase 1 WEF and Kuruman Phase 2 WEF and supporting infrastructure, in the Ga-Segonyana Local Municipality and the John Taolo Gaetsewe District Municipality, 8 km and 37 km south west from Kuruman and from Kathu, respectively, in the Northern Cape Province (see Figure A.1). The proposed WEF projects are being developed to generate electricity via wind energy which will feed into and supplement the national electricity grid. This report comprises the draft Basic Assessment (BA) for the development of **the supporting electrical infrastructure to the two WEFs, namely the "Kuruman Transmission Line" project**. The proposed project occurs within the Ga-Segonyana Local Municipality and the Gamagara Local Municipality and within the John Taolo Gaetsewe District Municipality

This assessment provides an assessment of three connectivity options that will enable the WEFs to evacuate the electricity generated by the WEFs into the National Grid. The connection options either entail the development of a 132 kV line to the existing Ferrum substation (located in Kathu) (Alternative 1) or to the Moffat substation (located in Kuruman) (Alternative 2 and 3) and two Eskom Switching (Metering) Stations. The two WEFs are considered as part of two separate Scoping and Environmental Impact Assessment (EIA) processes.

The preferred alternative connectivity option (Alternative 1) of the Kuruman Transmission Line project will be developed on the following land portions:

- Remainder of Farm Woodstock 441
- Portion 1 of Farm Bramcote 446
- Remainder of Farm Mansfield 445
- Portion 3 of Farm Newstead 449
- Portion 1 of Farm Newstead 449
- Portion 4 of Farm Thoresby 450
- Portion 3 of Farm Thoresby 450
- Remainder of Farm Hartnolls 458
- Remainder of Farm Demaneng 546
- Remainder of Farm Lylyveld 545
- Remainder of Farm Sekgame 461
- Portion 2 of Farm Sekgame 461

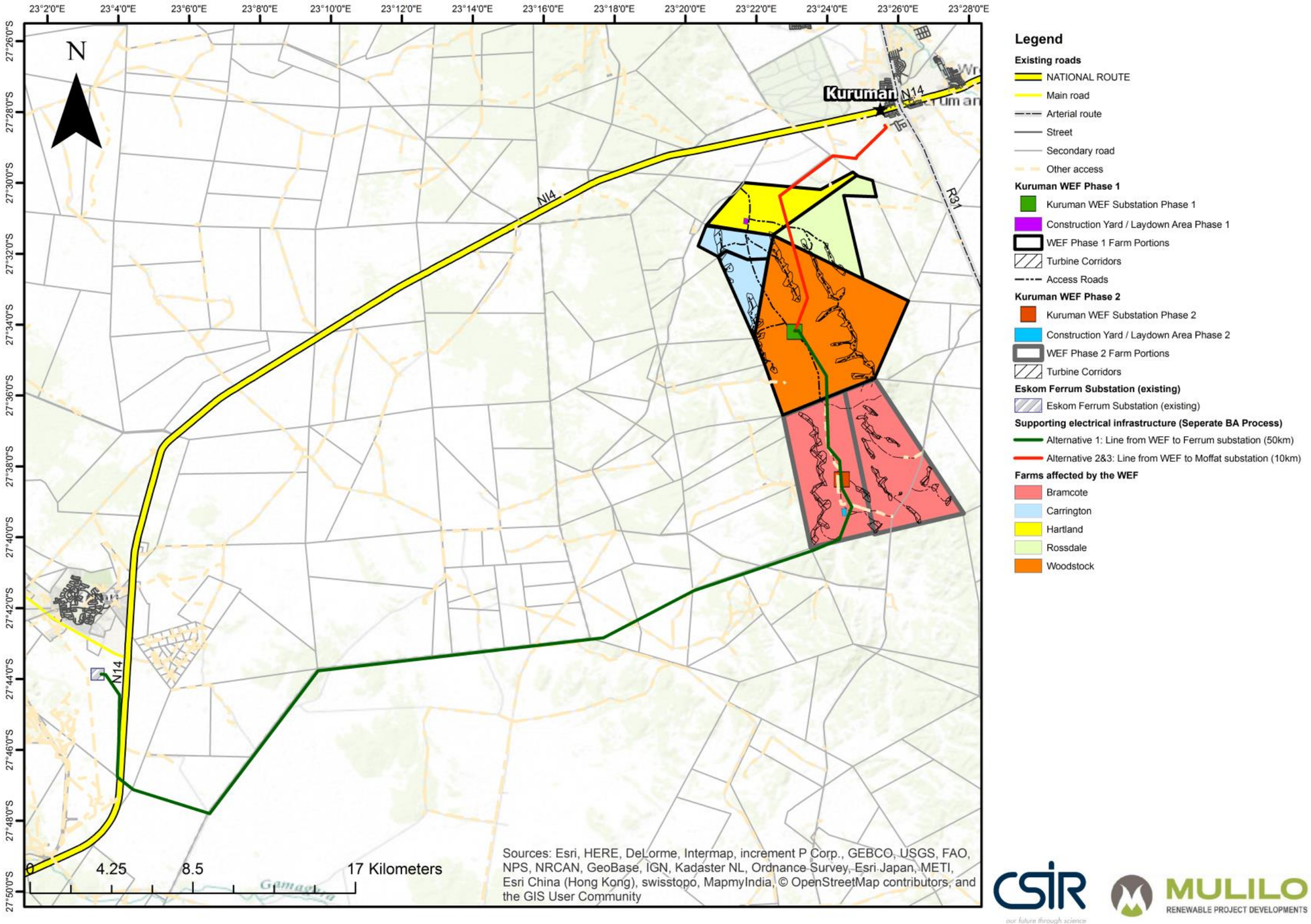

Figure A.1: Locality map of the two Kuruman WEFs and Kuruman Transmission Line

A.2 Project Team

In accordance with Regulation 12 (1) of the 2014 NEMA EIA Regulations (as amended, GN R326), the Applicant has appointed the CSIR to undertake a separate BA Process in order to determine the biophysical, social and economic impacts associated with undertaking the proposed development.

The BA is being managed by the Environmental Assessment Practitioner (EAP), Surina Laurie. Surina has more than 7 years of experience in environmental assessment and management and is a Senior EAP in the Environmental Management Services (EMS) group of the CSIR with a Masters degree in Environmental Management from the University of Stellenbosch and a Certificate in Environmental Economics from the University of London. She is a Registered Professional Natural Scientist (Registration Number: 400033/15) with the South African Council for Natural Scientific Professions (SACNASP). Surina has experience in the management and integration of various types of environmental assessments in South Africa for various sectors, including renewable energy, industry and tourism. She has also been part of advisory teams advising on financing, real estate, corporate, construction, environmental and regulatory aspects for various sponsors, developers and lenders during the DOE's first and second bidding windows in 2012 and 2013. Surina has undertaken several Solar Photovoltaic (PV) and Wind Energy Environmental Assessments (i.e. EIAs, BAs, and Amendment and Appeal Processes) in the Northern Cape, Western Cape and Free State.

The team which is involved in this BA Process is listed in Table A.1 below.

Table A.1: The BA Team

NAME	ORGANISATION	ROLE/SPECIALIST STUDY
Environmental Management Services (CSIR)		
Paul Lochner	CSIR	Technical Advisor and Quality Assurance (EAPSA) Certified
Surina Laurie	CSIR	EAP (*Pr. Sci. Nat.)*
Specialists		
Simon Todd	3foxes Biodiversity Solutions	Ecology Impact Assessment (Terrestrial Ecology including fauna and flora)
Chris van Rooyen	Chris van Rooyen Consulting	Bird Impact Assessment
Kate MacEwan	Inkululeko Wild Services (Pty) Ltd	Bat Impact Assessment
Natasha van der Haar	Enviroswift (Pty) Ltd	Freshwater Impact Assessment
Julian Conrad	Geohydrological and Spatial Solutions International (Pty) Ltd	Geohydrological Impact Assessment
Stephan Jacobs	SiVEST SA (Pty) Ltd	Visual Impact Assessment
Nicholas Wiltshire	Cedar Tower Services (Pty) Ltd	Heritage Impact Assessment
Dr John Almond	Private, sub-contracted by Cedar Tower Services (Pty) Ltd	Palaeontological Impact Assessment
Johann Lanz	Private	Soils and Agricultural Potential Assessment
Elena Broughton	Urban-Econ Development Economists	Socio-Economic Impact Assessment
Morné de Jager	Enviro-Acoustic Research	Noise Impact Assessment
Adrian Johnson	JG Afrika	Transportation Impact Assessment

A.3 Project Description

As noted above, Mulilo is proposing to develop two Kuruman WEFs close to Kuruman, Phase 1 will have up to 47 turbines and Phase 2 will have up to 52 turbines. The proposed WEFs and associated infrastructure are considered as part of separate Scoping and EIA processes. To enable the evacuation of the electricity generated by the WEFs to the National Grid, a 132 kV transmission line and associated infrastructure is required. As part of this BA process, the following is considered (Table A.2). Each of these project components are discussed in detail below.

Table A.2: Project components

Project components	Dimensions
Two Eskom Switching Stations	Footprint: 2 ha Height: 15 m A new Eskom switching station will be constructed adjacent to each of the IPP Collector Substations (assessed as part of a separate EIA process). The Eskom switching station serves as the point of supply and metering point for the wind facility to connect to the Eskom Grid.
Transmissions line	Height: 15m ▪ Alternative 1 (54 km): runs from the Kuruman Phase 1 substation to the Kuruman Phase 2 substation to the Ferrum substation (located in Kathu) (Preferred) ▪ Alternative 2 (14 km): runs from Kuruman Phase 1 substation to Moffat substation (located in Kuruman). ▪ Alternative 3 (21 km): runs from Kuruman Phase 2 substation to Kuruman Phase 1 substation to the Moffat substation (located in Kuruman). Steel monopole double circuit twin tern Width of service road below line(s): jeep track (up to 6 m wide)

The coordinates of the corner points of the preferred alternative from a technical perspective (Alternative 1) are detailed in Table A.3 below. The location of the project components and the coordinates referred to below are shown in Figure A.4.

Table A.3: Coordinates of the preferred line routing (Alternative 1)

Point	Latitude	Longitude	Point	Latitude	Longitude
A	27°34'10.62"S	23°23'5.63"E	J	27°42'51.14"S	23°17'40.65"E
B	27°34'10.57"S	23°23'11.35"E	K	27°43'46.69"S	23° 9'37.74"E
C	27°35'9.62"S	23°23'52.66"E	L	27°47'47.88"S	23° 6'33.85"E
D	27°37'25.99"S	23°24'1.64"E	M	27°47'7.84"S	23° 4'25.25"E
E	27°38'4.78"S	23°24'19.39"E	N	27°46'47.19"S	23° 3'58.73"E
F	27°38'18.30"S	23°24'17.97"E	O	27°44'28.25"S	23° 4'2.76"E
G	27°39'5.41"S	23°24'42.65"E	P	27°43'53.16"S	23° 3'39.22"E
H	27°40'4.08"S	23°24'19.66"E	Q	27°43'53.40"S	23° 3'28.81"E
I	27°41'31.07"S	23°20'12.81"E			

A.3.1 Transmission line

An overhead 132 kV transmission will be constructed from the WEFs and, depending on which alternative connection is considered the preferred connection, will have a length of between 14 - 54 km. It is proposed that a steel monopole, double circuit twin tern, will be developed on site. Examples of what the transmission line will look like is shown below (Figure A.2).

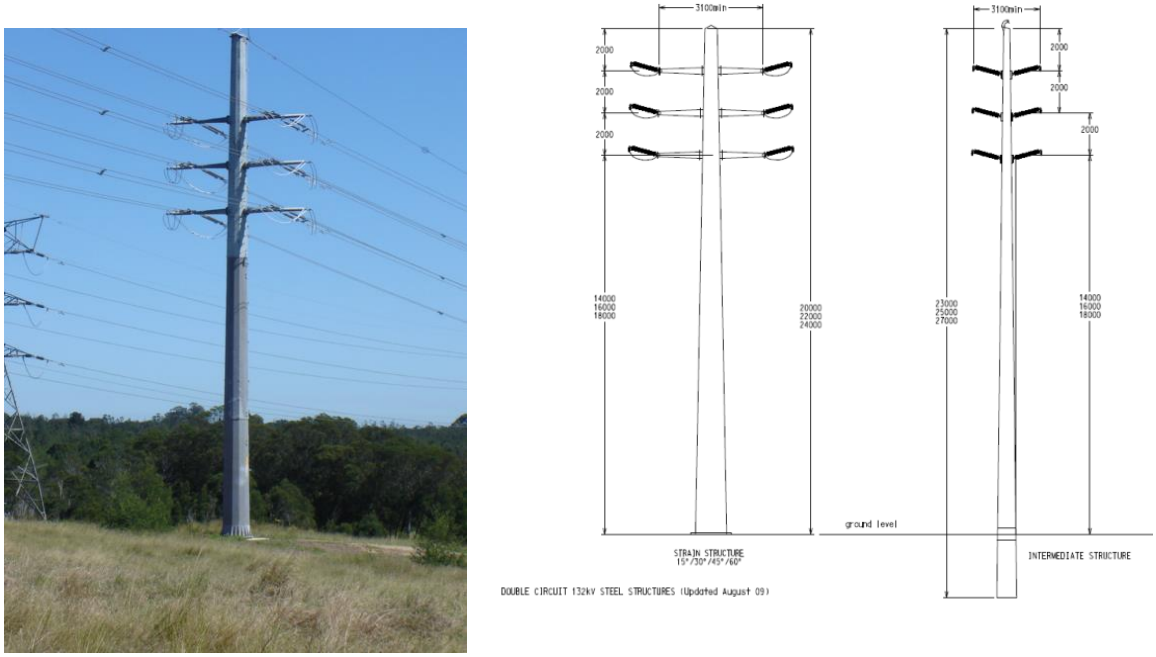

Figure A.2: Proposed design of the transmission line

A.3.2 Service road

To enable the construction and maintenance of the line, a jeep track is proposed below the transmission line. The road will be less than 6 m wide.

A.3.3 Eskom switching Station

As part of each WEF, underground 33 kV lines will be constructed from the wind turbines to an IPP collector substation. Adjacent to the collector substation, will be an Eskom switching station. This switching station is proposed within the same footprint as the collector substation (considered as part of the EIA processes undertaken for the WEFs). The proposed 132 kV line will connect to this switching station which will evacuate power to either the existing Ferrum or Moffat substations. The Eskom Metering Station will have a footprint of 2 ha and a height of 15 m.

A.3.4 Additional infrastructure (existing roads)

The substation components, including transformers, and electrical cables and pylons, will be transported to site using appropriate National and Provincial routes and the access roads to the site. It is expected that the components will generally be transported to site with normal heavy load vehicles, with the exception of the transformers which will require an abnormal load vehicle.

Alternative 1 will connect to the existing Ferrum substation in Kathu. Access to the Alternative 1 transmission line route alignment will be via the N14 at Kathu and associated internal (farm) roads (Figure A.3). The section of the transmission route alignment passing through the proposed WEF farm properties can be accessed via the D3441 and D3420 (Figure A.4). These roads will also be used, should Alternative 2 or 3 be deemed the preferred connectivity option.

The main access points to the proposed locations of the Eskom Metering Station are also via D3441 and D3420, as shown in the figure below. Substation components can be delivered to site via an access point on D3441 (Main access point for Phase 1) and 2 access points on D3420 (main access points for Phase 2). The existing internal gravel roads and the upgraded internal roads (part of the WEF development proposals) can be used during the construction and installation of the infrastructure.

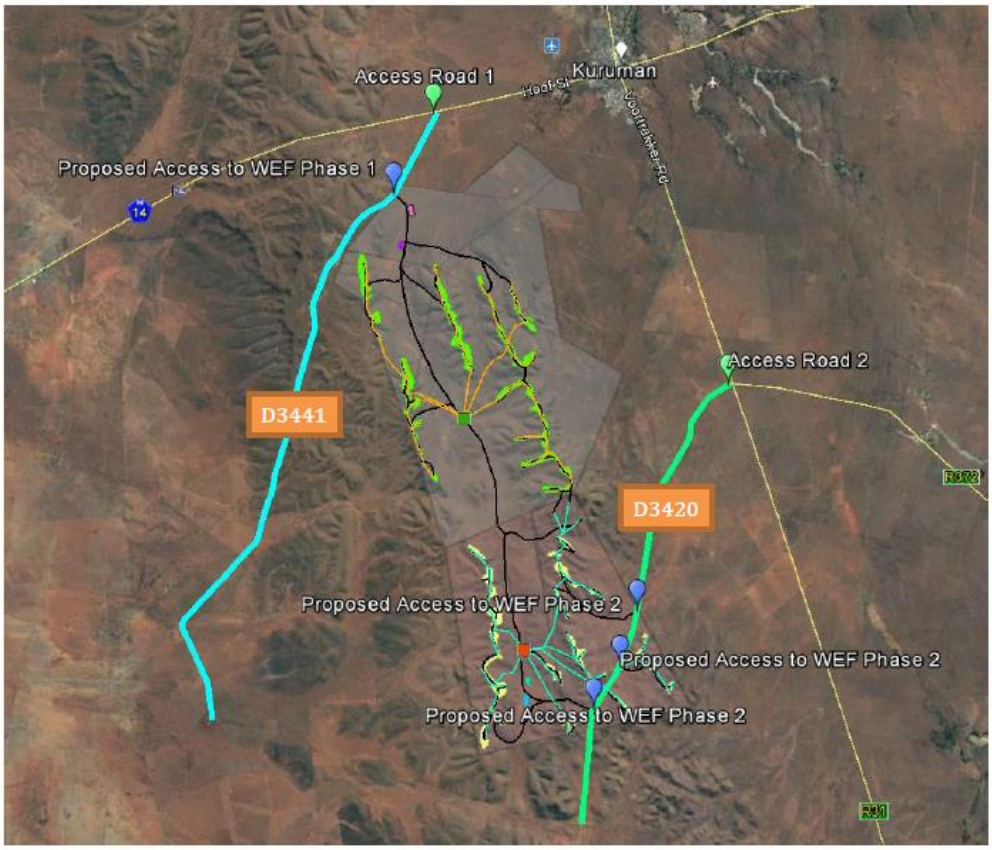

Figure A.3: Access options to the transmission line, using access roads proposed as part of the Kuruman WEFs.

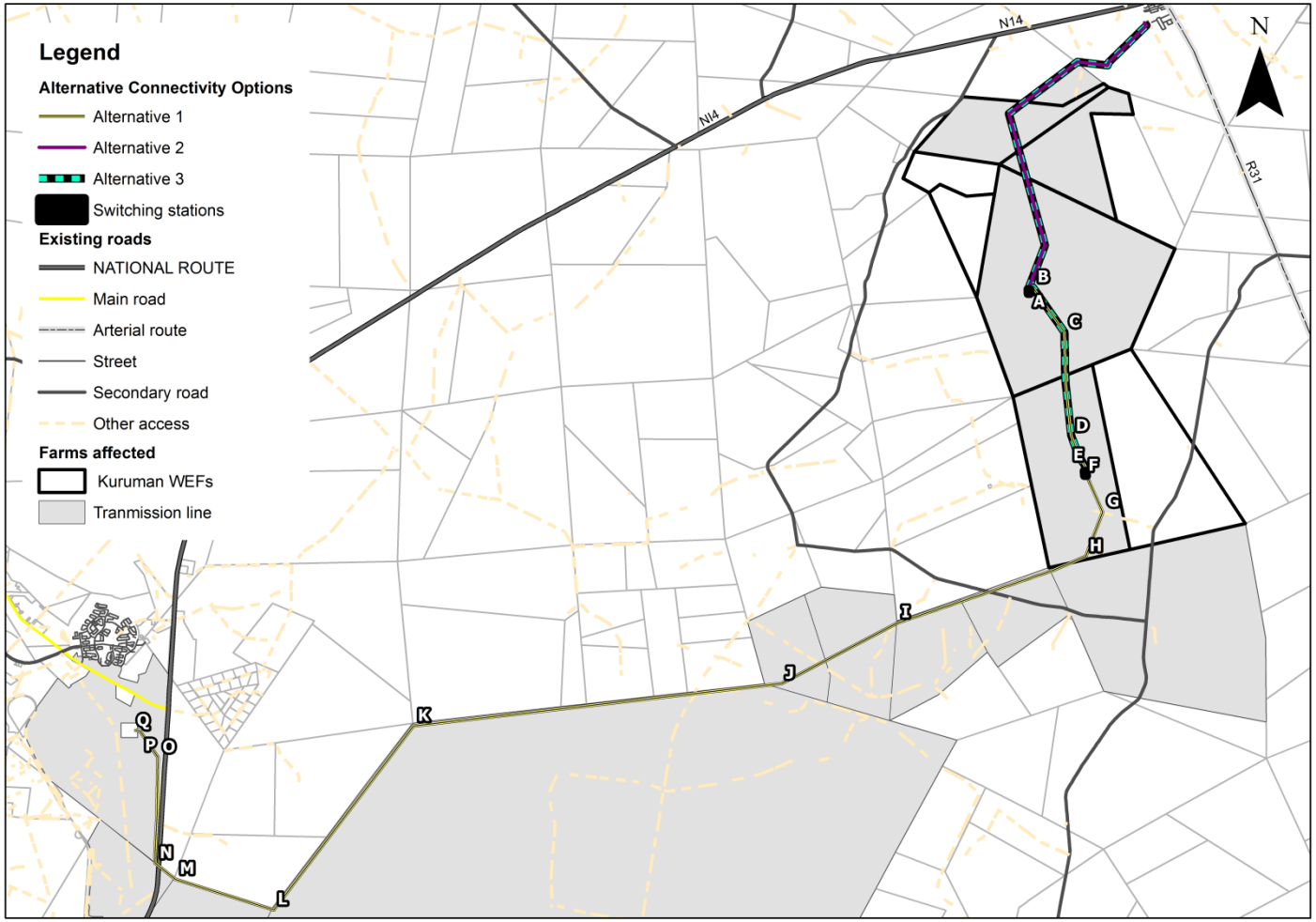

Figure A.4: The coordinate points of the preferred line routing (Alternative 1), connectivity options and project components proposed as part of the Kuruman Transmission Line project

A.4 Overview of the Project Development Cycle

The project can be divided into the following three main phases:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Each activity undertaken as part of the above phases may have environmental impacts and, where applicable, has been considered within the by the specialist studies undertaken to inform this BA (summarised in Section D and full studies included Appendix B of this BA Report).

A.4.1 Construction Phase

The construction phase will take place subsequent to the issuing of an EA from the DEA and a successful bid of one or both of the Kuruman WEFs in terms of the Renewable Energy Independent Power Producer Procurement Programme (REI4P) (i.e. the issuing of a Power Purchase Agreement (PPA) from the Department of Energy (DoE)). The construction phase for the proposed project is expected to extend 12 to 14 months.

- The main activities that will form part of the construction phase are:
- Removal of vegetation for the proposed infrastructure;
- Excavations for infrastructure and associated infrastructure;
- Stockpiling of topsoil and cleared vegetation;
- Creation of employment opportunities;
- Transportation of material and equipment to site, and personnel to and from site; and
- Construction of the 132 kV transmission line and additional infrastructure.

A.4.2 Operational Phase

The following activities will occur during the operational phase:

- The transmission of electricity generated from the WEF to an Eskom substation; and
- Maintenance of the transmission line.

During the life span of the WEF (approximately 20 years), on-going maintenance to the line will be required on a scheduled basis.

A.4.3 Decommissioning Phase

The main aim of decommissioning is to return the land to its original, pre-construction condition. Should the unlikely need for decommissioning arise, the decommissioning procedures will be undertaken in line with the EMPr and the site will be rehabilitated and returned to its pre-construction state.

A.5 Service Provision: Sewage and Waste Requirements

Mulilo will consult with the municipality in order to confirm the supply of services (in terms of waste removal and sewage) for the proposed project. The municipality will be consulted as part of

the 30-day public review period of this report and the confirmation services provision will be included in the Final BA Report. However, it must be noted that should the municipality not have adequate capacity for waste and sewage handling provisions available; then Mulilo will make use of private contractors to ensure that the services are provided. Mulilo will also ensure that adequate waste disposal measures are implemented by obtaining waste disposal slips for waste removed from site (in line with the EMPr).

An outline of the services that will be required are discussed below.

A.5.1 Water Usage

Groundwater will be utilised for water supply and will not be sourced from the municipality. A geohydrological impact assessment was undertaken for this project and the availability and suitability of groundwater confirmed. The full assessment is included in Appendix B of the report and summarised in Section D. Water on site will be used for construction purposes and for dust suppression.

A.5.2 Sewage or Liquid Effluent (Hazardous waste)

The proposed project will require sewage services during the construction phase. Sewage volumes of between 160- 3500 litres per month are estimated (this estimate is for both a WEF and transmission line since the one will not be developed without the other). Liquid effluent will be limited to the ablution facilities during the construction phase. Portable sanitation facilities (i.e. chemical toilets) will be used during the construction phase, which will be regularly serviced and emptied by a suitable (private) contractor on a regular basis. The waste water will be transported to a nearby Waste Water Treatment Works for treatment. Due to the remote location of the project site; a conservancy tank or septic tank system could be used on site, which could be serviced by the municipality or a private contractor. During the operational phase of the proposed transmission line, sewage generation is not applicable.

A.5.3 Solid Waste Generation (General waste)

The quantity of waste generated will depend on the construction phase, which is estimated is extend 12 to 14 months. However, it is estimated that between 40 kg – 1500 kg of waste will be generated every month during the construction phase (this estimate is for both a WEF and transmission line since the one will not be developed without the other). This will mostly consist ofpallets/wood, polymerizing vinyl chloride (pvc) off cuts, domestic waste, cleared vegetation and to a limited extent paper, plastic and wood.

Solid waste will be managed via the EMPr (Appendix D of the BA Report), which incorporates waste management principles. General waste will be collected and temporarily stockpiled in skips in a designated area on site and thereafter removed, emptied into trucks, and disposed at a registered waste disposal facility on a regular basis by an approved waste disposal Contractor (i.e. a suitable Contractor). Any hazardous waste (such as contaminated soil as a result of spillages) will be temporarily stockpiled (for less than 90 days) in a designated area on site (i.e. placed in leak-proof storage skips), and thereafter removed off site by a suitable service provider for safe disposal at a registered hazardous waste disposal facility. Waste disposal slips and waybills will be obtained for the collection and disposal of the general and hazardous waste. These disposal slips (i.e. safe disposal certificates) will be kept on file for auditing purposes as proof of disposal. The waste disposal facility selected will be suitable and able to receive the specified waste stream (i.e. hazardous waste will only be disposed of at a registered/licenced waste disposal facility). The details of the disposal facility will be finalised during the contracting process, prior to the commencement of construction. Where possible, recycling and re-use of material will be

encouraged. Waste management is further discussed in the EMPr (Appendix D of this BA Report). During the operational phase of the proposed distribution line, waste generation is not applicable.

A.6 Applicable legislation

A.6.1 National Legislation

A.6.1.1 The Constitution of the Republic of South Africa (Act 108 of 1996)

The Constitution, which is the supreme law of the Republic of South Africa, provides the legal framework for legislation regulating environmental management in general, against the backdrop of the fundamental human rights. Section 24 of the Constitution states that:

- "Everyone has the right:
    - to an environment that is not harmful to their health or well-being; and
    - to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that –
        - prevent pollution and ecological degradation;
        - promote conservation; and
        - secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

Section 24 of the Bill of Rights therefore guarantees the people of South Africa the right to an environment that is not detrimental to human health or well-being, and specifically imposes a duty on the State to promulgate legislation and take other steps that ensure that the right is upheld and that, among other things, ecological degradation and pollution are prevented.

In support of the above rights, the environmental management objectives of proposed project is to protect ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the towns nearest to the project site.

A.6.1.2 NEMA and EIA Regulations published on 8 December 2014 (as amended on 7 April 2017; GN R327, GN R326, GN R325 and GN R324)

The NEMA sets out a number of principles (Chapter 1, Section 2) to give guidance to developers, private land owners, members of public and authorities. The proclamation of the NEMA gives expression to an overarching environmental law. Various mechanisms, such as cooperative environmental governance, compliance and non-compliance, enforcement, and regulating government and business impacts on the environment, underpin NEMA. NEMA, as the primary environmental legislation, is complemented by a number of sectoral laws governing marine living resources, mining, forestry, biodiversity, protected areas, pollution, air quality, waste and integrated coastal management. Principle number 3 determines that a development must be socially, environmentally and economically sustainable. Principle Number 4(a) states that all relevant factors must be considered, *inter alia* i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and viii) that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

A.6.1.3 National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, and the use of indigenous biological resources in a sustainable manner, amongst other provisions". The Act states that the state is the custodian of South Africa's biological diversity and is committed to respect, protect, promote and fulfil the constitutional rights of its citizens.

Furthermore, NEMBA states that the loss of biodiversity through habitat loss, degradation or fragmentation must be avoided, minimised or remedied. The loss of biodiversity includes *inter alia* the loss of threatened or protected species.

Chapter 5 of NEMBA (Sections 73 to 75) regulates activities involving invasive species, and lists duty of care as follows:

- the land owner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or re-establishment;
- take all required steps to prevent or minimise harm to biodiversity; and
- ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

An amendment to the NEMBA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEMBA are triggered.

Based on the terrestrial ecological specialist study, the site does not fall within a threatened ecosystem. However the site provides habitat to numerous Species of Conservation Concern (SCC).

A.6.1.4 The National Heritage Resources Act (Act 25 of 1999)

The National Heritage Resources Act (Act 25 of 1999) (NHRA) introduces an integrated and interactive system for the managements of national heritage resources (which include landscapes and natural features of cultural significance).

Parts of sections 35(4), 36(3) (a) and 38(1) (8) of the NHRA apply to the proposed project:

Archaeology, palaeontology and meteorites:

Section 35 (4) No person may, without a permit issued by the responsible heritage resources authority:

a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;
b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;
c) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

Burial grounds and graves:
Section 36 (3) (a) No person may, without a permit issued by South African Heritage Resources Agency (SAHRA) or a provincial heritage resources authority:

a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment which assists in the detection or recovery of metals.

Heritage resources management:

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorized as:

a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
b) the construction of a bridge or similar structure exceeding 50 m in length;
c) any development or other activity which will change the character of the site –
    (i) exceeding 5000 m^2 in extent, or
    (ii) involving three or more erven or subdivisions thereof; or
    (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
d) the re-zoning of a site exceeding 10 000 m^2 in extent; or
e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

While landscapes with cultural significance do not have a dedicated Section in the NHRA, they are protected under the definition of the National Estate (Section 3). Section 3(2)(c) and (d) list "historical settlements and townscapes" and "landscapes and natural features of cultural significance" as part of the National Estate. Furthermore, Section 3(3) describes the reasons a place or object may have cultural heritage value. Section 38 (2a) of the NHRA states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted.

Ngwao-Boswa Ya Kapa Bokoni (Heritage Northern Cape) and the SAHRA are required to provide comment on the proposed project in order to facilitate final decision-making by the DEA. To this end and to facilitate comment from the relevant heritage authorities, the proposed project will be loaded onto the South African Heritage Resources Information System (SAHRIS) for comment.

Once a final comment has been issued by the heritage authority, the recommendations should be included in the conditions of the EA (should it be granted). This will essentially give 'permission' from the heritage authorities to proceed. If any archaeological mitigation is required then this would need to be conducted by an appropriate specialist under a permit issued to that specialist by SAHRA. This permit has no bearing on the developer or development but is purely a way in which the heritage authority can be sure that the mitigation work will be carried out satisfactorily.

A Heritage Impact Assessment (including Archaeology and Cultural Landscape) and a Palaeontological Impact Assessment was undertaken as part of the BA process. No heritage (archaeological or palaeontological) features were identified to be impacted on and no permits are required prior to the proposed project being developed.

A.6.1.5 National Forests Act (Act 84 of 1998)

The National Forest Act (Act 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The most recent list of protected tree species was published in November 2014. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees.

The abundance of protected tree species is however high in many parts of the affected areas. *Boscia albitrunca* is occasional along the route and very few trees would be affected and those along the route can probably all be avoided. The abundance of *Acacia erioloba* and Acacia haematoxylon is high in many areas and while *Acacia haematoxylon* is shorter and sometimes tolerated in the power line servitudes, it is likely that hundreds of *Acacia erioloba* will need to be cleared along the servitude. However as this species is very common in the area, this would not be a significant impact on the local population

The removal of *Acacia erioloba* or any other tree listed within the National Forest Act (NFA) 84 of 1998 at watercourse crossing points will require a tree removal permit which can be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF).

A.6.1.6 Conservation of Agricultural Resources Act (Act 43 of 1983)

The objectives of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- maintenance of the production potential of land;
- combating and prevention of erosion and weakening or destruction of the water sources; and
- protection of the vegetation and the combating of weeds and invader plants.

The CARA states that no land user shall utilise the vegetation of wetlands (a watercourse or pans) in a manner that will cause its deterioration or damage. This includes cultivation, overgrazing, diverting water run-off and other developments that damage the water resource. The CARA includes regulations on alien invasive plants. According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled,
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled, and
- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented, except within the flood line of watercourses and wetlands. It is the legal duty of the land user or land owner to control invasive alien plants occurring on the land under their control.

Should alien plant species occur within the study area; this will be managed in line with the EMPr. Rehabilitation after disturbance to agricultural land is also managed by CARA. The DAFF reviews and approves applications in terms of these Acts according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011.

A.6.1.7 National Water Act (Act 36 of 1998)

One of the important objectives of the National Water Act (Act 36 of 1998) (NWA) is to ensure the protection of the aquatic ecosystems of South Africa's water resources. Section 21 of this Act identifies certain land uses, infrastructural developments, water supply/demand and waste disposal as 'water uses' that require authorisation (licensing) by the Department of Water and Sanitation (DWS). Chapter 4 (Part 1) of the NWA sets out general principles for the regulation of water use. Water use is defined broadly in the NWA, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering the bed, banks, course or characteristics of a watercourse, removing water found underground for certain purposes, and recreation. In general a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence. The Minister may limit the amount of water which a responsible authority may allocate. In making regulations the Minister may differentiate between different water resources, classes of water resources and geographical areas.

All water users who are using water for agriculture: aquaculture, agriculture: irrigation, agriculture: watering livestock, industrial, mining, power generation, recreation, urban and water supply service must register their water use. This covers the use of surface and ground water.

Section 21 of the Act lists the following water uses that need to be licensed:

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 contemplated in section 36;
e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
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.

The crossing of watercourses e.g. with service roads is considered to be a water use as defined within the NWA and would require the authorisation from the Department of Water and Sanitation (DWS). In terms of the proposed project, water uses listed within Section 21 that will most likely require authorisation include water uses 21 (c) and (i).

In terms of groundwater abstraction, only a registration process will have to be followed for the groundwater use; i.e. Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) is applicable.

A.6.1.8 Subdivision of Agricultural Land Act (Act 70 of 1970)

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required.

A.6.1.9 Development Facilitation Act (Act 67 of 1995)

The Development Facilitation Act (Act 67 of 1995) (DFA) sets out a number of key planning principles which have a bearing on assessing proposed developments in light of the national planning requirements. The planning principles most applicable to the study area include:

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;
- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;
- Promoting the establishment of viable communities; and
- Promoting sustained protection of the environment.

A.6.1.10 Other Applicable Legislation

Other applicable national legislation that may apply to the proposed project include:

- Electricity Act (Act 41 of 1987);
- Electricity Regulations Amendments (August 2009);
- Energy Efficiency Strategy of the Republic of South Africa (Department of Minerals and Energy (DME) now operating as Department of Mineral Resources (DMR), March, 2005);
- Promotion of Administrative Justice Act (Act 2 of 2000);
- Civil Aviation Act (Act 13 of 2009) and Civil Aviation Regulations (CAR) of 1997;
- Civil Aviation Authority Act (Act 40 of 1998);
- White Paper on Renewable Energy (2003);
- Integrated Resource Plan for South Africa (2010);
- Occupational Health and Safety Act (Act 85 of 1993), as amended by Occupational Health and Safety Amendment (Act 181 of 1993);
- Road Safety Act (Act 93 of 1996);
- Fencing Act (Act 31 of 1963);
- National Environmental Management: Air Quality Act (Act 39 of 2004);
- National Environmental Management: Protected Areas Act (NEM:PA) (Act 31 of 2004);
- National Environmental Management: Waste Management Act (Act 59 of 2008); and
- National Road Traffic Act (Act 93 of 1996).

A.6.2 Provincial Legislation

A.6.2.1 Northern Cape Nature Conservation (Act 09 of 2009)

The Northern Cape Nature Conservation Act (Act 09 of, 2009) and in particular the Northern Cape Conservation: Schedule 2 – Specially Protected Species has reference to the proposed project. This Act aims at improving the sustainability in terms of balancing natural resource usage and protection or conservation thereof. It includes six schedules, as follow:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regard to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. As part of the EMPr management measures regarding a detailed plant search and rescue operation is included (Appendix D). If any of the listed species are found, the relevant permits should be obtained by the Project Applicant prior to their relocation or destruction. In addition, the Provincial Department of Environment and Nature Conservation (DENC) should be consulted on whether a permit is required for the clearance of indigenous vegetation on site. DENC have been pre-identified as a key stakeholder and therefore included on the project database.

A.6.3 Local Planning Legislation

A.6.3.1 John Taolo Gaetsewe Spatial Development Framework (John Taolo Gaetsewe District Municipality 2017)

The **vision** of the JTGDM SDF 2017 is that it will become a district in which all its residents…

• *… engage in viable and sustainable wealth-generating economic activities.*

The SDF states that a serious investment in and exploitation of renewable sources of energy will result in the district becoming self-reliant in the generation of electricity which will provide a sizeable injection into the national electricity grid.

The SDF notes that Strategic Integrated Project (SIP) 8 (Green Energy in support of the South African economy) of the National Infrastructure Plan (NIP, 2012) has significance to the JTGD with specific reference to mining development, provision of basic infrastructure and green energy (i.e. solar energy) respectively. Although solar energy is referenced specifically, wind energy is also a form of green energy and it is assumed that it would thus be supported by the SDF as it states that new energy sources must be investigated. This project will enable the evacuation of electricity from WEFs and will therefore support this vision.

A.6.3.2 Ga-Segonyana Integrated Development Plan (Ga-Segonyana Local Municipality 2017-2018)

The Ga-Segonyana Local Municipality Integrated Development Plan (IDP) (2017-2018) recognises renewable energy projects (with an emphasis on solar PV projects) as potential new economic development opportunities. The development of the this project along with a WEF will therefore also be in line with the vision of the municipality to diversity the job market by creating sustainable economic growth and development opportunities.

One of the economic priority issues identified within the Ga-Segonyana Local Municipality Integrated Development Plan (IDP) (2017-2018) is the fairly high level of unemployment. Although close to three-quarters of the working age population in the Ga-Segonyana LM were employed in the formal sector and approximately 20% in the informal sector (Quantec Easy Data, 2017), the unemployment rate of 35% is much higher than the national unemployment rate. The IDP further states that the Local Municipality constitutes close to a quarter of the adult population with no schooling and are in need of employment opportunities.

A.6.3.3 Gamagara Local Municipality IDP (2017-2022)

The Gamagara IDP includes the following key objectives:

- Providing universal access to basic services
- Attain safe and healthy environment
- Strengthening stakeholder relations
- Promoting active citizenry in Local Government affairs
- Providing sustainable services to communities
- Being a developmentally focused institution
- Promote social and economic development

The proposed project will contribute to the provision of access to basic services, providing sustainable services to communities and promote social and economic development. This project is therefore aligned with the objectives of the IDP.

A.6.3.4 Guidelines, Frameworks and Protocols

- Public Participation Guideline, October 2012 (Government Gazette 35769);
- DEADP and DEA Guidelines published in terms of the NEMA EIA Regulations, in particular:
  - Guideline on Alternatives (DEA, 2014);
  - Guideline on Transitional Arrangements (DEADP, March 2013);
  - Guideline on Alternatives (DEADP, March 2013);
  - Guideline on Public Participation (DEADP, March 2013);
  - National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008;
  - South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Developments – Pre-Construction (2016);
  - South African Good Practise Guidelines for Operational Monitoring for Bats at Wind Energy Facilities (2014);
  - Bird and Wind-Energy Best-Practice Guidelines. Best-Practice Guidelines for assessing and monitoring the impact of wind-energy facilities on birds in southern Africa (2015);
  - Guideline on Need and Desirability (DEADP, March 2013);
  - South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities. 1st Edition;
  - South African Good Practise Guidelines for Surveying Bats in Wind Energy Facility Development – Pre-construction. Edition 4.1;
  - The South African Bat Fatality Threshold Guidelines Edition 2 (under revision); and
  - Mitigation Guidance for Bats at Wind Energy Facilities in South Africa. 2nd Edition.
- Information Document on Generic Terms of Reference for EAPs and Project Schedules (March 2013);
- Integrated Environmental Management Information Series (Booklets 0 to 23) (Department of Environmental Affairs and Tourism (DEAT), 2002 – 2005);
- Guidelines for Involving Specialists in the EIA Processes Series (DEADP; CSIR and Tony Barbour, 2005 – 2007);
- United Nations Framework Convention on Climate Change (1997); and
- Kyoto Protocol (which South Africa acceded to in 2002).

A.6.4 Description of the listed activities associated with the proposed project

Section 24(1) of the NEMA states: "In order to give effect to the general objectives of integrated environmental management laid down in this Chapter, the potential impact on the environment of listed activities must be considered, investigated, assessed and reported to the competent authority charged by this Act with granting the relevant environmental authorization." The reference to "listed activities" in Section 24 of the NEMA relates to the regulations promulgated in GN R326, R327, R325 and R324, dated 7 April 2017. The relevant GN published in terms of the NEMA collectively comprise the NEMA EIA Regulations listed activities that require either a BA, or Scoping and EIA be conducted.

The Application for EA for this BA Process will be submitted to the DEA together with this BA Report, which makes reference to all relevant listed activities forming part of the proposed development. Table A.4 below provides a list of the applicable listed activities associated for the proposed project in terms of Listing Notice 1 (GN R 327) and Listing Notice 3 (GN R324) in terms of the 2014 NEMA EIA Regulations (as amended).

Table A.4. Applicable Listed Activities

Listed activity	Description of project activity that may trigger the listed activity
GN R327	
Activity 11: The development of facilities or infrastructure for the distribution and distribution of electricity: (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts or more;	The proposed project will entail the construction and installation of overhead 132 kV transmission line from the Kuruman WEF to Ferrum substation in Kathu, as well as two on-site Eskom switching stations. The proposed project will take place outside of an urban area.
Activity 12 The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- a) within a watercourse; c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	The proposed transmission line and associated service road will be 54 km in extent and will be developed within 32 m of some of the watercourses located within the proposed routing.
Activity 14 The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The storage of diesel and fuel in containers during construction phase for construction machinery and trucks may potentially trigger this listed activity.
Activity 19 (i) The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a	The proposed transmission line and associated service road will be developed within 32 m of some of the watercourses located within the proposed routing.

Listed activity	Description of project activity that may trigger the listed activity
watercourse.	It is therefore expected that more than 10m^2 of material will infilled or dredged, excavated or removed from the identified features.
Activity 28: Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 01 April 1998 and where such development: (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare	The proposed project will take place outside of an urban area, on several farm portions. It is understood that the land is currently used for agricultural purposes. The proposed project entails the construction two Eskom switching stations with a footprint of 2 ha each and transmission line (including towers and pylons). This will constitute infrastructure with a physical footprint of more than 1 ha.
GN R324	
Activity 4 The development of a road wider than 4 metres with a reserve less than 13,5 metres. (g) Northern Cape (ii) Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	A road wider than 4 m will be constructed below the transmission line. The road will be utilised as a service road to the line. A large portion of the transmission line routing and service road are located within an Ecological Support Area.
Activity 10 The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. (g) Northern Cape (ii) Outside urban areas: (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The storage of diesel and fuel in containers during construction phase for construction machinery and trucks may potentially trigger this listed activity.
Activity 12 The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (g) Northern Cape (ii) Within critical biodiversity areas identified in bioregional plans;	A road wider than 4 m will be constructed below the transmission line. The road will be utilised as a service road to the line. In addition, two Eskom switching stations (2 ha each) are proposed. A large portion of the transmission line routing and associated service road as well as the proposed Eskom switching stations are located within an Ecological Support Area.
Activity 14 The development of: (ii) infrastructure or structures with a physical footprint of 10 square metres or more;	The proposed project will take place outside of an urban area. The proposed project will entail the construction and installation of overhead 132 kV transmission line and associated service road from the Kuruman WEF to the Ferrum substation in Kathu.

Listed activity	Description of project activity that may trigger the listed activity
where such development occurs- (a) within a watercourse; (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; (g) Northern Cape (ii) Outside Urban Areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The proposed transmission line and associated service road will be developed within 32 m of some of the watercourses located within the proposed routing. A large portion of the transmission line routing and associated service road are located within an Ecological Support Area.

A.7 Description of Alternatives

This section discusses the alternatives that have been considered as part of the BA Process. Sections 24(4) (b) (i) and 24(4A) of the NEMA require an Environmental Assessment to include investigation and assessment of impacts associated with alternatives to the proposed project. In addition, Section 240 (1)(b)(iv) also requires that the Competent Authority, when considering an application for EA, takes into account "where appropriate, any feasible and reasonable alternatives to the activity which is the subject of the application and any feasible and reasonable modifications or changes to the activity that may minimise harm to the environment".

Therefore, the assessment of alternatives should, as a minimum, include the following:

- The consideration of the no-go alternative as a baseline scenario;
- A comparison of the reasonable and feasible alternatives; and
- Providing a methodology for the elimination of an alternative.

Compliance with Regulation 3 (1) (h) (i) of Appendix 1 of the 2014 NEMA EIA Regulations (as amended) is discussed below. Regulation 2 (e) of Appendix 1 of the 2014 NEMA EIA Regulations (as amended) states:

- The objective of the basic assessment process is to, through a consultative process, and through a ranking of the site sensitivities and possible impacts the activity and technology alternatives will impose on the sites and location identified through the life of the activity to (i) identify and motivate a preferred site, activity and technology alternative; (ii) identify suitable measures to avoid, manage or mitigate identified impacts; and (iii) identify residual risks that need to be managed and monitored.

A.7.1 No-go Alternative

The no-go alternative assumes that the proposed project will not go ahead i.e. it is the option of not constructing the proposed Kuruman Transmission Line. This alternative would result in no environmental impacts on the site or surrounding local area. It provides the baseline against which other alternatives are compared and will be considered throughout the report. The following implications will occur if the "no-go" alternative is implemented:

- No impacts to the environment due to the development of the Kuruman Transmission Line;
- No evacuation of electricity from the Kuruman WEFs (this line's purpose is to evacuate the electricity generated from one or two of the Kuruman WEFs into the National Grid) and therefore loss of benefits derived from the operation of the WEFs in the area;
- There will be lost opportunity for skills transfer and education/training of local communities;
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised; and

Converse to the above, the following benefits could occur if the "no-go" alternative is implemented:

- Only the agricultural land use will remain;
- No destruction of habitat will occur;
- No change to the current landscape will occur;
- No impacts to the cultural heritage will occur;
- No watercourses will be impacted on;
- No avifaunal or bat collisions will occur due to the establishment of the project; and
- No additional traffic will be generated.

As outlined in Section D of this report, all negative impacts identified as part of this assessment can be reduced to low or very low significance with the exception of the impacts identified as part of the bat assessment that would remain unmitigated in certain locations i.e infrastructure is proposed in high sensitivity areas and would therefore have a pre-mitigation impact significance of moderate and low.

While the "no-go" alternative will not result in any negative environmental impacts; it will also not result in any positive community development or socio-economic benefits. It will also not assist government in addressing climate change, reaching its set targets for renewable energy, nor will it assist in supplying the increasing electricity demand within the country. Hence the "no-go" alternative is not a preferred alternative.

A.7.2 Land-use Alternatives

At present the proposed site is zoned for agricultural land-use. As noted in Section B of this report, agricultural potential is uniformly low across the preferred and alternative routings and the choice of placement of the proposed line on the farms therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site (refer to Section D of this report for a summary of the agricultural and soils impact assessment and to Appendix B for the full report). **Hence, agricultural land use is not a preferred alternative.**

A.7.3 Technology Alternatives (pylon design options)

The preferred pylon design is a double circuit twin tern steel monopole with guyed wires. Alternative pylon alternatives and capacities can potentially be considered, however with the possibility of the growth in the renewable energy market it was decided to use a structure and conductor with more capacity than necessary. This pylon is also more economical compared to other options. The capacity of the line and final pylon design will be confirmed as part of the detailed design phase and based on the outcomes of discussion with Eskom.

A.7.4 Site Alternatives (connectivity options)

The purpose of the Kuruman Transmission Line is to enable the connection of one or two of the Kuruman WEFs to the National Grid. This connection will either be made via the existing Ferrum substation (future Segame substation ±5km from Ferrum substation) or to the Moffat substation. The site alternative selection process was therefore informed by the location of the Kuruman Phase 1 and 2 WEFs (Figure A.1). The site selection process for WEFs considered site selection factors of land availability, environmental sensitivities, distance to the national grid, site accessibility, topography, fire risk, current land use and landowner willingness and available grid capacity at the Eskom Substations. For a detailed discussion on how the WEFs site were determined, the reader is referred to the Final Scoping Reports for the two Kuruman WEFs, available at: https://www.csir.co.za/environmental-impact-assessment.

Given the uncertainty of whether one or two of the Kuruman WEFs will receive EA and be selected preferred bidder in REI4P**, three connectivity options and associated routings were considered as part of this BA process**, namely:

- Alternative 1 (54 km): runs from the Kuruman Phase 1 substation to the Kuruman Phase 2 to the Ferrum substation (located in Kathu and will have capacity to connect both projects).
- Alternative 2 (14 km): runs from Kuruman Phase 1 substation to Moffat substation (located in Kuruman. This substation only has capacity available for one project).
- Alternative 3 (21 km): runs from Kuruman Phase 2 substation to Kuruman Phase 1 substation to the Moffat substation (located in Kuruman. This substation only has capacity available for one project).

The farm portions affected by each connectivity option are detailed below (Table A.5). The selection of farm portions traversed by the transmission lines were informed by landowner willingness, connectivity options that will traverse the least amount of farms and the least cost path option for each connectivity alternative. The preferred connectivity was informed by the outcomes of the specialist studies and is further discussed in Section D of this report.

Table A.5: Farm portions affected by each connectivity option

Farm portion	Alternative 1	Alternative 2	Alternative 3
	56 km in length	14 km in length	21 km in length
Erf 1 of Kuruman		Yes-through	Yes-through
Portion 2 of Farm Hartland 381		Yes- along the perimeter	Yes-along the perimeter
Portion 1 of Farm Hartland 381		Yes- through	Yes- through
Remainder of Farm Rossdale 382		Yes-through	Yes-through
Remainder of Farm Woodstock 441		Yes- halfway through	Yes- halfway through
Portion 1 of Farm Bramcote 446	Yes-through		Yes- through
Remainder of Farm Mansfield 445	Yes- along the perimeter		
Portion 3 of Farm Newstead 449	Yes- along the perimeter		
Portion 1 of Farm Newstead 449	Yes- along the perimeter		
Portion 4 of Farm Thoresby 450	Yes- through		
Portion 3 of Farm Thoresby 450	Yes- through		
Remainder of Farm Hartnolls 458	Yes- along the perimeter		
Remainder of Farm Demaneng 546	Yes- along the perimeter		
Remainder of Farm Lylyveld 545	Yes- along the perimeter		
Remainder of Farm Sekgame 461	Yes-through		
Portion 2 of Farm Sekgame 461	Yes-through		

A.7.5 Location Alternatives (preferred routing)

Coupled with the preferred connectivity option (discussed above), the preferred routing of the line was informed by the specialist studies undertaken. The specialists studies identified environmental features that would be sensitive to the development of a transmission line and therefore, the routing of the preferred connectivity alternative was informed by the outcomes of the specialist studies (discussed in Section D of this report).

A.7.6 Concluding Statement for Alternatives

Based on the above, the preferred activity on site is the development of a double circuit steel monopole 132 kV transmission line with associated Eskom switching stations. In terms of the connectivity options, three options were considered by the various specialists. These connectivity options were determined based on the location of the Kuruman WEFs, landowner willingness and the least cost path options. The preferred connectivity and associated routing of transmission line were informed by the outcomes of the specialist studies, further discussed in Section D of this report.

A.8 Needs and desirability

It is an important requirement in the EIA Process to review the need and desirability of the proposed project. Guidelines on Need and Desirability were published in the Government Gazette of 20 October 2014. These guidelines list specific questions to determine need and desirability of proposed developments. This checklist is a useful tool in addressing specific questions relating to the need and desirability of a project and assists in explaining that need and desirability at the provincial and local context. Need and desirability answer the question of whether the activity is being proposed at the right time and in the right place. Table A.6 includes a list of questions based on the DEA's Guideline to determine the need and desirability of the proposed project. It should be noted this table was informed by the outcomes of the BA Process.

As noted previously, the proposed Kuruman Transmission Line project is proposed to support the Kuruman WEFs (undertaken as part of separate Scoping and EIA processes), the Kuruman Transmission Line will not be developed if one of the Kuruman WEFs are not realised. Therefore, any socio-economic opportunities and/or alignment with national policies that promote renewable energy will also be applicable to this project.

Table A.6: The Guideline on the Need and Desirability's list of questions to determine the "Need and Desirability" of a proposed project

NEED	
Question	**Response**
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area)?	
1.1. How were the following ecological integrity considerations taken into account?: 1.1.1. Threatened Ecosystems, 1.1.2. Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures,	**The environmental sensitivities present on site have been identified and are discussed in Section B and D of this Report.** **The Terrestrial Ecology specialist identified that the northern part of the site (applicable to Alternative 2 and 3) falls within a Critical Biodiversity Area (CBA) 2 which forms a buffer area around the Billy**

NEED	
Question	**Response**
especially where they are subject to significant human resource usage and development pressure, 1.1.3. Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4. Conservation targets, 1.1.5. Ecological drivers of the ecosystem, 1.1.6. Environmental Management Framework, 1.1.7. Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	**Duvenhage Nature Reserve. A large portion of the footprint of the project is within an Ecological Support Area (ESA). The footprint within the CBA 2 area is low and a significant impact on the CBA is not likely. In addition, it is unlikely that the development would compromise the functioning of the ESA. The development of a WEF is considered compatible with the aims and objectives of ESAs, from a terrestrial biodiversity point of view. The overall residual ecological impact after mitigation will be of low significance.**
1.2. How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**A CBA 2 and ESA are present on site. The footprint of the Kuruman Transmission Line in the CBA 2 area is limited and only applicable to Alternative 2 and 3 and a significant impact on the CBA is not likely. In addition, it is unlikely that the development would compromise the functioning of the ESA.** **The specialist identified all ecological sensitive areas on site that have to be avoided by the proposed development and proposed mitigation measures to reduce or minimise impacts to ensure that the ecological integrity of the areas is maintained. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.** **Measures to avoid, remedy, mitigate and manage impacts are included in the Environmental Management Programme (EMPr) included in Appendix D.**
1.3. How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**Measures to avoid, remedy, mitigate or manage biophysical impacts are included in the EMPr that compiled for this project.**
1.4. What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether; what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	**Waste will mostly be generated during the construction and decommissioning phases of the project. Measures to avoid, remedy, mitigate or manage waste are included within the EMPr. Waste generated on site will be disposed of at a licenced landfill site.** **Please refer to Section A.5.2 and A.5.3 for estimates on waste to be generated during the project.**

NEED	
Question	**Response**
1.5. How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**A Heritage Impact Assessment (HIA) was undertaken to assess potential archaeological, palaeontological and cultural impacts resulting from the proposed development. The HIA concluded that the proposed site is not a sensitive heritage landscape. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
1.6. How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	**Measures to avoid, remedy, mitigate or manage impacts on non-renewable natural resources are included in the EMPr.**
1.7. How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources of the proposed development alternative?)	**South Africa has heavily relied on coal as a source of electricity for decades. Due to the nature of coal as a non-renewable resource that causes major environmental degradation, there is therefore a need to identify alternative resources that could promote sustainable energy sources as well as cleaner energy production ways. The proposed project aims to support the Kuruman WEFs which will harness the wind resource available in the area for the generation of electricity. This project is seen as a source of 'clean energy' and reduces the dependence on non-renewable sources.** **The proposed project is a sustainable option for the area and the footprint avoids as far as possible, areas of very high environmental sensitivity (please refer to the sensitivity map included in Section D). Where impacts cannot be avoided, the footprint will be placed to minimise, mitigate or manage potential impacts to the receiving environment.**

NEED	
Question	**Response**
1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	
1.8. How were a risk-averse and cautious approach applied in terms of ecological impacts?: 1.8.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2. What is the level of risk associated with the limits of current knowledge? 1.8.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	**The precautionary approach has been adopted for this study, i.e. assuming the worst-case scenario will occur and then identifying ways to mitigate or manage these impacts.** **Please refer to Section D of this report for an assessment of the positive and negative impacts associated with this project.**
1.9. How will the ecological impacts resulting from this development impact on people's environmental right in terms following: 1.9.1. Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2. Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	**A detailed Socio-Economic Impact Assessment was undertaken to inform the BA process. The assessment concluded that the net effect of the proposed project is positive.** **Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
1.10. Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	
1.11. Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area?	
1.12. Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	**Please refer to Section A.7 for a discussion on the alternatives that were considered for this assessment.**

NEED	
Question	**Response**
1.13. Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	**Please refer to Section D for the cumulative assessment.**
2.1. What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1. The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	**The Ga-Segonyana Local Municipality Integrated Development Plan (IDP) (2017-2018) recognises renewable energy projects (with an emphasis on solar PV projects) as potential new economic development opportunities. The development of the Kuruman Transmission Line that will support the Kuruman WEFs will therefore also be in line with the vision of the municipality to diversity the job market by creating sustainable economic growth and development opportunities.** **The Gamagara Local Municipality IDP includes the following key objectives:** • **Providing universal access to basic services** • **Attain safe and healthy environment** • **Strengthening stakeholder relations** • **Promoting active citizenry in Local Government affairs** • **Providing sustainable services to communities** • **Being a developmentally focused institution** • **Promote social and economic development** **The proposed project will contribute to the provision of access to basic services, providing sustainable services to communities and promote social and economic development. This project is therefore aligned with the objectives of the IDP.**
2.1.2. Spatial priorities and desired spatial patterns (e.g. need for integration of segregated communities, need to upgrade informal settlements, need for densification, etc.),	**N/A- The proposed project is located within a rural area and the site is zoned for agricultural use.**
2.1.3. Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)	**As indicated above, the current land use on the site is agriculture, predominantly game farming. The impact of the proposed project on cultural/heritage areas (archaeology and palaeontology) were assessed as part of the EIA, and as indicated previously, the heritage landscape is considered to be of low sensitivity.** **As noted, an EMPr is included in this report (Appendix D) to ensure that all potentially negative**

NEED	
Question	**Response**
	impacts identified are suitably managed and mitigated, and potential positive impacts are enhanced. The impact on the sense of place is difficult to predict and would potentially be ambiguous. This is due to the subjective nature of perceptions regarding the relative attraction or disturbance of the wind facility in a rural landscape. The visual impact concluded that the proposed Kuruman Transmission Line is expected to have a low negative visual impact rating during both construction and operation. Cumulative impacts associated with the proposed WEF would have a moderate negative visual impact rating during both construction and operation. These impacts would remain low after the implementation of the relevant mitigation measures, due to the nature of the impacts. **Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.1.4. Municipal Economic Development Strategy ("LED Strategy").	**This was unavailable for the municipalities affected by the proposed development.**
2.2. Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	**A detailed Socio-Economic Impact Assessment was undertaken to inform the BA process. The assessment concluded that the net effect of the proposed project is positive. To improve the positive impact particularly for the local municipality, it is highly recommended that local procurement and employment is concentrated herein, as far as is feasible. From a socio-economic perspective therefore, no objections are made with regard to the proposed project.** **Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.3. How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	
2.4. Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long term? Will the impact be socially and economically sustainable in the short- and long-term?	
2.5. In terms of location, describe how the placement of the proposed development will:	
2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other,	**Local employment opportunities will be provided as far as possible.**
2.5.2. reduce the need for transport of people and goods,	**N/A- the proposed project is located within a rural area and the development site is zoned for agricultural use.**
2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of	**N/A -the proposed project is located within a rural area and the site is zoned for agricultural use. This project is a electrical grid project and not a transportation project.**

NEED	
Question	**Response**
thresholds in terms public transport),	
2.5.4. compliment other uses in the area,	**The farms are affected by this projects are currently used for agricultural purposes. It is not anticipate that the project will threaten the current land-use activities on site.**
2.5.5. be in line with the planning for the area,	
2.5.6. for urban related development, make use of underutilised land available with the urban edge,	**N/A - the proposed project is located within a rural area and the site is zoned for agricultural use.**
2.5.7. optimise the use of existing resources and infrastructure,	**The proposed project will connect to the future Segame substation or the existing Ferrum substation (located in Kathu) or to the Moffat substation (located in Kuruman). Both these substations are existing infrastructure.**
2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	**N/A**
2.5.9. discourage "urban sprawl" and contribute to compaction/densification,	**N/A**
2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	**N/A - the proposed project is located within a rural area and the site is zoned for agricultural use.**
2.5.11. encourage environmentally sustainable land development practices and processes,	**The farms are affected by this projects are currently used for agricultural purposes. It is not anticipate that the project will threaten the current land-use activities on site.**
2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	**The proposed project will connect to the future Segame substation or the existing Ferrum substation (located in Kathu) or to the Moffat substation (located in Kuruman). Both these substations are existing infrastructure. Please refer to Section A.7 for a discussion on the alternatives considered.**
2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	**A detailed Socio-Economic Impact Assessment was undertaken to inform the BA process. The assessment concluded that the net effect of the proposed project is positive. To improve the positive impact particularly for the local municipality, it is highly recommended that local procurement and employment is concentrated herein, as far as is feasible. From a socio-economic perspective therefore, no objections are made with regard to the proposed project.** **Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.5.14. impact on the sense of history, sense of	**The HIA concluded that the proposed site is not a**

NEED	
Question	**Response**
place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	**sensitive heritage landscape. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.** **The visual impact concluded that the proposed Kuruman Transmission Line is expected to have a low negative visual impact rating during both construction and operation. Cumulative impacts associated with the proposed WEF would have a moderate negative visual impact rating during both construction and operation. These impacts would remain low after the implementation of the relevant mitigation measures, due to the nature of the impacts.**
2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	**Several Renewable Energy projects (particularly solar energy projects) are proposed and environmentally approved in the area, which lends itself potentially to a renewable energy development area. This project is aimed to support the development of the Kuruman WEFs.**
2.6. How were a risk-averse and cautious approach applied in terms of socio-economic impacts?	

2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	**The Socio-Economic Impact Assessment included the following assumptions and limitations:**
	
	• **The secondary data sources used to compile the socio-economic baseline (demographics, dynamics of the economy), although not exhaustive, can be viewed as being indicative of broad trends within the study area.**
	• **Possible impacts and stakeholder responses to these impacts cannot be predicted with complete accuracy, even when circumstances are similar, and these predictions are based on research and years of experience, taking the specific set of circumstances into account.**
	• **It is assumed that the motivation and ensuing planning and feasibility studies for the project were done with integrity and that all information provided to the specialist by the project proponent and its consultants to date is accurate.**
	• **With regard to the telephonic and email interviews undertaken, the following assumptions are made:**
	  ○ **Questions asked during the interviews were answered accurately.**
	  ○ **No comments from Interested and Affected Parties (I&APs) outside the interviews were received to date during the conduct of this study. Therefore, all impacts assessed are premised from primary and secondary data collected**

2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	
2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	

NEED	
Question	**Response**
	as well as previous experience of wind farm development. **Neither the assumptions nor limitations were highlighted to negatively affect the assessment findings of the Socio-Economic Impact Assessment. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.7. How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	**A detailed Socio-Economic Impact Assessment was undertaken to inform the EIA process. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	
2.8. Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.9. What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	
2.10. What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	
2.11. What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	
2.12. What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	
2.13. What measures were taken to:	
2.13.1. ensure the participation of all interested and affected parties,	**Various methods were employed to notify potential I&APs of the proposed project, namely, through**

NEED	
Question	**Response**
2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,	**notices in the local newspaper, sites notices emails as well as notification letters. All I&APs registered for this project will be provided with an opportunity to comment on the BA report.**
2.13.3. ensure participation by vulnerable and disadvantaged persons,	
2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,	
2.13.5. ensure openness and transparency, and access to information in terms of the process,	
2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge,	
2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein was promoted.	
2.14. Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	**A detailed Socio-Economic Impact Assessment was undertaken to inform the BA process. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.15. What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	**An EMPr was developed to address, inter alia, health and safety concerns. An Environmental Control Officer (ECO) will be appointed to monitor compliance.**
2.16. Describe how the development will impact on job creation in terms of, amongst other aspects:	
2.16.1. the number of temporary versus permanent jobs that will be created,	**A detailed Socio-Economic Impact Assessment was undertaken to inform the BA process. Please refer to Section D outlining the key findings of the assessment and to Appendix B for the full assessment.**
2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),	
2.16.3. the distance from where labourers will have to travel,	
2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits),	

NEED	
Question	**Response**
2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	
2.17. What measures were taken to ensure:	
2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment,	**The different government departments have been listed as I&APs and were given the opportunity to register for this project during the project notification phase. All I&APs registered for this project will be provided with an opportunity to comment on the BA report.**
2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	
2.18. What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	**The proposed project will adhere to the principles of environmental management.**
2.19. Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	**The mitigation measures have been informed by detailed specialist studies that have all concluded that the project can go-ahead, with not fatal flaws or unacceptable impacts identified as part of the project's proposal. Therefore, the mitigation measures are deemed to be realistic.** **It should however be noted that the line routing, however, does not adhere to the bat specialist's recommendations: the line routing and the switching station are proposed within areas identified as high bat sensitivity. Within these areas, the impacts (discussed in Section D.1.2.9.2) identified by the bat specialist will therefore remain the impact significance prior to the implementation of mitigation measures (Moderate to Low).**
2.20. What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	**The EMPr (included in Appendix D) for this proposed project must form part of the contractual agreement and be adhered to by both the contractors/workers and the applicant.**
2.21. Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	**Please refer to Section A.7 for an outline of the alternatives identified.**

NEED	
Question	**Response**
2.22. Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	**Please refer Section D for a summary of each of the specialist studies undertaken. These studies included the assessment of the cumulative impacts**

SECTION B: DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section provides an overview of the affected environment for the proposed Kuruman Transmission Line and the surrounding region. The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development

This information is provided an overview of the proposed project's setting within the receiving environment. The information presented here has been sourced from:

- Inputs from the specialists that form part of the project team;
- Review of information available on the South African National Biodiversity Institute (SANBI) Biodiversity Geographical Information System (BGIS) and Agricultural Geo-Referenced Information System (AGIS); and
- Gamagara Local Municipality and Ga-Segonyana Local Municipality IDPs, the John Taolo Gaetsewe District Municipality SDF and the Northern Cape PSDF.

It is important to note that this section intends to provide a broad overview and does not represent a detailed environmental description of the features identified within the project site. Detailed descriptions of the project site and significant environmental features identified are provided in the relevant specialist studies summarised in Section D and full studies provided in Appendix B of this report.

B.1 Background

The proposed project is located approximately south-west of Kuruman and east of Kathu in the Northern Cape Province. The proposed Kuruman Transmission Line project (considering all alternatives) are proposed on the following farm portions:

- Erf 1 of Kuruman
- Portion 2 of Farm Hartland 381
- Portion 1 of Farm Hartland 381
- Remainder of Farm Rossdale 382
- Remainder of Farm Woodstock 441
- Portion 1 of Farm Bramcote 446
- Remainder of Farm Mansfield 445
- Portion 3 of Farm Newstead 449
- Portion 1 of Farm Newstead 449
- Portion 4 of Farm Thoresby 450
- Portion 3 of Farm Thoresby 450
- Remainder of Farm Hartnolls 458
- Remainder of Farm Demaneng 546
- Remainder of Farm Lylyveld 545
- Remainder of Farm Sekgame 461
- Portion 2 of Farm Sekgame 461

The study area is characterised by rural areas with low densities of human settlement. Agriculture in the form of livestock grazing is the dominant land use, which has transformed the natural vegetation in some areas. The area can be considered to be typical of a Karoo or "platteland" landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa's dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this perception has been changing, with the launching of tourism routes within the Karoo. In a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published "Getaway Guide to Karoo, Namaqualand and Kalahari". A contextual image of the region is shown in the figure below (Figure B.1).

Figure B.1: Typical view of the Kuruman Hills which dominate the eastern section of the study area

The most prominent anthropogenic elements in these areas include the N14 national route, the R31 main road, power lines and other linear elements, such as telephone poles, communication poles and farm boundary fences. In contrast to the overall rural character is the town of Kuruman, the suburb of Wrenchville and the nearby Bodulong settlement which are distinctly urban and disturbed in character. Although it is a small town, Kuruman has a concentration of housing and other buildings such as schools, hospitals and churches, as well as relatively well established commercial centre to distinguish it from the surrounding rural landscape. In contrast to Kuruman, the town of Kathu is characterised by large scale mining activities. The presence of this infrastructure is an important factor in this context, as the introduction of the proposed supporting electrical infrastructure would result in less visual contrast where other anthropogenic elements are already present.

The Billy Duvenhage Nature Reserve can also be found in the northern sector of the study area, adjacent to the rural settlement of Budolong. This nature reserve is however no longer operational and has subsequently been closed down. Despite the fact that this reserve is no longer operational and is situated adjacent to an area characterised by significant amounts of urban transformation and/or disturbance (i.e. the rural settlement of Budolong), the area set aside for this nature reserve is still regarded as being largely natural and/or scenic.

B.2 Biophysical Environment

B.2.1 Climatic Conditions

The climate of the Northern Cape is semi-arid with a late summer-autumn rainfall regime. The average rainfall of the area varies from 0 mm to 200 mm per year. Evaporation levels within this province exceed the annual rainfall. Climate conditions are extreme (i.e. very cold in winter and extremely hot in summer). The mean annual rainfall of South Africa is shown in Figure B.2 below.

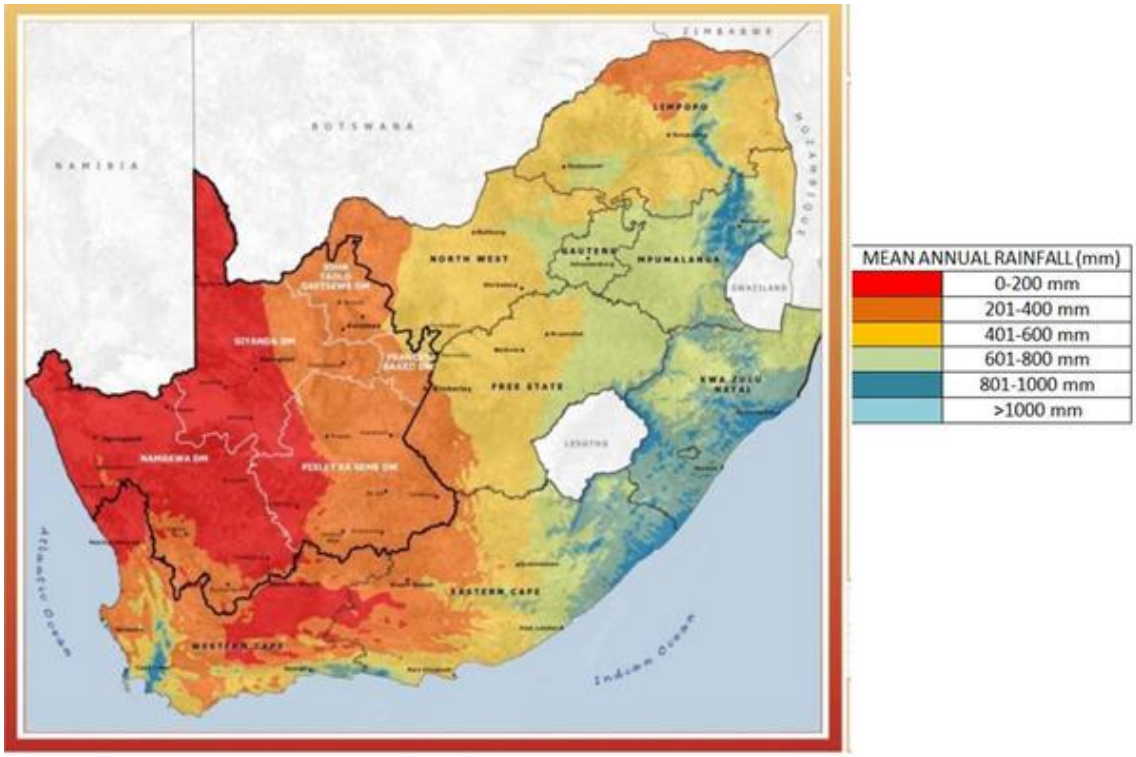

Figure B.2: Mean Annual Rainfall Levels of South Africa (*Source: Northern Cape PSDF, 2012*)

One of the most important climate parameters for agriculture in a South African context is moisture availability, which is the ratio of rainfall to evapotranspiration. According to the World Bank Climate Change Knowledge Portal (2005), the average annual rainfall for the proposed site is low, at 400 mm per annum. The average monthly distribution of rainfall is shown in Figure B.3 below.

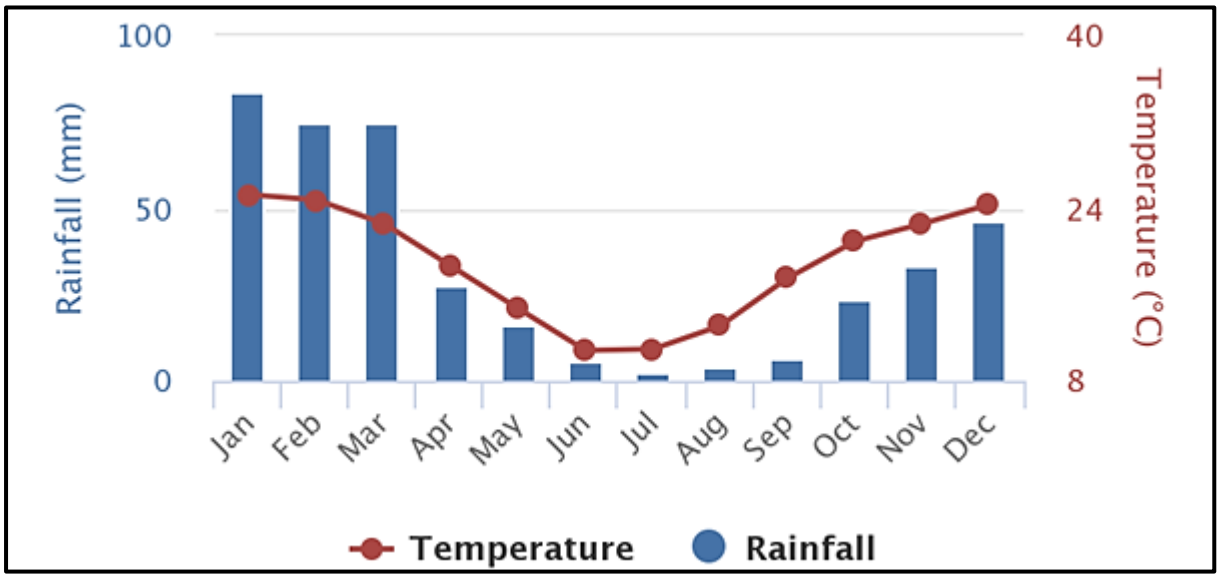

Figure B.3: The average monthly distribution of rainfall within the area, including the Kuruman WEF ***(Source: Lanz, 2018)***

B.2.2 Topography and Landscape

The proposed development is located on a series of hilly, north-south running ridges which rise from the plateau at varying altitudes of between 1 400 m and 1 700 m. Slopes vary across the area, with maximum slopes of 35% down the sides of the ridges where they are steepest. The proposed turbine locations are along the ridge lines with maximum slopes that would be impacted by any footprint of the development much less and are not likely to exceed 15%.The central and south-western sections of the study area and surrounding areas are however largely characterised by the relatively flat plains of the Ghaap Plateau with some relief in the form of isolated koppies and hills. As such, the terrain within these parts of the study area is characterised by flat to gently undulating landscape with gentle slopes. There are also areas of localised hilly topography characterised by the presence of relatively small hills / ridges / koppies.

B.2.3 Regional Geology

The underlying geology of the area is underlain by the Quaternary age alluvial material in the lower lying areas, which overlays the yellow-brown banded or massive jaspilite with crocidolite, and banded ironstone from the Danielskuil Formation with subordinate amphibolite, crocidolite and ferruginous brecciated banded ironstone from the Kuruman Formation. These geological units are part of the Griquatown group and form the distinctive north-south trending ironstone mountain ranges of the larger Kuruman area. This is underlain by fine and coarse - grained dolomite with interbedded chert of Ghaaplato Formation part of the Campbell Group (Council for Geoscience, 1:250 000 Map (2722 – Kuruman)).

B.2.4 Regional Hydrogeology

According to the 1:500 000 scale groundwater map of Kuruman (2723) the northern portion of the study area (where the Kuruman WEFs are proposed) hosts a fractured aquifer with an average borehole yield of 0.1 – 0.5 L/s and 2 – 5 L/s for the most southern portion.

Groundwater quality is good with greatest recharge occurring in the mountainous areas. The regional 1:500 000 groundwater quality maps indicate that the study area's groundwater quality is classified as "good" with an associated electrical conductivity (EC) of < 70 mS/m. Although groundwater quality in the area is considered to be generally good with greatest recharge occurring in the mountainous areas, the potential for groundwater vulnerability is overall low except for a small portion that is considered high towards the north-east corner of the proposed Kuruman WEFs project areas.

B.2.5 Soil Types and Soil Potential

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The transmission line alternative options to Kuruman (Alternative 2 and 3) cross only two land types, namely Ib236 across the hilly terrain of the wind farm site and land type Ae2 across the flatter land beyond that.

Land type Ib236 is dominated (71% of the surface) by rock outcrop. The soils between the rock outcrops are red, sandy soils on underlying hard rock, of the Hutton soil form. They are predominantly shallow, but patches of deeper sands occur. The soils of Ae2 are shallow to deep, red, sandy soils on underlying rock or hardpan carbonate and are of the Hutton or Plooysburg soil forms. The soils would fall into the Oxidic and Calcic (underlying hardpan carbonate) soil groups according to the classification of Fey (2010).

The Alternative 1 (Kathu) route crosses several land types, mostly Ae land types and one Ag land type all of which are similar in terms of dominant soils to Ae2 above. The patches of more hilly terrain are land type Ib1 which is similar to Ib236 above.

B.2.6 Agricultural Capability and Sensitivity

Land capability is defined as the combination of soil, climate and terrain suitability factors for supporting rainfed agricultural production. It is an indication of what level and type of agricultural production can sustainably be achieved on any land. The higher land capability classes are suitable as arable land for the production of cultivated crops, while the lower suitability classes are only suitable as non-arable grazing land, or at the lowest extreme, not even suitable for grazing. In 2017 DAFF released updated and refined land capability mapping across the whole of South Africa. This has greatly improved the accuracy of the land capability rating for any particular piece of land anywhere in the country. The new land capability mapping divides land capability into 15 different categories with 1 being the lowest and 15 being the highest. Values of below 8 are generally not suitable for production of cultivated crops.

The proposed routes are classified with a range of land capability evaluation values predominantly of between 4 and 6. There is a small patch of land on the Alternative 1 route that has a maximum value of 7. The areas of more hilly terrain have a range of values below 5. The land capability of the routes is therefore classified as being entirely unsuitable for the rainfed production of cultivated crops. The land capability is limited by the shallow, rocky soils, but even in the patches of deeper soils, land capability is still very limited by the climatic moisture availability.

B.2.7 Freshwater Environment

The quaternary catchments indicated for the project footprint are D41J, D41L and D41K and the project footprint falls within the Southern Kalahari Ecoregion and within the Lower Vaal Water Management Area (WMA) and the Molopo sub-Water Management Area (sub-WMA) as defined by NFEPA (2011). Only the Kuruman River and one of its larger tributaries, the Ga-Mogara River, traverse the Ga-Segonyana Local Municipality.

The Kuruman River originates east of Kuruman where it receives water from several springs of which the Great Koning Eye, Little Koning Eye and the Kuruman Eye are the largest. The confluence of the Kuruman River with the Molopo River is situated approximately 280km upstream of the project footprint. Both the Kuruman River and the Ga-Mogara River are usually dry, flowing only for short periods following sufficient rainfall.

The nearest river system is a tributary of the Kuruman River located approximately 1.4 km to the north east of the north eastern portion of the project footprint, with the Kuruman River itself located approximately 3,7km from the project footprint. The Kuruman River as well as the tributary are ephemeral watercourses indicated to be within a Class B (largely natural) PES (NFEPA, 2011). The Ga-Mogara River with its associated tributaries is located approximately 4km to the south of the south western portion of the project footprint Figure B.4).

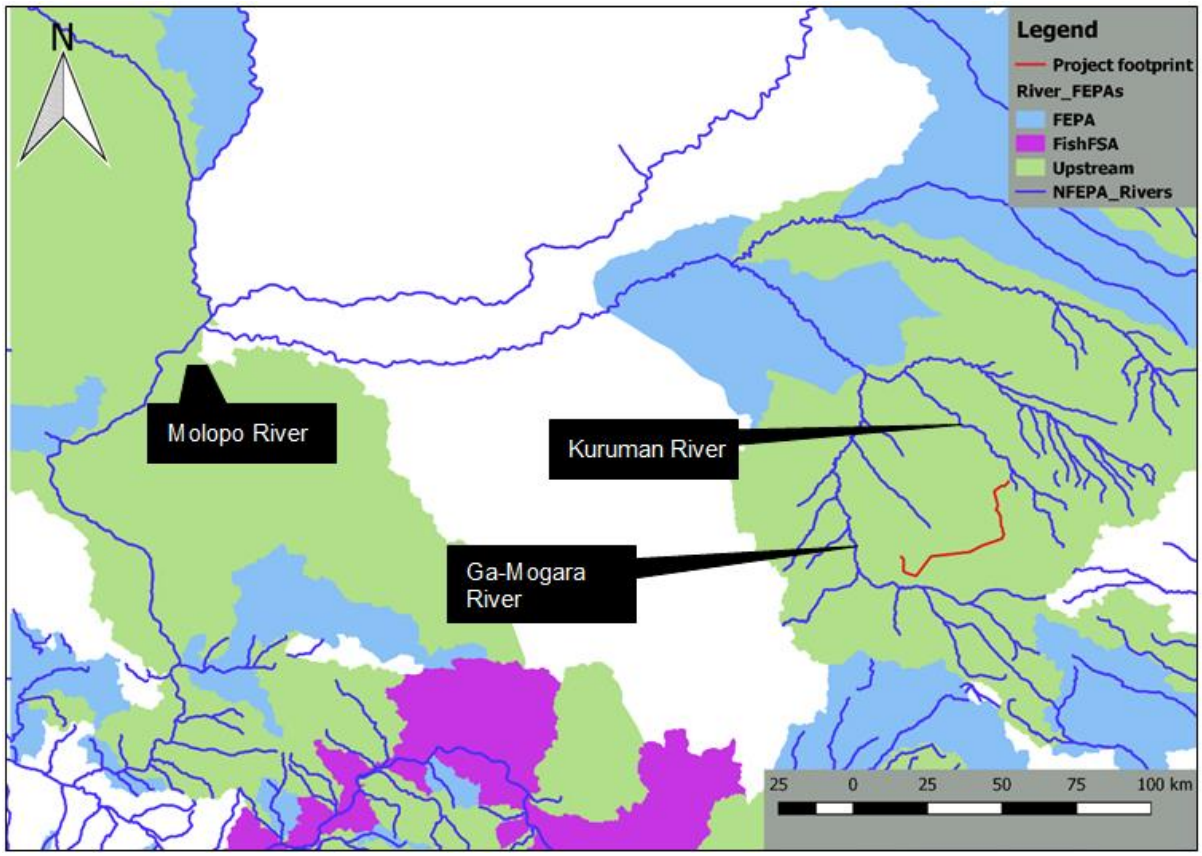

Figure B.4: Freshwater Ecosystem Priority Areas and major rivers (*Source*: *Van de Haar, 2018*).

The sub-quaternary catchment in which the project footprint is located was selected as an Upstream Management Area (Figure B.4). Upstream Management Areas, are sub -quaternary catchments in which human activities need to be managed to prevent degradation of downstream river Freshwater Ecosystem Priority Areas (FEPAs) and Fish Support Areas (FSAs). The sub-quaternary catchment located downstream of the confluence of the Ga-Mogara River with the Kuruman River was selected as a river FEPA and therefore requires adequate protection. River FEPAs achieve biodiversity targets for river ecosystems and fish species, and are identified in rivers that are currently in a good condition (A or B ecological category).

According to NFEPA (2011), Alternative 1 will traverse a single natural seep wetland (natural wetland a in Figure) indicated to fall within an AB wetland condition (natural or good) as well as a smaller artificial feature (artificial wetland a in Figure B.5); Alternative 3 will also traverse this artificial feature; and Alternative 2 will not traverse any wetland features. An additional artificial wetland (artificial wetland b in Figure) and an additional natural wetland (natural wetland b in Figure) have also been indicated in close proximity to Alternative 1 and 3, however, these features will not be traversed by either Alternative. The topography has also resulted in the formation of numerous small ephemeral drainage lines, several of which will be traversed by all three alternatives (Chief Directorate Surveys and Mapping attained August 2015). The applicable wetland vegetation unit for the seep wetlands is the Eastern Kalahari Bushveld Group 3 and 4 (Figure) which is listed as 'Least Threatened' (NFEPA, 2011).

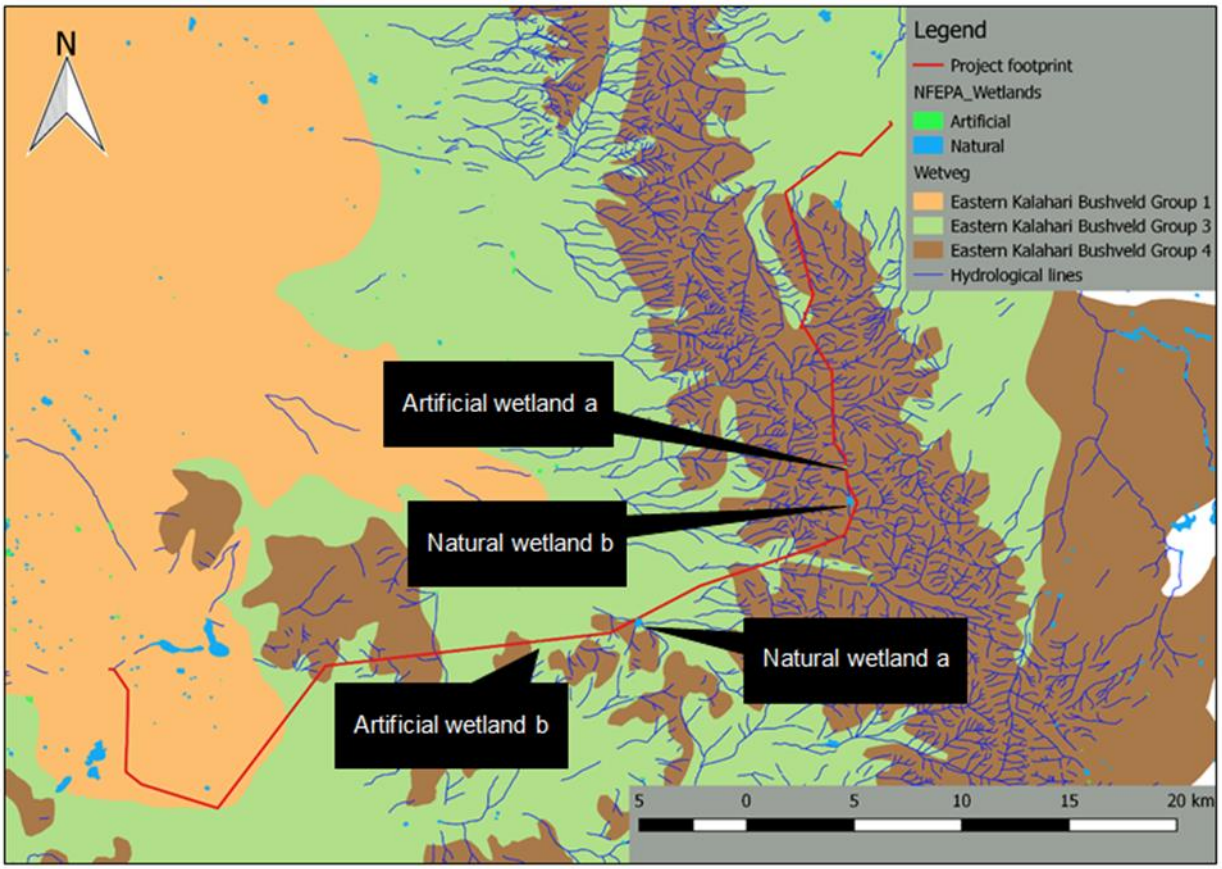

Figure B.5: Wetland vegetation units and wetland habitat (NFEPA, 2011) as well as hydrological lines

B.2.8 Terrestrial Environment

B.2.8.1 General Vegetation Description

According to the national vegetation map (Mucina & Rutherford 2006/2012), there are two vegetation types along the power line routes. Kuruman Mountain Bushveld which is associated with the rocky hills of the wind farm site as well as several other rocky hills along the route from the site to the Segame Substation. The plains north of the site to the Kuruman substation as well as the plains along the route towards Kathu consist of Kuruman Thornveld. The final section of the route towards the Segame Substation consists of Kathu Bushveld (Figure B.6).

Kuruman Mountain Bushveld is not widely distributed and has a total mapped extent of 4360 km^2 which is a narrow range for an arid vegetation type. It is distributed in the Northern Cape and North-West Provinces from Asbestos Mountains southwest and northwest of Griekwastad, along the Kuruman Hills north of Danielskuil, passing west of Kuruman and re-emerging as isolated hills at Makhubung and around Pomfret. This vegetation unit is associated with rolling hills with gentle to moderate slopes and hill pediment areas and typically consists of an open shrubveld. Kuruman Mountain Bushveld has been little impacted by transformation and is classified as Least Threatened, but is not currently conserved within any formal conservation areas. One vegetation-type endemic species Euphorbia planiceps is known from Kuruman Mountain Bushveld.

The majority of the plains of the power line route, except towards Kathu, are mapped as Kuruman Thornveld. This is also a restricted vegetation type which occupies 5794 km^2 of the Northern Cape and North West Provinces from the vicinity of Postmasburg and Danielskuil in the south, extending via Kuruman to Tsineng and Dewar in the North. It has been little impacted by transformation and more than 98% of the original extent is still intact and it is classified as Least Threatened. This vegetation unit occupies flat rocky plains and sloping hills with a very well developed, closed shrub layer and well-developed tree stratum usually consisting of Acacia erioloba. The only endemic taxon known from this vegetation type is *Gnaphalium englerianum*.

Kathu Bushveld occupies an area of 7 443 km^2 and extends from around Kathu and Dibeng in the south through Hotazel and to the Botswana border between Van Zylsrus and McCarthysrus. The Kathu Bushveld vegetation type is still largely intact and less than 2% has been transformed by mining activity and it is classified as Least Threatened. It is, however, poorly conserved and does not currently fall within any formal conservation areas. Although no endemic species are restricted to this vegetation type a number of Kalahari endemics are known to occur in this vegetation type such as *Acacia luederitzii* var *luederitzii*, *Anthephora argentea*, *Megaloprotachne albescens*, *Panicum kalaharense* and *Neuradopsis bechuanensis*.

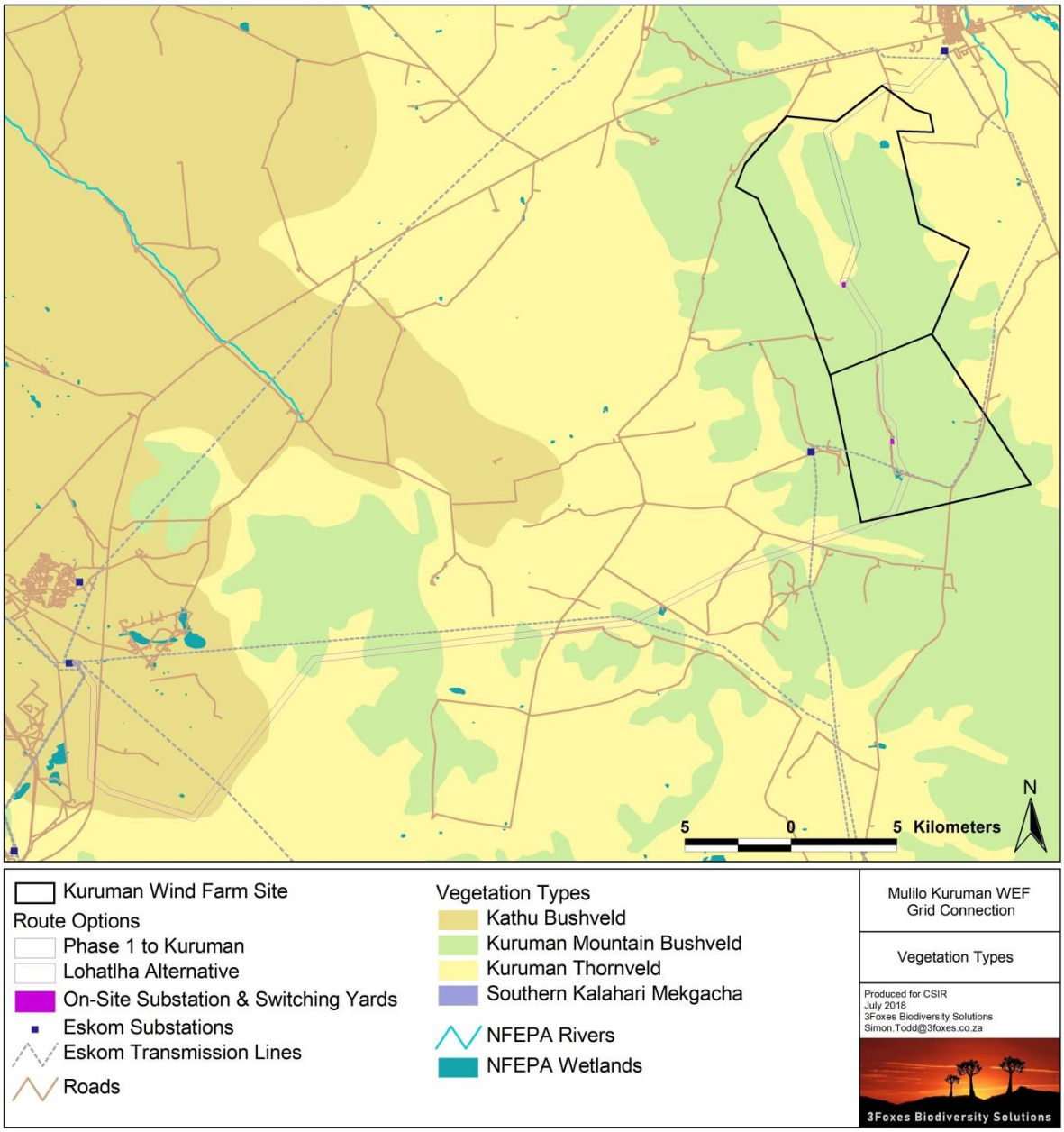

Figure B.6: Vegetation mapping for the proposed Kuruman Transmission Line study area (*Source: Todd, 2018*)

The CBA map for the wider area around the study site is illustrated below in Figure B.7. The northern parts of the route from near the Kuruman WEF 1 Substation to the Moffat Substation site (Alternative 3) fall within a Tier 2 CBA which forms a buffer area around the Billy Duvenhage Nature Reserve. As the footprint within the CBA would be low, a significant impact on any ecological processes within the CBA is highly unlikely. In addition, the area already has a lot of roads and human activity with the result that the additional power line would generate significant additional impact in the area.

Several sections of the route fall within Ecological Support Areas associated with the ridges and rocky hills of the area. Large tracts of the route especially in the South are also classified as other natural areas, which have not been identified as being of high importance for broad scale

biodiversity maintenance. It is highly unlikely that the power line would compromise the functioning of the ESAs due to their low terrestrial footprint. As a result, the overall impact of the development on ESAs is considered to be low and a long-term significant impact is unlikely. In addition, the site does not fall within an area identified as being a priority conservation expansion area under the Northern Cape Protected Area Expansion Strategy (NCPAES) Focus Area (2017) (Todd, 2018).

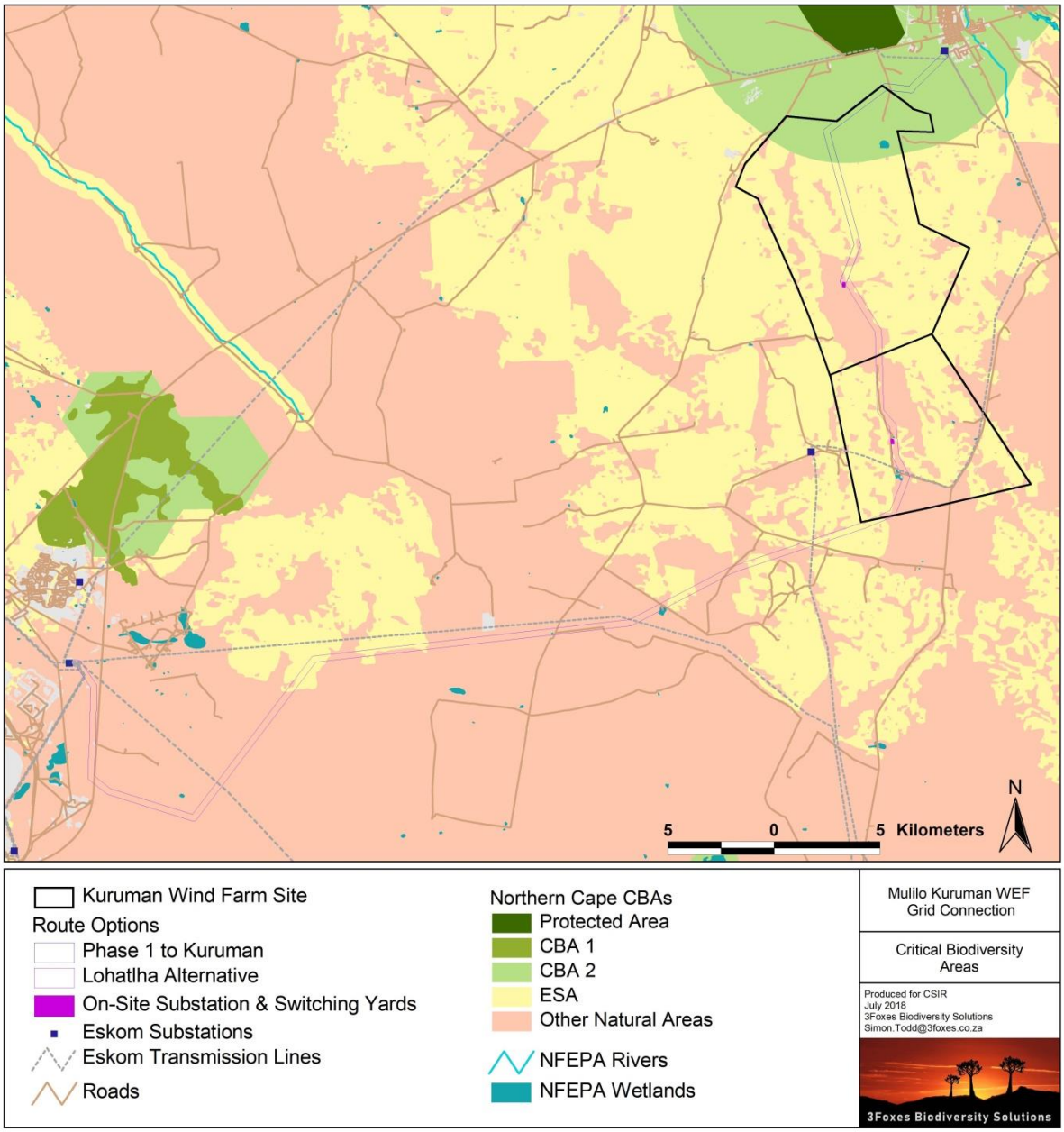

Figure B.7: Critical Biodiversity Areas map for the study area, showing that the site lies partially within a Tier 2 CBA (*Source: Todd, 2018*).

B.2.8.2 Flora

Based on the SANBI POSA database as well as the fieldwork that has been conducted in the area, the abundance of species of conservation concern in the area is low. The abundance of protected tree species is however high in many parts of the affected areas. *Boscia albitrunca* is occasional along the route and very few trees would be affected and those along the route can probably all be avoided. The abundance of *Acacia erioloba* and *Acacia haematoxylon* is high in many areas and while *Acacia haematoxylon* is shorter and sometimes tolerated in the power line servitudes, it is likely that hundreds of *Acacia erioloba* will need to be cleared along the servitude. However as this species is very common in the area, this would not be a significant impact on the local population.

B.2.8.3 Fauna

According to the MammalMap database, over 40 mammals are known from the broad area. Species which can be confirmed present include Kudu, Common Duiker, Steenbok, Cape Hare, Chacma Baboon, Rock Hyrax, Yellow Mongoose, Small Spotted Genet, Warthog, Aardwolf, Aardvark, African Wildcat, Caracal, Black-backed Jackal, Cape Porcupine, Smith's Red Rock Rabbit, Springhare, Suricate and Slender Mongoose. Small mammals trapped or observed in the area include the South African Pouched Mouse, Namaqua Rock Mouse, Four-striped Mouse, Desert Pygmy Mouse, Chestnut Climbing Mouse, Hairy-footed Gerbil, Bushveld Gerbil and Multimammate Mouse. There are also a number of larger mammals present in the area which are considered to be part of the local farming enterprises including Eland, Gemsbok, Giraffe, Red Hartebeest, Burchells Zebra, Cape Mountain Zebra, Blesbok, Waterbuck, Springbok, Impala, Blue Wildebeest, Black Wildebeest and the introduced Fallow Deer and Barbary Sheep.

Species of conservation concern that may occur in the area includes the Southern African Hedgehog *Atelerix frontalis* (NT) as well as Ground Pangolin *Smutsia temminckii* (VU). It is likely that the Hedgehog is present in the area as the habitat is broadly suitable and it is also possible that the Pangolin is present in the area, but this species occurs at a low density the extent of habitat loss for this species would be low. The Mountain Reedbuck *Redunca fulvorufula fulvorufula* is currently classified as *Endangered* and is confirmed present on the higher ground of the wind farm site. However, as the habitat of this species is the high-lying ridges that would be little impacted by the power line development, a direct impact on the Mountain Reedbuck as a result of the development is not likely.

Important habitats for mammals along the power line route include occasional rocky outcrops which provide shelter and habitat for rock-dwelling species and densely-vegetated lowlands along drainage lines which provide cover for numerous species.

Based on the Reptile Map database records for the area (Appendix 3), approximately 40 reptiles are known to occur in the area. No reptile species of concern have however been recorded from the area, which can be explained by the ubiquitous nature and broad distribution of the habitats present in the area. Within the study area, the rocky hills are likely to have a greater diversity of reptiles than the plains.

Across the majority of the routes, there are few other amphibian breeding opportunities apart from occasional farm dams. Some species such as Bushveld Rain Frogs are not dependent on water for breeding purposes and are certainly present within the lowlands of area. No listed species are known from the area. The only feature of significance for amphibians observed along the power line route is the wetland within Alternative 3. This clearly a locally important feature as other amphibian breeding sites in the area are rare. The Giant Bullfrog occurs widely in the Savannah Biome but there are no records from the vicinity of the Kuruman area, suggesting that this species

does not occur in the area. The observed wetland is considered suitable for this species, but at the time of the site visit there were no Bullfrogs or tadpoles present, suggesting that it is not present at the site. The only species observed in the area was the Tremelo Sand Frog although some of the other toad species such as Olive Toad are also likely to be present.

B.2.9 Bats

Bat important features include buildings and building ruins, trees, rocky outcrops, old mines and caves for roosting and natural vegetation, irrigated crops, wetlands, rivers and water bodies for foraging.

Geology is a significant environmental parameter for bats (Kunz *et al*. 2012), and many South African bats are crevice or hollow-roosting species (Monadjem *et al*. 2010). Crevice roosting bats utilizing rock cracks, bridge expansion joints, under tree bar, etc. usually roost individually or in small groups, although they can congregate in larger numbers, especially in the eastern parts of the country. Hollow-roosting bats utilize larger hollows, such as caves, tunnels and roofs of houses. Solution caves are the most frequently occurring caves and such caves form in rock that is soluble, such as limestone, dolomite and salt. In South Africa, caves or karst formations are mostly associated with rocks such carbonate rocks like limestone and dolomite. A map of the geology along and adjacent to the transmission line is shown in Figure B.8. Whilst there is no underlying dolomite along the corridor, it does feature prominently to the east and to a lesser extent in the south west. Rocky outcrops and overhangs in the north eastern sections of the corridor can provide several potential small roosting spaces for bats.

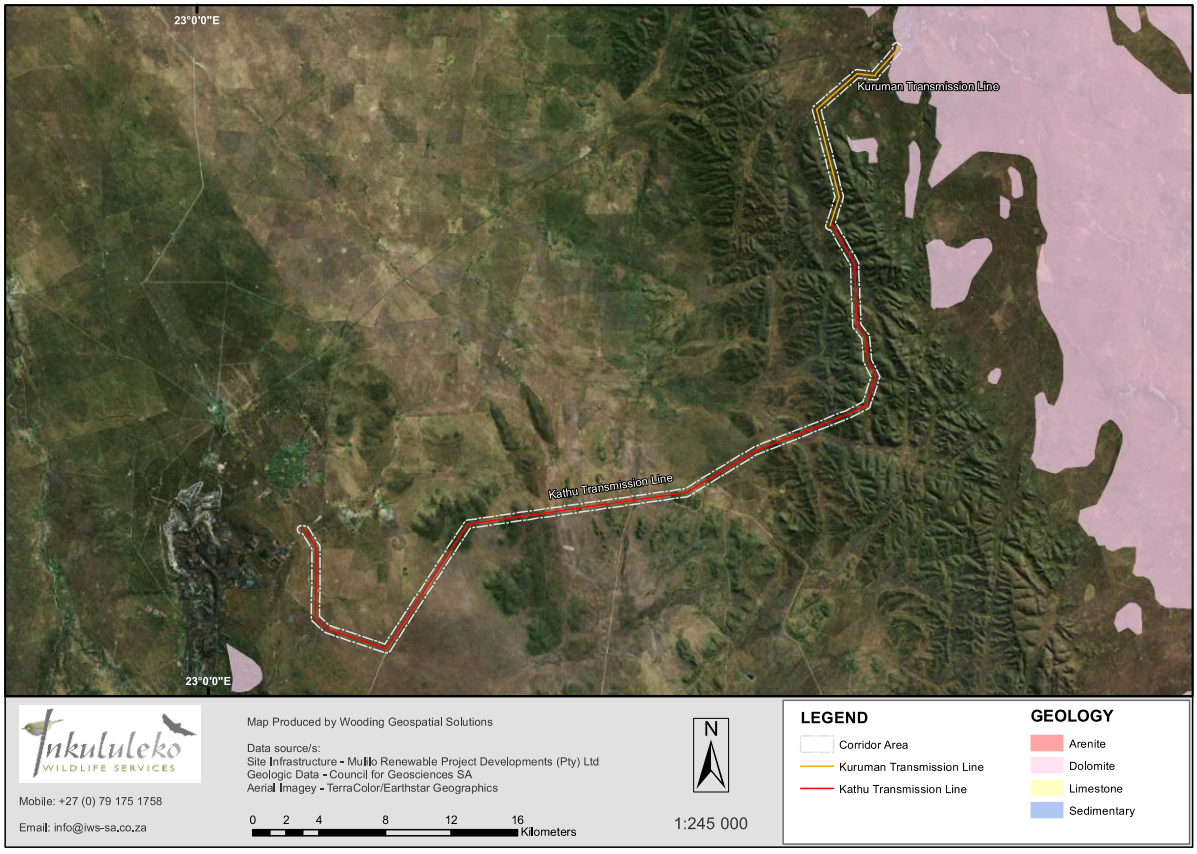

Figure B.8: Geology along the transmission line corridor

There is strong support for the importance of rivers and riparian areas for bats as movement corridors, refuge areas, for drinking and for foraging (Serra-Cobo *et al*. 2000; Akasaka *et al*. 2009; Hagen & Sabo 2012). Wetlands and dams provide drinking and foraging opportunities for bats. The hydrology along and adjacent to the transmission line is discussed in Section B.2.7 of this report.

Trees and heterogenic landscapes are important for bats (Heim *et al*. 2015) especially in dry regions (Hacket *et al*. 2013). The vegetation units along and adjacent to the transmission line is discussed in Section B.2.8.1 of this report.

Terrestrial Ecoregions are large units of land containing a geographically distinct assemblage of species, natural communities, and environmental conditions (WWF 2014). The Ecoregion concept is similar to the Biome concept, incorporating both vegetation communities and climate. There is evidence to suggest that bats might adapt to local environmental conditions at a Biome level (Miller-Butterworth *et al*. 2003). The entire transmission line corridor falls within the Kalahari Xeric Savanna Ecoregion.

Based on historical records and modelled distributions (Monadjem *et al*. 2010) and IWS's knowledge, 13 bats, presented in Table B.1 have the potential to occur along the alternative transmission line routes, but vary in their likelihoods of occurrence.

Table B.1: Potential Bat Species for the Kuruman Transmission Line

Scientific name	Common name	Regional Red List Status 2016*	Likelihood of Occurrence	Confirmed at / near certain cave roosts**
Cistugo seabrae	Angolan Hairy Bat	Near Threatened	Low	-
Eidolon helvum	African Straw-colored Fruit Bat	Least Concern	Medium	-
Eptesicus hottentotus	Long-tailed Serotine Bat	Least Concern	Medium	-
Hipposideros caffer	Sundevall's Leaf-nosed Bat	Least Concern	Low	Soetfonetin
Miniopterus natalensis	Natal Long-fingered Bat	Least Concern	High	Soetfontein, Blinkklip, Wonderwerk, Boesmansgat
Myotis tricolor	Temminck's Hairy Bat	Least Concern	Low	-
Neoromicia capensis	Cape Serotine Bat	Least Concern	High	Boesmansgat
Nycteris thebaica	Egyptian Slit-faced Bat	Least Concern	High	-
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	Least Concern	High	Soetfontein, Blinkklip, Eye of Kuruman
Rhinolophus damarensis	Damara Horseshoe Bat	Least Concern	High	Wonderwerk
Rhinolophus denti	Dent's Horseshoe Bat	Near Threatened	High	Soetfontein, Blinkklip, Wonderwerk,
Sauromys petrophilus	Flat-headed Free-tail Bat	Least Concern	Low	-
Tadarida aegyptiaca	Egyptian Free-tailed Bat	Least Concern	High	Wonderwerk, Boesmansgat

* Child *et al*. 2016

** This does not exclude them from occurring in other suspected roosts or foraging all along the corridor. Bats forage over long distances nightly and migrate over substantial distances seasonally. Non-cave dwellers are likely to occupy a variety of the identified potential roosts.

Whilst the two Near Threatened species listed in the table above will be of concern, particularly the confirmed Dent's Horseshoe Bat, it is not only conservation important or rare bats for which buffer zones, impact avoidance and mitigation measures should be implemented. All bats are particularly susceptible to anthropogenic changes because of their low reproductive rate, longevity, and high metabolic rates (Voigt and Kingston 2016), limiting their ability to recover from declines and to maintain sustainable populations (Barclay and Harder 2003).

B.2.10 Birds

The study area is not located in an Important Bird Area. The border of the closest Important Bird Area (IBA), the Spitskop Dam IBA SA028, is located approximately 120km away to the south-east of the study area (Marnewick *et al*. 2015). It is therefore not expected that the proposed powerline will have any impact on the avifauna in an IBA. The Animal Demography Unit (ADU) launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part South Africa's commitment to International waterbird conservation. This is being done by means of a programme of regular mid-summer and mid-winter censuses at a large number of South African wetlands, known as CWAC sites.The closest CWAC site is the Pudu Farm Dam, which is situated approximately 32km from the study area at its closest point. Due to the distance from the study area, no impacts on waterbirds at the Pudu Farm Dam is envisaged.

The closest protected area to the study area is the 1 131ha Billy Duvenhage Nature Reserve outside of Kuruman, where 115 bird species have been recorded (Olivier & Olivier 2005). This protected area falls outside the greater study area. The habitat in the reserve is primarily Kuruman Thornveld, which consists of a well-developed, closed shrub layer and well-developed open tree stratum consisting of *Vachellia erioloba* (Mucina & Rutherford 2005).

Whilst the distribution and abundance of the bird species in the study area can largely be explained by the description of the biomes and vegetation types (discussed in Section B.2.8), it is as important to examine the modifications which have changed the natural landscape, and which may have an effect on the distribution of avifauna. These are sometimes evident at a much smaller spatial scale than the biome or vegetation types and are determined by a host of factors such as topography, land use and man-made infrastructure.

The bird habitat classes that were identified in the study area, are woodland, waterbodies, grasslands, alien trees and high voltage lines and telephone lines.

B.3 Heritage, Archaeology and Palaeontology Profile

B.3.1 Heritage and archaeology

Approximately 35 km to the southwest of the inclusion zone is Kathu, where a large Camel Thorn Tree (*Vachellia erioloba*) forest is conserved. Known as the Kathu Forest, it is approximately 4000 ha in size and has been declared a National Heritage Site.

The Kuruman Hills (on which the proposed wind development is proposed) have historically been used for small scale pastoralist farming activities with goats and sheep, a practice which extends back possibly as much as 2,000 years ago when Khoekhoe herders first entered the area. Three sites with possible herder art were found in association with Later Stone Age artefact assemblages on the Tierkop farm during a survey undertaken by Dave Halkett and Jayson Orton in 2009, when investigating the potential impacts of iron and manganese ore mining on Bramcote farm (No. 446). All known heritage resources in the area are shown in Figure B.9 below.

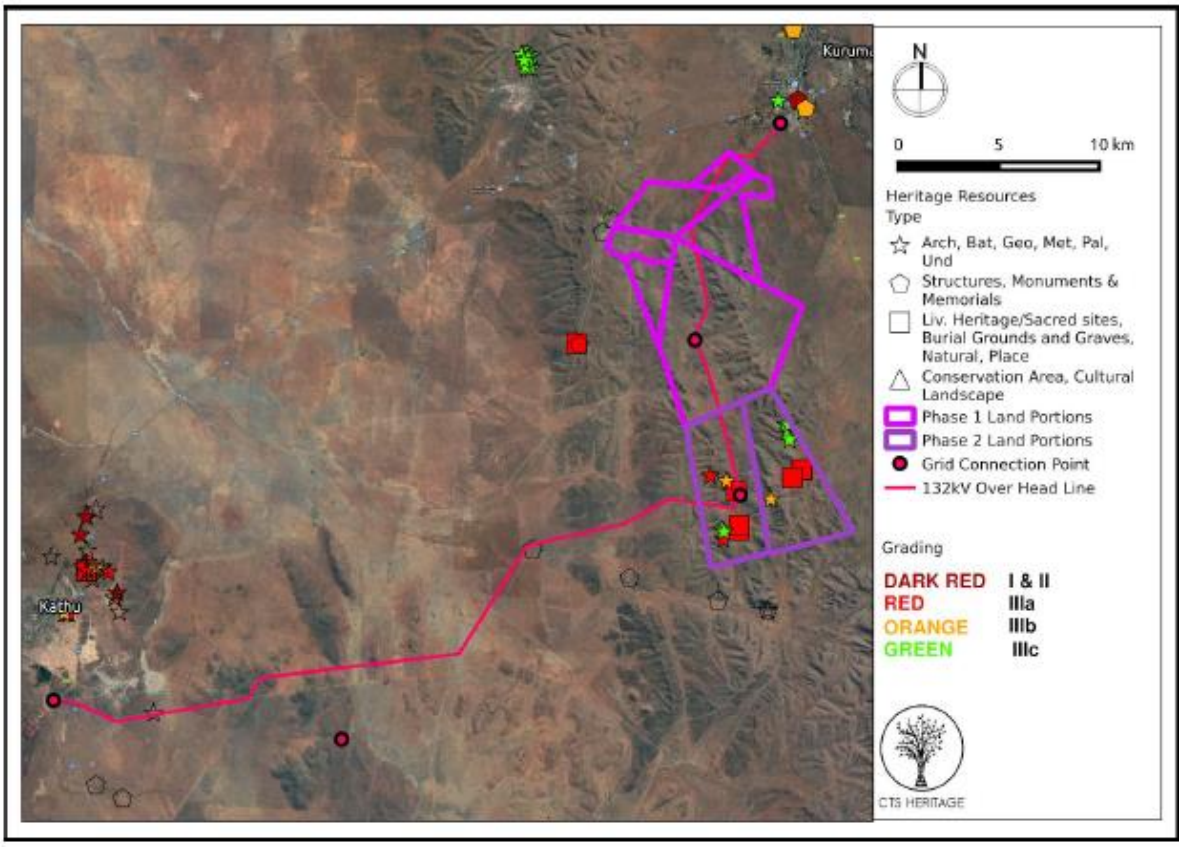

Figure B.9: Known heritage features present in the area

B.3.2 Palaeontology

The proposed development footprint is geologically underlain by Precambrian sediments and lavas of the Transvaal Supergroup, including the Ghaap Group (marine carbonates of the Campbell Rand Subgroup followed by banded iron formations of the Asbestos Hills Subgroup) and Postmasburg Group (Ongeluk Formation lavas). Most of these rock units are of low palaeontological sensitivity. However, the Campbell Rand carbonates near Kuruman may be stromalite-rich and therefore of high sensitivity. Late Caenozoic superficial sediments include windblown sands (Kalahari Group), colluvial and other surface gravels, alluvium and pedocretes (e.g. calcretes). Most of these younger sediments are of low sensitivity but older alluvial deposits along major drainage lines, as well as calcretes need to be inspected for fossils (e.g. mammalian remains).

B.4 Socio-Economic Environment

B.4.1 Land Use Profile in Surrounding Area

Economic activities are concentrated to the north-east and west of the proposed project site, wherein the town of Kuruman and Kathu, respectively, are located. Economic activity, including commercial and retail, is featured in the residential and business district. To the south-east of the alternative transmission line routes, additional activity includes military functions and mining.

Furthermore, commercial and retail activities feature in the residential and business districts of Kathu and Kuruman.

With regard to social facilities, there are numerous educational facilities serving the communities. In terms of healthcare, one private hospital is located near Kathu. Additional health facilities such as clinics and public hospitals are concentrated in Kuruman. Lastly, six police stations are within 15 km from the proposed project path, from the end points.

B.4.2 Demographic and Economic Profile

In 2016, The Ga-Segonyana Local Municipality (LM) economy was valued at R7 101 million in constant prices. The LM contributes a quarter to the economy of the John Taolo District Municipality and 6% to the economy of the Northern Cape (Quantec, 2017). Over a period of six years (2010-2016), the municipality's economy grew at a positive compounded annual growth rate (CAGR) of 3% per year. This is similar to the district and provincial growth of 2% and 3%, respectively.

The Gamagara LM economy was valued at R14 526 in 2016 and contributes 46% to the district and 12% to the province. Over a period of six years (2010-2016), the municipality's economy grew at a positive compounded annual growth rate (CAGR) of 4% per year.

The economic sector with the greatest contribution to the GDP-R of the Northern Cape is mining and quarrying. Similarly, mining is the highest contributing economic sector in the Ga-Segonyana LM and contributes to over half of the GDP in Gamagara LM (Quantec, 2017). This indicates the dependence of the municipal economies on mining and subsequent vulnerability in the case of a crisis in the mining sector. Electricity, gas and water is the economic sector with the least contribution to the GDP R for both municipalities (Quantec, 2017). Between 2008 and 2010, most economic sectors experienced a decrease in GDP-R as a result of the economic crisis. However, construction, trade, finance and business services and general government did not have a decline in GDP-R during that period

B.4.3 Labour Force Composition

Employment is the primary means by which individuals who are of working age may earn an income that will enable them to provide for their basic needs and improve their standard of living. As such, employment and unemployment rates are important indicators of socio-economic well-being. The following paragraphs examine the study area's labour market from a number of perspectives, including the employment rate and sectoral employment patterns.

According to Census 2011 data, the working age population of Ga-Segonyana LM was close to 59 000, while it was nearly half of this number in Gamagara. The unemployment rate in Gamagara LM of 15 % is less than half of that in Ga-Segonyana LM (35%). The employment situation in Gamagara is therefore relatively better.

B.4.4 Services and Infrastructure

The Ga-Segonyana LM has backlogs in all basic services, with refuse removal having the largest backlog of 37% (Stats SA, 2017). Nonetheless, the overall service delivery is moderate. The Gamagara LM has an 8% backlog in the provision of sanitation, and 12% backlog for electricity, while water and refuse removal have no backlogs (Stats SA, 2017).

According to the Ga-Segonyana's IDP, main roads are in good condition, however gravel roads serving as access routes to the rural areas are in poor condition. The roads, electricity

infrastructure and water infrastructure are poorly managed. Moreover, illegal electricity connections have been rife. Furthermore, there are areas such as Gantantelang that have no electricity connection for over 17 years. New electricity connections are planned as well as maintenance and upgrading (Ga-Segonyana Local Municipality, 2015).

B.4.5 Health risks

Historically, the larger Kuruman area has been mined for iron ore and asbestos (John Taolo Gaetsewe DM SDF, 2017). The mining of iron ore, an ongoing activity occurs towards the south west of the study area (mainly around Kathu) where large quantities of iron ore are still being mined from rocks characteristic of the geological Griquatown Group. Earlier mining of asbestos from rocks of the same geological formation in the vicinity of Kuruman and surrounds was ceased in 2002 and although all of these asbestos mines have been decommissioned, there might still be an ongoing risk of contamination through exposure to remaining mine dumps. The proposed Kuruman Transmission Line project site is located in close proximity to several rehabilitated, partially rehabilitated and un-rehabilitated asbestos mines, all of which continue to pose potential health risks to surrounding communities and land uses (Liebenberg-Weyers, 2010) (Figure B.10). Due to the carcinogenic nature of asbestos, numerous diseases can result from exposure to the asbestos fibres in the soil for prolonged periods. Asbestosis is an occupational disease confined to the workplace wherein continuous inhalation of asbestos fibres weakens the lungs. However, an additional disease linked to asbestos is Mesothelioma, which occurs as a result of trivial exposure to asbestos fibres (Journeyman.tv, 2002).

The quantification of the risk associated with a specific pollution site is a prerequisite for development in any asbestos polluted region (John Taolo Gaetsewe DM, 2017). As indicated in Figure B.10, the proposed project site is located in close proximity to:

- No active asbestos mines located on the envisaged project area
- Seven un-rehabilitated asbestos mines
- Three partially rehabilitated asbestos mines
- Three rehabilitated asbestos mines

However, the poor state of rehabilitation of the asbestos industry continues to render previously contaminated areas a serious constraint for development due to the remaining associated health risks (John Taolo Gaetsewe DM, 2017). Un-rehabilitated dumps continue to have the potential to pollute the environment and cause fatal diseases such as mesothelioma.

Local government allows minimal land use activities on rehabilitated areas and does not allow extensive development; the proposed project though is not considered to be an extensive development as it will not be associated with a large number of people present on site for a prolonged duration. Having said this, the risks associated with the proposed development will need to be quantified prior the commencement of the project, as per government requirements.

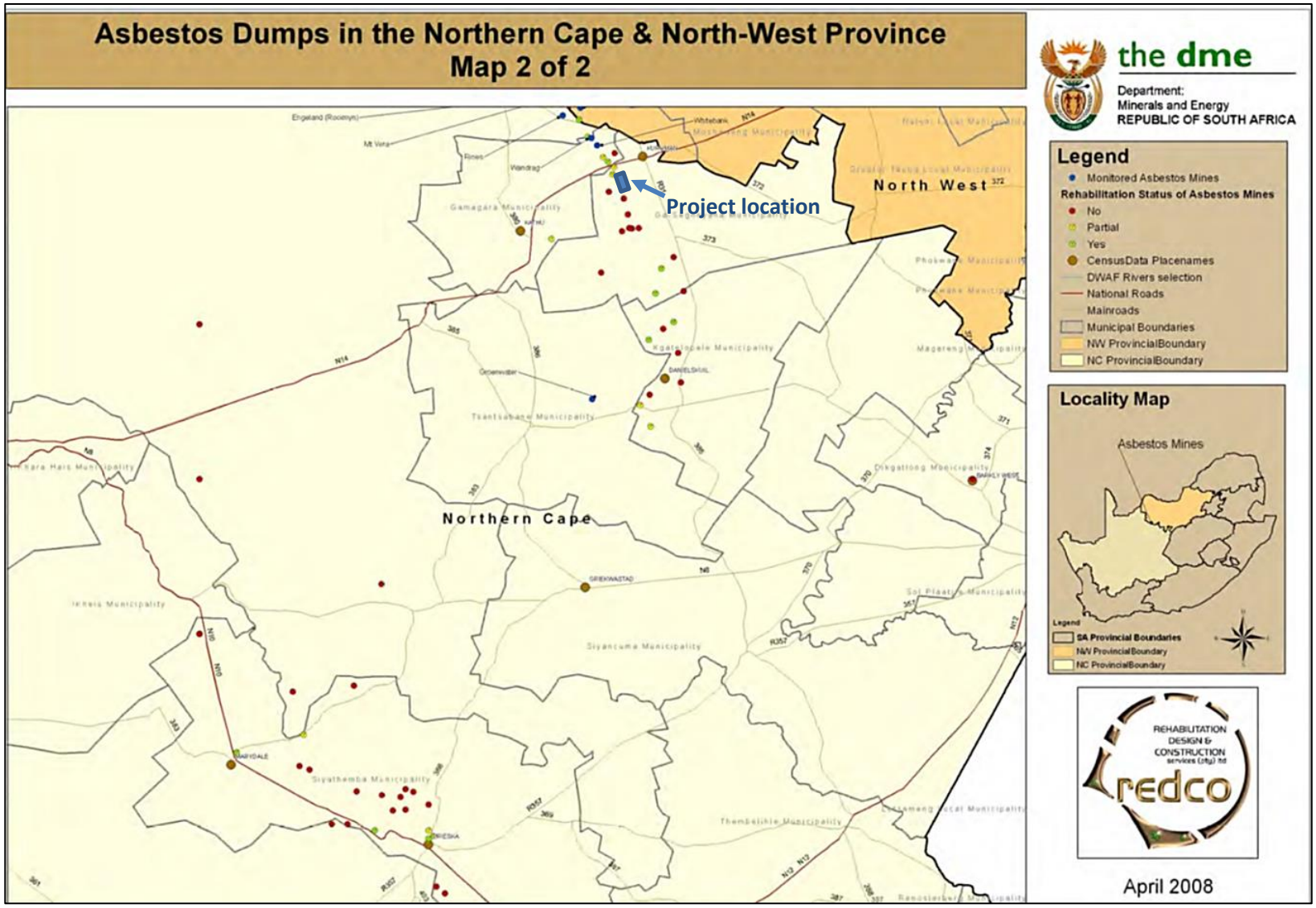

Figure B.10: Asbestos dumps in the Northern Cape

SECTION C: PUBLIC PARTICIPATION

An integrated PPP for the Kuruman Phase 1 and Phase 2 EIAs as well as the transmission line BA project is proposed. All notification letters and emails will therefore serve to notify the public and organs of state of the joint availability the EIA and BA reports for the above-mentioned projects and will provide I&APs with an opportunity to comment on the reports.

As part of the Project Initiation Phase, all potential stakeholders were notified of the commencement of the Kuruman Phase 1 EIA, Kuruman Phase 2 EIA and transmission line BA projects. A 30-day registration/commenting period from 12 March 2018 to 16 April 2018 was undertaken. During the Scoping Phase, the Scoping Reports for the Kuruman Phase 1 and Phase 2 projects were made available to Interested and Affected Parties (I&APs) and stakeholders for a 30-day comment period extending from 18 May 2018 to 21 June 2018. The finalised Scoping Report was submitted to the DEA in July 2018, in accordance with Regulation 21 (1) of the 2014 NEMA EIA Regulations, for decision-making in terms of Regulation 22 of the 2014 NEMA EIA Regulations. Since the BA process does not include a Scoping Report, no correspondence on the BA report was released during the Scoping Phase.

Details of the PPP undertaken for the Project Initiation is included in this report in Appendix C. The proof of PPP included in the appendix includes:

- Proof of placement of site notices on site and within Kuruman and Kathu;
- Proof of the placement of an advertisement to notify all stakeholders of the commencement of the Kuruman Phase 1 and Phase 2 EIA and transmission line BA processes (during the Project Initiation Phase);
- Proof of all correspondence sent (registered letters and emails) to stakeholders; and
- An issues trail that includes all comments received during the Project Initiation Phase and responses from the EIA team and/or Mulilo to the comments (where applicable to the BA project).

The key steps in the PPP for the EIA and BA Phases are described below.

TASK 1: I&AP REVIEW OF THE EIA AND BA REPORTS AND EMPR

The first stage in the EIA PPP will entail the release of the EIA and BA Reports for a 30-day I&AP and stakeholder review period. Relevant organs of state and I&APs will be informed of the review process in the following manner:

- Placement of one advertisement in the “Kathu Gazette” local newspaper to notify potential I&APs of the availability of the EIA and BA Reports for comment;
- A letter will be sent via registered mail and email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will include notification of the 30-day comment period for the EIA and BA Reports. The letter will include an Executive Summary of the EIA and BA Reports and a Comment and Registration Form;
- Telephonic consultations with key I&APs will take place, upon request; and
- Focus Group Meeting(s) with key authorities involved in decision-making for this EIA and BA processes (if required and requested).

The EIA and BA Reports will be made available and distributed through the following mechanisms to ensure access to information on the project and to communicate the outcome of specialist studies:

- Copies of the report will be placed at the Kuruman and Kathu local libraries for I&APs to access for viewing;
- Key authorities will be provided with either a hard copy and/or CD of the EIA and BA Reports;
- The EIA and BA Reports will be uploaded to the project website (i.e.https://www.csir.co.za/environmental-impact-assessment); and
- Telephonic consultations will be held with key I&AP and organs of state groups, as necessary.

TASK 2: COMMENTS AND RESPONSES TRAIL

A key component of the process is documenting and responding to the comments received from I&APs and the authorities. The following comments on the EIA and BA Reports will be documented:

- Written and emailed comments (e.g. letters and completed comment and registration forms);
- Comments made at public meetings and/or focus group meetings (if required);
- Telephonic communication with CSIR project team; and
- One-on-one meetings with key authorities and/or I&APs (if required).

The comments received during the 30-day review of the EIA and BA Reports will be compiled into a Comments and Responses Trail, each Comments and Responses Trail referring specifically to the relevant project (i.e. Kuruman Phase 1, Phase 2 or the Kuruman Transmission Line) for inclusion in an appendix to the EIA and BA Reports that will be submitted to the National DEA in terms of Regulation 23 (1) (a) for decision-making. The Comments and Responses Trail will indicate the nature of the comment, as well as when and who raised the comment. The comments received will be considered by the EIA team and appropriate responses provided by the relevant member of the team and/or specialist. The response provided will indicate how the comment received has been considered in the EIA Report for submission to the National DEA and in the project design or EMPrs.

TASK 3: COMPILATION OF EIA AND BA REPORT FOR SUBMISSION TO THE DEA

Following the 30-day commenting period of the EIA and BA Reports and incorporation of the comments received into the reports, the EIA and BA Reports (i.e. hard copies and electronic copies) will be submitted to the DEA for decision-making in line with Regulation 23 (1) of the 2014 EIA Regulations (as Amended). In line with best practice, I&APs on the project database will be notified via email (where email addresses are available) of the submission of the EIA and BA Reports to the DEA for decision-making.

The EIA and BA Reports submitted for decision-making will also include proof of the PPP that was undertaken to inform organs of state and I&APs of the availability of the EIA and BA Reports for the 30 day review (during Task 1, as explained above). To ensure ongoing access to information, copies of the EIA Report that are submitted for decision-making and the Comments and Response Trail (detailing comments received during the EIA and BA Reports and responses thereto) will be placed on the project website https://www.csir.co.za/environmental-impact-assessment).

The DEA will have 107 days (from receipt of the EIA and BA Reports) to either grant or refuse EA (in line with Regulation 24 (1) of the 2014 EIA Regulations (as Amended)).

TASK 4: EA AND APPEAL PERIOD

Subsequent to the decision-making phase, all registered I&APs and stakeholders on the project database will receive notification of the issuing or rejection of the EAs and the appeal period. Regulation 4 (1) of the 2014 EIA Regulations (as Amended) states that after the Competent Authority has reached a decision, it must inform the Applicant of the decision, in writing, within 5 days of such decision. Regulation 4 (2) if the 2014 EIA Regulations (as Amended) stipulates that I&APs need to be informed of the EA and associated appeal period within 14 days of the date of the decision. All registered I&APs will be informed of the outcome of the EA and the appeal procedure and its respective timelines.

The following process will be followed for the distribution of the EA (should such authorisation be granted by the DEA) and notification of the appeal period:

- A letter will be sent via registered mail and email to all registered I&APs and organs of state (where postal, physical and email addresses are available) on the database. The letter will include information on the appeal period, as well as details regarding where to obtain a copy of the EA;
- A copy of the EA will be uploaded to the project website; (https://www.csir.co.za/environmental-impact-assessment); and
- All I&APs on the project database will be notified of the outcome of the appeal period (if appeals are received) in writing.

C.1 Authority Consultation during the EIA Phase

Authority consultation is integrated into the PPP, with additional one-on-one meetings held with the lead authorities, where necessary. It is proposed that the Competent Authority (DEA) as well as other lead authorities will be consulted at various stages during the EIA Process:

- National DEA;
- Department of Environment and Nature Conservation of the Northern Cape Province;
- DWS of the Northern Cape Province;
- Department of Energy of the Northern Cape Province;
- Department of Mineral Resources of the Northern Cape Province;
- Eskom Holdings SOC Ltd;
- Transnet SOC Ltd;
- South African National Parks;
- World Wildlife Fund (WWF);
- Department of Social Development;
- National Energy Regulator of South Africa;
- National DAFF;
- DAFF of the Northern Cape Province;
- Department of Agriculture, Land Reform & Rural Development of the Northern Cape Province;
- Department of Public Works, Roads and Transport of the Northern Cape Province;
- Department of Labour;
- Birdlife South Africa;

- Square Kilometer Array Radio Telescope (SKA);
- South African Radio Astronomy Observatory (SARAO);
- South African Heritage Resources Agency (SAHRA);
- Ngwao Boswa Kapa Bokoni (Heritage Northern Cape);
- South African Civilian Aviation Authority;
- South African National Road Agency Limited;
- Gamagara Local Municipality;
- Ga-Segonyana Local Municipality, and the
- John Taolo Gaetsewe District Municipality.

The authority consultation process for the EIA and BA Phase is outlined in Table C.1 below.

Table C.1: Authority Communication Schedule

STAGE IN EIA PHASE	FORM OF CONSULTATION
During the EIA Process	Site visit for authorities (including DEA), if required.
During preparation of EIA and BA Reports	Communication with the DEA on the outcome of Specialist Studies, if required.
On submission of EIA and BA Reports for decision-making	Meetings with dedicated departments, if requested by the DEA, with jurisdiction over particular aspects of the project (e.g. Local Authority) and potentially including relevant specialists.

SECTION D: IMPACT ASSESSMENT

This section includes a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning phase, in line with the requirements of the 2014 NEMA EIA Regulations (as amended).

D.1.1 Approach to the BA: Methodology of the Impact Assessment

The identification of potential impacts should include impacts that may occur during the construction, operational and decommissioning phases of the development. The assessment of impacts is to include direct, indirect as well as cumulative impacts. In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed project is well understood so that the impacts associated with the project can be assessed. The process of identification and assessment of impacts will include:

- Determining the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured;
- Determining future changes to the environment that will occur if the activity does not proceed;
- Develop an understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

As per the DEAT Guideline 5: Assessment of Alternatives and Impacts the following methodology is to be applied to the predication and assessment of impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.
- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. The cumulative impacts will be assessed by identifying other wind and solar energy project proposals (this it assumed that these projects will include a transmission line to evacuate electricity from the facility to the National Grid) and other applicable projects, such Eskom transmission line (i.e. within 50 km of the proposed Kuruman Transmission Line project) that have been approved (i.e. positive EA has been issued) or is currently underway. The proposed and existing relevant projects that were considered as part of the cumulative impacts are detailed in Table D.1 below.

The projects that are being undertaken or are proposed to be undertaken within 50 km of the proposed project are detailed in Table D.1.

Table D.1: EIA Processes currently underway within 50 km of the proposed Kuruman Transmission Line project

DEA Reference number	Project title	Applicant	EAP	MW	Status
Wind Energy Projects					
14/12/16/3/3/2/1065	Kuruman Wind Energy Facility (WEF) Phase 1 near Kuruman, Northern Cape Province	Mulilo Renewable Project Developments (Pty) Ltd	Council of Scientific and Industrial Research (CSIR)	200	In process
14/12/16/3/3/2/1066	Kuruman Wind Energy Facility (WEF) Phase 2 near Kuruman, Northern Cape Province	Mulilo Renewable Project Developments (Pty) Ltd	Council of Scientific and Industrial Research (CSIR)	200	In process
Solar PV Projects					
14/12/16/3/3/2/819	The 75 MW AEP Legoko Photovoltaic Solar Facility on Portion 2 of the Farm Legoko 460, Kuruman Rd within the Gamagara Local Municipality in the Northern Cape Province	AEP Lekogo Solar (Pty) Ltd	Cape Environmental Assessment Practitioners	75	Approved
14/12/16/3/3/2/820	The 75 MW AEP Mogobe Photovoltaic Solar Facility on portion 1 of the farm Legoko 460 and farm Sekgame 461, Kuruman Rd within the Gamagara Local Municipality in the Northern Cape Province	AEP Mogobe Solar (Pty) Ltd	Cape Environmental Assessment Practitioners	75	Approved
12/12/20/1858/1	Kathu Solar Energy Facility near Kathu, Northern Cape Province	Renewable Energy Investments South Africa Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	75	In process
12/12/20/1858/2	Kathu Solar Energy Facility 25MW 2 near Kathu, Northern Cape Province	Lokian Trading and Investments	Savannah Environmental Consultants (Pty) Ltd	25	Approved
12/12/20/1860	Proposed establishment of the Sishen Solar Farm on Portion 6 of Wincanton 472 near Kathu, Northern Cape Province	VentuSA Energy Pty Ltd	Savannah Environmental Consultants (Pty) Ltd	74	In process
12/12/20/1906	Proposed construction of solar farm for Bestwood, Kgalagadi District Municipality, Northern Cape Province	Katu Property Developers Pty Ltd	Rock Environmental Consulting (Pty) Ltd	0	Approved
12/12/20/1994 12/12/20/1994/1 12/12/20/1994/2 12/12/20/1994/3	The Proposed Construction Of Kalahari Solar Power Project On The Farm Kathu 465, Northern Cape Province	Group Five Pty Ltd	WSP Environmental (Pty) Ltd	480	Approved
12/12/20/2566	A 19MW Photovoltaic Solar Power Generation Plant On The Farm Adams 328 Near Hotazel, Northern Cape Province	To review	To review	19	In process

DEA Reference number	Project title	Applicant	EAP	MW	Status
12/12/20/2567	The Proposed 150mw Adams Photo-Voltaic Solar Energy Facility On The Farm Adams 328 Near Hotazel Northern Cape Province	To review	To review	75	Approved
14/12/16/3/3/1/474	Construction of the Roma Energy Mount Roper Solar Plant on the Farm Moutn Roper 321, Kuruman, Ga-Segonyana Local Municipality	To review	EnviroAfrica Environmental Consultants (Pty) Ltd	10	In process
14/12/16/3/3/1/475	The Proposed Construction Of Keren Energy Whitebank Solar Plant On Farm Whitebank 379, Kuruman, Northern Cape Province	To review	EnviroAfrica Environmental Consultants (Pty) Ltd	10	Approved
14/12/16/3/3/2/273	The Proposed San Solar Energy Facility And Associated Infrastructure On A Site Near Kathu, Gamagara Local Municipality, Northern Cape Province	To review	Savannah Environmental Consultants (Pty) Ltd	75	Approved
14/12/16/3/3/2/616	Proposed renewable energy geneartion project on Portion 1 of the Farm Shirley No. 367, Kuruman RD, Gamagara Local Municipality, Shirley Solar Park	Danax Energy (Pty) Ltd	AGES Limpopo (Pty) Ltd	75	Approved
14/12/16/3/3/2/761	Proposed 75 MW Perth-Kuruman Solar Farm on the remainder of the farm Perth 276 within the Joe Morolong Local Municipality, Northern Cape Province	Agulhas-Hotazel Solar Power (Pty) Ltd	Strategic Environmental Focus (Pty) Ltd	75	In process
14/12/16/3/3/2/762	The 75MW Perth-Hotazel Solar Farm and its associated infrastructure on the Remainder of the Farm Perth 276 within the Joe Morolong Local Municipality in Northern Cape Province	Agulhus-Hotazel Solar Power (Pty) Ltd	Strategic Environmental Focus (Pty) Ltd	75	In process
14/12/16/3/3/2/911	Proposed 75MW AEP Kathu Solar PV Energy Facility on the Remainder of the Farm 460 Legoko near Kathu within the Gamagara local Municipality in the Northern Cape Province	AEP Kathu Solar (Pty) Ltd	Cape Eprac	75	Approved
14/12/16/3/3/2/934	Kagiso Solar Power Plant near Hotazel, Northern Cape Province	Kagiso Solar Power Plant (RF) (Pty) Ltd	Environamics cc	115	In process
14/12/16/3/3/2/935	Proposed 115 Megawatt (MW) Boitshoko Solar Power Plant on the Remaining Extent of Portion 1 of The Farm Lime Bank no. 471, near Kathu in the Gamagara Local Municipality, Northern Cape	Boitshoko Solar Power Plant (RF) (Pty) Ltd	Environamics cc	115	Approved
14/12/16/3/3/2/936	Tshepo Solar Power Plant near Hotazel, Northern Cape	Tshepo Solar Power Plant (RF) (Pty) Ltd	Environamics cc	115	In process

- **Nature of impact** - this reviews the type of effect that a proposed activity will have on the environment and should include "what will be affected and how?"

- **Status** - Whether the impact on the overall environment (social, biophysical and economic) will be:
    - Positive - environment overall will benefit from the impact;
    - Negative - environment overall will be adversely affected by the impact; or
    - Neutral - environment overall will not be affected.

- **Spatial extent** – The size of the area that will be affected by the impact:
    - Site specific;
    - Local (<2 km from site);
    - Regional (within 30 km of site);
    - National; or
    - International (e.g. Greenhouse Gas emissions or migrant birds).

- **Intensity** – The anticipated severity of the impact:
    - High (severe alteration of natural systems, patterns or processes);
    - Medium (notable alteration of natural systems, patterns or processes); or
    - Low (negligible alteration of natural systems, patterns or processes).

- **Duration** – The timeframe during which the impact will be experienced:
    - Temporary (less than 1 year);
    - Short term (1 to 6 years);
    - Medium term (6 to 15 years);
    - Long term (the impact will cease after the operational life of the activity); or
    - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient).

- **Reversibility of the Impacts** - the extent to which the impacts are reversible assuming that the project has reached the end of its life cycle (decommissioning phase) will be:
    - High reversibility of impacts (impact is highly reversible at end of project life, i.e. this is the most favourable assessment for the environment);
    - Moderate reversibility of impacts;
    - Low reversibility of impacts; or
    - Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).

- **Irreplaceability of Resource Loss caused by impacts** – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase) will be:

    - High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);
    - Moderate irreplaceability of resources;
    - Low irreplaceability of resources; or
        - Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).

Using the criteria above, the impacts will further be assessed in terms of the following:

- **Probability** –The probability of the impact occurring:
  - Improbable (little or no chance of occurring);
  - Probable (<50% chance of occurring);
  - Highly probable (50 – 90% chance of occurring); or
  - Definite (>90% chance of occurring).

- **Consequence**–The anticipated severity of the impact:
  - Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);
  - Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);
  - Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or
  - Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).

- **Significance** – To determine the significance of an identified impact/risk, the consequence is multiplied by probability. The approach incorporates internationally recognised methods from the Intergovernmental Panel on Climate Change (IPCC) (2014) assessment of the effects of climate change and is based on an interpretation of existing information in relation to the proposed activity, to generate an integrated picture of the risks related to a specified activity in a given location, with and without mitigation. Risk is assessed for each significant stressor (e.g. physical disturbance), on each different type of receiving entity (e.g. the municipal capacity, a sensitive wetland), qualitatively (very low, low, moderate, high, very high) against a predefined set of criteria (as shown in Figure D.1 below).

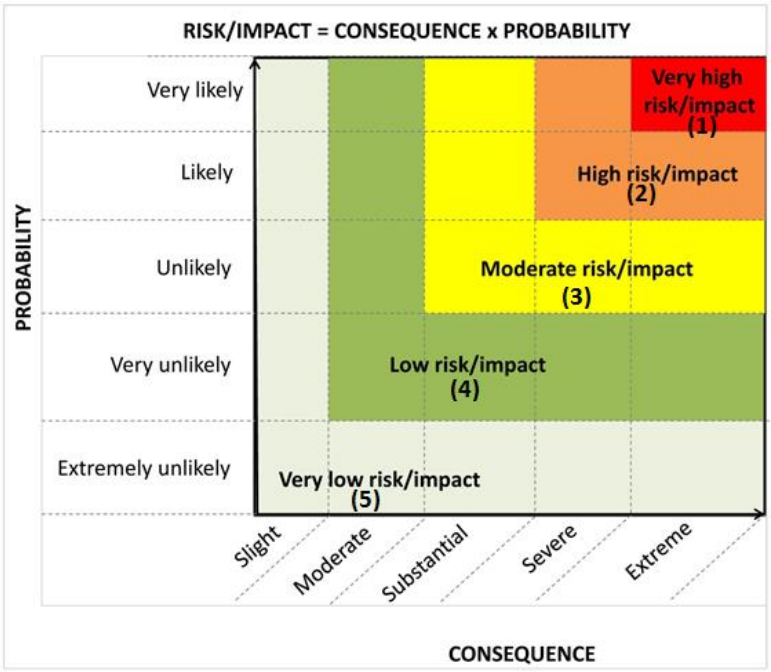

Figure D.1: Guide to assessing risk/impact significance as a result of consequence and probability.

- **Significance** – Will the impact cause a notable alteration of the environment?
    - Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
    - Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);
    - Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated); or
    - High (the risk/impacts will result in a considerable alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making);
    - Very high (the risk/impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).

The above assessment must be described in the text (with clear explanation provided on the rationale for the allocation of significance ratings) and summarised in an impact assessment table.

- **Confidence** – The degree of confidence in predictions based on available information and specialist knowledge:
    - Low;
    - Medium; or
    - High.

- **Ranking -** With the implementation of mitigation measures, the residual impacts/risks must be ranked as follow in terms of significance:
    - Very low = 5;
    - Low = 4;
    - Moderate = 3;
    - High = 2; and
    - Very high = 1.

Impacts will then be collated into the EMPr and these will include the following:

- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness;
- Identifying negative impacts and prescribing mitigation measures to avoid or reduce negative impacts. Where no mitigatory measures are possible this will be stated;
- Positive impacts will be identified and augmentation measures will be identified to potentially enhance positive impacts where possible.

Other aspects to be taken into consideration in the assessment of impact significance are:

- Impacts will be evaluated for the construction and operation phases of the development. The assessment of impacts for the decommissioning phase will be brief, as there is limited

understanding at this stage of what this might entail. The relevant rehabilitation guidelines and legal requirements applicable at the time will need to be applied;
- Impacts will be evaluated with and without mitigation in order to determine the effectiveness of mitigation measures on reducing the significance of a particular impact;
- The impact evaluation will, where possible, take into consideration the cumulative effects associated with this and other facilities/projects which are either developed or in the process of being developed in the local area; and
- The impact assessment will attempt to quantify the magnitude of potential impacts (direct and cumulative effects) and outline the rationale used. Where appropriate, national standards are to be used as a measure of the level of impact.

D.1.2 Impact assessment

The impacts presented in this Section have been identified via the environmental status quo of the receiving environment (environmental, social and heritage features present on site - as discussed in Section B of this report) and input from specialists that form part of the project team. The specialist studies undertaken to inform the BA process have been summarised in this section. The summary includes the key findings on site and the impact assessment. It should be noted that unless otherwise stated, impacts identified and their associated significance are deemed to be negative. The specialist study and reference to where it is discussed within this chapter is detailed below (Table D.2). Please refer to Appendix B of this report for the full specialist studies undertaken (including the Terms of Reference, Approach and Methodology and Assumptions and Limitations for each study). All proposed mitigation measures have been carried over into the project's EMPr, included in Appendix D of this report.

Table D.2: Specialist studies and reference to section where it is summarised

SPECIALIST ASSESSMENT	Summarised in Section
Freshwater Impact Assessment	Section D.1.2.1
Bird Impact Assessment	Section D.1.2.2
Visual Impact Assessment	Section D.1.2.3
Heritage Impact Assessment (including archaeology and palaeontology)	Section D.1.2.4
Soils and Agricultural Potential Assessment	Section D.1.2.5
Geohydrological Impact Assessment	Section D.1.2.6
Socio-Economic Impact Assessment	Section D.1.2.7
Transportation Impact Assessment	Section D.1.2.8
Ecology Impact Assessment (Terrestrial Ecology including fauna and flora)	Section D.1.2.9
Bat Impact Assessment	Section D.1.2.10

D.1.2.1 Freshwater

EnviroSwift undertook the required specialist study to determine the impact that the development of the Kuruman Transmission Line will have on freshwater features present in the area.

D.1.2.1.1 Sensitivity of the site in relation to the proposed activity

The north eastern and south eastern extent of the project footprint is located within a landscape dominated by a series of ridges running in a north to south direction. Multiple ephemeral drainage

lines originate at the crests along the length of the ridges. Some of these drainage lines steadily increase in size as they confluence with each other. However, drainage lines were also encountered which do not accumulate sufficient water volumes and which dissipate at the base of the ridge.

The central and south western extent of the project footprint is characterised by flat, open bushveld with isolated hills and koppies. The flatter topography of these areas is less susceptible to the formation of ephemeral drainage lines and only five ephemeral drainage lines were encountered which will be traversed by the project footprint of Alternative 1.

Ephemeral drainage lines occurring on steep hillslopes associated with the ridges along the north eastern and south eastern portion of the project footprints can be defined as A Section channels (Figure D.2). "A sections are those headward channels that are situated well above the zone of saturation at its highest level and because the channel bed is never in contact with the zone of saturation, these channels do not carry baseflow. They do however carry storm runoff during fairly high rainfall events but the flow is of short duration because there is no baseflow component." (DWAF, 2005). Many of these channels are located at gradients too steep to allow deposition of alluvial soil or overtopping of banks which in turn would be conducive of the formation of riparian zones.

Figure D.2: Representative photos of A Section channels (indicated by white arrows)

Additional ephemeral drainage lines extend through the flat valleys at the bases of hillslopes associated with the project footprint and are often augmented by the A section channels. These ephemeral drainage lines can be defined as 'arid drainage lines' or 'washes' and are often characterised by poorly defined or discontinuous channels due to lower annual rainfall, longer rainfall intervals, high evapotranspiration and high infiltration in areas with sandy soils (Lichvar *et al*. 2004 and Grobler 2016). Washes differ from arid drainage lines in that they are often larger and wider in extent. The lack of sufficient surface water flow within the majority of the arid drainage lines and washes in combination with the absence of shallow groundwater resources (pers. communication with Mr. du Plessis) is not conducive to the formation of riparian zones. All three alternatives will traverse arid drainage lines and Alternatives 1 and 3 will traverse a wash.

Poorly defined riparian zones are only associated with isolated areas along some of the larger arid drainage lines. Although the tree community is sparse within these isolated areas, trees such as *Vachellia erioloba* (Camel thorn) and *Ziziphus mucronata* (Buffalo thorn) provide shelter for avifauna as well as nutrient concentrations that enable the persistence of understory's which in turn provide foraging and breeding habitat for ground dwelling faunal species (van Rooyen, 2001).

At the time of the field investigation the route of the western portion of Alternative 1 had not yet been finalised and the natural seep wetland indicated to be traversed by the route (natural

wetland a in Figure D.3) as well as the artificial wetland in close proximity to the route (artificial wetland b in Figure D.3) were therefore not investigate on site. However, after careful examination of Google Earth Pro Imagery (2017) it was concluded that the area indicated as a natural seep wetland is in fact an area cleared of vegetation in the vicinity of a primary residence (c in Figure D.3). In addition, the area indicated as an artificial wetland is an impoundment within a drainage line within which artificial wetland habitat has developed (d in Figure D.3).

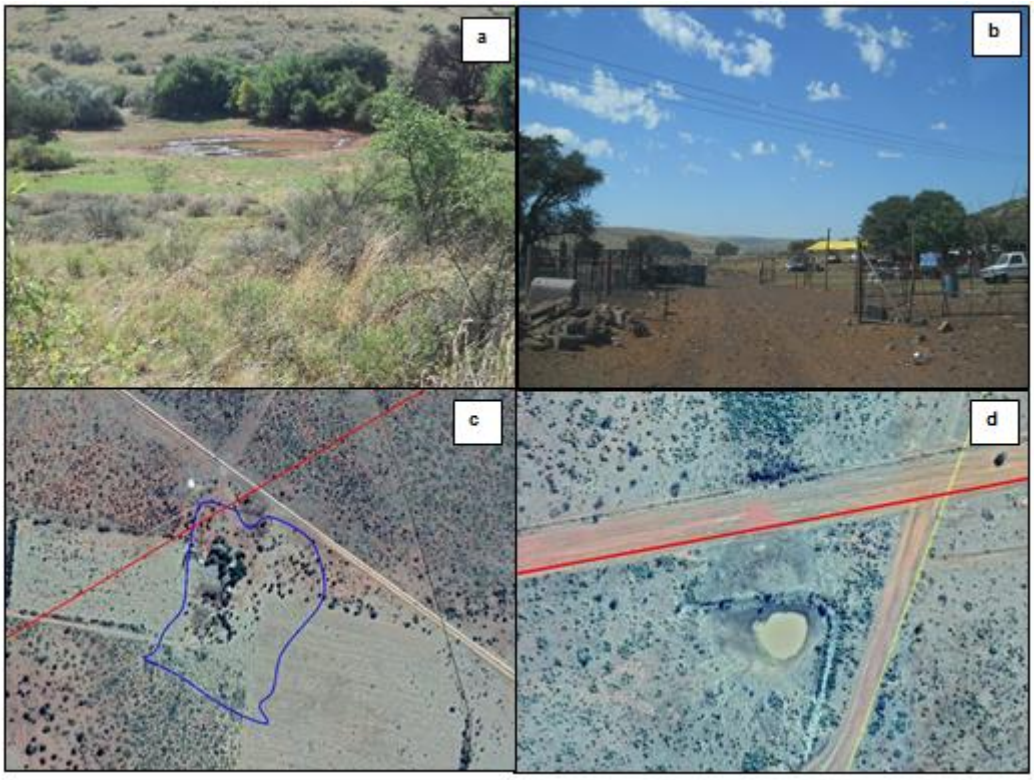

Figure D.3: Representative photos of A Section channels (indicated by white arrows)

Please refer to Section 1.3.3 of the Freshwater Impact Assessment for a discussion on the Aquatic Ecosystem Classification. In terms of watercourse delineation, according to DWAF (2008), indicators used to determine the boundary of the riparian zone of watercourses include: landscape position; alluvial soils and recently deposited material; topography associated with riparian areas; and vegetation associated with riparian areas. However, due to a lack of a distinctive riparian zone, indicators such as landscape position and topography were utilised as the primary indicators when delineating the boundary of ephemeral drainage lines during the site survey. The majority of the ephemeral drainage lines were characterised by the presence of poorly defined or discontinuous channels and, where present, the banks of these channels were utilised to define the extent of the watercourses. The Present Ecological State (PES) of the ephemeral drainage lines (discussed in detail in Section 1.3.4 of the Freshwater Impact Assessment) is shown in Figure D.4 to Figure D.6 below.

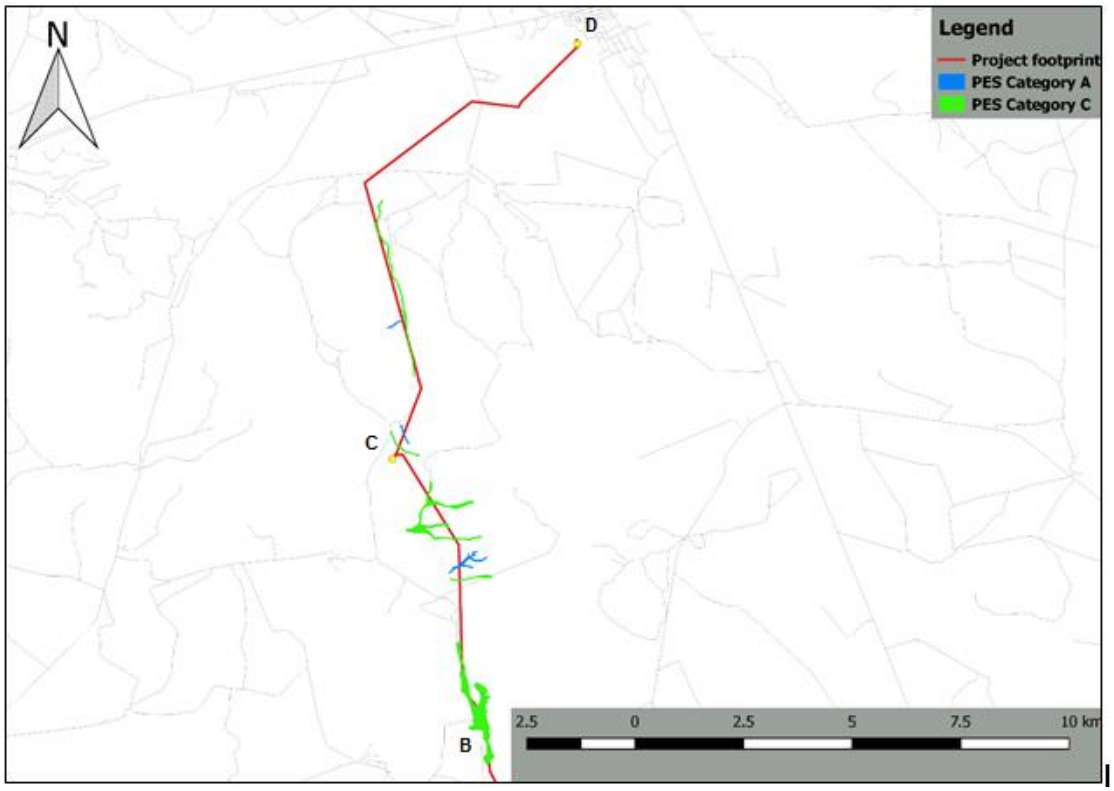

Figure D.4: PES of ephemeral drainage lines associated with the northern portion of the project footprint (Alternative 1, 2 and 3)

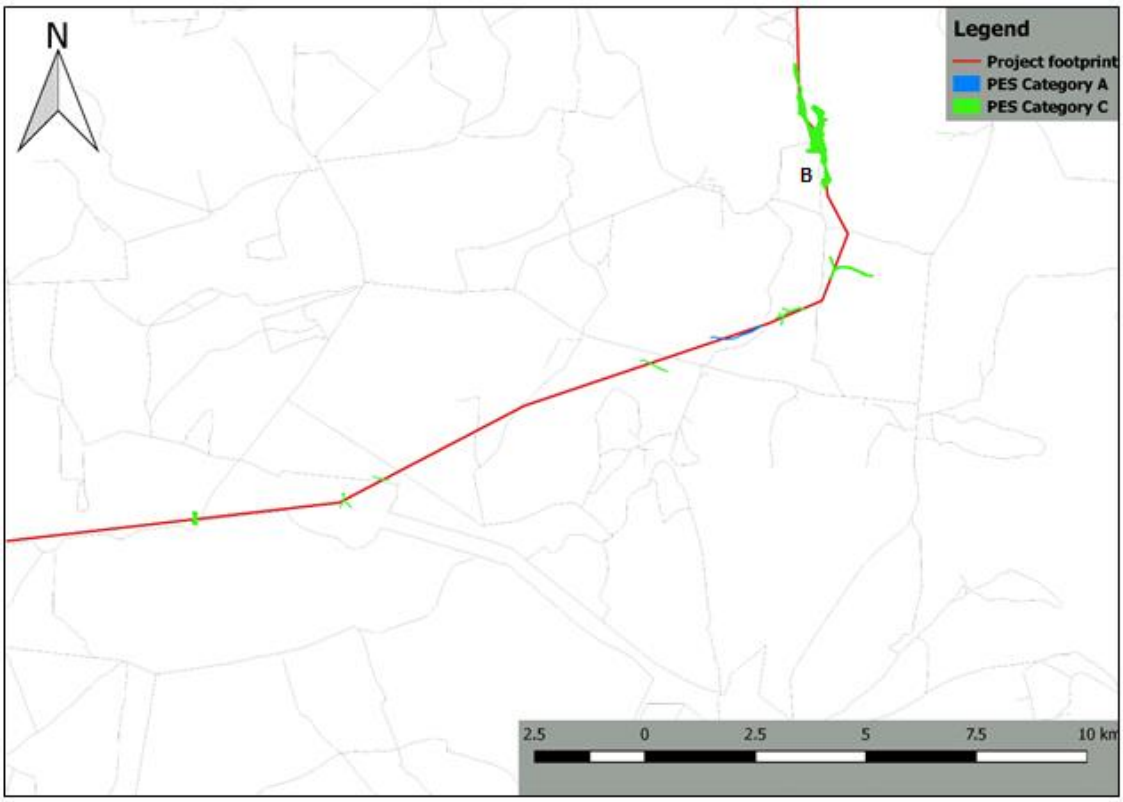

Figure D.5: PES of ephemeral drainage lines associated with the central portion of the project footprint (Alternative 1 and 3)

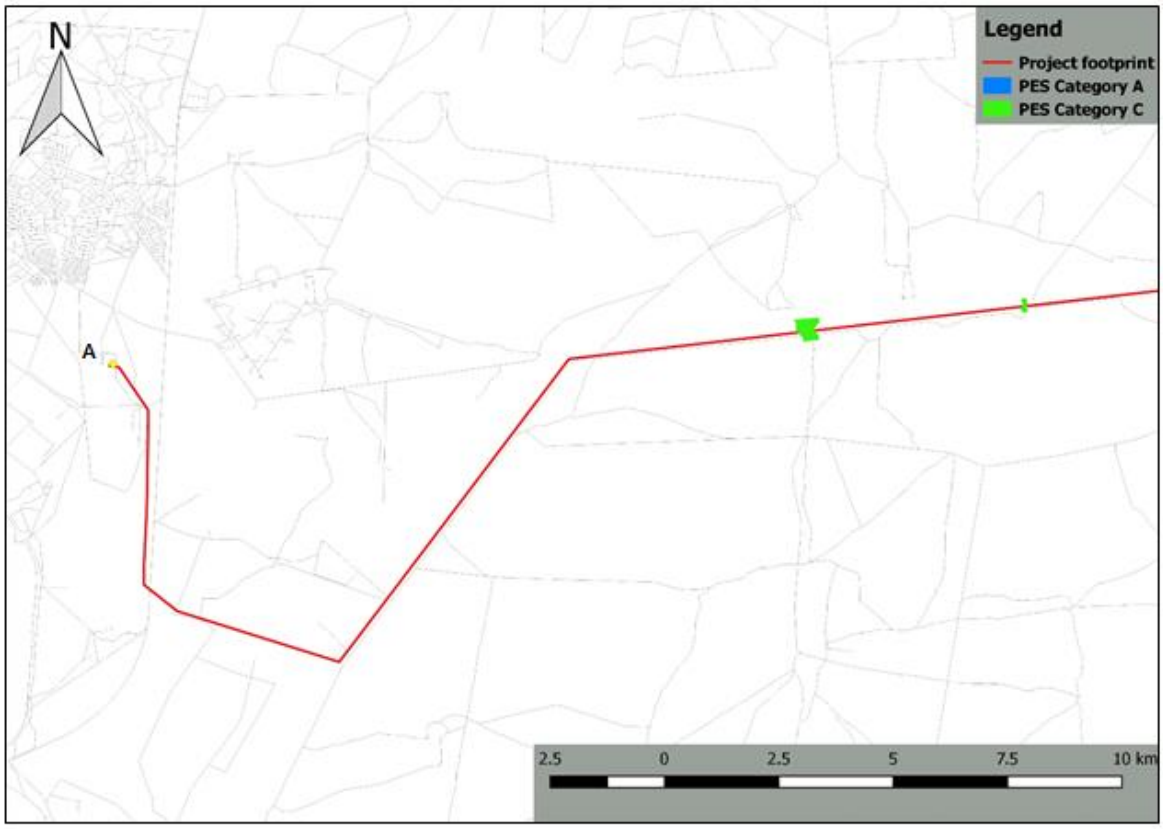

Figure D.6: PES of ephemeral drainage lines associated with the southern portion of the project footprint (Alternative 1)

The poor diversity of instream habitat units and the lack of riparian areas decreases the ability of the drainage lines to support a high diversity of species or to provide refugia to aquatic biota. The poor diversity of habitat units also decreases the sensitivity of the features to flow changes and flow related water quality changes. Furthermore, the lack of flowing water within the features for the majority of the year decreases the importance of the drainage lines in terms of the provision of migration corridors for aquatic biota. However, it should be noted that an impoundment within one of the drainage lines (indicated as artificial wetland b in Figure D.3) was found to contain artificial wetland habitat which may provide suitable breeding habitat for Giant Bullfrogs as well as additional toad species (Todd, 2018). All mitigation measures for this habitat as recommended by the faunal specialist must therefore be strictly adhered to in order to prevent the disturbance of potential habitat.

The ephemeral drainage lines were not found to support rare and endangered species or unique populations of species. It is also considered highly unlikely that the drainage lines will support biota which are intolerant to changes in flow due to the highly ephemeral nature of the features. However, the drainage lines are located within a natural area and provide the habitat to support individuals of protected species such as *Acacia erioloba* (Camel Thorn) and Nerine sp. which increases the importance of the features slightly.

Although the ephemeral drainage lines calculated an overall low EIS score (Table 10 of the Freshwater Impact Assessment) and are considered to be of low sensitivity in terms of water yield and quality (Macfarlane *et al*. 2014), these features do still provide valuable functions such as attenuation of floodwaters and retention of excess sediments. Furthermore, the drainage lines provide the habitat to support protected floral species. The unnecessary disturbance of these features must therefore be avoided.

D.1.2.1.1.1 Sensitivity map

The most recent guideline for buffer allocation in South Africa does not apply to channels which lack active channel characteristics i.e. channels which are not in contact with the zone of saturation and which do not have base flow (Macfarlane *et al*. 2014). The minimum buffer zone requirements for electricity generation works is 20m (Macfarlane and Bredin 2017). It is however the opinion of the specialist that a buffer of at least 32 m be provided for all drainage lines in order to reduce the risk of erosion. No laydown areas should be sited within any of the 32 m buffer areas. Where possible, transmission line support structures must also be placed outside of the 32 m buffer areas. However, it is noted that this will not be possible in areas where ephemeral drainage lines traverse extended distances across the landscape. In these situations it is recommended that mitigation measures below are implemented. In addition, the advocated buffers should be designated ''No Go'' zones within the project footprint wherein only essential activities should be allowed during the establishment of service roads and the placement of transmission line support structures and distribution lines. The sensitivity of the ephemeral drainage lines traversed by the various alternatives are shown in the figures below (Figure D.7 to Figure D.9)

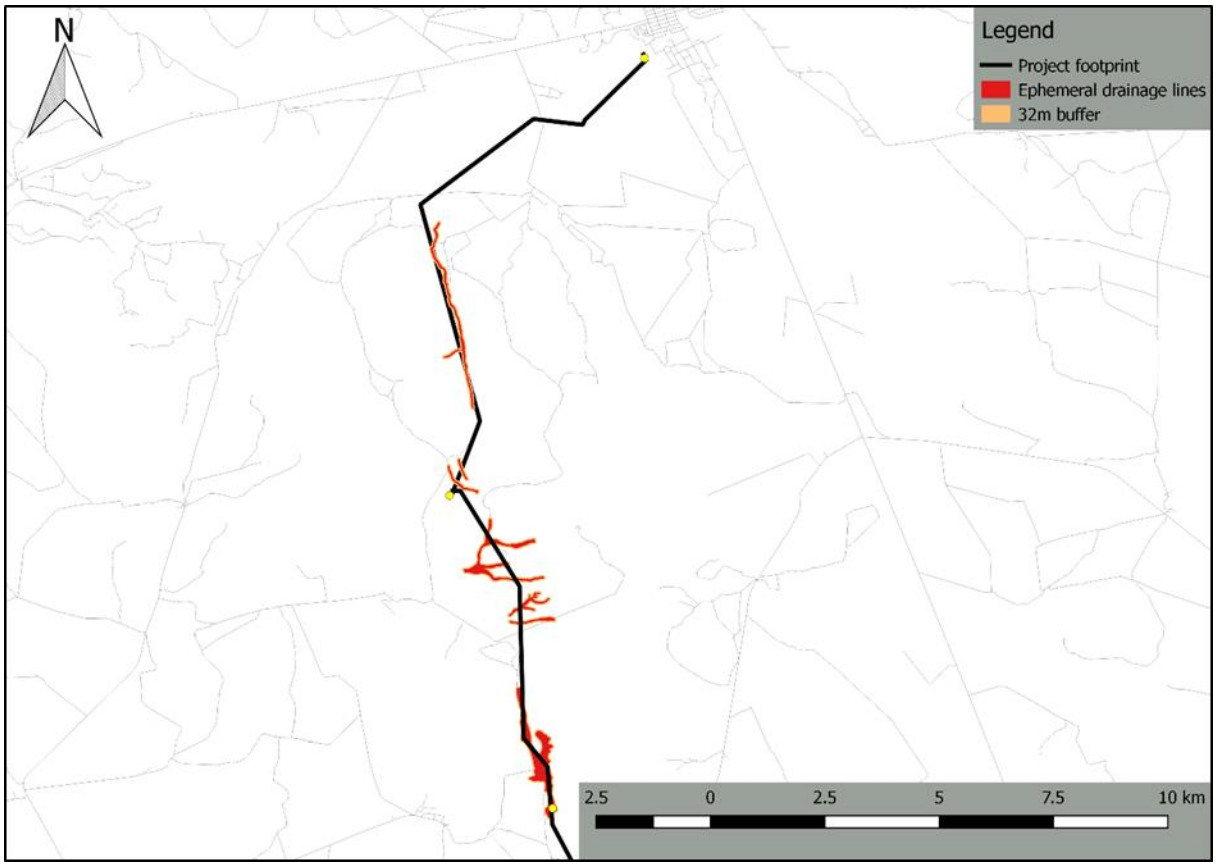

Figure D.7: Ephemeral drainage lines and 32m buffer areas associated with the northern portion of the project footprint (Alternative 1, 2 and 3)

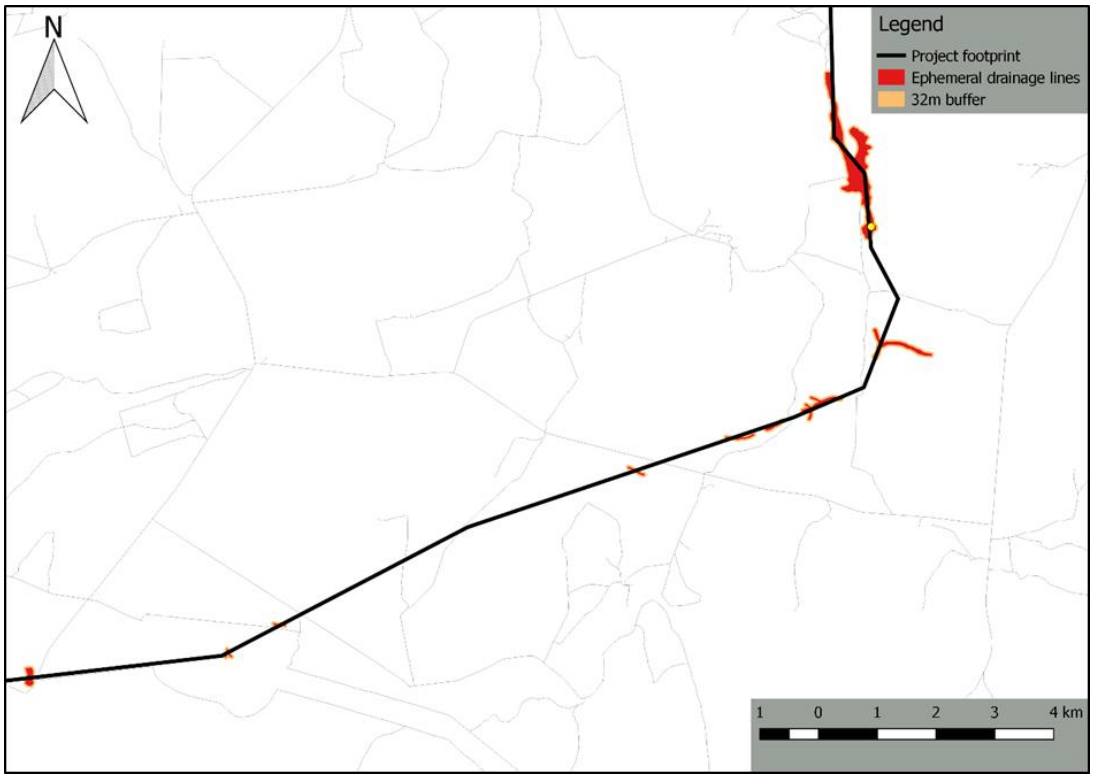

Figure D.8: Ephemeral drainage lines and 32m buffer areas associated with the central portion of the project footprint (Alternative 1 and 3)

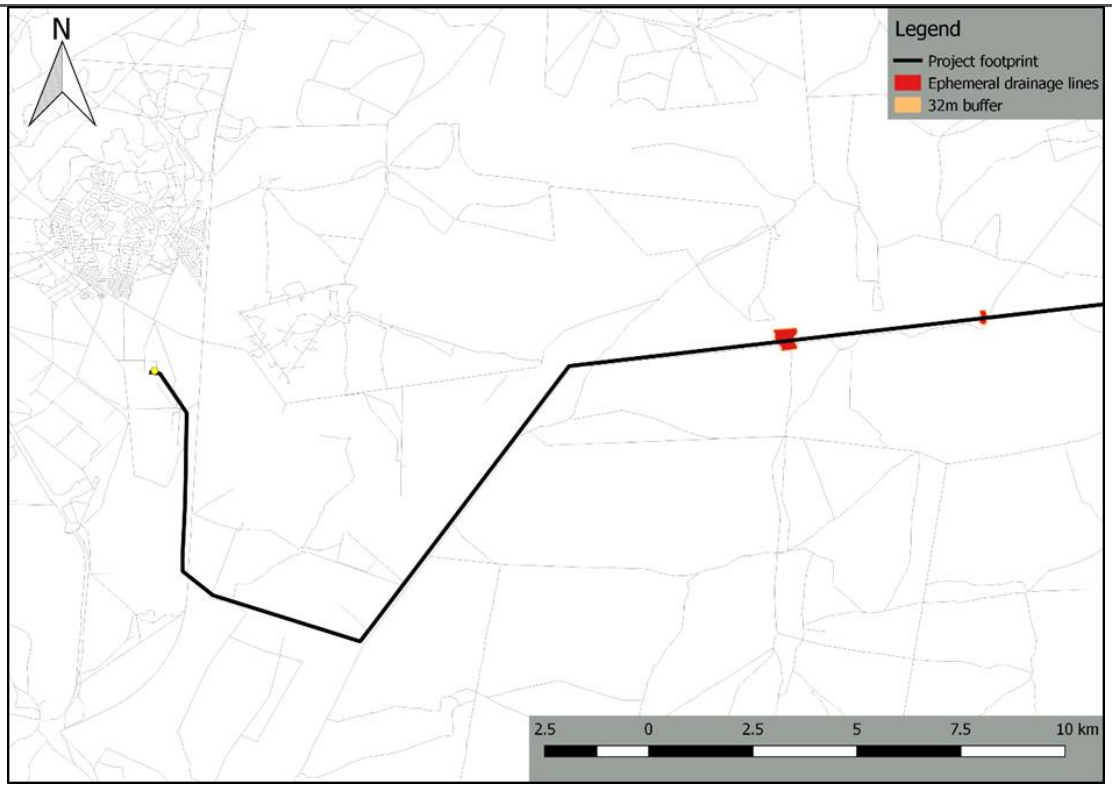

Figure D.9: Ephemeral drainage lines and 32m buffer areas associated with the southern portion of the project footprint (Alternative 1)

D.1.2.1.2 Freshwater impacts

D.1.2.1.2.1 Impacts Identified for the Construction Phase

D.1.2.1.2.1.1 Disturbance of drainage lines

Development of electrical and support infrastructure and laydown areas within ephemeral drainage lines, and the establishment of service roads traversing ephemeral drainage lines will result in disturbance of the bed and banks and the lowering of the PES of ephemeral drainage lines.

Movement of construction vehicles through ephemeral drainage lines will result in the compaction of soils which may impact on vegetation and result in erosion.

Edge effects and indiscriminate driving, fires and dumping of construction material and spoil will also result in disturbance, it is therefore important that access into areas bordering the designated crossings is strictly prohibited.

Proliferation of alien vegetation as well as bush encroachment are also considered highly likely if not adequately managed.

Significance of impact without mitigation

The significance of the impact associated with each Alternative was based on the total area of ephemeral drainage line habitat that will be disturbed as a result of the development of the proposed transmission lines and associated support structures, laydown areas and service roads.

However, transmission lines will be above ground and associated service roads will follow existing gravel roads where possible. It has also been assumed that transmission line support structures will be located outside of ephemeral drainage lines as far as possible.

The significant distance of ephemeral drainage line habitat which will be traversed by the alternatives is largely attributed to a significant portion of each Alternative which will traverse an extended area through an ephemeral drainage line (wash) where no existing gravel access roads are present (Figure D.10). A new jeep service track will therefore need to be established through this area. An existing gravel access road is however located to the west of the ephemeral drainage line and it is therefore highly recommended that the transmission line and service roads follow this existing access road in order to reduce the impact to surrounding ephemeral drainage line habitat.

The impact associated with Alternative 1 and 3 is therefore considered to be of a Moderate (negative) significance and the impact associated with Alternative 2 is considered to be of a Low (negative) significance prior to the implementation of mitigation measures.

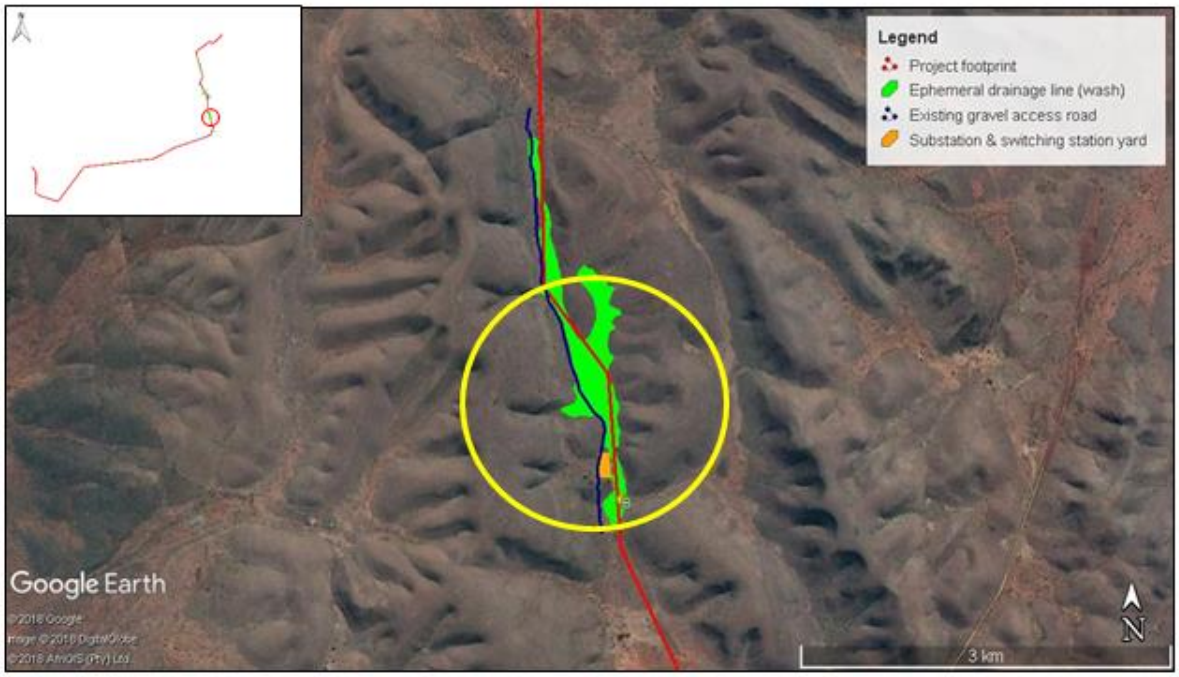

Figure D.10: Significant distance of an ephemeral drainage line (wash) traversed by alternatives 1 and 3 where no existing gravel access roads are present (indicated by yellow circle); and an existing gravel access road indicated in dark blue

Proposed mitigation measures

- Make use of existing access roads/service roads where possible and any turning areas required must be located outside of the buffer zones of ephemeral drainage lines;
- Where the project footprint (including the transmission line and associated support structures as well as service road) will traverse the ephemeral drainage line as indicated in Figure D.10 above, it should do so following the existing gravel access road which is located to the west of the ephemeral drainage line. The establishment of new jeep tracks should not be required within this feature;
- Where the crossing of ephemeral drainage lines is unavoidable, designate a single jeep track crossing area for new service roads. The following recommendations for new service road crossings apply:
  - No hard engineering should be utilized when establishing crossing areas;
  - If possible, new service road crossing areas should be developed at 90 degree angles to ephemeral drainage lines in order to limit the area of disturbance;
  - Vegetation at crossing areas should be cut rather than uprooted in order to avoid further disturbance of soils;
  - Excavation and cutting of channel banks and beds must be avoided;
  - Strictly prohibit any activity outside of the designated crossing area;
- Appoint an Environmental Control Officer (ECO) to inspect ephemeral drainage line crossings on a weekly basis (at least) and take measures to address unforeseen disturbances to the ephemeral drainage lines.
- Laydown areas must be place outside of ephemeral drainage lines and outside of 32 m buffer areas;
- Where possible, transmission line support structures must be placed outside of ephemeral drainage lines and outside of 32 m buffer areas;

- Mitigation measures for bullfrogs and toads (Todd, 2018) as specified for the artificial wetland habitat associated with an impoundment in an ephemeral drainage line (indicated as artificial wetland b in Figure D.3) must be adhered to;
- Where avoidance of ephemeral drainage lines is not possible due to the extended distances that they traverse through the landscape (e.g. Figure D.10 above), the following measures are recommended:
    - Make use of existing access roads to support structure localities where possible. The indiscriminate movement of vehicles through ephemeral drainage lines in order to reach support structures must be strictly prohibited;
    - Support structures should be placed at least 300 m apart and should preferably be placed within the buffer areas of the ephemeral drainage lines or within previously disturbed areas;
    - Support structures should only be placed within areas with a low risk of erosion;
    - Site specific erosion measures must be implemented where support structures will be placed within the ephemeral drainage lines or within 10m of the delineated boundaries of ephemeral drainage lines;
    - Engineer disturbed areas associated with transmission line support structures to coincide as closely as possible to original contours. Ensure that excavated vegetation and soil mounds are not left unattended (recreate original contours);
    - The appointed ECO must monitor each of the support structures located within ephemeral drainage lines or their buffer areas on a weekly basis for signs of erosion. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern and, where possible, only soft engineering techniques should be implemented.
- Keep the disturbance footprint at transmission line support structures to a minimum. Where possible, vegetation should be cut rather than uprooted in order to make way for support structures and laydown areas. This will prevent further disturbance of soils;
- Store topsoil removed from the construction footprint of transmission line support structures at designated stockpile areas for use in rehabilitation activities. Designated stockpile areas must be located outside of the buffer areas of ephemeral drainage lines, preferably within already disturbed areas;
- Stockpile topsoil and subsoil removed during construction separately for future rehabilitation;
- Prohibit the dumping of excavated material within ephemeral drainage lines. Spoil material must be appropriately disposed of at a registered waste disposal facility;
- Rehabilitate any areas surrounding transmission line support structures which have been disturbed as a result of construction related activities in order to prevent alien vegetation proliferation. A rehabilitation plan must be developed including rehabilitation measures such as:
    - Rip and loosen compacted soils to a depth of 300 mm in order to aid in the establishment of vegetation;
    - Redistribute stockpiled topsoil across the area;
    - Revegetate disturbed areas with vegetation assemblages reflecting the general species composition of the area as soon as possible after the application of topsoil

and stabilising of soils. A botanical specialist should advise on appropriate species to be utilised during revegetation; and
- Strictly prohibit the use of alien vegetation during rehabilitation activities.

- Alien and Invasive species control:
  - Appoint an ECO to check the construction footprint of transmission line support structures, service road crossing areas as well as immediately adjacent areas for alien and invasive species weekly and alien species noted must be removed;
  - Remove alien species manually, by hand as far as possible. The use of herbicides should be avoided. Should the use of herbicides be required, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered;
  - Dispose of removed alien plant material at a registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected;
  - Remove vegetation before seed is set and released;
  - Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles; and
- Prohibit fires.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.1.2 Alteration of flow patterns

Reduction of infiltration capacity and increase in runoff volume and intensity from areas cleared for service roads, transmission line support structures and for laydown areas will result in an increase in the volume of water reaching the ephemeral drainage lines and will ultimately result in an increase in the erosion of drainage lines

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Moderate (negative) significance and the impact associated with Alternative 2 was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Refer to mitigation measures provided in D.1.2.1.2.1.1;
- Strategically divert stormwater away from the construction footprint area of transmission line support structures and laydown areas. Stormwater must not be discharged into ephemeral drainage lines and their associated buffer areas. Stormwater should rather be discharged as diffuse flow at multiple discharge points into well vegetated areas outside of the buffer, and energy dissipaters (such as areas of rock riprap grassed with indigenous vegetation or similar structures) must be constructed where stormwater is released in order to reduce the runoff velocity and therefore erosion;
- Implement erosion control measures where required (e.g. covering steep/unstable/erosion prone areas with geotextiles; stabilising areas susceptible to erosion with sandbags; covering areas prone to erosion with brush packing, straw bales, mulch; diverting stormwater away from areas susceptible to erosion etc). This is of particular importance where the transmission line is located on steep hillsides which are prone to erosion; and

- The ECO must check ephemeral drainage lines and laydown areas associated with transmission line support structures for erosion damage after every heavy rainfall event. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.1.3 Impairment of water quality

The term water quality is used to describe the concentration of dissolved salts (solutes) and of particulate (clastic) sediment (Macfarlane *et al*. 2007). Therefore, accidental spillage of hazardous material including chemicals and hydrocarbons such as fuel, and oil, the use of cement within watercourses as well as sediment originating from disturbed areas, were all considered contributors to this impact. Construction areas located outside of the delineated drainage lines may also be a source of sedimentation, if the buffer zones are not kept intact.

It has been assumed that all housekeeping measures listed for the construction phase will be implemented through adherence to the EMPr, by so doing impact resulting from solutes will largely be addressed. However, the runoff of solutes from areas in which support structures will be developed as well as sediment laden runoff will still need to be adequately managed.

Due to the presence of permeable substratum along ephemeral drainage lines, impairment of the quality of surface water may also pose a risk to groundwater resources.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Moderate (negative) significance and the impact associated with Alternative 2 was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Refer to mitigation measures provided in D.1.2.1.2.1.1;
- If required, dispose of concrete and cement-related mortars utilised during the construction of support structure foundations in an environmental sensitive manner (can be toxic to aquatic life). Washout should not be discharged into drainage lines.
- Prohibit the mixing of concrete on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the buffer area.
- Minimise the area of disturbance and the amount of earthworks.
- Place silt fences / traps strategically on the periphery of the construction footprint area including soil stockpile areas and laydown areas. Ensure runoff is not channeled directly into the drainage lines.
- Appoint an ECO to check all sediment trapping devices weekly and to ensure devices are cleared and repaired when needed.

Significance of impact after mitigation

The impact associated with all alternatives is considered to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.2 Impacts Identified for the Operational Phase

D.1.2.1.2.2.1 Degradation of drainage lines

A lack of effective management of service road crossing areas and areas disturbed during the construction of transmission line support structures e.g. laydown areas, will result in the ongoing degradation of natural vegetation due to alien vegetation encroachment as well as the erosion of ephemeral drainage lines at service road crossing areas. This will likely result in a decrease in the PES of drainage lines.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Moderate (negative) significance and the impact associated with Alternative 2 was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Eradicate alien and weed vegetation at each service road crossing area as well as at areas disturbed as a result of the construction of transmission line support structures:
    - Appoint an ECO to check the construction footprint of transmission line support structures, service road crossing areas as well as immediately adjacent areas for alien and invasive species bi-monthly, and alien species noted must be removed;
    - Remove alien species manually, by hand as far as possible. The use of herbicides should be avoided. Should the use of herbicides be required, only herbicides which have been certified safe for use in aquatic environments by an independent testing authority may be considered;
    - Dispose of removed alien plant material at a registered waste disposal site or burn on a bunded surface where no stormwater runoff is expected;
    - Remove vegetation before seed is set and released; and
    - Cover removed alien plant material properly when transported, to prevent it from being blown from vehicles.
- Appoint an ECO to inspect the service road crossings twice a year as well as after heavy rainfall events for the duration of the operational phase in order to determine whether any additional erosion control measures are required. Should erosion or sedimentation be noted immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern and, where possible, only soft engineering techniques should be implemented.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.2.2 Alteration of the natural hydrological regime

Compaction of soils at service road crossing areas may result in an increase in runoff into, and the associated erosion of ephemeral drainage lines at crossing points. The erosion of the channels of ephemeral drainage lines will result in the concentration of flows through the features. Furthermore, inadequate rehabilitation of laydown areas/bare areas associated with transmission line support structures during the construction phase may result in an increase of bare areas and an increase of runoff into drainage lines.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Moderate (negative) significance and the impact associated with Alternative 2 was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Implement all construction phase hydrological/flow related mitigation measures in order to prevent operational phase impacts.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.3 Impacts Identified for the Decommissioning Phase

D.1.2.1.2.3.1 Degradation of drainage lines

Any area disturbed during decommissioning activities, not adequately rehabilitated, will result in proliferation of alien and weed vegetation and erosion.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Moderate (negative) significance and the impact associated with Alternative 2 was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Rehabilitate all areas disturbed during decommissioning activities;
- Eradicate alien and weed vegetation within the drainage lines as well as within any additionally disturbed areas;
- The contractor/EO must check each area where decommissioning has taken place within an ephemeral drainage line or associated buffer zone for alien vegetation proliferation and erosion damage once a year and after every heavy rainfall event, until an indigenous vegetation cover of at least 50% has been reached within disturbed areas. Any alien species noted must be removed immediately by hand. Should erosion or sedimentation be noted

immediate corrective measures must be undertaken. Rehabilitation measures may include filling of erosion gullies and rills and the stabilization of gullies with silt fences. Care must be taken to prevent additional disturbance to the ephemeral drainage lines during the implementation of these measures. Additional erosion control measures must then be applied in order to avoid any further disturbance. Erosion measures will need to be adapted according to each concern and, where possible, only soft engineering techniques should be implemented.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.3.2 Impairment of water quality

It has been assumed that all good housekeeping measures listed for the construction phase will be implemented in the decommissioning phase as well. Therefore, sediment originating from areas where service roads through ephemeral drainage lines have been decommissioned or from where infrastructure is removed is the main concern associated with impairment of water quality during the decommissioning phase.

Significance of impact without mitigation

The impact associated with all alternatives was assessed to be of a Low (negative) significance.

Proposed mitigation measures

- Minimise the area of disturbance and the amount of earthworks during decommissioning activities;
- Decommissioning of service roads traversing ephemeral drainage lines must be undertaken during the dry season;
- Decommissioning of transmission line support structures should also be undertaken during the dry season, However, if this is not possible the following mitigation measures are recommended:
  - Divert stormwater runoff from disturbed areas into sediment trapping devices. Ensure stormwater is not channeled directly into a drainage line;
  - Construct silt fences and earthen dikes / diversions at areas where sheet flow is expected, to retain and divert sediment-laden runoff;
  - Construct silt fences / traps in areas prone to erosion, to retain sediment-laden runoff;
  - Appoint an ECO to check all sediment trapping devices weekly to ensure devices are cleared and repaired when needed;
- Rehabilitate all areas disturbed during decommissioning activities.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance after the implementation of mitigation measures.

D.1.2.1.2.4 Cumulative Impacts

D.1.2.1.2.4.1 Proliferation of alien and invasive species

The abundance and diversity of alien and weed species within the project footprint is currently not considered to be high. However, with increased vehicle access and disturbance it is considered highly likely that it will worsen over time.

The significance of the encroachment of *Prosopis* spp. into watercourses was already documented by Henderson in 1991, at the time both the Molopo and Kuruman Rivers were invaded almost exclusively by *Prosopis* spp., which have formed extensive stands in places. Areas identified to be of increased risk to invasion included road transects and ephemeral drainage lines. The risk posed due to water abstraction by extensive stands is considered significant and could result in destruction of riparian ecosystems if not successfully managed (Van den Berg, 2010).

Mitigation measures have been provided in an attempt to limit alien vegetation proliferation within disturbed areas. It is however considered unlikely to be entirely successful, this project would therefore contribute to the cumulative impact posed by alien and invasive species along drainage lines.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance.

Proposed mitigation measures

- No mitigation measures in addition to those advocated for the construction, operational and decommissioning phase are available.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 will remain a Low (negative) significance and the impact associated with Alternative 2 will remain a Very Low (negative) significance.

D.1.2.1.2.4.2 Erosion of drainage lines

Inherent erosion potential (K factor) of catchment soils were documented as moderate to moderately high (refer to Section 1.3.1 of the Freshwater Impact Assessment) and erosion within disturbed areas along drainage lines was considered significant at the time of the field survey. Exacerbation of erosion in already eroded areas as well as additional erosion of disturbed drainage lines would most likely add to the cumulative impact within the erosion prone region.

Significance of impact without mitigation

The impact associated with Alternative 1 and 3 was assessed to be of a Low (negative) significance and the impact associated with Alternative 2 was assessed to be of a Very Low (negative) significance.

Proposed mitigation measures

- No mitigation measures in addition to those advocated for the construction, operational and decommissioning phase are available.

Significance of impact after mitigation

The impact associated with Alternative 1 and 3 will remain a Low (negative) significance and the impact associated with Alternative 2 will remain a Very Low (negative) significance.

D.1.2.1.3 Impact Assessment Summary

Impact	Alternative	Before mitigation	After mitigation
Construction Phase			
Disturbance of drainage lines	Alternative 1	Moderate	Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Low
Alteration of flow patterns	Alternative 1	Moderate	Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Low
Impairment of water quality	Alternative 1	Moderate	Very Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Very Low
Operational Phase			
Degradation of drainage lines	Alternative 1	Moderate	Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Low
Alteration of natural hydrological regime	Alternative 1	Moderate	Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Low
Decommissioning Phase			
Degradation of drainage lines	Alternative 1	Moderate	Low
	Alternative 2	Low	Very Low
	Alternative 3	Moderate	Low
Impairment of water quality	Alternative 1	Low	Very Low
	Alternative 2	Low	Very Low
	Alternative 3	Low	Very Low
Cumulative impact			
Proliferation of alien and invasive species	Alternative 1	Low	N/A
	Alternative 2	Very Low	N/A
	Alternative 3	Low	N/A
Erosion of drainage lines	Alternative 1	Low	N/A
	Alternative 2	Very Low	N/A
	Alternative 3	Low	N/A

D.1.2.1.4 Concluding statement

Multiple ephemeral drainage lines will be traversed by the proposed supporting electrical infrastructure alternatives. The current impact to these features is largely limited to erosion as a result of increased grazing pressure and the development of access roads, firebreaks, fence lines and impoundments within the features. The drainage lines were therefore calculated to fall within

PES Categories A (unmodified, natural) and C (moderately modified). Although the ephemeral drainage lines calculated an overall low EIS score and are considered to be of low sensitivity in terms of water yield and quality (Macfarlane *et al*. 2014), these features do still provide valuable functions such as attenuation of floodwaters and retention of excess sediments. The unnecessary disturbance of drainage lines must therefore be avoided, and a buffer zone of at least 32m is therefore considered important wherein only essential activities should be allowed during the establishment of service roads.

With the effective implementation of the mitigation measures as provided of the Freshwater Impact Assessment report, it is the opinion of the freshwater specialist that all impacts may be reduced to very low and low (negative) significances. **It is therefore the opinion of the freshwater specialist that authorisation may be granted for either of the three proposed transmission line alternatives.** It should however be noted that an application for an Environmental Authorisation in terms of the NEMA EIA Regulations (2014, amended in 2017) will be required as proposed development related activities will occur within 32m of a watercourse. Furthermore, the proposed development will require authorisation from the DWS in terms of Section 21 (c) and (i) of the NWA.

D.1.2.2 Birds

Chris van Rooyen consulting undertook the required avifauna impact assessment to inform the outcome of the Kuruman Transmission Line project.

D.1.2.2.1 Sensitivity of the site in relation to the proposed activity

The key source of information on avifaunal abundance and species diversity was the 12-months pre-construction monitoring which was conducted in the period September 2015 to January 2017 at the two Kruruman WEF sites. Surveys were conducted seasonally and data was collected by means of drive transect and walk transects, vantage point (VP) watches, focal point counts and incidental sightings. The findings at the two WEF sites are detailed below:

Kuruman WEF Phase 1

An estimated 201 species could potentially occur in the study area, of which 133 were recorded at the WEF development area during pre-construction monitoring. The results of the transect counts indicate a moderate diversity of avifauna at both the WEF development area and the control site. While this is to be expected to some extent of a fairly arid area such as this, the very low numbers or absence of some species e.g. Northern Black Korhaan is an indication that the avian populations might be under pressure from external factors, e.g. hunting. Flight activity of priority species at the WEF development area was also very low, with a passage rate of 0.05 birds/hour. See Appendix 3 of the Avifaunal Impact Assessment for a list of species recorded during surveys at the Kuruman WEF Phase 1 development.

Kuruman WEF Phase 2

An estimated 166 species could potentially occur in the study area, of which 136 were recorded at the WEF development area during pre-construction monitoring. The results of the transect counts indicate a moderate diversity of avifauna at both the WEF development area and the control site. While this is to be expected to some extent of a fairly arid area such as this, the very low numbers or absence of some species e.g. Northern Black Korhaan is an indication that the avian populations might be under pressure from external factors, e.g. hunting. Flight activity of priority species at the WEF development area was moderate, with a passage rate of 0.32 birds/hour. The vast majority of flights were Lesser Kestrels. See Appendix 4 of the Avifaunal Impact Assessment for a list of species recorded during surveys at the Kuruman WEF Phase 2 development.

Site sensitivity

The following site sensitivities from a potential powerline related impact were identified in the course of the field investigations (Figure D.11):

- High sensitivity: Surface water which attracts many powerline sensitive species, including Red Data Martial Eagle, Tawny Eagle, Verreaux's Eagle, Abdim's Stork, Cape Vulture, White-backed Vulture and Kori Bustard. This creates a collision risk as it becomes a focal point of bird activity when surface water is available with a high likelihood of interaction with the powerline.
- Medium sensitivity: The whole study area is classified as moderately sensitive as it constitutes mainly natural savanna. The natural savanna supports sparse numbers of Red Data Martial Eagle, Tawny Eagle and Kori Bustard which are at risk of displacement and powerline collisions anywhere in the study area, with a medium likelihood of interaction with the powerline. Cape Vultures and White-backed Vultures are occasional visitors.

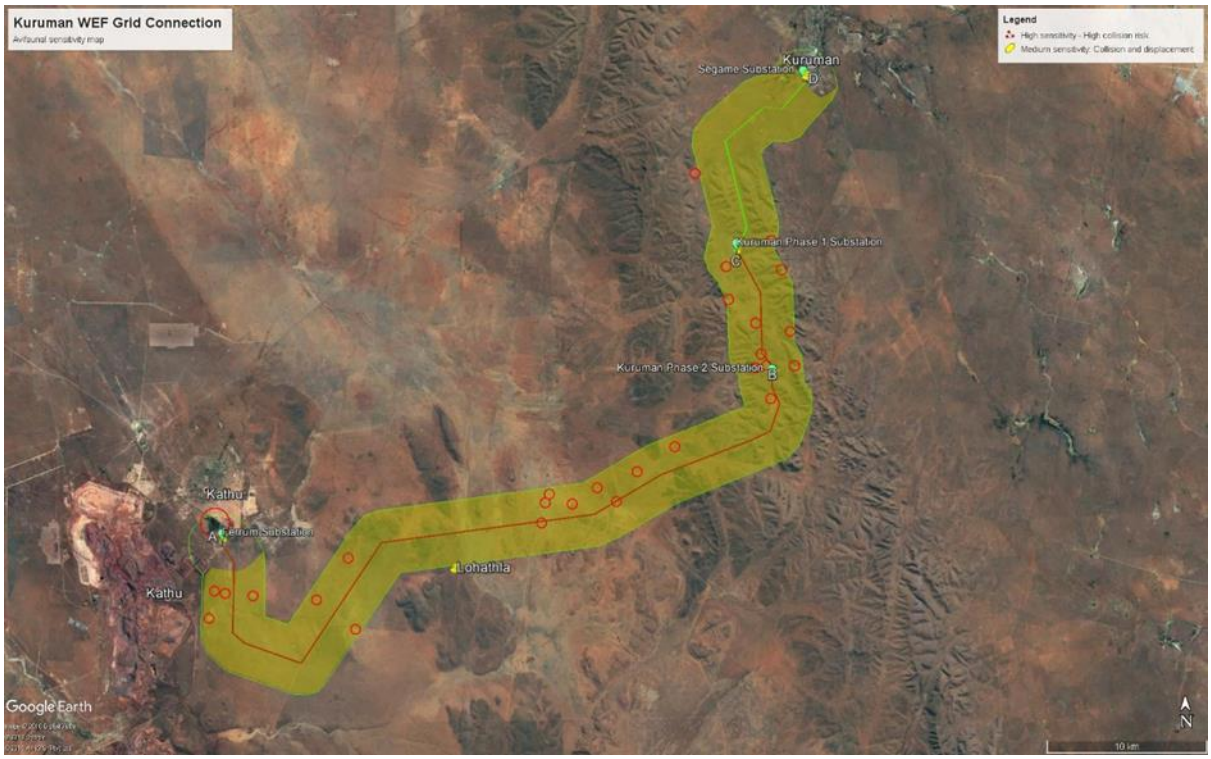

Figure D.11: Sensitivity map of the study area

D.1.2.2.2 Bird impacts

D.1.2.2.2.1 Impacts Identified for the Construction Phase

D.1.2.2.2.1.1 Displacement of Red Data species due to disturbance

Some birds could be displaced due to disturbance during the construction phase of the powerline and substations. While this is usually temporary, if it results in the interruption of a breeding cycle, at the critical time, could result in the death of the eggs or nestlings. In the case of slow reproducing species with long breeding seasons, e.g. large eagles, the interruption of a single

breeding season could have a more marked effect than for smaller, fast reproducing species, e.g. passerines, which can more easily lay a replacement clutch. Some sensitive species might also abandon a specific breeding site permanently due to disturbance. This is particularly the case with large raptor such as Martial Eagle and Tawny Eagle which could be breeding in large trees or on powerlines in the study area.

Significance of impact without mitigation

The overall pre-mitigation risk of displacement of Red Data species due to disturbance is rated as Low.

Proposed mitigation measures

- A site-specific Construction Environmental Management Plan (CEMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following:
    - No off-road driving;
    - Maximum use of existing roads;
    - Measures to control noise;
    - Restricted access to the rest of the property;
    - The appointed Environmental Control Officer (ECO) must be trained by an avifaunal specialist to identify the potential priority species as well as the signs that indicate possible breeding by these species. The ECO must then, during audits/site visits, make a concerted effort to look out for such breeding activities of Red Data species, and such efforts may include the training of construction staff to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species. If any of the Red Data species are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed.
    - Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes, to identify any nests/breeding/roosting activity of Red Data species. The results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around avian breeding and/or movement schedules, and lowering levels of associated noiseNo mitigation measures in addition to those advocated for the construction, operational and decommissioning phase are available.

Significance of impact after mitigation

The overall post-mitigation risk of displacement of Red Data species due to disturbance is rated as Very Low.

D.1.2.2.2.1.2 Displacement of Red Data avifauna due to habitat transformation associated with the construction of the powerline and on-site substation

During the construction 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. In some habitats, 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 of the servitude and/or substations through transformation of habitat, which could result in temporary or permanent displacement.

However, the results of habitat transformation may be subtler. Whereas the actual footprint of the development be small in absolute terms, the effects of the habitat fragmentation may be more significant. For example, Shaw (2013) found that Ludwig's Bustard generally avoid the immediate proximity of roads within a 500 m buffer. This means that power lines and roads also cause loss and fragmentation of the habitat used by the population in addition to the potential direct mortality. The physical encroachment increases the disturbance and barrier effects that contribute to the overall habitat fragmentation effect of the infrastructure (Raab *et al*. 2010). It has been shown that fragmentation of natural grassland in Mpumalanga (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Alan *et al*. 1997). In contrast to the findings of the studies above, it is notable that Strugnell (2017) did not find any significant displacement of large terrestrial species, and Denham's Bustard in particular, at the Kouga wind Farm, in the Eastern Cape. This indicates that there may be significant interspecies variation with regard to displacement thresholds, even for closely related species.

Both proposed on-site substations will be situated in valley bottoms in open woodland. From an avifaunal impact perspective, the impact will be low, as the actual footprint is small (2 ha) and there is ample similar habitat available within the immediate surroundings, which means that the displacement impact on Red Data species should be minimal.

In the case of the powerline itself, the vegetation clearing in the servitude should not be very extensive, as the vegetation consists mostly of grass and shrubs.

Significance of impact without mitigation

The overall pre-mitigation risk of displacement of Red Data species due to habitat transformation is rated as Low.

Proposed mitigation measures

- The recommendations of the ecological specialist studies must be strictly implemented, especially as far as limitation of the construction footprint, retention of natural vegetation and rehabilitation of transformed areas is concerned.
- Large trees should be retained as much as possible as they serve as potential roosting and breeding habitat for a variety of birds, including raptors.
- Annual audits must be performed by an external rehabilitation specialist for three years to assess the success of the rehabilitation programme and recommend changes or additions to the programme if need be.

Significance of impact after mitigation

The overall post-mitigation risk of displacement of Red Data species due to habitat transformation is rated as Very Low.

D.1.2.2.2.2 Impacts Identified for the Operational Phase

D.1.2.2.2.2.1 Mortality of Red Data avifauna due to collisions with the earthwire of the proposed 132kV line

Collisions are probably the biggest single threat posed by power lines to birds in southern Africa (van Rooyen 2004; Shaw 2013). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with power lines (van Rooyen 2004; Anderson 2001; Shaw 2013).

In her PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with power lines:

"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 (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini *et al*. 2005, Jenkins *et al*. 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are 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 (Bevanger 1998, Janss 2000). These birds must fly fast 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 low-resolution and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin *et al*. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown *et al*. 1987, Henderson *et al*. 1996).

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 cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). 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 (Brown *et al*. 1987, APLIC 1994).

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 (Bevanger 1994). 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 (Bevanger 1994, Jenkins *et al*. 2010). 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 (Brown *et al*. 1987, Faanes 1987, Bevanger 1994)."

As mentioned by Shaw (2013) in the extract above, several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is essential to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards, Blue Cranes and White Storks. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35° respectively are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (Accipitridae) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes and are also known to be vulnerable to power line collisions.

Thus, visual field topographies which have evolved primarily to meet visual challenges associated with foraging may render certain bird species particularly vulnerable to collisions with human artefacts, such as power lines and wind turbines that extend into the otherwise open airspace above their preferred habitats. For these species placing devices upon power lines to render them more visible may have limited success since no matter what the device the birds may not see them. It may be that in certain situations it may be necessary to distract birds away from the obstacles or encourage them to land nearby (for example by the use of decoy models of conspecifics, or the provision of sites attractive for roosting) since increased marking of the obstacle cannot be guaranteed to render it visible if the visual field configuration prevents it being detected. Perhaps most importantly, the results indicate that collision mitigation may need to vary substantially for different collision prone species, taking account of species specific behaviours, habitat and foraging preferences, since an effective all-purpose marking device is probably not realistic if some birds do not see the obstacle at all (Martin & Shaw 2010).

Quantifying the impact of collisions in terms of the likely number of birds that will be impacted, is very difficult because such a huge number of variables play a role in determining the risk, for example weather, rainfall, wind, age, flocking behaviour, power line height, light conditions, topography, population density and so forth.

Significance of impact without mitigation

The overall pre-mitigation risk of mortality of Red Data species due to powerline collisions is rated as Low.

Proposed mitigation measures

Despite speculation that line marking might be ineffective for some species due to differences in visual fields and behaviour, or have only a small reduction in mortality in certain situations for certain species, particularly bustards (Martin & Shaw 2010; Barrientos *et al*. 2012; Shaw 2013), it is

generally accepted that marking a line with PVC spiral type Bird Flight Diverters (BFDs) can reduce the collision mortality rates (Sporer *et al*. 2013; Barrientos *et al*. 2012, Alonso & Alonso 1999; Koops & De Jong 1982). Even bustards have been found to benefit from powerline marking (Raab *et al*. 2012). Regardless of statistical significance, a slight mortality reduction may be very biologically relevant in areas, species or populations of high conservation concern (e.g. Ludwig's Bustard) (Barrientos *et al*. 2012).

Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. A recent study reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease in bird collisions. At unmarked lines, there were 0.21 deaths/1000 birds (n = 339,830) that flew among lines or over lines. At marked lines, the mortality rate was 78% lower (n = 1,060,746) (Barrientos *et al*. 2011). Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5 metres, whereas using the same devices at 10 metre intervals only reduces the mortality by 57%. In an experiment in the Karoo, the Endangered Wildlife Trust found that the application of Bird Flappers significantly reduced the mortality of Blue Cranes, although the effect was less marked with Ludwig's Bustard (C. Hoogstad pers.comm 2017) .

Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important, as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al*. 2010).

The following mitigation measures are proposed:

- High risk sections of power line must be identified by a qualified avifaunal specialist during the walk-through phase of the project, once the alignment has been finalized.
- Where power line marking is required, bird flight diverters must be installed on the full span length on each of the conductors according to the Eskom Guidelines (see Appendix 5).
- Light and dark colour devices must be alternated so as to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung. In specific instances, i.e. high risk waterbodies (to be identified during the walk-through phase), the new experimental PLP LED (light emitting diode) BFD is recommended to increase the efficacy of the device during low light conditions for waterbirds.
- The line must be inspected once a quarter by a qualified avifaunal specialist for one year to establish if there are any additional areas where bird flight diverters are required.

Significance of impact after mitigation

The overall post-mitigation risk of mortality of Red Data species due to powerline collisions is rated as Very Low.

D.1.2.2.2.2.2 Electrocution of Red Data avifauna on the proposed 132kV

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). Electrocution risk is strongly influenced by the power line voltage and design of the pole structure and mainly affects larger, perching species, such as vultures, eagles and storks, easily capable of spanning the spaces between energized components on smaller distribution lines, or energized and earthed components.

Significance of impact without mitigation

The only species that could conceivably be at risk of electrocution on the 132kV structures, are large raptors or vultures. Vultures do not occur regularly in the area, although Cape Vulture *Gyps coprotheres* and White-backed Vulture *Gyps africanus* can occur sporadically (VulPro unpublished data 2018). The proposed structures do not pose a significant electrocution risk to solitary large eagles, but the steel monopole with stand – off insulators (DT 7611 or double circuit variants) can pose an electrocution risk to vultures if they congregate in numbers on a pole. In such an instance, they might attempt to perch on the stand-off insulators, which may lead them to bridge the air gap between the live conductor and the earthed steel pole. Such an occurrence is likely to be a very rare occurrence, and only likely to happen when they descend to a carcass in the vicinity of the powerline.

Proposed mitigation measures

- It is strongly recommended that the DT 7649 vulture-friendly structure is employed.

Significance of impact after mitigation

The significance of the potential impact can be reduced to very low through the employment of a vulture friendly design.

D.1.2.2.2.3 Impacts Identified for the Decommissioning Phase

D.1.2.2.2.3.1 Displacement of Red Data avifauna due to disturbance associated with the de-commissioning of the powerline and on-site substation

Some birds could be displaced due to disturbance during the de-commissioning phase of the powerline and substations. While this is usually temporary, if it results in the interruption of a breeding cycle, at the critical time, could result in the death of the eggs or nestlings. In the case of slow reproducing species with long breeding seasons, e.g. large eagles, the interruption of a single breeding season could have a more marked effect than for smaller, fast reproducing species, e.g. passerines, which can more easily lay a replacement clutch. Some sensitive species might also abandon a specific breeding site permanently due to disturbance. This is particularly the case with large raptor such as Martial Eagle and Tawny Eagle which could be breeding in large trees or on powerlines in the study area.

Significance of impact without mitigation

The overall pre-mitigation risk of displacement of Red Data species due to de-commissioning is rated as Low.

Proposed mitigation measures

- See mitigation measures included in D.1.2.2.2.1.1.

Significance of impact after mitigation

The overall post-mitigation risk of displacement of Red Data species due to de-commissioning is rated as Very Low.

D.1.2.2.2.4 Cumulative Impacts

D.1.2.2.2.4.1 Displacement of avifauna

A cumulative impact, in relation to an activity, is the impact of an activity that may not be significant on its own but may become significant when added to the existing and potential impacts arising from similar or other activities in the area. There are currently no wind energy facilities planned within a 50km radius around the proposed Kuruman WEFs, but at least 11 solar PV facilities. The primary potential long-term impacts of the grid connections associated with these facilities are:

- Displacement of Red Data avifauna due to disturbance associated with the construction of the powerline, service road and on-site substation.
- Displacement of Red Data avifauna due to habitat transformation associated with the construction of the powerline, service road and on-site substation.
- Mortality of Red Data avifauna due to collisions with the earthwire of the proposed 132 kV line.

Significance of impact without mitigation

Based on the information that could be sourced on the renewable energy projects in Table 14, these projects would result in an additional 50km – 70km of 132kV voltage lines being constructed within a 50km radius around the proposed Kuruman WEFs. The area currently contains at least 600 km of high voltage lines within the 50 km radius. The Kuruman WEF grid connection could potentially add another 70 km to this figure. Renewable projects would therefore add approximately 120 km – 140 km of to the existing high voltage grid, which increases the total high voltage grid to 720 km – 740 km within the 50 km radius around the Kuruman WEFs. The Kuruman WEF grid connection would increase the combined high voltage grid (i.e. existing and future renewable energy grid connections) by around 10-11%. The cumulative impact of this increase is likely to be of Moderate significance.

Proposed mitigation measures

The mitigation measures listed below, or variations of them, are recommended at all the proposed renewable energy grid connections:

- Use of bird-friendly pole designs.
- Marking of powerlines with Bird Flight Diverters.
- Reducing the footprint of the infrastructure.

Significance of impact after mitigation

The implementation of the mitigation measures listed in the previous bullet should reduce the cumulative impact of the Kuruman WEF grid connection to Low.

D.1.2.2.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction Phase		
Displacement of Red Data species due to disturbance	Low	Very low
Displacement of Red Data avifauna due to habitat transformation associated with the construction of the powerline and on-site substation	Low	Very low
Operational Phase		
Mortality of Red Data avifauna due to collisions with the earthwire of the proposed 132kV line	Low	Very low
Electrocution of Red Data avifauna on the proposed 132kV	Low	Very low
Decommissioning Phase		
Displacement of Red Data avifauna due to disturbance associated with the de-commissioning of the powerline and on-site substation	Low	Very low
Cumulative impact		
Displacement of avifauna	Moderate	Low

D.1.2.2.4 Concluding statement

The proposed Kuruman 132kV grid connection should have a low to very low impact on avifauna, provided the management recommendations listed in the Avifauna Impact Assessment report are strictly implemented. **No fatal flaws were identified from an avifaunal perspective – it is therefore recommended that the project is authorised to go ahead.**

D.1.2.3 Visual

Sivest undertook the visual impact assessment to identify potential visual issues associated with the development of the proposed Kuruman Transmission Line project, as well as to determine the potential extent of visual impact.

D.1.2.3.1 Sensitivity of the site in relation to the proposed activity

The field investigation revealed a total of one (1) sensitive receptor location and thirty-one (31) potentially sensitive receptor locations in the visual assessment zone. These receptor locations are shown below (Figure D.12).

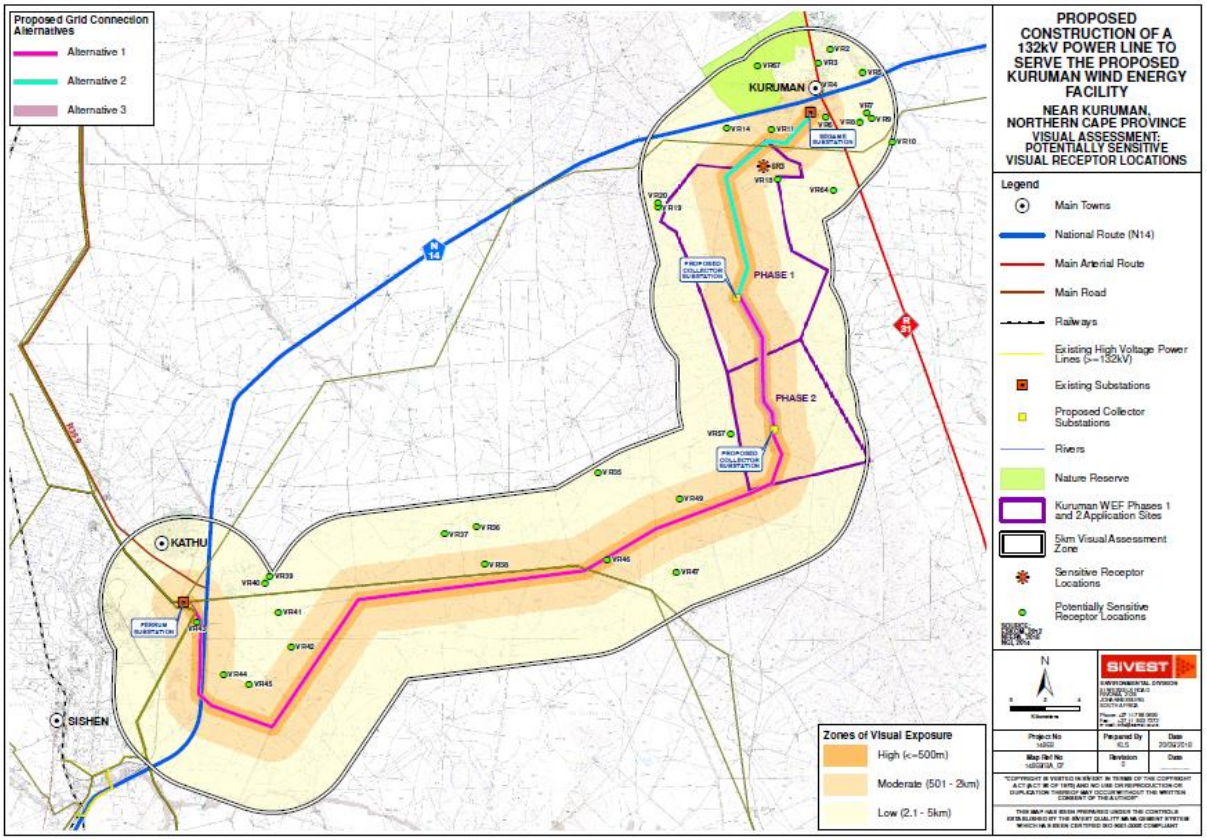

Figure D.12: Potential sensitive visual receptor locations

During the field investigation it was established that the Billy Duvenhage Nature Reserve (VR67), which is situated adjacent to the rural settlement of Budolong in the northern section of the study area, no longer functions as a nature reserve and is severely degraded. The reserve is however still listed in the South African Protected Areas Database (SAPAD 2017) and as such is regarded as a potentially sensitive receptor location.

Several places of interest identified in the towns of Kuruman and Kathu were assessed during the field investigation and subsequently excluded from the list of potentially sensitive receptor locations. These locations were not regarded as sensitive or potentially sensitive to the visual impact of the proposed development due to the existing visual degradation within these built-up areas, especially near the town of Kathu.

Please refer to Section 1.6.2 of the Visual Impact Assessment report for an outline of the visual sensitivity criteria and receptor impact ratings.

D.1.2.3.2 Visual impacts

D.1.2.3.2.1 Impacts Identified for the Construction Phase

D.1.2.3.2.1.1 Visual intrusion and dust emissions

During the construction phase, large construction vehicles and equipment will alter the natural character of the study area and expose visual receptor locations to visual impacts associated with

construction activities. These activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. A network of gravel roads will be required in order to provide access to the proposed power line servitude and substation sites. It is likely that the visual impact associated with these roads would be limited to the impact resulting from the clearing of vegetation. However, if these roads are not maintained correctly during the construction phase, vehicles travelling along these roads could increase dust emissions and create dust plumes. The increased traffic on the gravel roads and the resultant dust plumes could therefore also create a visual impact and may evoke negative sentiments from surrounding viewers. It should however be noted that the majority of the existing roads in the vicinity of the proposed development are also gravel roads and as such, additional gravel access roads are not expected to contribute to the overall visual impact of the proposed development. The visual intrusion of the construction activities associated with the proposed substations and power line could adversely affect farmsteads / homesteads within the visual assessment zone. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. Additionally, the temporary stockpiling of soil during construction may alter the landscape and wind blowing over these disturbed areas could result in dust which would have a visual impact. Vegetation clearance required for the construction of the proposed substations is expected to increase dust emissions and alter the natural character of the surrounding area, thus creating a visual impact.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Carefully plan to reduce the construction period.
- Minimise vegetation clearing and rehabilitate cleared areas as soon as possible.
- Vegetation clearing should take place in a phased manner.
- Maintain a neat construction site by removing rubble and waste materials regularly.
- Make use of existing gravel access roads where possible.
- Limit the number of vehicles travelling to and from the proposed development, where possible.
- If dust plumes become an issue, dust suppression techniques must be implemented on gravel access roads utilised during construction, where possible (unless there are water shortages).
- If dust plumes become an issue, dust suppression must be implemented in all areas where vegetation clearing has taken place (unless there are water shortages).
- Ensure that all soil stockpiles are covered in order to reduce dust.
- Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil.

Significance of impact after mitigation

Low

D.1.2.3.2.2 Impacts Identified for the Operational Phase

D.1.2.3.2.2.1 Alteration of visual character, visual intrusion, dust emissions and light pollution and glare

The proposed development could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive and/or potentially sensitive visual receptor locations to

visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. This is especially true for the power line towers, which are tall structures and will most likely be visible for greater distances. However, where existing power lines are present the visual environment would already be visually 'degraded' and thus the introduction of a new power line in this setting may be considered to be less of a visual impact than if no existing built infrastructure were visible. Security and operational lighting at the proposed substations could result in some light pollution and glare, which could be an annoyance to surrounding viewers, although the anticipated lighting impacts are not expected to be major. The visual intrusion of the proposed development could also adversely affect farmsteads / homesteads within the visual assessment zone.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Where possible, limit the amount of security and operational lighting present at the substations.
- Non-reflective surfaces should be utilised where possible.

Significance of impact after mitigation

Low

D.1.2.3.2.3 Impacts Identified for the Decommissioning Phase

D.1.2.3.2.3.1 Visual intrusion and dust emissions

During the decommissioning phase, large construction vehicles and equipment will alter the natural character of the study area and expose visual receptor locations to visual impacts associated with decommissioning activities. These activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. Gravel roads will be used to gain access to the proposed power line servitude and substation sites and if these roads are not maintained correctly during the decommissioning phase, vehicles travelling along these roads could increase dust emissions and create dust plumes. The increased traffic and the resultant dust plumes could therefore create a visual impact and may evoke negative sentiments from surrounding viewers. The visual intrusion of decommissioning activities associated with the proposed substations and power line could adversely affect farmsteads / homesteads within the visual assessment zone.

Decommissioning activities could also result in surface disturbance which could visually contrast with the surrounding environment. Additionally, the temporary stockpiling of soil during decommissioning may alter the landscape and wind blowing over these disturbed areas could result in dust which would have a visual impact. Any vegetation clearance required for the decommissioning activities is expected to increase dust emissions and alter the natural character of the surrounding area, thus creating a visual impact.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See mitigation measures included in D1.2.3.2.1.

Significance of impact after mitigation

Low

D.1.2.3.2.4 Cumulative Impacts

D.1.2.3.2.4.1 Alteration of visual character, visual intrusion and dust emissions

Large construction vehicles and equipment during the construction phase of the surrounding renewable energy facilities and their associated infrastructure will contribute further to the alteration of the natural character of the study area and will also expose a greater number of visual receptor locations to visual impacts associated with construction activities, especially if some of the construction phases coincide. This is also true for the operational phase as the surrounding renewable energy facilities and their associated infrastructure would alter the visual character of the surrounding area further and expose a greater number of sensitive and potentially sensitive visual receptor locations to visual impacts. The construction and operation activities may be perceived as unwelcome visual intrusions, particularly in more natural undisturbed settings. Vehicles and trucks travelling to and from the proposed development sites during the construction phases on gravel access roads are also expected to result in an increase in dust emissions in the greater area. In addition, maintenance vehicles may need to access the surrounding renewable energy facilities and their associated infrastructure via gravel access roads and are also expected to increase dust emissions in the surrounding area in doing so. The increased traffic on these roads and the dust plumes could create a greater visual impact within the greater area and may evoke more negative sentiments from surrounding viewers. It should however be noted that the majority of the existing roads in the vicinity of the project site are also gravel. As such, the gravel access roads are not expected to contribute significantly to the overall cumulative visual impact. Surface disturbance during construction of the surrounding renewable energy facilities and their associated infrastructure would also result in a greater amount of bare soil being exposed which could result in a greater visual contrast with the surrounding environment. In addition, temporary stockpiling of soil during construction may alter the landscape further. Wind blowing over these disturbed areas could result in a greater amount of dust which would have a visual impact. Security and operational lighting will be required for the operation of the surrounding renewable energy facilities and their associated infrastructure. This could therefore result in a greater amount of light pollution and glare within the surrounding area, which could be a significant annoyance to surrounding viewers.

Significance of impact without mitigation

Moderate

Proposed mitigation measures

No additional mitigation measures are applicable that are not mentioned within the sections above.

Significance of impact after mitigation

Moderate

D.1.2.3.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction Phase		
Visual intrusion and dust emissions	Low	Low
Operational Phase		
Alteration of visual character, visual intrusion, dust emissions and light pollution and glare	Low	Low
Decommissioning Phase		
Visual intrusion and dust emissions	Low	Low
Cumulative impact		
Alteration of visual character, visual intrusion and dust emission	Moderate	Moderate

D.1.2.3.4 Concluding statement

It is SiVEST's opinion that the visual impacts associated with the proposed electricity infrastructure development are of low significance. **From a visual perspective therefore, the project is deemed acceptable and the EA should be granted**. SiVEST is of the opinion that the impacts associated with the construction, operation and decommissioning phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented. No fatal flaws were identified for any of the route alternatives was determined.

D.1.2.4 Heritage

CTS Heritage undertook the required Heritage Impact Assessment (including archaeology and palaeontology) for the Kuruman Transmission Line project.

D.1.2.4.1 Sensitivity of the site in relation to the proposed activity

Archaeology and the built environment

The proposed powerline route is not a sensitive archaeological landscape, despite it crossing several eco-zones. Long stretches of the route, for example, from Bothaskop until the district gravel road, cross mostly flat lands covered in knee high dry grasses and dense Acacia thicket vegetation on a substrate of loose, red sands. Extensive scatters and patches of ironstone gravels occur in places, where only a few isolated tools were noted, but no settlement or occupation sites were located. Indications are that these tools represent mostly discarded flakes and/or flake debris.

The route, from the district gravel road, over the hilltops to Bramcote Farm is also not a sensitive archaeological landscape. Most of the route passes through Woodstock Farm towards the Eskom substation at Kuruman. It crosses flat lands covered in tall dry grasses, with small pockets of dense thicket (Acacia) vegetation (closer to Kuruman), on a substrate of red sands with virtually no surface stone occurring. However, patches and scatters of banded ironstone do occur in places, where a few isolated tools in banded iron stone were identified, however these are mostly discarded flakes and flake debris. Some of these occurrences are located outside of the study area, and were not given GPS locations. It is interesting to note that fine grained CCS / translucent chert flakes were also noted in the powerline route between Hartlands Farm and the Kuruman Eskom substation, and on Bothaskop (located outside of the study area). The archaeological finds within the transmission line route is shown in Figure D.13 below.

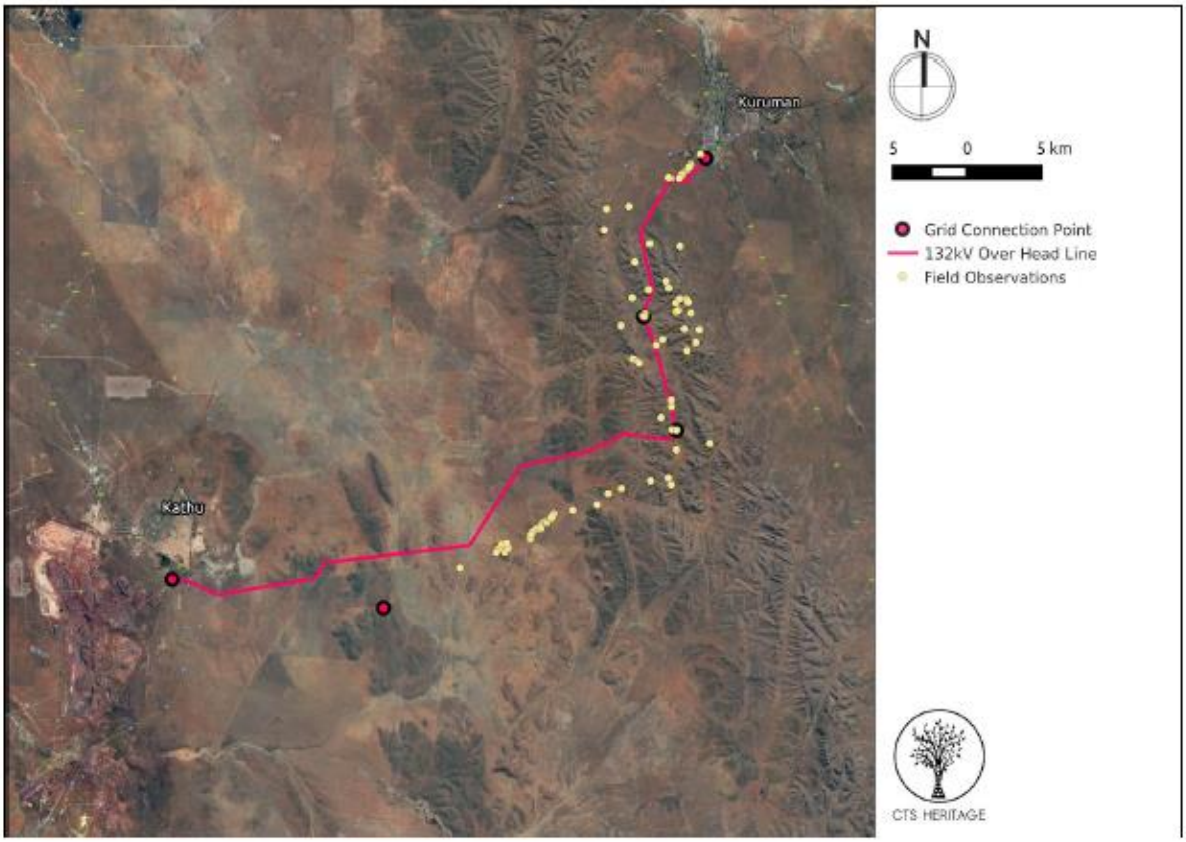

Figure D.13: Map of all archaeological observations in relation to the proposed development

Palaeontology

No palaeontologically-sensitive rock units are traversed by the alternative 132 kV grid connection corridor to the Ferrum Substation near Kathu. No fossil remains were recorded during the field-based assessment of the corridor.

D.1.2.4.2 Heritage impacts

D.1.2.4.2.1 Impacts Identified for the Construction Phase

D.1.2.4.2.1.1 Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces

- Destruction of archaeological artefacts.
- Destruction of pastoralist cultural landscape of heritage and historical significance.
- Destruction of palaeontological material (mainly of Precambrian Stromatolites).
- Destruction of burial grounds and graves, and sacred spaces

Significance of impact without mitigation

Low

Proposed mitigation measures

None required

Significance of impact after mitigation

Low

D.1.2.4.2.2 Impacts Identified for the Operational Phase

D.1.2.4.2.2.1 Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces

- Destruction of archaeological artefacts during operational activities, maintenance or upgrades.
- Destruction of pastoralist cultural landscape of heritage and historical significance.
- A loss of 'sense of place' resulting from the wind turbine placement on the landscape.
- Destruction of palaeontological material (mainly of Precambrian Stromatolites) during operational activities, maintenance or upgrades.
- Limitations regarding access to burial grounds and graves for friends and family

Significance of impact without mitigation

Low

Proposed mitigation measures

None required

Significance of impact after mitigation

Low

D.1.2.4.2.3 Impacts Identified for the Decommissioning Phase

D.1.2.4.2.3.1 Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces

Destruction of heritage resources during decommissioning (archaeological and palaeontological resources).

Significance of impact without mitigation

Low

Proposed mitigation measures

None required

Significance of impact after mitigation

Low

D.1.2.4.2.4 Cumulative Impacts

D.1.2.4.2.4.1 Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces

Please refer to Table 3 included in the Heritage Impact Assessment for a list of the heritage studies undertaken in the area.

Significance of impact without mitigation

Low

Proposed mitigation measures

Careful mapping and avoidance of identified heritage resources must be undertaken

Significance of impact after mitigation

Low

D.1.2.4.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
All Phases		
Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	Low	Low
Cumulative impact		
Destruction of heritage resources including archaeology palaeontology and cultural landscape resources and burial grounds and graves, and sacred spaces	Low	Low

D.1.2.4.4 Concluding statement

Overall, the proposed activity will not directly impact on significant archaeological, palaeontological or built environment heritage. The heritage impact significance is rated as being low. No mitigation is required prior to construction activities occurring. **There is no heritage objection to the proposed development proceeding.**

D.1.2.5 Soils and Agriculture

This section presents the Soil and Agricultural Potential Assessment undertaken by Johann Lanz (an independent consultant).

D.1.2.5.1 Sensitivity of the site in relation to the proposed activity

Agricultural sensitivity is a direct function of the capability of the land for agricultural production. This is because a negative impact on land of higher agricultural capability is more detrimental to agriculture than the same impact on land of low agricultural capability. Also, arable land is a scarce resource in South Africa and is therefore preservation worthy, and as a result has a high sensitivity. Land that is only suitable as grazing land however is not a particularly scarce resource and therefore has a low sensitivity. Because the land is not suitable for cultivation, it has a low agricultural sensitivity to development.

Agricultural sensitivity of a particular development is also a function of the severity of the impact which that development poses to agriculture. In the case of transmission lines, the impact is negligible (see impact assessment section). This even further reduces the agricultural sensitivity of the study area for the proposed development.

Agricultural conditions and potential are fairly uniform across the study area, with variation related to topography. The choice of placement of infrastructure therefore has negligible influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the study area and no parts of it therefore need to be avoided by the development. There are no required buffers.

D.1.2.5.2 Soils and Agriculture impacts

Because of the uniformity of agricultural conditions and the low sensitivity environment, the impact assessment below is applicable to all three alternatives.

D.1.2.5.2.1 Impacts Identified for the Construction and Decommissioning Phases

D.1.2.5.2.1.1 Soil and land degradation caused by construction excavation and vehicle passage.

Land surface disturbance including vegetation removal, vehicle passage and excavation may lead to erosion. However, the environment does not pose a particularly high erosion risk.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Implement an effective system of storm water run-off control, where it is required (It would only be required where land disturbance could potentially lead to run-off accumulation that might then lead to down slope erosion).
- The system should control water movement by means of bunds and ditches, so that it safely disperses and disseminates any run-off accumulation into the veld.

Significance of impact after mitigation

Very Low

D.1.2.5.2.2 Cumulative Impacts

Because of the very low impact of transmission lines on the agricultural environment of the study area, this environment could accommodate many times more transmission lines than currently exist or are ever likely to be proposed, before acceptable levels of change have any likelihood of being exceeded. Acceptable levels of change in terms of other areas of impact such as visual impact would be exceeded long before agricultural levels of change came anywhere near to being exceeded.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See mitigation measures included in Section D.1.2.5.2.1.1.

Significance of impact after mitigation

Very Low

D.1.2.5.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction and Decommissioning Phases		
Soil and land degradation caused by construction excavation and vehicle passage	Low	Very low
Cumulative impact		
Soil and land degradation caused by construction excavation and vehicle passage	Low	Very low

D.1.2.5.4 Concluding statement

Due to the low agricultural potential of the site, and the important fact that transmission lines have such little impact on agriculture, the impact of the development is assessed as very low. **There are therefore no restrictions relating to agriculture which preclude authorisation of the proposed development and therefore, from an agricultural impact point of view, the development should be authorised**. Because of the very low agricultural impact, there are no material differences between the agricultural impacts of any of the alternatives. Therefore, from an agricultural impact perspective, there is no preferred alternative and any of the alternatives is acceptable.

D.1.2.6 Geohydrological Impact Assessment

Geohydrological Assessment that was prepared by Geohydrological and Spatial Solutions International (PTY) Ltd (GEOSS).

D.1.2.6.1 Sensitivity of the site in relation to the proposed activity

GEOSS considered boreholes on the farm portions affected by the two Kuruman WEFs. As such, the discussion below relates to these farm portions and the respective groundwater sensitivities associated with groundwater abstraction on these sites. It is assumed that the water abstracted will be used as part of the construction and decommissioning phases of the Kuruman Transmission Line project as well.

Natural groundwater levels (which range from 14 to 87 metres below ground level) within the study area, do not vary much seasonally. Therefore, groundwater information can be gathered any time, irrespective of the season. Groundwater quality also does not vary significantly temporally or spatially across the study area.

Boreholes located in the fractured aquifer, which forms the greater portion of the study area have similar yields, whereas boreholes located in the karst aquifer environment are highly variable yields.

The boreholes identified on the WEFs are shown in Figure D.14. For more information on the geochemical analysis of the boreholes tested, please refer to Section 1.3.1.5 of the Geohydrological Assessment included in the EIA report.

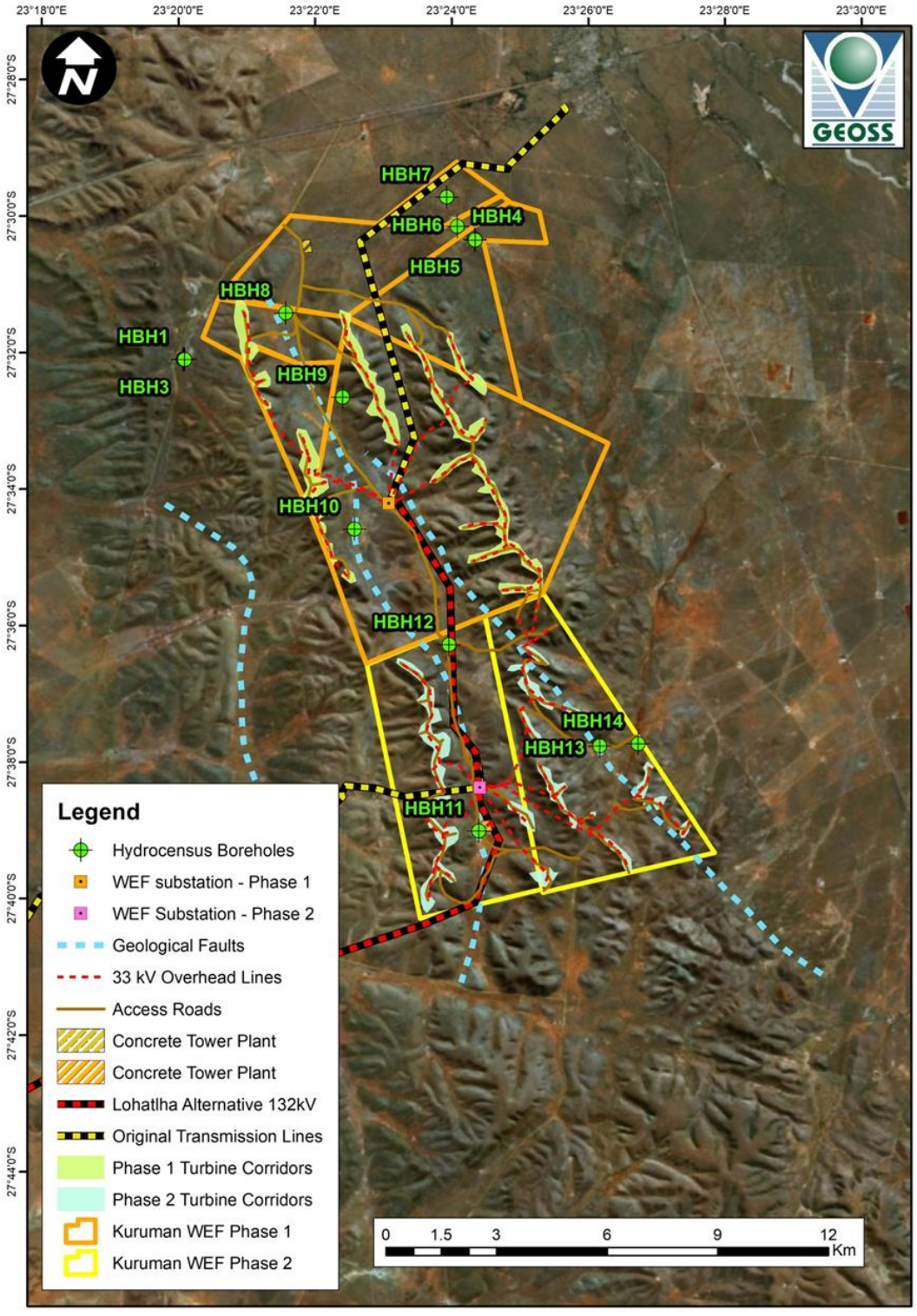

Figure D.14: Location of boreholes identified on the Kuruman WEFs project sites

Geohydrological Characterisation (Aquifer Vulnerability)

The proposed sites for the Kuruman WEFs hosts both a fractured and karst aquifer that possess water bearing properties due to fracturing and dissolution cavities within the rocks respectively. Due to the secondary porosity of these aquifers contaminants may be transmitted at a higher rate, especially for the karst environment. Several methods have been developed to classify an aquifer's vulnerability. The DRASTIC method (Aller *et al*. 1987) has been applied to this study. A national scale map of groundwater vulnerability has been completed for South Africa (DWAF, 2005). The groundwater vulnerability for the study area is shown in Figure D.15. The larger portion of the study area has low groundwater vulnerability to surface based contamination, however the vulnerability is classified as high towards the north-eastern portion of the study area

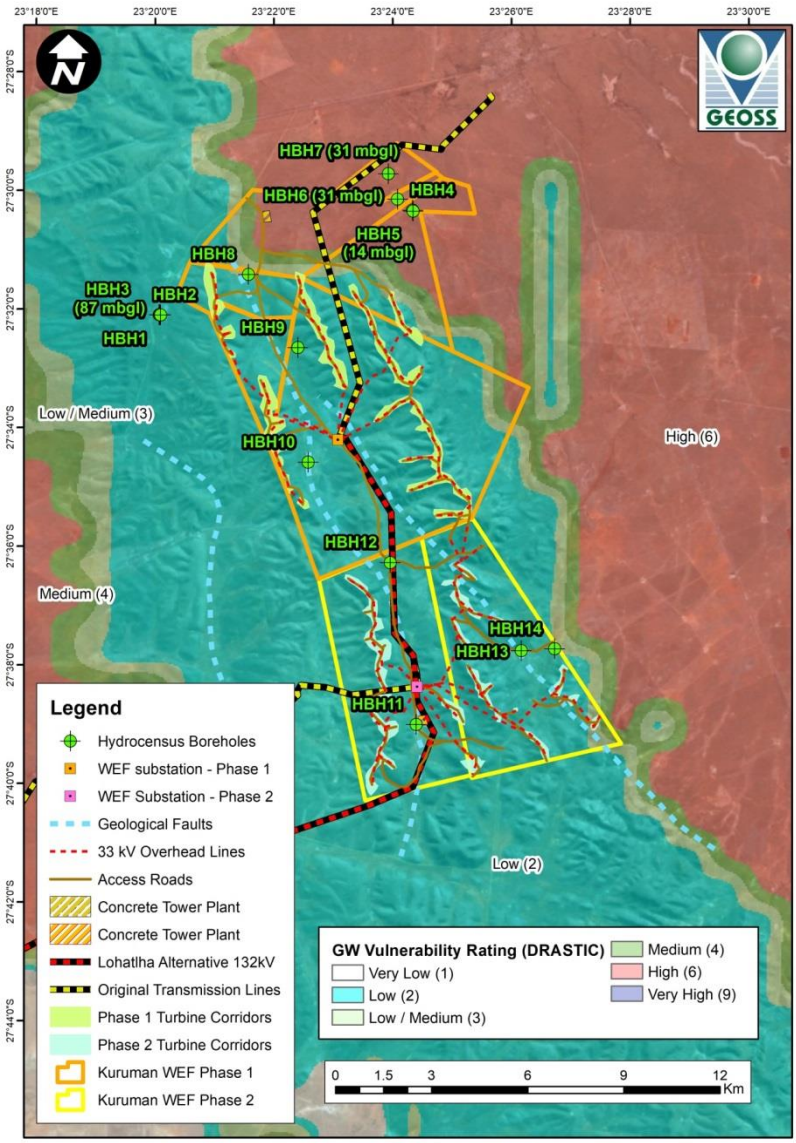

Figure D.15: National groundwater vulnerability (calculated according to the DRASTIC methodology) and boreholes with groundwater level depths (DWAF, 2005)

D.1.2.6.2 Geohydrological impacts

D.1.2.6.2.1 Impacts Identified for the Construction Phase

D.1.2.6.2.1.1 Groundwater impact as a result of groundwater abstraction

Any construction activities such as the excavation and installation of foundations and piling (narrow diameter holes for foundation purposes) will have minimal to no impact on the groundwater of the site or region, as the groundwater level is approximately 15 – 30 mbgl. Even at the peak requirement the proposed groundwater abstraction is very low relative to the aquifer storage and transmissivity.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Adhere to the borehole's safe yield and to monitor water levels and flow.

Significance of impact after mitigation

Very Low

D.1.2.6.2.1.2 Potential Impact on Groundwater Quality as a result of Accidental Oil Spillages or Fuel Leakages

If there is an accidental oil spill or fuel leakage during the construction phase, then the low permeability of the unsaturated zone will provide significant attenuation capacity.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Vehicles must be regularly serviced and maintained to check and ensure there are no leakages. Any engines that stand in one place for an excessive length of time (1-2 months) must have drip trays.
- Diesel fuel storage tanks should be above ground on an impermeable surface in a bunded area. Vehicles and equipment should also be refuelled on an impermeable surface.
- If spillages occur, they should be contained and removed as rapidly as possible, with correct disposal procedures of the spilled material. Proof of disposal (waste disposal slips or waybills) should be obtained and retained on file for auditing purposes
- All reasonable measures must be taken to prevent soil and groundwater contamination.
- Vehicles to be correctly serviced and maintained in a good condition.

Significance of impact after mitigation

Very Low

D.1.2.6.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction Phase		
Potential lowering of the groundwater level	Low	Very Low
Potential impact on groundwater quality as a result of accidental oil spillages or fuel leakages	Low	Very Low

D.1.2.6.4 Concluding statement

It is highly unlikely the proposed Kuruman Transmission Line construction for the Kuruman WEFs will impact on the groundwater resources of the site, especially if all safety and preventative measures are put in place. **From a groundwater impact perspective the Kuruman Transmission Line construction can proceed**.

D.1.2.7 Socio-economic Impact Assessment

Urban-Econ Development Economists (Urban-Econ) undertook the required Socio-Economic Impact Assessment for the proposed Kuruman Transmission Line project.

D.1.2.7.1 Sensitivity of the site in relation to the proposed activity

The socio-economic environment is described in Section B of this BAR and therefore not repeated here.

D.1.2.7.1.1.1 Creation of employment

The construction of electrical and associated infrastructure will require temporary employment of construction workers, foremen, and engineers on-site and long-term operations staff. Considering the current skills profile of the local municipalities, a good portion of the low to semi-skilled jobs are likely to be filled by people from the local communities.

During operations, periodic employment will be required for the maintenance of the servitude. The alternative 1 (56 km) transmission line will require more time for maintenance, while alternatives 2 and 3 will require less maintenance time. This insinuates a higher income prospective in the case that alternative 1 is constructed. In addition to improved standard of living during construction and operations, an improvement in skills will also prevail.

In addition to those benefitting from direct employment created at the project, various multiplier effects will assist in supporting existing jobs in the businesses offering services and goods that will be procured during construction activities. The increased income earned by these businesses will in turn stimulate consumption spending, creating another round of the multiplier effect.

As an enhancement measure, a local skills desk, wherein skills of interested and prospective employees are captured, ought to be implemented. This will assist the HR process of identifying skills at a local level and recruiting at a local level. Therefore, the awareness of the skills desk to the local communities is salient.

Proposed mitigation measures

- Set-up of a skills desk at accessible location. Use skills database to recruit local labour. Offer training to increase local employability.

D.1.2.7.2 Socio-economic impacts

D.1.2.7.2.1 Impacts Identified for the different development phases

D.1.2.7.2.1.1 Stimulation of the local economy

The establishment of the electrical infrastructure will be associated with numerous capital expenses. During construction, expenses would usually include expenditure on transport and electrical and grid connection, foundation, civil works and construction of supporting structures. If goods and services are procured locally, i.e. within South Africa, it increases the production of the respective industries. This has a positive impact on the national economy and economies of the municipalities where inputs are procured.

The size of the Ga-Segonyana LM's economy was estimated at R7 101 million in current prices while that in the Gamagara LM is over double this value. The economies are primarily comprised of mining and financial services sectors. Considering the structure of the local economy, the opportunities for the procurement of goods and services within the local economy will be very limited.

However, given that the Northern Cape has attracted the lion's share of renewable energy projects in the country, it is highly likely that local supply of key components will be established in the province over time. Having said this, it is likely that some of the local businesses will benefit from sub-contracting opportunities, consumer expenditure of the construction crew, and an increase in income of locals who are directly employed in the construction and operation activities or who benefit from the project through local procurement.

The expenditure for Alternative 1 will be the highest given that it is the only layout that connects to both Phase 1 and Phase 2 wind farms, and it covers the longest distance (50km). As a result, the stimulation of the economy will be greater. The expenditure will be relatively less in the other two alternatives due to the electrical infrastructure solely connecting to Phase 1 and the short distance of 14km of the transmission lines. This will have relatively less economic stimulation.

Proposed mitigation measures

- Investigate the prospect of local procurement. Where feasible, procure goods and services from the local municipality.
- Continuously improve and maintain electrical infrastructure to prolong operation span.

D.1.2.7.2.1.2 Potential increase in theft related crimes

The most common incidents in the project area include stock theft, burglary, and theft out of motor vehicle. The construction and operations will create additional movement of people and vehicles to the site, which can also increase the chances of theft along the project path. This negative impact is moderate and can cause the loss of livestock or valuables. To mitigate this potential negative impact, access to the project site should be controlled wherein only authorised staff are permitted entry. Moreover, movement to and from the project site should be controlled wherein construction workers are transported to and from the designated pick up area and project site.

The longer the transmission lines path, the greater the number of farms affected and therefore, the greater the exposure to stock or valuables theft. Therefore, alternative 1 increases the risk due to the higher exposure.

Proposed mitigation measures

- Implement controlled access to project site control movement to and from sites.
- Facilitate set-up of local community safety forum.

D.1.2.7.2.1.3 Potential health risk for employees due to asbestos prevalence in the region

The proposed project is located in close proximity to several rehabilitated, partially rehabilitated and un-rehabilitated asbestos mines, all of which continue to pose health risks to surrounding communities and land uses (Liebenberg-Weyers, 2010). Eleven asbestos mines have been rehabilitated in the Northern Cape since 2008 (Patsy Beangstrom, 2017). Due to the carcinogenic nature of asbestos, numerous diseases can result due to exposure to the asbestos fibres for prolonged periods. Asbestosis is an occupational disease confined to the workplace wherein continuous inhalation of asbestos fibres weakens the lungs. An additional disease linked to asbestos is mesothelioma, which occurs as a result of trivial exposure to asbestos fibres (Journeyman.tv, 2002).

No health statistics in terms of the number of asbestos-related illnesses are available from the local and regional health facilities. However, it is known that South Africa reports an average of 200 cases of mesothelioma per year (Patsy Beangstrom, 2017). Nearly 30% of Mesothelioma cases are tied to environmental exposure, most commonly in the Northern Cape. Even with the last asbestos mine closed, the Northern Cape still faces the challenge of exposure risks from the region's 82 remaining asbestos mines (Patsy Beangstrom, 2017).

For the proposed project, therefore, this is a potential negative impact particularly with respect to the exposure of workers during the construction phase of the electrical infrastructure. From data gathered, it is deduced that prolonged exposure in the area for the workers increases their likelihood of acquiring asbestos-related illnesses (such as asbestosis) but of the risks are reduced as they will not be working within the asbestos mines. All alternatives will be exposed to this health risk as they will follow a route in very close proximity to several un-rehabilitated asbestos mines located south of Kuruman.

Proposed mitigation measures

- Undertake a health risk assessment to quantify the potential risks associated with the possible pollution of the site by asbestos.
- Formulation of an adequate safety and health plan for the employees working on site.

D.1.2.7.2.1.4 Cumulative Impacts

The proposed electrical infrastructure is set to be connected to Kuruman Wind Energy Facility/Facilities. Likewise, the proposed and authorised energy projects will have some form of grid connection. Other constructed and proposed projects in the zone, depending on their timing in relation to the project which is the subject of this impact study, may influence the manifestation and significance of socio-economic impacts that could result from the current project. As such, knowledge of such projects is required in order to accurately predict and rate socio-economic impacts.

The Department of Environmental Affairs and Tourism's guidelines (DEAT, 2004) suggest that the identification of cumulative effects should focus on important and meaningful issues as "it is not practical to analyse the cumulative effects of an action on every environmental receptor". Furthermore, it is advised that the analysis should focus on "what is needed to ensure long-term productivity or sustainability of the resource" (DEAT, 2004).

Considering the above, the expected cumulative impacts assessed are:

- Job creation
- Economic stimulus and GDP growth

D.1.2.7.2.1.4.1 Employment creation due to numerous developments

To conduct and fulfil objectives of all proposed and authorised development, labour will be required. This requirement denotes that employment will be created. The exact number of employment opportunities to be made available by the 20 projects is not known, but it can be stated with confidence that the combined figure would contribute to a notable increase in employment figures. This positive impact can be augmented in the case that the majority of labour is sourced locally, which could then assist in reducing the 35% unemployment rate in the Ga-Segonyana and improving 13% unemployment rate in Gamagara.

Proposed mitigation measures

- Offer skills development programme to serve energy market in region and create local employability

D.1.2.7.2.1.4.2 Stimulation of economy due to capital expenditure from projects

The injection of investment from all proposed projects will have a multiplier effect on the economy, wherein numerous economic sectors such as the transport and manufacturing will benefit. The combined expenditure will be notable and will have a notable impact on GDP and production. Local business will not have the capacity to supply all required services and materials; therefore, the local economies will only benefit to a limited extent.

- Procure goods and services, as far as practically possible, from the local municipality.

D.1.2.7.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction Phase		
Increase in production and GDP-R	Low (+)	Low (+)
Temporary employment creation	Very low (+)	Very low (+)
Increase in theft related crimes	Low	Very low
Potential health risks for employees due to asbestos prevalence	Very low	Very low
Operational Phase		
Long term employment creation	Very low (+)	Very low (+)
Decommissioning Phase		
Local Economy stimulation	Very low (+)	Very low (+)
Temporary employment creation	Very low (+)	Very low (+)
Cumulative impact		
Employment creation	Moderate (+)	Moderate (+)
Stimulation of Economy	High (+)	High (+)

D.1.2.7.4 Concluding statement

From a socio-economic perspective therefore, no objections are made with regard to the proposed project. Furthermore, considering the nature of the alternatives either of the options could be developed to evacuate power from the operating wind farms, provided that the developer takes into account the concerns and preferences of the affected land owners during construction

and servitude maintenance periods, as well as ensuring that an appropriate health risk prevention plan is devised to be implemented during construction and maintenance periods.

D.1.2.8 Transportation

JG Afrika undertook the Transportation Study to identify the traffic related impacts associated with the development of the Kuruman WEF.

D.1.2.8.1 Transportation impacts

D.1.2.8.1.1 Impacts Identified for the Construction Phase

D.1.2.8.1.1.1 Dust and noise pollution

Construction related traffic including transportation of people, construction materials, water and equipment to the site (Abnormal trucks delivering substation components to the site). This phase also includes the grading and dust suppression (by water truck) of roads, excavations of footings, trenching for electrical cables and other ancillary construction works that will temporarily generate traffic. The construction phase traffic, however, is regarded as low.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Dust suppression as required.
- Regular maintenance of gravel roads by Contractor, as required.
- The delivery of electrical infrastructure components to the site can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- The use of mobile batch plants and quarries (stone/sand for concrete and gravel for backfilling) in close proximity to the site would decrease the impact on the surrounding road network.
- Staff and general trips should occur outside of peak traffic periods.

Significance of impact after mitigation

Low

D.1.2.8.1.2 Impacts Identified for the Decommissioning Phase

D.1.2.8.1.2.1 Dust and noise pollution

Construction related traffic including transportation of people, construction materials, water and equipment (abnormal trucks transporting components). The generated traffic, however, will be lower than the construction phase traffic and the impact on the surrounding road network will be low.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Dust suppression as required.
- Regular maintenance of gravel roads by Contractor, as required.
- Removal of electrical infrastructure components can be staggered and trips can be scheduled to occur outside of peak traffic periods.
- Staff and general trips should occur outside of peak traffic periods as far as possible.

Significance of impact after mitigation

Low

D.1.2.8.1.3 Cumulative Impacts

The construction and decommissioning phases are the only traffic generators. The duration of these phases is short term i.e. the impact of the traffic on the surrounding road network is temporary and WEF and the associated electrical infrastructure, when operational, do not add any significant traffic to the road network.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See mitigation measures included in Section D.1.2.8.1.3

Significance of impact after mitigation

Very Low

D.1.2.8.2 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction and Decommissioning Phases		
Dust and noise pollution	Low	Low
Cumulative impact		
Dust and noise pollution	Low	Low

D.1.2.8.3 Concluding statement

The construction and decommissioning phases are the only traffic generators and therefore noise and dust pollution will be higher during these phases. **The development is supported from a transport perspective provided that the recommendations and mitigations are adhered to.**

D.1.2.9 Terrestrial Ecology Impact Assessment

3Foxes Biodiversity Solutions was appointed to undertake the Terrestrial Biodiversity Study of the development as part of the EIA process. The study summarised below is based on the draft Terrestrial Biodiversity Study. The final study will be included in the Final BA Report and any significant changes to the report will be highlighted.

D.1.2.9.1 Sensitivity of the site in relation to the proposed activity

The ecological sensitivity map for the study area is illustrated below in Figure D.16. The majority of the routes are within areas of natural vegetation that are considered medium low sensitivity, with occasional areas of medium and medium high sensitivity areas associated with rocky hills or areas of high protected tree density. Alternative 2 is restricted to the low-lying areas the lower foothills of the Kuruman WEF 1 area and the only feature of significance along the route are some areas of high *Acacia erioloba* density. Similarly, Alternative 3, the link from Kuruman WEF 1 to Kuruman WEF 2 is restricted largely to the low lying areas with occasional stretches of high tree density. Alternative 1 is the longest and as a result, has the highest diversity of features. There are a few short sections of high sensitivity areas along this route, the wetland area within Lohatla in particular as well as some steep section of rocky hills towards the Kuruman WEF 2 area. Overall, the power line routes are well-directed within the lower sensitivity areas and no significant changes to the routing can be recommended.

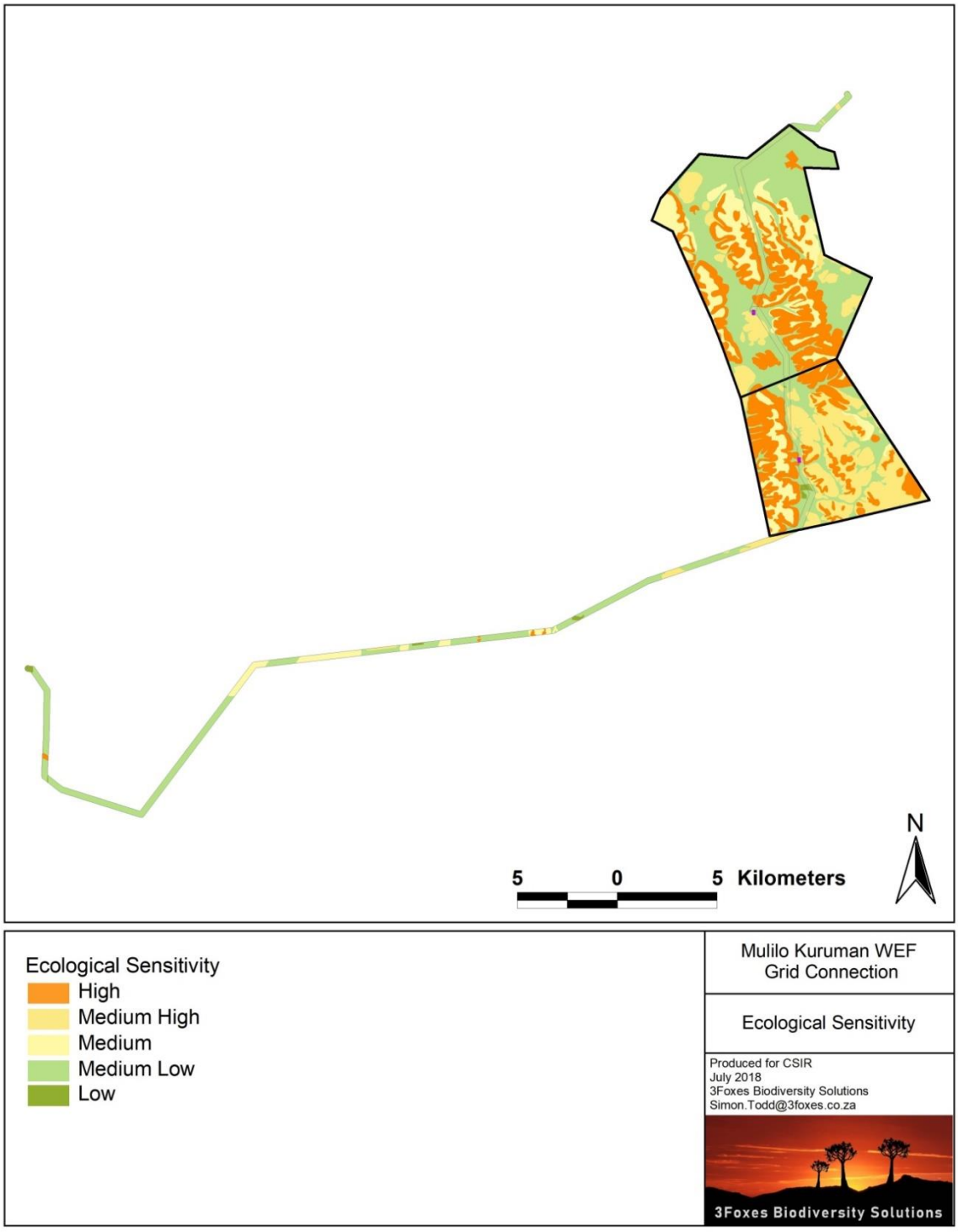

Figure D.16: Ecological sensitivity map for the grid connection corridor. The routes generally stick to the lower lying areas which are mostly considered medium low or medium sensitivity.

D.1.2.9.2 Terrestrial ecology impacts

D.1.2.9.2.1 Impacts Identified for the Construction Phase

D.1.2.9.2.1.1 Impacts on vegetation and plant species of conservation concern

The abundance of plant species of concern at the site is very low, although there are three protected tree species present that would be impacted by the development to a greater or lesser degree. It is likely that several hundreds or more *Acacia erioloba* and *Acacia haematoxylon* trees would be affected by the development, especially Alternative 1, given its length.

Significance of impact without mitigation

Moderate

Proposed mitigation measures

- No development of the transmission line, roads of other infrastructure within identified no-go (high sensitivity) areas.
- Avoid impact to the wetland features within Alternative 1's routing.
- Pre-construction walk-through by a qualitied terrestrial ecologist of the development footprint to further refine the pylon positions and further reduce impacts on sensitive habitats and protected species through micro-siting of the pylons and service roadsImplement an effective system of storm water run-off control, where it is required (It would only be required where land disturbance could potentially lead to run-off accumulation that might then lead to down slope erosion).
- The stormwater system should control water movement by means of bunds and ditches, so that it safely disperses and disseminates any run-off accumulation into the veld.

Significance of impact after mitigation

Very Low

D.1.2.9.2.1.2 Direct and indirect faunal impacts

The construction of the development will result in some habitat loss, noise and disturbance along the route. This will lead to direct and indirect disturbance of resident fauna. Some slow-moving or retiring species such as many reptiles would likely not be able to escape the construction machinery and would be killed. There are also several species present at the site which are vulnerable to poaching and there is a risk that these species may be targeted. This impact would be caused by the presence and operation of construction machinery and personnel on the site. This impact would however be short-lived and restricted to the construction phase, with significantly lower levels of disturbance during the operational phase.

Significance of impact without mitigation

Moderate

Proposed mitigation measures

- Avoidance of identified areas of high fauna importance.
- Search and rescue for reptiles and other vulnerable species during construction, before areas are cleared.

- Limiting access to the site and ensuring that construction staff and machinery remain within the demarcated construction areas during the construction phase.
- Environmental induction for all staff and contractors on-site.

Significance of impact after mitigation

Low

D.1.2.9.2.2 Impacts Identified for the Operational Phase

D.1.2.9.2.2.1 Increased Alien Plant Invasion

There are already several alien species present on the site such as *Prosopis glandulosa* disturbance created during construction would leave the site vulnerable to further alien plant invasion, especially along the access roads and other areas which receive additional run-off from the hardened surfaces of the development.

Significance of impact prior to mitigation

Moderate

Mitigation measures

- Alien management plan to be implemented during the operational phase of the development, which makes provision for regular alien clearing and monitoring.
- Rehabilitation of disturbed areas that are not regularly used after construction.

Significance of impact post mitigation

Low

D.1.2.9.2.2.2 Increased Soil Erosion

Parts of the route are on steep slopes or sandy soils that are vulnerable to erosion and the disturbance created will increase erosion risk at the site and specific mitigation would be required to manage erosion risk in these vulnerable areas.

Significance of impact prior to mitigation

Moderate

Mitigation measures

- Avoiding areas of high erosion vulnerability as much as possible.
- Using barriers, geotextiles, active rehabilitation and other measures during and after construction to minimise soil movement at the site.

Significance of impact post mitigation

Low

D.1.2.9.2.2.3 Operational Impacts on Fauna

Maintenance activities along the power line route may deter some sensitive fauna from the area or impact directly on wildlife within the servitude.

Significance of impact prior to mitigation

Low

Mitigation measures

- Open space management plan for the development, which makes provision for favourable management of the facility and the surrounding area for fauna.
- Limiting access to the site to staff and contractors only.
- Appropriate design of roads and other infrastructure where appropriate to minimise faunal impacts and allow fauna to pass through or underneath these features.
- No electrical fencing within 30 cm of the ground as tortoises become stuck against such fences and are electrocuted to death.

Significance of impact post mitigation

Low

D.1.2.9.2.2.4 Impacts on Critical Biodiversity Areas and ESAs

A part of the power line to the Moffat Substation is within a CBA 2 while large sections of the routes are within Ecological Support Areas. With mitigation, a long-term significant impact on CBAs and ESAs is not likely. As such impacts on CBA, ESAs and associated ecological processes are considered to be low.

Significance of impact prior to mitigation

Low

Mitigation measures

- Minimise the development footprint as far as possible in previously disturbed areas.
- Avoid impact to restricted and specialised habitats such as large rocky outcrops.

Significance of impact post mitigation

Low

D.1.2.9.2.3 Impacts Identified for the Decommissioning Phase

D.1.2.9.2.3.1 Increased Soil Erosion

As already described, the site has steep slopes that are vulnerable to erosion. Decommissioning will remove the hard infrastructure from the site, generating disturbance and leaving areas that are unvegetated and vulnerable to erosion.

Significance of impact prior to mitigation

Moderate

Mitigation measures

- Revegetation of cleared areas with monitoring and follow-up to ensure that rehabilitation is successful.
- Using net barriers, geotextiles, active rehabilitation and other measures during and after decommissioning to minimise sand movement at the site.

Significance of impact post mitigation

Low

D.1.2.9.2.4 Increased Alien Plant Invasion

There are already some alien species present on the site such as *Prosopis* and disturbance created during decommissioning would leave the site vulnerable to further alien plant invasion.

Significance of impact prior to mitigation

Moderate

Mitigation measures

- Alien management plan to be implemented during the decommissioning phase of the development, which makes provision for regular alien clearing and monitoring for up 5 years after decommissioning.
- Rehabilitation of disturbed areas that have been generated by decommissioning.

Significance of impact post mitigation

Low

D.1.2.9.3 Cumulative Impact

D.1.2.9.3.1 Cumulative habitat loss and impact on broad-scale ecological processes

There are several other renewable energy developments in the wider area and along with the current development, these would contribute to cumulative impacts on habitat loss and fragmentation and negative impact on broad-scale ecological processes such as dispersal and climate change resilience. However, not all of the developments in the area would impact on the same ridge habitat as the current development and overall, the current levels of cumulative development impact in the wider area is relatively low.

Significance of impact prior to mitigation

Moderate

Mitigation measures

- Minimise the current development footprint as much as possible and rehabilitate cleared areas after construction.
- Ensure that management of the transmission line occurs in a biodiversity-conscious manner in accordance with an open-space management plan for the facility.

Significance of impact post mitigation

Low

D.1.2.9.4 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction Phase		
Impacts on vegetation and protected tree species	Moderate	Low
Direct and indirect faunal impacts	Moderate	Low
Operational Phase		
Increased soil erosion	Moderate	Low
Increased alien plant invasion	Moderate	Low
Impacts on fauna due to operation	Low	Low
Impacts on CBA and ESAs	Low	Low
Decommissioning Phase		
Increased alien plant invasion	Moderate	Low
Increased soil erosion	Moderate	Low
Direct and indirect impacts on fauna	Moderate	Low
Cumulative impact		
Habitat loss and broad-scale ecological processes	Moderate	Low

D.1.2.9.5 Concluding statement

Overall, the three alternatives for the Kuruman WEF Grid Connection are likely to generate low impacts on fauna and flora and no high residual impacts on any species or habitats is likely. **As a result, the development of either of the power line alternatives can be supported from a terrestrial ecology perspective and are not opposed**.

D.1.2.10 Bat Impact Assessment

Inkululeko Wildlife Services (Pty) Ltd (IWS) to provide the bat specialist input. Whilst a bat specialist assessment is not required for input into all transmission line EA processes, there are certain development triggers for bat specialist assessments according to the South African Bat Assessment Association (SABAA). Due to the fact that the Kuruman area has extensive underlying dolomite geology (known for cave formation), the transmission line crosses over rocky outcrops and there is a known bat roost within 1.5 km of the Moffat substation and another within 25 km of the transmission line routed to the Ferrum substation, the triggers for the Kuruman project are as follows:

- Potential disturbance or destruction of cave-type roosts, abandoned or defunct mines or underground structures and/ or natural cave systems
- Potential disturbance within 500 m of the above. Please note: this is a minimum distance and the specialist may need to assess a bigger area, depending on the size of the roost and the type of the development.
- Potential disturbance or destruction of natural rocky outcrops.
- The transmission line corridor may also intersect foraging areas of the cave roosting bats or migration routes of the cave roosting bats.

D.1.2.10.1 Sensitivity of the site in relation to the proposed activity

Buffer zones

SABAA recommends a minimum 200 m buffer around all potentially important bat features including e.g., rocky ridges and outcrops, delineated watercourses, woody vegetation (aloes and trees including alien bush clumps), protected areas (as defined by NEM:PA (Act 57 of 2003) and built structures (e.g., mine adits, farm buildings, bridges and water towers) for any development.

For transmission lines: No transmission line infrastructure should be constructed within 2 km of any large known confirmed roosts and 500 m from smaller confirmed roosts. However, transmission lines can cross bat important foraging areas such as freshwater features, as long as all the other water use license mitigation measures are in place in the case of wetlands and rivers.

Appropriate site-specific buffers need to be selected by a qualified specialist for bat conservation important habitat (whether it is for foraging or roosting) that will meet the requirements of the particular species or populations occurring in the area

D.1.2.10.2 Bat impacts

Using data gathered from the desktop review and from on the ground field assessment, a sensitivity map was constructed for the transmission line corridor using the features and buffers specified in Table D.3. The resulting sensitivity map is shown in Figure D.17.

Table D.3: Bat Sensitivity Map Features for the Kuruman Phase 1 and Phase 2 Transmission Lines

Feature	Feature Sensitivity	Feature Buffer 1	Buffer 1 Sensitivity	Feature Buffer 2	Buffer 2 Sensitivity
All Old Mines	Medium-High	500 m	Medium-High	2000 m	Medium
All Dams, Wetlands, Rivers (perennial and non-perennial), Waterpoints and Reservoirs (please use the attached site-specific wetlands and rivers rather than the generic ones. However, please keep all dams, water points and resevoirs).	High for the feature and 32m buffer	200 m on top of the 32m buffer	Medium-High	2000 m	Medium
Rocky Areas/ Rocky Outcrops	Medium-High	500 m	Medium-High	2000 m	Medium
Homesteads/ Town Edges/ Sub-stations/ Stone Ruins/ Farm Buildings	Medium-High	500 m	Medium-High	2000 m	Medium
Eye of Kuruman	Medium-High	200 m	Medium-High	2000 m	Medium
Wonderwerk Cave	Medium-High	200 m	Medium-High	2000 m	Medium
Boesmansgat Cave	Medium-High	500 m	Medium-High	2000 m	Medium
Blinkklip Cave	Medium-High	500 m	Medium-High	2000 m	Medium
Soetfontein Cave	High	2000 m	High	10000 m	Medium
Dolomite Geology	Medium-High	500 m	Medium-High	10000 m	Medium

Protocol for areas of bat sensitivity

Table D.4: Protocol for varying levels of Bat Sensitivity

Sensitivity	Description and Protocol
High	High sensitivity areas were considered to have high roosting and/ or foraging potential. These areas are potentially unsuited to development owing to the High bat importance. Overhead transmission lines may cross overhead of linear wetlands and rivers, as long as no ground infrastructure such as pylons, lay-down areas, sub-stations or construction camps occur within these areas. All other areas of High bat sensitivity, especially roosts and their associated High sensitivity buffers should be avoided.
Medium-High	Medium-High sensitivity areas have potential for medium-high significance impacts and should be avoided, where possible. Overhead transmission lines may cross overhead of these areas. Where possible, ground infrastructure such as pylons, sub-stations or construction camps should avoid these areas. The exception would be for safety reasons in terms of pylon spacing.
Medium	Medium sensitivity areas were considered to have medium roosting and/ or foraging potential. These areas are potentially suitable for development, but low significance impacts may occur.
Low	Low sensitivity areas were all remaining areas and were considered to have low roosting and/ or foraging potential and no known occurrence of conservation important species. Impacts on bats in these areas are unlikely. These areas are the most suitable for development

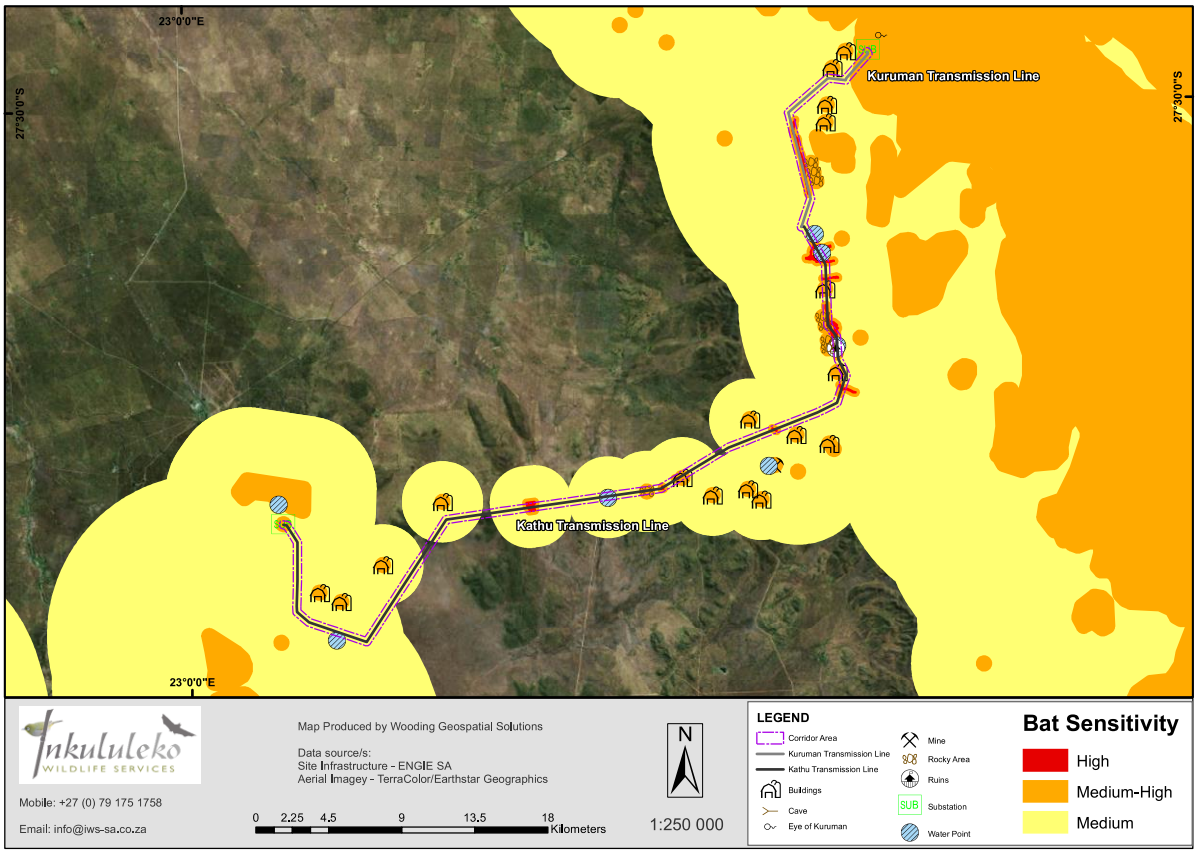

Figure D.17: Sensitivity Map for the Phase 1 and Phase 2 WEF Transmission Lines showing Features

D.1.2.10.2.1 Impacts Identified for the Construction and Decommissioning Phases

D.1.2.10.2.1.1 Disturbance to and destruction of bat foraging habitat

Bats forage over very large distances and migrate over even further distances, therefore, it is not only direct roost disturbance we are concerned about but foraging area and migration route disturbance. For example, the Natal Long-fingered Bat has been cited to travel up 22 km during a night's foraging and is known to migrate up to 260 km (Van der Merwe, 1975) between summer maternity caves and winter hibernation caves in South Africa. In Europe, bats have been reported to migrate from tens of km to up to 4000 km (Jones *et al*. 2009).

Construction activity footprint disturbance to and destruction of bat foraging or migration habitat, such as natural bushveld, thornveld, rocky ridges, open water and wetlands. South Africa and African species may do similar but the research is not available.

<u>Significance of impact without mitigation</u>

Moderate

<u>Proposed mitigation measures</u>

- See Protocol for Bat Sensitivity.
- Consult with a bat specialist during the design and construction phases.

Significance of impact after mitigation

Low

D.1.2.10.2.1.2 Disturbance to and destruction of bat roosts

Disturbance to and destruction of bat roosts. No large bat roosts occur along the transmission line corridor, however, if trees are removed or buildings disturbed, this could impact on smaller roosts. Dust and construction noise vibrations also can disturb or scare bats.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See Protocol for Bat Sensitivity.
- If any trees or buildings are demolished along the route, these should be thoroughly inspected for bat presence. If bats are present, they should be chased away before demolition. Each tree and/or building should be replaced with a bat box in an area near water and not intended for future development (contact: http://ecosolutions.co.za/products-services/bat-boxes).

Significance of impact after mitigation

Very low

D.1.2.10.2.1.3 Disturbance to foraging areas and small roosts will scare bats away from the area

Loss of ecosystem services offered by the bats and other possible unknown indirect impacts.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See Protocol for Bat Sensitivity

Significance of impact after mitigation

Very low

D.1.2.10.2.2 Impacts Identified for the Operational Phase

D.1.2.10.2.2.1 Electromagnetic radiation emissions from the transmission lines

No studies on the health effects of electromagnetic radiation on bats are available. Studies on humans to short-term exposure yield no clear health exposure-response (ICNIRP, 1998). Exposure to electromagnetic radiation has shown behavioural effects on bats and rats (Nicholls & Racey, 2007; Nicholls & Racey, 2009).

Significance of impact without mitigation

Moderate

Proposed mitigation measures

- See Protocol for Bat Sensitivity

Significance of impact after mitigation

Very Low

D.1.2.10.2.2.2 Collision with transmission lines and associated infrastructure

According to the IFC (2007), the combination of the height of transmission towers and distribution poles and the electricity carried by transmission and distribution lines can pose potentially fatal risk to birds and bats through collisions and electrocutions. Bats colliding with lines or pylon infrastructure is possible where high densities of bats occur, especially at roost exists, but information on this in SA is lacking.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See Protocol for Bat Sensitivity

Significance of impact after mitigation

Very Low

D.1.2.10.2.2.3 Electrocution of bats at sub-stations

According to the IFC (2007), the combination of the height of transmission towers and distribution poles and the electricity carried by transmission and distribution lines can pose potentially fatal risk to birds and bats through collisions and electrocutions. Whilst electrocution from the actual transmission lines may only affect fruit bats in SA (no evidence from SA, only from Malawi, Zambia and possibly Windhoek) where parallel power lines are closely spaced or sagging of lines has occurred, it is unlikely to affect insectivorous bats due to their small size. However, electrocution at the sub-stations is possible for bats seeking roosts.

Significance of impact without mitigation

Low

Proposed mitigation measures

- Make sure that sub-stations are bat-friendly. i.e. there should be no opportunity for roosting – no small gaps between electrical infrastructure and in roofs and buildings.
- No hanging spaces.
- High fencing to avoid fly throughs.

Significance of impact after mitigation

Very Low

D.1.2.10.2.2.4 Disturbance to foraging areas and small roosts, causing loss in bats from the area.

Loss of ecosystem services offered by the bats and other possible unknown indirect impacts.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See Protocol for Bat Sensitivity

Significance of impact after mitigation

Very low

D.1.2.10.2.3 Cumulative Impacts

Additive disturbance impact to foraging areas and potentially to roosts, in addition to existing transmission lines in the area, the proposed wind turbines and operational buildings.

This project may cause some impacts to bats which are already at risk due to other activities in the area. Such other impacts, which are considered of a higher significance for bats, include roost disturbance (clearing of trees for mining, closing of defunct mine shafts, human activities in caves and old mines), habitat decline (mining, wind energy, housing, litter all contribute to habitat decline in the greater area) and wind energy (bats are directly killed by wind turbines (Arnett and Baerwald, 2013; MacEwan, 2016) and the adjacent Kuruman WEFs will be no exception)).

D.1.2.10.2.3.1 Adding transmission lines to an area that already has several transmission lines and proposed wind turbines will create cumulative impacts

Land surface disturbance including vegetation removal, vehicle passage and excavation may lead to erosion. However, the environment does not pose a particularly high erosion risk.

Significance of impact without mitigation

Moderate

Proposed mitigation measures

- See Protocol for Bat Sensitivity
- Operational mitigation to be applied to wind turbines.
- All other mitigation measures recommended above in this report to be implemented.

Significance of impact after mitigation

Very Low

D.1.2.10.2.3.2 Bat disturbances and fatalities

Bat population declines and loss of ecosystem services offered by the bats and other possible unknown indirect impacts.

Significance of impact without mitigation

Low

Proposed mitigation measures

- See Protocol for Bat Sensitivity
- Operational mitigation to be applied to wind turbines.
- All other mitigation measures recommended above in this report to be implemented.

Significance of impact after mitigation

Very Low

D.1.2.10.3 Impact Assessment Summary

Impact	Before mitigation	After mitigation
Construction and Decommissioning Phases		
Disturbance to and destruction of bat foraging habitat	Moderate	Low
Disturbance to and destruction of bat roosts	Low	Very low
Disturbance to foraging areas and small roosts will scare bats away from the area.	Low	Very low
Operational Phase		
Electromagnetic radiation emissions from the transmission lines	Low	Very low
Collision with transmission lines and associated infrastructure	Low	Very low
Electrocution of bats at sub-stations	Low	Very low
Disturbance to foraging areas and small roosts, causing loss in bats from the area	Low	Very low
Cumulative impact		
Adding transmission lines to an area that already has several transmission lines and proposed wind turbines will create cumulative impacts	Moderate	Low
Bat disturbances and fatalities	Low	Very low

D.1.2.10.4 Concluding statement

If all the mitigation and management measures described in the Bat Impact Assessment Report are implemented, the residual impacts will likely be low and IWS does not object to the project. There are greater cumulative threats to bats in the area due to proposed wind energy developments, large scale mining operations and general habitat degradation.

D.1.2.11 Environmental sensitivity map

Based on the specialist studies undertaken and the results of the field studies, all features identified on site are shown in Figure D.18. The respective features identified vary in sensitivity to the proposed development. The sensitivities informed whether the Kuruman Transmission Line may be developed within and/or close to these features and informed the preferred routing alternative (discussed below).

D.1.2.12 Preferred connectivity and routing alternatives

Technical considerations

In terms of the preferred connectivity option, this would be determined by whether one or both the Kuruman WEFs (Phases 1 and 2) are realised. Should both projects be commissioned, then from a technical perspective, Alternative 1 would be the preferred option. This is because the Ferrum substation has confirmed capacity to enable the evacuation of the electricity generated by both facilities. Should only one project proceed, then depending on whether Phase 1 or Phase 2 proceeds, Alternative 2 or 3 would be the preferred alternative. The EIAs for the Kuruman WEFs are currently underway (September 2018). Should these projects receive EA, then they may be bid in the next Renewable Energy Independent Power Producer Programme (REIPPPP). Due to the uncertainty regarding whether both these projects will realise, the best-case outcome is currently being planned for and therefore, from a technical perspective, Alternative 1 is the preferred connectivity option.

Environmental considerations

When considering environmental impacts, none of the alternatives considered is deemed to be fatally flawed (i.e. have high negative impacts following the implementation of mitigation measures). Alternative 1, due to its length of 50 km compared to Alternative 2 of 14 km and 3 of 30 km, would traverse more features which means that its likelihood of impacting on the environment would be higher. The terrestrial specialist found that "*Alternative 1 is the longest and as a result, has the highest diversity of features. There are a few short sections of high sensitivity areas along this route, the wetland area, in particular, as well as some steep section of rocky hills towards the Kuruman WEF 2 area. Overall, the power line routes are well-directed within the lower sensitivity areas and no significant changes to the routing can be recommended*". However, none of the specialist studies indicated a preference for a specific connectivity option. All impacts identified by the specialists found that following the implementation of mitigation measures, the impacts would be reduced to low or very low.

Given that there is not a clear preference of an alternative based on environmental considerations, the preferred connectivity alternative is Alternative 1.

Within Alternative 1, the preferred routing was informed by the various specialist studies recommendations, these include:

- Freshwater: the significant distance of ephemeral drainage line habitat which will be traversed by the alternatives (Alternative 1 and 3) is largely attributed to a significant portion of each Alternative which will traverse an extended area through an ephemeral drainage line (wash) where no existing gravel access roads are present (Figure D.10). A new jeep service track will therefore need to be established through this area. An existing gravel access road is however located to the west of the ephemeral drainage line and it is therefore highly recommended that the transmission line and service roads follow this existing access road in order to reduce the impact to surrounding ephemeral drainage line habitat.

- Terrestrial ecology: avoid impact to the wetland features within the routing of Alternative 1.

- Bats: High sensitivity areas were considered to have high roosting and/or foraging potential. These areas are potentially unsuited to development owing to the High bat importance. Overhead transmission lines may cross overhead of linear wetlands and rivers, as long as no ground infrastructure such as pylons, lay-down areas, sub-stations or construction camps occur within these areas. All other areas of High bat sensitivity,

especially roosts and their associated High sensitivity buffers should be avoided. Medium-High sensitivity areas have potential for medium-high significance impacts and should be avoided, where possible. Overhead transmission lines may cross overhead of these areas. Where possible, ground infrastructure such as pylons, sub-stations or construction camps should avoid these areas. The exception would be for safety reasons in terms of pylon spacing.

Given the above considerations, the line routing has been amended to follow the existing gravel road (shown in the insert A in the figure below), as per the freshwater study's recommendation. The wetland feature identified by the terrestrial specialist is shown in the insert B in the figure below. The avifaunal specialist also identified this feature as having a high sensitivity. No pylons may be placed within this feature and bird flight diverters may need to be installed, following the final walk through by the avifaunal specialist.

The line routing and placement of the proposed switching station, however, does not adhere to the bat specialist's recommendations within insert A in the figure below. The line routing and the switching station are proposed within an area identified as a high bat sensitivity area that should be avoided by ground infrastructure. The key reason for the placement of the switching station, transmission line and pylons within this area is due to the fact that the switching station must be located directly adjacent to the WEF's substation to enable the evacuation of the electricity produced by the WEF. The WEF substation was considered as part of a separate EIA process undertaken for the Kuruman Phase 2 WEF and was determined to be acceptable in terms of impacts on the receiving environment. The line must be routed to the switching station and the pylon placement will occur within this area due to safety requirements in terms of spacing between pylons. Therefore, within this area, the bat impacts (discussed in Section D.1.2.10.2) identified by the bat specialist will remain unmitigated and the impact significance ratings prior to the implementation of mitigation measures (Moderate and Low) will apply to this assessment. The single Moderate impact of "disturbance to and destruction of bat foraging habitat" is likely to occur during the construction and decommissioning phases. However, as indicated in the paragraph above, the line routing and associated pylon placement will follow the existing gravel road, an already disturbed area and the feature impacted on within these areas are A Section channels. The freshwater specialist indicated that "*A sections are those headward channels that are situated well above the zone of saturation at its highest level and because the channel bed is never in contact with the zone of saturation, these channels do not carry baseflow. They do however carry storm runoff during fairly high rainfall events but the flow is of short duration because there is no baseflow component (DWAF, 2005). Many of these channels are located at gradients too steep to allow deposition of alluvial soil or overtopping of banks which in turn would be conducive of the formation of riparian zones*". It is therefore anticipated that these channels will mostly not contain water which will mean that the foraging potential of these systems may potentially be lower. All measures proposed by the freshwater specialist to maintain the integrity of these systems must be implemented.

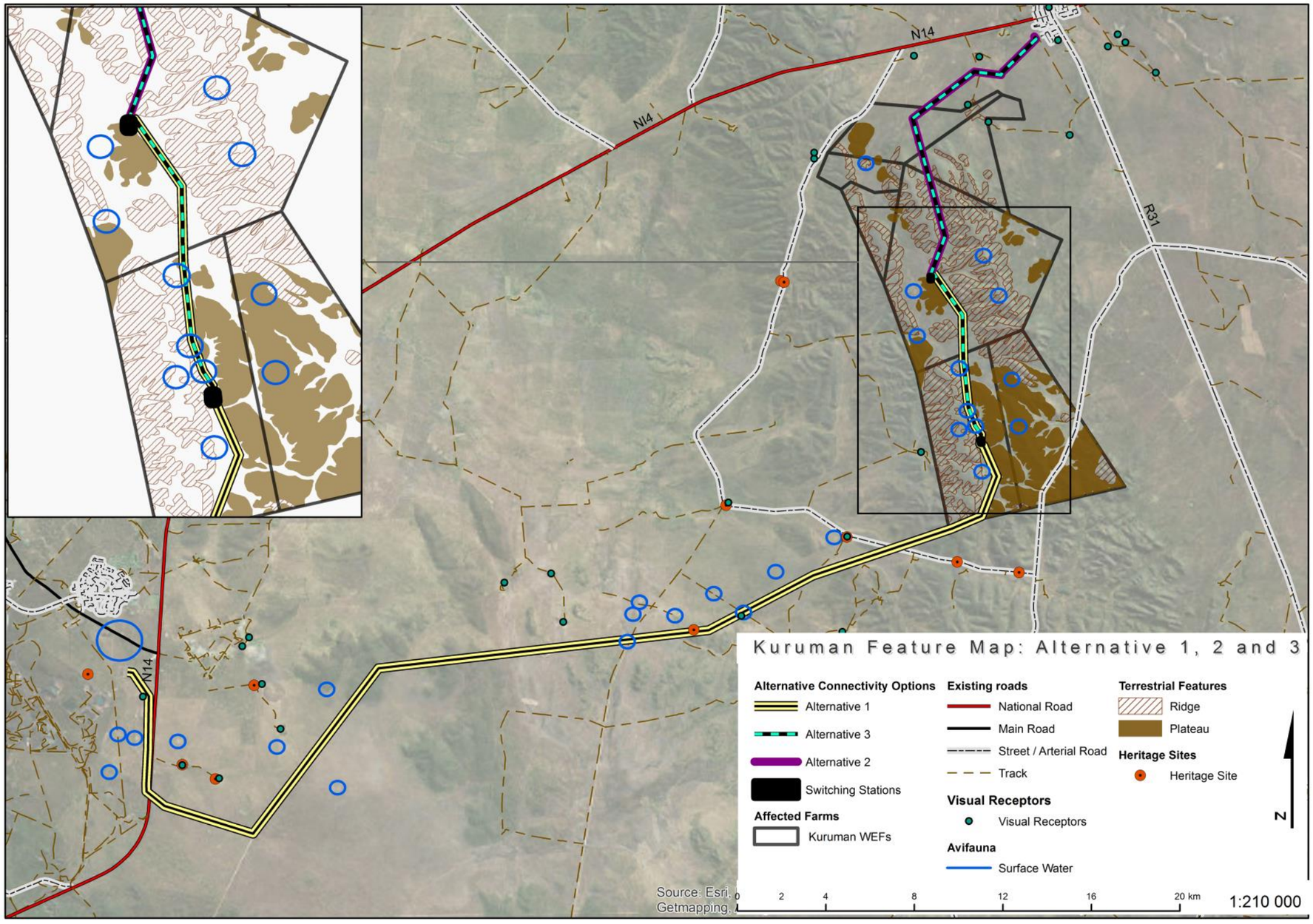

Figure D.18: Environmental feature map

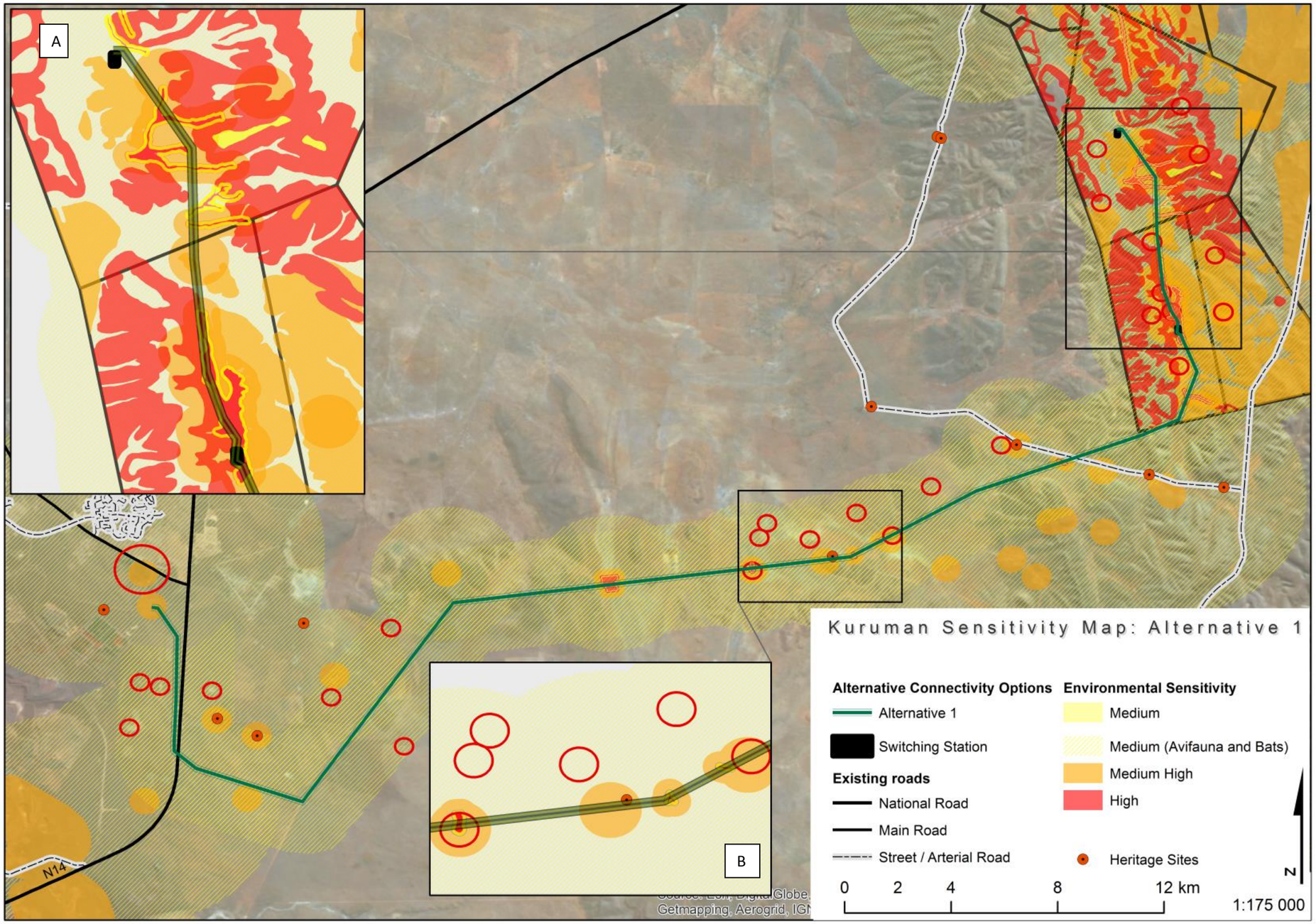

Figure D.19: Environmental Sensitivity Map: Alternative 1 (preferred connectivity and routing alternative)

SECTION E: RECOMMENDATION OF PRACTITIONER

This BA Report has investigated and assessed the significance of potential positive and negative direct, indirect and cumulative impacts associated with the proposed **Kuruman Transmission Line project.** Section 24 of the Constitutional Act states that "everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that prevents pollution and ecological degradation; promotes conservation; and secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." Based on this, this BA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures, and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site and through appropriate monitoring and management plans (refer to the EMPr in Appendix D of this BA Report).

It is understood that the information contained in this BA Report and appendices is sufficient to make an informed decision in respect of the activity applied for.

Table E.1 details the elements proposed and assessed as part of the Kuruman Transmission Line Project.

Table E.1: Project infrastructure proposed as part of the Kuruman Transmission Line Project

Project components	Dimensions
Two Eskom Switching Stations	Footprint: 2 ha Height: 15 m A new Eskom switching station will be constructed adjacent to the IPP Collector Substation (assessed as part of a separate EIA process). The Eskom switching station serves as the point of supply and metering point for the wind facility to connect to the Eskom Grid.
Transmissions line	Height: 15m ▪ Alternative 1 (54 km): runs from the Kuruman Phase 1 substation to the Kuruman Phase 2 substation to the Ferrum substation (located in Kathu) (Preferred) ▪ Alternative 2 (14 km): runs from Kuruman Phase 1 substation to Moffat substation (located in Kuruman). ▪ Alternative 3 (21 km): runs from Kuruman Phase 2 substation to Kuruman Phase 1 substation to the Moffat substation (located in Kuruman). Steel monopole double circuit twin tern Width of service road below line(s): jeep track (up to 6 m wide)

E.1 Alternatives

As noted in Section A.7 of this report, the preferred activity on site is the development of a double circuit steel monopole 132 kV transmission line with associated Eskom switching stations. In terms of the connectivity options, three options were considered by the various specialists. These connectivity options were determined based on the location of the Kuruman WEFs, landowner willingness and the least cost path options. The preferred connectivity and associated routing of transmission line were informed by the outcomes of the specialist studies (discussed in Section D of this report). Based on these outcomes, it was determined that Alternative 1 is the preferred connectivity option. The preferred routing of the connectivity option is shown in figure x of this report.

As indicated in Section D1.2.12, due to the uncertainty regarding the outcomes of the WEF application process and REIPPPP bidding process, Alternative 1 is currently the preferred alternative. However, should only one WEF realise, then the preferred connectivity option would be to route the transmission line to the Moffat substation in Kuruman (Alternative 2 and 3). These Alternatives were not deemed by the specialists as unacceptable and therefore, should Mulilo receive EA for this project and wish to amend the preferred routing, this would be considered to be non-substantive amendment process (i.e. a Part A amendment process).

E.2 Impact assessment findings

Based on the findings of the specialist studies, the proposed project is considered to have an overall low negative environmental impact and an overall low positive socio-economic impact (with the implementation of respective mitigation and enhancement measures). All of the specialists have recommended that the proposed project receive EA if the recommended mitigation measures are implemented. No negative impacts have been identified within this BA that, in the opinion of the EAP who have conducted this BA Process, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project. However, areas of high bat sensitivity, as discussed in Section D 1.2.10.2.1 of this Report will be developed in, which would mean that the impacts identified by the bat specialist will remain unmitigated (impacts prior to mitigation are rated Moderate to Low).

Provided that the specified mitigation measures are applied effectively, it is recommended that the proposed project receive EA in terms of the EIA Regulations promulgated under the NEMA.

E.3 Conditions to be include in the EA

In order to ensure the effective implementation of the mitigation and management actions, an EMPr has been compiled and is included in Appendix D of this BA report. The mitigation measures necessary to ensure that the project is planned and carried out in an environmentally responsible manner are listed in this EMPr. The EMPr includes the mitigation measures noted in this report and the specialist studies. The EMPr is a dynamic document that should be updated as required and provides clear and implementable measures for the proposed project. Listed below are the main recommendations that should be considered (in addition to those in the EMPr and BA Report) for inclusion in the EA (should such authorisation be granted by the DEA):

The following recommendations should be included as conditions in the EA:

Avifauna

- Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes, to identify any nests/breeding/roosting activity of Red Data species.
- Large trees should be retained as much as possible as they serve as potential roosting and breeding habitat for a variety of birds, including raptors.
- Audits must be performed by an external rehabilitation specialist once a year to assess the success of the rehabilitation programme and recommend changes or additions to the programme if need be.
- High risk sections of power line requiring marking with bird flight diverters must be identified by a qualified avifaunal specialist during the walk-through phase of the project, once the alignment has been finalized.
- The line must be inspected once a quarter by a qualified avifaunal specialist for one year to establish if there are any additional areas where bird flight diverters are required.

SECTION F: APPENDICES

Appendix A	Maps
Appendix B	Specialist Reports (including Terms of Reference)
Appendix C	Public Participation
Appendix D	Environmental Management Programme (EMPr)
Appendix E	Details of EAP and Expertise