OYA ENERGY (PTY) LTD

PROPOSED DEVELOPMENT OF THE 99MW OYA WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE, BETWEEN MATJIESFONTEIN AND SUTHERLAND IN THE WESTERN AND NORTHERN CAPE PROVINCES

Final Environmental Management Programme (EMPr)

DEFF Ref No.: 14/12/16/3/3/1/1976/AM2
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Document Title:	Proposed development of the 86MW Oya Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces: **Final Environmental Management Programme (EMPr)**
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GLOSSARY OF TERMS

Construction Phase: The activities pertaining to the preparation for and the physical construction of the proposed development.

Contractor: Persons/organisations contracted by the Holder of the EA to carry out parts of the work for the proposed development.

Decommissioning: Means to take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily recommissioned.

Environmental Authorisation (EA): "the authorisation by a competent authority of a listed activity or specified activity in terms of section 24 of the National Environmental Management Act" (Act No. 107 of 1998) (NEMA).

Engineer (E) / Project Manager (PM): Person / organisation appointed by the Holder of the EA to oversee the work of all consultants, sub-developers, contractors, residents and visitors.

Environmental Control Officer (ECO): Person / organisation appointed by the Holder of the EA who will provide direction to the Project Manager concerning the activities within the Construction Zone, and who will be responsible for conducting the environmental audit of the project during the construction phase of the project according to the provisions of the Environmental Management Programme (EMPr).

Environmental Management Programme (EMPr): The EMPr is a detailed plan for the implementation of the mitigation measures to minimise negative environmental impacts during the life-cycle of a project. The EMPr contributes to the preparation of the contract documentation by developing clauses to which the contractor must adhere for the protection of the environment. The EMPr specifies how the construction of the project is to be carried out and includes the actions required for the Post-Construction Phase to ensure that all the environmental impacts are managed for the duration of the project's life-cycle.

Operational Phase (Post Construction): The period following the Construction Phase, during which the proposed development will be operational.

Pre-Construction Phase: The period prior to commencement of the Construction Phase, during which various activities associated with the preparation for the Construction Phase will be undertaken.

Rehabilitation: Rehabilitation is defined as the return of a disturbed area to a state which approximates the state (where possible) which it was in before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the insurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Site Manager: The person, representing the Contractor, responsible for all the Contractor's activities on the site including supervision of the construction staff and activities associated with the Construction Phase. The Site Manager will liaise with the Project Manager in order to ensure that the project is conducted in accordance with the EMPr.

LIST OF COMMON ABBREVIATIONS

AIA	- Archaeological Impact Assessment
AP	- Action Plan
APM	- Archaeology, Palaeontology and Meteorites
ATNS	- Air Traffic and Navigation Services Company Limited
BA	- Basic Assessment
BESS	- Battery Energy Storage System
BID	- Background Information Document
BLSA	- BirdLife South Africa
CAA	- Civil Aviation Act (Act No. 13 of 2009)
CARA	- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
CBA	- Critical Biodiversity Area
CBD	- Convention on Biodiversity
CR	- Critically Endangered
DEA	- Department of Environmental Affairs
DEFF	- Department of Environment, Forestry and Fishery
DM	- District Municipality
DWS	- Department of Water and Sanitation
EA	- Environmental Authorisation
EAP	- Environmental Assessment Practitioner
ECA	- Environmental Conservation Act (ECA) (Act No. 73 of 1989)
ECO	- Environmental Control Officer
ED	- Economic Development
EHS	- Environmental, Health, and Safety
EIA	- Environmental Impact Assessment
EMPr	- Environmental Management Programme
EMI	- Electromagnetic Interference
EN	- Endangered
EP	- Equator Principles
ERA	- The Electricity Regulation Act No. 4 of 2006
ESA	- Ecological Support Area
EAS	- Early Stone Ages
ESMS	- Environmental and Social Management System
EX	- Extinct
EHS	- Environmental, Health, and Safety
GA	- General Authorisation
GIS	- Geographic Information System
GW	- Gigawatts
GWh	- Gigawatt Hours
HIA	- Heritage Impact Assessment
I&AP(s)	- Interested and/or Affected Party/Parties
IDP	- Integrated Development Plan
IEP	- Integrated Energy Plan
IFC	- International Finance Corporation
IPP(s)	- Independent Power Producers
IRP	- Integrated Resource Plan
IUCN	- International Union for the Conservation of Nature and Natural Resources
kPa	- Kilopascal
kV	- Kilo Volt
kW	- Kilowatts
LM	- Local Municipality
LED	- Local Economic Development
LSA	- Late Stone Age
m	- Metres

m^2	- Metres squared
m^3	- Metres cubed
MSA	- Middle Stone Age
MSL	- Mean Sea Level
MW	- Megawatt
NDCR	- National Dust Control Regulations
NEA	- The National Energy Act (Act No. 34 of 2008)
NEMA	- National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	- National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NEM:BA	- National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NEM:PAA	- National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
NFA	- The National Forest Act (Act No. 84 of 1998)
NFEPA	- National Freshwater Ecosystem Priority Areas
NFPA	- National Fire Protection Association
NHRA	- National Heritage Resources Act (Act No. 25 of 1999)
NPAES	- National Protected Areas Expansion Strategy
NRTA	- National Road Traffic Act (Act No. 93 of 1996)
NT	- Near Threatened
NWA	- National Water Act (Act No. 36 of 1998)
OHSA	- Occupational Health and Safety Act (Act No. 85 of 1993)
PES	- Present Ecological Status
PIA	- Palaeontological Impact Assessment
PM	- Public Meeting
PPA	- Power Purchase Agreement
PPP	- Public Participation Process
REDZ	- Renewable Energy Development Zone
REIPPPP	- Renewable Energy Independent Power Producer Procurement Programme
RE	- Renewable Energy
RMIPPPP	- Risk Mitigation Independent Power Producer Procurement Programme
SA	- South Africa
SACAA	- South African Civil Aviation Authority
SAHRA	- South African Heritage Resources Agency
SAHRIS	- South African Heritage Resources Information System
SALA	- Subdivision of Agricultural Land Act (Act No. 70 of 1970)
SALT	- Southern African Large Telescope
SANBI	- South African National Biodiversity Institute
SANS	- South African National Standards
SDF	- Spatial Development Framework
SDS	- Safety Data Sheet
SOP	- Standard Operating Procedure
SPVs	- Special Purpose Vehicles
TL	- Terrain Loss
VIA	- Visual Impact Assessment
VU	- Vulnerable
WEF	- Wind Energy Facility
WMA	- Water Management Area
WUA	- Water Use Authorisation
WUL	- Water Use License
WULA	- Water Use License Application
ZoR	- Zone of Regulation

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FIGURES

TABLES

LIST OF ANNEXURES

1 INTRODUCTION

This Environmental Management Programme (EMPr) has been prepared as part of the requirements of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 amended Environmental Impact Assessment (EIA) Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R325 on 7 April 2017. It should be noted that this EMPr was approved as part of the Environmental Authorisation (EA) for the Kudusberg Wind Energy Facility (WEF) (14/12/16/3/3/1/1976). However, due to the proposed amendments, the approved EMPr is being amended in accordance with Condition 17 of the EA. This EMPr is thus being submitted to the National Department of Environment, Forestry and Fisheries al Affairs (DEFFA) as part of the Application for a Part 2 EA Amendment to the Environmental Authorisation (EA) that was issued on 25 March 2019 (DEA Reference Number 14/12/16/3/3/1/1976).

Kudusberg Wind Farm (Pty) Ltd (hereafter referred to as "Kudusberg Wind Farm") was issued with an EA for the proposed construction of the 325MW Kudusberg WEF and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. The EA was granted on 25 March 2019 (14/12/16/3/3/1/1976), and subsequently amended on 04 April 2019 to correct a minor naming error (14/12/16/3/3/1/1976/AM1). The layout for the authorised Kudusberg WEF is presented in **Figure 1** below.

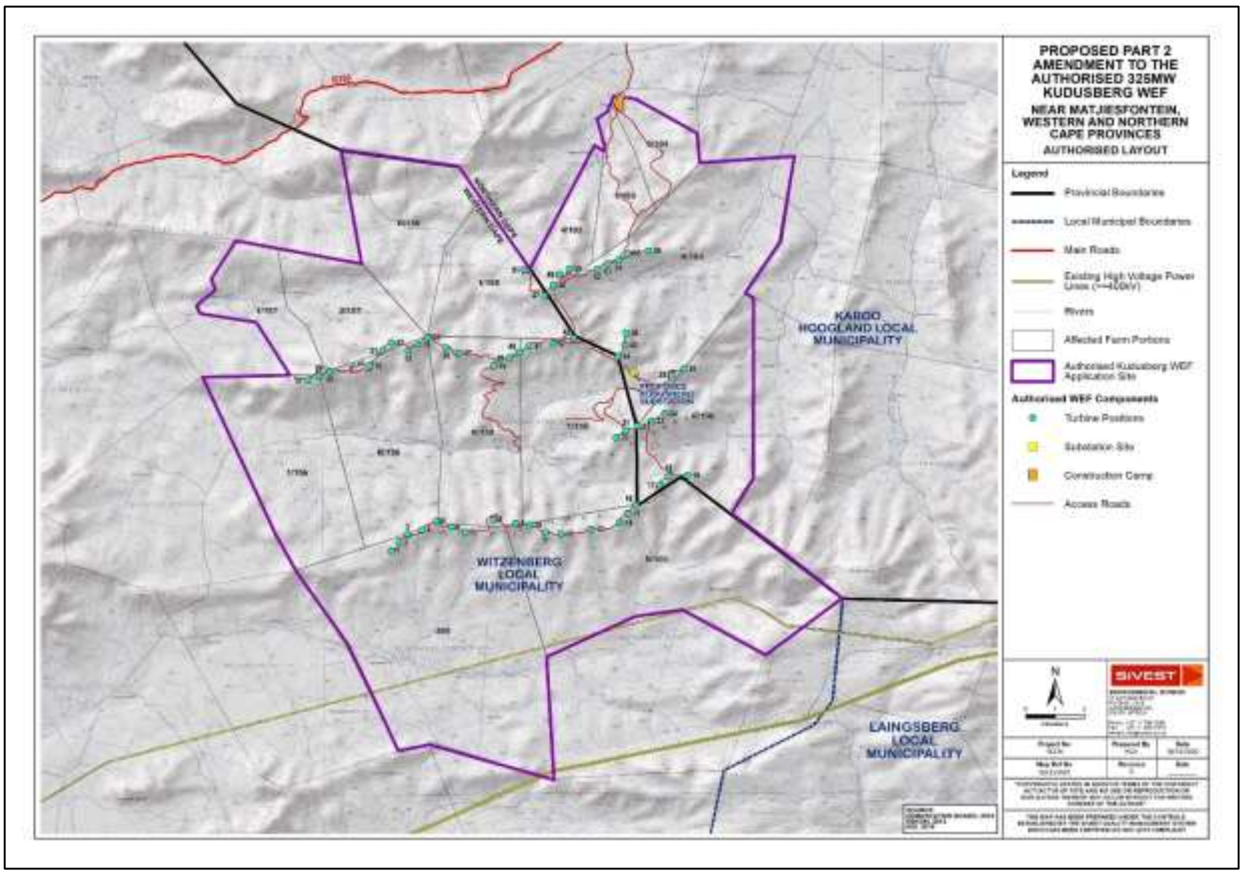

Figure 1 : Project locality map for the authorised Kudusberg WEF (14/12/16/3/3/1/1976/AM1)

Kudusberg Wind Farm is now proposing to submit a Part 2 EA Amendment Application to split the authorised Kudusberg WEF (14/12/16/3/3/1/1976/AM1) into two (2) separate smaller WEF projects, namely the Kudusberg WEF and Oya WEF, which will result in a number of technical and administrative changes detailed in Table 2 below. The split is being proposed to allow the projects to be suitable for numerous opportunities such as either the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP), other government run procurement programmes that may arise or for sale to private entities, if enabled and/or required in the drive for energy security in South Africa.

Following the split, the northern section of the authorised WEF will become the Oya WEF (**Figure 2**), while the southern section of the authorised WEF will remain known as the Kudusberg WEF (authorised under 14/12/16/3/3/1/1976/AM1).

In addition to the split, the final layout for the Oya WEF is being submitted which has been informed by detailed specialist walk-throughs and on-site micro-siting as per condition 29 of the Kudusberg EA[1]. The layout for the proposed Oya WEF the subject of this EMPr (northern section of the authorised WEF) is presented in **Figure 2** below.

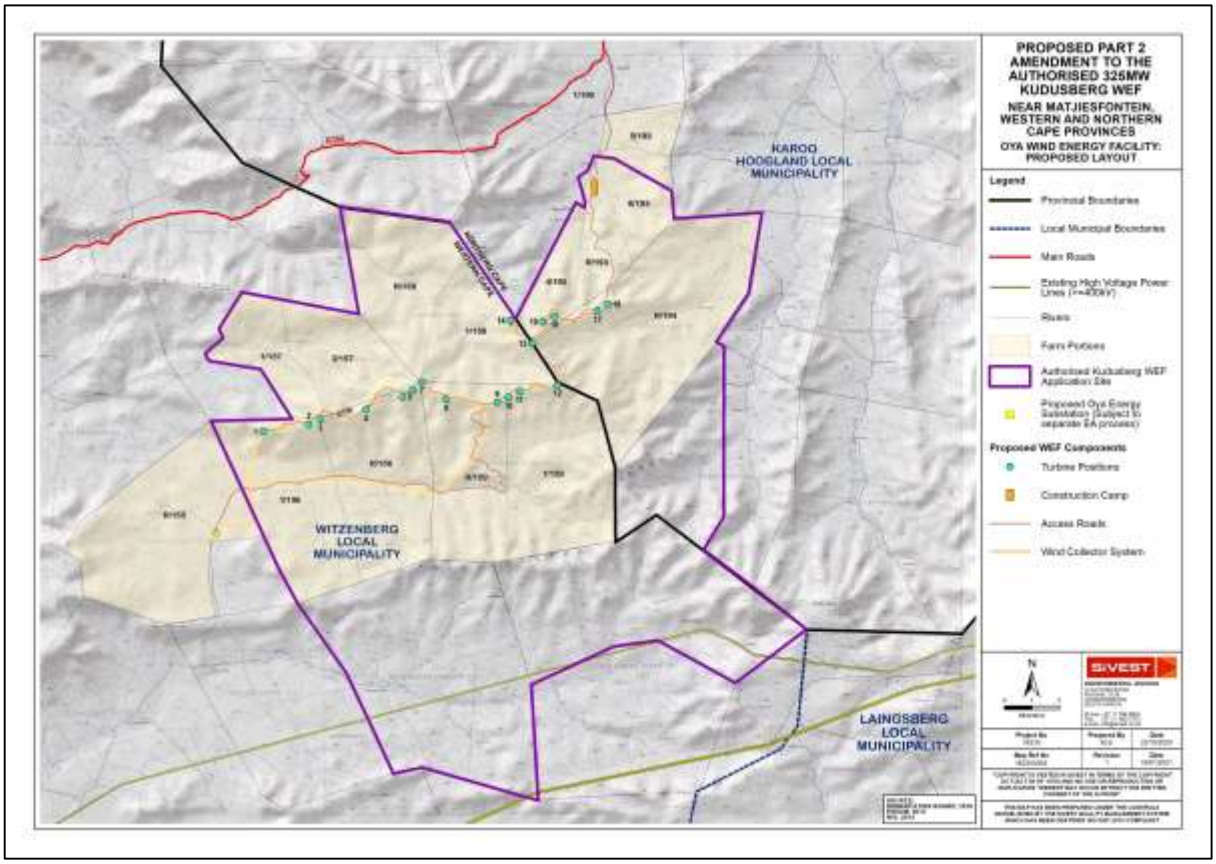

Figure 2: Project locality map for the proposed Oya WEF (northern section of the authorised WEF)

The approved EMPr (this document) authorised as part of the Kudusberg EA is being amended to each WEF and to incorporate the final layout for the Oya WEF, management plans[2] and the walk-throughs which were undertaken.

[1] Condition 29 of Kudusberg EA (**DEFF Ref:** 14/12/16/3/3/1/1976/AM1) – Page 15 of EA (page 17 of full document): *the final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists.*

[2] Includes Alien and Invasive Plant Species Management Plan; Plant Rescue Management Plan; Vegetation Rehabilitation Plan; Heritage Management Plan; Watercourse Rehabilitation & Maintenance Management Plan;

This EMPr will be made available to Interested and/or Affected Parties (I&APs), stakeholders and Organs of State (OoS), as part of the Draft EA Amendment Assessment Report, for a 30-day review and comment period. Comments received from stakeholders during this aforementioned review and comment period will be incorporated into the EMPr, where applicable. Following the incorporation of comments from I&APs, stakeholders and OoS, this EMPr is intended as a "living" document and should continue to be updated regularly, as needed. It should however be noted that this is the Final EMPr which is being submitted for approval.

The proposed Oya WEF (following the amendment) will be developed on the following land portions:

Table 1: The land portions that will be affected by the proposed Oya WEF

Number	Farm name and number	21-Digit Surveyor General (SG) Code
Western Cape:		
1	Portion 1 of the Farm Gats Rivier No 156	C01900000000015600001
2	Portion 2 of the Farm Gats Rivier No 156	C01900000000015600002
3	Remainder of the Farm Gats Rivier No 156	C01900000000015600000
4	Portion 1 of the Farm Riet Fontein No 157	C01900000000015700001
5	Portion 2 of the Farm Riet Fontein No 157	C01900000000015700002
6	Portion 1 of the Farm Amandelbloom No 158	C01900000000015800001
7	Remainder of the Farm Amandelboom No 158	C01900000000015800000
8	Portion 1 of the Farm Oliviers Berg No 159	C01900000000015900001
9	Remainder of the Farm Oliviers Berg No 159	C01900000000015900000
Northern Cape:		
10	Portion 4 of the Farm Urias Gat No 193	C07200000000019300004
11	Portion 6 of the Farm Urias Gat No 193	C07200000000019300006
12	Remainder of the Farm Urias Gat No 193	C07200000000019300000
13	Remainder of the Farm Matjies Fontein No 194	C07200000000019400000
14	Portion 5 of the Farm Urias Gat No 193	C07200000000019300005
Properties affected by access road:		
15	169 Zeekoegat Farm	C07200000000016900000
16	Portion 1 of 170 Roodeheuvel Farm	C07200000000017000001
17	Remainder of 170 Roodeheuvel Farm	C07200000000017000000
18	Remainder of 190 Wind Heuvel Farm	C07200000000019000000
19	Portion 1 of 190 Wind Heuvel Farm	C07200000000019000001
20	Portion 5 of 193 Urias Gat Farm	C07200000000019300005
21	Remainder of 171 Vinke Kuil Farm	C07200000000017100000
22	Alkant Re/220 Farm	C07200000000022000000
23	Portion 1 of 174 Lange Huis Farm	C07200000000017400001
24	Remainder of the Farm Baakens Rivier No. 155	C01900000000015500000

1.1 Project Team

SiVEST SA (Pty) Ltd has been appointed by Oya Energy (Pty) Ltd as the independent EAP to undertake the Part 2 Amendment for the proposed construction of the Oya Wind Energy Facility and associated infrastructure. As per the requirements of the EIA Regulations 2014 (as amended), the project team is provided in **Table 2** and the details and level of expertise of the persons who prepared the EMPr are provided in **Table 3** below.

Table 2: Project Team

Name	Organisation	Role
Environmental Assessment Practitioners (EAPs)		

Hydrological Assessment (including Storm Water Management & Erosion Control Plan); Traffic and Transport Management Plan; Post-Construction Avifaunal Monitoring Plan; Fire Management Plan and Waste Management

Name	Organisation	Role
John Richardson	SiVEST	Lead Environmental Consultant
Liandra Scott-Shaw	SiVEST	Project Coordinator / Environmental Assessment Practitioner (EAP) (see **Annexure A** of EMPr)
Stephan Jacobs	SiVEST	Environmental Consultant (see **Annexure A** of EMPr)
Specialist Input (see **Appendix G in Draft EA Amendment Report** for copies of CV's of specialists)		
Kerry Schwartz	SiVEST SA (Pty) Ltd	GIS, Mapping and Visual
Mark Summers	SiVEST	Visual*
Johann Lanz	-	Agriculture & Soils
Jenna Lavin and Nicholas Wilshire	CTS Heritage	Heritage
David Hoare	David Hoare Consulting	Terrestrial Ecology
Stephan van Staden	Scientific Aquatic Services (SAS)	Surface Water
Christel du Preez	FEN Consulting – part of SA Environmental	Surface Water
Miguel Mascaren	BioInsight	Birds and Bats
Dr Brett Williams	SAFETECH	Noise Impact
Elena Broughton	Urban-Econ Developme Economists	Socio-Economic
Iris Wink	JG Afrika (Pty) Ltd	Transportation

Table 3: Expertise of the EAP

Specialist assessments undertaken by SiVEST's in-house specialists. Based on recent correspondence with the DEFF, it was confirmed that assessments undertaken by in-house specialists do not need to be externally reviewed as a specialist permanently employed by an EAP is regarded as independent, provided he / she has no vested interest in the project and receives fair and normal remuneration for the work. An external peer review will be required should the Competent Authority have reason to believe that the EAP or specialist is not complying or has not complied with the requirements of Regulation 13 of the EIA regulations (as amended), in respect of the application. In addition, all specialists are required to sign a Declaration of Independence (DoI). Should the specialist be found not to be independent, then the process specified in Regulation 14 would apply, similar to when it relates to an EAP. It should be noted that the respective in-house specialists are deemed to be independent, have no vested interest in the project and receive fair and normal remuneration for the work, as confirmed as part of the signed specialist DoI, all of which have been submitted with the Draft EA Amendment Assessment Report (Appendix J1 of the Draft EA Amendment Assessment Report**). Refer to **Appendix H of the Draft EA Amendment Assessment Report** for proof of this correspondence with the DEFF.*

Lead Project Coordinator / Environmental Assessment Practitioner (EAP)	SiVEST SA (Pty) Ltd – Liandra Scott-Shaw
Contact Details	liandras@sivest.co.za
Qualifications	B.Sc. Biological Science and B.Sc. (Hons) Ecological Science
Professional Affiliations	SACNASP: 117442 IAIAsa Membership Number: 3624
Expertise	Liandra has approximately 8 years work experience specialising in undertaking and managing Environmental Impact Assessments (EIAs) and Basic Assessment (BAs), primarily related to energy generation and electrical distribution projects as well as Vegetation Ecology and Environmental Management. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental

	sensitivity analyses. She is responsible for the overall management of the SiVEST renewable energy projects and project management.
Lead Environmental Consultant	SiVEST SA (Pty) Ltd – John Richardson
Contact Details	johnr@sivest.co.za
Qualifications	B.Sc. – Geographic Science & B.Sc. Honours – Environmental Management
Professional Affiliations	Member of the International Association for Impact Assessment South Africa (IAIAsa) code of conduct and was between 2009 and 2017 a committee member of the KwaZulu-Natal branch. Elected in August 2014 as the IAIAsa KwaZulu-Natal Branch Chairman and severed as branch chairman for a two-year term. In August 2017 was then elected to serve on the IAIAsa National Executive Committee for a two year term.
Expertise	Approximately thirteen years' professional experience as an environmental scientist and GIS specialist in a range of environmental and strategic planning projects, processes and applications for private, government and commercial clients. Mr Richardson has experience in conducting Environmental Screening Assessments, Basic Assessment, Scoping and Full Environmental Impact Assessment, and Section 24G compliance process under the 2006, 2010 & 2014 National Environmental Management: Environmental Impact Assessment Regulations, his experience includes Environmental Control Officer (ECO) site auditing duties and management of the GIS mapping requirements for several Biodiversity Sector Plans, Strategic Environmental Assessments, Environmental Management Frameworks and Strategic Environmental Management Plans.
Environmental Consultant	SiVEST SA (Pty) Ltd - Stephan Jacobs
Contact Details	stephanj@sivest.co.za
Qualifications	B.Sc. Environmental Sciences (undergraduate) and B.Sc. (Hons) Environmental Management and Analysis
Professional Affiliations	IAIAsa Membership Number: 5736
Expertise	Stephan specialises in the field of Environmental Management and has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments, in particular renewable energy projects. Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Please refer to attached CV's in **Appendix G of the Draft EA Amendment Assessment Report and Annexure A in this EMPr** for more information. DoIs for each respective specialist are contained in **Appendix H of the Draft EA Amendment Assessment Report**.

2 LEGISLATIVE REQUIREMENTS

2.1 Applicable Legislation, Development Strategies and Guidelines

Several pieces of legislation and regulations will be applicable to the development of the project. These include:

- Constitution of South Africa

- NEMA
- NEMA EIA Regulations, 2014 (as amended)
- National Energy Act (Act No. 34 of 2008)
- Electricity Regulation Act (Act No. 4 of 2006)
- National Heritage Resources Act (NHRA) (Act No. 25 of 1999)
- National Water Act (NWA) (Act No. 36 of 1998, as amended)
- National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004, as amended)
- National Environmental Management: Protected Areas Act (NEM: PAA) (Act No. 57 of 2003, as amended)
- National Forests Act (NFA) (Act No. 84 of 1998)
- Conservation of Agricultural Resources Act (CARA) (Act No. 43 of 1983)
- Subdivision of Agricultural Land Act (SALA) (Act No. 70 of 1970, as amended
- National Road Traffic Act (NRTA) (Act No. 93 of 1996, as amended)
- Civil Aviation Act (CAA) (Act No. 13 of 2009)
- Nature and Environmental Conservation Ordinance 19 of 1974
- Western Cape Nature Conservation Laws Amendment Act, 2000
- Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998) Astronomy Geographic Advantage Act (Act No. 21 of 2007)
- Renewable Energy Development Zones (REDZs)
- Occupational Health and Safety Act (OHSA) (Act No. 85 of 1993);
- Road Safety Act (Act No. 93 of 1996);
- National Road Traffic Regulations Act (Act No. 22 of 2000);
- National Environmental Management: Air Quality Act (NEM:AQA) (Act No. 39 of 2004);
- National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008, as amended);
- The National Environmental Management: Biodiversity Act, 2014 (Alien and Invasive Species Regulations, 2014);
- Development Facilitation (Act No. 67 of 1995);
- National Ports Act (Act No. 12 of 2005)
- Water Services Act (Act No. 108 of 1998);
- Electricity Regulation Act (ERA) (Act No. 4 of 2006, as amended);
- Municipal Systems Act (Act No. 32 of 2000);
- Equator Principles (elaborated on below)

2.1.1 The Equator Principles

The Equator Principles (2013) are a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. A number of banks, exchanges and organisations worldwide have adopted the Principles as requirements to be undertaken for project funding on application and approval. Furthermore, certain funding institutions have not formally adopted the Principles, but require clients to be compliant with them in order to qualify for loans.

Under Principle 3, the Equator Principles establish the International Finance Corporations (IFC) Performance Standards, 2012 and associated General and Sector Specific EHS Guidelines as the applicable social and environmental standards that a project should comply with if the project is located in a non-OECD country or OECD country that is not designated as high income.

The social and environmental assessment that is undertaken for a project establishes whether or not the project is in compliance with the IFC Performance Standards[3].

[3] **NB** A project does not seek compliance with the Equator Principles per se but the standards that the EP refers to. A financial institution that has adopted the EP must ensure that any projects it is financing meet the standards referred to and that it adopts an appropriate risk management system to ensure this.

According to these principles, the performance standards relevant to the proposed development are summarised in **Table 4**.

Table 4: IFC 2012 Performance Standards

Performance Standard	Intent and objective	Requirements	Project Specific Applicability
Assessment and Management of Environmental and Social Risks and Impacts (1)	Underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders. **Objectives:** ▪ To identify and evaluate environmental and social risks and impacts of the project. ▪ To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment. ▪ To promote improved environmental and social performance of clients through the effective use of management systems. ▪ To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately. ▪ To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.	▪ Policy ▪ Identification of Risks and Impacts Management Programmes ▪ Organisational Capacity and Competency ▪ Emergency Preparedness and Response ▪ Monitoring and Review ▪ Stakeholder Engagement ▪ External Communication and Grievance Mechanism ▪ Ongoing Reporting to Affected Communities	An Environmental and Social Management System will be compiled in the future of which this EMPr can form the basis of. This will be applicable only if the project is funded on IFC principles.
Labour and Working Conditions (2)	▪ Looks at the working conditions by following these principles; ▪ To establish and maintain the worker- management relationship (including specifically a human resources policy).	▪ Working Conditions and Management of Worker Relationship ▪ Protecting the Work Force ▪ Occupational Health and Safety	A Formal human resource and labour policies will be compiled in the event that the project is developed by IFC in the future.

Performance Standard	Intent and objective	Requirements	Project Specific Applicability
	▪ To promote fair treatment, non-discrimination and equal opportunity of employees (and some contractors) and meet national employment laws. ▪ To protect the workforce by addressing child labour and forced labour. ▪ To promote healthy and safe working conditions.	▪ Workers Engaged by Third Parties ▪ Supply Chain	
Resource Efficiency and Pollution Prevention (3)	▪ To avoid and minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities. ▪ To promote the reduction of emissions that contributes to climate change.	▪ Resource Efficiency ▪ Pollution Prevention	The project entails renewable energy generation thus by virtue of its existence reduces emissions that contribute to climate change.
Community Health Safety and Security (4)	▪ To avoid or minimise risks to and impacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances. ▪ To ensure that the use of security personnel is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security.	Community Health and Safety Security Personnel	The requirements included in PS 4 have been addressed in the original BA and Part 2 amendment process and the development of the EMPr. The Management plans have been included in the EMPr and Emergency Response Plan (**Appendix J**) All plans have been made site specific as part of the development process nearing its end, in the event that the project is developed in the future. Furthermore, a Health and Safety Plan will be implemented during construction.
Land Acquisition and Involuntary Resettlement (5)	▪ To avoid or at least minimize involuntary resettlement wherever feasible by exploring alternative project designs. ▪ To mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by; (i) providing compensation for loss of assets at replacement cost, and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of	Displacement Private Sector Responsibilities Under Government-Managed Resettlement	No resettlement applicable

Performance Standard	Intent and objective	Requirements	Project Specific Applicability
	information, consultation, and the informed participation of those affected. ▪ To improve or at least restore the livelihoods and standards of living of displaced persons. ▪ To improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites.		
Biodiversity Conservation and Sustainable Management of Living Natural Resources (6)	▪ To promote and conserve biodiversity. ▪ To avoid the introduction of alien invasive species. ▪ To promote sustainable management and use of natural resources (NRM).	▪ Protection of Conservation of Biodiversity ▪ Management of Ecosystem Services ▪ Sustainable Management of Living Resources ▪ Supply Chain	The requirements included in PS 6 have been addressed via numerous specialist studies and the findings and assessment associated with these aspects have been discussed in the BA, part 2 amendment process and walk down assessment. The EMPr incorporates mitigation measures from the specialist reports and walk down assessment to ensure that aspects such as conservation of biodiversity and alien plants control are considered. This includes a Plant Rescue Plan (**Appendix E**), Alien Plant Management Plan (**Appendix F**) and Vegetation Rehabilitation Plan (**Appendix H**).
Indigenous People (7)	▪ To foster full respect for the dignity, human rights, aspirations, cultures and natural resource-based livelihoods of Indigenous Peoples (IP). ▪ To avoid impacts or where avoidance is not feasible, minimize, mitigate and compensate in a culturally appropriate fashion and within the framework of successful good faith negotiation (a form of stakeholder engagement requiring approval of both parties). ▪ To establish and maintain effective relationships with IPs over the course of the project.	▪ Circumstances Requiring Free, Prior and Informed Consent ▪ Mitigation and Development Benefits ▪ Private Sector Responsibilities where Government is Responsible for Managing Indigenous Peoples Issues ▪	The requirements included in PS 7 have been addressed in the BA, part 2 amendment process and walk down assessment and the development of the EMPr. An extensive public participation process was undertaken as part of the BA and the part 2 amendment process which engages all stakeholders, authorities and interested and

Performance Standard	Intent and objective	Requirements	Project Specific Applicability
			affected persons who may be affected. Furthermore, a Socio-Economic Study was undertaken and recommendations from this study incorporated into the EMPr.
Cultural Heritage (8)	▪ To protect cultural heritage from adverse impacts of project activities and support its preservation. ▪ To promote the equitable sharing of benefits from the use of cultural heritage in business activities.	▪ Protection of Cultural Heritage in Project Design and Execution ▪ Project's Use of Cultural Heritage	The requirements included in PS 8 have been addressed through a cultural heritage study that was undertaken as part of the original BA process as well as the Part 2 EA Amendment process. Recommendation and mitigation measures from this study are incorporated into the EMPr This includes a Heritage Management Plan (**Appendix K**).

(Source; IFC Guidelines, 2012)

2.2 Legislative Requirements for Oya Wind Energy Facility

Table 5: Compliance with National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations (2017) Content of Environmental Management Programmes (Appendix 4)

Requirements of Appendix 4 – GN R326 EIA Regulations of 7 April 2017	Section of Report
1. (1) An EMPr must comply with section 24N of the Act and include— (a) details of– (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Details of the EAP and full project team are in **Section 1.1** and EAP's CV is included in **Annexure A** of this EMPr.
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Detailed descriptions of the aspects of the activities that are covered by the EMPr can be found in **section 3.**
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	This map can be found in **section 3.2, Figure 8**. It shows the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including— (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Descriptions of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development can be found in **section 8.**
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Descriptions of proposed impact management actions, identifying the manner in which the impact management outcomes above are contemplated can be found in **section 8** and in **section 9.**
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Refer to **section 8** and **section 9** which outline High Level monitoring methods.
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Refer to **section 8** and **section 9** which outline High Level monitoring methods including the frequency monitoring is to be implemented.
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Refer to **section 7** which outlines the roles and responsibilities for the proposed Energy Facility.

Requirements of Appendix 4 – GN R326 EIA Regulations of 7 April 2017	Section of Report
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Refer to **section 8** and **section 9** which outline the time periods monitoring is to be implemented
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Refer to **section 8** and **section 9** which outline methods for monitoring compliance.
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Refer to **section 8** and **section 9** which outline methods for reporting on compliance
(m) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	This plan can be found in **section 9.11** and addresses all risks associated with the proposed development.
(n) any specific information that may be required by the competent authority.	All High Level plans that may be requested are included in **section 9.**
(2) Where a government notice *gazetted* by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Noted.

The amendments proposed for the Oya WEF are detailed in **Table 6** below as well as the location of the of the authorised aspects and the proposed amendments in relation to the original EA. In addition, compliance with conditions of the Environmental Authorisation (14/12/16/3/3/1/1976/AM1) are detailed in **Table 5** below.

Table 6: Details of the authorised WEF and the split of the EA between Oya WEF and Kudusberg WEF

Aspect to be amended	Authorised	Proposed Amendment Oya WEF	EA Reference
Administrative Aspects			
Amend the holder of the EA's	Kudusberg Wind Farm (Pty) Ltd	Oya Energy (Pty) Ltd	Pages 1 and 2 of EA dated 25 March 2019 (pages 1, 3 and 4 of full document)
Amend the name of the WEFs	Kudusberg Wind Energy Facility	Oya Wind Energy Facility	Pages 1, 9 and 10 of EA dated 25 March 2019 (pages 1, 3, 11 and 12 of full document)
Contact Details	kudusberg@g7energies.com	oya@g7energies.com	Page 2 of EA dated 25 March 2019 (pages 1 and 4 of full document)
Extend the validity of the EA	This activity must commence within a period of five (05) years from the date of issue of this environmental authorisation	This activity must commence within a period of five (05) years from the date of issue of this amended environmental authorisation	Page 11 of EA dated 25 March 2019 (page 13 of full document)
Location of Activity and SG codes	**Western Cape** 1. Portion 1 of 156 Gats Rivier Farm: C01900000000015600001 2. Portion 3 of 156 Gats River Farm: C01900000000015600002 3. Remainder of 156 Gats Rivier Farm: C01900000000015600000 4. Portion 1 of 157 Riet Fontein Farm: C01900000000015700001 5. Portion 1 of 158 Amandelbloom Farm: C01900000000015800001 6. Remainder of 158 Amandelboom Farm: C01900000000015800000 7. Portion 1 of 159 Oliviers Berg Farm: C01900000000015900001 8. Remainder of 159 Oliviers Berg Farm: C01900000000015900000 9. Portion 2 of 157 Riet Fontein Farm: C01900000000015700002 10. Remainder of 161 Muishond Rivier Farm: C01900000000016100000	**Western Cape** 1. Portion 1 of the Farm Gats Rivier No 156: C01900000000015600001 2. Portion 2 of the Farm Gats Rivier No 156: C01900000000015600002 3. Remainder of the Farm Gats Rivier No 156: C01900000000015600000 4. Portion 1 of the Farm Riet Fontein No 157: C01900000000015700001 5. Portion 2 of the Farm Riet Fontein No 157: C01900000000015700002 6. Portion 1 of the Farm Amandelbloom No 158: C01900000000015800001 7. Remainder of the Farm Amandelboom No 158: C01900000000015800000 8. Portion 1 of the Farm Oliviers Berg No 159: C01900000000015900001 9. Remainder of the Farm Oliviers Berg No 159: C01900000000015900000 **Northern Cape**	Page 7 – 8 of EA dated 25 March 2019 (page 9 - 10 of full document)

	11. Remainder of 395 Klipbanks Fontein Farm: C01900000000019500000 **Northern Cape** 12. Portion 4 of 193 Urias Gat Farm: C07200000000019300004 13. Portion 6 of 193 Urias Gat Farm: C07200000000019300006 14. Remainder of 193 Urias Gat Farm: C07200000000019300000 15. Remainder of 194 Matjes Fontein Farm: C07200000000019400000 16. Remainder of 196 Karree Kloof Farm: C07200000000019600000 **Properties affected by public road:** 17. 169 Zeekoegat Farm: C07200000000016900000 18. Portion 1 of 170 Roodeheuvel Farm: C07200000000017000001 19. Remainder of 170 Roodeheuvel Farm: C07200000000017000000 20. Remainder of 190 Wind Heuvel Farm: C07200000000019000000 21. Portion 1 of 190 Wind Heuvel Farm: C07200000000019000001 22. Portion 5 of 193 Urias Gat Farm: C07200000000019300005 23. Remainder of 171 Vinke Kuil Farm: C07200000000017100000 24. Alkant Re/220 Farm: C07200000000022000000 25. Portion 1 of 174 Lange Huis Farm: C07200000000017400001	10. Portion 4 of the Farm Urias Gat No 193: C07200000000019300004 11. Portion 6 of the Farm Urias Gat No 193: C07200000000019300006 12. Remainder of the Farm Urias Gat No 193: C07200000000019300000 13. Remainder of the Farm Matjies Fontein No 194: C07200000000019400000 14. Portion 5 of the Farm Urias Gat No 193: C07200000000019300005 **Properties affected by access road:** 15. Zeekoegat Farm No 169: C07200000000016900000 16. Portion 1 of the Farm Roodeheuvel No 170: C07200000000017000001 17. Remainder of the Farm Roodeheuvel No 170: C07200000000017000000 18. Remainder of the Farm Wind Heuvel No 190: C07200000000019000000 19. Portion 1 of the Farm Wind Heuvel No 190: C07200000000019000001 20. Portion 5 of the Farm Urias Gat No 193: C07200000000019300005 21. Remainder of the Farm Vinke Kuil No 171: C07200000000017100000 22. Alkant Farm No 220: C07200000000022000000 23. Portion 1 of the Farm Lange Huis No 174: C07200000000017400001 24. Remainder of the Farm Baakens Rivier No. 155: C01900000000015500000	
Co-ordinates	**Centre:** 32°50’ 56.0868”S; 20°19’ 25.0608”E **North:** 32°40’ 29.8812”S; 20°24’ 57.78”E	**APPLICATION SITE:** **Coordinates at Corner Points (DD MM SS.sss)** 1. S32° 46' 11.757"	Page 8 – 9 of EA dated 25 March 2019 (page 10 - 11 of full document)

	East: 32°43’ 53.8212”S; 20°29’ 32.28”E **South-East:** 32°54’ 6.66”S; 20°23’ 3.7788”E **South-West:** 32°55’32.0412”S; 20°16’24.8988”E **West:** 32°52’ 12.7812”S; 20°14’ 20.6988”E	E20° 21' 39.554" 2. S32° 45' 55.571" E20° 23' 32.919" 3. S32° 47' 3.530" E20° 23' 8.115" 4. S32° 48' 14.853" 20° 23' 15.057" 5. S32° 48' 7.939" 20° 25' 19.086" 6. S32° 49' 44.075" E20° 24' 59.144" 7. S32° 50' 41.159" E20° 24' 13.445" 8. S32° 53' 6.441" E20° 21' 52.752" 9. S32° 53' 8.532" E20° 21' 53.539" 10. S32° 54' 36.732" E20° 21' 50.816" 11. S32° 55' 2.170" E20° 18' 58.064" 12. S32° 54' 57.184" E20° 17' 28.053" 13. S32° 55' 48.840" E20° 14' 21.666" 14. S32° 55' 7.517" E20° 13' 55.356" 15. S32° 54' 28.981" E20° 13' 34.753" 16. S32° 54' 34.507" E20° 12' 20.205" 17. S32° 55' 13.194" E20° 12' 15.385" 18. S32° 56' 3.895" E20° 12' 26.330" 19. S32° 56' 12.929" E20° 11' 16.988" 20. S32° 55' 38.363"	

		E20° 9' 20.611" 21. S32° 54' 56.533" E20° 9' 15.790" 22. S32° 54' 45.536" E20° 8' 55.471" 23. S32° 54' 18.000" E20° 9' 11.192" 24. S32° 54' 13.557" E20° 9' 23.325" 25. S32° 53' 59.701" E20° 9' 41.082" 26. S32° 53' 54.356" E20° 9' 40.992" 27. S32° 52' 11.464" E20° 12' 21.280" 28. S32° 52' 9.896" E20° 14' 16.133" 29. S32° 51' 10.304" E20° 13' 32.215" 30. S32° 51' 0.223" E20° 12' 19.238" 31. S32° 50' 51.343" E20° 12' 14.058" 32. S32° 50' 33.384" E20° 12' 39.312" 33. S32° 50' 21.482" E20° 12' 33.983" 34. S32° 49' 38.848" E20° 13' 6.405" 35. S32° 50' 5.733" E20° 15' 50.817" 36. S32° 47' 57.718" E20° 15' 25.332" 37. S32° 48' 16.924" E20° 17' 59.136" 38. S32° 50' 12.452" E20° 19' 31.355" 39. S32° 47' 54.581"	

		E20° 20' 57.293" 40. S32° 48' 1.255" E20° 21' 9.303" 41. S32° 47' 54.387" E20° 21' 10.181" 42. S32° 47' 24.673" E20° 21' 0.698" 43. S32° 47' 17.149" E20° 21' 13.982" 44. S32° 46' 59.938" E20° 21' 22.475" 45. S32° 46' 56.504" E20° 21' 29.064" **Coordinates at Centre Point (DD MM SS.sss)** 26. S32° 51' 45.765" E20° 17' 43.464" **CONSTRUCTION CAMP:** **Coordinates at Centre Point (DD MM SS.sss)** **CENTRE:** S32° 47' 36.876" E20° 21' 23.588" **Coordinates at Corner Points:** **CC1_01:** S32° 47' 28.108" E20° 21' 19.647" **CC1_02:** S32° 47' 28.329" E20° 21' 28.144" **CC1_03:** S32° 47' 45.815" E20° 21' 27.943" **CC1_04:** S32° 47' 45.598" E20° 21' 19.332" **CC1_05:** S32° 47' 43.103" E20° 21' 20.053" **CC1_06:** S32° 47' 40.376" E20° 21' 20.085" **CC1_07:** S32° 47' 38.132" E20° 21' 19.168" **CC1_08:** S32° 47' 35.632"	

		E20° 21' 19.015" **CC1_09:** S32° 47' 34.407" E20° 21' 18.760" **SUBSTATION:** **<u>Coordinates at Centre Point (DD MM SS.sss):</u>** **CENTRE:** S32° 54' 24.333" E20° 12' 28.366" **<u>Coordinates at Corner Points (DD MM SS.sss):</u>** **SS1_01:** S32° 54' 19.886" E20° 12' 26.843" **SS1_02:** S32° 54' 23.125" E20° 12' 33.613" **SS1_03:** S32° 54' 28.772" E20° 12' 29.816" **SS1_04:** S32° 54' 25.569" E20° 12' 23.122"	
	Technical Aspects		
Aspect to be amended	**Authorised**	**Proposed Amendment** **Oya WEF**	**EA Reference**
Overall Capacity	325 MW	<u>99 MW</u>	Pages 1, 4 (Row 5 of listed activities table), 9 and 10 of EA dated 25 March 2019 (pages 1, 3, 6, 11 and 12 of full document), Row 4 of technical details table
Number of turbines	56	<u>18</u>	Page 10 of EA dated 25 March 2019 (page 12 of full document), Row 11 of technical details table
Hub height	Up to 140 m	<u>Up to 101 m above the foundation</u>	Page 9 of EA (page 11 of full document), Row 1 of technical details table
Rotor diameter	Up to 180 m	<u>Up to 158 m</u>	Page 9 of EA (page 11 of full document) dated 25 March 2019, Row 2 of technical details table

Blade length	Up to 90 m	Up to 79 m	Page 9 of EA (page 11 of full document) dated 25 March 2019, Row 3 of technical details table
Wind Measuring Lattice Masts	Up to 4 x 140 m high depending the final hub height	2 x height of the hub height	Page 10 of EA (page 12 of full document) dated 25 March 2019, Row 13 of technical details table
Layout	-	Layout submitted for final approval. The layout to be approved are contained in **Appendix J4** of Draft EA Amendment Assessment Report. Associated turbine GPS locations will be provided in the Final EA Amendment Report.	Page 14 and 15 of EA (pages 16 and 17 of full document) dated 25 March 2019
EMPr	The EMPr submitted as part of the Application for EA is hereby approved.	Approve Final EMPr	Page 12 and 13 of EA (page 14 and 15 of full document) dated 25 March 2019

Table 7: Compliance with conditions of the Environmental Authorisation (14/12/16/3/3/1/1976/AM1)

EA Condition	Comment
Scope of authorisation	
1. The 325MW Kudusberg Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces is approved as per the geographic coordinates cited in the table above.	N/A
2. Authorisation of the activity is subject to the conditions contained in this Environmental Authorisation, which form part of the Environmental Authorisation and are binding on the holder of the authorisation.	All conditions of the EA, as well as the Amended EA (should this be granted) will be adhered to
3. The holder of the authorisation is responsible for ensuring compliance with the conditions contained in this Environmental Authorisation. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.	The holder of the authorisation will ensure compliance with the conditions contained in this EA
4. The activities authorised may only be carried out at the property as described above.	Only activities authorised as part of the EA and subsequent amended EA (should this be granted) will be carried out at the property as described in **Table 1**
5. Any changes to, or deviations from, the project description set out in this Environmental Authorisation must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of the authorisation to apply for further Environmental Authorisation in terms of the regulations.	The Part 2 EA Amendment process which is being undertaken as part of the amendment of the authorised Kudusberg WEF has addressed this.
6. The holder of an Environmental Authorisation must apply for an amendment of the Environmental Authorisation with the Competent Authority for any alienation, transfer or change of ownership rights in the property on which the activity is to take place.	See above. A Part 2 EA Amendment process is being undertaken in order to amend the EA of the authorised Kudusberg WEF and thus this condition has been met.
7. This activity must commence within a period of five (05) years from the date of issue of this Environmental Authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for Environmental Authorisation must be made in order for the activity to be undertaken.	The current EA is still valid and has not lapsed. It was authorised in 2019 and is valid for a period of five (5) years.
8. Commencement with one activity listed in terms of this Environmental Authorisation constitutes commencement of all authorised activities.	N/A. No activity has commenced to date
Notification of authorisation and right to appeal	
9. The holder of the authorisation must notify every registered interested and affected party, in writing and within 14 (fourteen) calendar days of the date of this Environmental Authorisation, of the decision to authorise the activity.	All registered interested and affected parties were notified in writing and within 14 (fourteen) calendar days of the date of the EA of the Department's decision with regards to the EA for the original Kudusberg WEF. This notification met all of the requirements as specified in the EA.
10. The notification referred to must-	
10.1. specify the date on which the authorisation was issued;	

10.2. inform the interested and affected party of the appeal procedure provided for in the National Appeal Regulations, 2014;	
10.3. advise the interested and affected party that a copy of the authorisation will be furnished on request; and	
10.4. give the reasons of the Competent Authority for the decision.	
Commencement of the activity	
11. The authorised activity shall not commence until the period for the submission of appeals has lapsed as per the National Appeal Regulations, 2014, and no appeal has been lodged against the decision. In terms of Section 43(7), an appeal under Section 43 of the National Environmental Management Act, Act No. 107 of 1998, as amended will suspend the Environmental Authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged you may not commence with the activity until such time that the appeal has been finalised.	The appeal period for the original EA has lapsed and no appeals were lodged. The authorised activity has not commenced to date and will not commence until the Amended EA is granted. Should the Amended EA be granted, it can be confirmed that the authorised activity will not commence until the period for the submission of appeals has lapsed.
Management of the activity	
12. The Environmental Management Programme (EMPr) submitted as part of the Application for EA is hereby approved. This EMPr must be implemented and strictly adhered to.	The EMPr approved as part of the authorised Kudusberg WEF has been updated to incorporated the final layout for the Oya WEF, management plans[6] and the walk-throughs and is being submitted for approval. Should the EMPr be approved, it will be implemented and strictly adhered to.
Frequency and process of updating the EMPr	
13. The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 23 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the Environmental Authorisation or EMPr.	Not applicable at this stage as the activity has not yet commenced and environmental compliance auditing has thus also not commenced. This will be undertaken should the findings of the environmental audit reports, contemplated in Condition 23 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the Environmental Authorisation or EMPr
14. The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.	
15. The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation 34 of GN R982 of 04 December 2014, as amended The updated EMPr must have been subjected to a public participation process, which process has been agreed to by the Department, prior to submission of the updated EMPr to the Department for approval.	
16. In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of GN R982 of 04 December 2014, as amended. Prior to approving an amended EMPr, the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides for avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity.	

<table>
<tr><td>17. The holder of the authorisation may apply for an amendment of an EMPr, if such amendment is required before an audit is required. In assessing whether to grant such approval or not, the Department will consider the processes and requirements prescribed in Regulation 37 of GN R982 of 04 December 2014, as amended.</td><td></td></tr>
<tr><td colspan="2">Monitoring</td></tr>
<tr><td>18. The holder of the authorisation must appoint an experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this environmental authorisation are implemented and to ensure compliance with the provisions of the approved EMPr.</td><td rowspan="5">Not applicable at this stage. Should the Amended EA be granted and the proposed development reach construction, holder of the authorisation will appoint an experienced independent ECO for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in the EA are implemented and to ensure compliance with the provisions of the approved EMPr.</td></tr>
<tr><td>18.1. The ECO must be appointed before commencement of any authorised activities.</td></tr>
<tr><td>18.2. Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department.</td></tr>
<tr><td>18.3. The ECO must keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.</td></tr>
<tr><td>18.4. The ECO must remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.</td></tr>
<tr><td colspan="2">Recording and reporting to the Department</td></tr>
<tr><td>19. All documentation e.g. audit/monitoring/compliance reports and notfiications required to be submitted to the Department in terms of this Environmental Authorisation, must be submitted to the Director: Compliance Monitoring of the Department at Directorcompliance@environment.gov.za.</td><td>Not applicable at this stage. All documentation e.g. audit/monitoring/compliance reports and notifications in terms of the EA, will be submitted to the Director: Compliance Monitoring of the Department at Directorcompliance@environment.gov.za</td></tr>
<tr><td>20. The holder of the Environmental Authorisation must, for the period during which the Environmental Authorisation and EMPr remain valid, ensure that project compliance with the conditions of the Environmental Authorisation and the EMPr are audited, and that the audit reports are submitted to the Director: Compliance Monitoring of the Department at Directorcompliance@environment.gov.za.</td><td rowspan="3">This will be adhered to, should the Amended EA be granted, and the proposed development proceed to construction.</td></tr>
<tr><td>21. The frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicated in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GN R982 of 04 December 2014, as amended.</td></tr>
<tr><td>22. The holder of the authorisation must, in addition, submit an environmental audit reports to the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities.</td></tr>
</table>

23. The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014, as amended, and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the Environmental Authorisation conditions as well as the requirements of the approved EMPr.	
24. Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and Competent Authority in respect of this development.	
Notification to authorities	
25. A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purposes of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.	Should the Amended EA be granted, and the proposed development proceed to construction, a written notification of commencement will be given to the Department no later than fourteen (14) days prior to the commencement of the activity. The notice will include a date on which it is anticipated that the activity will commence, as well as a reference number
Operation of the activity	
26. A written notification of operation must be given to the Department no later than fourteen (14) days prior to the commencement of the activity operational phase.	Should the Amended EA be granted, a written notification of operation will be given to the Department no later than fourteen (14) days prior to the commencement of the activity operational phase.
Site closure and decommissioning	
27. Should the activity ever cease or become redundant, the holder of the authorisation must undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and Competent Authority at that time.	Should the activity ever cease or become redundant, the holder of the authorisation will undertake the required actions as prescribed by legislation at the time and will also comply with all relevant legal requirements administered by any relevant and Competent Authority at that time.
Specific conditions	
Conditions for Non-operational aspects	
28. All wind turbines as well as associated infrastructure (power line and substations) must avoid all areas designated as "no-go" areas as well as their buffers.	All specific conditions contained in the EA and Amended EA (should this be granted) will be strictly adhered to.
29. The final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists.	
30. Roads must avoid no go areas where possible.	
31. If archaeological heritage material, fossils and human remains are uncovered during construction all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that a systematic and professional investigation/ excavation can be undertaken.	
General	
32. A copy of this Environmental Authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-	Should the Amended EA be granted, copy of the EA, the audit and compliance monitoring reports, and the approved EMPr, will be made available for inspection and will meet all requirements of the EA.
33. at the site of the authorised activity;	

34. to anyone on request; and	
35. where the holder of the Environmental Authorisation has a website, on such publicly accessible website.	
36. National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.	N/A

3 PROJECT DETAILS

Kudusberg Wind Farm (Pty) Ltd (hereafter referred to as "Kudusberg Wind Farm") was issued with an Environmental Authorisation (EA) for the proposed construction of the 325MW Kudusberg Wind Energy Facility (WEF) and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. The EA was granted on 25 March 2019 (**DEFF Reference No.:** 14/12/16/3/3/1/1976), and subsequently amended on 04 April 2019 to correct a minor naming error (14/12/16/3/3/1/1976/AM1. The layout for the authorised Kudusberg WEF is presented in **Figure 3** below.

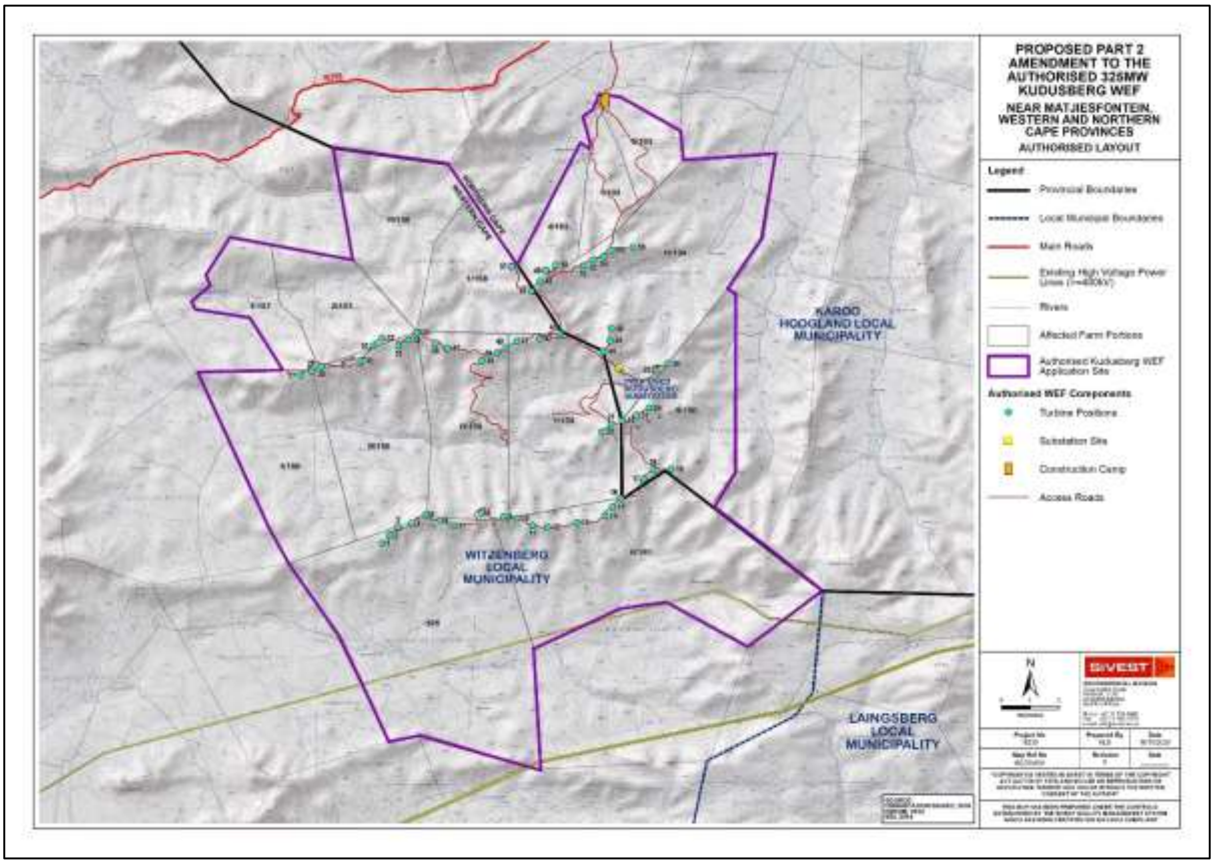

Figure 3: Layout map for authorised Kudusberg WEF (14/12/16/3/3/1/1976/AM1)

Kudusberg Wind Farm is now proposing to submit a Part 2 EA Amendment Application to split the authorised Kudusberg WEF (14/12/16/3/3/1/1976/AM1) into two (2) separate smaller WEF projects, namely the Kudusberg WEF and Oya WEF, which will result in a number of technical and administrative changes detailed below in **Table 8**. The split is being proposed to allow the projects to be suitable for numerous opportunities such as either the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP), other government run procurement programmes that may arise or for sale to private entities, if enabled and/or required in the drive for energy security in South Africa.

Following the split, the northern section of the authorised WEF will become the Oya WEF (**Figure 4**) (**Table 8**). In addition to the split, the final layout for the Oya WEF is being submitted which has been informed by detailed specialist walk-throughs[4] and on-site micro-siting as per condition 29 of the Kudusberg EA[5]. As a result of the proposed amendments and the specialist walk-throughs, the layout assessed in the FBAR (2018) has been amended. The Oya WEF (northern section of the authorised Kudusberg WEF) has been optimised based on wind resources, grid access and civil designs. The final layout has also been assessed by specialists as part of the amendment and has been as informed by detailed specialist walk-throughs and micro-sighting as per condition 29 of the EA and the EMPr.

Furthermore, this EMPr has incorporated the final layout for the Oya WEF, management plans[6] and the walk-throughs and is being submitted for approval. In this way, environmental best-practice prevails and is effectively deepened based on the findings of the respective walk-throughs.

The layout for the proposed Oya WEF (northern section of the authorised WEF) is presented in **Figure** 4 below.

[4] Namely Terrestrial Ecology, Surface Water, Avifauna, Bats and Heritage (including Archaeology, Palaeontology and Cultural Landscapes)

[5] Condition 29 of Kudusberg EA (**DEFF Ref:** 14/12/16/3/3/1/1976/AM1) – Page 15 of EA (page 17 of full document): *the final placement of turbines must follow a micro siting procedure involving a walk-through and identification of any sensitive areas by ecological, avifaunal, bat, surface water and heritage specialists.*

[6] Includes Alien and Invasive Plant Species Management Plan; Plant Rescue Management Plan; Vegetation Rehabilitation Plan; Heritage Management Plan; Watercourse Rehabilitation & Maintenance Management Plan; Hydrological Assessment (including Storm Water Management & Erosion Control Plan); Traffic and Transport Management Plan; Post-Construction Avifaunal Monitoring Plan; Fire Management Plan and Waste Management Plan

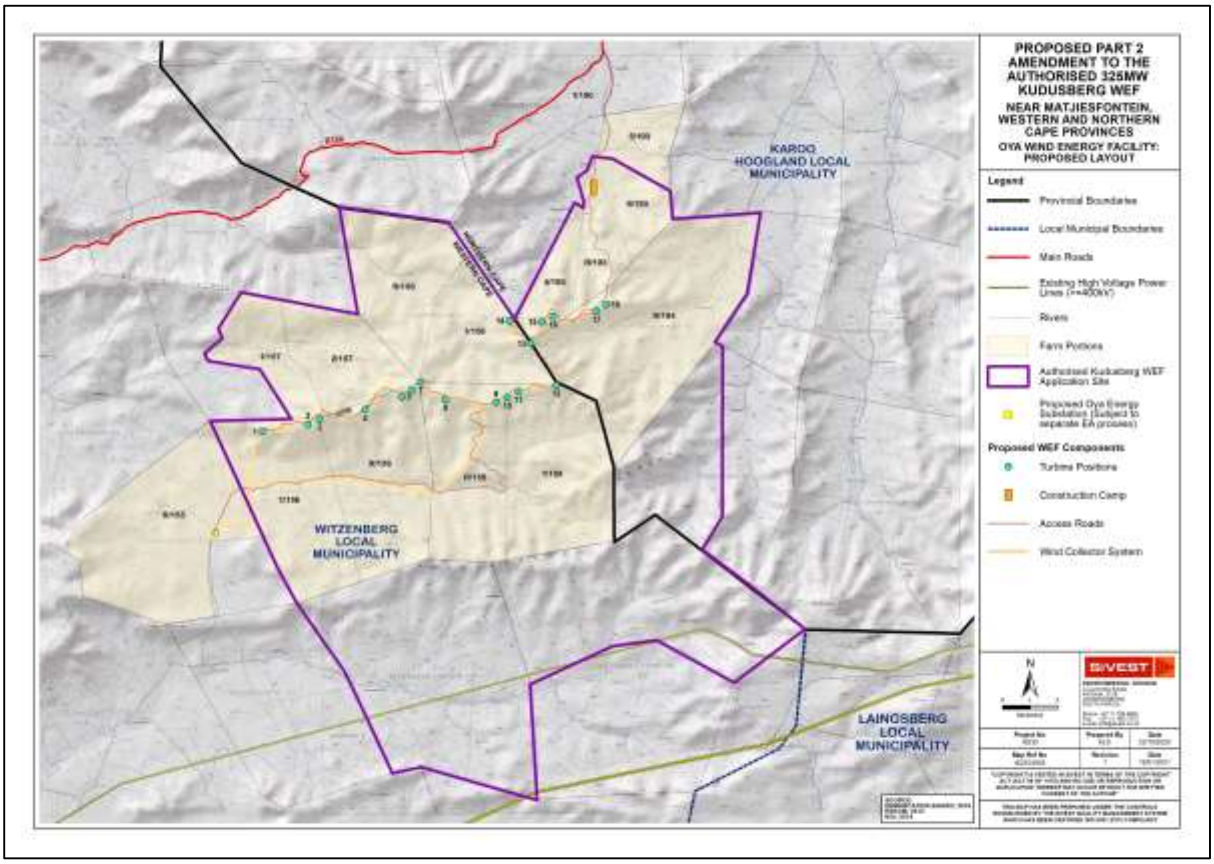

Figure 4: **Layout map for proposed Oya WEF (northern section of the authorised WEF)**

A comparison of the layout for the authorised Kudusberg WEF and proposed Oya WEF is provided in **Figure 5** below.

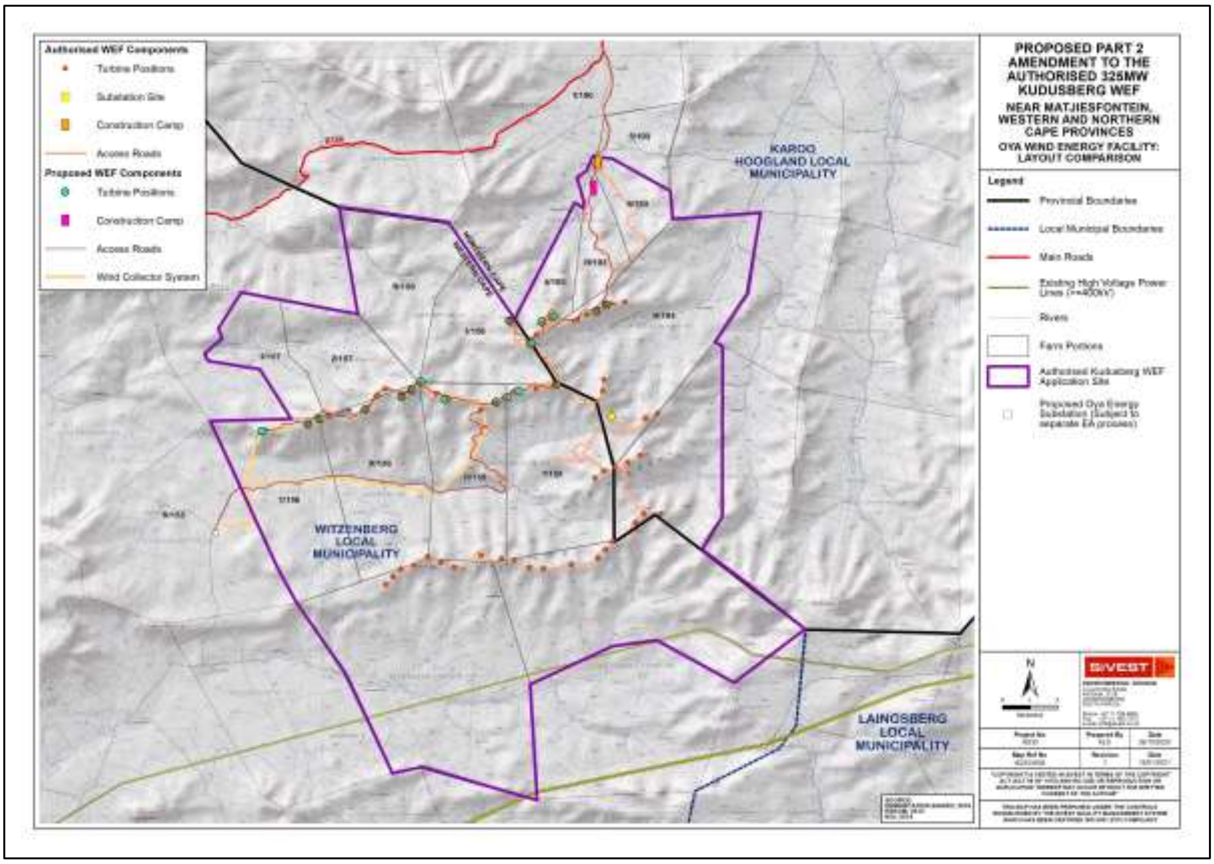

Figure 5: Layout comparison for authorised Kudusberg WEF and proposed Oya WEF (northern section of authorised WEF)

The proposed WEF is located approximately 45km south-west of the town of Sutherland within the Witzenberg and Karoo Hoogland Local Municipalities, which fall within the Cape Winelands and Namakwa District Municipalities of the Western and Northern Cape Provinces respectively. It should also be noted that the authorised Kudusberg WEF falls entirely within the Renewable Energy Zone (REDZ) 2 (i.e. Komsberg REDZ), which was Gazetted in February 2018 by the Minister of Environmental Affairs (GN 114), and therefore the proposed Oya WEF will also fall entirely within the above-mentioned REDZ.

The location of the proposed Oya WEF in relation to the Komsberg REDZ is shown in **Figure 6** below.

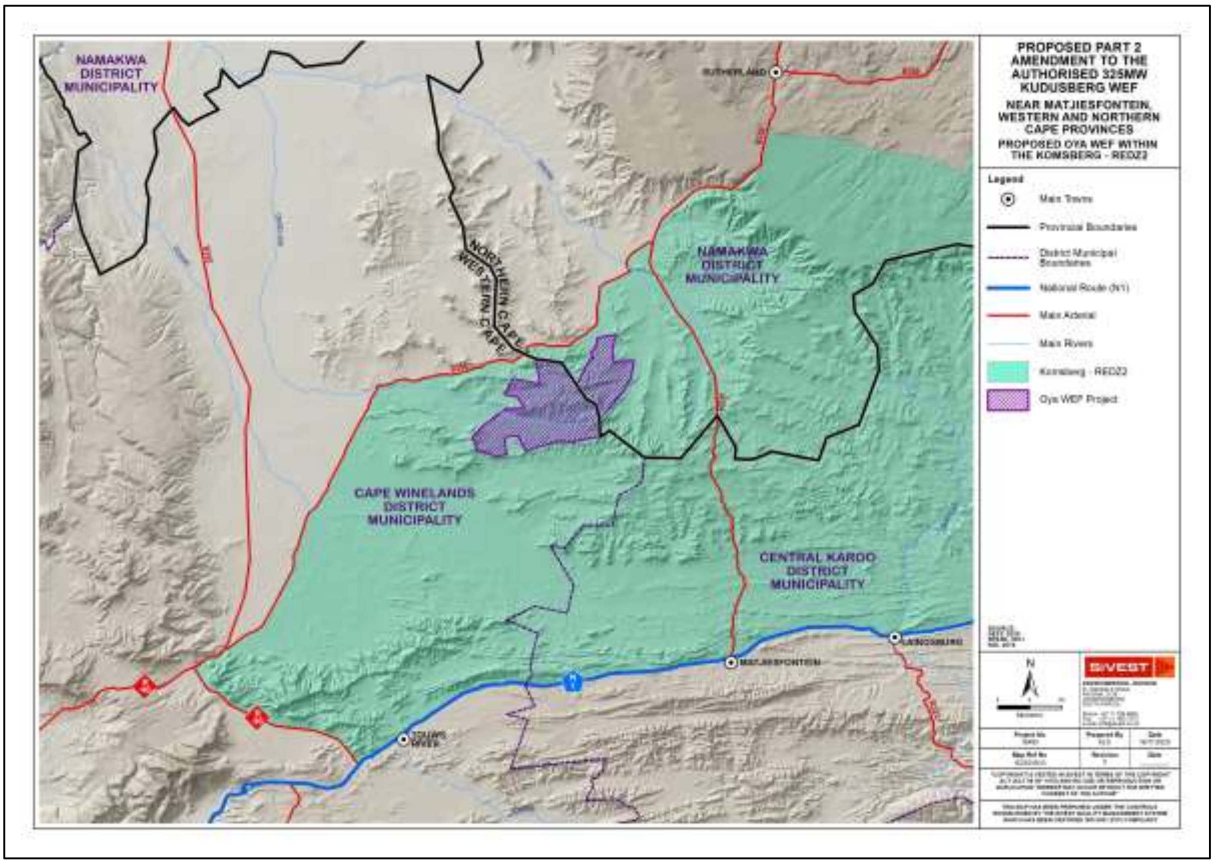

Figure 6: Location of proposed Oya WEF in relation to REDZ

The proposed amendments in themselves are not listed activities according to Government Notice (GN) R326, R327, R325 and R324 of the Environmental Impact Assessment (EIA) Regulations (as amended on 07 April 2017 and 13 July 2018), and do not trigger any new listed activity. In addition, the proposed amendments do not change the scope of the EA.

The amendments detailed in **Table 8** below are proposed for the proposed Oya WEF (northern section of the authorised WEF) mentioned above.

Table 8: Amendment to authorised EA to Oya WEF

Aspect to be amended	Authorised	Proposed Amendment Oya WEF
Administrative Aspects		
Amend the holder of the EA's	Kudusberg Wind Farm (Pty) Ltd	Oya Energy (Pty) Ltd
Amend the name of the WEFs	Kudusberg Wind Energy Facility	Oya Wind Energy Facility
Contact Details	kudusberg@g7energies.com	oya@g7energies.com
Extend the validity of the EA	This activity must commence within a period of five (05) years from the date of issue of this environmental authorisation	This activity must commence within a period of five (05) years from the date of issue of this amended environmental authorisation
Location of Activity and SG codes	**Western Cape** 1. Portion 1 of 156 Gats Rivier Farm: C01900000000015600001 2. Portion 3 of 156 Gats River Farm: C01900000000015600002 3. Remainder of 156 Gats Rivier Farm: C01900000000015600000 4. Portion 1 of 157 Riet Fontein Farm: C01900000000015700001 5. Portion 1 of 158 Amandelbloom Farm: C01900000000015800001 6. Remainder of 158 Amandelboom Farm: C01900000000015800000 7. Portion 1 of 159 Oliviers Berg Farm: C01900000000015900001 8. Remainder of 159 Oliviers Berg Farm: C01900000000015900000 9. Portion 2 of 157 Riet Fontein Farm: C01900000000015700002 10. Remainder of 161 Muishond Rivier Farm: C01900000000016100000 11. Remainder of 395 Klipbanks Fontein Farm: C01900000000019500000 **Northern Cape** 12. Portion 4 of 193 Urias Gat Farm: C07200000000019300004 13. Portion 6 of 193 Urias Gat Farm: C07200000000019300006	**Western Cape** 1. Portion 1 of the Farm Gats Rivier No 156: C01900000000015600001 2. Portion 2 of the Farm Gats Rivier No 156: C01900000000015600002 3. Remainder of the Farm Gats Rivier No 156: C01900000000015600000 4. Portion 1 of the Farm Riet Fontein No 157: C01900000000015700001 5. Portion 2 of the Farm Riet Fontein No 157: C01900000000015700002 6. Portion 1 of the Farm Amandelbloom No 158: C01900000000015800001 7. Remainder of the Farm Amandelboom No 158: C01900000000015800000 8. Portion 1 of the Farm Oliviers Berg No 159: C01900000000015900001 9. Remainder of the Farm Oliviers Berg No 159: C01900000000015900000 **Northern Cape** 10. Portion 4 of the Farm Urias Gat No 193: C07200000000019300004 11. Portion 6 of the Farm Urias Gat No 193: C07200000000019300006 12. Remainder of the Farm Urias Gat No 193: C07200000000019300000 13. Remainder of the Farm Matjies Fontein No 194: C07200000000019400000

	14. Remainder of 193 Urias Gat Farm: C07200000000019300000 15. Remainder of 194 Matjes Fontein Farm: C07200000000019400000 16. Remainder of 196 Karree Kloof Farm: C07200000000019600000 **Properties affected by public road:** 17. 169 Zeekoegat Farm: C07200000000016900000 18. Portion 1 of 170 Roodeheuvel Farm: C07200000000017000001 19. Remainder of 170 Roodeheuvel Farm: C07200000000017000000 20. Remainder of 190 Wind Heuvel Farm: C07200000000019000000 21. Portion 1 of 190 Wind Heuvel Farm: C07200000000019000001 22. Portion 5 of 193 Urias Gat Farm: C07200000000019300005 23. Remainder of 171 Vinke Kuil Farm: C07200000000017100000 24. Alkant Re/220 Farm: C07200000000022000000 25. Portion 1 of 174 Lange Huis Farm: C07200000000017400001	14. Portion 5 of the Farm Urias Gat No 193: C07200000000019300005 **Properties affected by access road:** 15. Zeekoegat Farm No 169: C07200000000016900000 16. Portion 1 of the Farm Roodeheuvel No 170: C07200000000017000001 17. Remainder of the Farm Roodeheuvel No 170: C07200000000017000000 18. Remainder of the Farm Wind Heuvel No 190: C07200000000019000000 19. Portion 1 of the Farm Wind Heuvel No 190: C07200000000019000001 20. Portion 5 of the Farm Urias Gat No 193: C07200000000019300005 21. Remainder of the Farm Vinke Kuil No 171: C07200000000017100000 22. Alkant Farm No 220: C07200000000022000000 23. Portion 1 of the Farm Lange Huis No 174: C07200000000017400001 24. Remainder of the Farm Baakens Rivier No. 155: C01900000000015500000
Co-ordinates	**Centre:** 32°50' 56.0868"S; 20°19' 25.0608"E **North:** 32°40' 29.8812"S; 20°24' 57.78"E **East:** 32°43' 53.8212"S; 20°29' 32.28"E **South-East:** 32°54' 6.66"S; 20°23' 3.7788"E **South-West:** 32°55' 32.0412"S; 20°16' 24.8988"E **West:** 32°52' 12.7812"S; 20°14' 20.6988"E	**APPLICATION SITE:** **Coordinates at Corner Points (DD MM SS.sss)** 1. S32° 46' 11.757" E20° 21' 39.554" 2. S32° 45' 55.571" E20° 23' 32.919" 3. S32° 47' 3.530" E20° 23' 8.115" 4. S32° 48' 14.853" E20° 23' 15.057" 5. S32° 48' 7.939" E20° 25' 19.086" 6. S32° 49' 44.075" E20° 24' 59.144"

		7. S32° 50' 41.159" E20° 24' 13.445" 8. S32° 53' 6.441" E20° 21' 52.752" 9. S32° 53' 8.532" E20° 21' 53.539" 10. S32° 54' 36.732" E20° 21' 50.816" 11. S32° 55' 2.170" E20° 18' 58.064" 12. S32° 54' 57.184" E20° 17' 28.053" 13. S32° 55' 48.840" E20° 14' 21.666" 14. S32° 55' 7.517" E20° 13' 55.356" 15. S32° 54' 28.981" E20° 13' 34.753" 16. S32° 54' 34.507" E20° 12' 20.205" 17. S32° 55' 13.194" E20° 12' 15.385" 18. S32° 56' 3.895" E20° 12' 26.330" 19. S32° 56' 12.929" E20° 11' 16.988" 20. S32° 55' 38.363" E20° 9' 20.611" 21. S32° 54' 56.533" E20° 9' 15.790" 22. S32° 54' 45.536" E20° 8' 55.471" 23. S32° 54' 18.000" E20° 9' 11.192" 24. S32° 54' 13.557" E20° 9' 23.325" 25. S32° 53' 59.701" E20° 9' 41.082" 26. S32° 53' 54.356" E20° 9' 40.992"

		27. S32° 52' 11.464" E20° 12' 21.280" 28. S32° 52' 9.896" E20° 14' 16.133" 29. S32° 51' 10.304" E20° 13' 32.215" 30. S32° 51' 0.223" E20° 12' 19.238" 31. S32° 50' 51.343" E20° 12' 14.058" 32. S32° 50' 33.384" E20° 12' 39.312" 33. S32° 50' 21.482" E20° 12' 33.983" 34. S32° 49' 38.848" E20° 13' 6.405" 35. S32° 50' 5.733" E20° 15' 50.817" 36. S32° 47' 57.718" E20° 15' 25.332" 37. S32° 48' 16.924" E20° 17' 59.136" 38. S32° 50' 12.452" E20° 19' 31.355" 39. S32° 47' 54.581" E20° 20' 57.293" 40. S32° 48' 1.255" E20° 21' 9.303" 41. S32° 47' 54.387" E20° 21' 10.181" 42. S32° 47' 24.673" E20° 21' 0.698" 43. S32° 47' 17.149" E20° 21' 13.982" 44. S32° 46' 59.938" E20° 21' 22.475" 45. S32° 46' 56.504" E20° 21' 29.064" **Coordinates at Centre Point (DD MM SS.sss)**

		26. <u>S32° 51' 45.765"</u> <u>E20° 17' 43.464"</u> **CONSTRUCTION CAMP:** **<u>Coordinates at Centre Point (DD MM SS.sss)</u>** **CENTRE:** S32° 47' 36.876"; E20° 21' 23.588" **<u>Coordinates at Corner Points:</u>** **CC1_01:** S32° 47' 28.108"; E20° 21' 19.647" **CC1_02:** S32° 47' 28.329"; E20° 21' 28.144" **CC1_03:** S32° 47' 45.815"; E20° 21' 27.943" **CC1_04:** S32° 47' 45.598"; E20° 21' 19.332" **CC1_05:** S32° 47' 43.103"; E20° 21' 20.053" **CC1_06:** S32° 47' 40.376"; E20° 21' 20.085" **CC1_07:** S32° 47' 38.132"; E20° 21' 19.168" **CC1_08:** S32° 47' 35.632"; E20° 21' 19.015" **CC1_09:** S32° 47' 34.407"; E20° 21' 18.760" **SUBSTATION:** **<u>Coordinates at Centre Point (DD MM SS.sss):</u>** **CENTRE:** S32° 54' 24.333"; E20° 12' 28.366" **<u>Coordinates at Corner Points (DD MM SS.sss):</u>** **SS1_01:** S32° 54' 19.886"; E20° 12' 26.843" **SS1_02:** S32° 54' 23.125"; E20° 12' 33.613" **SS1_03:** S32° 54' 28.772"; E20° 12' 29.816" **SS1_04:** S32° 54' 25.569"; E20° 12' 23.122"
Technical Aspects		
Aspect to be amended	**Authorised**	**Proposed Amendment**
		Oya WEF
Overall Capacity	325 MW	<u>99 MW</u>
Number of turbines	56	<u>18</u>
Hub height	Up to 140 m	<u>Up to 101 m above the foundation</u>
Rotor diameter	Up to 180 m	<u>Up to 158 m</u>
Blade length	Up to 90 m	<u>Up to 79 m</u>
Wind Measuring Lattice Masts	Up to 4 x 140 m high depending the final hub height	<u>2 x height of the hub height</u>
Layout	-	Layout submitted for final approval. The layout to be approved are contained in **Appendix J4** of Draft EA Amendment Assessment Report. Associated turbine GPS locations will be provided in the Final EA Amendment Report.

EMPr	The EMPr submitted as part of the Application for EA is hereby approved.	Approve Final EMPr

3.1 Site Description

The proposed development area is located towards the southwest of the main Karoo region, with the centre of the study area some 11 km south of the R356 and 22 km west of the R354, off the Sutherland to Matjiesfontein road. The closest towns to the proposed project are Matjiesfontein and Sutherland. The area is on the border of the summer and winter rainfall regions and receives some snow and precipitation in winter as well as summer thunderstorms, although precipitation is limited, and the region is semi-arid. The vegetation is characteristic of the Succulent Karoo biome in the low-lying areas and the Karoo Renosterveld Fynbos in the high-lying portions (Mucina and Rutherford 2006). The development area lies within the foothills of the Great Escarpment, and is characterised by valleys located between long ridges, and flat plains surrounded by hills and mountains. The ridges are largely undeveloped, while the valleys and plains contain several farmsteads comprising varying numbers of buildings. The site has an extremely low average rainfall of 125 mm per annum. The low rainfall is a very significant agricultural constraint that seriously limits the level of agricultural production (including grazing) which is possible. There are no dams across the project area.

The project is located across very hilly terrain. Turbines are to be located along the crests of several east-west orientated ridges with valleys between them. The ridges attain a maximum altitude of approximately 1,350 m and the valleys drop down to approximately 850 m. There is a wide range of slopes across the hilly terrain. There are several non-perennial water courses, typical of arid areas, in the valleys.

Much of 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, with isolated patches of cultivation also present in small parts of the study area. This has therefore transformed the natural vegetation in some areas. However, a large portion of the study area has retained a natural appearance due to the presence of the natural vegetation which is dominated by low shrubs. As such, majority of the study area is dominated by largely natural / scenic views.

The geology of the site is depicted in the 1:250 000 geological map 3220 Sutherland. The region is almost entirely covered by greenish-grey mudstone and subordinate sandstone of the Abrahamskraal Formation (Pa) of the Beaufort Group. While the steep upper slopes, cliffs and s of the region consist mainly of sandstone, the middle and lower slopes are dominated by mudstone and subordinate sandstones. Some minor east-west trending fold axes and minor faults occur in the region.

Dominant soil forms are Glenrosa and Mispah and lime is generally present. Glenrosa has a low erodibility when occurring on flat or gentle slopes but increases on steeper slopes of ridges, hills and mountains. This is often ameliorated by stony deposits that reduce runoff intensity. Mispah soil is often found in association with Glenrosa and has a low erodibility. It is important to note that crests cover only approximately 10% of the landscape

Phytogeographically, the study area falls in the Cape and the Karoo – Namib Regional Centres of Endemism (White, 1983). The vegetation types in the region fall in the Succulent Karoo and Fynbos Biomes (Rutherford and Westfall, 1986; Mucina and Rutherford, 2006), and specifically in the Karoo Renosterveld Bioregion (F09) and Rainshadow Valley Karoo Bioregion (SKv). Various vegetation types occur in the region of which the Koedoesberge-Moordenaars Karoo (SKv 6) and the Central Mountain Shale Renosterveld (FRs 5) cover the study site (Mucina and Rutherford, 2006).

The layout for the proposed Oya WEF (northern section of the authorised WEF) which is being submitted for approval is presented in **Figure 7** below. The proposed layout in relation to all identified environmental sensitivities is provided in **Figure 8** below.

3.2 Findings of the Part 2 Amendment Process and Specialist Site Walk Downs

As part of the original BA process[9] for the proposed Kudusberg WEF and associated infrastructure undertaken in 2018, the following specialist studies were undertaken:

- Agricultural Assessment;
- Avifaunal Assessment;
- Bat Assessment;
- Biodiversity (including fauna and flora) Assessment;
- Heritage Assessment;
- Noise Impact Assessment;
- Socio-Economic Impact Assessment;
- Surface Water / Aquatic Impact Assessment;
- Transportation Assessment, and
- Visual Impact Assessment.

The above-mentioned specialist studies were commissioned to assess the impacts of the proposed amendments.

In addition, the following specialists have undertaken detailed walk-throughs and micro-siting of the Oya WEF in accordance with the recommendations contained in the approved EMPr and in accordance with condition 29 of the EA:

- Avifauna;
- Bats;
- Surface Water / Aquatic;
- Palaeontology
- Cultural Landscape;
- Ecology; and
- Heritage (including Archaeology, Palaeontology and Cultural Landscapes).

The above-mentioned walk-throughs were undertaken to identify any additional sensitive / "no-go" areas based on the final layout and/or any other special features which need to be avoided. Furthermore, the necessary specialists were commissioned to compile the requisite management plans detailed in the EMPr[6].

Based on the assessment of the proposed amendments undertaken by the respective specialists, no new environmental risks or impacts were identified and it was concluded that the impacts identified and mitigation measures and/or recommendations proposed as part of the BA process for the original Kudusberg WEF in 2018 would remain unchanged. The 2020 Freshwater Assessment (du Prrez, 2020) which replaces the original Surface Water Impact Assessment (BlueScience, 2018) also concluded that impacts can be mitigated to acceptably low levels after the implementation of the recommended mitigation measures.

With regards to the specialist walk-throughs which were undertaken, no fatal flaws or additional environmental sensitivities were identified and all specialists found the proposed layout for the Oya WEF to be acceptable. Additionally, all specialists recommended that the layout should be approved. Very few new (previously unknown) heritage resources were identified during the Heritage walk-through, however, it was confirmed by the specialist that they do not fall within the development footprint and will not be directly impacted. It should be noted that the Ecologist recommended (not critical) shifting Turbine 1 a minimum of 90m eastwards and locating the crane pad to the east of the new position if a possible Vulnerable plant species (tentatively identified as *Octopoma quadrisepalum*) is identified within 40m of Turbine 1. If this is not technically feasible due to the terrain an application can be submitted for a permit to relocate the plant or destroy it. No additional layout changes were however recommended from a Terrestrial Ecology perspective.

From a Surface Water perspective, it was found that the proposed Oya WEF overhead collector power line will traverse several watercourses, however, the pylons will be constructed outside the 32m NEMA zone of regulation. It was however determined that should the above infrastructure components be moved to be located at least 32m from a watercourse and the watercourse road crossings only be constructed during the driest period of the year, the impacts significance for the construction and operation for these components can be considered low with mitigation. In addition, no fatal flaws in terms of freshwater ecological aspects were identified. In terms of the walk-down, recommended amendments to the Oya WEF layout were made, in order to limit the infrastructure components within the watercourses and the 32m NEMA and 100m GN 509 zones of regulation. These amendments are however **not considered critical** for the protection of watercourses (as the risk assessment determined a Low Risk significance for linear infrastructure within the watercourses), but are suggested as best practice and to further reduce impacts on the receiving natural environment as a whole. The proposed Oya WEF layout respects the required buffers and is however considered acceptable from a freshwater ecological perspective, provided the recommended mitigation measure be applied, and should be granted EA.

It should be noted that none of the specialists identified any fatal flaws and all specialists (including the Ecologist and Surface Water Specialist) subsequently recommended that the layout should be approved. Various management plans[6] have also been compiled by some of the specialists for incorporation into the EMPr and subsequent implementation.

As such, no environmental fatal flaws were identified in the detailed specialist studies conducted, provided that the recommended mitigation measures are implemented. These measures include, amongst others, the avoidance of sensitive features within the development footprint and the undertaking of the construction and operational monitoring and mitigation set forward by the specialists. Summaries of the impacts identified by the specialist are detailed below.

The development footprint was designed by the Holder of the EA in order to respond to and avoid the sensitive features located within the project site. Therefore, it is concluded that the development footprint is suitable and appropriate from an environmental perspective for the proposed Wind Energy Facility and all detrimental or adverse impacts on sensitive features were avoided, reduced and/or mitigated.

A summary of specialist Findings (amendment letters and walk-throughs) are provided in **Table 9** below. In addition, the summary of changes in overall impact ratings is provided in **Table 10** below.

Table 9: Summary of Specialist Findings (amendment letters and walk-throughs)

Environ. Parameter	Summary of findings	Additional Impact management measures
	Amendment Letter	
Agriculture **Johann Lanz** **Report dated 5 January 2021** This document is an amendment to, and should be read together with, the original Agricultural Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (Lanz, 2018)	There are no additional agricultural impacts related to any of the proposed amendments. All impacts identified in the original Agricultural report (2018) are still valid for the proposed amendments. The amendments and final layout will not change the nature or significance of any of the impacts assessed in the original study. There are no agricultural advantages or disadvantages related to the amendments. The agricultural impacts of the amended projects will therefore be identical to the impact for the authorised development, that was assessed in the original specialist assessment report. Conclusion of assessment is that the proposed amendments will have no agricultural impacts. No additional No-Go areas were identified as a result of this amendment. Therefore, from an agricultural impact point of view, the amendments and final layout should be authorised.	The amendment does not require any changes or additions to the mitigation measures for agricultural impacts that were recommended for the authorised development, and there are therefore no required changes to the EMPr(s).
	Amendment Letter	
Avifauna **BioInsight** **Letter dated 12 January 2021** This document is an amendment to, and should be read together with, the original Avifauna Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in December 2018 (BioInsight, 2018)	Bioinsight finds that this split is merely administrative and should hold no significant impact on the bird community on site. It is also not envisaged that the conclusions of the final specialist impact assessment report (Bioinsight, 2018) will change, as a result of this split. This being said, however, it is noted that minor disadvantages may occur as a result of the split. As an example, the proposed split may potentially result in additional infrastructures being built (in comparison to what would exist in a single facility). This may potentially include (but not limited to) additional construction camps (estimated that two are to be built), batching plants, offices / control centres etc. In addition to this, it can also be noted that two separate smaller facilities will be assessed separately for real impacts during the operational phase. This could potentially result in a perception that few birds are potentially being impacted. Although challenging and potentially not possible (due to different bidding and construction times), it would be idea if the two facilities could	No changes or additions to mitigation measures are proposed at this stage. It will however be important for all relevant management / mitigation measures, as described in Bioinsight (2018) to be strictly adhered to for each wind farm, independently. Wherever possible, it will also be useful for a relevant site walk-through to be conducted at both wind farms (Oya WEF walk-through already completed), prior to construction, in order to assess any relevant sensitivities against proposed infrastructures – for further approval of final site layouts. Given that the authorised project is to be split into two separate smaller ones, Bioinsight emphasises the importance that each individual wind farm must have its own unique monitoring plan with sampling design, going forward (to assess real impacts in the construction and/or post-construction phases).

Environ. Parameter	Summary of findings	Additional Impact management measures
	be evaluated jointly (once both are in operation) in order to understand the real impact of all turbines in the area, collectively. Careful consideration should be taken with this, and both wind farms should ideally work closely together during the operational phase so that the relevant avifauna specialist(s) can have access to fatality data from both facilities, wherever possible. No specific advantages (as a result of the proposed split) for the bird community were identified at this stage. Bioinsight finds the split acceptable for the bird community on site. Additionally, we find our previous impact assessment (Bioinsight, 2018) for the authorised Kudusberg WEF to still be valid in present day conditions.	
	Walk-though Report	
BioInsight **Walk-through Report dated <u>January 2021</u>** This document is an amendment to, and should be read together with, the original Avifauna Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in December 2018 (BioInsight, 2018)	The pre-construction avifauna site walk-through at Oya WEF aimed to analyse the study area and proposed final layout against any old and potentially new sensitivities that may affect the bird community on site. This analysis was required to determine the acceptability of the final layout being proposed. After careful comparisons between the layout and on-site conditions observed today, it was determined that no new updates to the initial sensitivity analysis would be required, and that no fatal flaws to the project were identified. All habitats in the area remain the same as before, with the majority of the site being very homogenous and mostly dominated by large stretches of typical Karoo Scrub vegetation. No new species nests were found, and existing nests showed no signs of occupancy. No new areas to be avoided were identified, and all previously-identified no-go areas are still applicable under present day conditions. All turbine locations avoid the previously identified no-go areas, and the overlap of certain associated infrastructures are deemed acceptable for the project, given the nature and extent of these activities & features – provided that all previously proposed	As all present day conditions on site have been described as being the same as during the initial monitoring campaign, and as the proposed final layout is deemed acceptable against the pre-defined environmental sensitivities, no new specific management / monitoring plans have been identified to be included in the EMPr going forward, other than those already identified in the initial avifauna specialist assessment report – which are to be strictly adhered to.

Environ. Parameter	Summary of findings	Additional Impact management measures
	mitigation/management measures are strictly adhered to. It is not expected for this project to cause an irreplaceable loss to biodiversity. In light of the above, it is our professional opinion that the proposed final layout for Oya WEF is considered to be acceptable and allowable for implementation, provided that all previously identified management / mitigation measures are strictly adhered to during all phases of the project. It is therefore considered allowable for the project and final layout to undergo approval for EA.	
<u>Bats</u> **BioInsight** **Letter dated <u>12 January 2021</u>** This document is an amendment to, and should be read together with, the original Avifauna Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in December 2018 (BioInsight, 2018)	**Amendment Letter**	
	Bioinsight finds that this split is merely administrative and should hold no significant impact on the bat community on site. It is also not envisaged that the conclusions of the final specialist impact assessment report (Bioinsight, 2018) will change, as a result of this split. This being said, however, it is noted that minor disadvantages may occur as a result of the split. As an example, the proposed split may potentially result in additional infrastructures being built (in comparison to what would exist in a single facility). This may potentially include (but not limited to) additional construction camps (estimated that two are to be built), batching plants, offices / control centres etc. In addition to this, it can also be noted that two separate smaller facilities will be assessed separately for real impacts during the operational phase. This could potentially result in a perception that few bats are potentially being impacted. Although challenging and potentially not possible (due to different bidding and construction times), it would be ideal if the two facilities could be evaluated jointly (once both are in operation) in order to understand the real impact of all turbines in the area, collectively. Careful consideration should be taken with this, and both wind farms should ideally work closely together during the operational phase so that the relevant bat specialist(s) can have access to fatality data from both facilities, wherever possible. No specific advantages (as a result of the proposed split) for the bat community were identified at this stage.	No changes or additions to mitigation measures are proposed at this stage. It will however be important for all relevant management / mitigation measures (as described in Bioinsight [2018]) to be strictly adhered to for each wind farm, independently. Wherever possible, it will also be useful for a relevant site walk-through to be conducted at both wind farms (Oya WEF walk-through already completed), prior to construction, in order to assess any relevant sensitivities against proposed infrastructures – for further approval of final site layouts. Given that the authorised project is to be split into two separate smaller ones, Bioinsight emphasises the importance that each individual wind farm must have its own unique monitoring plan with sampling design, going forward (to assess real impacts in the construction and/or post-construction phases).

Environ. Parameter	Summary of findings	Additional Impact management measures
	Based on the above, Bioinsight finds the split acceptable for the bat community on site. Additionally, we find our previous impact assessment (Bioinsight, 2018) for the authorised Kudusberg WEF to still be valid in present day conditions.	
	Walk-though Report	
BioInsight **Walk-through Report dated January 2021** This document is an amendment to, and should be read together with, the original Avifauna Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (BioInsight, 2018)	After careful comparisons between the layout and on-site conditions observed today, it was determined that no new updates to the initial sensitivity analysis would be required, and that no fatal flaws to the project were identified. All habitats in the area remain the same as before, with the majority of the site being very homogenous and mostly dominated by large stretches of typical Karoo Scrub vegetation. No new significant roosting structures were found, and existing roosts were still intact. No new significant areas to be avoided were identified, and all previously-identified no-go areas are still applicable under present day conditions. All turbine locations avoid the previously identified no-go areas, and the overlap of certain associated infrastructures are deemed acceptable for the project, given the nature and extent of these activities & features – provided that all previously proposed mitigation/management measures are considered. It is not expected for this project to cause an irreplaceable loss to biodiversity. In light of the above, it is our professional opinion that the proposed final layout for Oya WEF is considered to be acceptable and allowable for implementation, provided that all previously identified management/mitigation measures are considered during all phases of the project. It is therefore considered allowable for the project and final layout to undergo approval for Environmental Authorisation.	As all present day conditions on site have been described as being the same as during the initial monitoring campaign, and as the proposed final layout is deemed acceptable against the pre-defined environmental sensitivities, no new specific management / monitoring plans have been identified to be included in the EMPr going forward, other than those already identified in the initial bat specialist assessment report – which are to be considered.
Terrestrial Ecology (Fauna & Flora) **David Hoare** **Letter dated 22 January 2021**	**Amendment Letter** Cumulative impacts are unchanged in terms of the proposed amendment, and no additional cumulative impacts will occur.	The EMPr recommendations in the original report and Oya walk

Environ. Parameter	Summary of findings	Additional Impact management measures
This document is an amendment to, and should be read together with, the original Terrestrial Ecology Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (Ekotrust, 2018)	When the original project plan for the integrated project is compared to that of the project once split into the two components, it can be concluded that the split, from a terrestrial ecological perspective, has no significant change in the risk profile from that of the original integrated project. it is therefore recommended that the amendment be granted, subject to implementation of the recommendations.	down remain valid and no additional mitigation is required. The recommendations should be included in the EMPr and the EA.
<u>David Hoare</u> **Walk-through Report dated <u>22 January 2021</u>** This document is an amendment to, and should be read together with, the original Terrestrial Ecology Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (Ekotrust, 2018)	**Walk-through Report**	
	On the basis of the walk down, no sensitivities have been identified within the footprint of proposed infrastructure, except for a possible occurrence of a Red List species near to Turbine 1, the identity of which needs to be confirmed before any final recommendations are made. If the identity is confirmed as a Red List species, then a shift of the Turbine 1 location 100 m to the east is recommended. No other changes are required to the proposed layout. Of the remaining Red List plant species that were considered to have a probability of occurring on site (see list in Appendix 1 of Terrestrial Ecology Walk-through Report – **Appendix D3**), none similar to those in the Appendix were observed on site, except for four observations of *Lotononis* that have not yet been identified to species level - there is a small risk that they could be *Lotononis venosa*, listed as Vulnerable, but it is more likely that they are observations of more common species from the genus since none closely match the published description for the listed species (Van Wyk 1990). From an ecological point of view, on the basis that few sensitivities occur within the proposed footprint, it is recommended that the final layout is approved.	If the identity a possible occurrence of a Red List species is confirmed as a Red List species, then a shift of the Turbine 1 location 100 m to the east is recommended. No other changes are required to the proposed layout. A permit is required for the destruction of all protected species (marked in bold in the lists for each turbine position).
<u>Heritage</u> **Letter dated <u>11 January 2021</u> prepared by Katie Smuts, Rennie Scurr Adendorff**	**Amendment Letter**	
	The proposed development area for the split facilities occupies the same area as that surveyed and assessed in 2018, with only slight deviations in proposed layouts of roads, turbines and associated infrastructure.	Due to the fact that the recommended walk-downs are being undertaken (part of separate standalone report, the findings of which have been detailed below), and appropriate mitigatory measures pertaining to heritage resources identified during the assessments have been recommended

Environ. Parameter	Summary of findings	Additional Impact management measures
This letter is an amendment to, and should be read in conjunction with the original Heritage Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (Smuts, 2018b).	Due to the fact that the recommended walk-downs are being undertaken (part of separate standalone report), and appropriate mitigatory measures pertaining to heritage resources identified during the assessments have been recommended and provided in the EMPr for implementation accordingly, it is not anticipated that the proposed changes will result in any further, different or greater impacts to heritage resources than those already identified in the 2018 HIA. All buffers previously imposed are respected and, in the case of the northern site clusters on Urias Gat, the new proposal increases the buffer between sites and infrastructure; no turbines are proposed for this area and these buffers pertain to road and construction infrastructure. In light of the above, it is not anticipated that the proposed amended developments will have significant impacts to heritage resources, beyond those to the cultural landscape, given that they are generally of low heritage significance. Cumulative impacts are unchanged in terms of the proposed amendment, and no additional cumulative impacts will be effected. It is therefore recommended that the amendment be granted, subject to implementation of the above recommendations.	and provided in the EMPr for implementation accordingly, it is not anticipated that the proposed changes will result in any further, different or greater impacts to heritage resources than those already identified in the 2018 HIA. The recommendations should be included in the EMPr and the EA.
<u>Archaeological and Palaeontological Walk-through</u> **<u>CTS Heritage</u>** **Walk-through Report dated November 2020** This walk-through report is an amendment to, and should be read in conjunction with the original Heritage Impact Assessment for Kudusberg Wind Energy Facility Project,	**Walk-through Report** Based on the outcomes of the required walk down, it is not anticipated that the proposed development of turbines, cables and roads associated with the proposed WEF will negatively impact on significant archaeological or palaeontological heritage and as such, there is no heritage objection to the final alignment proposed for the WEF development. The identified built environment and graves do not fall within the development footprint and will not be directly impacted. The findings of this walk-down assessment align with the conclusions of the HIA conducted for the Kudusberg WEF (Smuts *et al.,* 2018) in that ***" The study area is largely***	The conditions and recommendations from HWC and SAHRA in response to the initial HIA submission remain applicable. The Chance Fossil Finds Procedure attached as Appendix 1 of the Heritage Walk-through Report (**Appendix D4**) must be implemented during the construction phase of the development. All recommended mitigation measures from the approved Kudusberg WEF HIA (Smuts *et al.,* 2018) will be applied including buffer areas and no-go areas ensuring that no impact occurs.

Environ. Parameter	Summary of findings	Additional Impact management measures
which was compiled in October 2018 (Smuts, 2018b).	***devoid of heritage resources at elevation, and entirely devoid of significant heritage resources above 1200m asl. As such, it is not anticipated that turbines located on ridges will negatively impact on heritage resources.”.”***	
	Letter addressing project changes made after the submission of the Draft EA Amendment Assessment Report[7]	
Letter dated January 2021 This letter should be read in conjunction with the original Heritage Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in October 2018 (Smuts, 2018b), as well as Archaeological and Palaeontological Walk-through Report dated November 2020 (Lavin, 2020)	This letter thereby serves to confirm that the refined layout related to the Oya WEF (dated January 2021) has no material change on the assessment, findings, impacts (including nature, significance and mitigation measures) and recommendations of the specialist reports including the completed and approved Final Walk Down Report and Heritage Management Plan. From a heritage perspective, the results are identical and the change in location has no material effect on the specialist assessment conducted for the project. The recommendations and findings of the reports therefore apply without modification to the refined layout. Copies of the letter will be provided to both HWC and SAHRA for inclusion in the relevant case files for this project.	Refined layout related to the Oya WEF (dated January 2021) has no material change on the assessment, findings, impacts (including nature, significance and mitigation measures) and recommendations of the specialist reports including the completed and approved Final Walk Down Report and Heritage Management Plan. The recommendations and findings of the reports therefore apply without modification to the refined layout.
	Amendment Letter	
Palaeontology **Letter dated 5 January 2021 prepared by Elize Butler, Banzai Environmental (Pty) Ltd** This letter is an amendment to, and should be read in conjunction with the original PIA report for Kudusberg Wind Energy Facility Project, which	As the geology of the Authorized and New Kudusberg WEF is the same, there will be no differences on the Impacts affecting these two WEFs. However, the New Proposed Oya WEF is underlain by the Waterford Formation (Ecca Group) additionally to the Abrahamskraal Formation (Lower Beaufort Group, Adelaide Subgroup, Karoo Supergroup). The Impact on palaeontological heritage will thus be higher for the Oya WEF. A Palaeontological and Archaeological walk-down has recently been conducted assessing the heritage of the Oya WEF (Lavin, 2020). No fossiliferous outcrops were identified	No further mitigation measures are needed other than those already contained in the original study.

[7] Specialist compiled letter addressing project changes made after the submission of the Draft EA Amendment Assessment Report as walk-though report and Heritage Management Plan (HMP compiled in 2020 and submitted as part of Draft EA Amendment Assessment Report was approved by SAHRA and HWC. A copy of this letter has been provided in **Appendix D4**, along with walk-through report and HMP.

Environ. Parameter	Summary of findings	Additional Impact management measures
was compiled in October 2018 (Almond, 2018)**.**	during the walk-down and thus a low overall Palaeontological significance was allocated to the site. **From a Palaeontological perspective there will be no advantages or disadvantages of the proposed split.** The overall impact rating reflected in the Palaeontological Impact Assessment report for the authorised Kudusberg WEF will not change as: ▪ the geology of the authorised Kudusberg WEF and proposed new Kudusberg WEF is the same; and ▪ A recent palaeontological walk-down of the Oya WEF allocated a low overall Palaeontological significance to the site as no fossils were recovered	
	Amendment Letter	
<u>Noise</u> **Letter dated <u>21 December 2021</u>** This letter is an amendment to, and should be read in conjunction with the original noise impact assessment as the noise impact assessment methodologies, impact results and recommendations remain the same (Safetech Report Number 26/8377 of 16 October 2018).	▪ The noise impacts identified as part of the original Kudusberg WEF will remain the same for the proposed Oya and Kudusberg WEF as the number of turbines has not increased. ▪ The turbines have not been placed any closer to any of the noise sensitive areas. ▪ There are no disadvantages to splitting the wind farm into smaller components from a noise impact perspective as the only implication will be administrative in nature i.e. allocating turbines to separate legal entities. The noise impact has not changed based on the above comments and information. The proposed turbine layouts of the Oya and Kudusberg WEFs is acceptable. Due to the potential low impacts associated with the construction and operational phases of the proposed Oya and Kudusberg WEFs, it is recommended that both proposed WEFs receive EAs from a noise perspective.	No further mitigation measures are needed other than those already contained in the original study
<u>Socio-Economic</u> **<u>Letter</u> dated <u>5 January 2021</u>**	The proposed changes to the authorised 325MW Kudusberg WEF would not change the scope, nature or level of the impacts and therefore no change to the initial assessment conducted <u>(Urban-Econ, 2018)</u> should occur.	Mitigation measures previously identified would not change between the initial and the amended layout.

Environ. Parameter	Summary of findings	Additional Impact management measures
This document is an amendment to, and should be read together with, the original Socio-economic Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in 2018 (Urban-Econ, 2018)	Furthermore, the split of the authorised 325 MW Kudusberg WEF would result in a phased period of the identified positive impacts which in turn would be advantageous to both local / regional economies. The disadvantage of the split of the authorised 325MW Kudusberg WEF, lies in the prolonged period of identified negative impacts (i.e. criminal activity, social ills, impacts on farms, etc.), however, the identified disadvantage could be reduced through the implementation of the environmental management programme. Thus, from a socio-economic perspective, there is no reason why the proposed amendment should not be authorised and the final proposed layout approved as part of the Amended EA (should this be granted by the DEFF).	
	Amendment Letter	
<u>Surface Water</u> **Letter dated <u>21 January 2021</u>** This letter is an amendment to, and should be read in conjunction with the original Surface Water Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in 2018 (BlueScience, 2018)	All freshwater ecological assessment methodologies applied to the original freshwater ecological study undertaken by FEN Consulting (2020), is still relevant to irrespective of the proposed project split. The Freshwater Ecological assessment undertaken by FEN Consulting in October 2020 reports on the freshwater environment as a whole (including reference to the Kudusberg WEF project components). The outcome of that report is still relevant, and no additional assessments are required. The site walk-down assessment as reported upon by FEN Consulting in November 2020, was a follow up detailed assessment reporting on any potential sensitivities of the proposed Oya WEF. The outcome of the site walk- down assessment reiterated the outcome of the freshwater ecological assessment and did not note any additional sensitivities as covered in the freshwater ecological assessment. Specialist Impact statement Based on the proposed amendment including the Kudusberg and Oya WEF when compared to the original Kudusberg WEF project (as reported upon in FEN Consulting, 2020), the	The outcome of the original freshwater ecological study undertaken is still relevant, and thus no additional mitigation measures or assessments are required.

Environ. Parameter	Summary of findings	Additional Impact management measures
	proposed project split is not considered to pose any change in impact / risk significance to the identified and assessed watercourses. As such, no advantages or disadvantages (when considering the authorised specifications, versus the proposed specifications) can be identified from a freshwater ecological perspective. When the original project plan for the integrated project is compared to that of the project once split into the two components, it can be concluded that the split, from a freshwater ecological perspective, has no significant change in the risk profile from that of the original integrated project. It is noted that the proposed project split will entail application for authorisation for each WEF development separately, however the specialist freshwater ecological assessment of FEN Consulting (2020) is considered sufficient to inform this process, and no additional studies is considered to be required. The cumulative impacts of the combined project development versus splitting of the project into two separate projects is considered unchanged, and no additional cumulative impacts are expected. It is therefore recommended that the amendment be granted, subject to implementation of the above recommendations. These recommendations should be included in the EMPr and the Environmental Authorisation EA.	
<u>**Surface Water**</u>	**New Freshwater Ecological Assessment**	
Freshwater Ecological Assessment dated October 2020[8] This report is a new report which was compiled in <u>2020</u> <u>and subsequently updated in</u>	No surface infrastructure components are located within any of the delineated watercourses, with the exception of road crossings. However, the proposed Kudusberg WEF construction camp is located approximately 11m an episodic drainage line (EDL), the Kudusberg substation is located approximately 26m from an EDL and Kudusberg WEF Turbine 23 crane pad is located approximately 26 m from an EDL. As such it is recommended these infrastructure components be relocated at least 32m from the delineated	The mitigation measures proposed as part of the 2020 Freshwater Assessment (du Preez, ,2020) still hold true. In addition, the mitigation measures have been incorporated into the respective EMPrs (**Appendix I**).

[8] <u>2020 Freshwater Ecological Assessment updated to include separate risk assessment for assessing risk significance on watercourses for additional section of existing road which was not presented in previous layout for Oya WEF since road is an existing road and entails existing large watercourse crossings via culvert and bridge crossings</u>

Environ. Parameter	Summary of findings	Additional Impact management measures
2021 in light of the project changes[8] (du Preez, 2020) in order to meet DWS requirements for Water Use Authorisations. It replaces the original Surface Water Impact Assessment for Kudusberg Wind Energy Facility Project, which was compiled in 2018 (BlueScience, 2018)	extent of the watercourse. The Oya WEF overhead collector power line will also traverse several watercourses, however the pylons will be constructed outside the 32m NEMA ZoR. The DWS Risk Assessment was applied to ascertain the significance of perceived impacts on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the assessed watercourses and assuming that the above mentioned surface infrastructure components will be relocated as recommended. No fatal flaws in terms of freshwater ecological aspects were identified. Should the construction of the road crossings in the watercourses be undertaken in the driest period of the year when no surface flow is present and the recommended mitigation measures are applied, the risk significance of the proposed WEF development can be reduced and Water Use Authorisation by means of General Authorisation in terms of Section 21(c) and (i) water uses may potentially be obtained in consultation with the DWS. However, the DWS, the custodian of water resources in South Africa, must be consulted with regards to the outcome of this assessment. Once road watercourse crossing designs become available, with specific mention of the R356 road watercourse crossings, they should be reviewed by a freshwater ecological specialist and of the DWS Risk assessment be revised. It must be noted that the outcome of the DWS Risk assessment may thus change pending the outcome of the watercourse road crossing designs. Based on the findings of the freshwater ecological assessment and the results of the risk assessment, it is the opinion of the ecologist that the proposed WEF development poses a negative low risk to the integrity of the identified watercourses provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practice are adhered to, the proposed WEF development is considered acceptable.	

Environ. Parameter	Summary of findings	Additional Impact management measures
	Walk-through Report	
Walk-through Report dated January 2021 **This walk-through report should be read in conjunction with the Freshwater Assessment which was compiled in 2018 (du Preez, 2020)**	Based on the findings site walk-down undertaken in October 2020 which focused on identifying any watercourses that may be directly traversed by the proposed infrastructure of the proposed Oya WEF, twenty-five (25) direct watercourse crossings were identified. Eight (8) of these crossings is attributed to access road crossings and the remainder to overhead power line crossings. Provided the recommended mitigation measure be applied, the proposed Oya WEF layout is considered acceptable from a freshwater ecological perspective and should be granted EA. It is noted that the proposed project split will entail application for authorisation for each WEF development separately, however, the specialist freshwater ecological assessment of FEN Consulting (2020) is considered sufficient to inform this process, and no additional studies is considered to be required.	No additional studies are considered to be required. The mitigation measures as provided by FEN Consulting (2020) for the proposed Oya WEF layout are considered sufficient to mitigate any potential impacts that may arise from the proposed WEF development. These mitigation measure must be included in the EMPr as part of the Part 2 EA Amendment Application to DEFF
	Amendment Letter	
Transportation **Letter dated 8 January 2021** This letter is and an amendment to, and should be read in conjunction with for the Kudusberg Wind Energy Facility which was compiled in October 2018 (JG Afrika, 2018).	The splitting of the Kudusberg WEF into two (2) smaller WEF projects, namely Oya WEF (99MW) and Kudusberg WEF (226MW), will result in the same traffic impacts during the construction and decommissioning phases. The advantage of splitting the Kudusberg WEF, from a transport perspective, is that the individual WEFs will generate less traffic during the construction and decommissioning phases as the overall capacity of 325MW (i.e. number of turbines) of the original Kudusberg WEF will be distributed between the two (2) smaller WEF projects. The impacts assessed in the original Kudusberg WEF report can therefore be viewed as the worst-case scenario as construction of the two (2) smaller WEF projects will likely not commence at the same time or construction will be slightly staggered. The splitting of the Kudusberg WEF, from a transport perspective, will not lead to any disadvantages. The specifications for the proposed Oya WEF and Kudusberg WEF do not exceed the specifications of the authorised Kudusberg WEF i.e. the turbines proposed for the	The proposed Oya WEF and Kudusberg WEF will not require any additional recommendations or mitigation measures and all the proposed mitigation measures stated in the original Kudusberg report remain valid.

<table>
<tr><th>Environ. Parameter</th><th>Summary of findings</th><th>Additional Impact management measures</th></tr>
<tr><td></td><td>Oya WEF and Kudusberg WEF do not exceed the turbine specifications of the original Kudusberg WEF report (candidate turbine with a maximum hub height of up to 140m and a blade length of approximately 90m and rotor diameter up to 180m).

The impact ratings during the construction and decommissioning phases will remain at low significance for the two (2) smaller WEF projects.

In light of the above, the impacts identified in the original Kudusberg Transport Study dated October 2018 remain relevant to the proposed Oya WEF and Kudusberg WEF.

The impacts associated with the project split are acceptable, from a transport perspective, with the implementation of the recommended mitigation measures and it is therefore recommended that the proposed amendments and the final layout be authorised.</td><td></td></tr>
<tr><td rowspan="2"><u>Visual</u>

Letter dated <u>5 January 2021</u>

This letter must be read in conjunction with the final VIA report for Kudusberg WEF dated 16 September 2018.</td><td colspan="2">Amendment Letter</td></tr>
<tr><td><u>Visual Character:</u>
The amendments to the Kudusberg WEF as proposed will not result in any additional impacts on the visual character of the broader study area.

<u>Cultural Landscapes:</u>
The amendments to the Kudusberg WEF as proposed will not result in any additional impacts on the cultural landscape in the study broader area.

<u>Visual Sensitivity:</u>
The amended layouts for the Kudusberg WEF and the Oya WEF have taken cognisance of the areas of visual sensitivity identified in the original VIA. Furthermore, the smaller turbines proposed for the Oya WEF will be less visible from the surrounding area, thus reducing the visual sensitivity of the Oya WEF site. As such, the proposed amendments will not result in any changes in the findings of the visual sensitivity analysis.</td><td>No additional recommendations or mitigation measures will be required and all of the proposed mitigation measures identified in the original VIA are still valid for the two new WEF projects.</td></tr>
</table>

Environ. Parameter	Summary of findings	Additional Impact management measures
	<u>Potentially Sensitive Receptors:</u> The amended turbine layouts will only affect one potentially sensitive receptor, this being VR13. The proximity of the nearest turbine to this receptor increases the impact rating for this receptor from Moderate to High. As this receptor is located on the Kudusberg WEF development site however, it is assumed that the owner of this receptor has a vested interest in the development and as such would not perceive the WEF in a negative light. **<u>Cumulative Impacts:</u>** The amendments to the Kudusberg WEF as proposed will not result in any additional cumulative impacts in the surrounding area. **<u>Overall Visual Impact Rating:</u>** <u>The amendments to the Kudusberg WEF as proposed will not give rise to any additional impacts nor will it change the impact ratings</u>. **<u>Assessment of Alternatives:</u>** The proposed changes to the authorised road and turbine layouts, the position of the authorised construction camp and the provision of a new construction camp site to serve the smaller Kudusberg WEF are all considered acceptable from a visual perspective. In addition, the proposed Oya WEF layout, including the turbine positions and construction camp site, is considered acceptable from a visual impact perspective and should be authorised as final. **<u>Conclusion:</u>** It is SiVEST's opinion that the proposed amendments to the authorised Kudusberg WEF (14/12/16/3/3/1/1976/AM1) to split the WEF into two (2) separate smaller WEF projects, namely the Kudusberg WEF and Oya WEF, do not give rise to additional visual impacts or exacerbate the impacts	

Environ. Parameter	Summary of findings	Additional Impact management measures
	previously identified in the VIA for this development. Given the low level of human habitation and the relative absence of sensitive receptors in the area, the proposed changes to the road and turbine layouts, the reduction in the turbine dimensions for eighteen (18) of the fifty-six (56) wind turbines, the shift in the position of the authorised construction camp and the provision of a new construction camp site to serve the smaller Kudusberg WEF are deemed acceptable from a visual perspective and the EA should be amended. 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.	

Table 10: Summary of changes in overall impact ratings

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
Agriculture	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high	Low (-)	Very Low (-)	No change	No change
	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high	Low (-)	Very Low (-)	No change	No change
	Additional land use income will be generated by the farming enterprise through the lease of the land to the energy facility. This will provide the farming enterprise with increased cash flow and rural livelihood, and thereby improve its financial sustainability	Low (+)	N/A	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	Erosion by water and topsoil loss. Changes to the surface that lead to accumulation and channelling of run-off water can cause erosion. Because of the slopes, the aridity and the shallow soils, erosion risk is high	Low (-)	Very Low (-)	No change	No change
	Cumulative impacts are likely to occur as a result of the loss of agricultural land on a regional basis because of other developments on agricultural land in the region	Very Low (-)	Very Low (-)	No change	No change
Avifauna	Destruction of important habitat areas (natural vegetation & water features etc.) due to the construction of wind turbines and associated infrastructures	Low (-)	Very Low (-)	No change	No change
	Disturbance of the bird community due to the increase of people and vehicles in the area	Low (-)	Very Low (-)	No change	No change
	Displacement of bird community due to increased disturbances in the area.	Low (-)	Very Low (-)	No change	No change
	Fatalities due to collision with wind turbine blades or associated infrastructures	Medium (-)	Low (-)	No change	No change
	Disturbance of bird community due to noise and movement generated by turbines and people / vehicles operating in the area	Low (-)	Very Low (-)	No change	No change
	Displacement of bird species due to increased disturbances	Low (-)	Very Low (-)	No change	No change
	Population decline due to long-term increasing fatality events	Low (-)	Very Low (-)	No change	No change
	Disturbance of bird community due to the increase of people and vehicles in the area, when dismantling wind turbines and associated infrastructures	Low (-)	Very Low (-)	No change	No change
	Displacement of bird community due to the increase in disturbances in the	Low (-)	Very Low (-)	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	area, while dismantling wind turbines and associated infrastructures				
	Destruction of important habitat areas (natural vegetation & water features etc.) at multiple renewable energy facilities	Medium (-)	Low (-)	No change	No change
	Disturbance of bird community due to the increase of wind turbine infrastructures, people and vehicles at multiple renewable energy facilities	Medium (-)	Low (-)	No change	No change
	Displacement of bird communities due to the increase in disturbances at multiple renewable energy facilities	Medium (-)	Low (-)	No change	No change
	Fatalities as a result of increased collisions with wind turbine blades at multiple renewable energy facilities	Medium (-)	Low (-)	No change	No change
	Decline in the broader population of avifauna due to long-term fatality events at multiple renewable energy facilities	Medium (-)	Low (-)	No change	No change
Bats	Destruction of important habitat areas (natural vegetation, water features, roosts, etc.) due to the construction of wind turbines and associated infrastructures	Medium (-)	Low (-)	No change	No change
	Disturbance of the bat community due to the increase of people and vehicles in the area, high levels of noise and machinery movements	Low (-)	Very Low (-)	No change	No change
	Displacement of bat community due to increased disturbances in the area	Low (-)	Very Low (-)	No change	No change
	Fatalities due to collision with turbine blades or barotrauma	Medium (-)	Low (-)	No change	No change
	Disturbance of bat community due to high levels of noise and movement generated by turbines operation and increase of people and vehicles associated with maintenance activities	Low (-)	Very Low (-)	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	Displacement of bat community due to increased disturbances in the area	Low (-)	Very Low (-)	No change	No change
	Population decline due to long-term increasing fatality events	Low (-)	Very Low (-)	No change	No change
	Disturbance of bat community due to the increase of people and vehicles in the area, high levels of noise and machinery movements when dismantling wind turbines and associated infrastructures	Low (-)	Very Low (-)	No change	No change
	Displacement of bat community due to increased disturbances in the area	Low (-)	Very Low (-)	No change	No change
	Destruction of important habitat areas (natural vegetation, water features, roosts, etc.) due to the construction of wind turbines and associated infrastructures	Medium (-)	Low (-)	No change	No change
	Disturbance of the bat community due to the increase of people and vehicles in the area, high levels of noise and machinery movements	Medium (-)	Low (-)	No change	No change
	Displacement of bat community due to increased disturbances in the area	Medium (-)	Low (-)	No change	No change
	Fatalities due to collision with turbine blades or barotrauma	Medium (-)	Low (-)	No change	No change
	Population decline due to long-term increasing fatality events	Medium (-)	Low (-)	No change	No change
Biodiversity	Clearing of natural vegetation	High – Very High (-)	High (-)	No change	No change
	Loss of Species of Conservation Concern	Low (-)	Low (-)	No change	No change
	Loss of faunal habitat	Medium (-)	Low (-)	No change	No change
	Direct faunal mortalities	Low - Medium (-)	Low (-)	No change	No change
	Loss of animal refugia	Medium (-)	Very Low (-)	No change	No change
	Increased dust deposition	Low (-)	Very Low (-)	No change	No change
	Loss of animal and plant species by illegal collecting	Low (-)	Very Low (-)	No change	No change
	Increased noise and light levels	Medium (-)	Low (-)	No change	No change
	Establishment of alien vegetation	Low (-)	Very Low (-)	No change	No change
	Changes in animal behaviour	Medium (-)	Low (-)	No change	No change
	Changes in community composition of plants	Medium (-)	Low (-)	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	Increased erosion and water run-off	High (-)	Low (-)	No change	No change
	Clearing and disturbance of natural vegetation	Low (-)	Very Low (-)	No change	No change
	Direct faunal mortalities	Low (-)	Very Low (-)	No change	No change
	Increased noise levels	Low (-)	Low (-)	No change	No change
	Loss of animal and plant species by illegal collecting	Low (-)	Very Low (-)	No change	No change
	Establishment of alien vegetation	Low (-)	Very Low (-)	No change	No change
	Changes in animal behaviour	Medium (-)	Low (-)	No change	No change
	Increased erosion and water run-off	Medium (-)	Low (-)	No change	No change
	Clearing and disturbance of natural vegetation	Low (-)	Very Low (-)	No change	No change
	Direct faunal mortalities	Low (-)	Very Low (-)	No change	No change
	Increased dust deposition	Low (-)	Very Low (-)	No change	No change
	Changes in animal behaviour	Medium (-)	Low (-)	No change	No change
	Increased erosion and water run-off	Low (-)	Very Low (-)	No change	No change
	Vegetation loss and habitat destruction	High (-)	Medium (-)	No change	No change
	Loss of Species of Conservation Concern	Medium (-)	Low (-)	No change	No change
	Dissection of mountain crest habitat	Medium (-)	Medium (-)	No change	No change
	Turbine noise	Low (-)	Low (-)	No change	No change
	Compromising integrity of CBA, ESA and NPAES	High (-)	Low (-)	No change	No change
	Increased erosion and water run-off	Medium (-)	Low (-)	No change	No change
Noise	Noise impact from the construction of the WEF	Very Low (-)	Very Low (-)	No change	No change
	Noise impact from the operation of the wind turbines	Very Low (-)	Very Low (-)	No change	No change
	Noise impact from the decommissioning of the wind turbines	Very Low (-)	Very Low (-)	No change	No change
	Noise impact from the operation of the wind turbines	Very Low (-)	Very Low (-)	No change	No change
Socio-Economic	Economy will be stimulated due to capital investment and resultant increased production	High (+)	High (+)	No change	No change
	Unemployment figures will slightly decrease due to jobs created	Low (+)	Low (+)	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	Skills levels in municipalities and for benefitting individuals will improve due to employment created	Low (+)	Medium (+)	No change	No change
	Movement of vehicles and workers may change livestock habits and ranges	Low (-)	Very Low (-)	No change	No change
	Employment due to wind farm construction work will result in household income earnings for benefitting households	Low (+)	Low (+)	No change	No change
	The in-migration of migrant labour and job seekers will place pressure on local government to adequately provide housing, services and social facilities	Low (-)	Very Low (-)	No change	No change
	The increased number of people on site creates potential for theft, particularly livestock theft	Medium (-)	Low (-)	No change	No change
	The rates, payroll taxes and Value Added Tax paid to local government will increase government revenue	Low (+)	Low (+)	No change	No change
	Diseases, substance abuse and other social ills could increase leading to increased community dissatisfaction	Medium (-)	Low (-)	No change	No change
	Expenditure associated with the operation of the wind farm will impact on production in the economy	Medium (+)	Medium (+)	No change	No change
	Operation and maintenance activities will create long term job opportunities	Very Low (+)	Very Low (+)	No change	No change
	Skills levels in municipality and for benefitting individuals will improve due to employment created	Very Low (+)	Very Low (+)	No change	No change
	Upliftment initiative will increase the local communities' access to basic services	Medium (+)	Medium (+)	No change	No change
	Employment in operations and maintenance of the windfarm will result in household income earnings for benefitting households	Very Low (+)	Very Low (+)	No change	No change

Specialist Study	Impact	Original Rating		Revised Rating	
		Pre-Mitigation Rating	Post Mitigation Rating	Pre-Mitigation Rating	Post-Mitigation Rating
	The rates, payroll taxes and Value Added Tax paid to local government will increase government revenue	Very Low (+)	Very Low (+)	No change	No change
	The cost of the removal and disconnection of the wind turbines will stimulate economic activity	Very Low (+)	Very Low (+)	No change	No change
	Unemployment figures will slightly decrease due to jobs created for a short period of time	Very Low (+)	Very Low (+)	No change	No change
	The influx into the region will possibly be immense due to the numerous projects in the area attracting migrant job seekers. This will increase the demand for services	Medium (-)	Low (-)	No change	No change
	The numerous projects will create a notable number of jobs	High (+)	High (+)	No change	No change
	Capital and operating expenditure of numerous projects will increase production in the economy	High (+)	High (+)	No change	No change
	Local roads upgraded as a result of numerous WEFs in the area	Low (+)	Low (+)	No change	No change
	Numerous upliftment initiatives will increase the local communities' access to basic services	Medium (+)	Medium (+)	No change	No change
Transportation	Traffic congestion	High (-)	Medium (-)	No change	No change
	Noise and dust pollution	High (-)	Medium (-)	No change	No change
	The traffic generated during the operational phase will be minimal and will have very little, if any impact on the surrounding road network				
	Noise and dust pollution	Medium (-)	Medium (-)	No change	No change
	Noise and dust pollution with the delivery of equipment, material and staff to site	High (-)	Medium (-)	No change	No change
Visual	Visual intrusion and dust emissions	Medium (-)	Low (-)	No change	No change
	Visual intrusion, dust emissions and light pollution and glare	Medium (-)	Medium (-)	No change	No change
	Visual intrusion and dust emissions	Medium (-)	Low (-)	No change	No change
	Visual intrusion and dust emissions	Medium (-)	Medium (-)	No change	No change
	Visual intrusion, dust emissions and light pollution and glare	Medium (-)	Medium (-)	N/A	N/A

It should be noted that a new Freshwater Ecological Assessment was undertaken in October 2020 as part of the Water Use Authorisation Process for the proposed 99MW Oya WEF, as the previous assessment undertaken in 2018 (Ekotrust, 2018 – **Appendix C8b**) did not meet the Department of Water and Sanitation (DWS) requirements for Water Use Authorisations. The 2020 Freshwater Assessment replaces the original Surface Water Impact Assessment for the Kudusberg WEF Project, which was compiled in 2018 (BlueScience, 2018). The results of the DWS risk assessment applied to the proposed WEF development activities undertaken as part of the 2020 Freshwater Ecological Assessment (du Preez, 2020) are presented in **Table 11** below.

Table 11: Summary of the results of the DWS risk assessment applied to the proposed WEF development activities

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
1	**Construction Phase**	Site preparation prior to construction activities of surface infrastructure components located outside the watercourses and at least 32 m from the delineated extent of a watercourse,	Vehicular movement (transportation of construction materials)	• Loss of watercourse vegetation, associated habitat and ecosystem services; • Transportation of construction materials can result in disturbances to soils, and increased risk of sedimentation/erosion; and • Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles.	1	3	12	36	L	As this activity was assessed based on the recommendation that the proposed Kudusberg WEF construction camp, Kudusberg substation an Kudusberg WEF Turbine 23 crane pad and all pylons associated with the Oya WEF overhead collector system power line would be located at least 32m from the delineated extent of a watercourse (thus outside the 32m NEMA ZoR), this in itself is considered a mitigation measure which complies with the mitigation hierarchy as advocated by the DEFF et al. (2013). The presence of various other Kudusberg WEF crane pads (as listen in Table 9) within the 100m GN509 ZoR but at least 42m from the delineated extent of a watercourse is not considered to pose a direct negative impact	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
2		but still within the 100 m GN509 ZoR, which includes the Oya WEF overhead collector system, Oya WEF construction camp, Kudusberg WEF construction camp, Kudusberg Substation and the identified crane pads within the 100m GN509 ZoR.	Removal of vegetation and associated disturbances to soils.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream watercourse areas; • Exposure of soils, leading to increased runoff, and erosion, and thus increased sedimentation of the watercourses; • Increased sedimentation of the watercourses, leading to smothering of vegetation associated in the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	1	3	12	36	L	to the watercourses. Since no site preparation activities associated with the construction of the surface infrastructure will be within the 32 m of these watercourses, the risk significance thereof will be "Low". The following mitigation measures should be implemented to retain a "Low" risk significance: • All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential; • Retain as much indigenous vegetation as possible; • All vegetation removed as part of the site clearing activities (specifically where large areas need to be cleared) should be transported from the construction site (may not be stockpiled) and disposed of at a registered waste disposal facility; • During construction of the surface infrastructure within close proximity to a watercourse, regular spraying of non-potable water or the use of chemical dust suppressants must be implemented to reduce dust and to ensure no smothering of vegetation within the watercourses occurs from excessive dust settling. It must be noted that specifics as to what type of dust suppressant (grey water vs. chemical dust suppressant) that will be utilised as part of the proposed WEF development was not available at the time of assessment. Should this detail become available, it is recommended that the freshwater ecologist provide a statement on the suitability of the use of the proposed dust suppressant; • The watercourses outside the construction footprint not having authorised road crossings	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										must be considered as no-go areas. No construction vehicles, nor construction personnel or vehicles may traverse through these watercourses (except on approved road crossings); • As far as possible, existing roads must be utilised to gain access to sites; • Contractor laydown areas, and material storage facilities to remain outside of the 32 m ZoR; • All vehicle re-fuelling is to take place outside of the 32 m ZoR; and • No vegetation may be removed from the 32 m ZoR surrounding the watercourse where no infrastructure is planned, as this provides a natural buffer zone around the watercourses which disperse surface runoff into the watercourses, and thus prevents sedimentation and erosion thereof.	
3		Site preparation prior to construction activities relating to the upgrading of existing roads and installation of underground cables traversing through watercourses.	Removal of vegetation and associated disturbances to soils.	• Earthworks and exposure of soils could result in sedimentation of the watercourses, which may be transported as runoff into the downstream watercourse areas and may smother vegetation associated with the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	1,75	3,75	14	52,5	L	• It is imperative that all construction works be undertaken during the driest period of the year when there is no flow within the watercourses, and thus no diversion of flow would be necessary; • The reaches of the watercourses where no activities are planned to occur must be considered no-go areas. These no-go areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be upgraded; • For trenching of the cables, the topsoil has to be stored separately and may not be contaminated. Furthermore, the soil layers	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										should be replaced in the same order and the topsoil returned last; • Contractor laydown areas, vehicle re-fuelling areas and material storage facilities are to remain outside of the watercourses and at least 32m from the delineated extent; and • The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.	
4		Site preparation prior to the construction of new roads and installation of underground cables (along new roads) traversing through watercourses.	Removal of vegetation and associated disturbances to soils.	• Earthworks and exposure of soils could result in sedimentation of the watercourses, which may be transported as runoff into the downstream watercourse areas and may smother vegetation associated with the watercourses; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	2,5	4,5	15	67,5	M	It is considered imperative that road watercourse construction works be undertaken during the driest periods of the year to limit surface water contamination and the need for any surface water diversion during the construction works (diverting the flow of water through a pipe or an excavated channel was not included as part of this risk assessment). In so doing, the severity scoring (specifically pertaining to the flow regime) will be significantly reduced as would the frequency of an impact. Should this specific mitigation measure be implemented and with implementation of the mitigation measures as per **Activity 3 above**, it is the opinion of the freshwater ecologist that the risk of the proposed road crossing construction in the watercourses be deemed 'low'.	L (-7)

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
5		Construction of surface infrastructure outside of the watercourses and at least 32 m from the delineated extent of a watercourse (as all proposed infrastructure will be located outside the 32m NEMA ZoR), but still within the 100 m GN509 ZoR, which includes the Oya WEF overhead collector system, Oya WEF construction camp, Kudusberg WEF construction camp, Kudusberg Substation and the identified crane pads	• Removal of vegetation and topsoil and associated stockpiling; • Ground-breaking and earthworks relating to foundations and trenches; • Mixing and casting of concrete for construction purposes; • Backfilling of excavated and disturbed areas; and • Miscellaneous activities by construction personnel.	• Disturbances of soils leading to increased alien vegetation proliferation within the terrestrial buffer zone surrounding the watercourses, with the potential to affect the watercourse habitat; • Altered runoff patterns within the local catchment of the watercourses, potentially leading to increased erosion and sedimentation of the watercourses; • Potential impacts on the water quality of surface water runoff (when present) which may potentially enter the watercourses and contamination of soils due to concrete casting; and • Potential of backfill material entering the watercourses, increasing the sediment loads therein.	1	3	12	36	L	As this activity was assessed based on the recommendation that the proposed Kudusberg WEF construction camp, Kudusberg substation an Kudusberg WEF Turbine 23 crane pad and all pylons associated with the Oya WEF overhead collector system power line would be located at least 32m from the delineated extent of a watercourse (thus outside the 32m NEMA ZoR), this in itself is considered a mitigation measure which complies with the mitigation hierarchy as advocated by the DEFF et al. (2013). The presence of various other Kudusberg WEF crane pads (as listen in Table 9) within the 100m GN509 ZoR but at least 42m from the delineated extent of a watercourse is not considered to pose a direct negative impact to the watercourses. Since no site preparation activities associated with the construction of the surface infrastructure will be within the 32 m of these watercourses, the risk significance thereof will be "Low". If the following mitigation measures are adhered to, the risk significance of the construction of surface infrastructure would be of Low risk significance: With regards to ground-breaking activities at least 32 m from the delineated extent of a watercourse, but within the 100 m GN509 ZoR: • During excavation activities, the topsoil and vegetation should be stockpiled separately from other material outside of the 32 m NEMA ZoR; • Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up by any stockpiled materials. The mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later use as	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
		within the 100m GN509 ZoR.								backfill material after construction has commenced; • All exposed soils must be protected from wind using tarpaulins for the duration of the construction phase to prevent potential erosion and sedimentation of the watercourses; • Suitable drainage should be insured along the crane pads, in order to ensure that water does not pond on the crane pad or drain in a concentrated manner into the watercourses. This must be considered as part of the stormwater management plan and be overseen by a freshwater ecologist; • Construction of the proposed surface infrastructure may result in disturbance to the natural buffer zone surrounding the watercourses which may result in the reduction of surface roughness. This can be mitigated by ensuring that no concentrated runoff from the surface infrastructure construction areas enter the watercourses by installing silt traps or placing haybales down gradient of the construction footprint (until suitable basal vegetation cover has been restored) to ensure no sediment laden or concentrated runoff generates from the construction footprint; and • It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction. With regards to concrete mixing on site: • No mixed concrete may be deposited outside of the designated construction footprint;	

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										• Protective equipment should be provided, onto which any mixed concrete can be deposited while it awaits placing; and • Concrete spilt outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site. With regards to backfilling of excavated areas: • Stockpiled material should be used as backfill material; • All excavated areas should be backfilled to the natural ground level with excavated material; and • Soil must be suitably compacted, and all construction material must be removed from the site upon the completion of construction or used in the rehabilitation process. Rehabilitation of the construction footprint areas: • All footprint areas which have been compacted should be ripped and revegetated within indigenous vegetation as soon as the construction activities have been completed. This will prevent soil erosion and the creation of gullies within the operational area; and • The operational area should regularly be inspected for alien and invasive vegetation species which might have established due to the construction activity related disturbances.	

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
6		Upgrading of existing road crossings and trenching through the watercourses.	• Compaction of soil in the existing road crossing footprint to increase the width of the roads; and • Importation of materials to construct the roads.	• Earthworks could be potential sources of sediment, which may be transported as runoff into the downstream reach of the watercourse; and • Proliferation of alien and/or invasive vegetation as a result of disturbances.	1,75	3,75	14	52,5	L	• During the upgrading of existing internal roads and associate cable installation that may potentially traverse watercourses, a buffer of no more than 5 m on either side of the road crossing footprint through the watercourses may be impacted. This area must be cordoned off, and no vehicles or personnel are permitted outside of the authorised construction area; • Material to be used (gravel – if applicable) as part of the upgrading of the existing roads must be stockpiled outside the 32 m NEMA ZoR of the watercourses to prevent sedimentation thereof and to avoid any other vegetation being impacted by the construction activities. These stockpiles may not exceed a height of 2 m and should be protected from wind using tarpaulins; • Any remaining soils following the completion of backfilling of the trenches are to be spread out thinly in an area within the watercourses to aid in the natural reclamation process; • After upgrading of roads traversing watercourses, the area surrounding the road must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring; • It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction; and • All existing alien and invasive vegetation should be removed. All material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
7	**CONSTRUCTION PHASE**	Construction of new road crossings and trenches through watercourses	• Removal of vegetation and topsoil and associated stockpiling; • Ground-breaking and earthworks relating to foundations and trenches; • Compaction of soil in the road crossing footprint area; • Importation of materials to construct the roads; • Backfilling of excavated and disturbed areas; and • Miscellaneous activities by construction personnel.	• Disturbances of soils leading to increased alien vegetation proliferation within the watercourses, thus impacting on the watercourse habitat; • Altered runoff patterns within the watercourses, potentially leading to increased erosion and sedimentation of the watercourses; and • Potential of imported materials to entering the watercourses, increasing the sediment loads therein.	2,25	4,25	15	63,75	M	It is considered imperative that watercourse road construction works be undertaken during the dry period to limit surface water contamination and the need for any surface water diversion during the construction works (diverting the flow of water through a pipe or an excavated channel was not included as part of this risk assessment). In so doing, the severity scoring (specifically pertaining to the flow regime) will be significantly reduced as would the frequency of an impact. Should this specific mitigation measure be implemented and with implementation of the below mitigation measures it is the opinion of the freshwater ecologist that the risk of the proposed road crossing construction in the watercourses be deemed 'low': • The design of the new road crossings should ensure that no erosion occurs, specifically along the embankments of the watercourse. As such, vegetation must be established in the construction footprint immediately after the construction of the road/ installation of cables is complete; • New road crossings must intersect the watercourse at a right angle (perpendicular) to minimise disturbance to the watercourse; • No road crossing designs were available at the time of this assessment. However, it is strongly advised that suitably sized culverts be installed within all road crossings and vehicles should not be allowed to cross within the riverbed. This will ensure hydrological connectivity is maintained and no hydrocarbons are not washed into the downstream watercourses from potential vehicle spills. Should road crossing designs	L (-7)

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										become available, it is advised that it be revised by a freshwater ecologist; • During the construction of roads and associate cable installation that may potentially traverse watercourses, a buffer of no more than 5 m on either side of the proposed road crossing footprint through the watercourses may be impacted. This area must be cordoned off, and no vehicles or personnel are permitted outside of the authorised construction area; • Soils excavated from the cable trench must be stockpiled immediately upstream of the trench. Once the cable is installed the trench must be infilled with the removed material and suitably compacted to avoid any erosion and preferential flow paths from forming; and • Any remaining soils following the completion of backfilling of the trenches are to be spread out thinly in an area within the watercourses to aid in the natural reclamation process.	
6	**OPERATIONAL PHASE**	Operation and maintenance of the surface infrastructure outside the watercourses and at least 32 m from the delineated extent of a watercourse, but still within the 100 m GN509 ZoR.	• Potential indiscriminate movement of maintenance vehicles within the watercourses or within close proximity to the watercourses; and • Increased risk of sedimentation and/or hydrocarbons	• Disturbance to soils and ongoing erosion as a result of periodic maintenance activities; and • Altered water quality (if surface water is present) as a result of increased availability of pollutants.	1,5	3,5	12	42	L	• No indiscriminate movement of construction equipment through the watercourses may be permitted during standard operational activities or maintenance activities. Use must be made of the existing watercourse crossings only; • Unnecessary disturbances surrounding the perimeter of the surface infrastructure must be avoided; • Vehicles used in the development site must be regularly washed (on a non-permeable surface or off-site) to avoid the dispersal of seeds on any alien or invasive species into the watercourses; • Ensure that routine inspections and monitoring of any instream infrastructure are undertaken to monitor any build-up of debris	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
			entering the watercourses via stormwater runoff from the surface infrastructure (such as from crane pads and the construction camp)							that will impact on structure integrity or lead to erosion and sedimentation. Furthermore, monitoring to determine the establishment of indigenous vegetation and the presence of any alien or invasive plant species; • Should erosion be noted at the base of the pylon that may potentially impact on a watercourse in the surrounding area, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation; • The surface infrastructure areas must be inspected to ensure that no concentrated runoff from these areas form erosion gullies leading to erosion and sedimentation of receiving watercourses. Should these impacts be noted, these gullies/preferential flow paths must be infilled with *in situ* material and appropriately stabilised and/or revegetated; and • Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically at the road crossings and surface infrastructures. Should alien and invasive plant species be identified, they must be removed and disposed of as per an alien and invasive species control plan and the area must be revegetated with suitable indigenous vegetation.	
7		Operation and maintenance of roads (new and existing) traversing watercourses.	• Concentrated runoff entering the watercourses; and • Disturbance to the vegetation within and	• Concentrated runoff from the road crossings leading to erosion and subsequent sedimentation of the watercourses (increase in the sediment load) and	1,75	3,75	12	45	L	• Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings/instream infrastructure. Such maintenance activities must specifically be undertaken after high rainfall events; • Stormwater runoff from the road crossings should be monitored (by the Operation and Maintenance (O&M) Manager), to ensure it	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
			surrounding the watercourses.	turbulent flows when surface water is present; • Higher flood peaks into the watercourses due to reduced surface roughness in the watercourses.						does not result in erosion of the watercourses. Stormwater should be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the watercourse (through vegetation and rocky areas); • Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted; • During periodic maintenance activities of the roads/surface infrastructure, monitoring for erosion should be undertaken; and • Should erosion be observed, caused by the road crossings/instream infrastructure, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation. Use can also be made of rocks collected from the surrounding area to infill any area prone to erosion, as a natural dispersal mechanism.	
8	DECOMMISSIONING PHASE	Removal of all surface infrastructure from the project area.	• Movement of construction vehicles and personnel; and • Disturbance to the buffer zone surrounding the watercourses.	• Disturbance of soil and vegetation that established within the operational area.	1,75	3,75	13	48,75	L	• No indiscriminate movement of construction equipment in the watercourses and buffer zones surrounding the watercourses may be permitted. Use must be made of the existing roads during the decommissioning phase; • All surface infrastructure must be decommissioned. All materials must be removed from the watercourses (where applicable) and may temporarily be stockpiled outside the 32 m NEMA ZoR, where after is must be removed from site and disposed of at a registered disposal facility; • High flood peaks from the decommissioning footprint areas can be mitigated by ensuring that no concentrated runoff from the surface infrastructure area and subsequent cleared	NA

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										area enters the watercourses. The velocity of surface water flow from these areas must be reduced by ensuring that the vegetation in the buffer area surrounding the watercourses are intact or by the strategic placement of silt traps of haybales as a means to obstruct flow but still allow flow to percolate at a reduced velocity and encourages a diffuse flow pattern. In this regard it is recommended at an alien and invasive plant species management plan be implemented during the construction and operational phases to specifically prevent the spread of any such species into the sensitive ecological areas; • Areas where surface infrastructure have been decommissioned and removed must be suitably compacted/ripped and revegetated to ensure that no erosion occurs which may contribute to the sediment load of the watercourses; • Should erosion gullies be noted, these areas must be rehabilitated by infilling them with suitable soil and ensuring the area is vegetated. The increased surface roughness will discourage concentrated flow paths to develop and ensure diffuse flow patterns; • Should road crossings be decommissioned, road footprint areas within the watercourse must be levelled to the same level and shape as that of the upstream and downstream reaches. This will ensure a continuous bed level and prevent any concentration of surface flow from occurring; • Watercourse embankments must be suitably rehabilitated (shaped end revegetated) to prevent any erosion from occurring; • All bare areas in the project area, specifically where vegetation was initially cleared for	

	Phases	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes
										surface infrastructure components) must be ripped and be revegetated within suitable indigenous vegetation species; • Follow up revegetation should take place in areas where initial revegetation is not successful; • It is recommended that a Watercourse Rehabilitation and Management Plan must be compiled and implemented. Implementation must be overseen by a suitably qualified Environmental Site Officer (ESO) and the ESO must sign off the rehabilitation before the relevant contractors leave site; and • Post-closure monitoring of the watercourses (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken.	

In light of the above, no new environmental risks or impacts were identified and it was concluded that the impacts identified as part of the BA process for the original Kudusberg WEF in 2018 would remain unchanged. The 2020 Freshwater Assessment which replaces the original Surface Water Impact Assessment (BlueScience, 2018) also identified impacts which can be mitigation to acceptably low levels after the implementation of the recommended mitigation measures. In addition, none of the specialists found that the proposed amendments and subsequent addition of the proposed Oya WEF (northern section of authorised WEF) would change the original cumulative impact ratings or result in fatal flaws from a cumulative impact perspective. This is mainly due to the fact that the overall number of turbines will still remain the same and the two (2) proposed WEFs will be clustered in a REDZ (namely REDZ – Komsberg REDZ), in line with the REDZ intention.

The layout for the proposed Oya WEF (northern section of the authorised WEF) which is being submitted for approval is presented in **Figure 7** below. The proposed layout in relation to all identified environmental sensitivities is provided in **Figure 8** below.

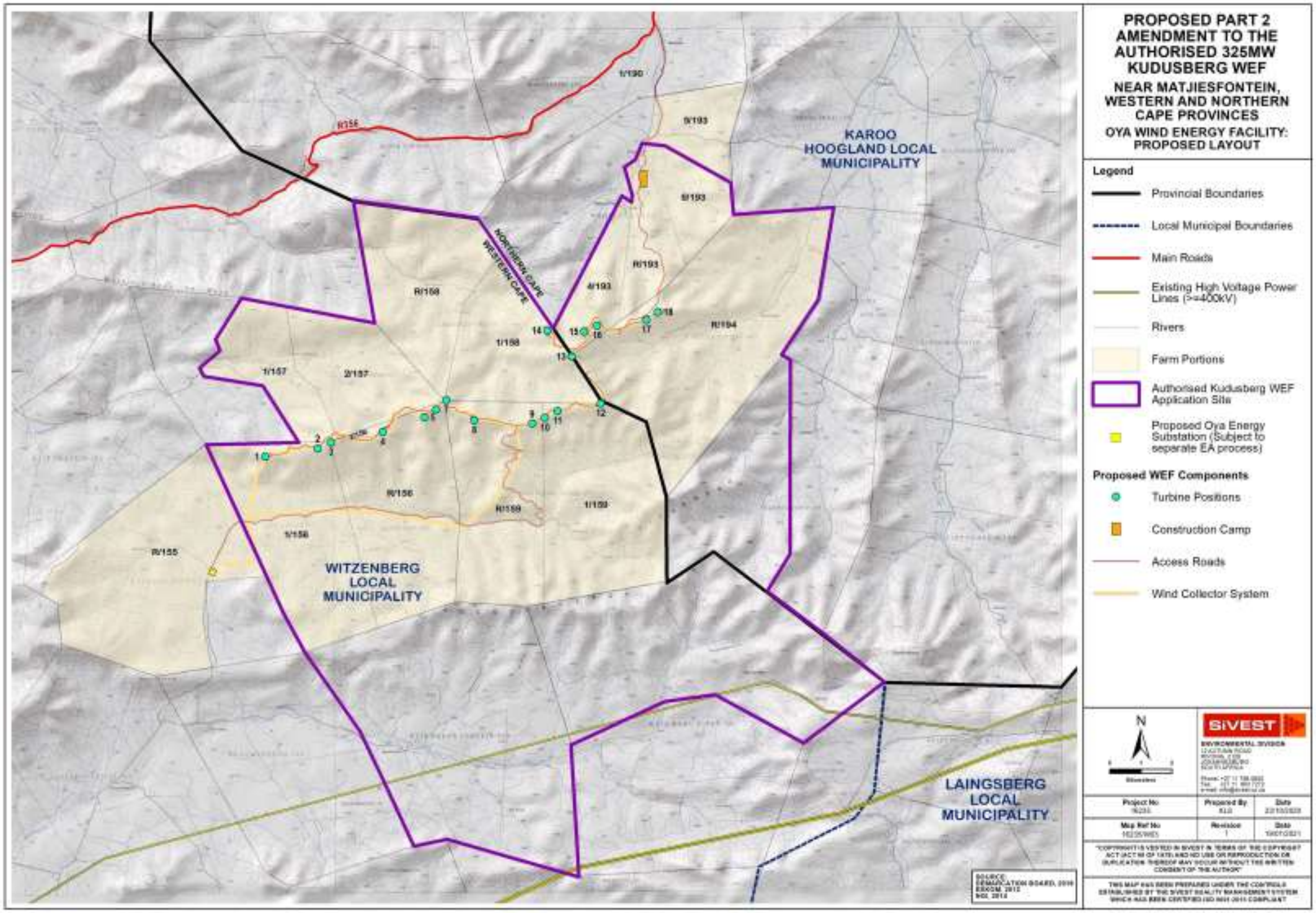

Figure 7: Layout map for proposed Oya WEF (northern section of the authorised WEF)

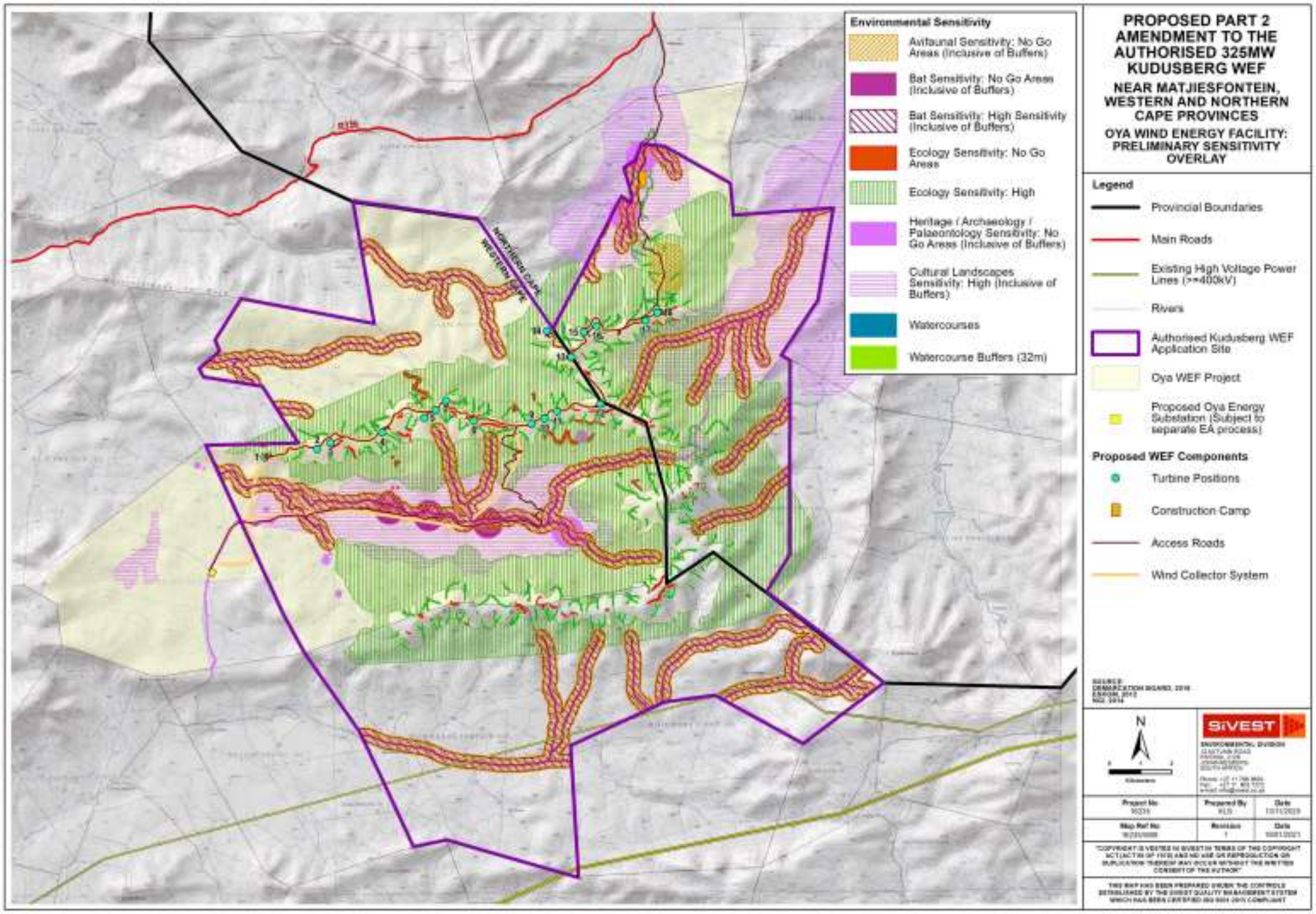

Figure 8: Layout map for proposed Oya WEF (northern section of authorised Kudusberg WEF) in relation to environmental sensitivities[9]

[9] Please note that at the scale of this map some of the turbine locations may appear to be in high sensitivity areas. However, all turbines avoid high sensitivities.

3.3 Activities and Components associated with the Oya Wind Energy Facility

Table 12: **Activities associated with Planning, Construction, Operation and Decommissioning of the Oya Wind Energy Facility**

Planning Phase	
Requirements	Conduct technical surveys prior to initiating construction.
Activities to be undertaken	
Surveys Conducted	Including, but not limited to: a geotechnical survey, site survey and confirmation of the WEF micro-siting footprint (namely Terrestrial Ecology, Heritage[10], Surface Water, Avifauna and Bats) to confirm tower locations and all other associated infrastructure.
Construction Phase	
Requirements	Project requires multiple permits and approvals not limited to Environmental Authorisation (EA) from DEFF, preferred bidder allocation granted by DMRE, a generation license issued by NERSA, and a Power Purchase Agreement secured with Eskom or a private offtake, amongst others. It should be noted that all of the required permits are being applied for.
	Construction phase is anticipated to be expected to be up to 24 months for the Oya Energy Facility. Up to 250- 1000 jobs created
	No on-site labour camps. Employees to be accommodated in the nearby towns
	Overnight on-site worker presence would be limited to security staff.
	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 will be 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 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 / licensed 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. During the operational phase of the proposed Oya WEF, waste generation will be minimal and will be disposed of a licensed landfill site.
	In terms of electricity supply for the construction phase, the applicant will utilise Wind Turbines, an onsite 33/132kV substation as well as underground and above ground collector systems connecting the turbines to the onsite Substation.
	During the construction phase a temporary water supply for construction will need to be installed that will make use of existing or new boreholes and will comprise of over-ground water pipelines and tanks to the construction camp. Approval for any additional water requirements is currently part of a separate water use authorisation approvals process which the Applicant is in the process of undertaking.
Activities to be undertaken	

[10] Includes Archaeology, Palaeontology and Cultural Landscapes

Surveys conducted prior to construction	Including, but not limited to: a geotechnical survey, site survey and confirmation of the micro-siting footprint. It should be noted that all the required surveys have been undertaken.
Establishment of access roads to the Site	Access / haul roads and internal access roads within the site will be established at the commencement of construction.
	Existing access roads will be utilised where possible to minimise impact, and upgraded where required.
	Internal access roads up to 12 m wide, including structures for storm water control are required to access each turbine and the substation. Turns will have a radius of up to 50m for abnormal loads (especially turbine blades} to access the various turbine positions.
	Access roads to be established between the wind turbines for construction and/or maintenance activities within the development footprint.
	Internal service road alignment will be approximately 12m wide to wind turbines an 8m for substation roads.
Undertake site preparation	Including the clearance of vegetation for establishment of the WEF, Construction Camp and Substation, the establishment of internal access roads and excavations for foundations.
	Stripping of topsoil to be stockpiled, backfilled, removed from site and/or spread on site.
	To be undertaken in a systematic manner to reduce the risk of exposed ground being subjected erosion.
	Include search and rescue of floral species of concern (where required) and the identification and excavation of any sites of cultural / heritage value (where required). A Plan Rescue Plan has been complied and is provided in **Appendix E.**
Establishment of laydown areas / construction camp and batching plant on site	A Construction camp for the storage of WEF components, including civil engineering construction equipment, total footprint of up to approximately 12.6 ha
	Crane pads (laydown areas): 20 turbines x 90 m x 50 m (total footprint 9ha)
	The laydown area will also accommodate building materials and equipment associated with the Turbines and cranes
	No borrow pits will be required. Infilling or depositing materials will be sourced from licensed borrow pits within the surrounding areas.
	A temporary concrete batching plant to facilitate the concrete requirements for foundations.
Transport of components and equipment to and within the site	Abnormal load vehicles will bring in wind turbine components, blades and associated infrastructure.
	Transportation will take place via appropriate National and Provincial roads, and the dedicated access / haul road to the site.
	Components considered as abnormal loads in terms of Road Traffic Act (Act No 29 of 1989) due to dimensional limitations (abnormal length of the blades) and load limitations (i.e. the nacelle) will require a permit for the transportation of the abnormal loads on public roads.
	Civil engineering construction equipment to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement trucks, site offices etc.).
	Components for the establishment of the substation (including transformers) and the associated infrastructure to be transported to site.
Connection of WEF, to the substation	To be connected to the on-site substation via underground 33kV electrical cables.
	Excavation of trenches are required for the installation of the cables. Trenches will be approximately 1.5m deep.

	Underground cables are planned to follow the internal access roads, as far as possible.
Establishment of ancillary infrastructure	A workshop, contractor's equipment camp, temporary storage areas and a construction compound will be required.
	Service buildings for site offices, storage and safe re-fueling areas are also required.
	Establishment will require the clearing of vegetation, levelling and the excavation of foundations prior to construction.
Undertake site rehabilitation	Commence with rehabilitation efforts once construction is completed in an area, and all construction equipment is removed.
	On commissioning, access points to the site that will not be required for the operation phase will be closed and prepared for rehabilitation, as per the Vegetation Rehabilitation Plan which is to be implemented and adhered to (**Appendix K**).
Operation Phase	
Requirements	Duration will be 20-25 years.
	Requirements for security and maintenance of the facility.
	Employment opportunities relating mainly to operation activities and maintenance. Up to 20 full-time employment opportunities will be available.
	Current land-use activities, i.e. farming activities, being undertaken within the project site can continue during the operation of the Energy Facility.
Activities to be undertaken	
Operation and Maintenance	Full time security, maintenance and control room staff.
	WEF will be operational except under circumstances of mechanical breakdown, inclement weather conditions, or maintenance activities.
	WEF to be subject to periodic maintenance and inspection.
	Disposal of waste products (e.g. oil) in accordance with relevant waste management legislation.
	Areas which were disturbed during the construction phase to be utilised should a laydown area be required during operation.
Decommissioning Phase	
Requirements	Decommissioning of the Oya WEF infrastructure at the end of its economic life.
	Potential for repowering of the facility, depending on the condition of the facility at the time.
	Expected lifespan of approximately 20 - 25 years (with maintenance) before decommissioning is required.
	Decommissioning activities to comply with the legislation relevant at the time.
Activities to be undertaken	
Site preparation	Confirming the integrity of site access to accommodate the required equipment
	Preparation of the site (e.g. laydown areas).
	Mobilisation of decommissioning equipment.
Disassemble and remove wind turbine	Components to be reused, recycled, or disposed of in accordance with regulatory requirements.
	All parts of the facility that can be recycled/reused will be.
	Concrete will be removed to a depth of ~1m and rehabilitated.
	Cables will be excavated and removed, as may be required.
Components to be disposed of or recycled.	Blades
	Turbines
	Foundations

4 PURPOSE AND OBJECTIVES OF THE EMPr

An EMPr is defined as "*an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented or mitigated, and that the positive benefits of the projects are enhanced*". The objective of this EMPr is to provide information and guidance for implementing the management and monitoring methods established and to help ensure continuous improvement of environmental performance, reducing negative impacts and enhancing positive effects during the construction and operation of the facility.

The EMPr provides specific environmental guidance for the construction and operation phases of a project, and project and is intended to manage and mitigate construction and operation activities so that negative environmental impacts are mitigated or do not result.

The EMPr also defines monitoring requirements in order to ensure that the specified objectives are met.

This EMPr is applicable to all employees and contractors working on the pre-construction, construction, and operation and maintenance phases of the Oya WEF. The document will be adhered to and updated throughout the project life cycle.

This EMPr has been compiled in accordance with Appendix 4 of the EIA Regulations, 2014 (as amended) and the conditions of the EA (**Table 5**). This is a dynamic document and will be further developed in terms of specific requirements listed in any authorisations issued for the Oya WEF and/or as the project develops. The EMPr has been developed as a set of environmental specifications (i.e. principles of environmental management), which are appropriately contextualised to provide clear guidance in terms of the on-site implementation of these specifications.

The EMPr has the following objectives:

- Outline mitigation measures and environmental specifications which are required to be implemented for the planning, construction, rehabilitation and operation phases of the project in order to minimise the extent of environmental impacts, and to manage environmental impacts associated with the Oya Wind Energy Facility.
- Ensure that the construction and operation phases do not result in undue or reasonably avoidable adverse environmental impacts and ensure that any potential environmental benefits are enhanced.
- Identify entities who will be responsible for the implementation of the measures and outline functions and responsibilities.
- Propose mechanisms and frequency for monitoring compliance and prevent long-term or permanent environmental degradation.
- Facilitate appropriate and proactive responses to unforeseen events or changes in project implementation that were not considered in the BA process.

The mitigation measures identified within the original BA process are systematically addressed in the EMPr, ensuring the minimal adverse environmental impacts.

The Oya Wind Energy Facility must ensure that the implementation of the project complies with the requirements of all environmental authorisations, permits, and obligations arising from relevant environmental legislation. This obligation is partly met through the development and the implementation of this EMPr, and through its integration into the relevant contract documentation provided to parties responsible for construction and/or operation activities on the site. The adequacy and efficacy of implementation is to be monitored by an independent Environmental Control Officer (ECO). Since this EMPr was approved as part of the EA for the original Kudusberg WEF (14/12/16/3/3/1/1976/AM1) and is being updated as part of the part 2 amendment process for the authorised Kudusberg WEF, it is important that this document be read in conjunction with the EA Amendment Assessment Report compiled for this project. This will contextualise the EMPr and enable understanding of its purpose in the integrated environmental management process. Should there be a conflict of interpretation between this EMPr and the Environmental

Authorisation, the stipulations in the Environmental Authorisation shall prevail over those of the EMPr, unless otherwise agreed by the authorities in writing. Similarly, any provisions in legislation overrule any provisions or interpretations within this EMPr.

This EMPr shall be binding on all the parties involved in the planning, construction and operational phases of the project, and shall be enforceable at all levels of contract and operational management within the project. The document must be adhered to and updated as required throughout the project life cycle.

5 STRUCTURE OF THE EMPr

The first four (4) chapters provide background to the EMPr and the Oya Wind Energy Facility, while the subsequent chapters include the following:

- Planning and design activities;
- Construction activities;
- Operation activities; and
- Decommissioning activities.

These Sections set out the processes necessary for Oya Wind Energy Facility as the Holder of the EA, to minimise environmental impacts and achieve environmental compliance. For each of the phases of implementation, environmental objectives are listed. The EMPr has been structured to show each phase and associated objectives, activities / risk sources, mitigation actions, monitoring requirements and performance indicators. A specific EMPr table has been established for each environmental objective.

The objectives and EMPr tables are required to be reviewed and possibly modified throughout the life of the Energy Facility whenever changes, such as the following, occur:

- Planned activities change (i.e. in terms of the components of the Energy Facility).
- Modification to or addition to environmental objectives and targets.
- Additional or unforeseen environmental impacts are identified and additional measures are required to be included in the EMPr to prevent deterioration or further deterioration of the environment.
- Relevant legal or other requirements are changed or introduced.
- Significant progress has been made in achieving an objective or target such that it should be re-examined to determine if it is still relevant or should be modified, etc.

This EMPr seeks to manage and keep to a minimum the negative impacts of a development and at the same time, enhance the positive and beneficial impacts.

The EMPr specifies mitigation measures for the following environmental aspects:

5.1.1 Planning and Design Phase (Site establishment)

- Site Preparation
- Consultation

5.1.2 Construction Phase

- Site Clearing
- Construction Camp
- Documentation
- Environmental Education and Training
- Erosion Control
- Water Use and Quality
- Waste Management

- Flora and Fauna
- Avifauna and Bats
- Air Quality
- Soils and Geology
- Noise and Vibrations
- Visual Impact
- Heritage, Archaeology, Paleontological and Cultural Landscape
- Social Environment
- Construction Traffic and Access
- Energy Use
- Employment
- Occupational Health and Safety
- Security

5.1.3 Operation Phase

- Rehabilitation and Maintenance and Biodiversity
- Operation and Maintenance
- Avifauna and Bats
- Air Quality
- Noise and Vibrations
- Aquatic Ecology
- Agriculture
- Visual Impact
- Heritage, Archaeology, Paleontological and Cultural Landscape
- Social Environment
- Health and Safety

5.1.4 Decommissioning Phase

- Ongoing Stakeholder involvement
- Construction Site Decommissioning
- Community health and safety
- Waste Management
- Biodiversity
- Aquatic Ecology
- Agriculture
- Geotechnical
- Visual Impact
- Air Quality
- Heritage, Archaeology, Paleontological and Cultural Landscape
- Transportation

Please refer to section 8 of EMPr for activities associated with Planning and Design, Construction, Operation and Decommissioning phases.

5.2 Objectives of an EMPr

The objectives of this EMPr are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;

- To identify measures that could optimise beneficial impacts;
- To create management structures that address the concerns and complaints of I&APs with regards to the development;
- To establish a method of monitoring and auditing environmental management practices during all phases of development;
- Ensure that the construction and operational phases of the project continues within the principles of Integrated Environmental Management and Environmental Management System (EMS) ISO 14001 Principles;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Makes sure that the safety recommendations are complied with;
- Propose mechanisms for monitoring compliance with the EMPr and reporting thereon; and
- Specify time periods within which the measures contemplated in the EMPr are implemented, where appropriate.

The EMPr Seeks to highlight the following:

- Avoiding impacts by not performing certain actions;
- Minimising impacts by limiting aspects of an action;
- Rectifying impacts through rehabilitation, restoration, etc. of the affected environment;
- Compensating for impacts by providing substitute resources or environments;
- Minimising impacts by optimising processes, structural elements and other design features;
- Provide ongoing monitoring and management of environmental impacts of a development and documenting of any digressions /good performances; and
- The EMPr is a legally binding document that all parties involved in the project must be made aware of.

5.3 Environmental Monitoring

A monitoring programme will be implemented for the duration of the lifecycle of proposed development. This programme will include:

- Monthly Audits During the Construction Phase
- According to the EMPr, EA and permit conditions which will be conducted by the ECO. These audits can be conducted randomly and do not require prior arrangement with the project manager.
- Compilation of an audit report with a rating of the compliance with the EMPr. This report will be submitted to the relevant authorities.
- Audits conducted during the Operational Phase
- Undertaken by the ECO.

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

The EMPr will be made binding on all contractors operating on the site and must be included within the Contractual Clauses. Those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (the polluter pays principle).

6 ENVIRONMENTAL COMPLIANCE

6.1 Compliance with the EMPr

The Contractor/s is/are deemed not to have complied with the EMPr if:

- Within the boundaries of the site, site extensions and access roads there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence;
- The contractor fails to comply with corrective or other instructions issued by the ECO or Authorities within a specified time;
- The Contractor fails to respond adequately to complaints from the public; and
- Contravention of or deviation from any condition stipulated in the EA.

The Holder of the EA is deemed not to have complied with the EMPr if:

- Within the construction footprint there is evidence of contravention of clauses;
- If environmental damage ensues due to negligence or failure to implement conditions of the EMPr;
- They fail to respond adequately to complaints from the public; and
- Contravention of or deviation from any condition stipulated in the EA.

6.1.1 Non-Conformance Report (NCR)

A NCR will be issued to the Contractor as a final step towards rectifying a failure in complying with a requirement of the EMPr. This will be issued to the Contractor in writing. Preceding the issuing of the NCR, the Contractor will be presented with an opportunity to rectify the outstanding issue in a timely manner.

Preceding requirements to the submitting of the NCR will entail an issue that has been highlighted to the Contractor in the audits for corrective action. Should this issue not be corrected or completed to the satisfaction of the Holder of the EA and ECO, the issue is escalated to an NCR.

Should the ECO assess an incident / issue and find it to be significant (e.g. non-repairable damage upon the environment), it will be reported to the DEFF and immediately escalated to the level of an NCR. This will be done in consultation with the Holder of the EA. The following information should be recorded in the NCR:

- Details of non-conformance;
- Any plant or equipment involved;
- Any chemicals or hazardous substances involved;
- Work procedures not followed;
- Any other physical aspects;
- Nature of the risk;
- Actions agreed to by all parties following consultation that should adequately address the identified non-conformance. This may take the form of specific control measures and should take the hierarchy of controls into account. This must accompany the NCR for filing purposes;
- The agreed timeframe by which the Contractor should have implemented the actions documented in the NCR; and
- The ECO should verify that the agreed actions have taken place on or soon after the agreed completion date. Where the actions are complete, the ECO and Contractor should sign the Close Out portion of the Non-Conformance Form and file it with the contract documentation.

6.1.2 Environmental Emergency Response

The Contractor's environmental emergency procedures must ensure that there will be an appropriate response to unexpected or accidental actions or incidents that could cause environmental impacts. Such incidents may include but are not limited to:

- Accidental discharges to water (i.e. into a water resource) and land;
- Accidental spillage of hazardous substances (e.g. oil, petrol, and diesel);
- Accidental toxic emissions into the air;
- Specific environmental and ecosystem effects from accidental releases or incidents;

The Environmental Emergency Response Plan is separate to the Health and Safety Plan as it is aimed at responding to environmental incidents and must ensure and include the following:

- Construction employees must be adequately trained in terms of incidents and emergency situations;
- Details of the organisation (manpower) and responsibilities, accountability and liability of personnel;
- A list of key personnel and contact numbers;
- Details of emergency services (e.g. the fire department, spill clean-up services) must be listed;
- Internal and external communication plans, including prescribed reporting procedures;
- Actions to be taken in the event of different types of emergencies;
- Incident recording, progress reporting and remediation measures to be implemented; and
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.

The Contractor(s) will comply with the environmental emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act (Act No. 85 of 1993), the National Environmental Management Act (Act No. 107 of 1998), the National Water Act (Act No. 36 of 1998), and/or any other relevant legislation.

6.1.3 Non-compliance

Non-conformance will be issued to the Contractor for incidents of non-compliance. The Contractor (through the Environmental Officer) must also take the necessary steps (e.g. training) to prevent a recurrence of the infringement. The Contractor is also advised that the imposition of non-conformance does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor. The Contractor must be required to make good any damage caused as a result of the infringement at his own expense. A preliminary list of infringements for which non-conformance will be imposed is as follows:

- Using areas outside the working areas without permission / accessing “no-go areas”;
- Clearing and/or levelling area outside of the working areas;
- Littering on the site and surrounds;
- Burying / burning waste on site and surrounds;
- The undertaking of informal ablutions
- Making fires on site;
- Spillage onto the ground or water bodies of oil, diesel, or any other potential pollutants;
- Picking/damaging plant material, especially that from the residual areas of natural bush on the site;
- Damaging/killing wild or domestic animals/birds;
- Discharging effluent and/or storm water onto the ground or into surface water;
- Repeated contravention of the specification or failure to comply with instruction;
- Mixing cement directly on soil or bare ground outside designated batching plant; and
- Keeping animals as pets on site.

The Senior Site Supervisor, on recommendation from the ECO, may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMPr (i.e. more than 3 cases of infringements). The suspension will be enforced until such time as the offending actions, procedure or equipment is corrected. No extension of time will be granted for such delays and all costs will be borne by the Contractor.

<u>Penalty Fines</u>

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the Contractor shall be liable to pay a penalty fine. The following transgressions should be penalised:

- Hazardous chemical / oil spill;
- Damage to sensitive environments;
- Damage to cultural and historical sites;
- Unauthorised removal / damage to indigenous trees and other vegetation, particularly in identified sensitive areas;
- Uncontrolled / unmanaged erosion;
- Unauthorised blasting activities; and
- Violation of environmental authorisation conditions.

<u>Spot Fines</u>

These activities, along with the appropriate guidelines to determining fines, shall be agreed to by Oya Energy Facility, the Project Manager and Contractor, and will be included within the final EMPr. In addition to penalties, the Project Manager has the power to remove from site any person who is in contravention of the EMPr, and if necessary, the engineer can suspend part of or all of the works, as required.

The ESO and ECO shall be authorised to impose spot fines for any of the transgressions detailed below:

- Littering on site;
- Lighting of illegal fires on site;
- Any persons, vehicles or equipment related to the contractor’s operations found within the designated ‘no-go’ areas (especially for significant cultural resources such as nearby graves etc.);
- Creating dust or noise;
- Possession or use of intoxicating substances or weapons on site;
- Trapping, hunting or trading of fauna and / or plants on site;
- Any vehicles being driven in excess of designated speed limits;
- Unauthorised removal and/or damage to fauna, flora or cultural or heritage objects on site; and
- Urination and defecation anywhere other than using the toilet facilities that have been provided.

These activities, along with the appropriate guidelines to determining the fines, shall be agreed to by Oya Energy Facility, the Project Manager and the Contractor. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications and or legal obligations. Oya Wind Energy Facility will inform the contractor of the contravention and the amount of the fine.

6.1.4 Training and Awareness

The Main Contractor is to take responsibility for the management of their staff and subcontractors on the project site during the construction and decommissioning phase and supervise them closely at all times. The onus is on the Contractor to make sure that all their staff and subcontractors fully comprehend the contents of the EMPr. The Contractor must organise environmental awareness training programmes, which should, be targeted at the two (2) levels of employment: management and labour.

6.1.5 Training of Construction Workers

The construction workers must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered. They must also be appraised of the EMPr’s requirements. Environmental awareness training programmes need to be formulated for these levels and must comprise:

- A record of all names, positions and duties of staff to be trained;

- A framework for the training programmes;
- A summarised version of the training course(s); and
- An agenda for the delivery of the training courses.

Such programmes will set out the training requirements, which need to be conducted prior to any construction works occurring and will include:

- Acceptable behaviour with regard to flora and fauna;
- Management and minimising of waste, including waste separation;
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, cement, mortar and other chemicals;
- Responsible handling of chemicals and spills;
- Environmental emergency procedures and incident reporting; and
- General code of conduct towards I&APs.

The ECO may be requested to provide additional training (in a first language) on-site regarding environmental aspects that are unclear to the construction personnel. A translator may be required and requested to assist in this additional training. The cost for the translator will be borne by the Contractor.

6.1.6 Contractor Performance

The Main Contractor must ensure that the conditions of the EMPr are adhered to. Should the Main Contractor require clarity on any aspect of the EMPr, the Main Contractor must contact the ECO for advice.

7 PROJECT RESPONSIBILITIES

Formal responsibilities are necessary to ensure that key procedures are executed. Specific responsibilities of the Holder of the EA; Project Manager (PM); Contractor Project Manager (CPM), Main Contractor (MC), Safety, Health and Environment Quality Representative (SHEQ); Environmental Control Officer (ECO) and Community Liaison Officer (CLO) for the construction phase of this Wind Energy Facility are as detailed below. **Figure 9** below provides an organogram indicating the organizational structure for the implementation of the EMPr.

Although the exact terminology of the respective roles may differ, the structure below outlines the intended hierarchy in terms of reporting to ensure successful implementation of the EMPr. Similar reporting and responsibility protocols or improved structures are also allowed.

Basic Organogram:

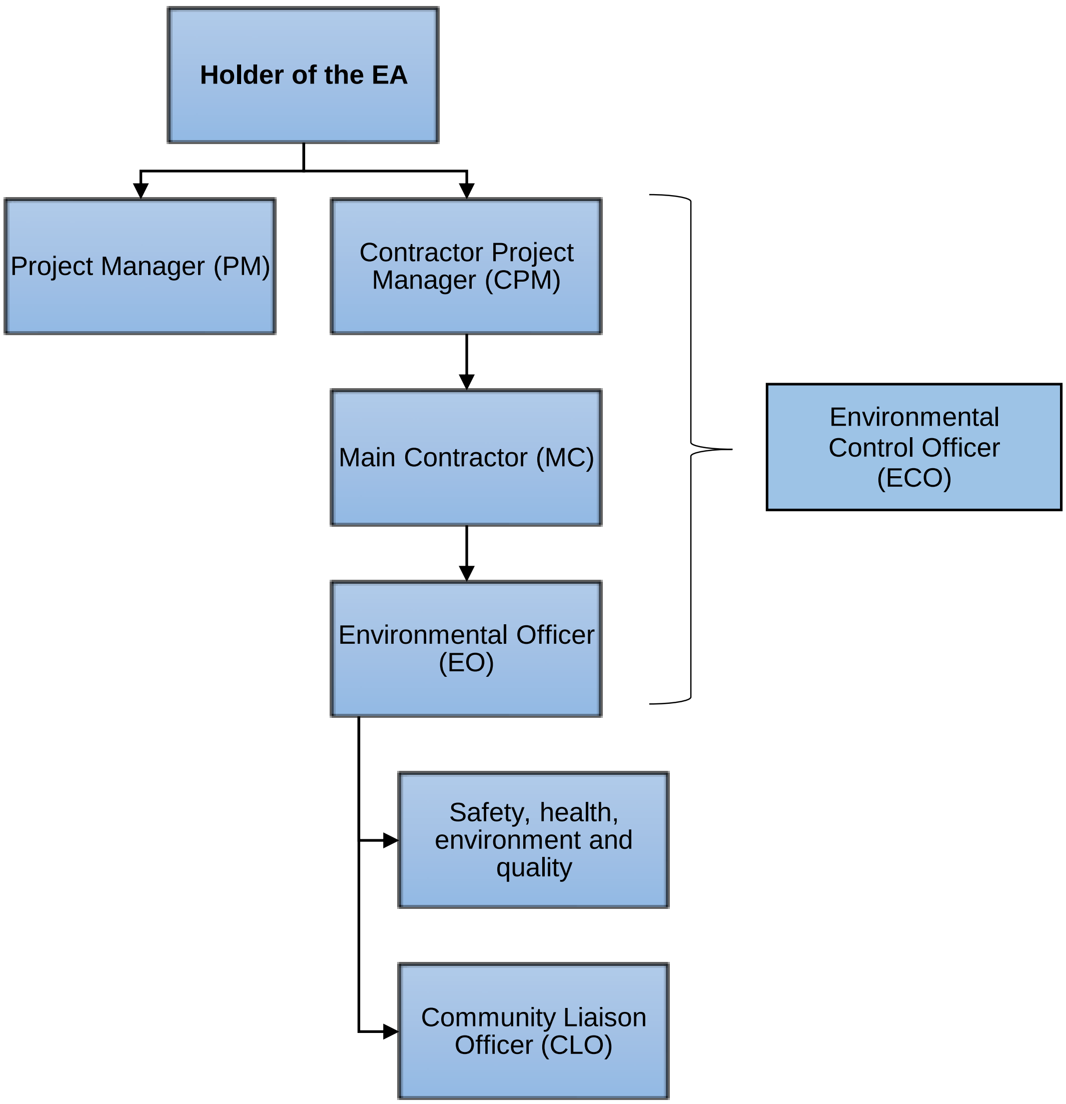

Figure 9: Organogram indicating the organisational structure

Holder of the EA will:

- Ensure all specifications and legal constraints specifically with regards to the environment are highlighted to the Contractor(s) so that they are aware of these;
- Ensure that Oya Energy (Pty) Ltd and its Contractor(s) are made aware of all stipulations within the EMPr;
- Ensure that the EMPr is correctly implemented throughout the project by means of site inspections and meetings. This must be documented as part of the site meeting minutes;
- Be fully conversant with the BA and EA Amendment Assessment for the project, the EMPr, the conditions of the EA (once issued), and all relevant environmental legislation; and
- Be fully knowledgeable with the contents of all relevant licences and permits.

Project Manager (PM) will:

- Be fully knowledgeable with the contents of the BA and risk management;
- Be fully knowledgeable with the contents and conditions of the EA (once issued);
- Be fully knowledgeable with the contents of the EMPr;
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with these;

- Have the overall responsibility of the EMPr and its implementation;
- Conduct audits to ensure compliance to the EMPr;
- Ensure there is communication with the Contractors, the ECO, and relevant discipline engineers on matters concerning the environment;
- Be fully knowledgeable with the contents of all relevant licences and permits;
- Ensure that no actions are taken which will harm or may indirectly cause harm to the environment, and take steps to prevent pollution on the site; and
- Confine activities to the demarcated construction site.

An independent ECO must be appointed by the project developer prior to the commencement of any authorised activities and will be responsible for monitoring, reviewing and verifying compliance by the EPC Contractor with the environmental specifications of the EMPr and the conditions of the EA. Accordingly, the ECO will:

- Be fully knowledgeable with the contents with the BA;
- Be fully knowledgeable with the contents and the conditions of the EA (once issued);
- Be fully knowledgeable with the contents of the EMPr;
- Be fully knowledgeable of all the licences and permits issued to the site;
- Be fully knowledgeable with the contents of all relevant environmental legislation, and ensure compliance with them;
- Ensure that the contents of this document are communicated to the Contractor site staff and that the Site Manager and Contractor are constantly made aware of the contents through discussion;
- Ensure that the compliance of the EMPr, EA and the legislation is monitored through regular and comprehensive inspection of the site and surrounding areas;
- Ensure that if the EMPr, EA and/or the legislation conditions, regulations or specifications are not followed then appropriate measures are undertaken to address any non-compliances (for example an ECO may cease construction or an activity to prevent a non-compliance from continuing);
- Monitoring and verification must be implemented to ensure that environmental impacts are kept to a minimum, as far as possible;
- Ensure that the Site Manager has input into the review and acceptance of construction methods and method statements;
- Ensure that activities on site comply with all relevant environmental legislation;
- Ensure that a removal is ordered of any person(s) and/or equipment responsible for any contravention of the specifications of the EMPr;
- Keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO;
- Ensure that the compilation of progress reports for submission to the Holder of the EA, with input from the Site Manager, takes place on a regular basis, including a final post-construction audit;
- Ensure that there is communication with the Site Manager regarding the monitoring of the site;
- Ensure that any non-compliance or remedial measures that need to be applied are reported; and
- Submit independent reports to the DEFF and other regulating authorities regarding compliance with the requirements of the EMPr, EA and other environmental permits.

The ECO must be present for the site preparation and initial clearing activities to ensure the correct demarcation of no-go areas, to facilitate environmental induction with construction staff and supervise any flora relocation and faunal rescue activities that may need to take place during the site clearing (i.e. during site establishment, and excavation of foundations). The developer should appoint a designated Environmental Officer (EO) to be present on-site to deal with any environmental issues as they arise. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site handed over for operation.

Contractors and Service Providers: It is important that contractors are aware of the responsibilities in terms of the relevant environmental legislation and the contents of this EMPr. The contractor is responsible for informing employees and sub-contractors of their environmental obligations in terms of the environmental specifications, and for ensuring that employees are adequately experienced and properly trained in order to execute the works in a manner that will minimise environmental impacts. The contractor's obligations in this regard include the following:

- Employees must have a basic understanding of the key environmental features of the construction site and the surrounding environment;
- A copy of the EMPr must be easily accessible to all on-site staff members;
- Employees must be familiar with the requirements of this EMPr and the environmental specifications as they apply to the construction of the Energy Facility;
- Prior to commencing any site works, all employees and sub-contractors must have attended an environmental awareness training course which must provide staff with an appreciation of the project's environmental requirements, and how they are to be implemented; and
- Staff will be informed of environmental issues as deemed necessary by the ECO.

All contractors (including sub-contractors and staff) and service providers are ultimately responsible for:

- Ensuring adherence to the environmental management specifications;
- Ensuring that Method Statements are submitted to the Site Manager (and ECO) for approval before any work is undertaken;
- Any lack of adherence to the above will be considered as non-compliance to the specifications of the EMPr;
- Ensuring that any instructions issued by the Site Manager on the advice of the ECO are adhered to;
- Ensuring that a report is tabled at each site meeting, which will document all incidents that have occurred during the period before the site meeting;
- Ensuring that a register is kept in the site office, which lists all transgressions issued by the ECO;
- Ensuring that a register of all public complaints is maintained; and
- Ensuring that all employees, including those of sub-contractors receive training before the commencement of construction in order that they can constructively contribute towards the successful implementation of the EMPr (i.e. ensure their staff are appropriately trained as to the environmental obligations)

The EO must be appointed by the Main Contractor and is responsible for managing the daily onsite implementation of the EMPr, and for the compilation of weekly environmental monitoring reports. In addition, the EO must act as liaison and advisor on all environmental and related issues, seek advice from the ECO when necessary, and ensure that any complaints received from I&APs are duly processed and addressed and that conflicts are resolved in an acceptable manner and timely manner. The EO must be a full time dedicated member of the Main Contractor's team and must be approved by the Holder of the EA.

The following qualifications, qualities and experience are recommended for the individual appointed as the EO:

- A relevant environmental diploma or degree in natural sciences, as well as a minimum of three years' experience in construction site monitoring, excluding health and safety;
- A level-headed and firm person with above-average communication and negotiating skills. The ability to handle and address conflict management situations will be an advantage; and
- Relevant experience in environmental site management and EMPr compliance monitoring.

The EO's responsibilities include:

- Monitoring, on a daily basis, environmental specifications on site and compliance with the conditions of the EA, environmental legislation and EMPr;
- Keeping a register of compliance / non-compliance with the environmental specifications;
- Identifying and assessing previously unforeseen, actual or potential impacts on the environment;
- Ensuring that a brief weekly environmental monitoring report is submitted to the ECO;
- Conducting site inspections during the defects liability period, and bringing any environmental concerns to the attention of the ECO and Contractor;
- Advising the Contractor on the rectification of any pollution, contamination or damage to the construction site, rights of way and adjacent land;
- Attending site meetings (scheduled and *ad hoc*);
- Presenting the environmental awareness training course to all staff, Contractors and Sub contractors, and monitoring the environmental awareness training for all new personnel on-site, as undertaken by the Contractor;

- Ensuring that a copy of the EA and the latest version of the EMPr are available on site at all times;
- Ensuring that the Contractor is made aware of all applicable changes to the EMPr that are approved by the DEFF;
- Assisting the Contractor in drafting environmental method statements and/or the Environmental Policy where such knowledge / expertise is lacking;
- Undertaking daily environmental monitoring to ensure the Contractor's activities do not impact upon the receiving environment. Such monitoring must include dust, noise and water monitoring; and
- Maintaining the following on-site:
    - A weekly site diary.
    - A non-conformance register.
    - An I&AP communications register, and
    - A register of audits.

The EO will remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to the Operator.

Contractor's Safety, Health and Environment Representative: The Contractor's Safety, Health and Environment and Quality (SHEQ) Representative, employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. In addition, the SHE must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor. A separate EO may be appointed to support this function.

The Contractor's Safety, Health and Environment Representative and/or Environmental Officer should:
- Be well versed in environmental matters.
- Understand the relevant environmental legislation and processes.
- Understand the hierarchy of Environmental Compliance Reporting, and the implications of non-compliance.
- Know the background of the project and understand the implementation programme.

Be able to resolve conflicts and make recommendations on site in terms of the requirements of this Specification.
- Keep accurate and detailed records of all EMPr-related activities on site.

7.1 Responsible Parties and Auditing Process

Table 13: Responsible Parties and Auditing Process

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION	ROLE DURING DECOMMISSIONING
Holder of the EA	Oya Energy (Pty) Ltd (Holder of EA)	Assume ultimate responsibility	Assume ultimate responsibility	Assume ultimate responsibility
Project Manager	To be appointed by Holder of the EA	Construction management	N/A	Decommissioning management
Contractor's Project Manager	To be appointed by Holder of the EA	Project management	N/A	Project management of decommissioning

TITLE	PARTY	ROLE DURING CONSTRUCTION	ROLE DURING OPERATION	ROLE DURING DECOMMISSIONING
Main Contractor/s	There will be multiple contracts placed and managed by the Contractor's Project Manager for the construction phase. These may cover civil earthworks and concrete, structural mechanical and electrical / instrumentation. Then there could also be the construction camp management contract.	Main Contractor will undertake day to day construction activities covering aspects such as civil earthworks and concrete, structural mechanical and electrical / instrumentation.	O&M	Main Contractor will undertake day to day decommissioning activities.
Environmental Officer	To be appointed by Main Contractors	Day to day environmental responsibility, point of contact for ECO	N/A	Day to day environmental responsibility, point of contact for ECO
Environmental Control Officer	To be appointed by Holder of the EA	Monthly audits	Annual audits	Day to day environmental responsibility, point of contact for ECO

Unless otherwise stated, the EMPr will be adhered to as follows:

- The EO will be the responsible party for all daily compliance of this EMPr during the construction phase;
- The monitoring party will be the ECO;
- Method of record keeping will be monthly audits undertaken by the ECO; and
- Audit Technique will be the review of records and documentation (including EMPr / EA / permits) that will be kept on site by the EO and/or site inspections.

The Holder of the EA will bear ultimate responsibility during the construction, operational and decommissioning phase.

8 MANAGEMENT PROGRAMME

8.1 Planning and Design Phase

- Makes sure that the design of the Energy Facility responds to the identified environmental constraints and opportunities.
- Makes sure that pre-construction activities are undertaken in accordance with all relevant legislative requirements.
- Makes sure that adequate regard has been taken of identified environmental sensitivities, as well as any landowner and community concerns and that these are appropriately addressed through design and planning (where applicable).
- Permits construction activities to be undertaken without significant disruption to other land uses and activities in the area.
- Makes sure that the best environmental options are selected for the Energy Facility.
- The EMPr specifies mitigation measures for the following environmental aspects:
  - Site Preparation
  - Consultation
  - Site clearing

8.1.1 Site Preparation

This section deals with the preparation of the site and actions that need to be implemented before construction commences.

Table 14: Site preparation

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
Site preparation: Failure to appoint construction team and suitable manager	1. Carefully plan to minimize the construction period and avoid construction delays. 2. Appoint an Environmental Control Officer (ECO) and Environmental Liaison Officer (ELO). The ELO is appointed on the contractor's behalf while the ECO is appointed on the Holder of the Environmental Authorisation's (EA's) behalf. 3. The Contractor must draw up method statements for relevant construction activities. The ECO must approve all of the method statements before they become operational.	Holder of the EA	Avoid construction delays Ensure the EMPr is adhered to	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
Site preparation: Site demarcation and compliance	4. All Construction Camp(s) are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage must be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp must be controlled by a guard or otherwise monitored, to prevent unlawful access. 5. Increase permeability of the fences to medium-to-small wildlife and wildlife-friendly designs. This will allow for wildlife to either jump over or crawl under the fence without causing harm to the animal. Smooth wire, instead of barbed wire should be used to avoid damage to the animal. Dimensions should allow for small to medium sized mammals and reptiles to pass underneath without causing harm. 6. The contractor and ECO must ensure compliance with conditions described in the EA. 7. Records of compliance / non-compliance with the conditions of the authorisation must be kept and be available on request. 8. Records of all environmental incidents must be maintained and a copy of these records be made available to provincial department on request throughout the project execution. 9. All waste must ultimately be disposed at registered landfill sites registered to receive the type of waste generate (general vs hazardous waste).	Holder of the EA	Ensure safety of the public and prevent loss/ damage equipment Ensure the conditions of the EA are adhered to Compliance to all legislative requirements	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	10. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013. 11. Where new water course crossings are required, the engineering team must provide an effective means to minimise the potential upstream and downstream effects of sedimentation and erosion (erosion protection) as well minimise the loss of riparian vegetation (reduce footprint as much as possible).			
Site preparation: Labour	12. All unskilled labourers must be drawn from the local market and where possible use must be made of local semi-skilled and skilled personnel where possible.	Holder of the EA	Fair employment practices in place Maintain a locals first recruitment policy as far as possible, reduced social impact from development	Continuous
Site preparation: Training of site staff	13. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. 14. In the event of a significant spill or leak of hazardous substances (e.g. petrol and diesel), such incident(s) must be reported to all relevant authorities,	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	including the Directorate: Pollution and Chemicals Management of the Western Cape Department of Environmental Affairs and Development Planning (WC DEA&DP), in accordance with section 30(1)(c) of the NEMA pertaining to the control of incidents. 15. Project Manager must ensure that the training and capabilities of the Contractor's site staff are adequate to carry out the designated tasks. 16. Staff operating equipment (such as loaders, etc.) must be adequately trained and sensitised to any potential hazards associated with their tasks. 17. No operator must be permitted to operate critical items of mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager. 18. Staff must be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training. 19. Staff must be trained in the hazards and required precautionary measures for dealing with these substances 20. Spillage packs must be available at construction areas.			
	SPECIFIC MITIGATION MEASURES			
Potential impact on terrestrial ecology	21. Ensure that the design of the WEF takes the sensitivity mapping of the Ecological Impact Assessment into account to avoid and reduce impacts on Species and Habitats of Conservation Concern.	Holder of the EA	Sensitive areas demarcated Management plans derived from specialist walk downs to be adhered to (Found in	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	22. Results of site visits to locate SCC should also be considered. 23. Location of footprint such that no threatened are affected. 24. The cliffs and rocky sheets as delineated by the ecologist are no- go areas and should be avoided entirely.		Section 9 as well as in Annexures)	
Potential impacts on avifauna	25. Ensure that the design of the WEF takes the sensitivity mapping of the avifauna specialist into account to avoid and/or reduce the impacts on Species and habitats of Conservation Concern. 26. Regarding the above, minimise the footprint of the construction to an acceptable level, as defined by the avifaunal specialist. 27. Use existing road networks as far as possible. 28. All overhead power lines must be signed off as “bird-friendly” by an avifaunal specialist prior to construction. 29. Power lines should cross very-high sensitive areas as little as possible, but should mainly aim to not be orientated perpendicularly to known flight bird paths. Instead, to reduce the risk of collision, the orientation should rather be parallel to these flight paths. This should be further assessed for approval by the avifaunal specialist as soon as the power line layout becomes available (to be subject of a separate basic assessment report).	Holder of the EA	Sensitive areas demarcated Management plan derived from specialist walk downs to be adhered to (Found in Section 9 as well as in Annexures)	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
Potential impacts on bats	30. Ensure that the design of the WEF takes the sensitivity mapping of the bat specialist into account to avoid and reduce impacts on bat species and bat important features. 31. Use existing road networks as far as possible.	Holder of the EA	Sensitive areas demarcated Management plan derived from specialist walk downs to be adhered to (Found in Section 9 as well as in Annexures)	Once off
Potential impact on freshwater ecology	32. Ensure final layout of WEF (except roads and power lines) avoids watercourses and recommended buffers as far as possible; utilise existing disturbed areas where possible. Refer to the project sensitivity mapping in Appendix B of the EMPr to view the freshwater sensitive areas and buffers to be avoided. 33. A comprehensive stormwater management plan should be compiled for the compacted surfaces within the site by the project engineer with input from the freshwater specialist. The plan should aim to reduce the intensity of runoff particularly on the steeper slopes and reduce the intensity of the discharge into the adjacent drainage lines. Where necessary measures to dissipate flow intensity or protect erosion should be included in the plan. Adjacent to wetland areas, the plan should encourage infiltration rather than runoff and should prevent the impedance of surface or sub-surface flows. The plan should also mitigate any contaminated runoff from the construction and operation activities from being discharged into any of the aquatic features within the site. 34. Adequate erosion mitigation measures should be incorporated into designs.	Holder of the EA	Sensitive areas demarcated Management plans derived from specialist walk downs to be adhered to (Found in Section 9 as well as in Annexures) Storm Water management plan to be implemented (Found in Section 9.5 and Annexure I)	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	35. For any new infrastructure placed within the watercourses: • The structure should not impede or concentrate the flow in the watercourse without required WUL/ GA. • The structure should also be placed at the base level of the channel and be orientated in line with the channel. and • Any rubble or waste associated with the construction works within the aquatic features should be removed once construction is complete. 36. Water consumption requirements for the site for the construction and operation of the site if not obtained from an authorised water user within the area, must be authorised by the Department of Water and Sanitation (DWS). 37. No liquid waste should be discharged into any of the aquatic features within the site without the approval of the DWS. Wastewater should be properly contained on-site and removed to a licensed wastewater treatment facility that is able to treat the wastewater. 38. It is imperative that all construction works be undertaken during the driest period of the year when there is no flow within the watercourses, and thus no diversion of flow would be necessary. 39. The reaches of the watercourses where no activities are planned to occur must be considered no-go areas. These no-go			

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be upgraded; 40. For trenching of the cables, the topsoil has to be stored separately and may not be contaminated. Furthermore, the soil layers should be replaced in the same order and the topsoil returned last; 41. Contractor laydown areas, vehicle re-fuelling areas and material storage facilities are to remain outside of the watercourses and at least 32 m from the delineated extent; and 42. The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.			
Mortality of Red Data avifauna (bats) due to disturbance	43. A buffer of 200 m must be maintained around potentially important bat features such as along water lines and associated riverine vegetation. It is recommended that should any new infrastructure (including roads and electrical infrastructure) cross these features, then	Holder of the EA	Sensitive areas demarcated Management plans derived from specialist walk downs to be adhered to (Found in Section 9 as well as in Annexures)	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	they should not be routed to run parallel with them, but rather cross them perpendicularly, as far as possible. This does not apply to use of existing roads. 44. Four roosts are confirmed on the Oya WEF site. These should be buffered by 500 m according to the current South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments - Pre-construction: 4th Edition. South African Bat Assessment Association. However, the applicable Best Practice Guidelines at the time of construction and operation should be implemented.			
Impacts to archaeology, graves and palaeontological material.	▪ Avoid impacts to archaeological resources, graves and/or palaeontological material. ▪ The following buffers must be applied: ▪ Graves: no development should be permitted within 50 m of identified graves and cemeteries; existing roads within this buffer should not be altered or widened; ▪ Cave site (KDB045): construction staff should not be permitted within 200 m of the site; ▪ Farmsteads: no turbines should be located within 500 m of farmsteads; and ▪ Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100 m of these sites and no development should occur within 15m of these sites.	Holder of the EA	Management Plan (Annexure K) informed by the Pre-construction walk-through undertaken in October 2020 Chance Find Procedure Implemented (Annexure K) Complaints / grievance register	*Continuous*

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	▪ Buffers around identified heritage resources (100m for stone structures and 50m for land use features such as dams, intersections, wind pumps) ▪ buffer around historic trunk road for any new structures (50m) ▪ All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached should be inspected by the ECO during the construction phase to ensure they are being respected; ▪ The R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward; ▪ New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape by observing appropriate buffers around these features; ▪ If supported in consultation with local inhabitants (of permanent or seasonal habitation, owners or labourers), the negative impact of non-local inhabitants on cultural lifeways and language, employees associated with the new WEF should be reduced by housing the employees away from the CLAs			

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	▪ Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of the development process through to the end of the decommissioning phase; ▪ The Chance Fossil Finds Protocol should be implemented in the event of the discovery of significant new fossils during the construction phase; ▪ Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, etc.) by the ECO on an on-going basis during the construction phase. Significant fossil finds to be reported to Heritage Western Cape (HWC) (Western Cape sites) or the South African Heritage Resources Agency (SAHRA) (Northern Cape sites) for recording and sampling by a professional palaeontologist; 45. If any archaeological material or human burials are uncovered during the course			

Impact	Impact Management Actions	Responsibility	Impact Management Outcomes	Time frames
	of development, then work in the immediate area should be halted at once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.			

8.1.2 Consultation

This section deals with the public consultation of the site and actions that need to be implemented before construction commences

Table 15: Consultation

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Consultation	1. Provide a mechanism through which information could be exchanged between the Holder of the EA and stakeholders. 2. Identify relevant stakeholders and engage them at applicable stages of the construction process. 3. Inform the public about the proposed construction process. 4. Surrounding communities must be kept informed, through the identified and agreed consultation channels, of the commencement of construction. 5. Solicit views and concerns from the public and allow them to suggest mitigations and enhancement measures.	Holder of the EA	Clear communication channels established	Continuous

Employment creation for construction, operation and decommissioning activities.	6. Advise on the set-up of a skills desk and where it will be situated. Provide awareness of skills desk for local communities. 7. Set up a complaints register/grievance mechanism to allow any potentially negatively affected party to raise its concerns, which are then assessed and resolved.	Holder of the EA	HIV/AIDS awareness	Continuous

8.2 Construction Phase

- Makes sure that construction activities are properly managed in respect of environmental aspects and impacts.
- Makes sure construction activities to be undertaken without significant disruption to other land uses and activities in the area, in particular concerning noise impacts, farming practices, traffic and road use, and effects on local residents.
- Minimises the impact on the indigenous natural vegetation, protected tree species, and habitats of ecological value.
- Minimises impacts on fauna using the site.
- Minimises the impact on heritage sites should they be uncovered.

8.2.1 Site Clearing

This section deals with site clearing and actions that need to be implemented before construction commences

Table 16: Site Clearing

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Site Clearing	1. The area cleared must be as small as feasibly possible. 2. Site clearing must take place in a phased manner, as and when required. 3. Areas which are not to be constructed on within two (2) months must not be cleared to reduce erosion risks.	Holder of the EA	Site establishment undertaken in line with the requirement of the EMPr Management Plan (Section 9) informed by the Pre-	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	4. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 5. Spoil that is removed from the site must be removed to an approved spoil site or a licensed landfill site. 6. The necessary silt fences and erosion control measures must be implemented in areas where these risks are more prevalent.		construction walk-through undertaken in October 2020 Sensitive areas identified and avoided Erosion and Storm Water Plan (Annexure I) implemented and hydrological measures in place. Appropriate Storm Water structures as informed by the Storm Water Management Plan (Annexure I)	
SPECIFIC MITIGATION MEASURES				
	7. If electric fences are to be constructed, these should be erected according to the standards of Nature Conservation authorities. Limit clearing of natural habitat designated as sensitive, especially rocky outcrops, and riparian habitats. 8. Increase permeability of the fences to medium-to-small wildlife and wildlife-friendly designs. This will allow for wildlife to either jump over or crawl under the fence without causing harm to the animal. Smooth wire, instead of barbed wire should be used to avoid damage to the animal. Dimensions should allow for small to medium sized mammals and reptiles to pass underneath without causing harm.	Holder of the EA	Impacts avoided or managed as per specialist recommendations.	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	9. Restrict impact to development footprint only and limit disturbance spreading into surrounding areas. 10. Stockpile topsoil for re-use in rehabilitation phase. Maintain stockpile shape and protect from erosion. All stockpiles must be positioned at least 50m away from watercourses. Limit the height of stockpiles as far as possible in order to reduce compaction. 11. Disturbance of vegetation and topsoil must be kept to a practical minimum. 12. Removal or disturbance of any TOPs, Red Data listed or Provincially protected species may only be done after obtaining permits from relevant authorities. 13. A CapeNature permit is required for animal and plant search-and-rescue. 14. If the identity of the Vulnerable plant species within 40 m of Turbine 1 is confirmed to be *Octopoma quadrisepalum*, then it may be required that Turbine 1 is shifted a minimum of 90 m eastwards and that the crane pad is located to the east of the new position. 15. Alternatively, an application can be submitted for a permit to relocate the plant or destroy it, but there is no guarantee that the permit application would be approved			

8.2.2 Construction Camp

This section deals with construction camp and actions that need to be implemented during construction

Table 17: Construction Camp

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Camp: Site of construction camp	1. The Contractor's camp must take into account location of local residents and / or ecologically sensitive areas (such a wetlands and drainage lines), including flood zones. The Construction camp position will be determined by the Environmental Authorisation. 2. The size of the construction camp must be where technically feasible minimized 3. Adequate parking must be provided for site staff and visitors. The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion. 4. Suitable control measures over the Contractor's yard (Clean and tidy yard area) plant (not causing smoke, and or, noise pollution unnecessarily) and material storage (organised, and neat) to mitigate any visual impact of the construction activity must be implemented.	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements. Impacts avoided or managed as per specialist recommendations.	Once off

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Camp: Construction camp	5. The ECO and Contractor must inspect the Construction Camp site at each ECO site inspection (depending on conditions in the EA as per the Authorising Authorities recommendation) to confirm and note any environmental sensitivity. 6. The construction camp layout plan must be provided to the ECO for approval prior to the construction of the camp. 7. The construction camp must be fenced off and on-site security must be put in place prior to commencing with the construction activities. 8. The Contractor must supply a wastewater management system that will comply with legal requirements and be acceptable to the Holder of the EA if this does not already exist on the site. 9. Site establishment must take place in an orderly manner and all required amenities must be installed at camp sites before the main workforce move onto site. 10. All construction equipment must be stored within the construction camp unless temporarily stored at immediate area where work is undertaken. 11. All oil changes must take place on a sealed surface such as a concrete slab that is bunded, or a similar appropriate surface. 12. The Construction Camp must be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and must be readily accessible. 13. The Contractor must provide sufficient ablution facilities (1 toilet per every 12 workers), in the form of portable / VIP toilets,	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements. Impacts avoided or managed as per specialist recommendations. Ensure safety of the public and prevent loss/ damage equipment. All hazardous substances managed according to approved Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO No unauthorised open fires on site.	Once off Once established- Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	at the Construction Camps, and must conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems must be allowed and toilets must not be situated within 100 meters of any surface water body or 1:100 year flood line. 14. The portable chemical toilet/s (ablution facilities) at the construction camp must be serviced on a weekly basis (as well as when required) for the duration of the construction phase, to ensure that no spillages occur, and to provide safe working conditions for workers. 15. The Contractor must inform all site staff to make use of supplied ablution facilities and under no circumstances must indiscriminate sanitary activities be allowed. 16. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas must be used, provided that all required safety measures are in place. The Contractor must take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures must include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter. 17. Should an area for cooking be required, it must be inspected and approved by the ECO prior to use.			

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Camp: Storage of materials (including hazardous materials)	18. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment. 19. Choice of location for storage areas must take into account prevailing winds, distances to water bodies, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary. 20. Storage areas must be designated, demarcated and fenced if necessary. 21. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons i.e. children / animals etc. 22. Fire prevention facilities must be present at all storage facilities. 23. Proper storage facilities for the storage of oils, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines on a site with the approval of the ECO. 24. All fuel storage areas must be roofed to avoid creation of dirty storm water 25. Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible the available, MSDSs	Holder of the EA	All hazardous substances managed according to approved Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Once off Once established- Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	must additionally include information on ecological impacts and measures to minimise negative environmental impacts during accidental releases or escapes. 26. Storage areas containing hazardous substances / materials must be clearly signposted. 27. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. 28. All excess cement and concrete mixes are to be contained within a bunded area on the construction site prior to disposal off site. 29. All major spills as specified in the contractor emergency response procedure of any materials, chemicals, fuels or other potentially hazardous or pollutant substances must be cleaned immediately, and the cause of the spill investigated. Preventative measures must be identified and submitted to the MC and ECO for information. Emergency response procedures to be followed and implemented. 30. In the event of a significant spill or leak of hazardous substances (e.g. petrol and diesel), such incident(s) must be reported to all relevant authorities, including the Directorate: Pollution and Chemicals Management of the WC DEA&DP, in accordance with section 30(1)(c) of the NEMA, 1998 pertaining to the control of incidents.			

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Camp: Drainage of construction camp	31. Surface drainage measures must be established in the Construction Camps so as to prevent • Ponding of water; • Erosion as a result of accelerated runoff; and, • Uncontrolled discharge of polluted runoff.	Holder of the EA	Appropriate Storm Water structures as informed by the Storm Water Management Plan (Annexure I) Erosion and Storm water Plan (Annexure I) implemented	Once off Once established- Monthly audits by the ECO
Construction Camp: Reporting on suspicious activities	32. Encourage local people to report any suspicious activity associated with the construction sites through the establishment of a community liaison forum; 33. Prevent loitering within the vicinity of the construction camp as well as construction sites.	Holder of the EA	Clear communication channels established	Continuous

8.2.3 Documentation

This section deals with the preparation and storage of documents essential for the duration of the project.

Table 18: Site documentation

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Site documentation: Documents to be kept and updated on site for the duration of the contract	1. The following documents are to be kept in an Environmental File in the site camp: ▪ Final EMPr once approved by the DEFF; ▪ EA issued by the DEFF; ▪ Relevant permits; ▪ Environmental Policy of the Contractor; ▪ Environmental method statements compiled by the Contractor;	Holder of the EA	All relevant documentation will be up to date and available for inspection by Key Stakeholders and the Public. Ensure the EA and EMPr is adhered to.	Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	▪ Weekly environmental monitoring records; ▪ Minutes and record of attendance of all environmental meetings; ▪ Environmental incident book; ▪ Communications register; ▪ Register of audits; ▪ Non-conformance reports; and ▪ Waste manifests.			
Site documentation: Method Statements for approval prior to commencement of construction	2. A method statement including the following information where applicable: ▪ The type of construction activity; ▪ Timing and location of the activity; ▪ Construction procedures; ▪ Materials and equipment to be used; ▪ Transportation of the equipment to and from site; ▪ How the equipment / material will be moved while on site; ▪ Location and extent of construction site office and storage areas; ▪ Identification of impacts that might result from the construction activity; ▪ Population impacts; ▪ Community / institutional arrangements; ▪ Conflicts between local residents and newcomers; ▪ Individual and family level impacts; ▪ Community infrastructure needs; ▪ Intrusion impacts; ▪ Methodology and/or specifications for impact prevention or containment and for environmental monitoring; ▪ Emergency / disaster incident and reaction procedures (required to be demonstrated); and	Holder of the EA Contractor will be accountable for all actions taken in non-compliance of approved method statements	Detailing the process of how particular activities will be carried out. Dangers and risks associated with certain activities are highlighted by the Contractor Contractor must keep all method statements and subsequent revisions on file, copies of which must be distributed to all relevant personnel for implementation. Ensure the EMPr is adhered to.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	▪ Rehabilitation procedures and continued maintenance of the impacted environment. 3. A Method Statement is a document detailing how a particular process will be carried out. It must detail the possible dangers / risks associated with the particular part of the project and the methods of control to be established and to show how the work will be managed in a safe and environmentally responsible manner.			
Site documentation: Communications register / environmental complaints register	4. All complaints or communications that are received from I&APs or any other stakeholder must be recorded in a communications register, which must include the following information: ▪ Record the time and date of the complaint/communication; ▪ A detailed description of the complaint/communication; ▪ Action and resources used to correct the complaint; ▪ Photographic evidence of the complaint (where possible); ▪ A written response to the complainant indicating rectification of the complaint; and ▪ Information regarding the relevant authority that was contacted or notified in writing where applicable (person, time and date). 5. Complaints and communications must be brought to attention of the Holder of the EA, whereupon it must be investigated and a response to the Complainant, I&APs or stakeholder must be given within ten (10) days.	Holder of the EA	All environmental incidents and community complaints are adequately dealt with. Ensure effective communication with the community and Key Stakeholders	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	6. Relevant authorities include: ▪ Department of Water and Sanitation (DWS) (e.g. for any incidents involving the contamination of water resources). ▪ Department of Environment, Fisheries and Forestry (DEFF) (e.g. for any significant incident of pollution of the soil and air). ▪ Department of Agriculture, Forestry and Fisheries (DAFF) (e.g. uses of appropriate herbicides for eradication of alien invasive species, and permits for trees of special concern). ▪ Department of Health (e.g. for incidents such as contamination of water resources, accidental spill of hazardous substances). ▪ Department of Transport (e.g. for the diversion of traffic due to construction activities). ▪ Department of Environmental Affairs and Development Planning (DEADP) ▪ Heritage Western Cape (HWC). ▪ Heritage Northern Cape (HNC)			
Site documentation: Photographic record for all phases of the project	7. Compile photographic record (dated) of all activities on site prior to start of construction related activities, during construction process and on completion of construction related works. This photographic record must include: ▪ A pre-construction site record ▪ Monthly environmental audit reports; ▪ Weekly environmental monitoring reports; ▪ Corrective action; ▪ Progress of environmental works; and ▪ Incidences of non-conformance.	Holder of the EA	The state of the environment in pre-construction, construction, rehabilitation and operation phases are captured for effective documentation of the environment. To ensure EMPr is adhered to.	Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
			All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	
Site documentation: Waste manifests	8. The Contractor must ensure that all solid (including any hazardous) waste removed from site is disposed of at a registered landfill site or nearby waste transfer station with capacity to accept the project generated waste. 9. Waste manifest must be kept on record for auditing purposes. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility.	Holder of the EA	All waste is disposed of in the correct manner and accounted for. To ensure EMPr is adhered to.	Monthly audits by the ECO
Site documentation: Good housekeeping	10. Contractor must practice good housekeeping. This must eliminate disputes about responsibility, facilitate efficient and timeous running of the project. Over and above practicing accepted construction methods in accordance with SANS 10120, this must include measures to preserve the environment inside the work area. 11. Records of such actions taken to ensure the maintenance and management of housekeeping must be recorded. 12. Contractor must record and report upon environmental management measures undertaken to mitigate assessed impacts upon the environment.	Holder of the EA	All waste is disposed of in the correct manner and accounted for. Housekeeping is attended to timeously. To ensure EMPr is adhered to.	Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Site documentation: Management and control	13. Contractor must implement environmental management in a reasonable manner and should such management not prove effective, must implement measures to satisfaction of the Holder of the EA. Appropriate measures must include: ▪ Appointment of necessary resources to monitor and manage environmental requirements; ▪ Implement aspect-specific method statements to deal with emergency situations; ▪ Provision of adequate emergency response equipment to mitigate and manage an incident or emergency; and ▪ Provision of specific training related to implementation of environmental management requirements. ▪ The Contractor must maintain detailed records of parameters monitored. These detailed records must demonstrate the effectiveness of the management actions implemented to mitigate potential impacts. The Contractor must submit a monthly database / report of management works implemented to the Holder of the EA, as part of the Contractors monthly report.	Holder of the EA	Appointment of a responsible EO to implement the EMPr, EA and Method Statements on behalf of the Contractor.	
Site documentation: Monitoring	14. Contractor must submit Environmental Monitoring Method Statement which details scope, nature, process, schedule, and templates for environmental monitoring. 15. Monitoring results must be used to determine effectiveness of management programme. 16. All complaints, compliments or other comments relating to environmental	Holder of the EA	Effective implementation of the EMPr and monitoring of the environment by the Contractor. EO to provide Main Contractor with brief weekly environmental monitoring report covering	Continuous Weekly reports submitted by the Contractor's Manager prior to submission to Holder of EA for monthly reporting. Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	management parameters must be recorded in site issues register of Contractor for inclusion in project issues register held by Holder of EA. 17. Contractor must monitor and maintain the following on an on-going basis: ▪ Re-growth of alien invasive vegetation; ▪ Validity of the pest control officer certificate; ▪ Fire break requirements associated to construction related activities; ▪ Storm Water systems; ▪ Topsoil and backfill volumes; ▪ Access road condition; ▪ Dust generated from stockpiles; ▪ Noise; ▪ Water quality; ▪ Erosion prevention; and ▪ Landscaping requirements for rehabilitation. 18. The Contractor must maintain detailed records of parameters monitored. These detailed records must demonstrate the effectiveness of the management actions implemented to mitigate potential impacts. 19. Contractor must submit monthly database / report of management works implemented to Holder of the EA, as part of Contractors monthly report 20. Daily and weekly reports must detail observations and information relating to requested management actions and their effectiveness. 21. Monitoring results and associated required management and mitigation actions for coming monitoring period must be		onsite events which occurred during past week. Will highlight key performance areas and provide feedback on corrective and preventive actions taken.	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	presented in the monitoring section of the Contractors monthly report. 22. Contractor must submit a monthly database of *inter alia* the following works to the Holder of the EA. This database must include as a minimum: ▪ Extent of alien invasive clearing operations; ▪ Volumes of herbicide used on the project; ▪ Stockpile volumes of chipped material, topsoil, fertile soil and subsoil; ▪ Volume of recyclable waste removed from site; ▪ Water volumes recycled and used for dust suppression; and ▪ Maintenance of chemical toilets. 23. All complaints, compliments or other comments relating to construction related works must be recorded by Contractor in communications register of receiving party for inclusion in project issues register. 24. Site clearance monitoring results and associated required management and mitigation actions for the coming monitoring period must be presented in the monitoring section of Contractors monthly report. 25. Weekly reports must detail observations and information relating to requested management actions and their effectiveness.			

8.2.4 Environmental Education and Training

This section deals with the environmental training of construction employees.

Table 19: Environmental Education and Training

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Environmental education and training: Environmental training	1. The Holder of the EA must appoint an ECO prior to construction 2. Ensure that all site personnel have a basic level of environmental awareness training. The ECO will be responsible for the training and topics covered must include: • What is meant by "Environment"; • Why the environment needs to be protected and conserved; • How construction activities can impact on the environment; • What can be done to mitigate against such impacts; • Awareness of emergency and spills response provisions; • Social responsibility during construction e.g. being considerate to local residents; and • Specific mitigation measures stipulated in the EMPr and EA. 3. Environmental awareness training for all construction staff must be undertaken by the ECO prior to construction starting. Translators are to be used where necessary. The topics covered must include, but not be limited to the following: • Use of the appropriate fire-fighting equipment; • The need for a "clean site" policy; • The prevention of accidental spillage of hazardous chemicals and oil; • Pollution of water resources (both surface and groundwater); • Air pollution and litter control;	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them.	Monthly tool box talks by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	• The need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources; and • General safety. 4. Training of new staff that did not receive the initial training is the responsibility of the ECO. 5. Staff operating equipment (such as cranes, etc.) must be adequately trained and sensitized to any potential hazards associated with their tasks. 6. No operator must be permitted to operate critical mechanical equipment without having been trained by the Contractor and certified competent by the Project Manager.			
Environmental education and training: Monitoring of environmental training	7. The Contractor must monitor the performance of construction workers to ensure that the points relayed during their introduction have been properly understood and are being followed. If necessary, the ECO and / or a translator must be called to the site to further explain aspects of environmental or social behaviour that are unclear. Toolbox talks are required	Holder of the EA	Thorough induction to site.	Monthly tool box talks by the ECO

8.2.5 Erosion Control

This section deals with erosion issues and actions that need to be implemented during construction

Table 20: Erosion Control

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Erosion Control	1. Wind screening and storm water control must be undertaken to prevent soil loss from the site. 2. The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if any. 3. All erosion control mechanisms need to be regularly maintained. 4. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 5. Retention of vegetation where possible to avoid soil erosion 6. Vegetation clearance must be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 7. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. 8. No impediment to the natural water flow other than approved erosion control works is permitted. 9. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I) Erosion minimised and due care illustrated throughout project life cycle Appropriate storm water structures incorporated in final design.	Continuous Monthly audits by the ECO
SPECIFIC MITIGATION MEASURES				
Increased wind erosion and resultant deposition of dust.	10. Sand, stone and cement should be stored in demarcated areas, and covered or sealed to prevent wind erosion and resultant deposition of dust on the surrounding indigenous vegetation. 11. During construction, efforts should be made to retain as much natural vegetation as possible on the site, to reduce disturbed	Holder of the EA	Storm Water Management Plan provided and accepted prior to construction commencing Storm Water Management Plan implemented (Annexure I) (Section 9)	Continuous Daily inspection by the contractor Monthly audits by the ECO

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	areas and maintain plant cover, thus reducing erosion risks. 12. All stockpiles must be protected from erosion and stored on flat areas where run-off will be minimised. Erosion and sedimentation into water bodies must be minimised through effective stabilisation.		Appropriate storm water structures incorporated in final design Storm Water and Erosion Management Plan implemented (Annexure I) (Section 9)	
Excessive loss of natural vegetation within the development footprint area.	13. Vegetation clearing during construction must be restricted to the footprint of the proposed project components and planned infrastructure only. It should be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 14. Stockpile the shallow topsoil layer separately from the subsoil layers (especially if the excavation exceeds 0.5 m). Reinstate the topsoil layers (containing seed and vegetative material) when construction is complete to allow the plants to rapidly re-colonise the bare soil areas. 15. Re-seed with locally-sourced seed of indigenous grass species that were recorded on site pre-construction. 16. Topsoil stockpiles not used in three months after stripping must be seeded to prevent dust and erosion.	Holder of the EA	Erosion and Storm water Plan (Annexure I) implemented	Continuous
Erosion of surface soils, rilling and gulleys due to water erosion.	17. Identify cause of erosion and possible means of redress (i.e. implement erosion control measures, where applicable), such as the use of geofabric, stone gabions and re-vegetation or similar measures. 18. Erosion control measures should seek to reduce surface flow velocity and allow for settlement on site of silt laden surface waters. Washaways, excessive loss of soils	Holder of the EA	Erosion and Storm Water Plan (Annexure I) implemented Storm Water and Erosion Management Plan (Annexure I) implemented.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	and gulleys can be considered to be indicative of excessive erosion.			

8.2.6 Water Use and Quality and Aquatic Ecology

This section deals with water use and quality issues and actions that need to be implemented during construction

Table 21: Water Use and Quality and aquatic ecology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Water Use and Quality: Water Use	1. Develop a sustainable water supply management plan to minimize the impact to natural systems by managing water use, avoiding depletion of aquifers and minimizing impacts to water users. 2. Water must be reused, recycled or treated where possible. 3. Consultation with key stakeholders to understand any conflicting water use demands and the community's dependency on water resources and conservation requirements within the area.	Holder of the EA	Compliance to all legislative requirements.	Continuous
Water Use and Quality: Water Quality	4. The quality and quantity of effluent streams discharged into the environment including storm water must be managed and treated to meet applicable effluent discharge guidelines. 5. Efficient oil and grease traps or sumps must be installed and maintained at refuelling facilities, workshops, fuel storage depots, and containment areas and spill kits must be available with emergency response plans.	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	6. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over within 100m of any on-site watercourses. All vehicle maintenance or refuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site.			
Water Use and Quality: Storm Water	7. The site must be managed in order to prevent pollution of drains, downstream watercourses or groundwater, due to suspended solids and silt or chemical pollutants. 8. Temporary cut off drains and berms must be required to capture storm water and promote infiltration. 9. Promote a water saving mind set with construction workers in order to reduce water wastage. 10. New storm water systems must be developed strictly in accordance with engineers' specifications in order to ensure efficiency. 11. Hazardous substances (fuel) must be stored at least 100m from any water bodies on site to avoid pollution. 12. The installation of the storm water system must take place as soon as possible to attenuate storm water from the construction phase as well as the operation phase. 13. Earth, stone and rubble is to be properly disposed of, or utilized on site so as not to obstruct natural water pathways over the site. i.e. these materials must not be placed in storm water channels, drainage lines or rivers.	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	14. There must be periodic checking of the site's drainage system to ensure that the water flow is unobstructed. 15. If a batching plant is necessary, run-off must be managed effectively to avoid contamination of other areas of the site. Untreated runoff from the batch plant must not be allowed to get into the storm water system or nearby streams, rivers or erosion channels or dongas.			
Water Use and Quality: Concrete Mixing	16. Concrete contaminated water must not enter soil or any natural drainage system as this disturbs the natural acidity of the soil and affects plant growth.	Holder of the EA	Batching plant managed according to approved Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous
Water Use and Quality: Public areas	17. Food preparation areas must be provided with adequate washing facilities and food refuse must be stored in sealed refuse bins which must be removed from site on a regular basis. 18. The contractor must take steps to ensure that littering by construction workers does not occur and persons must be employed on site to collect litter from the site and immediate surroundings, including litter accumulating at fence lines. 19. No washing or servicing of vehicles on site unless in abounded area and agreed to by the ECO.	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them. Storm Water and Erosion Management Plan implemented (Annexure I) Compliance to all legislative requirements. All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
			ECO compiled by the contractor and approved by the engineer and reviewed by ECO Vehicles repaired as per the Method Statement for vehicles management compiled by the contractor and approved by the engineer and reviewed by ECO	
SPECIFIC MITIGATION MEASURES				
Potential impact on freshwater ecology as a result of the proposed Oya WEF and associated infrastructure.	20. For any new infrastructure placed within the watercourses: 21. The structure must not impede or concentrate the flow in the watercourse without required WUL/ GA. • The structure must not impede or concentrate the flow in the watercourse without required WUL/ GA. • The structure must also be placed at the base level of the channel and be orientated in line with the channel. and • Any rubble or waste associated with the construction works within the aquatic features must be removed once construction is complete. 22. Water consumption requirements for the site for the construction and operation of the site if not obtained from an authorised water user within the area, must be authorised by the Department of Water and Sanitation (DWS). 23. No liquid waste should be discharged into any of the aquatic features within the site	Holder of the EA	Ensure compliance with the WULA/GA Storm Water and Erosion Management Plan implemented (Annexure I) Demarcate sensitive areas Vehicles repaired as per the approved Method Statement for vehicles management compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	without the approval of the DWS. Wastewater should be properly contained on-site and removed to a licensed wastewater treatment facility that is able to treat the wastewater. 24. It is imperative that all construction works be undertaken during the driest period of the year when there is no flow within the watercourses, and thus no diversion of flow would be necessary. 25. The reaches of the watercourses where no activities are planned to occur must be considered no-go areas. These no-go areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be upgraded; 26. For trenching of the cables, the topsoil has to be stored separately and may not be contaminated. Furthermore, the soil layers should be replaced in the same order and the topsoil returned last; 27. Contractor laydown areas, vehicle re-fuelling areas and material storage facilities are to remain outside of the watercourses and at least 32 m from the delineated extent; and 28. The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m. Should the vegetation not be suitable for reinstatement		Storm Water and Erosion Management Plan implemented (Annexure I) Rehabilitation Plan implemented (Annexure H)	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.			

8.2.7 Waste Management

This section deals with waste management issues and actions that need to be implemented during construction

Table 22: Waste Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Waste Management: Litter Management	1. Refuse bins must be placed at strategic locations to ensure that litter does not accumulate within the construction site. 2. The Contractor must supply waste collection bins where such are not available and all solid waste collected must be disposed of at registered/licensed landfill. 3. A housekeeping team must be appointed to regularly maintain the litter and rubble situation on the construction site. 4. If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled. An independent contractor can be appointed to conduct this recycling. 5. Littering by the employees of the Contractor must not be permitted under any circumstances. The ECO must monitor the	Holder of the EA	All waste managed according to the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	neatness of the work sites as well as the Contractor campsite. 6. Skip waste containers must be maintained on site. These must be kept covered and arrangements made for them to be collected regularly. 7. All waste must be removed from the site and transported to a landfill site promptly to ensure that it does not attract vermin or produce odours. 8. Where a registered waste site is not available close to the construction site, the Contractor must provide a method statement with regard to waste management. 9. Certificates of disposal must be obtained by the Contractor and kept on file, if relevant. 10. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013. 11. Under no circumstances will solid waste be burnt on site. 12. All waste must be removed promptly to ensure that it does not attract vermin or produce odours. 13. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its personnel are made aware of the health risks associated with any hazardous			

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	substances used, have been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 14. No solid waste may be burned or buried on-site during the construction phase			
Waste Management: Hazardous Waste	15. All hazardous waste materials, if present, must be carefully stored as advised by the ECO, and then disposed of off-site at a licensed landfill site, where practical. 16. Contaminants to be stored safely to avoid spillage. 17. Machinery must be properly maintained to keep oil leaks in check 18. All necessary precaution measures must be taken to prevent soil or surface water pollution from hazardous materials used during construction and any spills must immediately be cleaned up and all affected areas rehabilitated	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous
Waste Management: Remedial Actions	19. Depending on the nature and extent of the spill, contaminated soil must be either excavated or treated on-site. 20. Excavation of contaminated soil must involve careful removal of soil using appropriate tools/machinery to storage containers until treated or disposed of at a licensed hazardous landfill site. 21. The ECO must determine the precise method of treatment for polluted soil. This could involve the application of soil absorbent materials as well as oil-digestive powders to the contaminated soil. 22. If a spill occurs on an impermeable surface such as cement or concrete, the surface spill	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	must be contained using oil absorbent material. 23. If necessary, oil absorbent sheets or pads must be attached to leaky machinery or infrastructure. 24. Materials used for the remediation of petrochemical spills must be used according to product specifications and guidance for use. 25. Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriate disposal.			
SPECIFIC MITIGATION MEASURES				
Contamination of soil and risk of damage to vegetation and/or fauna through spillage of concrete and cement.	26. If any concrete mixing takes placed on site, this must be carried out in a clearly marked, designated area at the site camp on an impermeable surface (such as on boards or plastic sheeting and/or within a bunded area with an impermeable surface). 27. Bagged cement must be stored in an appropriate facility and at least 10 m away from any water courses, gullies and drains. 28. A washout facility must be provided for washing of concrete associated equipment. Water used for washing must be restricted. 29. Hardened concrete from the washout facility or concrete mixer can either be reused or disposed of at an appropriate licensed disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	30. Empty cement bags must be secured with adequate binding material if these will be temporarily stored on site. Empty cement bags must be collected from the construction area at the end of every day or in line with prevailing legislation for management of waste. Sand and aggregates containing cement must be kept damp to prevent the generation of dust. 31. Any excess sand, stone and cement must be removed from site at the completion of the construction period and disposed at a licensed waste disposal facility. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.			
Contamination of soil and risk of damage to vegetation and/or fauna through spillage of fuels and oils.	32. Ensure that adequate containment structures are provided for the temporary storage of liquid dangerous goods and hazardous materials on site (such as chemicals, oil, fuel, hydraulic fluids, lubricating oils etc.). Appropriate bund areas must be provided for the storage of these materials at the site camp. Bund areas should contain an impervious surface in order to prevent spillages from entering the ground. Bund areas should have a capacity of 110 % of the volume of the largest tank in the bund (tanks include storage of fuel/diesel). 33. Monitor and inspect construction equipment and vehicles to ensure that no fuel spillage takes place. Ensure that drip trays are provided for construction equipment and vehicles as required.	Holder of the EA	A Spill Response Method Statement must be compiled by the Contractor, approved by the engineer and reviewed by the ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	34. Spilled fuel, oil or grease must be retrieved and contaminated soil removed, cleaned and replaced. 35. Contaminated soil to be collected by the Contractor and disposed of at a registered waste facility designated for this purpose. Proof of disposal (i.e. waste disposal slips or waybills) should be retained on file for auditing purposes.			

8.2.8 Flora and Fauna

This section deals with floral issues and actions that need to be implemented during construction

Table 23: Flora

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Flora: Existing Vegetation	1. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 2. Removal or disturbance of any TOPs, Red Data listed or Provincially protected species may only be done after obtaining permits from relevant authorities. 3. A CapeNature / DENC permit is required for animal and plant search-and-rescue. 4. Materials must not be delivered to the site prematurely if possible, which could result in additional areas being cleared or affected.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them Plant Rescue Plan Implemented (Annexure E) Rehabilitation Plan implemented (Annexure H)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Flora: Rehabilitation	5. All natural areas outside of the project footprint impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. Seeds from surrounding seed banks can be used for re-seeding. 6. Rehabilitation must take place in a phased approach as soon as possible. 7. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.	Holder of the EA	Plant Rescue Plan Implemented (Annexure E) Impacts avoided or managed as per specialist recommendations.	Continuous
Flora: Demarcation of construction and laydown areas	8. All plants outside of the construction footprint must be left undisturbed. Species of special concern must be clearly marked and recorded electronically. 9. The construction area must be well demarcated where this is viable and no construction activities must be allowed outside of this demarcated footprint 10. Vegetation removal must be phased in order to reduce impact of construction. 11. Strict and regular auditing of the construction process to ensure containment of the construction and laydown areas. 12. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.	Holder of the EA	Plant Rescue Plan Implemented (Annexure E) Impacts avoided or managed as per specialist recommendations.	Continuous
Flora: Utilisation of resources	13. Gathering of firewood, fruit, muti plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO.	Holder of the EA	Impacts avoided or managed as per specialist recommendations.	Continuous
Flora: Exotic Vegetation	14. Alien vegetation on the site will need to be controlled.	Holder of the EA	Alien Plant Management Plan (Annexure F)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	15. The contractor must be responsible for implementing a programme of weed and exotic species control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion.			
Fauna	1. No trapping or snaring of fauna on the construction site. 2. No faunal species are to be harmed by maintenance staff during any routine maintenance at the development. 3. No animals are to be kept as pets except those owned by the landowners. 16. Any trenches that are required for cabling etc., must not be left open for extended periods as fauna such as tortoises will fall in and become trapped. Any open trenches must be checked regularly for trapped fauna.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements	Continuous
SPECIFIC MITIGATION MEASURES				
Impacts due to establishment of alien invasive plants.	17. Ensure the appropriate removal of alien invasive vegetation from the proposed project area and prevent the establishment and spread of alien invasive plants due to the project activities.	Holder of the EA	Alien Plant Management Plan (Annexure F)	Continuous
Disturbance of refugia and general change in habitat	4. The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance created by the proposed project. 5. Where new roads need to be constructed, the existing road infrastructure should be rationalised and any unnecessary temporary roads decommissioned and rehabilitated to reduce the disturbance of the area and within	Holder of the EA	Plant Rescue Plan Implemented (Annexure E) Alien Plant Management Plan (Annexure F) Rehabilitation Plan implemented (Annexure H)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
	the river beds. the disturbance of the channels should be limited. 6. Wetland areas should be avoided and any road adjacent to a wetland feature should also remain outside of the 50 m buffer zone. 7. Incorporate minor drainage lines into design and avoid unnecessary disturbance, where applicable. 8. Appoint a specialist or suitable contractor to identify any plant species on site that may require "rescue" as well as any exotic weeds/vegetation that require removal. Appoint a specialist team flush game from the construction area. 9. Restrict night driving during construction phase. 10. Proper waste management procedures should be put in place. 11. Ensure electrical fences are built according to standards of Nature Conservation Authorities. 12. Appropriate lighting to be installed in construction camp to minimize effect on nocturnal animals.			

8.2.9 Avifauna and Bats

This section deals with avifaunal issues and actions that need to be implemented during construction

Table 24: Avifauna

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Avifauna	1. Ensure that key areas of conservation importance and sensitivity are avoided. 2. Implement appropriate working practices to protect sensitive habitats. 3. Provide adequate briefing for site personnel and, in particularly sensitive locations, employing an on-site ecologist during construction if necessary. 4. Implement an agreed post-development monitoring programme. 5. Where possible, install low voltage collector cables between the WEFs underground (subject to habitat sensitivities and in accordance with existing best practice guidelines for underground cable installation). 6. Time construction to avoid sensitive periods, where possible	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements Compliance with Construction Phase Monitoring Programme Plant Rescue Plan Implemented (Annexure E) Storm Water Management Plan implemented (Annexure I)	Continuous
Bats	1. Ensure that key areas of conservation importance and sensitivity are avoided. 2. Implement appropriate working practices to protect sensitive habitats. 3. Provide adequate briefing for site personnel and, in particularly sensitive locations, employing an on-site ecologist during construction. 4. Implement an agreed post-development monitoring programme. 7. Minimize the use of lights needed to operate the facility to the maximum extent practicable in order to prevent the local displacement of photophobic bat species, altering the species assemblages of the areas bat populations.	Holder of the EA	Impacts avoided or managed as per specialist recommendations. Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements	**Continuous**
SPECIFIC MITIGATION MEASURES				

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frame
Mortality of Red Data avifauna and bats due to disturbance during construction phase	5. Existing roads and farm tracks should be used where possible; 6. The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths; 7. Sensitive zones and no-go areas (e.g. nesting areas) are to be avoided 8. No off-road driving; 9. Facility Manager and the onsite Environmental Manager, and are to be trained to identify Red Data and priority bird species, as well as their nests 10. No construction activities with the potential to physically affect any bat roosts will be permitted without the express permission of a suitably qualified bat specialist following appropriate investigation and mitigation. 11. Internal 33 kV lines must be placed underground as far as possible, excluding sections where there may be geotechnical or other physical obstacles. 12. Fit bird flight diverters to overhead power lines and weather mast guyed wires to allow them to be more visible to bird species. The spacing of devices should be not more than 5-10 m apart. 13. Power lines should cross very high sensitive areas as little as possible, but should mainly aim to not be orientated perpendicularly to known bird flight paths. 14. Lowest tip of turbines blades should not be lower than 40 m.	Holder of EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020	Continuous

8.2.10 Air Quality

This table deals with mitigation measures to prevent air pollution

Table 25: Air Quality

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Air Quality: Dust Control	1. Wheel washing and damping down of un-surfaced and un-vegetated areas must be undertaken if required. 2. Retention of vegetation where possible will reduce dust travel. 3. Excavations and other clearing activities must only be done during agreed working times and permitting weather conditions to avoid drifting of sand and dust into neighbouring areas. 4. Damping down of all exposed soil surfaces with a water bowser or sprinklers when necessary to reduce dust. 5. In cases where severe water restrictions are imposed, other measures like the use of wetting agents such as chemical stabilisation or "hydromulch", must be considered. In situations where the use of water is necessitated, non-potable water sources are to be utilised. 6. The Contractor must be responsible for dust control on site to ensure no nuisance is caused to the neighbouring communities. 7. A speed limit of 40km/h for cars and 30km/h for trucks must not be exceeded on site. 8. Any complaints or claims emanating from the lack of dust control must be attended to immediately by the Contractor.	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements	Continuous

	9. Any dirt roads that are utilised by the workers must be regularly maintained to ensure that dust levels are controlled.			
Air Quality: Odour control	10. Regular servicing of vehicles in order to limit gaseous emissions. 11. Regular servicing of on-site toilets to avoid potential odours.	Holder of the EA	Vehicles repaired as per the approved Method Statement for vehicles management compiled by the contractor and approved by the engineer and reviewed by ECO Records of servicing of toilets being kept	

8.2.11 Soils and Geology

General guidelines for management of soils are provided in **Annexure D**.

This section deals with soils and geology issues and actions that need to be implemented during construction.

Table 26: Soils and Geology

Impact	**Impact Management Actions**	**Responsibility**	**Impact Management Outcome**	**Time frames**
Soils and Geology: Topsoil	1. The contractor must, prior to the commencement of earthworks determine the average depth of topsoil (if any) and agree on this with the ECO. The full depth of topsoil must be stripped from areas affected by construction and related activities prior to the commencement of foundations. This must include the building footprints, working areas and storage areas. Topsoil must be reused where possible to rehabilitate disturbed surface areas. 2. Care must be taken not to mix topsoil and subsoil during stripping.	Holder of the EA	Erosion and Storm Water Plan (Appendix I) implemented All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO All waste managed according to approved the Method	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	3. Should any topsoil become polluted the contractor must remove the polluted soil to the full depth of pollution and replace it at his own expense with clean topsoil. 4. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over bare soil. All vehicle maintenance or refuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site. 5. Removed polluted topsoil must be transported to a licensed landfill site. 6. The topsoil must be conserved on site in and around the pit area		Statement compiled by the contractor and approved by the engineer and reviewed by ECO Ensure the EMPr is adhered to.	
Soils and Geology: Soil Stripping	7. No soil stripping must take place on areas within the site that the contractor does not require for construction works or areas of retained vegetation. 8. Construction vehicles must only be allowed to utilize existing tracks or pre-planned access routes.	Holder of the EA	Ensure the EMPr is adhered to. Erosion and Storm Water Plan (Annexure I) implemented	
Soils and Geology: Soil Stockpiles	9. Stockpiles must not be situated such that they obstruct natural water pathways. 10. Stockpiles must not exceed 2m in height unless otherwise permitted by the Engineer. 11. If stockpiles are exposed to windy conditions or heavy rain, they must be covered either by vegetation or geofabric, depending on the duration of the project. Stockpiles must further be protected by the construction of berms or low brick walls around their bases. 12. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.	Holder of the EA	Erosion and Storm Water Plan (Annexure I) implemented	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	13. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occurs must be attained and given to the project manager.			

8.2.12 Noise and Vibrations

This section deals with noise issues and actions that need to be implemented during construction.

Table 27: Noise and vibrations

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Noise and Vibrations	1. The construction phase must aim to adhere to the relevant noise regulations and limit noise to within standard working hours in order to reduce disturbance of dwellings in close proximity to the development. 2. The construction crew must abide by the local by-laws (if applicable) regarding noise. 3. Ensure that noise as a component is included in the induction of employees and contractors, and how their activities and actions can impact on residents in the area (reverse alarms and reversing close to dwellings, driving fast past residential dwellings at night, maintenance of equipment). All contractors and employees must receive this induction.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO Ensure the EMPr is adhered to.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	4. Construction site yards, workshops, concrete batching plants, and other noisy fixed facilities must be located well away from noise sensitive areas. Once the proposed final layouts are made available by the contractor(s), the sites must be evaluated in detail and specific measures designed into the system. 5. Truck traffic must be routed away from noise sensitive areas, where possible. 6. Noisy operations must be combined so that they occur where possible at the same time. 7. Construction workers to wear necessary ear protection gear. 8. Noise from labourers must be controlled. 9. The contractor must take measures to discourage labourers from loitering in the area and causing noise disturbance. Where possible labour must be transported to and from the site by the contractor or his Sub-Contractors by the contractors own transport. 10. Implementation of enclosure and cladding of processing plants. 11. When working in very close proximity to potentially sensitive receptors, coordinate the working time with periods when the receptors are not at home where possible. An example would be to work within the 08:00 to 17:00 time-slot to minimize the significance of the impact because: 12. Where possible construction work must be undertaken during normal working hours (07H00 – 17H00), from Monday to Saturday; If agreements can be reached (in writing) with all the surrounding (within a 500m distance)			

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	potentially sensitive receptors, these working hours can be extended. 13. The Holder of the EA must investigate any reasonable and valid noise complaint if registered by a receptor staying within 2,000m from location where construction activities are taking place. 14. When any noise complaints are received, noise monitoring must be conducted at the complainant, followed by feedback regarding noise levels measured. 15. Reduce the noise impact during the construction phase by: ▪ Using the smallest/quietest equipment for the particular purpose. Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures.			

8.2.13 Visual Impact

This section deals with visual issues and actions that need to be implemented during construction

Table 28: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Visual Impact: General	1. Construction activities must not occur at night and lighting must only be erected where absolutely necessary. 2. Construction traffic must stick to designated routes or access roads. 3. Construction areas are to be kept clean and tidy.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	4. Measures must be taken to suppress dust arising from construction activities. 5. Labour being transported to the site must take cognisance of litter and waste concerns. 6. Equipment being transported to the site must be covered with tarps. 7. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months. 8. It is recommended that equipment be stored discreetly so as not to increase visual impacts. 9. Construction must be conducted in the shortest possible time in order to reduce visual impacts.		Alien Plant Management Plan (Annexure F) Rehabilitation Plan implemented (Annexure H)	
SPECIFIC MITIGATION MEASURES				
Visual impact	10. No turbines should be placed within 500 m of the dwellings or farmsteads which are situated within the proposed application site 11. Where possible, fewer but larger turbines with a greater output should be utilised rather than a larger number of smaller turbines with a lower capacity. 12. Turbine colours should adhere to Civil Aviation Authority (CAA) requirements. 13. If possible, the operation and maintenance buildings should be painted with natural tones that fit with the surrounding environment. In addition, non-reflective surfaces should be utilised where possible. 14. Select the alternatives that will have the least impact on visual receptor locations.	Holder of the EA	Adhere to Civil Aviation Authority (CAA) requirements.	Continuous

8.2.14 Heritage, Archaeological, Palaeontological and Cultural Landscape

This section deals with the impact that the new development has on potential archaeological artefacts on the site

Table 29: Heritage

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Heritage	1. The contractor must ensure that his workforce is aware of the necessity of reporting any possible historical or archaeological finds to the ECO so that appropriate action can be taken. 2. Any discovered artefacts must not be removed under any circumstances. Any destruction of a site can only be allowed once a permit is obtained and the site has been mapped and noted. Permits must be obtained from Heritage Western Cape (HWC)/ Heritage Northern Cape should the proposed site affect any world heritage sites or if any heritage sites are to be destroyed or altered. 3. Should any archaeological sites / graves be uncovered during construction, their existence must be reported to the Holder of the EA and Contractor immediately. 4. If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in	Holder of the EA	Chance Find Procedure Implemented (Annexure K) A Heritage Management Plan Implemented (Annexure K)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	terms of section 51(1)e of the NHRA and item 5 of the Schedule. 5. If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. 6. If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.			

8.2.15 Social Environment

This section deals with social environment and actions that need to be implemented during construction

Table 30: Social Environment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Social Environment	1. All contact with the affected parties must be courteous at all times. The rights of the affected parties must be respected at all times. 2. A complaints register must be kept on site. Details of complaints must be incorporated into the audits as part of the monitoring process. This must be in carbon copy format, with numbered pages. Any missing pages must be accounted for by the Contractor. 3. Damage to infrastructure must not be tolerated and any damage must be rectified immediately by the Contractor. A record of all damage and remedial actions must be kept on site. 4. Care must be taken not to damage irrigation equipment, lines, channels and crops.	Holder of the EA	Clear communication channels maintained Compliance to all legislative requirements. Ensure the EMPr is adhered to.	Continuous
SPECIFIC MITIGATION MEASURES				
Employment creation for construction, operation and decommissioning activities.	5. Advise on the set-up of a skills desk and where it will be situated. Provide awareness of skills desk for local communities. 6. Set up a complaints register/grievance mechanism to allow any potentially negatively affected party to raise its	Holder of the EA	HIV/AIDS awareness	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	concerns, which are then assessed and resolved.			

8.2.16 Construction Traffic and Access

This section deals with construction traffic and access and actions that need to be implemented during construction

Table 31: Construction Traffic and Access

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Traffic and Access: Construction traffic	1. Construction routes and required access roads must be clearly defined. 2. A route study is to be undertaken as part of the final traffic transportation plan to confirm the most appropriate route to site. 3. Recommendations of the Stormwater Management Plan[11] must be implemented. 4. All equipment moved onto site or off site during a project is subject to the legal requirements. 5. The Contractor must ensure that all the necessary precautions against damage to the environment and injury to persons are taken in the event of an accident. 6. Stagger component delivery to site. 7. Reduce the construction period. 8. The use of mobile batch plants and quarries in close proximity to the site	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I) Ensure the EMPr is adhered to.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	9. Staff and general trips should occur outside of peak traffic periods. 10. Regular maintenance of gravel roads by the Contractor during the construction phase and by Client/Facility Manager during operation phase. 11. Access of all construction and material delivery vehicles must be strictly controlled, especially during wet weather to avoid compaction and damage to the topsoil structure. 12. Damping down of the un-surfaced roads must be implemented to reduce dust and nuisance. 13. In cases where severe water restrictions are imposed, other measures like the use of wetting agents such as chemical stabilisation or "hydromulch", must be considered. 14. In situations where the use of water is necessitated, non-potable water sources are to be utilised.			
Construction Traffic and Access: Access	15. The main routes on the site must be clearly signposted and printed delivery maps must be issued to all suppliers and Sub-Contractors.	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9)	
Construction Traffic and Access: Road Maintenance	16. Where necessary suitable measures must be taken to rehabilitate damaged areas. Contractors must ensure that access roads are maintained in good condition by attending to potholes, corrugations and storm water damages as soon as these develop. If necessary, staff must be employed to clean surfaced roads adjacent to construction sites where materials have spilt.	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9)	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Construction Traffic and Access: General	17. The contractor must meet safety requirements under all circumstances. All equipment transported must be clearly labelled as to their potential hazards according to specifications. All the required safety labelling on the containers and trucks used must be in place. 18. Care for the safety and security of community members crossing access roads must receive priority at all times. 19. Ensure that roadworthy and safety standards are implemented at all times for all construction vehicles. 20. Trips must be planned to avoid peak hours as far as possible (i.e. 06:00 - 08:00 and 16:00 – 17:00) 21. Management strategies for dust suppression to be implemented and dust generating activities to be suspended during periods of strong winds. 22. Road kill monitoring programme must be established and fences erected where necessary to direct animals to safe road crossings on access roads. 23. Limit the number of vehicles and trucks travelling to and from the construction site, where possible. 24. Unless there are water shortages, ensure that dust suppression techniques are implemented • on all access roads; • in all areas where vegetation clearing has taken place; • on all soil stockpiles.	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9) Adhere to Health and Safety Regulations	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
SPECIFIC MITIGATION MEASURES				
Dust and noise pollution caused by transportation of material, components, equipment and staff to site.	25. Stagger turbine component delivery to site 26. The use of mobile batch plants and quarries in close proximity to the site would decrease the impact on the surrounding road network 27. Dust suppression. 28. Maintenance of gravel roads. 29. Apply for abnormal load permits prior to commencement of construction. 30. Assess the preferred route and undertake a 'dry run' to test. 31. All low hanging overhead lines to be moved. 32. Road design engineer to be consulted regarding design of internal roads.	Holder of the EA	Ensure the EMPr is adhered to. All staff members are aware of the EMPr requirements relevant to them Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous

8.2.17 Energy Use

This section deals with energy use and actions that need to be implemented during construction

Table 32: Energy Use

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Energy Use:	1. Energy saving lighting must be implemented across the board. 2. Minimal lighting, while maintaining health and safety regulations, must be kept on during the night operations.	Holder of the EA	Adhere to Health and Safety Regulations Noise and lighting managed as per the approved Method Statement for noise and lighting management	Continuous

	3. Equipment not in use must be switched off and unplugged to save on unnecessary energy costs and carbon footprint.		compiled by the contractor and approved by the engineer and reviewed by ECO	

8.2.18 Employment

This section deals with employment issues and actions that need to be implemented during construction

Table 33: Employment

Impact	**Impact Management Actions**	**Responsibility**	**Impact Management Outcome**	**Time Frames**
Employment: Labour	1. The use of labour intensive construction measures must be used where appropriate. 2. Training of labour to benefit individuals.	Holder of the EA	Fair employment practises in place	Continuous
Employment: Recruitment Plan	3. The majority of unskilled labourers must be drawn from the local market and where possible use must be made of local semiskilled and skilled personnel. 4. Local suppliers to be used where possible. 5. The Project Manager must ensure that all staff working on the proposed project are in possession of a South African Identity Document or a relevant work permit. 6. Ensure adequate advertising in the project community areas, local papers for labour. Adverts are to be placed in each area where the public meetings were conducted namely, Sutherland. 7. Local community key stakeholders must be utilised to source labour where possible. 8. The recruitment process must be equitable and transparent. A concerted effort will be	Holder of the EA	Maintain a "locals first" recruitment policy as far as possible, reduced social impact from development HIV/AIDS awareness	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	made to guard against nepotism and/or any form of favouritism during the process 9. A record of official complaints by employees is to be maintained 10. Where possible, subcontract to local construction companies 11. Consultation with local authorities is essential so as to manage job creation expectations and ensure that all eligible workers in the primary study area are informed of the opportunities. 12. To ensure that skills are adequately acquired, additional training programmes need to be held during the construction phase to prepare the identified community members to be employed at the next phase, i.e. operational. 13. Initiating the education campaign among the local community (in partnership with the community members already active in the area) focusing on alcohol abuse, drug abuse, HIV/AIDS, STDs, etc. prior to the start of construction and maintaining this campaign throughout the project's duration.			

8.2.19 Occupational Health and Safety

This section deals with health and safety and actions that need to be implemented during construction

Table 34: Occupational Health and Safety

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Occupational Health Safety: Worker Safety	1. Implementation of safety measures, work procedures and first aid must be implemented on site. This must include the provision of first aid facilities, and the training of a number of employees to carry out first aid procedures. 2. Workers must be thoroughly trained in using potentially dangerous equipment. 3. Contractors must ensure that all equipment is maintained in a safe operating condition. 4. A safety officer must be appointed. 5. A record of health and safety incidents must be kept on site. 6. Any health and safety incidents must be reported to the Project Manager immediately. 7. Workers have the right to refuse work in unsafe conditions. 8. A record must be kept of drugs administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court must any claims be instituted against the Holder of the EA or the Contractor. 9. Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	Holder of the EA	Adhere to Health and safety Regulations Ensure the EMPr is adhered to.	Continuous
Occupational Health Safety: Electrical Safety and Isolation	10. All sources of hazardous energy or hazardous substances must have written procedures for isolation, identifying how the system, plant or equipment can be made and kept safe.	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety:	11. Geotechnical safety - All structures must be planned, designed and operated such that	Holder of the EA	Adhere to Health and Safety Regulations	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Physical Hazards	the geotechnical risks are appropriately managed.			
Occupational Health Safety: Machine and Equipment	12. Use must be made of reflective markings on structures, traffic junctions, and other areas with a potential for accidents. 13. Safety barriers must be installed in high risk locations.	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety: Fitness for work	14. Shift management systems must minimize risk of fatigue. Establish alcohol and other drug policy for the operation.	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety: Travel and remote site health	15. Develop programs to prevent both chronic and acute illnesses through appropriate sanitation and vector control systems.	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety: Protective Gear	16. Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn where necessary i.e. dust masks, ear plugs etc. 17. No person is to enter the site without the necessary PPE.	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety: Construction equipment safety	18. All equipment used for construction must be in good working order with up to date maintenance records	Holder of the EA	Adhere to Health and Safety Regulations	Continuous
Occupational Health Safety:	19. A spill kit needs to be kept on site to address any unforeseen spillages.	Holder of the EA	All waste managed according to approved the Method Statement compiled	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Procedure in the event of a petrochemical spill	20. The individual responsible for or who discovers the petrochemical spill must report the incident to the Project Manager, Contractor or ECO. 21. The problem must be assessed and the necessary actions required will be undertaken. 22. The immediate response must be to contain the spill. 23. The source of the spill must be identified, controlled, treated or removed wherever possible.		by the contractor and approved by the engineer and reviewed by ECO	
Occupational Health Safety: Safety of surrounding residents	24. Landowners within 1km must be notified in advance of any known potential risks associated with the construction site and the activities on it. Examples of these are: • Blasting • Earthworks / earthmoving machinery on steep slopes above houses / infrastructure • Risk to residence along haulage roads / access routes.	Holder of the EA	Clear communication channels	Continuous
Occupational Health Safety: Emergency evacuation plan	25. Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency.	Holder of the EA	Adhere to Emergency Evacuation Plan	Continuous
Occupational Health Safety: Maintenance	26. The WEF facility and surrounding areas are to be regularly maintained.	Holder of the EA	A maintenance schedule must be drawn up and records of all maintenance kept.	Continuous

8.2.20 Security

This section deals with security and actions that need to be implemented during construction.

Table 35: Security

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Security	1. A security company must be employed to guard the construction site and monitor access. 2. Site access must be controlled via a boom and gatehouse, with security staff stationed at access booms during construction. 3. Labour must be transported to and from the site to discourage loitering in adjacent areas and a possible increase in crime or disturbance. 4. Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site must be prohibited. Disciplinary or criminal action must be taken against any persons found to be engaged in such activities. 5. Only pre-approved staff must be permitted to stay in the staff accommodation where staff accommodation is provided. 6. The construction camp site must be fenced, where necessary to prevent any loss or injury to persons during the construction phase. 7. No alcohol / drugs to be present on site.	Holder of the EA	All staff members are aware of the EMPr requirements relevant to them Ensure the EMPr is adhered to.	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
	8. No firearms allowed on site or in vehicles transporting staff to / from site (unless used by security personnel or landowners). 9. Construction staff is to make use of the facilities provided for them, as opposed to ad-hoc alternatives (e.g. fires for cooking, the use of surrounding bush as a toilet facility are forbidden). 10. Trespassing on private / commercial properties adjoining the site is forbidden.			

8.3 Operation Phase

- Makes sure that operation activities are properly managed in respect of environmental aspects and impacts.
- Permits WEF Facility operation activities to be undertaken without significant disruption to other land uses in the area, in particular with regard to farming practices, traffic and road use, and effects on local residents.
- Minimises impacts on fauna.
- Conduct annual basis reviews of the EMPr to evaluate its effectiveness.
- Take appropriate action as a result of findings and recommendations in management reviews and audits.
- Develop and implement an Environmental Management System (EMS) for the WEF Facility and associated infrastructure.
- Manage and report on the WEF Facility's environmental performance.
- Maintain a register of all known environmental impacts and manage the monitoring thereof.
- Conduct internal environmental audits and co-ordinate external environmental audits.
- Liaise with statutory bodies such as the National and Provincial departments of Environment, Forestry and Fisheries (DEFF and DENC) on environmental performance and other issues.
- Conduct environmental training and awareness for the employees who operate and maintain the WEF Facility.
- Compile environmental policies and procedures.
- Liaise with interested and affected parties on environmental issues of common concern.
- Track and control the lodging of any complaints regarding environmental matters.
- The EMPr specifies mitigation measures for the following environmental aspects:
    - Construction Site Decommissioning
    - Rehabilitation and Maintenance
    - Operation and Maintenance
    - Biodiversity
    - Avifauna

- Bats
- Air Quality
- Aquatic Ecology
- Agriculture
- Visual Impact
- Heritage
- Social Environment
- Health and Safety
- Glint and Glare

8.3.1 Rehabilitation and Maintenance and Biodiversity

This section deals with the issues relating to rehabilitation after construction as well and therefore must be applied during rehabilitation.

Table 36: Rehabilitation and maintenance and Biodiversity

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time frames
Rehabilitation: Rehabilitation	1. A mixture of vegetation seed can be used provided the mixture is carefully selected to ensure the following: • Annual and perennial species are chosen. • Pioneer species are included. • All the species must not be edible. • Species chosen will grow in the area under natural conditions. • Root systems must have a binding effect on the soil. • The final product must not cause an ecological imbalance in the area. 2. All-natural areas impacted during construction must be rehabilitated with locally indigenous species that were present on the site prior to construction.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them Plant Rescue Plan Implemented (Annexure E) Alien Plant Management Plan (Annexure F) Rehabilitation Plan implemented (Annexure H)	Continuous

	3. Rehabilitation must take place in a phased approach as soon as possible. 4. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas.		Impacts avoided or managed as per specialist recommendations.	
Rehabilitation: Maintenance	5. The site need to be monitored every three (3) months for the first year to identify the emergence of alien species and any erosion concerns.	Holder of the EA	Alien Plant Management Plan (Annexure F) (Section 9)	Continuous
Biodiversity: Flora	6. Indigenous vegetation must be maintained and all exotics removed as they appear and disposed of appropriately. 7. Vegetative re-establishment must, as far as possible, make use of indigenous or locally occurring plant varieties within the servitude. 8. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas during and following rehabilitation. 9. Regular monitoring for alien plants within the development footprint as well as adjacent areas which receive runoff from the new development as there are also likely to be prone to invasion problems. 10. Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible.	Holder of the EA	Plant Rescue Plan Implemented (Annexure E) Alien Plant Management Plan (Annexure F) Rehabilitation Plan implemented (Annexure H)	Continuous
Biodiversity: Fauna	11. No faunal species must be harmed by maintenance staff during any routine maintenance. 12. Management of the site must take place within the context of an Open Space Management Plan. 13. The collection, hunting or harvesting of any plants or animals at the site must be strictly forbidden by anyone except landowners or other individuals with the appropriate permits and permissions where required.	Holder of the EA	Ensure the EMPr is adhered to. Ensure the conditions of the EA are adhered to. All staff members are aware of the EMPr requirements relevant to them	Continuous

	14. If any parts of the site need to be lit at night for security purposes, this must be done with downward-directed low-UV type lights (such as most LEDs) as far as possible, which do not attract insects. 15. All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill. 16. All vehicles accessing the substation sites and servitude must adhere to a low speed limit (30-40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 17. If parts of the facility are to be fenced, no electrified strands must be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution as they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands must be placed on the inside of the fence and not the outside. 18. Erosion management[12] at the site must take place according to the Erosion Management Plan and Rehabilitation Plan. 19. All roads and other hardened surfaces must have runoff control features which redirect water flow and dissipate any energy in the water which will pose an erosion risk. 20. All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and re-vegetation techniques. Any roads that		Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO A traffic management Strategy developed and Implemented throughout the construction and operation phases. Erosion and Storm Water Management Plan (Annexure I) implemented Vegetation Rehabilitation Plan Implemented (Annexure H)	

	will not be rehabilitated must have runoff control features which redirect water flow and dissipate any energy in the water which will pose an erosion risk. 21. All cleared areas must be re-vegetated with indigenous perennial shrubs and grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow. 22. There must be an integrated management plan for the development area during operation, which is beneficial to fauna and flora.			

8.3.2 Operation and Maintenance

This section deals with the potential impacts that could result from the operation and maintenance of the line and substation.

Table 37: Operation and maintenance

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Operation and Maintenance: Maintenance	1. All applicable standards, legislation, policies and procedures must be adhered to during operation. 2. Regular ground inspection of the energy facilities must take place to monitor their status	Holder of the EA	Ensure the conditions of the EA are adhered to. Compliance to all legislative requirements	Continuous
Rehabilitation: Public awareness	3. The emergency preparedness plan must be ready for implementation at all times should an emergency situation arise.	Holder of the EA	Adhere to Emergency Evacuation Plan	Continuous

8.3.3 Avifauna and Bats

This section deals with avifaunal and bat issues and actions that need to be implemented during operation

Table 38: Avifauna and Bats

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Avifauna	1. Reduce noise levels as far as possible. 2. Driving should, at all times, remain on existing roads. 3. Speed limits should be implemented for driving, and should not exceed 40km/h.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO A traffic management Strategy developed and Implemented throughout the construction and operation phases.	Continuous
Bats: **Operation and Maintenance:** Maintenance	4. Minimise on-site disturbances. 5. Minimize the use of lights needed to operate the facility to the maximum extent practicable in order to prevent the local displacement of photophobic bat species, altering the species assemblages of the areas bat populations.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO A traffic management Strategy developed and Implemented throughout the construction and operation phases.	Continuous
Bats: **Nocturnal Foraging**	6. Only use outside security lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. Ensure all lights are down hooded, and where possible and practical	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	utilise lights with colour temperatures that attracts less insects.		engineer and reviewed by ECO A traffic management Strategy developed and Implemented throughout the construction and operation phases.	
SPECIFIC MITIGATION MEASURES				
Birds: Fatalities due to collision.	7. Implement an operational phase avifaunal monitoring programme, in full compliance with the relevant Best Practice Guidelines, considering the following aspects: 8. During the first two years of the projects' operational phase: o Monitoring campaign mirroring as a minimum, that conducted by Bioinsight during the pre-construction phase. o Carcass searches, searcher efficiency trials and scavenger removal trials. 9. In the fifth year of the operational phase, and every five years thereafter (for the entire lifespan of the project): o Carcass searches, searcher efficiency trials and scavenger removal trials. o Necessity for a monitoring campaign (or parts thereof) to be reviewed after completion of the second operational monitoring year, and then again after the fifth	Holder of the EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	year, and every five years thereafter. 10. If post-construction monitoring reveals significant unexpected impacts on birds that requires additional mitigation measures to be implemented then these mitigation measures will be determined and agreed upon between the holder of the EA, the DEA and Birdlife. 11. Further operational mitigation measures to be researched during the operational monitoring campaign.			
Birds: Disturbance effects.	12. Minimise general on-site disturbances. 13. No off-road driving. 14. Implement speed limits.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous
Birds: Displacement effects	15. Minimise on-site disturbances.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous
Birds:	16. Implement an operational monitoring programme with carcass searches, searcher efficiency trials and scavenger removal	Holder of the EA	Management Plan informed by the Pre-construction	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Bird Population Decline.	trials, to gain a better understanding of real impacts occurring on the avifaunal community. 17. Further operational mitigation measures to be researched and implemented (as required) during the operational monitoring campaign. 18. Avoid turbine placement in very high sensitive areas. 19. Bird habitats should not be severely destroyed, particularly in sensitive areas.		walk-through undertaken in October 2020	
Bats: Fatality events.	20. If turbines are to be lit at night, lighting should be kept to a minimum; 21. Lighting of wind energy facility (for example security lights) should be kept to a minimum and should be directed downwards (with the exception of aviation security lighting); 22. Appoint a bat specialist to develop and a post-construction monitoring programme (operation phase) to survey bat communities on the wind energy facility and the impacts resulting from the installed infrastructure, according to the Best Practice Guidelines available at that time; 23. The results of the operational phase monitoring programme must be taken into account for the implementation of further mitigation measures, if necessary.	Holder of the EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020 Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous
Bats: Population Decline.	24. Appoint a bat specialist to develop and implement an operational monitoring programme with carcass searches, searcher efficiency trials and scavenger removal trials, to gain a better understanding of real impacts occurring on the bat community. 25. Further operational mitigation measures to be researched during the operational	Holder of the EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	monitoring campaign and implemented, if needed.			

8.3.4 Air Quality

This section deals with the issues relating to air pollution during operation

Table 39: Air Pollution

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Air Quality: Dust Management	1. Any dirt roads utilised to access the sites must be regularly maintained and dust mitigation measures to be enforced to ensure that dust levels are controlled.	Holder of the EA	Dust mitigation measures enforced	Continuous
Air Quality: Litter management	2. Remove unwanted materials and litter on a regular basis to avoid potential odours.		All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

8.3.5 Noise and Vibrations

This section deals with noise issues and actions that need to be implemented during Operation.

Table 40: Noise and vibrations

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Reduce operational noise	1. Ambient noise monitoring to be conducted at NSA 1 when operations commence to verify the noise emissions meet the noise rating limit. 2. The Generator exhaust systems should be fitted with a suitable noise silencer.	Holder of the EA	As per the requirements of SANS 10103 Ensure the EMPr is adhered to.	Continuous

8.3.6 Aquatic Ecology

This section deals with the issues relating to surface water during operation

Table 41: Aquatic Ecology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Potential impact on freshwater ecology as a result of the proposed Oya WEF and associated infrastructure.	1. Ongoing control of invasive alien plants within the site should be undertaken according to an approved plan. The plan should make use of alien clearing methods as provided by the Working for Water Programme. Monitoring and control measures should take place at least biannually for the first 3 years of the project. 2. Invasive alien plant material that has been cleared should be removed from the riparian zones and not left on the river banks or burnt within the riparian zone and buffer area. 3. Ongoing monitoring of the structures, in particular prior to the rainfall period, should	Holder of the EA	Alien Plant Management Plan (Annexure F) Ensure compliance with the WULA/GA	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	be undertaken to ensure that the integrity of the structures is intact and that they are not block with sediment or debris. Ongoing monitoring post large rainfall events should also be undertaken to identify and address any erosion occurring within the watercourses.			
SPECIFIC MITIGATION MEASURES				
Infrastructure within 100m of watercourse	4. No indiscriminate movement of construction equipment through the watercourses may be permitted during standard operational activities or maintenance activities. Use must be made of the existing watercourse crossings only; 5. Unnecessary disturbances surrounding the perimeter of the surface infrastructure must be avoided; 6. Vehicles used in the development site must be regularly washed (on a non-permeable surface or off-site) to avoid the dispersal of seeds on any alien or invasive species into the watercourses; 7. Ensure that routine inspections and monitoring of any instream infrastructure are undertaken to monitor any build-up of debris that will impact on structure integrity or lead to erosion and sedimentation. Furthermore, monitoring to determine the establishment of indigenous vegetation and the presence of any alien or invasive plant species; 8. The surface infrastructure areas must be inspected to ensure that no concentrated runoff from these areas form erosion gullies leading to erosion and sedimentation of receiving watercourses. Should these	Holder of the EA	Ensure compliance with the WULA/GA Storm Water and Erosion Management Plan implemented (Annexure I)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	impacts be noted, these gullies/preferential flow paths must be infilled with in situ material and appropriately stabilised and/or revegetated; and 9. Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically at the road crossings and surface infrastructures. Should alien and invasive plant species be identified, they must be removed and disposed of as per an alien and invasive species control plan and the area must be revegetated with suitable indigenous vegetation.			
Maintenance of roads traversing watercourses	10. Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings/instream infrastructure. Such maintenance activities must specifically be undertaken after high rainfall events; 11. Stormwater runoff from the road crossings should be monitored (by the Operation and Maintenance (O&M) Manager), to ensure it does not result in erosion of the watercourses. Stormwater should be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the watercourse (through vegetation and rocky areas); 12. Maintenance vehicles must make use of dedicated access roads and no indiscriminate movement in the watercourses may be permitted;	Holder of the EA	Ensure compliance with the WULA/GA Storm Water and Erosion Management Plan implemented (Annexure I) Vehicles repaired as per the approved Method Statement for vehicles management compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	13. During periodic maintenance activities of the roads/surface infrastructure, monitoring for erosion should be undertaken; and 14. Should erosion be observed, caused by the road crossings/instream infrastructure, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation. Use can also be made of rocks collected from the surrounding area to infill any area prone to erosion, as a natural dispersal mechanism.			

8.3.7 Agriculture

This section deals with issues relating to agricultural potential and resources and actions that need to be implemented during operation

Table 42: Agriculture

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Agriculture: Erosion	1. Maintain, where possible, all vegetation cover, and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion. 2. Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control	Holder of the EA	Plant Rescue Plan Implemented (Annexure E) Storm Water and Erosion Management Plan implemented (Annexure I)	Continuous

	system in the event of any erosion occurring.			

8.3.8 *Visual Impact*

This section deals with issues relating to visual receptors and actions that need to be implemented during operation

Table 43: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Visual Impact: Maintenance and lighting	1. The site must be kept clean, tidy and well maintained to reduce negative visual impacts. 2. Rehabilitation of surrounding areas must take place with indigenous species that were present on the site prior to construction. 3. Regular maintenance of the associated infrastructure must be undertaken.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Plant Rescue Plan Implemented (Annexure E)	Continuous
SPECIFIC MITIGATION MEASURES				
Potential visual intrusion of the proposed WEF (turbines) on the	4. Turbines should be repaired promptly, as they are considered more visually appealing when the blades are rotating (or at work) (Vissering, 2011).	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
views of sensitive visual receptors (skyline and open landscape).receptors (skyline and open landscape).	5. If required, turbines should be replaced with the same model, or one of equal height and scale. Repeating elements of the same height, scale and form can result in unity and lessen the visual impact that would typically be experienced in a chaotic landscape made up of diverse colours, textures and patterns (Vissering, 2011). 6. Light fittings for security at night should reflect the light toward the ground and prevent light spill. 7. Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads where practically possible, the operations and maintenance buildings should not be illuminated at night.		lighting management compiled by the contractor and approved by the engineer and reviewed by ECO.	
Potential impact of night lighting of the proposed WEF on the nightscape of the region.	8. Light fittings for security at night should reflect the light toward the ground and prevent light spill. 9. Use non-reflective lights on turbines.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO.	Continuous

8.3.9 Heritage, Archaeological, Palaeontological and Cultural Landscape

This section deals with the impact that the new development has on potential archaeological artefacts on the site

Table 44: Heritage

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Heritage, archaeology and cultural: homesteads, structures and burial grounds	1. Operational crew must be informed of the significance and vulnerability of the resources and maintain a 10m distance at all times. Operations manager must manage the heritage resources and ensure compliance of buffers and distance.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: Stone Age and Rock Art sites	2. Operational crew must be informed of the significance and vulnerability of the resources and maintain a 10m distance at all times. Operations manager must manage the heritage resources and ensure compliance of buffers and distance. 3. If any subsurface construction needs to be done in the vicinity of the heritage resources, a suitably qualified archaeologist should be on site to monitor.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: Land use patterns and associated material features	4. Operational crew must be informed of the significance and vulnerability of the resources and maintain a 10m distance at all times. The holder of the EA must manage the heritage resources and ensure compliance of buffers and distance. The patterns of current land use are to be left in place as far possible including current fence layouts and wind pumps should have a 50m buffer from any new development. Existing roads to be used as far possible without extreme widening and new farm tracks must be minimised. The impact on the land use patterns is neutral if done within the development threshold and will be read as a new, potentially positive, layer of land use.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Heritage, archaeology and cultural: Historic roads	5. Existing historic roads must be maintained as close to current state as possible. Operational traffic must be reduced in amount and weight as far as is possible to accommodate the width and strength of the roads as they currently exist. Strengthening of any stone retaining walls must be done without reducing the aesthetic and authenticity of the stone structure. Existing roads must be used as far possible and minimally altered. 50m buffer from the Historic Trunk Road for any new buildings (road widening and upgrade is acceptable).	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: Watercourses and confluences	6. Watercourses must have a buffer of 100m for any development or activity on either side.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: Intersections of watercourses and roads	7. Existing watercourse and road intersections must be maintained as close to current state as possible. Existing patterns must be maintained and current points of crossing to be used for new development. Operational traffic must be reduced in amount and weight as far as is possible to accommodate the width and strength of the roads as they currently exist. Strengthening of any crossings must be done without reducing the aesthetic and authenticity of the current site. Intersections of watercourses with main historic route must be maintained as is.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Heritage, archaeology and cultural: Transhuman land use patterns and characteristics - Living heritage	8. New geographical names must be appropriate and reflect aspects of the landscape and the new layer of land use. With sensitive operational activity that stays within the threshold and adheres to mitigation measures, the land use and living heritage of the landscape can be improved by introducing new interactions with people.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: Unidentified heritage structures, beyond the already surveyed portions of the property.	9. The nature of heritage resources are such that they are non-renewable. The proper mitigation and documentation of these resources can however preserve the data for research. 10. Any heritage features of significance identified during the operational phase will require formal mitigation or where possible accommodate such resources.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous
Heritage, archaeology and cultural: General	11. <u>If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule.</u> 12. <u>If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi</u>			

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offense in terms of section 51(1)e of the NHRA and item 5 of the Schedule. 13. If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.			

8.3.10 Social Environment

This section deals with social environment and actions that need to be implemented during operation

Table 45: Social Environment

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Social Environment	1. All contact with the affected parties must be courteous at all times. The rights of the affected parties must be respected at all times. 2. Ensure that the expectations (rules) of the farmers regarding access to farms are understood and effectively adhered to.	Holder of the EA	Clear communication channels maintained Complaints register	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	3. Installation of an electronic number plate reader at the entrance to the WEF Facility. 4. Establish a local skills desk to identify the skills set of the local residents available for the operation phase of the WEF. 5. Up-skill construction workers with aptitude to maintain the WEF facility. 6. Set up a complaints register/grievance mechanism to allow any potentially negatively affected party to raise its concerns, which are then assessed and resolved.			

8.3.11 Health and Safety

This section deals with the issues relating to health and safety during operation

Table 46: Health and Safety

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Health and Safety: Emergency evacuation plan	1. Upon completion of the construction phase, an emergency evacuation plan must be drawn up to ensure the safety of the staff and surrounding land users in the case of an emergency. 2. Train all onsite personnel handling chemical or hazardous substances in the use of such substances and the environmental, health and safety consequences of incidents.	Holder of the EA	Emergency Evacuation Plan implemented (Annexure J) Occupational Health and Safety Plan appointed by holder of the EA	Continuous
Health and Safety: Maintenance	3. A maintenance schedule must be drawn up and records of all maintenance kept.	Holder of the EA	Maintenance Schedule Implemented compiled by the contractor, approved by the engineer and reviewed by the ECO	Continuous
Health and Safety: Fire safety	4. Firefighting equipment in the form of fire hydrants or fire extinguishers must be available on the site. These must be regularly maintained by an appropriate company.	Holder of the EA	Adhere to Health and safety Regulations Ensure the EMPr is adhered to.	Continuous
Health and Safety: Storage and handling of hazardous waste	5. A spill kit needs to be kept on site to address any unforeseen spillages. 6. Transport of all hazardous substances must be in accordance with the relevant legislation.	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Compliance to all legislative requirements.	Continuous

8.4 Decommissioning Phase

The Facility is expected to have a lifespan of 25 to 30 years (with maintenance). Equipment associated with this would only be decommissioned once it has reached the end of its economic life or at the end of the power purchase agreement. It is most likely that decommissioning activities of the infrastructure would comprise the dismantling and replacement of the equipment with more appropriate technology / infrastructure available at that time. It must be noted that decommissioning activities will need to be undertaken in accordance with the legislation applicable at that time, which will require this section of the EMPr to be revisited and amended.

Please note that there are relevant mitigation measures contained under the construction section that should be applied during decommissioning and therefore are not repeated.

The general specifications of Construction and Rehabilitation are also relevant to the decommissioning of the Oya Wind Energy Facility and must be adhered to.

- All structures not required for the post-decommissioning use of the site are dismantled and/or demolished, removed and waste material disposed of at an appropriately licensed waste disposal site or as required by the relevant legislation.
- Rehabilitate access / service roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- All disturbed areas are compacted, sloped and contoured to ensure drainage and runoff and to minimise the risk of erosion.
- Monitor rehabilitated areas quarterly for at least a year following decommissioning and implement remedial action as and when required.
- Any fauna encountered during decommissioning activities should be removed to safety by a suitably qualified person.
- All vehicles to adhere to low speed limits (i.e.40km/h max) on the site, to reduce risk of faunal collisions as well as reduce dust.
- Retrenchments should comply with South African Labour legislation of the day.
- The EMPr specifies mitigation measures for the following environmental aspects:
  - On-going Stakeholder involvement
  - Community health and safety
  - Waste Management
  - Biodiversity
  - Aquatic Ecology
  - Agriculture
  - Visual Impact
  - Air Quality

Mitigation measures implemented during construction with regards to the construction camp and equipment will remain the same for the decommissioning phase when a construction camp will need to be established again.

8.4.1 On-going Stakeholder involvement

This is the process that is recommended if the substations sites are decommissioned.

This section relates to the stakeholder involvement that needs occur during decommissioning.

Table 47: On-going stakeholder involvement

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Ongoing stakeholder involvement	1. Community to be notified, as culturally appropriate, timeously of the planned decommissioning, e.g.: Proposed decommissioning start date; and Process to be followed. 2. Recommend that a meeting with community leader(s) be held before decommissioning commence to inform them: • What activities will take place during the decommissioning phase. • How these activities will impact upon the communities and/or their properties. • Regarding the timeframes of scheduled activities 3. Regular interaction between Holder of the EA and community leader(s) during the decommissioning phase 4. A reporting office / channel to be established must community members experience problems with contractors / sub-contractors during the decommissioning phase. 5. A register to be kept of problems reported by community members and the steps taken to address / resolve it.	Holder of the EA	Clear communication channels maintained	Continuous

8.4.2 Construction Site Decommissioning

This section deals with the demolishing of the construction camp and the actions that need to be implemented

Table 48: Construction Site Decommissioning

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Construction Site Decommissioning: Removal of equipment	1. All structures comprising the construction camp are to be removed from site apart from what may be required for the operation of the facility. 2. The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint etc., and these must be cleaned up. 3. All hardened surfaces within the construction camp area must be ripped, all imported materials removed, and the area must be top soiled and regressed using the guidelines set out in the re-vegetation plan that forms part of this document.	Holder of the EA	Compliance to all legislative requirements. Ensure the EMPr is adhered to. Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase
Construction Site Decommissioning: Temporary services	4. The Contractor must arrange the cancellation of all temporary services. 5. Temporary roads must be closed and access across these, blocked. 6. All areas where temporary services were installed are to be rehabilitated to the satisfaction of the ECO.	Holder of the EA	Clear communication channels maintained Traffic Management Plan (Section 9.8 and Section 9.9) Alien Plant Management Plan (Annexure G) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase
Construction Site Decommissioning: Associated Infrastructure	7. Surfaces are to be checked for waste products from activities such as concreting or asphalting and cleared in a manner approved by the Engineer. 8. All surfaces hardened due to construction activities are to be ripped and imported material thereon removed. 9. All rubble is to be removed from the site to an approved disposal site as approved by	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO	Continuous throughout decommissioning phase

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	the ECO. Burying of rubble on site is prohibited. 10. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place over bare soil or within 32m of any on-site watercourses. All vehicle maintenance or refuelling must be done off-site, or alternatively, in a designated (hard or impermeable surface) area on-site. 11. The site is to be cleared of all litter. 12. The Contractor is to check that all watercourses are free from building rubble, spoil materials and waste materials. 13. Fences, barriers and demarcations associated with the construction phase are to be removed from the site unless stipulated otherwise by the Engineer. 14. All residual stockpiles must be removed to spoil or spread on site as directed by the Engineer. 15. The Contractor must repair any damage that the construction works has caused to neighbouring properties, specifically, but not limited to, damage caused by poor storm water management.			
Construction Site Decommissioning: Rehabilitation plan	16. Rehabilitate and re-vegetate cleared areas with indigenous plant species that were present on the site prior to construction. 17. All roads utilized during the construction phase must be rehabilitated to an acceptable standard after construction is complete.	Holder of the EA	Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase

8.4.3 *Community Health and Safety*

This section deals with the issues relating to health and safety during decommissioning

Table 49: Community Health and Safety

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Ongoing stakeholder involvement	1. Demarcated routes to be established for construction vehicles to ensure the safety of communities, especially in terms of road safety and communities to be informed of these demarcated routes. 2. Excavated areas to be fenced off and regularly inspected to ensure that humans and animals do not have access to the site. 3. Where dust is generated by trucks passing on gravel roads, dust mitigation measures to be enforced. 4. Any infrastructure that would not be decommissioned must be appropriately locked and/or fenced off to ensure that it does not pose any danger to the community	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9) Ensure the EMPr is adhered to.	Continuous

8.4.4 *Waste Management*

This section deals with the issues relating to waste management during decommissioning

Table 50: Waste Management

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Waste Management	1. All decommissioned equipment must be removed from site and disposed of at a	Holder of the EA	All waste managed according to approved the Method Statement compiled	Continuous

	registered land fill. Records of disposal must be kept. 2. All waybills and disposal slips (e.g. safe disposal certificates, waste manifests) must be retained for a minimum period of five (5) years for the disposal activities associated with the construction and decommissioning of the proposed facility, per regulation 8(1) of the NEM:WA, 2008 Waste Classification and Management Regulations published in GN No. R. 634 of 23 August 2013. 3. WEFs must be recycled if possible.		by the contractor and approved by the engineer and reviewed by ECO	

8.4.5 Biodiversity

This section deals with the issues relating to biodiversity during decommissioning

Table 51: Biodiversity

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Biodiversity: Fauna	1. All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill. 2. All vehicles accessing the site must adhere to a low speed limit (30-40km/h max) to avoid collisions with susceptible species such as snakes and tortoises. 3. No excavated holes or trenches must be left open for extended periods as fauna may fall in and become trapped. 4. All above-ground infrastructure must be removed from the site. Below-ground infrastructure such as cabling can be left in place if it does not pose a risk, as removal	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Traffic Management Plan (Section 9.8 and Section 9.9) Ensure the EMPr is adhered to.	Continuous throughout decommissioning phase

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	of such cables must generate additional disturbance and impact, however, this must be in accordance with the decommissioning and recycling plan, and as per the agreements with the land owners concerned.			
Biodiversity: Erosion control	5. There must be regular monitoring for erosion for at least 2 years after decommissioning by the Holder of the EA to ensure that no erosion problems develop as a result of the disturbance, and if they do, to immediately implement erosion control measures. 6. All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and re-vegetation techniques. 7. All disturbed and cleared areas must be re-vegetated with indigenous perennial shrubs and grasses from the local area.	Holder of the EA	Storm Water and Erosion Management Plan implements (Annexure I) Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase
Biodiversity: Alien invasive plant control	8. Wherever excavation is necessary for decommissioning, topsoil must be set aside and replaced after construction to encourage natural regeneration of the local indigenous species. 9. Due to the disturbance at the site alien plant species are likely to be a long-term problem at the site following decommissioning and regular control will need to be implemented until a cover of indigenous species has returned. 10. Regular monitoring for alien plants within the disturbed areas for at least two years after decommissioning or until alien invasives are no longer a problem at the site.	Holder of the EA	Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	11. Regular alien clearing must be conducted using the best-practice methods for the species concerned. The use of herbicides must be avoided as far as possible			
SPECIFIC MITIGATION MEASURES				
Ecological Impacts: Clearance of vegetation.	12. Restrict driving to designated roads. 13. No new roads to be built. 14. Decommissioning camp to be located at the construction camp site. 15. Any areas that will be denuded as a result of activities on site, should be re-vegetated (rehabilitated) as soon as possible to prevent soil erosion and establishment of alien invasive plant species. 16. No alien species should be used in landscaping or rehabilitation on the sites.	Holder of the EA	Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous throughout decommissioning phase
Ecological Impacts: Impact on animal behavior.	17. No night driving during decommissioning phase. 18. Proper waste management procedures should be put in place. 19. All material brought in for the development should be removed.	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous throughout decommissioning phase
Ecological Impacts: Increased dust levels.	20. Dust control measures should be implemented.	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous throughout decommissioning phase
Birds and Bats: Disturbance effects.	21. Minimise on-site disturbances.	Holder of the EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020	Continuous throughout decommissioning phase

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Birds and Bats: Displacement effects.	22. Minimise on-site disturbances.	Holder of the EA	Management Plan informed by the Pre-construction walk-through undertaken in October 2020	Continuous throughout decommissioning phase

8.4.6 Aquatic Ecology

This section deals with the issues relating to Aquatic Ecology during decommissioning

Table 52: Aquatic ecology

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Habitat and biota (inclusive of the vegetation component) and ecological structure of the watercourses identified in the study area.	1. No indiscriminate movement of construction equipment in the watercourses and buffer zones surrounding the watercourses may be permitted. Use must be made of the existing roads during the decommissioning phase; 2. All surface infrastructure within the watercourses and that within its 100m ZoR must be decommissioned. All materials must be removed from the watercourses (where applicable) and may temporarily be stockpiled outside the 32 m NEMA ZoR, where after is must be removed from site and disposed of at a registered disposal facility;	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Ensure the EMPr is adhered to Alien Plant Management Plan (Annexure F)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	3. Should road crossings be decommissioned, road footprint areas within the watercourse must be levelled to the same level and shape as that of the upstream and downstream reaches. This will ensure a continuous bed level and prevent any concentration of surface flow from occurring; 4. Watercourse embankments must be suitably rehabilitated (shaped and revegetated) to prevent any erosion from occurring; 5. All bare areas in the study area, specifically where vegetation was initially cleared for surface infrastructure components) must be ripped and be revegetated within suitable indigenous vegetation species; 6. All areas revegetated must be monitored until suitable basal cover has been re-established. Follow up revegetation should take place in areas where initial revegetation is not successful; 7. It is recommended that a Watercourse Rehabilitation and Management Plan be compiled and implemented once the layout plan has been finalised. Implementation must be overseen by a suitably qualified Environmental Site Officer (ESO) and the EO must sign off the rehabilitation before the relevant contractors leave site; 8. Refuelling, handling of hydrocarbon products or maintenance and servicing of heavy earthmoving vehicles must not take place within 32m of any on-site watercourses. All vehicle maintenance or refuelling must be done off-site, or		Plant Rescue Plan Implemented (Annexure E)	

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	alternatively, in a designated (hard or impermeable surface) area on-site; and 9. Post-closure monitoring of the watercourses (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken.			
Geomorphology, hydrological functioning and surface water quality (if present) within the watercourses identified in the study area.	10. No indiscriminate movement of construction equipment through the watercourses outside of the existing crossing point or driving in unmarked areas through the buffer zones of the watercourses may be permitted. This will avoid any disturbance to the hydrological regime of the watercourses as disturbances has already occurred and the existing road crossings are considered to promote hydrological connectivity and avoid any concentrated flow in the watercourses; 11. High flood peaks from the decommissioning footprint areas can be mitigated by ensuring that no concentrated runoff from the surface infrastructure area and subsequent cleared area enters the watercourses. The velocity of surface water flow from these areas must be reduced by ensuring that the vegetation in the buffer area surrounding the watercourses are intact or by the strategic placement of silt traps of haybales as a means to obstruct flow but still allow flow to percolate at a reduced velocity and encourages a diffuse flow pattern; 12. Areas where surface infrastructure have been decommissioned and removed must be suitably compacted and revegetated to ensure that no erosion occurs which may	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Ensure the EMPr is adhered to Ensure compliance with the WULA/GA	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	contribute to the sediment load of the watercourses; and 13. Should erosion gullies be noted, these areas must be rehabilitated by infilling them with suitable soil and ensuring the area is vegetated. The increased surface roughness will discourage concentrated flow paths to develop and ensure diffuse flow patterns.			
SPECIFIC MITIGATION MEASURES				
Removal of surface infrastructure within project area	14. Should road crossings be decommissioned, road footprint areas within the watercourse must be levelled to the same level and shape as that of the upstream and downstream reaches. This will ensure a continuous bed level and prevent any concentration of surface flow from occurring; 15. Watercourse embankments must be suitably rehabilitated (shaped end revegetated) to prevent any erosion from occurring; 16. All bare areas in the project area, specifically where vegetation was initially cleared for surface infrastructure components) must be ripped and be revegetated within suitable indigenous vegetation species; 17. Follow up revegetation should take place in areas where initial revegetation is not successful; 18. It is recommended that a Watercourse Rehabilitation and Management Plan must be compiled and implemented. Implementation must be overseen by a	Holder of the EA	All waste managed according to approved the Method Statement compiled by the contractor and approved by the engineer and reviewed by ECO Ensure the EMPr is adhered to Ensure compliance with the WULA/GA	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	suitably qualified Environmental Site Officer (ESO) and the ESO must sign off the rehabilitation before the relevant contractors leave site; and 19. Post-closure monitoring of the watercourses (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken.			

8.4.7 Agriculture

This section deals with issues relating to agricultural potential and resources and actions that need to be implemented during decommissioning

Table 53: Agriculture

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Agriculture: Soil erosion	1. Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Any occurrences of erosion must be attended to immediately and the integrity of the erosion control system at that point must be amended to prevent further erosion from occurring there. 2. Maintain, where possible, all vegetation cover, and facilitate re-vegetation of denuded areas throughout the site, to stabilize the soil against erosion. 3. Maintain the storm water run-off control system. Monitor erosion and remedy the storm water control system in the event of any erosion occurring.	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I) Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous

8.4.8 Geotechnical

This section deals with issues relating to soil management actions that need to be implemented during decommissioning

Table 54: Geotechnical

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Removal of subsoils (soil, rock)	1. Use of temporary berms and drainage channels to divert surface water where feasible. 2. Minimize earthworks and demolish footprints. 3. Use of existing roads and tracks were feasible.	Holder of the EA	Storm Water and Erosion Management Plan implemented (Annexure I)	Continuous throughout the decommissioning phase

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	4. Rehabilitation of affected areas (such as re-grassing). 5. Develop a chemical spill response plan. 6. Develop dust and demolition fly suppression plan. 7. Vehicle repairs to be undertaken in designated areas. 8. Reinstate channelized drainage features.			

8.4.9 Visual Impact

This section deals with visual issues and actions that need to be implemented during decommissioning

Table 55: Visual Impact

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Visual Impact: General	1. Decommissioning activities must not occur at night and lighting must only be erected where absolutely necessary. 2. Decommissioning traffic must stick to designated routes or access roads. 3. Decommissioning areas are to be kept clean and tidy. 4. Measures must be taken to suppress dust arising from decommissioning activities. 5. Labour being transported to the site must take cognisance of litter and waste concerns. 6. Equipment being transported to and from the site must be covered with tarps.	Holder of the EA	Noise and lighting managed as per the approved Method Statement for noise and lighting management compiled by the contractor and approved by the engineer and reviewed by ECO Traffic Management Plan (Section 9.8 and Section 9.9) All staff members are aware of the EMPr	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
	7. Topsoil stockpiles must be well managed and seeded when possible if not utilised within three months. 8. It is recommended that equipment be stored discreetly so as not to increase visual impacts. 9. Decommissioning must be conducted in the shortest possible time in order to reduce visual impacts.		requirements relevant to them Storm Water and Erosion Management Plan implemented (Annexure I) Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	
SPECIFIC MITIGATION MEASURES				
Potential visual intrusion of decommissioning activities (removal of WEF structures) on existing views of sensitive visual receptors. Visual impacts of remaining roads, platforms and concrete slabs.	10. Carefully plan to minimize the decommissioning period and avoid delays. 11. Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. 12. Make use of existing gravel access roads where possible. 13. Unless there are water shortages, ensure that dust suppression techniques are implemented on all access roads. 14. Maintain a neat construction site.	Holder of the EA	Traffic Management Plan (Section 9.8 and Section 9.9) All staff members are aware of the EMPr requirements relevant to them Storm Water and Erosion Management Plan implemented (Annexure I) Alien Plant Management Plan (Annexure F) Plant Rescue Plan Implemented (Annexure E)	Continuous

8.4.10 Air Quality

This section deals with the issues relating to air quality during decommissioning

Table 56: Air Pollution

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Air quality	1. Regular maintenance of equipment to ensure reduced exhaust emissions	Holder of the EA	Ensure the EMPr is adhered to.	Continuous

8.4.11 Heritage, Archaeological, Palaeontological and Cultural Landscape

This section deals with the impact that the decommissioning has on potential archaeological artefacts on the site

Table 57: Heritage

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Heritage, archaeology and cultural	1. Same as construction phase	Holder of the EA	Chance Find Procedure Implemented (Annexure K) A Heritage Management Plan Implemented (Annexure K)	Continuous
SPECIFIC MITIGATION MEASURES				
Vehicles and activities associated with the removal of the WEF and rehabilitation of site could result in	2. Ensure that no activity takes place outside of the authorized footprint. 3. Report any chance finds of fossils or palaeontological resources. 4. Ensure excavation and sampling of affected archaeological sites. 5. Report any chance finds of graves.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
damage to or destruction of archaeological sites and/or graves.				
Loss of significance through erosion of visual qualities and integrity of cultural landscape.	6. Keep site crew informed of heritage sensitivity of landscape. 7. Keep vulnerable sites cordoned off as no-go areas.	Holder of the EA	A Heritage Management Plan Implemented (Annexure K)	Continuous

8.4.12 Transportation

This section deals with the issues relating to traffic and transportation during decommissioning

Table 58: Traffic and Transportation impacts

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Traffic Congestion	1. Stagger component removal from site 2. Reduce the decommissioning period 3. Staff and general trips should occur outside of peak traffic periods. 4. Regular maintenance of gravel roads.	Holder of the EA	Ensure the EMPr is adhered to. Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous
Air Quality	5. Dust Suppression of gravel roads, as required. 6. Regular maintenance of gravel roads 7. Staff and general trips should occur outside of peak traffic periods	Holder of the EA	Ensure the EMPr is adhered to. Traffic Management Plan (Section 9.8 and Section 9.9)	Continuous

Impact	Impact Management Actions	Responsibility	Impact Management Outcome	Time Frames
Noise pollution	8. Stagger component removal from site 9. Reduce the decommissioning period as far as possible 10. Staff and general trips should occur outside of peak traffic periods	Holder of the EA	Ensure the EMPr is adhered to. Traffic Management Plan (Section 9.8 and Section 9.9	Continuous

9 ADDITIONAL MANAGEMENT PLANS

9.1 High-level Alien Invasive Management Plan[13]

Table 59: Alien Invasive Management Plan for construction phase

ALIEN INVASIVE MANAGEMENT PROGRAMME	
MITIGATION MEASURES	1. Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding. 2. Alien vegetation and the spread of exotic species on the site will need to be controlled. 3. The contractor must be responsible for implementing a programme of weed control (particularly in areas where soil has been disturbed); and grassing of any remaining stockpiles to prevent weed invasion. 4. Herbicide use must only be allowed according to contract specifications. The application must be according to set specifications and under supervision of a qualified technician. The possibility of leaching into the surrounding environment must be properly investigated and only environmentally friendly herbicides must be used. 5. The use of pesticides and herbicides must be discouraged as these can impact on important pollinator species of indigenous vegetation. 6. Six monthly checks of the area must take place for the emergence of invader species. 7. Mitigation measures mentioned for the construction phase above must be implemented for any maintenance of the development that must be undertaken during the operation phase. 8. Correct rehabilitation with locally indigenous species. 9. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided. 10. Constant maintenance of the area to ensure re-colonisation of floral species. 11. Regular removal of alien species which will jeopardise the proliferation of indigenous species.

[13] Final and site specific Alien Plant Management Plan provided in **Appendix F** of the EMPr

9.2 Plant Rescue and Protection Plan[14]

Table 60: Plant Rescue and Protection Plan

PLANT RESCUE PROTECTION PLAN	
MITIGATION MEASURES	1. The removal of protected plant species from the proposed development areas must take place prior to construction commencing. These plant species should be grown ex-situ and then relocated after construction has been completed. 2. Where possible, preference be given to conservation organisations to remove seeds, cuttings and plants prior to construction commencing for conservation purposes. 3. A large proportion of the impact of the development stems from the access roads and the number of roads must be reduced to the minimum possible and routes must also be adjusted to avoid areas of high sensitivity as far as possible, as informed by a preconstruction walk-though survey. 4. Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes topics such as no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc. 5. A pre-construction walk-through survey by the biodiversity specialist will be required during a favourable season to locate any protected plants / trees and/or sensitive species and/or ecological feature. This survey must cover the footprint of all proposed infrastructure, including internal access roads. If necessary, shift infrastructure to avoid impacts on species or specific features. 6. Vegetation clearing must only commence after the walk-through has been conducted and necessary permits obtained. 7. Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. 8. Vegetation to be removed as it becomes necessary rather than removal of all vegetation throughout the site in one step. 9. Materials must not be delivered to the site prematurely which could result in additional areas being cleared or affected. 10. No vegetation to be used for firewood. 11. Gathering of firewood, fruit, “muti” plants, or any other natural material onsite or in areas adjacent to the site is prohibited unless with prior approval of the ECO. 12. Only vegetation within the footprint must be removed. 13. Vegetation removal must be phased in order to reduce impact of construction. 14. Construction site office and laydown areas must be clearly demarcated and no encroachment must occur beyond demarcated areas. 15. All natural areas impacted during construction must be rehabilitated with locally indigenous plant species.

[14] Final and site specific Plant Rescue Plan provided in **Appendix E** of EMPr

PLANT RESCUE PROTECTION PLAN	
	16. A buffer zone must be established in areas where construction will not take place to ensure that construction activities do not extend into these areas. 17. Construction areas must be well demarcated and these areas strictly adhered to. 18. The use of pesticides and herbicides in the study area must be discouraged as these impacts on important pollinator species of indigenous vegetation. 19. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora. 20. Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which must inhibit the later growth of vegetation in the soil.

9.3 Re-Vegetation and Habitat Rehabilitation Plan[15]

Table 61: Re-Vegetation and Habitat Rehabilitation Plan

RE-VEGETATION AND HABITAT REHABILITATION PLAN	
MITIGATION MEASURES	1. Re-vegetation must aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment. 2. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with indigenous grasses. 3. Re-vegetation of the disturbed site is aimed at approximating as near as possible the natural vegetative conditions prevailing prior to construction. 4. All natural areas impacted during construction must be rehabilitated with locally indigenous species typical of the representative botanical unit. 5. Rehabilitation must take place in a phased approach as soon as possible. 6. Rehabilitation process must make use of species indigenous to the area. Seeds from surrounding seed banks can be used for re-seeding. 7. Rehabilitation must be executed in such a manner that surface run-off will not cause erosion of disturbed areas. 8. Planting of indigenous tree species in areas not to be cultivated or built on must be encouraged. 9. Habitat destruction must be limited to what is absolutely necessary for the construction of the infrastructure, including the construction of new roads. In this respect, the recommendations from the Ecological Specialist Study must be applied strictly. Personnel must be adequately briefed on the need to restrict habitat destruction, and must be restricted to the actual construction area. 10. Monitoring programme to ensure that rehabilitation efforts are successful to ensure that risks such as erosion, spread of exotic species and the edge effect are avoided.

[15] Final and site specific Vegetation Rehabilitation Plan provided in **Appendix H** of EMPr

9.4 Erosion Management Plan[16]

Table 62: Erosion Management Plan

EROSION MANAGEMENT PLAN	
MITIGATION MEASURES	1. Contractor to provide method statement on erosion control, showing how storm water will be managed. 2. To prevent erosion, material stockpiled for long periods (2 weeks) must be retained in a bermed area. 3. Areas which are not to be constructed on within two months must not be cleared to reduce erosion risks. 4. The area to be cleared must be clearly demarcated and this footprint strictly maintained. 5. Wind screening and storm water control must be undertaken to prevent soil loss from the site. 6. Other erosion control measures that can be implemented are as follows: • Brush packing with cleared vegetation • Mulch or chip packing • Planting of vegetation • Hydroseeding / hand sowing 7. Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented. 8. All erosion control mechanisms need to be regularly maintained. 9. Seeding of topsoil and subsoil stockpiles to prevent wind and water erosion of soil surfaces. 10. Retention of vegetation where possible to avoid soil erosion. 11. Vegetation clearance must be phased to ensure that the minimum area of soil is exposed to potential erosion at any one time. 12. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed. This must be done through seeding with indigenous grasses that were present on site prior to construction. 13. No impediment to the natural water flow other than approved erosion control works is permitted. 14. To prevent storm water damage, the increase in storm water run-off resulting from construction activities must be estimated and the drainage system assessed accordingly. 15. Stockpiles not used in three (3) months after stripping must be seeded to prevent dust and erosion.

9.5 Open Space Management Plan

[16] Final and site specific Storm Water Management & Erosion Control Plan provided in **Appendix I** of EMPr

Table 63: Open Space Management Plan

OPEN SPACE MANAGEMENT PLAN	
MITIGATION MEASURES	1. A buffer zone must be established in areas where construction will not take place, to ensure that construction activities do not extend into these areas. 2. Vehicle movement must be restricted to authorised access roads. 3. Before construction begins, all areas to be developed must be clearly demarcated with pegs, fencing or orange construction barrier where applicable. 4. All Construction Camp are to be fenced off in such a manner that unlawful entry is prevented and access is controlled. Signage must be erected at all access points in compliance with all applicable occupational health and safety requirements. All access points to the Construction Camp must be controlled by a guard or otherwise monitored, to prevent unlawful access. 5. The contractor and ECO must ensure compliance with conditions described in the EA. 6. Records of compliance/ non-compliance with the conditions of the authorisation must be kept and be available on request. 7. Records of all environmental incidents must be maintained and a copy of these records be made available to the national and provincial departments on request throughout the project execution. 8. Site establishment must take place in an orderly manner and all required amenities must be installed at camp sites before the main workforce move onto site. 9. All construction equipment must be stored within this construction camp. 10. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and that provides for spillage prevention and containment. 11. The Contractor must provide sufficient ablution facilities, in the form of portable / VIP toilets, at the Construction Camps, and must conform to all relevant health and safety standards and codes. No pit latrines, French drain systems or soak away systems must be allowed and toilets must not be situated within 100 meters of any surface water body or 1:100 year flood line. A sufficient number of toilets must be provided to accommodate the number of personnel working in the area. 12. The Contractor must inform all site staff to make use of supplied ablution facilities and under no circumstances must indiscriminate sanitary activities be allowed. 13. No fires will be allowed and the Contractor must make alternative arrangements for heating. LP Gas must be used, provided that all required safety measures are in place. The Contractor must take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures must include appropriate instruction of employees about fire. 14. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts. 15. Project manager must ensure that the training and capabilities of the Contractor’s site staff are adequate to carry out the designated tasks. 16. Staff must be educated as to the need to refrain from indiscriminate waste disposal and/or pollution of local soil and water resources and receive the necessary safety training.

OPEN SPACE MANAGEMENT PLAN	
	17. Staff must be trained in the hazards and required precautionary measures for dealing with these substances

9.6 Monitoring System

Table 64: Monitoring System

MONITORING SYSTEM	
MITIGATION MEASURES	1. Monitoring must be undertaken to evaluate the success of mitigation measures. Monitoring methods must be in accordance with features that need to be monitored. 2. An area for the storage of hazardous materials must be established that conforms to the relevant safety requirements and provides for spillage prevention and containment. 3. Environmental awareness training for construction staff, concerning the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control. 4. Spillage packs must be available at construction areas. 5. Proper storage facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater regime around the temporary storage area(s). These pollution prevention measures for storage must include a bund wall high enough to contain at least 110% of any stored volume, and this must be sited away from drainage lines in a site with the approval of the Project Manager. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material with an additional allocation for potential storm water events. 6. These storage facilities (including any tanks) must be on an impermeable surface that is protected from the ingress of storm water from surrounding areas in order to ensure that accidental spillage does not pollute local soil or water resources. 7. An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. 8. Where contamination of soil is expected, analysis must be done prior to disposal of soil to determine the appropriate disposal route. Proof from an approved waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be attained and given to the project manager. 9. Topsoil and subsoil to be protected from contamination. This must be monitored on a monthly basis by a visual inspection of diesel/oil spillage and pollution prevention facilities. 10. Concrete and chemicals must be mixed on an impervious surface and provisions must be made to contain spillages or overflows into the soil.

MONITORING SYSTEM	
	11. Relevant departments and other emergency services must be contacted in order to deal with spillages and contamination of aquatic environments. 12. Soils must be kept free of petrochemical solutions that must be kept on site during construction. Spillage can result in a loss of soil functionality thus limiting the re-establishment of flora.

9.7 Traffic Management Plan

Table 65: Traffic Management Plan

TRAFFIC MANAGEMENT PLAN	
MITIGATION MEASURES	1. A designated transport coordination manager must be appointed to oversee and manage the traffic safety officers. Additionally, the designated transport coordination manager must inform and keep up-to-date the interested and affected parties of all the activities taking place that will have a direct impact on them. 2. A traffic safety officer must be nominated to make all the necessary arrangements to maintain the required traffic measures for the duration of the project. The safety officer must liaise daily with the transportation coordination manager to keep them apprised of the state of all the traffic arrangements. 3. All construction traffic must comply with the legal load requirements as outlined in the National Road Traffic Act and National Road Traffic Regulations. 4. During periods of high construction traffic entering and exiting the site, it is recommended that flagmen help direct the traffic. This will enable the safe movement of construction and public traffic at the entrance and reduce the number of potential conflicts. 5. The South African Road Traffic Signs Manual (SARTSM), Volume 2, June 1999 is to be used for all traffic during the construction activities of the proposed project. 6. Any damage caused by the construction vehicles to the existing road infrastructure must be repaired in kind, prior to the completion of the project. 7. A dust suppression system for the gravel roads must be in place to prevent excessive dust from the traffic polluting the air. 8. All abnormal loads must be transported under a permit. 9. A route study be undertaken to confirm the most appropriate route to site. 10. The appropriate load permits be obtained from the Western and Northern Cape Departments of Transport prior to construction.

9.8 Transportation Management Plan

Table 66: Transportation Management Plan

TRANSPORTATION MANAGEMENT PLAN	
MITIGATION MEASURES	1. For each convoy of abnormal vehicles/loads a designated safety officer must be nominated. 2. All vehicles used during the transport of materials and in the construction activities are required to be roadworthy per the National Road Traffic Act (NRTA) and display all pertinent certificates as required. 3. For any vehicles that operate under an exemption permit, a roadworthy certificate will not be required; however, the exemption permit will require that the vehicle is fit for operation on public roadways. 4. All vehicles travelling to and from the site must adhere to all laws imposed by the law enforcement agencies, and must comply with any requests made by the law enforcement officials. 5. All construction vehicles that are entering the site must also be available via radio or telephone communication to the transport coordination manager. So that in the event of an emergency, all vehicles can be accounted for. 6. During the delivery of the components and associated infrastructure, the person in charge must be in communication with transport coordination manager, so that he/she will keep track and document the progress of the vehicles to facilitate any issues that may arise during the transportation phase. 7. All vehicles must comply with the posted speed limits on public roads as well as the speed limits within the development. 8. All abnormal vehicles and loads to be transported are required to have a valid permit before any trip is begun. 9. SANRAL Western & Southern Region will need to be contacted in order to obtain consent for the abnormal load transport on their roadways. 10. An escort is required to accompany the abnormal vehicle to warn the normal travelling public and to promote the safe flow of traffic if the normal flow of traffic is disrupted by the abnormal vehicle. 11. Construction vehicles delivering raw materials to the site must be covered to prevent any debris along the roads. 12. Ensure a large portion of vehicles traveling to and from the proposed development site travel in the 'off peak' periods. 13. Implement pedestrian safety initiatives. 14. Trucks must stop at regular intervals to allow queuing vehicles to pass.

A consolidated Traffic and Transport Management Plan, taking into account the final route selection must be prepared once the Project advances to the preliminary phase. This plan must ensure that vehicles arrive in a dispersed manner throughout the day to reduce the impact to other road users. Methods to improve driver safety must also be outlined, e.g. the use of speed cameras or Average Speed Over Distance (ASOD). Furthermore, this plan must include measures to minimise the impact on local commuters so as not to disturb existing retail and commercial operations.

9.9 Heritage Management Plan[17]

Table 67: Heritage Management Plan

HERITAGE MANAGEMENT PLAN	
MITIGATION MEASURES	1. In the event that an area previously not included in an archaeological or cultural resources survey is to be disturbed, HWC needs to be contacted. An enquiry must be lodged with them into the necessity for a Heritage Impact Assessment. 2. In the event that a further heritage assessment is required it is advisable to utilise a qualified heritage practitioner, preferably registered with the Cultural Resources Management Section (CRM) of the Association of Southern African Professional Archaeologists (ASAPA). (a) This survey and evaluation must include: (b) The identification and mapping of all heritage resources in the area affected; (c) An assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6 (2) or prescribed under section 7 of the National Heritage Resources Act; (d) An assessment of the impact of the development on such heritage resources; (e) An evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development; (f) The results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources; (g) If heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and (h) Plans for mitigation of any adverse effects during and after the completion of the proposed development. 3. It is advisable that an information section on cultural resources be included in the SHEQ training given to contractors involved in surface earthmoving activities. These sections must include basic information on: (a) Heritage; (b) Graves; (c) Archaeological finds; and (d) Historical Structures. 4. This module must be tailor made to include all possible finds that could be expected in that area of construction. Possible finds include: (a) Open air Stone Age scatters, disturbed during vegetation clearing. This will include stone tools. (b) Palaeontological deposits such as bone, and teeth in fluvial riverbank deposits. 5. In the event that a possible find is discovered during construction, all activities must be halted in the area of the discovery and a qualified archaeologist contacted. 6. The archaeologist needs to evaluate the finds on site and make recommendations towards possible mitigation measures.

[17] Final and site specific Heritage Management Plan provided in **Appendix K** of EMPr

HERITAGE MANAGEMENT PLAN	
	7. If mitigation is necessary, an application for a rescue permit must be lodged with HWC. 8. After mitigation, an application must be lodged with HWC for a destruction permit. This application must be supported by the mitigation report generated during the rescue excavation. Only after the permit is issued will such a site be destroyed. 9. If during the initial survey sites of cultural significance are discovered, it will be necessary to develop a management plan for the preservation, documentation or destruction of such a site. Such a program must include an archaeological/palaeontological monitoring programme, timeframe and agreed upon schedule of actions between the company and the archaeologist. 10. In the event that human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made. 11. If the remains are to be exhumed and relocated, the relocation procedures as accepted by HWC need to be followed. This includes an extensive social consultation process.

9.10 Fire Management Plan

The intent of a Fire Management Plan (FMP) is to provide fire safety requirements to ensure that the construction and operation of the proposed Oya Energy Facility, which are defensible from wildfire and, in turn, do not represent a significant threat of ignition source for the surrounding native habitat.

It must be noted that during extreme fire conditions, there are no guarantees that a given structure will not burn. Precautions and mitigating measures identified in this plan are designed to reduce the likelihood that fire would impinge upon the proposed structures as well as minimise the impact of fires if they do occur. This FMP does not guarantee that fire will not occur in the area or that fire will not damage property or cause harm to persons or their property.

Oya Wind Energy Facility will rely heavily on the co-operation and proactive participation between managers, employees and contractors to maintain a high level of Fire safety awareness at all times.

This management plan is also a reflection of Oya Wind Energy Facility commitment towards the constant safeguarding of employees against Fire hazards, whilst complying with the requirements of the Fire Safety Act, 6 of 2002 and Occupational Health and Safety Act, 85 of 1993.

9.10.1 Fire and Maintenance of Access Roads for Energy Facility

- A primary access and escape route will be visible and known to all who visit the facility and will be controlled by a security gate.
- There will be other dedicated secondary gravel roads leading to/from the project site to/from the primary access.
- There will be more than one vehicular access gate leading into the project.
- An escape route map with safe gathering points needs to be visible at all the entrance gates/construction camps for anyone to familiarise themselves with upon entry (and will be provided prior to construction once the final facility layout and building plans have been approved by the appropriate department / authority).

9.10.2 Fire Safety Act, 6 of 2002

A copy of the fire safety act is to be available at the facility for everyone's easy access purposes.

9.10.3 Principles of Fire Safety

The aims of implementing measures to limit the incidences and spread of fire are:

- To ensure the safety of people, minimising loss of life and injury.
- To minimise loss of and damage to property and possessions.
- To minimise the negative impact on the environment.
- To safely and effectively extinguish fire when needed.

9.10.4 Requirements in Terms of the South African Bureau of Standards (SABS)

From a fire safety point of view, all buildings erected within the boundaries of South Africa must comply with the SABS 0400:1990- The application of the National Building Regulations. The following requirements are appropriate and can be adapted for planning and design of buildings. Any building must be so designed, constructed and equipped that in case of fire:

- The protection of occupants or users therein is ensured and that provision is made for the safe evacuation of such occupants or users.
- The spread and intensity of such fire within such buildings and the spread of fire to any other building will be minimised.
- Adequate means of access and equipment for detecting, fighting, controlling and extinguishing such fire are adopted.

9.10.5 Management Commitment

It will be the responsibility of managers to:

- Enforce such measures as may be necessary in the interest of the preservation of employee's safety including safety against fire.
- Permit employees to perform work only once the precautionary measures are put in place.
- Provide the necessary supervision to staff to ensure that precautionary measures are maintained.
- Ensure that the staff are adequately trained in fire procedures.
- Ensure that all staff are informed regarding their scope of authority.
- Ensure that the FMP is reviewed and updated regularly to meet the projects needs at that particular point in time.
- Ensure that the firefighting equipment is regularly serviced.
- Make sure that the FMP forms part of the facility induction which will be made compulsory for each new member to the facility to attend.

9.10.6 Employees' Contribution to Fire Management

The successful implementation of the FMP will require the full co-operation of every employee.

In this regard it will be expected of every employee to:

- Take care of the fire detection and fire protection systems and equipment.
- Carry out any lawful order given to him/her and obey the fire procedures laid down, or authorised thereto, by Oya in the interest of health and fire safety.
- Report any situation which may cause fire to the supervisor and/or Health and Safety Representative.
- Be able to make recommendations to the relevant Health and Safety representative who will take the recommendation into consideration and if agreed upon then implemented.

Co-operation will be expected from any other Contractor or subcontractor to ensure that any duty or requirement imposed on Oya, as the employer, through legislation, is complied with.

9.10.7 Fire Prevention / Control

The following preliminary measures will be taken to try and prevent and/or control fires on site:

- Smoking and open flames will be prohibited in areas near flammable and/or combustible materials.
- Fire Fighting equipment will be sufficiently available on site and must comply with the relevant legislation.
- All equipment will be serviced annually and pressure tested every five (5) years.

9.10.8 Response

- The facility must at all times have emergency numbers readily available to all employees and staff. These include the fire department as well as emergency care numbers to make sure that fires are quickly extinguished when they occur and that the victims (if any) are medically treated and taken to a nearby hospital or clinic if needs be.

- The staff will be trained to use the firefighting equipment for small fires that can be contained but alternatively if the fire cannot be contained, the appropriate authorities must be contacted to assist in extinguishing the fire.
- If the fire cannot be contained, workers must evacuate the site in an orderly manner led by a trained Health and Safety representative.
- During construction phase, fire protection measures like placing fire extinguishers on site are compulsory before any hot work can commence or where any flammable substances are present.
- During operation phase, Fire protection equipment like Fire Extinguishers will be situated at carefully selected locations for easy access during an emergency.

9.10.9 Management Plan

The following will form the key elements of the FMP:

- Legal Compliance
    - A work place that is safe and without risk to the health and safety of employees in compliance with the requirements of the Occupational Health and Safety Act 85 of 1993 and its regulations as well as the Fire Safety Act, 6 of 2002.

- Fire hazard identification and risk assessment
    - Identify any fire hazards and risks and then determine the extent and impact.
    - Endeavour to eliminate fire hazards and develop control measures to contain the fires.

- Fire Safety, Health and Environmental Proficiency
    - Ensure that employees are conversant with the potential fire hazards and the precautionary measures required with respect to these hazards through regular awareness training.
    - Incorporate and discuss Fire Safety into the daily Toolbox talks.

- Written Safe Word Procedures
    - Develop written safe work procedures for all fire high risks and provide the necessary training to employees if needs be.

- Training and Education
    - Include the fire management plan in all Health and Safety training and assessments and provide the necessary training and awareness to all categories of employees.
    - Provide awareness and training to all new employees including temporary employees and contractors on site.

- Prevention
    - Suitable preventative measures against exposure to hazards are an integral part of daily activities.
    - Personnel protective equipment must be provided for the protection of employees when necessary.
    - Corrective and/or fire preventative measures must be put in place.

- Elimination of Fire Incidents
    - The elimination of fire incidents, including injuries on duty to which employees and the public can be exposed to will be achieved through the proper investigation of any fire incidents. Factors which cause any fire incidences will be determined and then corrective and preventative measures will be developed and implemented in liaison with all relevant stakeholders.

- First Aid Kit
    - A first aid kit will be available on site which will contain all the necessary medication (e.g. pain medication) and equipment to pre-treat any fire injury depending on the magnitude of

the injury. If the injury is too severe, the victim must be taken to the nearest hospital or clinic to be treated by professionals and not treated on site.
    - There will be a sufficient number of employees trained in first aid medical assistance in case of small controllable fire incidents occurring on site.

- Machinery, Plant and Equipment
    - All mechanical equipment will be safeguarded in order to protect the health and safety of persons that must be exposed to such equipment.
    - Regular maintenance of all equipment (including firefighting equipment) and inspections will be recorded.
    - Only equipment that is safe and in working condition will be used by the employees. Equipment is to be inspected every day before use.

- Sub-Contractors
    - Sub-contractors will sign an agreement with the Developer to ensure their compliance with the FMP.
    - Sub-contractors will work according to the Health and Fire Safety standards.

9.11 Environmental Awareness Plan

Legislation requires that a company who prepares an environmental management program must develop an environmental awareness plan describing the manner in which the company intends to inform his or her employees of any environmental risks which must result from their work and the manner in which the risks must be dealt with in order to avoid pollution or the degradation of the environment. In recognition of the need to protect our environment, environmental management should not only be seen as a legal obligation but also as a moral obligation.

This Environmental Awareness Plan is intended to create the required awareness and culture with personnel and contractors / service providers on environmental safety and health issues associated with the development activities.

9.11.1 Policy on Environmental Awareness

This Environmental Awareness Plan must serve as the basis for the induction of all new employees (as well as contractors depending on the nature of their work on site) on matters as described herein and read in conjunction with the EMPr. The Plan will also be used to hone awareness of all employees on a continuous basis.

Specific environmental awareness performance criteria will also form part of the job descriptions of employees, to ensure diligence and full responsibility at all levels of the organisational work force.

9.11.2 Implementation of Environmental Awareness

General environmental awareness will be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout the project’s duration. This will ensure that environmental accidents are minimised and environmental compliance maximised.

Environmental awareness will be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site.
- Refresher courses as and when required

- Daily toolbox talks with all workers on the site at the start of each day, where workers can be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working.
- Displaying of information posters and other environmental awareness material at the general assembly points.

9.11.3 Training and awareness

The Main Contractor is to take responsibility for the management of their staff and subcontractors on the project site during the construction phase and supervise them closely at all times. The onus is on the MC to make sure that all their staff and subcontractors fully comprehend the contents of the EMPr. The MC must organise environmental awareness training programmes, which should be targeted at the two levels of employee: management and labour.

9.11.4 Training of construction workers

All construction staff must receive basic training in environmental awareness, including the storage and handling of hazardous substances, minimisation of disturbance to sensitive areas, management of waste, and prevention of water pollution. They must be informed of how to recognise historical / archaeological artefacts that may be uncovered. They must also be apprised of the EMPr's requirements. Environmental awareness training programmes need to be formulated for these employee levels and must comprise:

- A record of all names, positions and duties of staff to be trained;
- A framework for the training programmes;
- A summarised version of the training course(s); and
- An agenda for the delivery of the training courses.

Such programmes will set out the training requirements, which need to be conducted prior to any construction works occurring and will include:

- Acceptable behaviour with regard to flora and fauna;
- Management and minimising of waste, including waste separation;
- Maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, lubricants, cement, mortar and other chemicals;
- Responsible handling of chemicals and spills;
- Environmental emergency procedures and incident reporting; and
- General code of conduct towards I&APs.

The ECO may be requested to provide additional on-site training (in a first language) in respect of environmental aspects that are unclear to the construction personnel. A translator may be required to assist with this additional training. The cost for the translator will be borne by the Main Contractor.

10 CONCLUSION

The environmental and social impacts of the project were identified through the four (4) project phases (pre-construction, construction, operation and decommissioning) in compliance with National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (as amended) and the EIA Regulations 2014 (as amended). **No fatal flaws have been found for the proposed. No unacceptable negative impacts have been identified that cannot be reduced with the implementation of the proposed mitigation and management measures. Both positive and negative project impacts have been identified.**

Based on the above information and proposed mitigation measured, SiVEST is of the opinion that the Project will not have significant adverse social and environmental impacts. Most adverse impacts will be of a temporary nature during the construction phase and can be managed to acceptable levels with implementation of the recommended mitigation measures for the Project such that the overall benefits from the Project will greatly outweigh the few adverse impacts.

All the negative impacts could be easily mitigated. Generally, the proposed development will result in appreciable benefits to the people in the project area of influence and bring opportunities for development to the country.

The EAP is satisfied that the EMPr is in compliance with National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (as amended) and the EIA Regulations 2014 (as amended)

ANNEXURE A

CURRICULUM VITAE

CURRICULUM VITAE

Name	Liandra Scott-Shaw (neé Bertolli)
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	5 Years
Date of Birth	08 March 1986
Nationality	South African
ID No.	8603080022083

Education

- Matric Exemption (Natal Education Department) Durban Girls High School (2002-2003)

Professional Qualifications

- Bachelor of Science (Biological Science): University of KwaZulu-Natal, 2008
- Bachelor of Science (Honours) Ecological Science: University of KwaZulu-Natal, 2009
- Pr.Sci.Nat. Registration No. 117442

Membership to Professional Societies

- South African Council for Natural Scientific Professions (SACNASP)
- Royal Society of South Africa 2010-Present
- International Association for Impact Assessment South Africa (IAIAsa)

Employment Record

Jan 2014 - date	SiVEST SA (PTY) LTD – Environmental Division: Environmental Consultant
Jun 2013 - Dec 2013	ECO-PULSE Environmental Consulting Services - Internship
Jan 2010 - Jan 2013	University of the North West (Diatom collection, process and analysis)
Jan 2012 - Dec 2012	John Bews Herbarium, (Geo referencing specimen)
Feb 2006 - June 2013	University of KwaZulu-Natal (Laboratory and field assistant for the School of Biological and Conservation Science, Demonstrating and Lecturing in Biology and Biogeography)

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent
Afrikaans	Basic	Basic	Basic

Years of Working Experience: 6

Countries of Work Experience

- South Africa

Field of Specialisation

- Plant biodiversity assessments
- Alien plant identification/management
- Diatom diversity assessments
- Field identification
- Taxonomical background
- Report writing
- NEMA and NEM:BA regulations and policies

Overview

Liandra has completed a Bachelor of Science Degree in Biological Science (University of KwaZulu-Natal, PMB), a Bachelor of Science (Honours) in Ecological Science (University of KwaZulu-Natal, PMB) and is completing her Master of Science Degree in Environmental Science (University of KwaZulu-Natal, PMB), of which the focus is on Diatoms as indicators of wetland water quality in the KZN Midlands.

Liandra has been involved in consulting since 2013, which included biodiversity assessments and analyses as well as report writing. Prior to that, Liandra had been involved in academic research and demonstrating/lecturing since 2008.

Projects Experience (by Sector)

<u>VEGETATION ASSESSMENTS, REHABILITATION PLANS AND PERMIT APPLICATIONS</u>

- Ntunjambili Bulk Water Supply Scheme
- Eshowe SSA1 Pipeline Project
- Bishopstowe Development Area
- Dube TradePort State of Environment Report
- Transnet Richards Bay Port Development Vegetation Assessment
- Transnet South Dune Vegetation Assessment
- Umsunduzi Greater Edendale Environmental Management Framework
- Sumitomo Rubber Manufacturing Plant Vegetation Assessments, Alien Plant Management Plan And Plant Permits
- Umgeni Water Darvill Constructed Wetland Vegetation Assessment
- P75-2 Road Upgrade Vegetation Assessment
- Masinege Sewer Line Vegetation Permits
- Tongaat Hulett Cornubia North Development Vegetation Assessment
- Tongaat Hulett Lindokuhle Housing Development Vegetation Assessment
- Tongaat Hulett Simhlangentsha Pipeline Vegetation Assessment
- Tongaat Hulett Dudley Pringle Development Vegetation Assessment
- Tongaat Hulett Maidstone Mill Development Vegetation Assessment
- Arcelor Mittal Newcastle Works Alien Plant Management Plan
- Umgeni Water Umshawathi Pipeline Vegetation Assessment
- ACSA GCS Diatom Sampling
- Mandeni Cemetery Vegetation Assessment
- Fountain Hill Development Vegetation Assessment
- Salt Rock Development Vegetation Assessment
- Colenso Coal Project
- Strode Property Development Vegetation Assessment
- Tongaat Hulett Tinley Manor South Wetland Assessment (vegetation)
- Tongaat Hulett Tinley Manor North Wetland Assessment (vegetation)
- Umgeni Water South Coast Pipeline Vegetation Assessment, Plant Permits
- Swayimane Bulk Water Pipeline
- Westbrook Club Development Vegetation Assessment
- Eskom Candover – Mbazwana Vegetation Assessment and Plant Permits

- Eskom Eshowe Electrification Vegetation Assessment and Plant permits
- Eskom Empangeni Electrification Vegetation Assessment and Plant permits
- Eskom Jozini Electrification Vegetation Assessment and Plant permits
- Eskom Electrification Vegetation Assessment and Plant permits
- Eskom Nsele Godi Electrification Vegetation Assessment and Plant permits
- Eskom Makhatini Electrification Vegetation Assessment and Plant permits
- Eskom Esicabazeni Electrification Vegetation Assessment and Plant permits
- Ethekwini Hammarsdale Electrification Vegetation Assessment
- Shemula Pipeline Vegetation Assessment and Plant permits
- Ezakheni Housing Vegetation Assessment
- Ashton College Vegetation Assessment
- eThekwini Metropolitan Marianridge Housing Development Vegetation Assessment
- Edendale Town Centre Development Vegetation Assessment
- N2 Pongola Ecological Studies Vegetation Assessment
- Sani Pass Hotel Upgrades Vegetation Assessment
- Eskom Lake Eland Vegetation Assessment and Plant permits
- Eskom Phungashe Phase 3 Vegetation Assessment and Plant permits
- Eskom Bhanbanani Vegetation Assessment and Plant permits
- Eskom Sunduza Vegetation Assessment and Plant permits
- Eskom TC Xumalo Vegetation Assessment and Plant permits
- Eskom Cwakeme Vegetation Assessment and Plant permits
- Eskom Mambane Vegetation Assessment and Plant permits
- Eskom Nkangala Vegetation Assessment and Plant permits
- Eskom Estcourt Permits Vegetation Assessment and Plant permits
- Eskom Emahusheni Permits Vegetation Assessment and Plant permits
- Eskom Mamfene Permits Vegetation Assessment and Plant permits
- Eskom Qwabe Permits Vegetation Assessment and Plant permits
- Eskom BA Khumalo Permits Vegetation Assessment and Plant permits
- Eskom Zululand Melmoth Vegetation Assessment and Plant permits
- Eskom Muller Helgardt Permits Vegetation Assessment and Plant permits
- Eskom Zamazama Permits Vegetation Assessment and Plant permits
- World Tomorrow Fund South Bank Permits Vegetation Assessment and Plant permits

ENVIROMENTAL CONTROL OFFICER

- Eskom Candover-Mbazwana Powerline
- Lombardskop Pipeline
- Zimbali Lakes Golf Course
- Fitty Park Water Pipeline
- Driefontein Phase 1 Water Pipeline
- Middledrift SSA5 Water Pipeline
- Lower Tugela Bulk Water Off-take 12
- Lower Tugela Bulk Water Off-take 10
- Lower Tugela Bulk Water Off-take 1
- Lower Tugela Bulk Water Off-take 11
- Mpumulanga Unit G Development
- Maphumulo (Invutshane Dam) Phase 2 Pipeline

BASIC ASSESSMENTS / ENVIRONMENTAL IMPACT ASSESSMENTS

- La Mercy Integrated Human Settlement Development
- Waterval Prison Upgrade Project
- Greater Kokstad Bulk Raw Water Upgrade Project
- Dube TradePort Agrizone 2
- D1562 Road Upgrade BA
- Mthandeni Irrigation Extension Project
- Shemula Bulk Raw Water Phases 2 - 6 BA
- Izinga Phase 3 BA

- Zimbali Estate Properties BA
- Cornubia Portion 14 Petrol Filling Station
- South Coast Pipeline BA
- Swayimane Bulk Water BA
- Mswhathi Pipeline (Amendment)
- Compensation Organic Waste Facility
- Sumitomo Rubber Manufacturing Plant
- Darvill Constructed Wetland
- Dube Tradeport Agrizone 2
- Chansbury Poultry Farm

STRATEGIC PROJECTS

- Greater Edendale Area EMF
- Bishopstowe Development Area SEA
- Ray Nkonyeni Municipality SEA
- Dube TradePort State of Environment Report (SoER)

MANAGEMENT PLANS

- Phinda Private Game Reserve Maintenance Management Plan

Academic Contributions

Lang P, Taylor J, Bertolli L, Lowe S, Dallas H, Kennedy MP, Gibbins C, Sichingabula H, Saili, Day J, Willems F, Briggs JA and Murphy KJ 2013. Proposed procedure for the sampling, preparation and analysis of benthic diatoms from Zambian rivers: a bioassessment and decision support tool applicable to freshwater ecoregions in tropical southern Africa. Africa, Caribbean, Pacific- European Union Project Report.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2013. SAFRASS Methodology Manual.

Shrader AM, Bell C, Bertolli L and Ward D 2012. Forest or the trees: at what scale do elephants make foraging decisions? Acta Oecologica 42: 3-10.

Lang P, Taylor J, Bertolli L, 2012. River diatom biodiversity assessments in Zambian rivers: a SAFRASS conservation perspective. European Congress of Conservation Biology, Glasgow.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Photographic guide to the Aquatic Macroinvertebrates of Zambia. European Union Project Report.

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Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. 2012. SAFRASS Macrophyte Identification Manual.

Conferences and workshops

SAFRASS Diatom Genera Guide Workshop 2013

Programa de Avaliação de Rios no Sul de África (SAFRASS): estabelecimento de uma estrutura de investigação na construção de capacidade para promoção da saúde e biodiversidade dos rios africanos.

Martins S, Kennedy M, Lowe S, Lang P, Briggs J, Dallas H, Taylor J, Bertolli L, Gibbins C, Soulsby C, Day J, Sichingabula H, Saili H, Kapungwe E, Willems F, Mbulwe F, Murphy K. *14th Congr. Bras. Limnol., Bonito, Brasil,* Sept. 2013

SAFRASS biomonitoring scheme: general aspects, macrophytes (ZMTR) and benthic macroinvertebrates (ZISS) protocols 2013

SAFRASS Training Introduction May 2012: Helen Dallas

SAFRASS Decision Support Scheme (DSS) to assist the use of river health biomonitoring protocols in Zambia: general aspects, invertebrates (ZISS) and macrophytes (ZMTR) components 2012

SAFRASS Training Macrophytes May 2012 Mike Kennedy 2012

SAFRASS Training Invertebrates May 2012 Steven Lowe

SAFRASS Training Diatoms May 2012 Jonathan Taylor

Shrader AM, Bell C, **Bertolli L** and Ward D 2011. Forest or the trees: at what scale do elephants make foraging decisions? *Ezemvelo KZN Wildlife Contemporary Conservation Symposium*.

SAFRASS Proposed procedure for the sampling, preparation and analysis of benthic diatoms from Zambian rivers: a bioassessment and decision support tool applicable to freshwater ecoregions in tropical southern 2011

SAFRASS Assessment of performance of the SAFRASS pilot river biomonitoring scheme 2011

CURRICULUM VITAE

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant
Years with Firm	5 years
Date of Birth	28 May 1991, Pretoria, South Africa
ID Number	910528 5065 080
Nationality	South African

Education

- Pretoria Boys High, Pretoria, South Africa, Matriculated 2009.

Professional Qualification

- B.Sc. Hons Environmental Management and Analysis, (Post Graduate) University of Pretoria Honours (2014).
- B.Sc. Environmental Sciences (Undergraduate) University Of Pretoria (2012-2013)

Employment Record

Jan 2019 – Current	SiVEST SA (Pty) Ltd - Environmental Consultant
Aug 2018 – Dec 2018	Marang Environmental and Associates (Pty) Ltd – Environmental Consultant
May 2015 – Aug 2018	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Years of Working Experience: 5 Years

Countries of Working Experience

- South Africa

Fields of Specialisation

- Environmental Management

Overview

Stephan originally joined SiVEST in May 2015 and held the position of Graduate Environmental Consultant in the Johannesburg office. After leaving SiVEST in August 2018, and being employed for a brief period at another environmental consulting company, Stephan re-joined SiVEST in January 2019 and currently holds the position of Environmental Consultant in the Gauteng region (Pretoria and Johannesburg).

Stephan has been extensively involved in Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects / developments, in particular renewable energy projects / developments which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). As such, Stephan has vast experience with regards to the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Additionally, Stephan has extensive experience in undertaking public participation and stakeholder engagement processes. Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as Surface Water and Visual Impact Assessments. Stephan also has considerable experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Skills:

- Strong computer skills (Work, excel, PowerPoint etc.);
- Strong Proposal and report writing skills;
- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);
- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience:

- Environmental Impact Assessment (EIA) of small, medium and large-scale infrastructure projects,
- Basic Assessment (BA), of small, medium and large-scale infrastructure projects,
- Environmental Management Plans (EMPr), of small, medium and large-scale infrastructure projects,
- Undertaking of Public Participation and Stakeholder Engagement Processes
- Proposal and tender compilation,
- Environmental Compliance and Auditing (ECO);
- Various site inspections, and
- Visual Impact Assessments (Field work and report compilation).

Projects Experience (by Sector)

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities, along with a description of the role played in each project / activity, are outlined in detail below:

ENVIRONMENTAL CONTROL OFFICER (ECO) MONITORING / AUDITING PROJECTS: -

- Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province.

- Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the proposed NuPay Office Block development at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the proposed Construction of the Decathlon Building at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the External Road Upgrades at the Newmarket Retail Development, Gauteng Province.

- Environmental Control Officer (ECO) for the Netcare Alberton Hospital Development as part of the Greater Newmarket Development, Gauteng Province.

BASIC ASSESSMENTS (BAS) FOR INFRASTRUCTURE PROJECTS:

- Basic Assessment (BA) for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province.

- Basic Assessment (BA) for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province.

- Basic Assessment (BA) for the Proposed Construction of a New SPAR Distribution Centre on Erf 1092 at Redhouse in Port Elizabeth, Eastern Cape Province.

BASIC ASSESSMENTS (BAs) FOR RENEWABLE ENERGY PROJECTS:

- Basic Assessment (BA) for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Basic Assessment (BA) for the Proposed Development of the Tooverberg Wind Energy Facility (WEF) near Touws River, Western Cape Province.

- Basic Assessment (BA) for the Proposed Development of the Tooverberg On-site Eskom Substation and 132kV Power Line for the proposed Tooverberg Wind Energy Facility (WEF) near Touws River, Western Cape Province.

ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) FOR RENEWABLE ENERGY PROJECTS: -

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Graskoppies Wind Farm near Loeriefontein, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriefontein, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Ithemba Wind Farm near Loeriefontein, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the !Xha Boom Wind Farm near Loeriefontein, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the 325MW Rondekop Wind Energy Facility between Matjiesfontein and Sutherland, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Mooi Plaats Solar Photovoltaic (PV) Energy Facility near Noupoort, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Wonderheuvel Solar Photovoltaic (PV) Energy Facility near Noupoort, Northern Cape Province.

- Environmental Impact Assessment (EIA) for the Proposed Construction of the Paarde Valley Solar Photovoltaic (PV) Energy Facility near Middelburg, Eastern Cape Province.

PART 2 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS:

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the Aletta 140MW Wind Energy Facility (WEF) and Associated Infrastructure near Copperton, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the 140 MW Beaufort West Wind Farm in the Prince Albert Local Municipality, Western Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Development of the 140MW Trakas West Wind Farm in the Prince Albert Local Municipality, Western Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Graskoppies Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Hartebeest Leegte Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW Ithemba Wind Farm near Loeriefontein, Northern Cape Province.

- Part 2 Environmental Authorisation (EA) Amendment Process for the Proposed Construction of the 235MW !Xha Boom Wind Farm near Loeriefontein, Northern Cape Province.

VISUAL IMPACT ASSESSMENTS (VIAs) FOR INFRASTRUCTURE PROJECTS

- Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland.

- Visual Impact Assessment for the Proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.

- Visual Impact Assessment for the Proposed Tinley Manor South Banks Beach Enhancement Solution, KwaZulu-Natal Province.

- Visual Impact Assessment for the proposed Mlonzi Hotel and Golf Estate Development, Near Lusikisiki, Eastern Cape Province

- Visual Impact Assessment for the Proposed Assagay Valley Development, KwaZulu-Natal Province.

- Visual Impact Assessment for the Proposed Kassier Road North Development, KwaZulu-Natal Province.

VISUAL IMPACT ASSESSMENTS (VIAs) FOR RENEWABLE ENERGY PROJECTS: -

- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.
- Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province.
- Visual Impact Assessments for the proposed construction of the Tlisitseng Solar 1 and Tlisitseng Solar 2 Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 1 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the Tlisitseng 2 132kV Substation and associated 132kV Power Line near Lichtenburg, North West Province.
- Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province.
-
- Visual Impact Assessment for the proposed construction of the Aletta 132kV Substation and associated 132kV Power Line near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 400kV Substation and 400kV Power Line neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Graskoppies Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Graskoppies Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Hartebeest Leegte Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Visual Impact Assessment for the Proposed Construction of the Ithemba Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.
- Visual Impact Assessment for the Proposed Construction of the !Xha Boom Wind Farm near Loeriesfontein, Northern Cape Province.

- Basic Visual Impact Assessment for the Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province.

- Visual Impact Assessment for the Proposed Construction of the 315MW Phezukomoya Wind Energy Facility near Noupoort, Northern Cape Province.

- Visual Impact Assessment for the Proposed Construction of the 390MW Sankraal Wind Energy Facility near Noupoort, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the Phase 1 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the Phase 2 Kuruman Wind Energy Facility, Kuruman, Northern Cape Province.

- Basic Visual Impact Assessment for the proposed development of Supporting Electrical Infrastructure to the Phase 1 and Phase 2 Kuruman Wind Energy Facilities, Kuruman, Northern Cape Province.

- Visual Impact Assessment for the proposed development of the 325MW Kudusberg Wind Energy Facility (WEF) located between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces.

- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.

- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces.

ENVIRONMENTAL SCREENING / ENVIRONMENTAL REVIEW / ENVIRONMENTAL DUE DILIGENCE PROJECTS

- Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development.

- Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province.

SURFACE WATER ASSESSMENTS FOR INFRASTRUCTURE PROJECTS

- Surface Water Assessment for the Steve Thswete Local Municipality, Mpumalanga Province.

- Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

ANNEXURE B
ENVIRONMENTAL INCIDENTS

LOG Environmental Incident Log

ENVIRONMENTAL INCIDENT LOG				
Date	**Env. Condition**	**Comments** *(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)*	**Corrective Action Taken** (*Give details and attach documentation as far as possible)*	**Signature**

ANNEXURE C

COMPLAINTS RECORD SHEET

Complaints Record Sheet

COMPLAINTS RECORD SHEET	**File Ref:** **Page …. of ….**	**DATE:** **…………………………**
COMPLAINT RAISED BY:		
CAPACITY OF COMPLAINANT:		
COMPLAINT RECORDED BY:		
COMPLAINT:		
PROPOSED REMEDIAL ACTION:		
ECO: ___________________ Date: ___________________		
NOTES BY ECO:		
ECO: ___________ Date: ___________ Site Manager: ___________ Date: ___________		

ANNEXURE D
MANAGEMENT OF SOILS: GUIDELINES

Topsoil

- Source of topsoil
- Topsoil must be stripped from all areas that are to be utilised during the construction period and where permanent structures and access is required. These areas will include temporary and permanent access roads, construction camps, and lay down areas. Topsoil must be stripped after clearing of woody vegetation and before excavation or construction commences.
- The topsoil is regarded as the top 300mm of the soil profile irrespective of the fertility appearance, structure, agricultural potential, fertility and composition of the soil.

Topsoil stripping

- Soil must be stripped to a minimum depth of 150mm and maximum depth of 300mm or to the depth of bedrock where soil is shallower than 300mm. Herbaceous vegetation, overlying grass and other fine organic matter must not be removed from the stripped soil.
- No topsoil which has been stripped must be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
- Topsoil must preferably be stripped when it is in a dry condition in order to prevent compaction.

Topsoil stockpiling

- The Consulting Engineer or Environmental Control Officer must stockpile stripped topsoil in areas, which have been approved. Soil stockpiles must take the form of windows.
- To prevent erosion, material stockpiled for long periods (2 weeks) must be retained in a bermed area.
- Topsoil, mulch and subsoil stockpiles must be placed in higher-lying areas of the sit, and must not be positioned within stormwater channels or areas of ponding.
- Topsoil stripped from different soil zones must be stockpiled separately and clearly identified as such. Under no circumstances must topsoil obtained from different soil zones be mixed.
- Soil stockpiles must not be higher than 2m or stored for a period longer than one year. The slopes of soil stockpiles must not be steeper than 1 vertical to 2.5 horizontal.
- No vehicles must be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles must be clearly demarcated in order to prevent vehicle access and for later identification when required.
- Soil stockpiles must not become contaminated with oil, diesel, petrol, garbage or any other material, which may inhibit the later growth of vegetation in the soil.
- After topsoil removal has been completed, the Contractor must apply soil conservation measures to the stockpiles where and as directed by the Consulting Engineer or Environmental Control Officer. This must include the use of erosion control fabric or grass seeding.

Topsoil replacement

- Topsoil must be replaced to a minimum depth of 75mm over all areas where it has been stripped and over disused borrow pits, after construction in those areas has ceased. Topsoil placement must follow as soon as construction in an area has ceased.

- All areas onto which topsoil is to be spread must be graded to the approximate original landform with maximum slopes of 1:25 and must be ripped prior to topsoil placement. The entire area must be ripped parallel to the contours to a minimum depth of 300mm.
- Topsoil must be placed in the same soil zone from which it had been stripped. However, if there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil must be brought from other soil zones at the approval of the Consulting Engineer or Environmental Control Officer.
- Where topsoil that has been stripped by the Contractor is insufficient to provide the minimum specified depth, the Contractor must obtain suitable substitute material from other sources at no cost to the employer. The suitability of the substitute material must be determined by means of soil analyses, which are acceptable to the Consulting Engineer or Environmental Control Officer.
- No vehicles must be allowed access onto or through topsoil after it has been reinstated.
- After topsoil reinstatement is complete, cleared and stockpiled vegetative matter must be spread randomly by hand over the top soiled area. The vegetative material must be replaced on the areas from where it has been removed.

ANNEXURE E

PLANT RESCUE PLAN

Plant Rescue Management Plan

David Hoare
Consulting

99 MW Oya Wind Energy Facility (WEF) and associated infrastructure between Sutherland and Matjiesfontein, Western and Northern Cape Provinces

David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Telephone: 087 701 7629
Cell: 083 284 5111
Fax: 086 550 2053
Email: dhoare@lantic.net

Plant Rescue Management Plan for the proposed 99 MW Oya Wind Energy Facility between Sutherland and Matjiesfontein in the Western and Northern Cape Provinces.

Location:
Witzenberg Local Municipality within the Cape Winelands District Municipality

Prepared for

Oya Energy (Pty) Ltd
5th Floor, 125 Buitengracht Street
Cape Town 8001

Report author:

Dr D.B. Hoare (Pr.Sci.Nat.)

18 January 2021

Report version: 2nd draft

Details of specialist consultant

Company name	David Hoare Consulting (Pty) Ltd
Registration no.:	CK2017/308639/07
Address	Postnet Suite #116 Private Bag X025 Lynnwood Ridge 0040
Contact person	Dr David Hoare
Contact details	Cell: 083 284 5111 Email: dhoare@lantic.net
Qualifications	PhD Botany (Nelson Mandela Metropolitan University) MSc Botany (University of Pretoria) BSc (Hons) Botany (Rhodes University) BSc Botany, Zoology (Rhodes University)

TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

This document provides a management plan for the rescue of listed plants for the project area under the control of the 99 MW Oya Wind Energy Facility (WEF) and associated infrastructure (Figure 1). This site-specific management plan was developed to address the requirement to rescue any plants that could reasonably be expected to survive transplanting from the path of proposed construction. Currently, the site is in a mostly natural state, but this will be altered during the course of the development of the project, at which time various locations will be cleared of natural

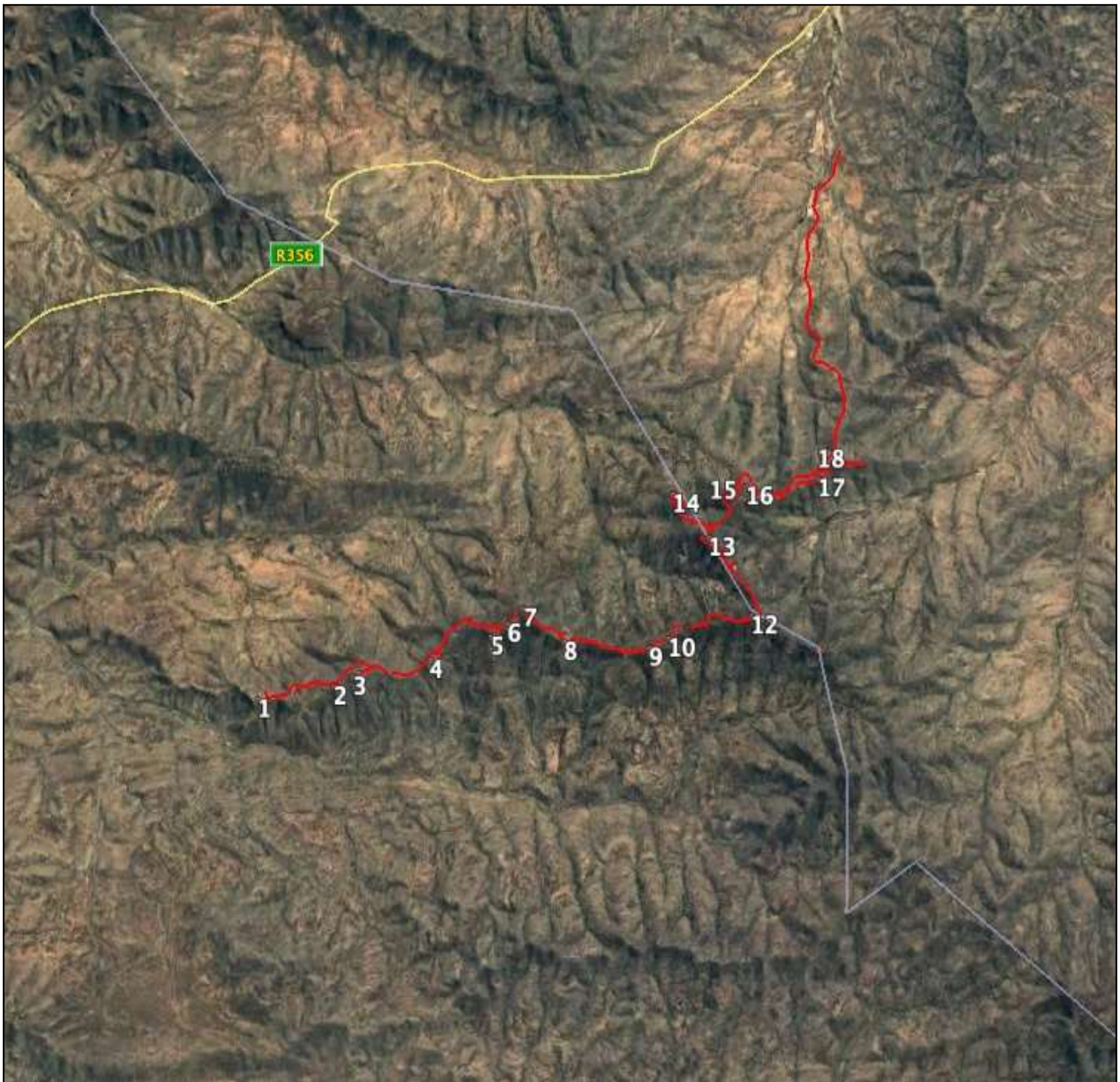

Figure 1: Location and extent of the study area.

habitat in preparation for construction of components of the authorised project. Where possible, it is desirable to undertake rescue of suitable plant material.

1.2 Purpose of the Plant Rescue Plan

The purpose of the Plant Rescue Plan is:

- to provide practical guidance on search and rescue of threatened or protected plant species (TOPS), as weell as any other plants that can be used in the rehabilitation process.

The objective is to identify, remove and, where possible, rescue or relocate species of concern and other species, as discussed. The area to which this Plan refers is the footprint areas of the project within the study area (Figure 1).

1.3 Responsible persons

Rescue of sensitive plant species during the construction phase of the project will be dependent on a number of project personnel. These are listed below:

The Developer

This refers to the project proponent, Oya Energy (Pty) Ltd. It will be responsible for the following:

1. Ensure that the requirements set out in this Plan are adhered to and implemented;
2. Allocate the responsibilities assigned to the Environmental Control Officer (ECO) to an independent suitably qualified individual prior to the start of construction activities on site; and
3. Provide all principal contractors working on the project with a copy of this management plan as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts or alternatively, commission a suitable service provider to undertake the required Search and Rescue independent from any contract documentation with individual contractors.

The Project Environmental Manager

The Project Environmental Manager of the proposed development will be responsible for the overall implementation of the Plan during the construction phase of the project. To effectively implement the plant rescue plan, the Project Environmental Manager must be aware of the findings, mitigation measures and conclusions of the Final EIA report, the requirements of the EA, the EMPr, and this Plan.

The Environmental Control Officer (ECO)

The ECO is responsible for monitoring and verifying the implementation of the Plan during the construction phase of the project. To effectively implement the Plan, the ECO must be aware of the findings, mitigation measures and conclusions of the Final EIA Report, the EA, and this Plan.

The Contractor

The contractor, being any directly appointed company or individual undertaking the implementation of works, may be responsible for complying with the Plan at all times during the construction phase. Alternatively, an independent Nursery Contractor/Horticulturalist may be appointed to undertake the Search and Rescue. If such a contractor is appointed, they require competency in horticulture, and possibly landscaping.

1.4 Legal Requirements

- National Environmental Management: Biodiversity Act (Act 10 of 2004), including Threatened or Protected Species Regulations;
- National Environmental Management Act (Act 107 of 1998);
- Cape Nature and Environmental Conservation Ordinance 19 of 197
- Northern Cape Nature Conservation Act No. 9 of 2009

2. ECOLOGICAL PRINCIPLES FOR PLANT RESCUE

Plant rescue is considered to be a last resort to conserve individual plants, when authorization for development has been obtained and construction is imminent. The ecosystem within the footprint of the development, with all its species diversity, genetic variation and ecological interrelationships will be lost and the objective is to salvage something prior to the destruction. Some considerations are as follows:

1. Plant rescue can usually only salvage a small proportion of the plants on site. This is due to two main factors, firstly, the fact that different species appear at different times and some species will almost certainly be dormant at the time that the Search and Rescue is undertaken, and secondly, there may be practical limitations in terms of how much plant material can be salvaged.
2. Globally, it has been recognised that the selection of plants to rescue is based on criteria that may have little to do with conservation, for example, ease of access, horticultural value and probability of survival.
3. Plants chosen for rescue may not thrive or even survive. It is highly unlikely that all rescued plants will survive. This is based on the fact that it is virtually impossible to predict without experimentation and research exactly what artificial conditions will be required for the management of each species in order to ensure survival.
4. Various agencies globally (e.g IUCN) and nationally (e.g. SANBI) have expressed concern regarding the concept of plant rescue. The concern is that the implementation of a plant Search and Rescue can weaken support for habitat conservation by fostering the perception that rescuing selected plants can compensate for destruction of an entire habitat, or that landscape plantings can substitute for natural areas.
5. Plant rescue can divert time, energy, resources and leadership from tasks that may be more effective in protecting natural habitats.
6. Plants can be used for rehabilitation of affected areas, thereby restoring something resembling the natural vegetation.
7. It can also make a long-term contribution to public education by providing native plants for public gardens and nature centers.

2.1 Principles

- *In situ* conservation is preferable to *ex situ* conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species. This principle is very strongly emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:

> "*In situ conservation is vital and should be recommended as the only option for conserving species of conservation concern. Ex situ conservation, i.e. the removal of a subpopulation from its natural habitat to an artificial environment, a practice often termed 'search and rescue', will result in the erosion of the inherent genetic diversity and characteristics of that species and increase its extinction risk in the wild. Similarly, translocation of subpopulations is an unacceptable conservation measure.*"

- In order to ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist. This requires that natural habitats are maintained in an ecologically functional condition.
- Translocation of Red List species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects, as follows:
    - Alterations to habitat by translocated species may be harmful to other species,
    - Translocations may lead to transmission of pathogens or parasites (Hodder & Bullock, 1997).
    - Translocation may result in rapid changes in the species itself (Conant, 1988).
    - Translocations are expensive and rarely successful (Griffith et al., 1989).
    - Success entails not only survival of the translocated individuals but also establishment of a self-sustaining, viable population able to reproduce and adapt to changing environmental conditions (Milton et al., 1999).
    - Relocation of rescued plants to undisturbed habitats falsifies the local history of natural dispersal and alters the natural species composition of the target site.

Once again, this has been emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:

> *"Translocations are expensive and rarely successful. Even if they are successful, translocated individuals may harm other species within the receiving environment, the translocated individuals may transmit pathogens and/or parasites, and translocation may result in rapid changes in the species itself."*

"Search and Rescue" as a conservation ideal therefore contradicts principles espoused by the South African National Biodiversity Institute (SANBI) and IUCN.

The implications of these principles are as follows:

- It is highly preferable <u>not</u> to replant rescued plants into other natural habitats. Based on scientific evidence and concerns expressed by SANBI, translocation to an existing conservation area cannot be supported as a management measure.
- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. However, as stated in the previous paragraph, re-planting into natural areas is not supported as a management measure.
- Re-planting into the wild must cause as little disturbance and harm as possible to existing natural ecosystems. As stated in the previous paragraph, re-planting into natural areas is not supported as a management measure.
- Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.
- Rescue should not be undertaken from any site where there is a significant risk that well-established invasive alien plants or other pests will be spread by the relocation of native plants.
- The solution would be for rescued plants to only be replanted into disturbed areas after construction for rehabilitation purposes.

2.2 Planning considerations

The following factors affect planning of plant rescue:

- Adequate time must be allowed to obtain the necessary information about the site and its flora. This is usually achieved during the EIA stage and follow-up surveys. A detailed walk-through survey has already been undertaken for the current project. A reliable inventory of the plants found on a site is a key factor in determining whether a rescue is appropriate and, if it is, how the plants will be used. In general, a rescue should not be undertaken if an appropriate use of the rescued plants is not ready at hand or easily found. Where invasive alien species are present, which is not the case here, the numbers and concentrations must be known. If there are large concentrations of alien invasive species, this may rule out any rescue and limits the choice of relocation sites or eventual use of the rescued plants.
- There must be adequately qualified and equipped personnel to undertake a plant rescue. Personnel undertaking the rescue should have the knowledge and skills to ensure that the rescue operation is a success. A trained and qualified botanist is required to identify the species to be rescued, but horticultural skills are required for nursery establishment and for the actual planning and management of a nursery.
- In principle, rescued plants should be utilized for public benefit, not private gain. Acceptable uses are therefore replanting in rehabilitated areas, providing stock for propagation and providing plant material for a scientific project. Problematic uses are selling rescued plants to the public and providing plants for private gardens. This is because additional permits would be required for transport and trade of protected species. An incentive is also created to remove plants from the wild, which is not supported.
- Rescuing plants that are listed as protected under National or Provincial legislation is subject to requirements that cover the collection and use of whole plants, their progeny and plant parts, including seeds. A permit is required to possess, transport or propagate such species. The general permit for removal of TOPS will cover these components. Any trader would be required to get their own permits.
- A priority for replanting is to maintain the ecological integrity of the target habitat. Appropriate target sites include a managed wildflower garden, such as a botanical garden, and an interpretative nature trail. Botanical gardens offer programs to help visitors identify and learn about native plants and can make it clear that plants have been rescued, not wild collected, especially for those species that are not commercially available. Inappropriate target sites are natural habitats in which ecological integrity is currently uncompromised.

Identified limitations in meeting RoD requirements

Based on the limitations provided above, it is proposed that the following activities should be undertaken to address the conditions that can be met:

1. All TOPS that can be located within the footprint of the development zone, as identified by a botanist, should be rescued. This includes suitable tree seedlings and understory plants inside the servitude in the forest areas. A rescue operation should be undertaken by the horticultural contractor / plant rescue team to remove as many of these as possible.
2. Temporary nurseries should be established in close proximity to the construction areas, as far as possible, and should be located in non-sensitive areas.
3. An invitation should be sent to CREW[1] to remove any plants within the footprint of the development zone prior to construction. Whether or not they respond positively to this or not will be based on policies and

[1] The Custodians of Rare and Endangered Wildflowers (CREW) programme involves volunteers from the public in the monitoring and conservation of South Africa's threatened plants. The programme is a partnership between SANBI and the Botanical Society of South Africa (BotSoc).

discussions which they will need to develop internally, but it is important to maintain communications with them in this regard.

4. Topsoil removed from the footprint of the construction path should be carefully managed to ensure that propagules within the soil mass also have an opportunity to survive. This will include any geophytes or plants with underground parts that will grow after soil translocation.
5. Stockpiled soil should be used for rehabilitation and any plants within the soil that have survived should become established.
6. Rescued plants within temporary nurseries that are appropriate to transplant into rehabilitated areas should be planted out during rehabilitation.
7. Remaining plants not used in rehabilitation should be kept in temporary nurseries for a limited period of time. Thereafter, these remaining plants should be handed over to new custodians, which may include public and educational institutions.
8. No translocation to other natural areas should take place.

3. SPECIES OF CONSERVATION CONCERN THAT OCCUR ON SITE

This section provides an outline of the existing status of the study area with respect to the occurrence of any species of conservation concern or any other plant species that are deemed worthy of rescue prior to construction. The purpose is to provide an indication of the identity of such species.

3.1 Protected plants (National Environmental Management: Biodiversity Act)

Only one plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) could potentially occur on site, namely *Hoodia gordonii*. There are no other plant species protected according to this legislation that have a geographical distribution that includes the study area. The walk-down survey did not encounter any individuals of this species. There are therefore no species for which permits will be required under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).

3.2 Protected plants (Cape Nature and Environmental Conservation Ordinance 19 of 1974)

Plant species protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974 are listed in Appendix 2. There are two Schedules under this Ordinance, the first (Schedule 3) being Endangered species and the second (Schedule 4) Protected species. None of the species in the first Schedule (Schedule 3: Endangered species) have a geographical distribution that includes the site. They therefore do not occur there.

A number of species protected according to Schedule 4 were found on site. From the field surveys of the site, this includes the following species:

- *Antimima hallii* (AIZOACEAE)
- *Antimima pumila* (AIZOACEAE)
- *Astroloba bullulata* (ASPHODELACEAE)
- *Babiana cuneata* (IRIDACEAE)
- *Babiana spathacea* (IRIDACEAE)
- *Brunsvigia comptonii* (AMARYLLIDACEAE)
- *Cephalophyllum* sp. (AIZOACEAE)
- *Cheiridopsis namaquensis* (AIZOACEAE)
- *Crassula columnaris* subsp. *columnaris* (CRASSULACEAE)
- *Delosperma* sp. (AIZOACEAE)
- *Drosanthemum* sp. (AIZOACEAE)
- *Gladiolus splendens* (IRIDACEAE)

- *Hammeria gracilis* (AIZOACEAE)
- *Hammeria meleagris* (AIZOACEAE)
- *Lampranthus* sp. (AIZOACEAE)
- *Leipoldtia schultzei* (AIZOACEAE)
- *Mesembryanthemum guerichianum* (AIZOACEAE)
- *Mesembryanthemum junceum* (AIZOACEAE)
- *Mesembryanthemum nitidum* (AIZOACEAE)
- *Mesembryanthemum noctiflorum* (AIZOACEAE)
- *Mesembryanthemum tortuosum* (AIZOACEAE)
- *Microloma sagittatum* (APOCYNACEAE)
- *Moraea cuspidata* (IRIDACEAE)
- *Moraea flaccida* (IRIDACEAE)
- *Moraea pritzeliana* (IRIDACEAE)
- *Moraea tripetala* (IRIDACEAE)
- *Pectinaria articulata* (APOCYNACEAE)
- *Psilocaulon junceum* (AIZOACEAE)
- *Quaqua mammillaris* (APOCYNACEAE)
- *Ruschia intricata* (AIZOACEAE)
- *Ruschia multiflora* (AIZOACEAE)
- *Veltheimia capensis* (HYACINTHACEAE)

3.3 Protected plants (Northern Cape Nature Conservation Act No. 9 of 2009)

A number of flora species protected according to Schedule 2 of the Northern Cape Nature Conservation Act No. 9 of 2009 were found on site. From the field surveys of the site, this includes all the species listed for the Western Cape Province (above), as well as the following species:

- *Adromischus liebenbergii* (CRASSULACEAE)
- *Albuca tenuifolia* (ASPHODOLACEAE)
- *Aloe microstigma* (ASPHODOLACEAE)
- *Crassula cotyledonis* (CRASSULACEAE)
- *Crassula deltoidea* (CRASSULACEAE)
- *Crassula dependens* (CRASSULACEAE)
- *Crassula subaphylla* (CRASSULACEAE)
- *Drimia physodes* (HYACINTHACEAE)
- *Euphorbia mauritanica* (EUPHORBIACEAE)
- *Euphorbia multiceps* (EUPHORBIACEAE)
- *Lachenalia comptonii* (HYACINTHACEAE)
- *Pelargonium abrotanifolium* (Pelargonium spp.)
- *Pelargonium crithmifolium* (Pelargonium spp.)

- *Pelargonium luteopetalum* (Pelargonium spp.)
- *Pelargonium moniliforme* (Pelargonium spp.)

4. PLANT RESCUE PLAN

This section provides details on the actions that are required to rescue any TOPS and/or listed plant species from the path of development and what steps are to be taken to house them temporarily and then to place them back into suitable habitats.

4.1 Plant rescue activities required

Before construction commences at the site, the following actions must be taken:

Action	***Responsible person***
<u>Collate information on potential species of concern</u> ***Initial identification of all listed species that may occur within the project area. This is covered in this report and other survey reports related to this project. The action is therefore complete.***	Botanist
<u>Mark footprint of proposed construction area</u> ***The footprint of proposed development must be marked out prior to breaking ground. (It is assumed that this will follow a phased approach and that not all areas will be marked simultaneously. An example would be pegging out the route of a section of road to be constructed prior to earth-moving equipment beginning work on construction but could also include provision of a GPS track or GIS polygon file that depicts the affected areas.)***	Contractor / Engineer / Developer
<u>Species search and rescue</u> ***Location and rescue of all plants to be rescued that may occur within marked out areas (within the footprint of proposed infrastructure). The marked-out area must be walked and required species rescued.***	Botanist
<u>Plant marking and information requirements</u> ***For all plants that are rescued, relevant information should be collected, as is determined by the horticulturalist as being adequate for reporting and monitoring. This information could include the number of individuals/clumps and date collected, as well as where they came from.***	Qualified botanist / horticulturalist
<u>Establishment of nurseries</u> • ***Nursery facilities must be established within either the proposed site office area or in a construction laydown area or in any other suitable site where***	

additional natural habitat will not be affected and where there is access to water. • *Permits to collect, relocate and propagate plant material and to collect seed or cuttings for the contract must be obtained from the relevant authorities. This should be a single permit application that covers all components of the project.* • *The landscaping contractor must provide a comprehensive method statement relating to the nursery locality, layout, structures, operations and security. The method statement must also cover all aspects of operation, including sources of water and growing medium and a description of the intended practices to be used. The intended use of all horticultural practices should be described, as well as the intended use of additives such as polymer gels and resins. The proposed practices must be suited to the list of rescued species and should take specialized growing requirements into consideration.* • *The nursery must include a storage area. The nursery and storage area must be of adequate capacity to provide an amount of material stored (of whatever sort required for the completion of the works) sufficient to ensure that no interruption to the progress of the work is occasioned by lack of seeds, plants and other materials. The facility must also be cool and dry and rodent free.* • *The horticulturist / landscaping contractor must inspect all plant materials weekly to locate any diseased or insect pest infestations or weeds. If any are identified, appropriate control measures must be applied.*	
Plant rescue • *Appoint an experienced horticulturalist or landscaping contractor to undertake the rescue operation, manage the rescued plant material and operate the nursery.* • *From information gathered during the process of marking plants, establish the resource requirements for the plant rescue team workforce and the methodology to be employed to maximize the likelihood of success.* • *A multipronged approach to plant rescue should be followed to maximize the likelihood of success. This should take into account overall genetic variability and alternatives to preserving genetic variability. In addition to transplanting of whole plants, seed can be collected to sow* in situ *in suitable habitats. For plants that can be successfully grown in a nursery environment, seed and other propagules (cuttings, wildlings) must be propagated to supplement the plant rescue effort.* • *Habitats that are currently disturbed/transformed and that are outside the development footprint are possible sites for rehabilitation where a positive biodiversity outcome can be locally achieved.* • *Rescued plants must be planted into a container to be housed within a temporary nursery on site or immediately planted into the target habitat.*	

If planted into natural habitat, it must be protected from construction activities and monitored to ensure survival. • ***Where appropriate, it may be possible to directly transplant individuals from areas about to be cleared backwards to areas that are already undergoing rehabilitation.***	
<u>Control of impacts on adjacent areas</u> • ***Any listed plants close to the development servitude that will remain in place may not be defaced, disturbed, destroyed or removed. They should be cordoned off with construction tape or similar barrier and marked as no-go areas.*** • ***The collecting of plants by unauthorized persons should be prevented.*** • ***ECO to monitor that vegetation clearing only happens once all search and rescue operations have been completed.*** • ***The ECO should monitor construction activities in sensitive habitats to ensure that impacts within these areas are kept to a minimum.***	ECO / qualified botanist

5. MONITORING REQUIREMENTS

The following monitoring activities are recommended as part of the plant rescue plan:

- Post-relocation monitoring of plants relocated during search and rescue to evaluate whether the intervention was successful or not. This should be undertaken on an annual basis over a period of three years in order to evaluate the success thereof.
- Provision of a detailed record, including photographs, that indicates the success of the plant rescue operation.

5.1 Indicators and Targets

Indicator	Target
Written and photographic records from all all search and rescue operations.	All species of conservation concern identified or removed prior to clearing.
Survival rate of translocated plants	50-80% (based on probable survival rate of grassland species)

6. CONCLUSIONS

This Control Plan is an initial assessment and should be modified as control methods are activated and conditions related to invasion change on site. This requires continuous input and monitoring, including periodic collection of field data in order to analyse the status of the site and the effectiveness of management interventions, notably in terms of improving habitat condition of priority management units. This Control Plan should feed into / be adapted to a broader biodiversity strategy for the Oya WEF project.

10. REFERENCES:

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10. APPENDICES:

Appendix 1: Plant species of conservation importance that were assessed as having a high probability of being found in the study area.

Taxon	Latest (IUCN version 3.1) Conservation Status**	Habitat	Flowering Time	Probability of occurrence*
Lotononis venosa FABACEAE	Vulnerable	Few known locations. Some of the habitat has been transformed for crop cultivation in the past. Further agricultural expansion and overgrazing by livestock are potential threats. Klein Roggeveld Mountains. Central Mountain Shale Renosterveld, Koedoesberge-Moordenaars Karoo. Open karroid scrub on sandy clay alluvium.	September	**HIGH,** vegetation type and habitat suitable.
Octopoma nanum / octojuge / quadrisepalum AIZOACEAE	Vulnerable	A localized habitat specialist with fewer than 10 known locations and declining due to overgrazing by livestock and game. Tanqua Karoo, Western Little Karoo, Koedoesberge-Moordenaars Karoo, Matjiesfontein Quartzite Fynbos, Tanqua Wash Riviere, Flats and gentle slopes with loamy soils and sparse quartz gravel. Previously recorded in grid as well as a number of surrounding grids that include Roggeveld plateaux, Moordenaars karoo and Cape mountains.	November	**HIGH,** Found on flats and gentle slopes with loamy soils and sparse quartz grave
Ehrharta eburnea *POACEAE*	Near Threatened	Calvinia, Sutherland and Montagu. Rocky places in mountain renosterveld.	September-November	**HIGH,** habitat and distribution matches
Geissorhiza karooica *IRIDACEAE*	Near Threatened	Roggeveld Mountains to Matjiesfontein. Succulent karoo shrubland on course shale slopes.	August-September	**HIGH,** previously recorded on nearby site
Lachenalia whitehillensis *HYACINTHACEAE*	Near Threatened	Southern Roggeveld Escarpment near Sutherland to Matjiesfontein in the southern Great Karoo. Sandy soils in riverbeds and on alluvial plains, sometimes in damp places among rocks in river beds.	October	**HIGH,** recorded on nearby project
Senecio erysimoides ASTERACEAE	Data Deficient – Taxonomically problematic	Unknown, but recorded on three occasions in similar landscapes (Roggeberg foothills) to the north of the site.	December-April	**HIGH**, habitat matches

* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria. *IUCN (3.1) Categories: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NT = Near Threatened.

Appendix 2: Flora protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974

SCHEDULE 3: Endangered Flora
As per the Cape Nature and Environmental Conservation Ordinance 19 of 1974

Family: APOCYNACEAE	Common name / Additional notes
Pachypodium namaquanum	Halfmens (currently listed as LC)
Family: GESNERIACEAE	
Charadrophila capensis	Cape Gloxinia (currently listed as Rare)
Family: LILIACEAE	
Aloe pillansii	Now called *Aloidendron pillansii*, currently listed as Endangered
Aloe buhrii	Currently listed as Vulnerable
Aloe erinacea	Now called *Aloe melanacantha*, currently listed as Least Concern
Family: PROTEACEAE	
Mimetes capitulates	Currently listed as Endangered
Mimetes hottentoticus	Currently listed as Critically Endangered
Mimetes stokoei	Currently listed as Critically Endangered
Orothamnus zeyheri	Currently listed as Vulnerable
Protea odorata	Currently listed as Critically Endangered
Family: STANGERIACEAE	
Stangeria eriopus	Bobbejaankos (currently listed as Vulnerable)
Family: ZAMIACEAE	
Encephalartos spp.	Cycads, all species

SCHEDULE 4: PROTECTED SPECIES
As per the Cape Nature and Environmental Conservation Ordinance 19 of 1974

Family:AMARYLLIDACEAE	**All species**
Family: APOCYNACEAE	**All species except those listed in Schedule 3**
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia elliottiana	Yellow arum lily (currently DDT)
Family: ASCLEPIADACEAE (now Apocynaceae)	**All species**
Family: BORAGICNACEAE	
Echiostachys spicatus	
Family: BRUNIACEAE	All species
Family: COMPOSITAE (now Asteraceae)	
Senecio colyphyllous (*coleophyllous*?)	
Cotula duckitteae	
Family: CRASSULACEAE	
Crassula columnaris	
Crassula perfoliata	
Crassula pyramidalis	
Kalanchoe thyrsiflora	
Rochea coccinea (now Crassula cochinea)	
Family: CUNONIACEAE	
Cunonia capensis	
Platylophus trifoliatus	

Family: DIOSCOREACEAE	
Testudinaria sylvatica (now Dioscorea sylvatica)	
Testudinaria elephantipes (now Dioscorea elephantipes)	
Family: ERICACEAE	All species
Family: EUPHORBIACEAE	
Euphorbia bupleurifolia	
Euphorbia fasciculata	
Euphorbia globosa	
Euphorbia horrida	
Euphorbia meloformis	
Euphorbia obesa	
Euphorbia schoenlandii	
Euphorbia symmetrica	
Euphorbia valida	
Family: GEISSOLOM(AT)ACEAE	All species
Family: GESNERIACEAE	
Streptocarpus	All species
Family: GRAMINAE (now Poaceae)	
Arundinaria tessellata (Thamnocalamus tessellatus)	
*Secale africanum (*now *Secale strictum* subsp. *africanum)*	
Family: GRUBBIACEAE	All species
Family: IRIDACEAE	**All species**
Family: LEGUMINOSAE (now Fabaceae)	
Erythrina acanthocarpa	
Erythrina humeana	
Liparia comantha	
Liparia sphaerica	
Liparia splendens	
Podalyria calyptrata	
Priestleya vestita	
Priestleya tomentosa	
Family: LILIACEAE (now split into a number of families)	
All species of the genus ALOE except those specified in Schedule 3 and the species *Aloe ferox*	
Gasteria beckeri	
Gloriosa superba	
All species of the genus Haworthia	
All species of the genus Kniphofia	
All species of the genus Lachenalia	
Littonia modesta	
Sandersonia aurantiaca	
All species of the genus Velthemia	
Agapanthus walshii	
Daubenya aurea	
Family: MELIACEAE	
Nymania capensis	
Family: MESEMBRYANTHEMACEAE (now Aizoaceae)	**All species**
Family: MUSACEAE (now Strelitziaceae)	
Strelitzia	All species
Family: NYMPHAECEAE	
Nymphaea capensis (now N. nouchali)	
Family: ORCHIDACEAE	All species
Family: OXALIDACEAE	
Oxalis nutans (no such species)	

Family: PENAEACEAE	All species
Family: POLYGALACEAE	
Muraltia minuta	
Family: POLYPODIACEAE	
Adiantium (now Family Pteridaceae)	All species
Hemitelia capensis (now Alsophila capensis, Family Cyathaceae)	
Polystichum adiantiforme (now Rumohra adiantiformis, Family Dryopteridaceae)	
Family: PORTULACACEAE	
Anacampseros (now Family Anacampserotaceae)	All species
Family: PROTEACEAE	
All species	
Family: RANUNCULACEAE	
Anemone capensis (now A.tenuifolia)	
Family: RESTIONACEAE	
Chondropetalum	
Acockii pillans (no such species)	
Elegia fenestrata	
Restio acockii	
Restio micans	
Restio sabulosus	
Family: RETZIACEAE (now Stilbaceae)	
Retzia capensis	
Family: RHAMNACEAE	
Phylica pubescens	
Family: RORIDULACEAE	All species
Family: RUTACEAE	All species
Family: SCROPHULARIACEAE	
Diascia	All species
Harveya	All species
Nemesia strumosa	
Halleria	All species
Family: THYMELAEACEAE	
Lachnaea aurea	

Appendix 3: Flora protected under the Northern Cape Nature Conservation Act No. 9 of 2009.

SCHEDULE 1: SPECIALLY PROTECTED SPECIES
As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 1

Family: AMARYLLIDACEAE	
Clivia mirabilis	Oorlofskloof bush lily / Clivia
Haemanthus graniticus	April fool
Hessea pusilla	
Strumaria bidentata	
Strumaria perryae	
Family: ANACARDIACEAE	
Ozoroa spp.	All species
Family: APIACAEAE	
Centella tridentata	
Chamarea snijmaniae	
Family: APOCYNACEAE	
Hoodia gordonii	
Pachypodium namaquanum	Elephant's trunk
Family: ASPHODOLACEAE	
Aloe buhrii	
Aloe dichotoma	
Aloe dichotoma var. rumosissima	Maiden quiver tree
Aloe dabenorisana	
Aloe erinacea	
Aloe meyeri	
Aloe pearsonii	
Aloe pillansii	
Trachyandra prolifera	
Family: ASTERACEAE	
Athanasia adenantha	
Athanasia spathulata	
Cotula filifolia	
Euryops mirus	
Euryops rosulatus	
Euryops virgatus	
Felicia diffusa subsp. khamiesbergensis	
Othonna armiana	
Family: CRASSULACEAE	
Tylecodon torulosus	
Family: DIOSCORACEAE	
Dioscorea spp.	Elephant's foot, all species
Family: ERIOSPERMACEAE	
Eriospermum erinum	
Eriospermum glaciale	
Family: FABACEAE	
Amphithalea obtusiloba	
Lotononis acutiflora	
Lotononis polycephala	
Lessertia spp.	
Sceletium toruosum	
Sutherlandia spp.	Cancer Bush, all species

Wiborgia fusca subsp. macrocarpa	
Family: GERANIACEAE	
Pelargonium spp.	Pelargonium, all species
Family: HYACINTHACEAE	
Drimia nana	
Ornithogalum bicornutum	
Ornithogalum inclusum	
Family: IRIDACEAE	
Babiana framesii	
Ferraria kamiesbergensis	
Freesia marginata	
Geissorhiza subrigida	
Hesperantha minima	
Hesperantha oligantha	
Hesperantha rivulicola	
Lapeirousia verecunda	
Moraea kamiesensis	
Moraea namaquana	
Romulea albiflora	
Romulea discifera	
Romulea maculata	
Romulea rupestris	
Family: MOLLUGINACEAE	
Hypertelis trachysperma	
Psammotropha spicata	
Family: ORCHIDACEAE	
Corycium ingeanum	
Disa macrostachya	Disa
Family: OXALIDACEAE	
Oxalis pseudo-hirta	Sorrel
Family: PEDALIACEAE	
Harpagophytum spp.	Devils' claw
Family: POACEAE	
Prionanthium dentatum	
Secale strictum subsp. africanum	Wild rye
Family: PROTEACEAE	
Leucadendron meyerianum	Tolbos
Mimetes spp.	All species
Orothamnus zeyheri	
Family: ROSACEAE	
Cliffortia arborea	Sterboom
Family: SCROPHULARIACEAE	
Charadrophila capensis	Cape Gloxinia
Family: STANGERIACEAE	
Stangeria spp.	Cycads, all species
Family: ZAMIACEAE	
Encephalartos spp.	Cycads, all species

SCHEDULE 2: PROTECTED SPECIES
As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 2

Family: ACANTHACEAE	
Barleria paillosa	
Monechme saxatile	

Peristrophe spp.	All species
Family: ADIANTHACEAE	
Adiantium spp.	Maidenhair Fern, all species
Family: AGAPANTHACEAE	
Agapanthus spp.	All species
Family: AIZOACEAE (MESEMBRYANTHEMACEAE)	**All species**
Family:AMARYLLIDACEAE	All species except those listed in Schedule 1
Family: ANTHERICACEAE	All species
Family: APIACEAE	All species except those listed in Schedule 1
Family: APOCYNACEAE	All species except those listed in Schedule 1
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia spp.	Arum lilies, all species
Family: ARALIACEAE	
Cussonia spp.	Cabbage trees, all species
Family: ASPHODOLACEAE	**All species except those listed in Schedule 1 and the species *Aloe ferox***
Family: ASTERACEAE	
Helichrysum jubilatum	
Felicia deserti	
Gnaphalium simii	
Lopholaena longipes	
Senecio albo-punctatus	
Senecio trachylaenus	
Trichogyne lerouxiae	
Tripteris pinnatilobata	
Troglophyton acocksianum	
Vellereophyton lasianthum	
Family: BURMANNIACEAE	
Burmannia madagascariensis	Wild ginger
Family: BURSERACEAE	
Commiphora spp.	All species
Family: CAPPARACEAE	
Boscia spp.	Shepherd's trees, all species
Family: CARYOPHYLLACEAE	
Dianthus spp.	All species
Family: CELASTRACEAE	
Gymnosporia spp.	All species
Family: COLCHICACEAE	
Androcymbium spp.	All species
Gloriosa spp.	All species
Family: COMBRETACEAE	
Combretum spp.	All species
Family: CRASSULACEAE	All species except those listed in Schedule 1
Family: CUPPRESSACEAE	
Widdringtonia spp.	Wild cypress, all species
Family: CYATHEACEAE	
Cyathea spp.	Tree ferns, all species
Cyathea capensis	Tree Fern
Family: CYPERACEAE	
Carex acocksii	
Family: DROSERACEAE	
Drosera spp.	Sundews, all species

Family: DRYOPTERIDACEAE	
Rumohra spp.	Seven Weeks Fern, all species
Family: ERICACEAE	Erica, all species
Family: EUPHORBIACEAE	
Alchornea laxiflora	Venda Bead-string
Euphorbia spp.	**All species**
Family: FABACEAE	
Aspalathus spp.	Tea Bush, all species
Erythrina zeyheri	Ploughbreaker
Argyrolobium petiolare	
Caesalpinia bracteata	
Calliandra redacta	
Crotalaria pearsonii	
Indigofera limosa	
Lebeckia bowieana	
Polhillia involucrate	
Rhynchosia emarginata	
Wiborgia humilis	
Family: HYACINTHACEAE	
Daubenya spp	
Lachenalia spp.	Daubenya, all species
Veltheimia spp.	Viooltjie, all species
Eucomis spp.	Pineapple flower, all species
Neopatersonia namaquensis	
Ornithogalum spp.	All species
Family: IRIDACEAE	All species except those listed in Schedule 1
Family: LAURACEAE	
Ocotea spp.	Stinkwood, all species
Family: MESEMBRYANTHEMACEAE	**All species**
Family: MELIACEAE	
Nymania capensis	Chinese Lantern
Family: OLEACEAE	
Olea europea subsp. africana	Wild olive
Family: ORCHIDACEAE	Orchids, all species except those listed in Schedule 1
Family: OROBANCHACEAE	
Harveya spp.	Harveya, all species
Family: OXALIDACEAE	
Oxalis spp.	Sorrel, all species except those listed in Schedule 1
Family: PLUMBAGINACEAE	
Afrolimon namaquanum	
Family: POACEAE	
Brachiaria dura var. dura	
Dregeochloa calviniensis	
Pentaschistis lima	
Family: PODOCARPACEAE	
Podocarpus spp.	Yellowwoods, all species
Family: PORTULACACEAE	
Anacampseros spp.	All species
Avonia spp.	All species
Portulaca foliosa	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	

Phylica spp.	All species
Family: RUTACEAE	
Agathosma spp.	Buchu, all species
Family: SCROPHULARIACEAE	
Diascia spp.	All species
Halleria spp.	All species
Jamesbrittenia spp.	All species
Manulea spp.	All species
Nemesia spp.	All species
Phyllopodium spp.	All species
Polycarena filiformis	
Chaenostoma longipedicellatum	
Family: STRELITZIACEAE	
Strelitzia spp.	All species
Family: TECOPHILACEAE	
Cyanella spp.	All species
Family: THYMELAEACEAE	
Gnidia leipoldtii	
Family: ZINGIBERACEAE	
Siphonochilus aethiopicus	Wild ginger

ANNEXURE F

ALIEN PLANT MANAGEMENT PLAN

Alien and Invasive Plant Species Management Plan

David Hoare Consulting

99 MW Oya Wind Energy Facility (WEF) and associated infrastructure between Sutherland and Matjiesfontein, Western and Northern Cape Provinces

Alien and Invasive Plant Species Management Plan for the proposed 99 MW Oya Wind Energy Facility between Sutherland and Matjiesfontein in the Western and Northern Cape Provinces.

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1. INTRODUCTION

1.1 Background

This Invasive Species Plan has been compiled according to the requirements of the Alien and Invasive Species Regulations, 2014 of the National Environmental Management: Biodiversity Act (Act 10 of 2004).

The format of this report is based on the document, "*Guidelines for Monitoring, Control and Eradication Plans as required by Section 76 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) for species listed as invasive in terms of Section 70 of this Act, 30 September 2015*", published by the Department of Environmental Affairs. The Guidelines have been drawn up to follow the legal requirements of the Act. Although the study area is not under the control of an organ of state, the Guidelines provide a standardized format that is useful for structuring the Plan.

The Regulations on the management of Listed Alien and Invasive Species under the National Environmental Management: Biodiversity Act were promulgated on 1 August 2014 as Regulation Gazette No. 10244 in Volume 590 of the South African Government Gazette (Publication No. 37885). These regulations came into effect on 1 October 2014.

The Listed Invasive Species were also published on 1 August 2014 as Government Notice No. 599 National Environmental Management: Biodiversity Act (10/2004): “Alien and Invasive Species List, 2014” also in Volume 590 of the South African Government Gazette (Publication No. 37886). In terms of the Act’s Section 70 (1), 559 species /groups of species were listed. These Lists also came into effect on 1 October 2014.

According to Section 75 of NEMBA, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed 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.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

According to NEMBA and the regulations published in Government Notices R.506, R.507, R.508 and R.509 of 2013, any species designated under section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories:

- Category 1a: Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.

- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

1.2 Site characteristics

This Invasive Species Plan applies to the project area under the control of the 99 MW Oya Wind Energy Facility (WEF) and associated infrastructure (Figure 1). This site-specific management plan was developed to address the monitoring, control and eradication of all invasive plant species only for the Oya Wind Energy Facility (WEF) and associated infrastructure. Currently, the site is in a mostly natural state, but this will be altered during the course of the development of the project.

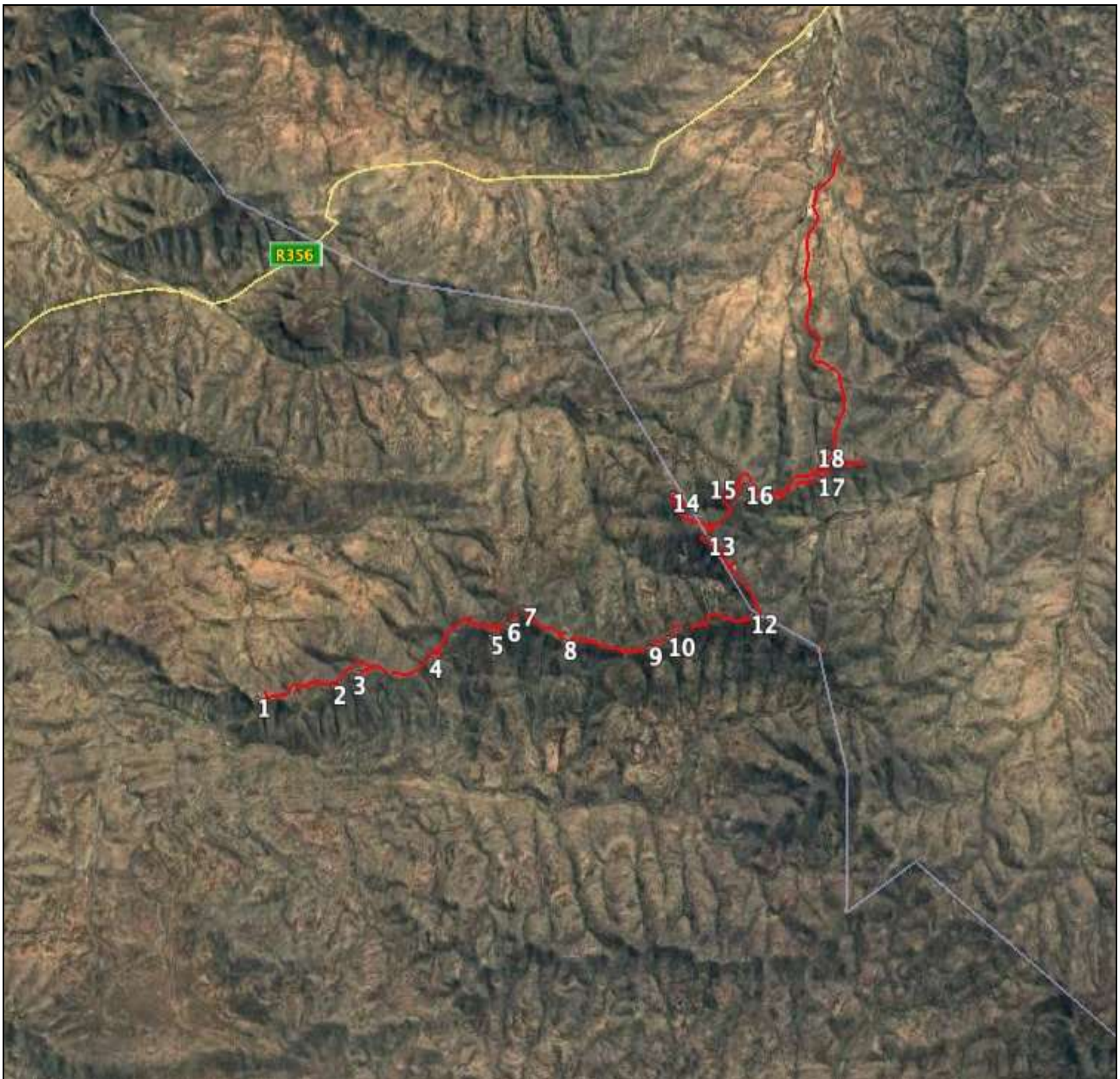


Figure 1: Location and extent of the study area.

Key vulnerabilities to invasion on site include the following:

1. Extensive areas of natural vegetation on site, which house important biodiversity within the study area;
2. Riparian areas, which could act as conduits for alien invasions, as well as being vulnerable to altered ecological conditions under heavy invasion - they are also the areas that most often become heavily invaded in this geographical area;
3. Neighbouring areas that may potentially be vulnerable due to spreading of invasive alien species on site.

Key factors that may promote establishment and spreading of invasive alien species on site include the following:

1. High levels of disturbance anticipated in parts of the site, especially areas of proposed construction, but also various areas that will develop secondary or previously disturbed vegetation following construction.
2. Transport of propagules of alien invasive species via various vectors, primarily construction vehicles and materials.
3. A number of alien invasive species in the general geographical area that are especially problematic within arid parts of South Africa, and especially within specific habitats, such as riparian areas.

Key current advantages are as follows:

4. There are no existing stands of alien trees on site or in neighbouring areas.
5. No nearby urban areas with formal gardens in which high numbers of exotic species are established in the gardens.

Current management of invasive alien species on site has not been required.

Management objectives are proposed to be as follows:

1. Compliance with relevant legislation;
2. Protection of existing biodiversity on site;
3. Enhancement of biodiversity value of disturbed areas, areas of secondary vegetation and rehabilitated areas;
4. Eradication and control of unwanted invasive alien species.

2. APPLICABLE LEGISLATION

2.1 National Environmental Management: Biodiversity Act, 2004 (Act No 10 of 2004)

The National Environmental Management: Biodiversity Act (NEMBA) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. The purpose of Chapter 5 is:

a) to prevent the unauthorized introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur;
b) to manage and control alien species and invasive species to prevent or minimize harm to the environment and to biodiversity in particular;
c) to eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats;

According to Section 65 of the Act, "**Restricted activities involving alien species**":

1) A person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7. Restricted activities include the following:
    a. Importing into the Republic, including introducing from the sea, any specimen of a listed invasive species.
    b. Having in possession or exercising physical control over any specimen of a listed invasive species.
    c. Growing, breeding or in any other way propagating any specimen of a listed invasive species, or causing it to multiply.
    d. Conveying, moving or otherwise translocating any specimen of a listed invasive species.
    e. Selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any other way acquiring or disposing of any specimen of a listed invasive species.
    f. Spreading or allowing the spread of any specimen of a listed invasive species.
    g. Releasing any specimen of a listed invasive species.
    h. Additional activities that apply to aquatic species.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**alien species**" is defined in the Act as:

a) a species that is not an indigenous species; or
b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by means of migration or dispersal without human intervention.

According to Section 71 of the Act, "**Restricted activities involving listed invasive species**":

1) A person may not carry out a restricted activity involving a specimen of a listed invasive species without a permit issued in terms of Chapter 7.
2) A permit referred to in subsection (1) may be issued only after a prescribed assessment of risks and potential impacts on biodiversity is carried out.

An "**invasive species**" is defined in the Act as any species whose establishment and spread outside of its natural distribution range:

a) threaten ecosystems, habitats or other species or have demonstrable potential to threaten ecosystems, habitats or other species; and
b) may result in economic or environmental harm or harm to human health.

A "**listed invasive species**" is defined in the Act as any invasive species listed in terms of section 70(1).

According to Section 73 of the Act, "**Duty of care relating to listed invasive species**":

2) A person who is the owner of land on which a listed invasive species occurs must-

a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land;
b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and
c) take all the required steps to prevent or minimize harm to biodiversity.

According to Section 75 of the Act, "**Control and eradication of listed invasive species**":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed 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.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

It is important to note that alien species that are regulated in terms of the Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA) as weeds and invader plants are exempted from NEMBA. This implies that the provisions of the CARA in respect of listed weed and invader plants supersede those of NEMBA.

2.2 GN No. R.598 National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Regulations, 2014

Provides categories of listed invasive species, defines restricted activities, describes national framework documents (including Exempted Alien Species and Invasive Species Monitoring, Control and Eradication Plans), provides a risk assessment framework and procedure and issuing, amendment and cancellation of permits. These Regulations repeal "The Alien and Invasive Species Regulations 2013, published in Government Notice No R.506, Gazette No. 33683 of 19 July 2013.

According to this Act and the regulations, any species designated under section 70 cannot be propagated, grown, bought or sold without a permit. Below is an explanation of the three categories, according to these Regulations:

2.2.1 Regulation 2. Category 1a Listed Invasive Species

1) Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combatted or eradicated.
2) A person in control of a Category 1a Listed Invasive Species must -
   a) comply with section 73(2) of the Act;
   b) immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of the Act; and
   c) allow an authorised official from the Department to enter onto land to monitor, assist with or implement the combatting or eradication of the listed invasive species.
3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must combat or eradicate the listed invasive species in accordance with such programme.

2.2.2 Regulation 3. Category 1b Listed Invasive Species

4) Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled.
5) A person in control of a Category 1b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act.

6) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
7) A person contemplated in sub-regulation (2) must allow an authorised official from the Department to enter onto land to monitor, assist with or implement the control of the listed invasive species, or compliance with the Invasive Species Management Programme contemplated in section 75(4) of the Act.

2.2.3 Regulation 4. Category 2 Listed Invasive Species

1) Category 2 Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be.
2) Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit.
3) A landowner on whose land a category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
4) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.
5) Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area contemplated in sub-regulation (1), must, for purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to Regulation 3.
6) Notwithstanding the specific exemptions relating to existing plantations in respect of Listed Invasive Plant Species published in Government Gazette No. 37886, Notice 599 of 1 August 2014 (as amended), any person or organ of state must ensure that the specimens of such Listed Invasive Plant Species do not spread outside of the land over which they have control.

2.2.4 Regulation 5. Category 3 Listed Invasive Species

1) Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the Act, as specified in the Notice.
2) Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, must, for the purposes of these regulations, be considered to be a Category 1b Listed Invasive Species and must be managed according to regulation 3.
3) If an Invasive Species Management Programme has been developed in terms of section 75(4) of the Act, a person must control the listed invasive species in accordance with such programme.

In summary:

1) Category 1a: Invasive species requiring compulsory control. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
2) Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have a high invasive potential. No permits will be issued.
3) Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
4) Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

2.2.5 Regulation 6. Restricted activities

In addition to those activities defined in section 1 of the Act as restricted activities, the following activities are hereby prescribed as restricted activities:

a) spreading or allowing the spread of any specimen of a listed invasive species;
b) (b) - (g) do not apply to terrestrial plants.

2.2.6 Chapter 6, Regulations 14 to 17 Risk Assessment:
These regulations describe the framework, facilitator, procedure and report required for a risk assessment, if it becomes necessary to undertake one.

2.3 GN No. R.599 National Environmental Management: Biodiversity Act (10/2004): Notice 3: National List of Invasive Species in terms of Section 70(1)A

This Notice provides a National list of invasive terrestrial and fresh-water plant species, categorized according to GN R.598. This list was compiled in terms of Section 70(1)A, which states that "the Minister must within 24 months of the date on which this section takes effect, by notice in the Gazette, publish a national list of invasive species in respect of which this Chapter must be applied nationally.

2.4 Conservation of Agricultural Resources Act (Act No. 43 of 1983)

In terms of of the amendments to the regulations under this Act, landowners are legally responsible for the control of invasive alien plants on their properties. The schedules provide a list of declared weeds and invaders, which have been divided into three categories, as follows:

- **Category 1 plants** are prohibited and must be controlled.
- **Category 2 plants** (commercially used plants) may be grown in demarcated areas providing that there is a permit and that steps are taken to prevent their spread.
- **Category 3 plants** (ornamentally used plants) may no longer be planted; existing plants may remain, as long as all reasonable steps are taken to prevent the spreading there of, except within the floodline of watercourses and wetlands.

2.5 Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947)

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to “acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container”.

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947). This is regulated by the Department of Agriculture, Forestry and Fisheries.

3. CONCEPTUAL GUIDELINES FOR DETERMINING PRIORITY SPECIES AND AREAS FOR CONTROL

In order to accurately identify and prioritise alien vegetation species for removal and control and to delineate subsequent management units, the invasiveness of a plant species must be assessed.

3.1 Factors that affect the risk of a species becoming invasive

There are a number of factors to take into account when evaluating the potential risk of an invasive species:

1. the impact on ecosystem processes and system-wide parameters,
2. the impact on community structure,
3. the impact on community composition,
4. the impact on individual native species,
5. the conservation value and/or significance of ecological communities and native species threatened by the invasive species,
6. the current range size of the invasive species,
7. the proportion of the current range where the invasive species is negatively impacting biodiversity,
8. the proportion of a region's biogeographical units that are invaded by the species,
9. the diversity of habitats or ecological systems invaded by the invasive species,
10. the current trend in total range of the invasive species (expanding, contracting or stable),
11. the proportion of the current range currently occupied,
12. the long-distance dispersal potential of the invasive species,
13. the local range expansion or change in abundance,
14. inherent ability to invade native habitat,
15. similar habitats invaded elsewhere,
16. reproductive characteristics of invasive species,
17. general difficulty in managing the species,
18. minimum time commitment for managment of the species,
19. impacts of the management programme on native species and habitats,
20. accessibility of invaded areas.

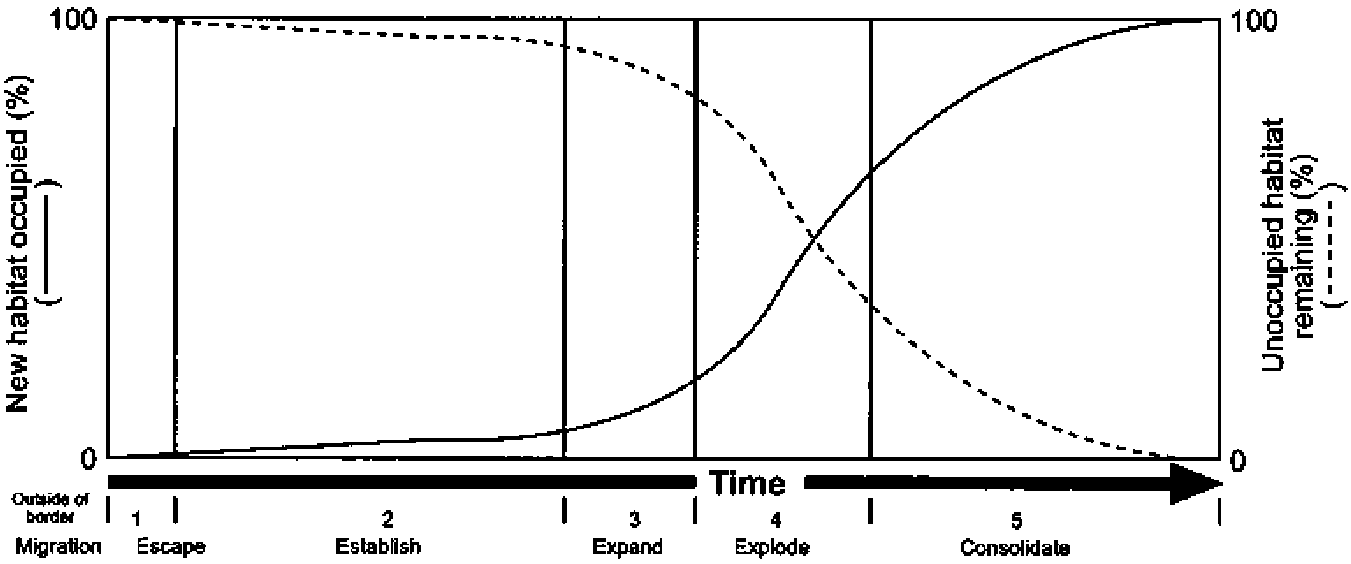
These factors taken in combination provide some indication of the current and future potential invasiveness of a species and thus the extent to which individual invasive species should be prioritized for management.

3.2 Conceptual phases in the invasion of a weed

The biological characteristics of an invasive species, as well as its ability to spread are determined by population processes that may occur over extended periods of time and which may not be immediately evident at any single point in time. These relate to the ability of a species to become established and then to become increasingly invasive. Plants may follow a number of patterns in time and space, depending on such factors as its means of dispersal, life cycle, longevity, size, fecundity, and so on. Many follow a simplified ‘S’ shaped pattern (Figure 3, solid line) that can be illustrated graphically as the proportion of all potential habitat occupied by the pest at any point in time.

The essential features are a long tail at the beginning of a species spread as it crosses the first series of barriers, a steep rise as it breaks through these barriers and finds suitable habitats, and then a flattening off as these habitats are saturated. As the plant spreads, the proportion of the uninfested habitat declines at a rate defined by a 'reverse S' (Figure 3, dotted line). The process of spread may be continuous, but points are still recognisable (usually only with hindsight) where the rate of change alters markedly from the preceding period. For management purposes the 'S' shape can be idealised as stages based on the extent and rate of spread. This concept can be applied at any geographic scale, from a field to a continent.

Figure 1. Conceptual phases in the invasion of a weed through time, and the way these relate to the percentage of occupied and unoccupied land (from Williams, 1997).



3.2.1 Migration phase

The species must first reach the border of the area. Once it has arrived it may, or may not, enter, depending on a variety of factors. Where there are efficient quarantine protocols and risk management procedures it will be detected and, it is hoped, eliminated before it becomes problematic to control.

3.2.2 Escape phase

Once inside the area it may escape only occasionally, or finally become fully naturalised. The locations of these naturalisation points are likely to be associated with the pathway of introduction, e.g. in fields planted with contaminated corn, or adjacent to erosion-control plantings. They have been referred to as 'sentinel sites.'

3.2.3 Establishment phase

During this phase, the plant is able to reproduce in the new environment, and population numbers slowly begin to build up. Virtually all potential habitat is still uninfected.

3.2.4 Expansion phase

Eventually, the number of sites occupied expands beyond the initial loci. Expansion is fastest where there are multiple loci. The causes of this expansion differ among species and are not well documented. Factors are diverse, including particularly favourable growing seasons, the arrival of new pollinators or dispersers, the species becoming adapted to its new environment by the formation of new genotypes. New habitats may be created, e.g. by changes in land use. Some local areas of habitat are noticeably infested, but most potential habitat is un-infested. It is often only at this stage that the plant begins to be perceived as a pest.

3.2.5 Explosion phase

The period where the pest expands rapidly and often where it begins to attract official concern. Many potential habitats are infested during this phase.

3.2.6 Entrenchment phase
The pest slowly spreads to the last remaining habitats over its full range within the area. This does not mean that it occurs on all suitable land at any one time, but that it has a high chance of occurring there. Further spread can occur only if more suitable habitat is created, e.g. by fire. Importantly, the pest may be present only in a dormant stage of its life cycle.

3.3 Implications for management of invasive species

These potential changes in the spread of a pest have implications for weed-risk assessment imperatives:

- The most cost-effective means of avoiding pest impacts is to prevent their introduction or establishment in an area. Failing that, the greatest return for expenditure of money and effort comes from controlling a pest before it has spread.

- Once it has established and begun to spread, the ongoing effort required to eliminate it increases dramatically.

- During the earliest spread phases, when the required funds to extirpate a pest are low, these may be effectively obtained as an adjunct to other pest control programmes. Once the pests begin to spread rapidly, the effort required to obtain the funds may be orders of magnitude greater.

- Effective weed-risk assessment systems must be appropriate to:
    - whether or not a pest has established and spread;
    - the pest's biology and ecology;
    - the values being threatened;
    - the extent to which it has have or has not established in an area; and
    - the technologies and resources available.

3.4 Procedure for removal of invasive species

There are four steps in developing a procedure to remove alien plants from a site:

1. Determine which species occur on site, map their occurrence and density;
2. Decide on priority species and areas to control and determine costs associated with this control;
3. Undertake clearing;
4. Follow-up with ongoing clearing of re-emergence and monitor success.

3.5 General guidelines

There are various overall strategies to be taken into consideration in compiling an eradication programme. These include the following:

1. Controlling alien invasive species, although a legal requirement, is usually a means to achieving a higher goal, such as protecting biodiversity, rehabilitating disturbed areas, restoring ecological functionality, preventing economic loss, protection of human health, etc. Alien invasive clearing should therefore be aligned with the broader biodiversity targets and strategy for the project.
2. Different species require different control methods.

3. It is important to break the reproductive cycle of a species.
4. There should always be follow-up of clearing to prevent invasive species from becoming re-established in areas that were previously cleared.
5. The size of the area being cleared should always be manageable.
6. In principle, start in the least-invaded areas and work towards the heavier infestations. This will make it possible to safeguard relatively large areas of natural habitat.
7. Clearing should always start at the highest point in the landscape and work downwards.
8. Cover any exposed soil with plant material, but ensure that this is free of seeds of the invasive species or other propagules.
9. If possible, try to clear plants before they produce seeds by cutting them back before they flower.
10. Do not transport seeds, fruits, bulbs, tubers or stems that root easily from one site to another. It is best to burn material where it is cleared, if possible.
11. Follow-up is essential. This is linked to ongoing monitoring to detect alien seedlings and remove them while they are easy to manage and also to progressively deplete the soil seed-bank.
12. Rehabilitation or restoration of cleared areas is necessary to restore ecological functionality and to create conditions that are less favourable for invasive species.
13. As alien invasive species impact on the condition of habitats and populations of species, their control or eradication, as appropriate, should be undertaken to increase the overall positive biodiversity footprint of the project, in line with an overall biodiversity strategy.

4. ALIEN INVASIVE SPECIES OCCURRING ON SITE

Currently, there are no known problematic alien invasive species on site. The following section provides infromation on categorizing species, in the event that they become established on site.

4.1 Legal definitions of species

It is vitally important to know which species occur on site, at what densities, in which locations and also understand the behaviour of each species on site to understand the risk of each one becoming problematic. There are two pieces of legislation applicable to control of alien invasive plants:

- Conservation of Agriculture Resources Act (CARA; Act 43 of 1983); and
- National Environmental Management: Biodiversity Act (NEM:BA; Act 10 of 2004):
    - NEM:BA Regulations August 2014 - Government Gazette Vol. 590, No. 37885.

In terms of the amendments to the regulations under CARA, landowners are legally responsible for the control of alien species on their properties. Declared weeds and invasive species had been divided into three categories in accordance with the Act. These categories are as follows:

- **Category 1:** Declared weeds that are prohibited on any land or water surface in South Africa. These species must be controlled, or eradicated where possible.
- **Category 2:** Declared invader species that are only allowed in demarcated areas under controlled conditions and prohibited within 30m of the 1:50 year flood line of any watercourse or wetland.
- **Category 3:** Declared invader species that may remain, but must be prevented from spreading. No further planting of these species are allowed.

Chapter 5 of NEM:BA deals specifically with organisms posing a threat to biodiversity. The purposes of Chapter 5 are as follows:

- Prevent the unauthorised introduction and spread of alien species and invasive species to ecosystems and habitats where they do not naturally occur.
- Manage and control alien species and invasive species to prevent or minimise harm to the environment and to biodiversity in particular.
- Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats.

Section 73 (2) states that a person who is the owner of land on which a listed invasive species occurs must:

- Notify any relevant competent authority, in writing, of the listed invasive species occurring on that land.
- Take steps to control and eradicate the listed invasive species and to prevent it from spreading.
- Take all the required steps to prevent or minimise negative impacts to biodiversity.

The Regulations for this Act list the categories of alien invasive species, which are given in Table 1.

Table 1: Definitions of NEM:BA categories for alien and invasive species.

Definitions of NEM:BA Categories	
Category 1a Listed Invasive Species	**Species requiring compulsory control:**

	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. Landowners are obliged to take immediate steps to control Category 1a species.
Category 1b Listed Invasive Species	**Species controlled by an invasive species management programme:** Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled or 'contained'. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. However, where an Invasive Species Management Programme has been developed for a Category 1b species, then landowners are obliged to "control" the species in accordance with the requirements of that programme.
Category 2 Listed Invasive Species	**Species controlled by area:** Species which require a permit to carry out a restricted activity e.g. cultivation within an area specified in the Notice or an area specified in the permit, as the case may be. Category 2 includes plant species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasiveness. It is important to note that a Category 2 species that falls outside the demarcated area specified in the permit, becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species.
Category 3 Listed Invasive Species	**Species controlled by activity:** A species listed by notice in terms of section 70(1)(a) of the act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the act, as specified in the notice. Category 3 species are less-transforming invasive species which are regulated by activity. The principal focus with these species is to ensure that they are not introduced, sold or transported. However, Category 3 plant species are automatically Category 1b species within riparian and wetland areas.
Exempted Alien Species	**Exempted species:** An alien species that is not regulated in terms of this statutory framework - as defined in Notice 2 of the AIS List.
Prohibited Alien Species	**Prohibited species:** An alien species listed by notice by the Minister, in respect of which a permit may not be issued as contemplated in section 67(1) of the act. These species are contained in Notice 4 of the AIS List, which is referred to as the List of Prohibited Alien Species.

NEMBA Sections 75 and 76 are very specific in terms of who must develop Invasive Species Monitoring, Control and Eradication Plans, what the plans must include and how they should be implemented, i.e.:

"Control and eradication of listed invasive species
75. (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
(2) Any action taken to control and eradicate a listed 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.
(3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.
(4) The Minister must ensure the coordination and implementation of programmes for the prevention, control or eradication of invasive species.
(5) The Minister may establish an entity consisting of public servants to coordinate and implement programmes for the prevention, control or eradication of invasive species."

4.2 Species found on site

Fieldwork for the current indicates that there are currently no problematic alien invasive species on site.

Some species that are known to occur in the general area are shown in Table 2, as an example. This table should be updated over time to provide site-specific information.

Table 2: List of alien invasive species found in the general area that could become established on site.

Taxon	Common name	Category (NEM:BA)	Category (CARA)
Agave americana	American century plant	Category 3 in Western Cape, not listed elsewhere	Declared invader category 2
Argemone ochroleuca subsp. ochroleuca	White-flowered Mexican poppy	Category 1b	Declared weed category 1
Cortaderia selloana	Pampas grass	Category 1b	Declared weed category 1
Datura stramonium	Common thorn apple	Category 1b	Declared weed category 1
Eucalyptus camaldulensis	Red river gum	Category 1b in riparian areas, protected areas, Listed Ecosystem or ecosystem identified for conservation in Bioregional Plan. Not listed within Nama-Karoo, Succulent Karoo and Desert Biomes. Category 1b in Fynbos, Grassland, Savanna, Albany Thicket, Forest, Indian Ocean Coastal Belt biomes. Category 2 for plantations, woodlots, bee-forage areas, wind-rows and the lining of avenues. Not listed within cultivated land that is at least 50 metres from any untransformed land, excluding within any area in (a) above. Not listed within 50 metres of the main house on a farm, excluding in (a) above. Not listed in urban areas for trees with a diameter of more than 400 mm at 1000 mm height at the time of the publishing of Notice, but excluding in (a) above.	Declared invader category 2
Tamarix ramosissima	Pink tamarisk	Category 1b	Declared invader category 3
Tecoma stans	Yellow bells	Category 1b	Declared weed category 1

5. MANAGEMENT UNITS

If alien invasive species become established on site and it becomes necessary for management purposes, the study area should be divided up into separate management units to facilitate more efficient control, based on practical criteria. The factors of greatest importance are existing biodiversity patterns on site that need to be protected, the identity and invasive potential of alien species occurring on site, and the practical issues related to management, such as connectedness, access, size of area, degree of invasion, and current activities on site. A map of the location of different management units should be compiled. Once the broader biodivesity strategy and targets for the study area are adopted, these management units may need to be adjusted to reflect quantified control and biodiversity restoration targets.

It is critical that the management units' status is reviewed periodically in order to: (1) track and document the extent of any infestations; (2) that the applicant be able to report and track the efficacy of the previous control and eradication measures; and (3) measure the progress and success of the control plan. This should support or contribute to quantified biodiversity targets (e.g., habitat or vegetation condition score) for each management unit as per an overall biodiversity strategy.

Table 3: Assessment criteria for Alien Species Management Unit.

Text item	**Description**
Common Name	Assist with species identification
NEMBA category	Indicates the invasive species category, that effects the eradication priority
Estimated cover/density	Provided as a performance indicator to compare future management efficacy. Ideally annual updates to the plan should show a decrease in alien invasive cover/density
Prioritization	A score assigned to assist with prioritising alien species removal within a unit, based on its invasion and rate of spread. High prioritisation scores means that those individual species should be cleared as a priority within the general Species Management Unit.
Risk of invasion	A rating given to indicate the ability of a certain species to spread and thus lead to increases in density and cover of the invasive species if not appropriately managed. Species with a high ability to spread/invade ("Medium" or "High") should thus be further prioritised in areas where natural vegetation can be affected.

The priorities for managment of alien invasive plant species on site are based on the need to (1) protect important biodiversity areas, (2) eliminate the most problematic weeds, and (3) clear aliens from areas where they occur at a high density and threatened surrounding areas.

6. CONTROL METHODS

6.1 Generic control methods

This section provides specific generic methods for controlling alien and invasive plants. It is an outline of existing control measures that have been published for the various alien plant species that could potentially occur on site. The section is a summary of control measures – there are more detailed publications for control measures. Some of these publications are referenced. It includes physical removal methods, use of herbicides and biocontrol methods.

6.1.1 Mechanical control
Many invasive plants can be removed manually or with the help of simple tools. This entails damaging or removing the plant by physical action. Different techniques could be used, e.g. uprooting, felling, slashing, mowing, ring-barking or bark stripping. This control option is only really feasible in sparse infestations or on small scale, and for controlling species that do not coppice after cutting. Species that tend to coppice, need to have the cut stumps or coppice growth treated with herbicides following the mechanical treatment. Mechanical control is labour intensive and therefore expensive, and could cause severe soil disturbance and erosion. For the current project, there are no existing dense stands of invasive alien plants.

Advantages	Disadvantages
Effective method in areas with low infestation.	Not an effective method for dense infestations, as the cost of clearing is extremely high, with little or no impact.
High job creation and associated poverty alleviation potential.	Time consuming.
No contamination of water with herbicides.	If no herbicides are used then the manual control techniques must be very well executed to ensure success.

Seedlings
Seedling of many invasive plants appear all the time, courtesy of birds passing through. When seedlings appear, pull them out as soon as possible to eliminate costly tree felling at a later stage. It is easier to remove seedlings when the soil is moist.

Shrubs and small trees
Use a 'Tree Popper' to remove shrubs and smaller trees. Alternatively, cut off the top growth and then remove the stem and roots from the soil. It is vital that the root ball and any taproots are totally removed to prevent re-growth, as invasive plants often have roots capable of regeneration.

Large trees
If the tree is too large for physical removal, consider ring-barking the tree. This technique involves removing a ring of bark at least 25cm wide. Peel the bark down to just below ground level, pulling outwards. Bark peeling is a particularly useful method for destroying invasive *Acacia* species. Ring-barking interferes with the circulation of the tree and results in it slowly dying. If you wish to hasten the process, fell the tree to a stump that is 30cm above ground level. Then loosen the bark on the stump by hitting it with a hammer and peel the bark downwards to ground level. Any re-growth that appears must be cut off cleanly at once, to prevent nutrition from new growth reaching the roots.

6.1.2 Chemical control
Chemical control should only be used as a last resort, since it is hazardous for natural vegetation. It should not be necessary if regular monitoring is undertaken, which should be effective for controlling invasive alien plants.

Chemical control involves the use of registered herbicides to kill the target weed. Managers and herbicide operators must have a basic understanding of how herbicides function. The use of inappropriate herbicides and the incorrect use of the appropriate herbicides are wasteful, expensive practices and often do more harm than good, especially when working close to watercourses. Some herbicides can quickly contaminate fresh water and/or be transported downstream where they may remain active in the ecosystem. Contractors using herbicides are required to have a permit according to Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947).

Herbicides are either classified as selective or non-selective. Selective herbicides are usually specific to a particular group of plants, e.g. those specified for use on broad leaf plants, but should not kill narrow-leaf plants such as grasses. Non-selective herbicides can kill any plant that they come into contact with and are therefore not suitable for use in areas where indigenous vegetation is present. Care should be taken not to impact on threatened or protected species.
Chemical application techniques include foliar (leaf) application, stem applications (basal stem, total frill, stem injections) and stump applications (cut stump, total stump, scrape and paint).

Advantages	Disadvantages
Complements mechanical control methods, increasing the effectiveness of control activities.	May kill non-target plants or species. This is a very important consideration and poses risks for remaining natural areas on site.
Achieve results over short period (within 6 weeks of application).	Herbicides are expensive.
Large areas can be treated quickly.	The use of herbicides may contaminate sites used for drinking water, for washing and for fishing, and can therefore threatened human and animal health.
	Specialized training and certification is required for use of herbicides.

Seedlings and small shrubs
Herbicides can be sprayed on plants less than 2m in height for quick results. Spray when there is no wind. This will help to avoid spray drift onto adjacent wanted plants. Some weed killers are non selective and others selective so be careful! All plants that are subjected to the spray will be destroyed.

Large shrubs and trees
Cut-stump treatment: Fell the tree, leaving a stump as flat and as close to the ground as possible, and apply a recommended herbicide.
Basal stem treatment: Paint a herbicide (mixed with diesel) onto the base of the tree trunk and any exposed roots. Paint the herbicide up to a height of 25cm above ground level. In the case of multi-stemmed trees, each individual stem should be painted. The herbicide will enter the tree's circulation and eventually kill the tree.
Foliar spraying: In the case of re-growth from stumps (otherwise known as coppicing), mix a herbicide with water and spray on the re-growth. Allow the re-growth to reach a height of 50cm before treatment. Ensure that a full cover spray is achieved. Trees with bud banks or lignotubers can be destroyed using use a herbicide after sawing off the trunk at ground level.

Resprouting plants
Known as regenerative plants, this group of resprouting invaders are designed by nature to survive ravaging veld fires. This ability means that they are impossible to eradicate simply by felling. Resprouting IAPs have a variety of survival techniques. *Eucalyptus* species have woody lignotubers capable of resprouting indefinitely. Many wattles (*Acacia mearnsii*, *A. pycnantha*, *A. saligna*, *A. melanoxylon*) and red sesbania (*Sesbania punicea*) have a section of bark situated at ground level, where the fire is coolest, which is more moist and spongier than normal bark. This section is well supplied with undeveloped buds and acts as a 'bud bank'. The bud bank extends about 4cm below the surface of the ground to the point where the roots begin to form. Due to the size of the surviving rootstock, post-fire regeneration is extremely fast, with the plant able to seed itself again usually in as little as two years.

Physical removal of the bud bank or lignotuber is quite easy to do on plants that are too big to pull up by hand, but not so big as to require sawing down. The best tool to use is a pair of long-handled clippers or loppers. Keep the blades closed, and push the clippers into the ground next to the main root. Use the clippers to widen a space large enough for the clippers to be opened. Then clip off the root below the bud bank.

Loosen the soil around the bud bank and pull out the plant. If there are lateral roots on the end, you know you've removed the whole bud bank. Without the bud bank the plant can't resprout, while the use of this method ensures that there is minimal disturbance to the soil, and so less germination of alien seeds.

Another way of destroying the bud bank of a plant that is too big to clip is to peel the bark down to just below ground level, pulling outwards. In order to have enough bark to hold on to, saw the tree off at 30cm above ground level and peel from the top.

Herbicides will destroy large plants with bud banks or lignotubers. First, saw the trunk of the plant off at ground level. Then, immediately dab herbicide onto the trunk.

6.1.3 Biocontrol

Biological weed control consists in the use of natural enemies to reduce the vigour or reproductive potential of an invasive alien plant. Biological control agents include insects, mites, and micro-organisms such as fungi or bacteria. They usually attack specific parts of the plant, either the reproductive organs directly (flower buds, flowers or fruit) or the seeds after they have dropped. The stress caused by the biological control agent may kill a plant outright or it might impact on the plants reproductive capacity. In certain instances, the reproductive capacity is reduced to zero and the population is effectively sterilized. All of these outcomes will help to reduce the spread of the species.

South Africa has a long history of biological control of weeds, which began in 1913 with the highly-successful introduction of a cochineal insect against a prickly pear cactus (*Opuntia monacantha*). Over the succeeding 100 years of biological control use at least 73 plant species have been targets for biological control. Agents have become established on 48 of the targeted species and South Africa remains committed to expanding this area of research.

To obtain biocontrol agents, provincial representatives of the Working for Water Programme or the Directorate: Land Use and Soil Management (LUSM), Department of Agriculture, Forestry and Fisheries (DAFF) can be contacted.

Advantages	Disadvantages
Most environmentally friendly and most sustainable of all control methods.	Generally slow, especially initially.
Usually does not require high or long-term maintenance.	Low levels of infestation, with occasional outbreaks, will remain a feature of systems under biological control.
Relatively low cost implication over the long term.	Any use of chemicals around biocontrol agent colonies may adversely affect the potency of this control method.
	Cannot be used where the biocontrol agent would threaten commercial populations of the target species that may exist nearby.
	Biocontrol agents are not available for all target species.

It should be noted that industry best practice must be followed during eradication and removal to reduce the potential negative impacts of the following:

- Impacts on surface water quality from erosion and sedimentation;
- Nuisance impacts on air quality from dust and noise during clearing;
- Impacts on surface and ground water quality from herbicide use;
- Impacts on surface and ground water flow rates from vegetation clearing; and
- Impacts on habitat and ecological functioning from vegetation clearing.

It is recommended that the project develop internal procedures to assist in the effective management of these potential impacts during eradication and removal. All contractors must also be trained in these procedures to ensure the potential impacts are minimised. Eradication and removal activities must be scheduled in the appropriate dry or wet season to reduce impacts as far as possible.

Specific methods of control for each species that may be found on site must be researched. Where available, this information includes registered herbicide options for each species, as provided by the Working for Water Programme.

7. RESPONSIBILITIES AND REPORTING REQUIREMENTS

The following are possible reporting requirements:

1. Annual reports by Environmental Officer to Head Office on progress in terms of clearing activities. This is most important during times of active clearing and monitoring in order to document activities.
2. Annual reports by Environmental Officer/Manager reviewing control activities and reporting on monitoring activities. The Monitoring, Control and Eradication Plan should be updated annually to take into account new information and revised priorities, including the eventual development and adoption of broader biodiversity targets for the mine and each management unit.
3. Biennial assessments by the Environmental Manager to review progress OR once a management unit has been completed and a new unit is targeted (to ensure successful removal was implemented and to ensure targets for removal in the new unit remain as per the original management plan).

In due time, progress monitoring on alien invasive species management should be embedded in the monitoring of the broader set of biodiversity activities for the project.

8. MONITORING AND EVALUATION

Monitoring is a form of assessment that provides land managers with information essential to making well-informed management decisions. Monitoring

- is conducted on a regular or systematic basis,
- follows the trend over time of an indicator or variable of the resource compared to predetermined management objectives,
- involves collecting data by sampling or on the entire resource if financially and logistically feasible.

Monitoring can play an essential role in managing invasive plants-it provides nonbiased information to make well-informed management decisions. Monitoring results can be used to demonstrate where management actions (e.g., control treatments) are effectively and successfully meeting invasive plant management objectives, and to more quickly detect and modify actions that are ineffective. Monitoring can also be used to

- detect new populations,
- determine the status and temporal trends in population sizes and distributions over time (e.g., evaluate invasiveness),
- determine effects of invasive plant species on biota and processes of the ecosystem,
- measure success of restoration and revegetation projects,
- measure success of best management practices that are meant to prevent the introduction and spread of invasive plants into and throughout a management area.

There are four types of invasive plant monitoring:

1. Monitoring for early detection,
2. Monitoring for the effect of management actions on target species of invasive plants,
3. Monitoring for the effect of management actions on non-target species and the environment,
4. Monitoring for the status and trends of target species populations.

8.1 Monitoring for Early Detection

Early detection monitoring is implemented before unwanted species have arrived in an area. It is the most cost-effective monitoring because when rapid eradication takes place, control efforts are minimal. The following factors are important:

- It is aimed at finding species when they first appear in a management area.
- It is performed on a systematic schedule; either a predetermined one (e.g., every two years) or one that is based on known events of vector transport of new species through pathways into new areas.
- It is important to sample target areas using inventory/survey methods or using information from predictive models based on ecosystem attributes, species establishment characteristics, and vectors and pathways
- It is important to record non-infested sites during each monitoring event.
- Requires skilled field botanists to identify plant species.

8.2 Monitoring for the Effect of Management Actions on Target Species

Monitoring the effects of management actions (i.e., a control treatment) on the target invasive plant populations is implemented unless the effects of that management action are already well understood and predictable. Such monitoring helps determine the most effective control method. Considerations include the following:

- Provides information on the effectiveness of control treatments (e.g., mowing, herbicide spraying, prescribed grazing and burning) in suppressing, containing or eradicating target invasive species is quantified.
- Requires knowledge of target species characteristics and site conditions.
- Monitoring should take place before and after treatment events.
- Results from monitoring data are used to adjust management actions.

8.3 Monitoring for the Effect of Management Actions on Non-target Species and the Environment

Monitoring for the effect of management actions on nontarget species and the environment is ideally employed when management actions are being implemented. Given time and money considerations, this type of monitoring can be used when it is suspected that native species or ecological processes may be negatively impacted. It can also help determine whether it is better to leave the invasive plant species untreated rather than risk damage to the ecosystem. The following applies:

- measuring the positive or negative effects of control treatments on other species (e.g., plants, animals, fungi, microbes) or ecological processes (e.g., soil stability, water quality). An example of a negative effect is contamination of ground or surface water by herbicides that are toxic to aquatic organisms. An example of a positive effect is an increase in abundance of desired plant species. These effects would be reflected in future biodiversity footprint assessments as per the Biological Diversity Protocol[1].
- Requires knowledge of target species characteristics and site conditions.
- Requires knowledge of ecosystem components and processes in the area where treatments will occur.
- Requires monitoring before and after treatment events

8.4 Monitoring for the Status and Trends of Target Species Populations

The current status and trends of target species populations can be monitored when management actions are not being implemented. Such monitoring determines when a threshold has been reached for a particular population, and at which point a management action may begin (e.g., if species is increasing) or end (e.g., if species is decreasing). The following applies:

- measuring the current status or characteristics of a population parameter such as abundance or distribution
- measuring the trend or change in population abundance or vigor over a period of time

8.5 Monitoring Methods

There are numerous sampling methods one can use to monitor changes in invasive species populations (Sutter 1997). The level of monitoring that is appropriate is dependent on the information required:

- Qualitative Monitoring: this is quick, inexpensive monitoring that has a significant subjective component, is observer-dependent, provides data that can not be statistically analyzed, and can only detect changes that are dramatic. It includes the following methods:
    - mapping of populations,
    - presence/absence of population or plants,
    - estimates of individuals,

[1] URL: http://www.bdprotocol.org/bdp-protocol.php

    - estimates of cover, and
    - photomonitoring.
- Quantitative Monitoring: this is repeatable, analyzable, but usually does not address changes in individuals, and is time-consuming and expensive. It includes measures of individuals, cover, or frequency in sampling units.
- Demographic Monitoring: this includes the strengths of quantitative monitoring with more data on individuals and the biology of the species, greater predictability, but is very time consuming and expensive. It includes following individuals over time to assess their life history characteristics and obtain demographic parameters (survival, mortality, fecundity) of the population.

Specific parameters that can be monitored are as follows:

- Abundance Parameters: numbers, density, cover, frequency.
- Condition Parameters: measures of vigor, performance, fecundity.
- Structure Parameters: size or age class information.

The parameters one chooses is determined by the biology of the species and the management objective. Exotics that occur as discreet individuals can be counted, while rhizomotous species are best measured by cover. Measures of condition are important when the process controlling an exotic species will take a long time and benchmarks are needed for short-term assessments (vigor measurements such as for plant height or reproduction).

8.6 Monitoring Plan

Elements of a monitoring plan include:

- statement of problem and invasive plant management objectives,
- monitoring objectives for target species (level of accuracy and precision),
- sampling design (to achieve monitoring objectives),
- field sampling methods,
- data management and analyses,
- evaluation of monitoring results in achieving invasive plant management objectives,
- adjustment of management actions or invasive plant management objectives if needed.

In the "Introduction" section, management objectives are proposed. These are repeated here as follows:

1. Compliance with relevant legislation;
2. Protection of existing biodiversity on site;
3. Enhancement of biodiversity value of disturbed areas, areas of secondary vegetation and rehabilitated areas;
4. Eradication and control of unwanted invasive alien species.

The objectives of monitoring are therefore to:

1. detect new invasions,
2. detect changes in density, extent, location of invasive species,
3. detect effects of invasive species on habitats,
4. detect effects of management measures on invasive species,
5. detect effects of management measures on habitats, especially their condition or quality, in line with the Biological Diversity Protocol, for biodiversity footprint assessment purposes

The following monitoring is proposed (Table 4) and should be reported for each individual management unit as well as for the site as a whole.

Table 4: Proposed monitoring plan.

Monitoring action	Indicator	Survey method	Data to be collected	Data management	Timeframe
Early detection survey	New species appearing on site. This can be reported as a list, latitude-longitude positions of new observations and observations on numbers of individuals and/or estimated density.	Rambling transects (walk-through survey) through target habitats ensuring all habitats are covered in each management unit.	Presence data (identify which species are present on site, in the form of a list), estimates of cover / numbers (GPS co-ordinates of individual plants and/or mapped areas of dense invasion with estimates of total numbers within mapped area), photo record (if necessary). The data collected for this Control Plan is an example of an early detection survey.	List, maps and/or data positions curated by environmental manager/officer	Every two years
Document alien species present on site	Alien species list, which must be amended from time to time. Can include density information, which can be analysed and presented as bar graphs.	Rambling transects (walk-through survey) through target habitats ensuring all habitats are covered in each management unit.	As for previous point.	List can be saved as document or spreadsheet curated by environmental manager/officer	Every two years
Map concentrations of invasive species	Extent of invasive species populations	Field mapping using GPS to record perimeter of invasive population.	Mapping data. Where there are stands of invasive species that can be defined as individual landscape units, these should be mapped. Mapping can be repeated after clearing activities and/or after detecting invasive species spreading (if applicable). From this the size and location of areas under cover of different invasive species can be calculated and changes documented over time.	GIS files curated by environmental manager/officer	Every two years or whenever changes detected
Document and record alien control measures implemented	Record of clearing activities	Visual observation, report from clearing crew	Descriptive information	Electronic document curated by environmental manager/officer	Can be daily, weekly, monthly and/or annually, depending on

					reporting requirements
Review alien control success rate	Decline in abundance of alien plant species over time	Plot, transect or targeted surveys	Density, latitude-longitude co-ordinates. Which species have been completely removed or what proportion / numbers were removed.	Electronic document curated by environmental manager/officer	Monthly or annually, depending on reporting requirements

9. CONCLUSIONS

This Control Plan is an initial assessment and should be modified as control methods are activated and conditions related to invasion change on site. This requires continuous input and monitoring, including periodic collection of field data in order to analyse the status of the site and the effectiveness of management interventions, notably in terms of improving habitat condition of priority management units. This Control Plan should feed into / be adapted to a broader biodiversity strategy for the Oya WEF project.

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Appendix 1: Safety standards and guidelines

Safety is of the utmost importance when working with invasive alien plant control. Staff are likely to be working in remote areas with potentially dangerous equipment and chemicals. Proper safety training and equipment is therefore required.

Herbicide safety

Herbicides must be stored in a dedicated storeroom. The Herbicide Storeroom needs to comply with national Occupational Health and Safety standards. Some important safety rules are as follows:

- A herbicide storeroom must have adequate ventilation. If the air is stagnant or there is a smell of herbicides when opening up the storeroom then it is a good indication that there is not enough ventilation.
- Clean water needs to be available in close proximity to the storeroom.
- The floor must be non-porous. This is important because when the floor is cleaned (which must be done regularly), no residue of herbicides must remain. Place herbicide containers on wooden pallets to increase ventilation and make mopping up after spillage easier.
- 'No Smoking' and 'No Fire' signs should be posted on the door of the storeroom as well as a sign stating that it is a chemical store and who the responsible person is for the store.
- Keep the storeroom locked to prevent herbicide getting into the wrong hands.
- A spill kit needs to be kept in the storeroom to mop up any spill. The spill kit must contain a bucket with sand and a spade. The sand is to be placed on the spill to absorb the liquid. Once the sand has absorbed the spill, it is to be collected and disposed of where it cannot contaminate the environment. It is preferable to keep contaminated sand in a container and dispose of it with empty containers at a certified chemical recycling plant.
- Obtain the Material Safety Data Sheet from the supplier of the herbicide and ensure that you are familiar with the product before using it. Keep the Material Safety Data Sheet in the storeroom in case of an emergency.
- Always store herbicides in the original labelled container to avoid confusion with other products. Do not store other products in the store, such as protective clothing, food, etc., as they can become contaminated.
- All empty herbicide containers, or herbicides that have reached their expiry date, need to be safely disposed of. This can be done at a registered chemical recycling company. It is important that all empty containers are spiked before disposal. This ensures that they cannot later be used for carrying drinking water, food, etc.
- The contact number for the nearest Poison Control Centre should be posted nearby.

Personal Protective Equipment (PPE)

The use of Personal Protective Equipment (PPE) by staff controlling invasive alien plants in the field is required by law. The PPE specifications differ for the different types of control. Mechanised control includes the use of chainsaws and brush cutters and will therefore require slightly different PPE from someone using manual control (slasher, knapsack sprayer, etc.). PPE required for manual control is as follows:

Item	***Specification***
Overall	100% cotton, two-piece overalls are best for absorbing perspiration, they last longer and are cooler.
Rubber gloves	Standard, wrist-length rubber gloves are sufficient.

Leather gloves	Standard wrist-length leather gloves are appropriate.
Safety boots	Gumboots or standard safety boots, which support the ankles, are sufficient. Steel toecaps are recommended for workers that are working with heavy equipment or large trees.
Hat	If working with large trees, on steep gradients or if any other safety risk may be present, then wearing a hardhat is advisable. Otherwise a wide-brim hat can be used to protect the worker from the sun.
Safety glasses	Large, clear safety glasses, which allow air to pass through, are acceptable.
Face mask	A face mask which covers the nose and mouth is essential when mixing herbicides and for foliar spraying.

Appendix 2: Field guide to alien invasive species occurring on site.

This Appendix should be populated with photographic and descriptive information to aid fieldworkers in positively identifying alien invasive species that could occur on site. If necessary, information should be provided for distinguishing species from one another, as well as from non-invasive indigenous species, where there may be similarities.

ANNEXURE G

WATERCOURSE REHABILITATION AND MANAGEMENT PLAN

FEN CONSULTING

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WATERCOURSE REHABILITATION, MAINTENANCE AND MANAGEMENT PLAN FOR THE PROPOSED 99 MW OYA WIND ENERGY FACILITY (WEF), AND ASSOCIATED INFRASTRUCTURE BETWEEN SUTHERLAND AND MATJIESFONTEIN IN THE WESTERN AND NORTHERN CAPE PROVINCES

Prepared for

G7 Renewable Energies (Pty) Ltd

November 2020

Updated January 2021

Prepared by:	**FEN Consulting (Pty) Ltd**
Report Author:	**C. du Preez (Pr. Sci. Nat)**
Report reviewers:	**K. Marais (Pr. Sci. Nat)**
Report Reference:	**FEN 20-0054**
Date:	**November 2020**
Updated:	**January 2021**

SAS Environmental Group of Companies

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GLOSSARY OF TERMS

Alien Invasive plant species:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animans and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Groundwater:	Subsurface water in the saturated zone below the water table.
Hydrology:	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Mottles:	Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species:	Species almost always found in wetlands (>99% of occurrences).
Perennial:	Flows all year round.
RAMSAR:	The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilisation of wetlands, i.e., to stem the progressive encroachment on and loss of wetlands now and in the future, recognising the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971.
RDL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status
Seasonal zone of wetness:	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50cm of the surface
Temporary zone of wetness:	the outer zone of a wetland characterised by saturation within 50cm of the surface for less than three months of the year
Watercourse:	In terms of the definition contained within the National Water Act, a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks
Wetland Delineation	To determine the boundary of a wetland based on soil characteristics, vegetation and hydrological indicators.
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may, in turn, have an influence on the ecological characteristics and functioning of wetlands.

LIST OF ABBREVIATIONS

AIP	Alien and Invasive Plant
CAS	Conventional Activated Sludge
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EDRR	Early Detection and Rapid Response
EIS	Ecological Importance and Sensitivity
GA	General Authorisation
GN	Government Notice
MEA	Millennium Ecosystem Assessment
NEMA	The National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFEPA	National Freshwater Ecosystem Priority Areas
NRCS	Natural Resources Conservation Service
NWA	The National Water Act, 1998 (Act No. 36 of 1998)
PES	Present Ecological State
RMO	Recommended Management Objective
RoD	Record of Decision
SACNASP	South African Council for Natural Scientific Professions
SAS	Scientific Aquatic Services
SDP	Site Development Plan
WetVeg Groups	Wetland Vegetation Groups
WMA	Water Management Areas
WRMP	Watercourse Rehabilitation and Management Plan

1 INTRODUCTION

1.1 Background

FEN Consulting (Pty) Ltd was appointed to compile a Watercourse Rehabilitation and Management Plan (WRMP) in terms of the Section 21 (c) and (i) water uses as per the National Water Act, 1998 (Act No. 36 of 1998) and Appendix 6 of Government Notice (GN) 326 of 2017 as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) to provide technical specialist input for the proposed Oya Wind Energy Facility (WEF), between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces. Please refer to Section 2 for the project description. This report serves to provide mitigation measures within the rehabilitation process for the proposed activities associated with the various watercourses identified within the project site.

The purpose of this WRMP was prepared to include objectives to achieve the two (2) overarching targets (Figure 1), thereby ensuring negative impacts on the identified watercourses associated with the proposed Oya WEF development are rehabilitated, managed, and monitored.

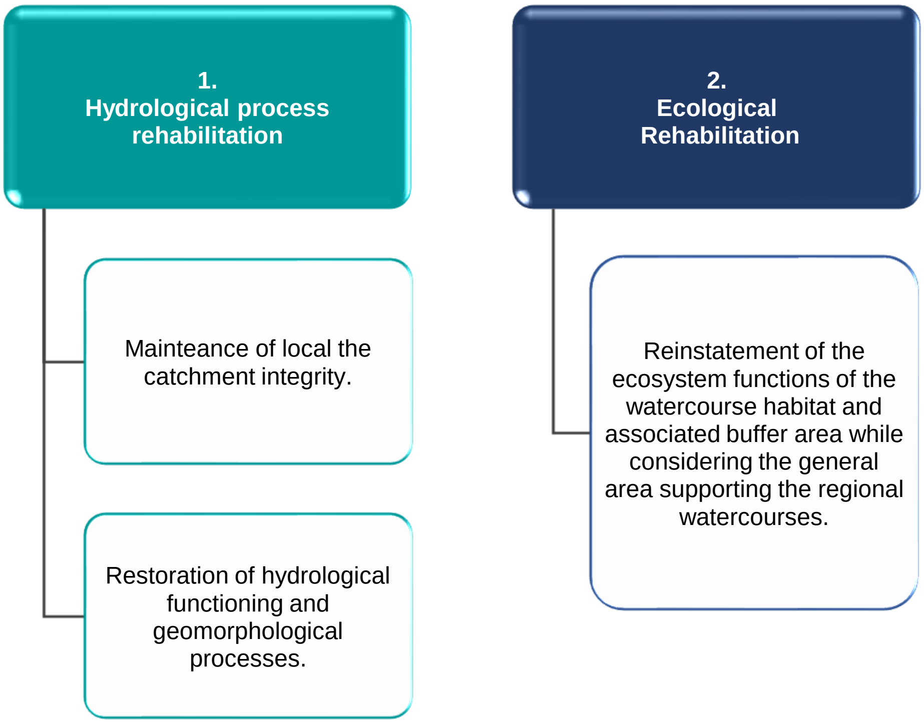


Figure 1: An illustration of the two (2) overarching targets - 1) hydrological process rehabilitation aiming to ensure the local catchment integrity is maintained, and hydrological function as well as geomorphological processes are restored and 2) ecological rehabilitation focus aimed to reinstate the ecosystem functions of watercourse habitat.

This WRMP is seen as a critical component of the project and should be implemented by the proponent as soon as it has been approved by the relevant authorities and once the proposed Oya WEF development has reached a stage rehabilitation activity become viable.

1.2 Structure of this report

This report investigates the need for rehabilitation and maintenance activities for the proposed Oya WEF development, from a watercourse management perspective. The report has been structured in the following way:

Chapter 1: Introduction
Provides an introduction, the structure of this report as well as the including the principles and objectives of this WRMP.

Chapter 2: Legislative Framework and Key Objectives
Provides all relevant legislation that was considered as part of the compilation of this report as well as the key objectives of this WRMP.

Chapter 3: Project Description
Provides the locality of the development and the proposed Oya WEF development plan.

Chapter 4: Receiving Freshwater Environment
This section includes a summary of the site assessment findings undertaken by FEN Consulting (Pty) Ltd during October and November 2020 and visually represents the watercourses.

Chapter 5: Watercourse Rehabilitation and Management Plan
This section comprises site specific details pertaining to the construction mitigation and rehabilitation measures that must be implemented. A list of the roles and responsibilities of all individuals involved in the implementation of this WRMP is provided.

Chapter 6: Conclusion and Recommendations
This section summarises the key findings and recommendations based on the recommended rehabilitation and management actions listed and the overall requirements in order to ensure the best rehabilitation of the watercourses as part of the proposed WEF development.

2 PROJECT DESCRIPTION

The proposed Oya WEF is located between Matjiesfontein and Sutherland, within the Northern and Western Cape Provinces (Figure 2 and 3), over a variety of farm portions. Technical information pertaining to the proposed Oya WEF development is provided in Table 1 below.

Table 1: Technical details pertaining to the proposed Oya WEF development.

Overall capacity	99 MW
Number of turbines	18
Hub height	Up to 101 m
Rotor diameter	Up to 158 m
Blade length	75 m
Wind measuring lattice masts	2 x met masts (same as hub height)
Layout	Layout submitted for final approval
EMPr	Approve Final EMPr

Additional to the above, internal access roads, underground cabling and an overhead power line as part of the collector system and an onsite construction camp will be developed. The proposed access road will traverse several watercourses; however, all other infrastructure components will be located at least 32 m from the delineated extent of a watercourse. At the time of compilation of this report, no designs for the proposed watercourse road crossings were available. Once these designs become available it is recommended that the freshwater specialist review the designs to determine if the mitigation measures as presented in this report is adequate.

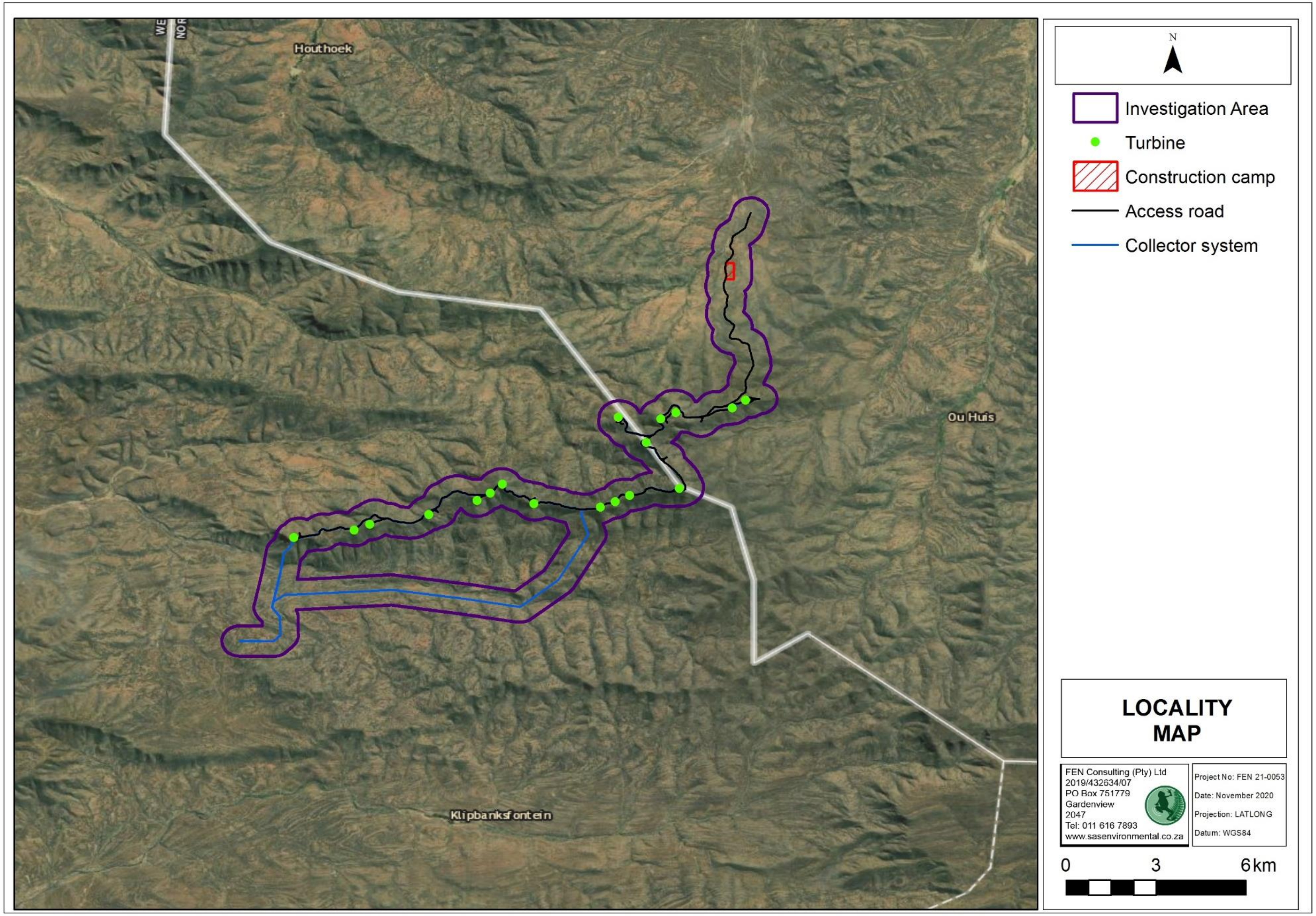


Figure 2: Digital satellite image depicting the proposed Oya WEF development in relation to the surrounding areas.

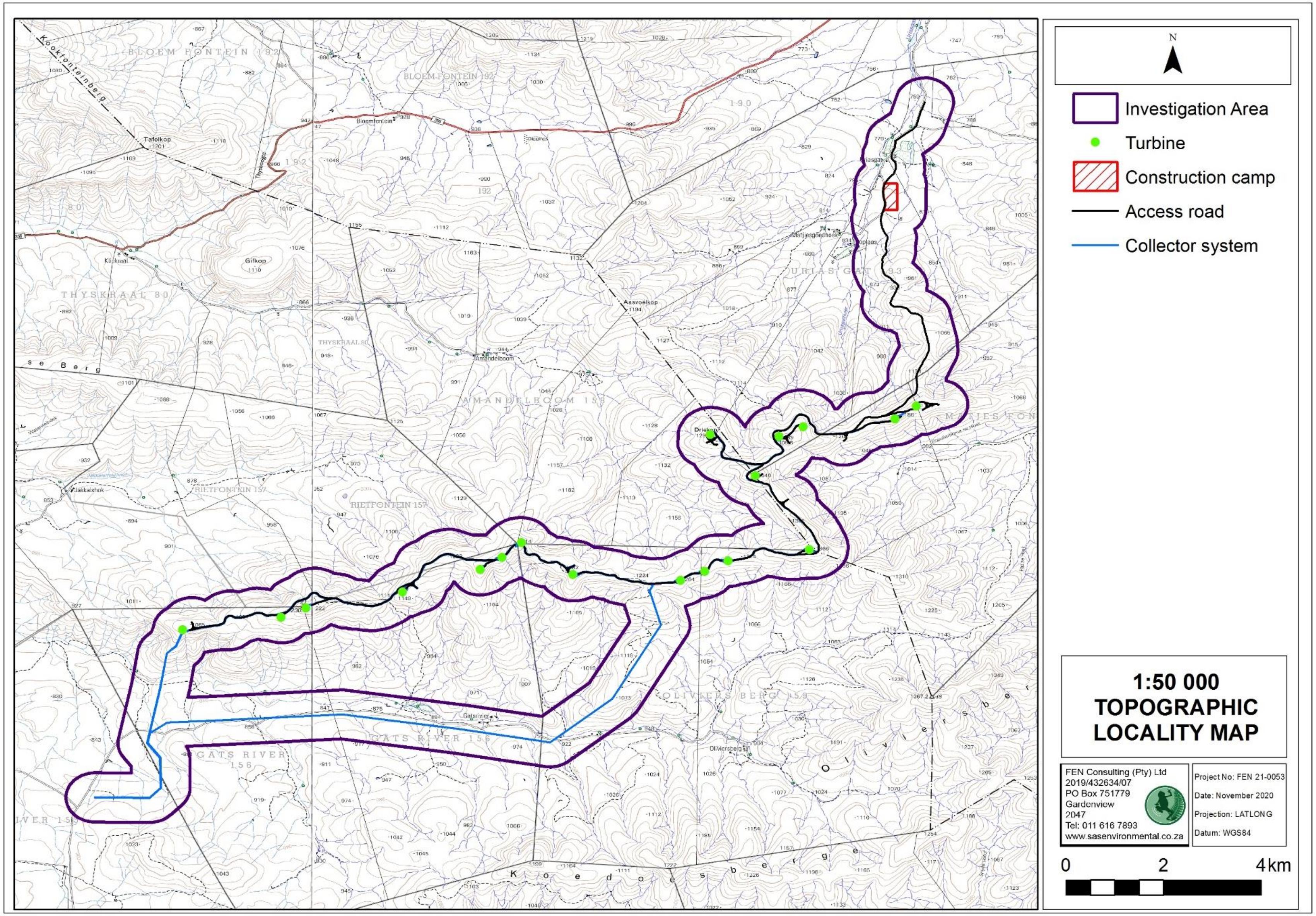


Figure 3: Location of the proposed Oya WEF development and investigation area depicted on a 1:50 000 topographical map in relation to surrounding areas.

3 LEGISLATIVE FRAMEWORK AND KEY OBJECTIVES

The following legislative documents were considered and the aspects which are pertinent to watercourse management including the rehabilitation of disturbed areas, were utilised. Further details of each is provided in **Annexure B** as well as the WRMP principles and objectives framework.

- The Constitution of the Republic of South Africa, 1996[1];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- The National Environmental Management: Biodiversity Act, 2014 (Alien and Invasive Species Regulations, 2014);
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA);
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).

Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) lists the following activities as water uses:

- Section 21 (c): impeding or diverting the flow of water in a watercourse; and
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.

4 RECEIVING FRESHWATER ENVIRONMENT

The following information on the ecological characteristics of the proposed Oya WEF development are taken from FEN Consulting (2020) entitled: “Freshwater Ecological Assessment as part of the water use authorisation process for the proposed 99 MW Oya Wind Energy Facility (WEF) and the 239 MW Kudusberg WEF and associated infrastructure between Sutherland and Matjiesfontein in the Western and Northern Cape Provinces” which also provides further information if required. Table 2 below provides an overview of the desktop database investigation while Table 3 presents the outcome of the freshwater ecological assessment. The delineations of watercourses associated with the proposed Oya WEF development are visually depicted in Figure 4 to 10.

Table 2: A summary of outcomes from the desktop database assessment as presented in FEN Consulting (2020).

Desktop database information	
Ecoregion	Great Karoo
Catchment	Olifants - Cape
Quaternary Catchment	E22B, E232, E23B, E23G, E23H
WMA	Olifants/Doorn
Wetland Vegetation Type (Mbona *et al,* 2015)	The investigation area is located in the Karoo Shale Renosterveld Wetland Vegetation type (least threatened) and the Rainshadow Valley Karoo (Skv) Wetland Vegetation type (critically endangered). The threat status of each wetland vegetation type is provided by Mbona et al. (2015).

[1] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the ‘Constitution of the Republic of South Africa, 19996”. It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

Western Cape Biodiversity Spatial Plan (2017)	According to the Western Cape Biodiversity Spatial Plan (2017), several areas within the most western and southern portions of the investigation area are classified as Critical Biodiversity Areas (CBA) 1, of watercourse and terrestrial ecological importance. CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure, in this case specifically for riverine environments. CBA 1 are areas likely to be in a natural condition. The headwaters of the regional drainage network as identified by the topographical map are considered to be Ecological Support Areas (ESAs) 1 (of aquatic importance). ESAs are important in supporting the functioning of CBAs and are often vital for delivering ecosystem services. ESA 1 are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. Small areas classified as ESA 2 are also located in the investigation area. ESA 2 are areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas (PAs) or CBAs and are often vital for delivering ecosystem services. All other remaining areas in the investigation area are considered to be Other Natural Areas (ONAs). These are areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.
Importance of the investigation area according to the Critical Biodiversity Areas of the Northern Cape (2016)	According to the Critical Biodiversity Areas of the Northern Cape (2016), the investigation area is located within several areas classified as Ecological Support Areas (ESAs) and Other Natural Areas (ONAs). ESAs are areas that are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning in Critical Biodiversity Areas (CBAs). ONAs are areas that have not been identified as a priority in the current systematic biodiversity plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem

Table 3: A summary of outcome of the watercourse ecological assessment as presented in FEN Consulting (2020).

Watercourses associated with the proposed Oya WEF development	
Watercourse Type	Rivers, ephemeral tributaries and Ephemeral Drainage Lines (EDLs)

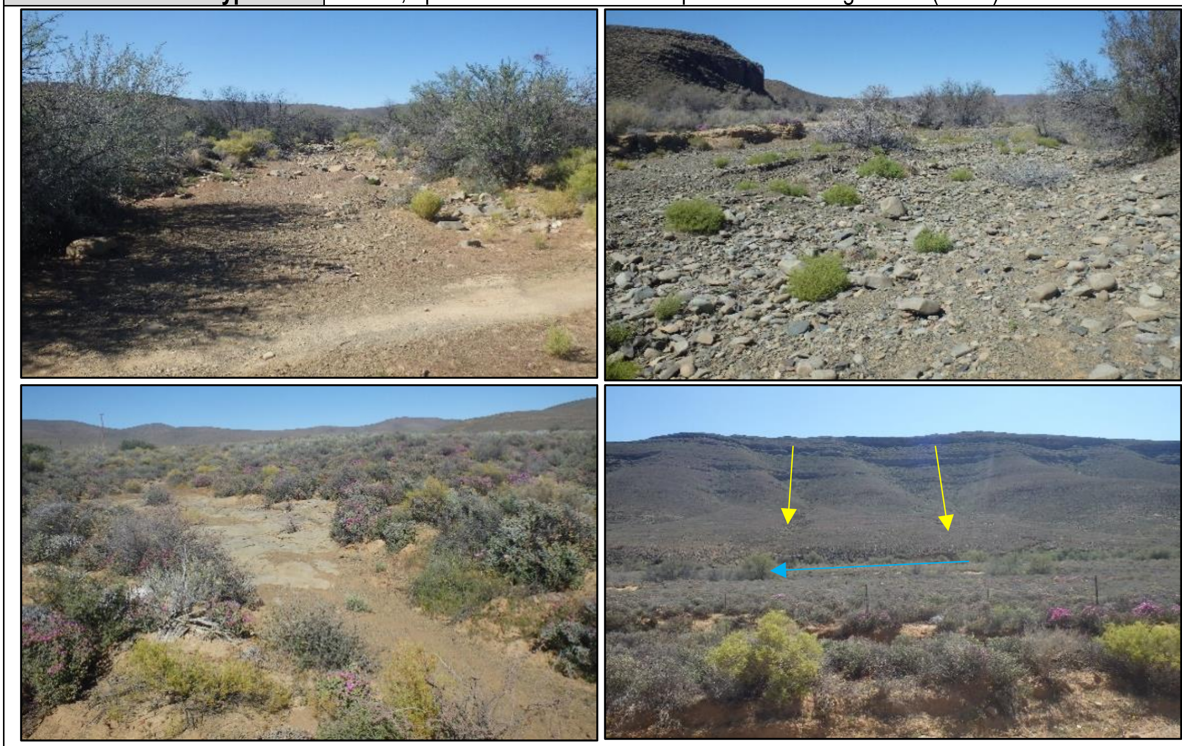
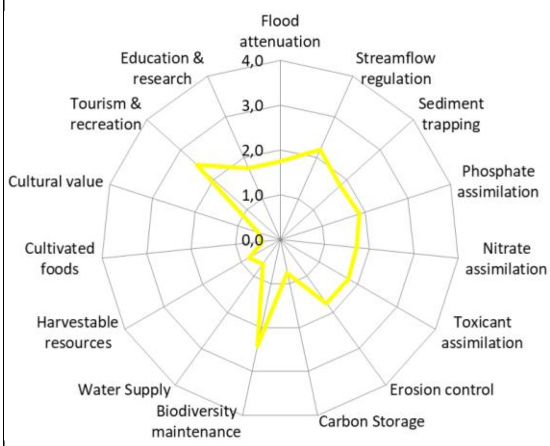


Figure 4: Representative photographs of the watercourses associated with the proposed Oya WEF development. (Top left) a photograph of the ephemeral tributary of the Windheuwels River located east of the proposed construction camp.

<table>
<tr><td colspan="2">The active channel of these tributaries consists of a shallow layer of alluvial soil; (Top right) a photograph depicting the Ongeluks River; (Bottom left) An EDL associated with the Windheuwels River drainage system. These drainage lines are clearly defined by an unvegetated channel of exposed bedrock. No significant change between the vegetation associated with the edge of the drainage line channel to that of the surrounding terrestrial area is evident. (Bottom right) Typical topographical setting of the project area, displaying the locality of the headwater drainage lines (yellow arrow) flowing into an ephemeral tributary (blue arrow).</td></tr>
<tr><td>Aquatic IHI discussion (as per BlueScience (2018)</td><td>IHI Riparian PES Category: A/B (Largely natural with few modifications)
Based on the assessment of the habitat integrity of the watercourses, BlueScience (2018) reports that the instream and riparian habitat integrity of the upper reaches of the watercourses are considered to be unmodified and natural. Their middle reaches and the middle reach of the Windheuwels River has seen some modification but is still reported to be in a largely natural ecological condition. The riparian habitat of the Windheuwels River is slightly more degraded as a result of direct habitat modification when compared to the reference conditions in both the marginal as well as non-marginal zones. Some disturbance from anthropogenic activity (informal road crossings and artificial instream impoundments) in the immediate surroundings of the watercourses were noted, which has resulted in some bank erosion, an increase in the presence of alien vegetation species and loss of tree diversity within the riparian zone.</td></tr>
<tr><td>Ecoservice provision</td><td>Ecoservice Provisioning: 1,5 (Intermediate)
Due to the ephemeral nature of these watercourses, their capacity to provide certain ecological services is reduced, although this is counteracted by their relatively intact ecological integrity, which increases its overall functionality. These watercourses are considered important for biodiversity maintenance. As these are ephemeral watercourses, they are of seasonal importance for the supply of water for a variety of faunal species. The watercourses are not considered important for harvestable resources or cultivated foods, mainly due to them being located in a natural water scarce region.

</td></tr>
<tr><td>EIS discussion (as per BlueScience (2018))</td><td>EIS Category: High (Windheuwels River & vernal pool) and Moderate (ephemeral tributaries and EDLs)
The larger watercourses located primarily downgradient of the proposed Oya WEF development (such as the Muishond, Ongeluks, Jakkalshok, Brak, Windheuwels, Wilgebos and Kleinpoorts Rivers), have a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The larger watercourses tend to be more ecologically important but less sensitive to impacts while the smaller tributaries and drainage lines are less ecologically important but more sensitive to flow, water quality and habitat modification. Based on the outcome of the biodiversity assessment undertaken by Ekotrust CC (2018), the watercourses are also considered to be of 'High' sensitivity, due to the good ecological condition of the project site and minimal disturbance thereof. The high sensitivity ranking is attributed to the high level of protected species identified within the watercourses (Ekotrust CC, 2018).</td></tr>
<tr><td>REC Discussion (as per BlueScience (2018))</td><td>REC: Category B (Largely natural with few modifications)
Considering the natural to largely natural ecological condition of the drainage systems associated with the proposed WEF development and their moderate to high ecological importance and ecological sensitivities, the Recommended Ecological Condition (REC) of these watercourses would be that they remain in a natural ecological condition. This is with the exception of the middle reaches of the Windheuwels and Ongeluks Rivers that are in a largely natural to moderately modified ecological condition as a result of direct habitat modification from the surrounding activities. These rivers should be maintained in their current ecological condition and should not be allowed to degrade further.</td></tr>
<tr><td colspan="2">Watercourse characteristics:</td></tr>
<tr><td>Hydraulic regime</td><td>Despite a relatively large drainage network associated with each drainage system identified, most of these watercourses only convey water during the wet season and do not consist of water bearing strata with the capacity to store and then to convey water to the downstream larger river systems. As such, discharge into the larger tributaries/rivers from the EDLs are highly variable due to the seasonal nature of the rainfall of the area. When flow occurs within the watercourses, it occurs as a high flow event, which can result in erosion of the stream banks. Notwithstanding the direct crossing of access</td></tr>
</table>

	roads and smaller informal roads, the hydrological connectivity and functionality of the watercourses are considered intact.
Geomorphology and sediment balance	Most of the larger tributaries and rivers are characterised by rocky embankments and a shallow layer of alluvial soils over a solid rock bed. Erosion was noted in areas where a high drop has formed, where water drops into a section of the active channel not underlain by bedrock. The geomorphology of the upstream reaches of the EDLs are considered largely intact. Some erosion of the downstream reaches of the EDLs just below the instream impoundments (where applicable) and at road crossings were noted, however, it is not considered significant. Despite erosion noted within isolated areas of the EDLs, no significant deposition of sediment was observed. As surface water is only present during and after rainfall events, sand and sediment are only transported through the EDLs into the tributaries and rivers during high flood periods. Thus, the sediment load of the tributaries and rivers is deemed to be high during flood events.
Water quality	No surface water was present within the watercourses during the site assessment; thus, no water quality parameters could be measured. Nevertheless, due to the relatively remote locality the watercourses (with specific mention of the headwater EDLs) and the low degree of catchment transformation, it can be concluded that when surface water is present, the water quality is likely to be good, with limited impacts from pollutants.
Habitat and biota	The larger watercourses (tributaries and rivers) are characterised by riverine terraces and ridges supporting a variety of macrophytic vegetation, marginal reed belts as well as riverine thickets (comprising low growing trees and shrubs). Although not necessarily large enough by themselves to support significant populations of fauna, habitat along the EDLs remains largely intact and representative of the natural vegetation type. The vegetation associated with the EDLs are predominantly short growing shrubs, but no facultative vegetation species were identified within these EDLs. Overall, the vegetation component of the watercourses associated with the Oya WEF is considered intact (Ekotrust CC, 2018). Due to the seasonal nature of the watercourses, they do not retain water for a long enough period of time to provide breeding and foraging habitat for aquatic macro-invertebrates or avifaunal species. However, it does provide migratory connectivity as well as sheltered nesting habitat for terrestrial avifaunal species. Very few alien or invasive vegetation species were noted within the reaches of the watercourses verified during the site assessment, however within the footprint area of the Oya WEF of the existing informal road crossings, alien vegetation species were noted where disturbances (such as the road crossings) had occurred.

IHI= Index of Habitat Integrity; EIS = Ecological Importance and Sensitivity, RMO = Recommended Management Objective; WCBSP = Western Cape Biodiversity Spatial Plan

Table 4 below lists the proposed Oya WEF development infrastructure relative to the delineated extent of the watercourses as depicted in Figure 5 to 10.

Table 4: Summary of the distance the proposed surface infrastructure components are located relative to a watercourse.

Proposed surface infrastructure component	Approximate distance from the closest watercourse
Oya WEF	
Construction camp	32 m from ephemeral tributary of the Windheuwels River system
Turbine 4	60 m from episodic drainage line of the Ongeluks River system
Crane pad associated with Turbine 4	44 m from episodic drainage line of the Ongeluks River system
Access road crossings	
Access road towards Oya WEF construction camp	Traverses several tributaries and EDLs of the Windheuwels River system.
Access road north of Oya WEF Turbine 18	Traverse EDL of the Windheuwel River system.
Access road between Oya WEF Turbine 17 and 16	Traverse EDL of the Windheuwel River system.
Access road between Oya WEF Turbine 3 and 4	Traverse EDL of the Jakkalshok River system.
Oya WEF overhead collector system	
Overhead power line & associated pylons	Several watercourses associated with the Ongeluks River System are traversed by the overhead power line. It must be noted that all pylons will be constructed outside of the delineated extent of the watercourses and at least 32m from its delineated extent.

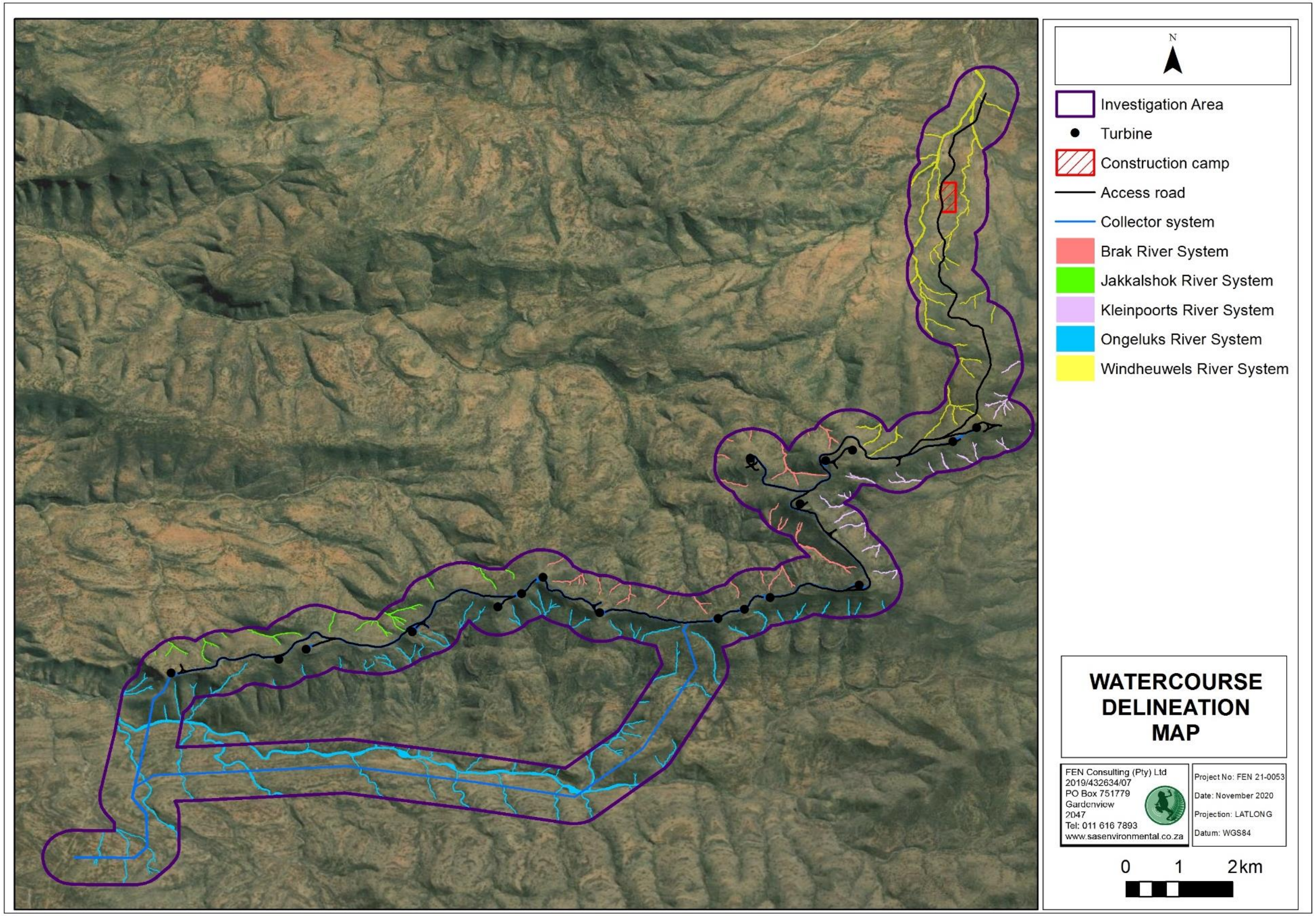


Figure 5: An overview map depicting the locality of the delineated watercourses associated with the proposed Oya WEF development.

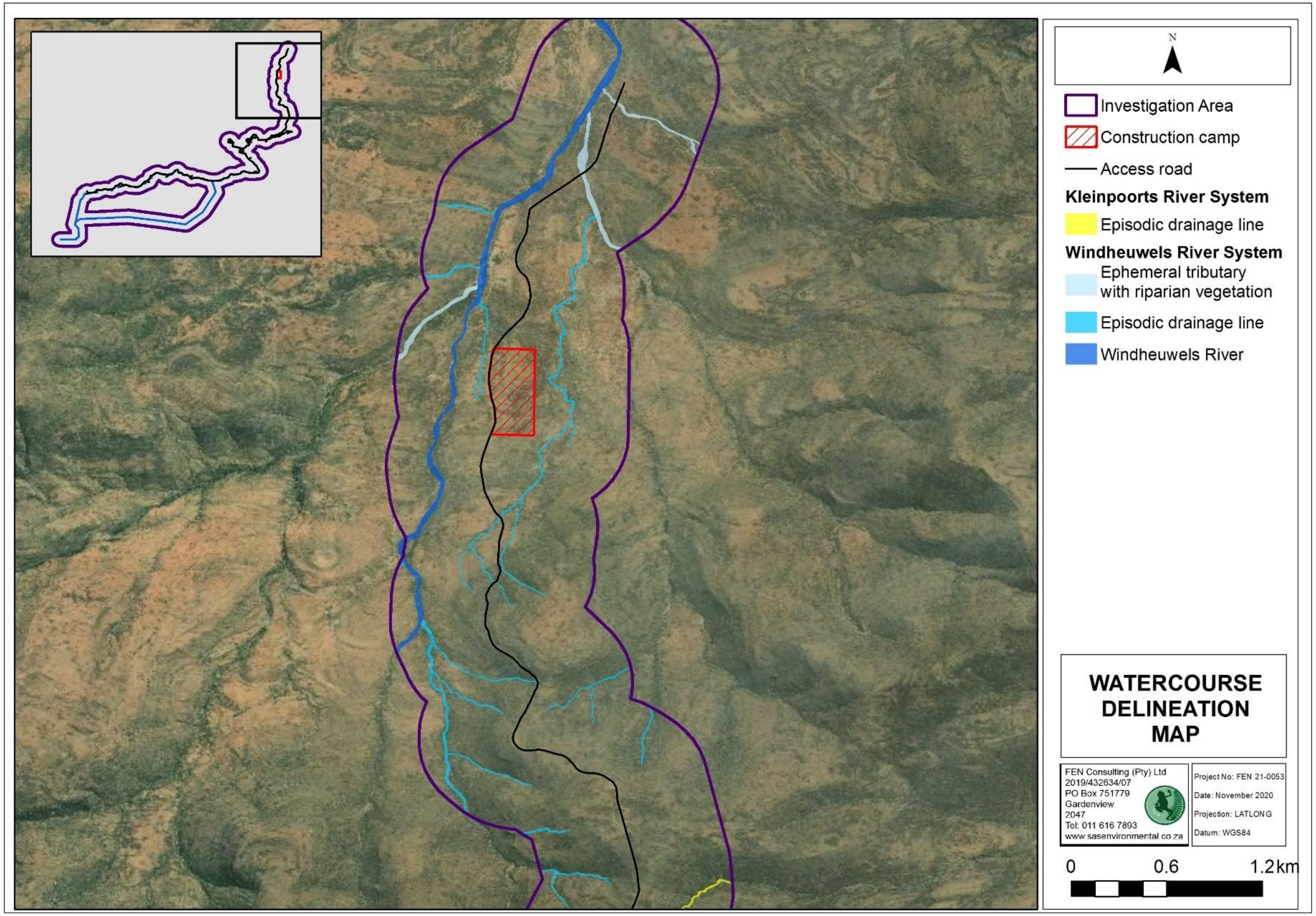


Figure 6: The locality of the delineated watercourses of the Windheuwels River system associated with the proposed access road and construction camp.

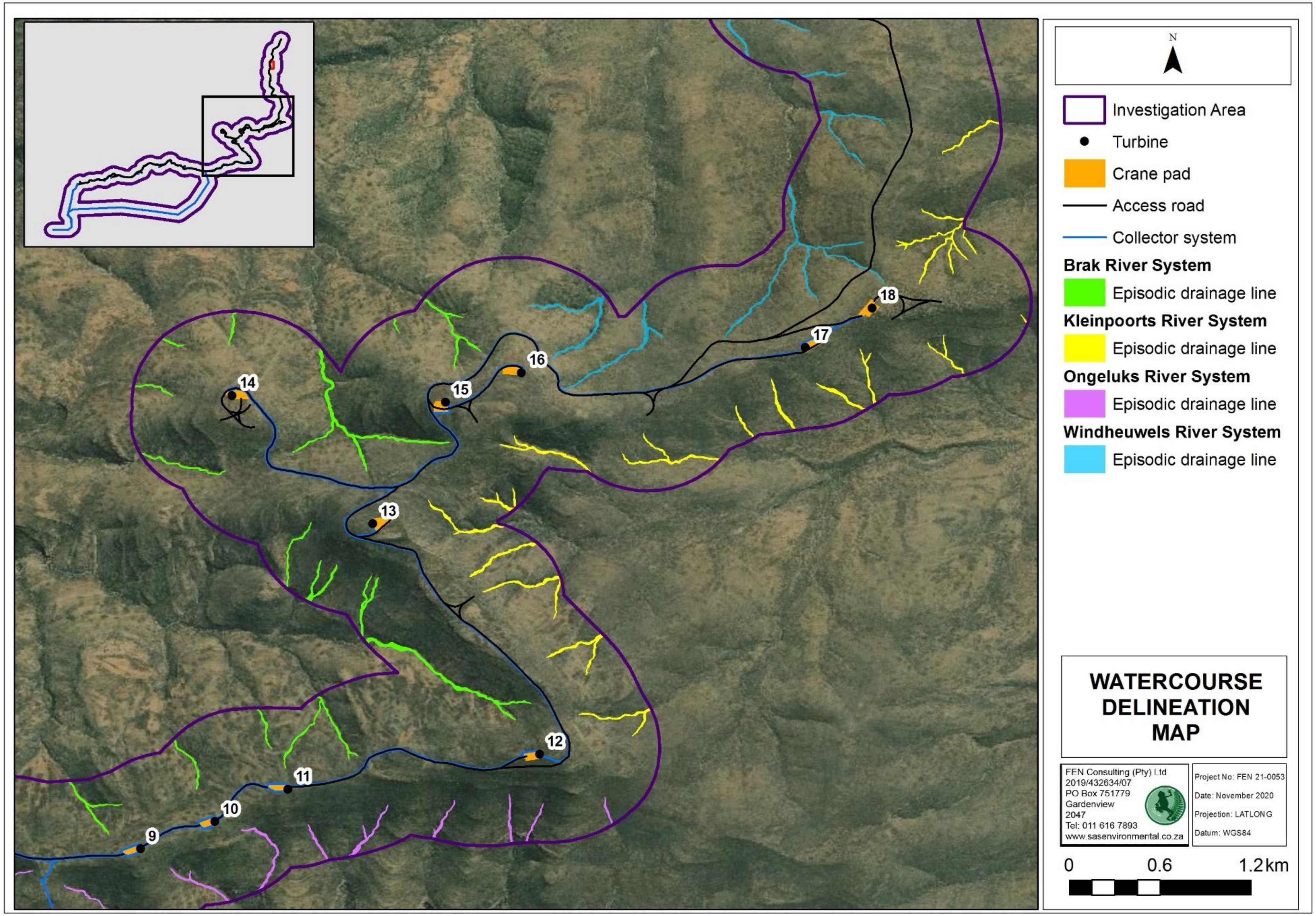


Figure 7: The locality of the delineated watercourses of the Windheuwels, Kleinpoorts, Brak and Ongeluks River system associated with the proposed internal roads, turbines and crane pads.

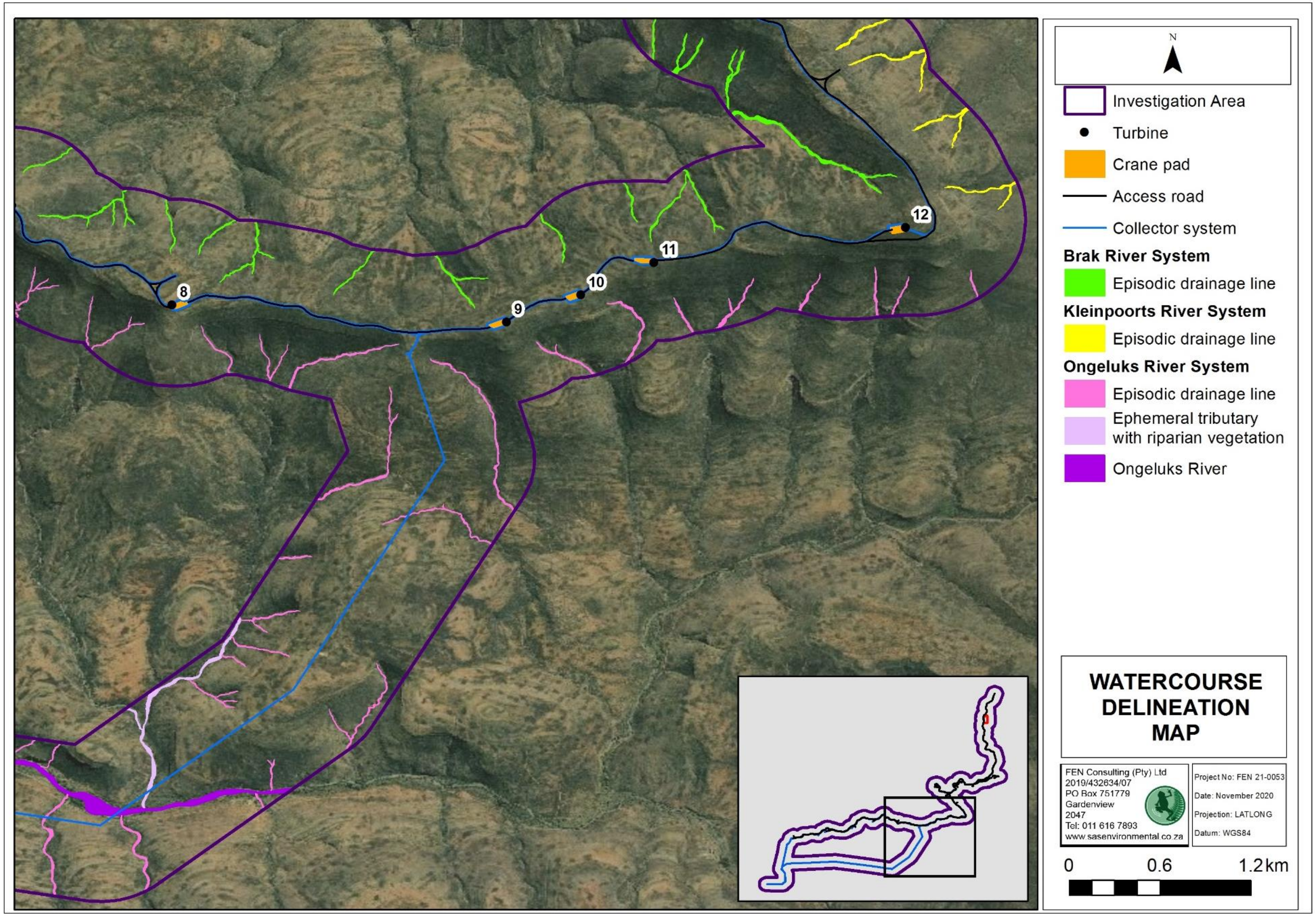


Figure 8: The locality of the delineated watercourses of the Kleinpoorts, Brak and Ongeluks River systems associated with the proposed internal roads, turbines and crane pads.

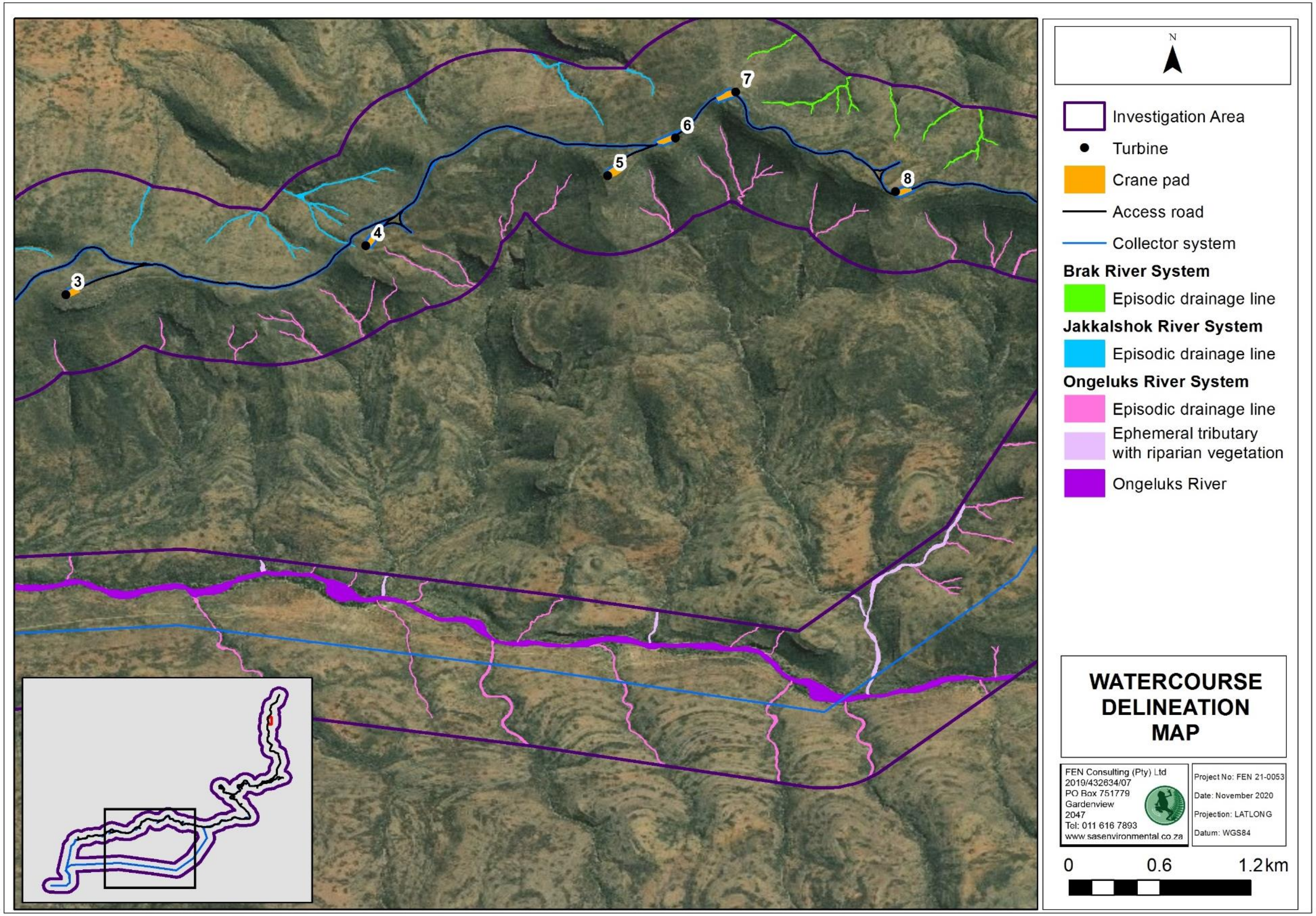


Figure 9: The locality of the delineated watercourses of the Kleinpoorts, Jakkalshok, Brak and Ongeluks River systems associated with the proposed internal roads, turbines and crane pads.

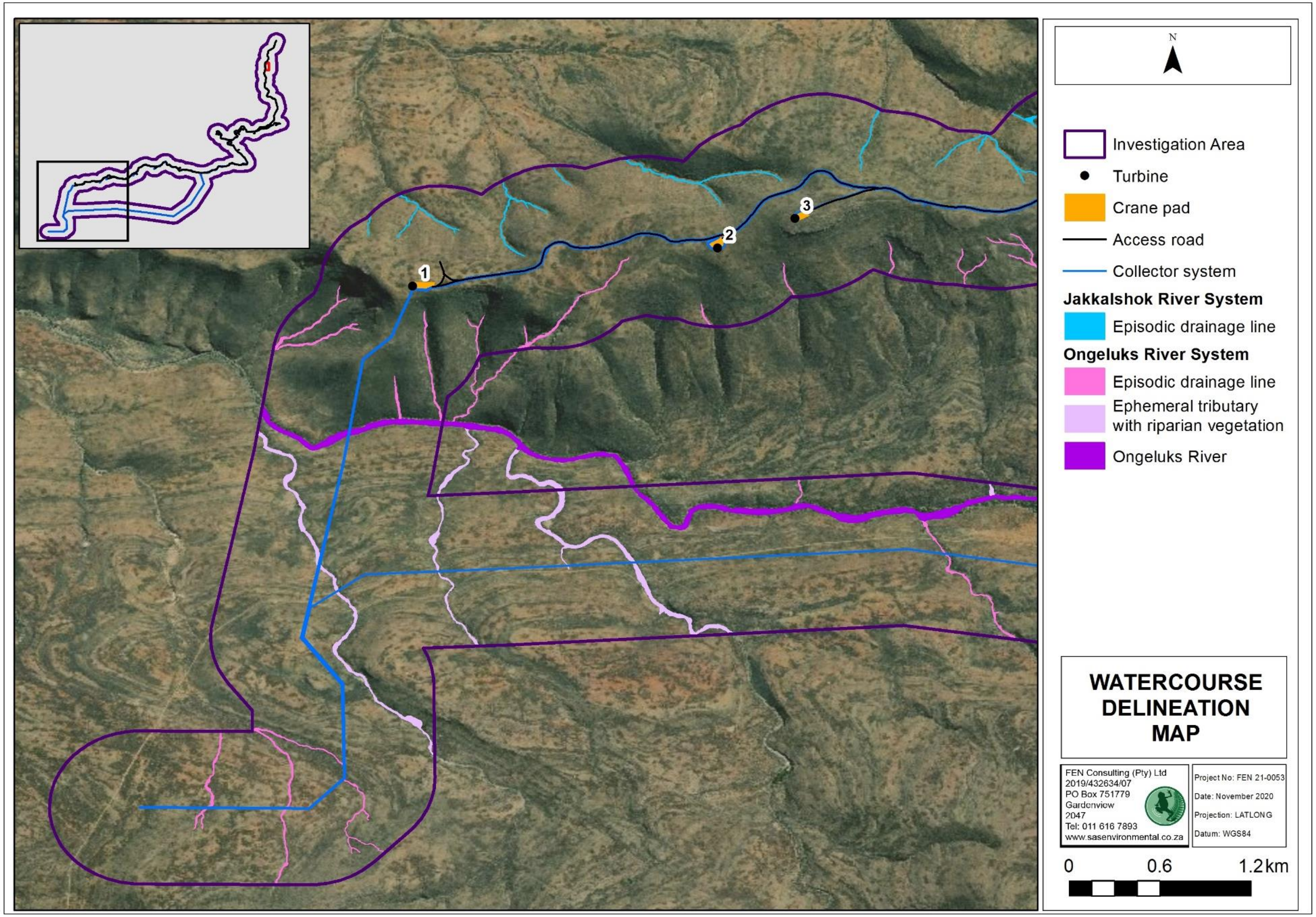


Figure 10: The locality of the delineated watercourses of the Ongeluks River and Jakkalshok River systems associated with the proposed internal roads, turbines and crane pads.

4.1 Assumptions and Limitations associated with the Freshwater Assessment

The following assumptions and limitations should be noted, as per FEN Consulting (2020):

- The ground-truthing and verification of the delineated extent of the watercourses identified by BlueScience (2018) are confined to a single site visit undertaken on the 22nd and 23rd of September 2020 (early spring season) and on the 22nd to the 24th of October (early summer season) of the proposed Oya WEF development. All watercourses identified within the investigation area were delineated in fulfilment of Government Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) using various desktop methods with limited field verification including the use of topographic maps, historical and current digital satellite imagery and aerial photographs;
- It is proposed that new or existing boreholes will supply water to the on-site batching plant as part of the proposed Oya WEF development. These activities (abstraction of water, pipeline construction) will be applied for separately should it be required by the relevant authorities, and as such, were not considered or assessed as part of this assessment. It is however recommended that a geohydrological investigation be undertaken for the borehole to ensure sustainable abstraction that does not impact other water users or the water resources within the area;
- Due to the landscape in some areas being rugged and very undeveloped, some reaches of the identified watercourses were inaccessible. Therefore, verification points for watercourses were located at points as close to the watercourse to be verified as possible and, where necessary the conditions at the exact point required were inferred or extrapolated;
- Due to the majority of the watercourses being ephemeral within the region, very few areas were encountered that displayed more than one watercourse characteristic as defined by the DWAF (2008) method (such as containing alluvial or inundated soils, or hosts riparian vegetation adapted to saturated conditions). As a result, identification of the outer boundary of the temporary watercourse zones and marginal riparian zones proved difficult in some areas and, in particular, in the areas where watercourse conditions and riparian zones are marginal, and therefore delineations were augmented with the use of digital satellite imagery. Nevertheless, the watercourse delineations as presented in this report are regarded as a best estimate of the watercourse boundaries based on the site conditions present at the time of assessment and the results obtained are considered sufficiently accurate to allow informed planning and decision making to take place;
- At the time of this assessment, no designs for the proposed watercourse road crossings were available. As such, once these designs become available, they should be reviewed by a freshwater ecological specialist and the impact/risk assessment updated. It must be noted that the outcome of the risk assessment may thus change pending the outcome of the watercourse road crossing designs;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur. However, the delineations as provided in this report are deemed accurate enough to fulfil the environmental authorisation requirements as well as the implementation of the mitigation measures provided;
- Watercourses and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the watercourse boundaries may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the watercourses have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of riparian and wetland ecology.

4.2 Risk Assessment Summary

The following table provides a summary of the anticipated risks associated with the proposed Oya WEF development, as undertaken as part of the Freshwater Assessment (FEN, 2020).

Table 5: A summary of the Risk Assessment outcomes

	Activities	Impacts	Risk Significance	Rehabilitation Objectives
Direct impacts	Construction of new road watercourse crossings and underground cables along the road crossings	In order to develop new watercourse road crossings, vegetation will need to be removed and where necessary, soil will need to be compacted. This will lead to potential increased run-off and sedimentation of the watercourses, increase dust generation which may smother riparian vegetation and result in a potential decrease in ecoservices.	**Low Negative**	• Manage vegetation removal and ensure it is disposed of correctly; • Mitigate and manage soil erosion and sedimentation within the watercourses; • Revegetation of footprint areas
Indirect impacts	Construction of construction camp, turbine crane pad, and overhead collector system power line over watercourses. All infrastructures and pylons will be located at least 32 m from the delineated extent of a watercourse but still within the 100m GN509 Zone of Regulation.	Due to the locality of the pylons, only terrestrial habitat will be directly impacted. Nevertheless, potential indirect impacts may be sediment laden runoff entering the watercourses due to reduced surface roughness as vegetation clearing has occurred. As the power line pylons are assumed to be concrete cast and the construction camp will host the batching plant, the potential of contaminated runoff entering the watercourses are also possible.	**Low Negative**	
		Increased impermeable surfaces within the vicinity of watercourses due to the compaction of soil associated with the proposed construction camp and turbine crane pads.	**Low Negative**	• Mitigate and manage potential stormwater runoff that may result in sedimentation and erosion. .

The proposed Oya WEF development is expected to have a low risk significance on the watercourses (FEN Consulting, 2020), with the implementation of the set out mitigation measures. This can primarily be attributed to all surface infrastructure components being located at least 32 m from the delineated extent of the watercourses, with the exception of new road watercourse crossings.

5 WATERCOURSE REHABILITATION AND MANAGEMENT PLAN

This implementation of this WRMP is based on four (4) key actions illustrated in Figure 11 and discussed in detail in Section 5.1 to 5.4. These four actions should be considered as an ongoing process, where the WRMP is refined and improved if further information may become available, or if required by the competent authority.

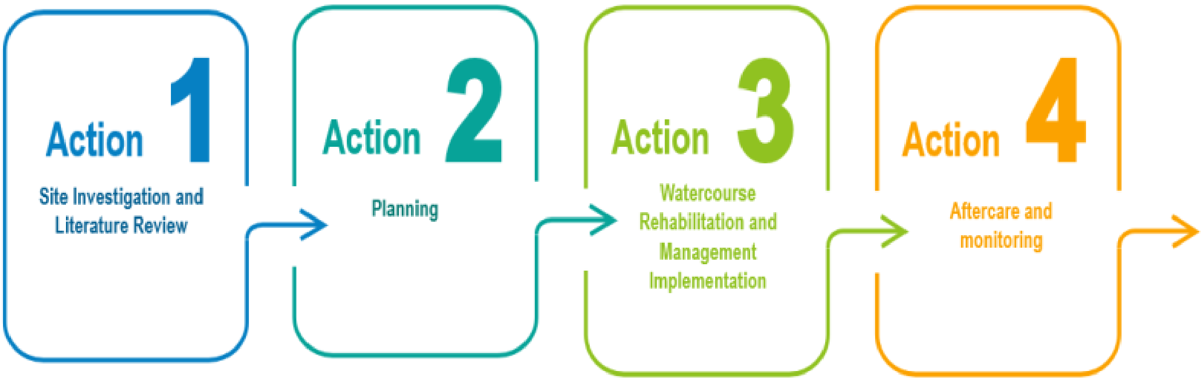
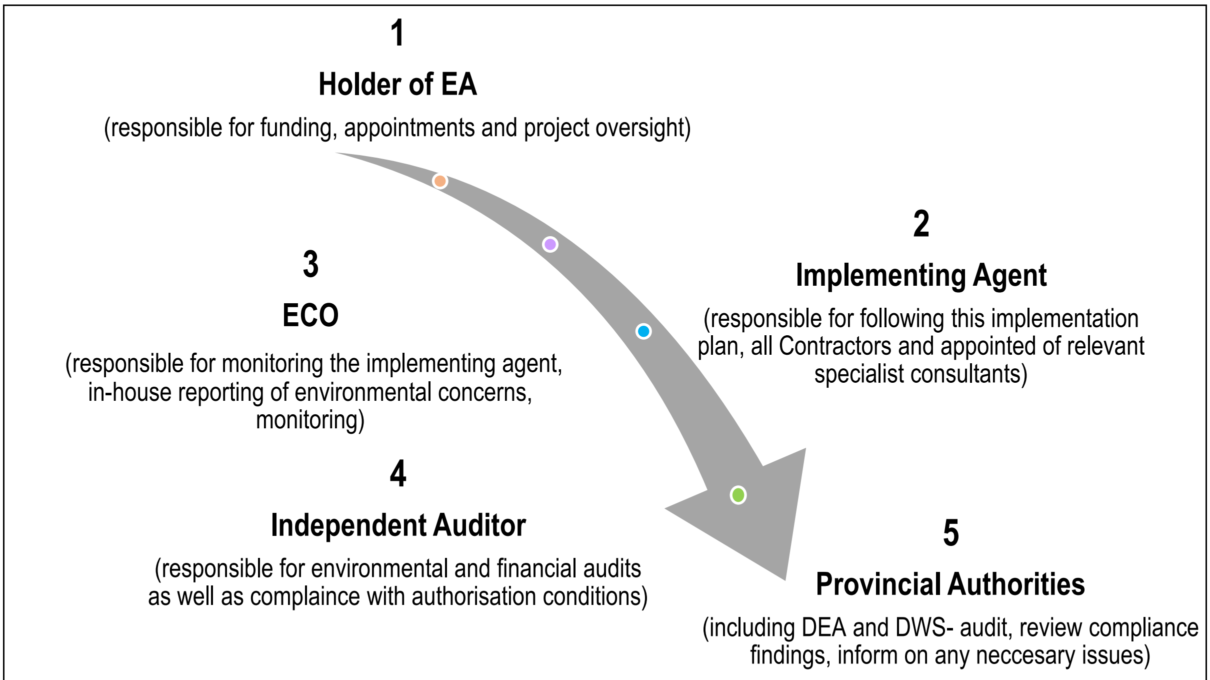


Figure 11: The four (4) key actions of the WRMP implementation.

5.1 Roles and Responsibilities

Table 6 provides a summary of the various parties that are involved with the implementation of this WRMP as well as their responsibilities

Table 6: Summary of various parties involved with the implementation of this WRMP.



Party	Responsibility
Holder of EA	• The Holder of the EA must ensure sufficient funding for the implementation and long-term maintenance of the mandated rehabilitation requirements as stipulated in this WRMP; • The Holder of the EA will be responsible for the appointment of an environmental manager/ Environmental Control Officer (ECO) to monitor and audit the rehabilitation requirements, the implementing agent, as well as an independent auditor; • The Holder of the EA will be responsible for ensuring the implementing agent receives a copy of this document and understands its contents; • It is the responsibility of the Holder of the EA to ensure that the measures stipulated within the Water Use Licence, Environmental Authorisation as well as this WRMP are adhered to; and • The proponent must ensure that that suitable penalties are in place for non-conformance of the conditions of authorisations, licence as well as this WRMP by the implementing agent and any sub-contractors;

	• The Holder of the EA must give the authority to the environmental manager/ Environmental Control Officer (ECO) to stop works on site should he feels that there is a serious threat to or impact on the surrounding environment; and • Should ownership of Oya WEF change, the role and responsibility for compliance with this WRMP as well as long-term maintenance must also be transferred.
Implementing Agent	• An overarching contractor should be appointed as the implementing agent, to manage all sub-contractors and appoint specialists, as required; • The implementing agent must ensure that all sub-contractor/s take full responsibility for each of his/her employees and any penalties imposed; • The implementing agent must immediately inform the proponent and environmental manager if any changes to the project are envisaged and if any aspects of this WRMP cannot be complied with; • Should the implementing agent require clarity on any aspect of this implementation plan, the implementing agent must contact the environmental manager for advice or alternatively, a suitably qualified specialist. **Training of Rehabilitation Workers** The implementing agent is to facilitate an initial environmental induction to all sub-contractors and associated workers in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity, as well as fauna and flora with a no poaching policy, management of waste and prevention of water pollution. Furthermore, the implementing agent is to ensure that all operational workers have received basic training on fire management and prevention measures and be aware of any emergency protocols required. **Contractor Performance** • The implementing agent must ensure that the relevant sub-contractors adhere to the conditions of this WRMP. Should the contractor require clarity on any aspect of this WRMP, the contractor must contact the implementing agent directly, who, if needed can consult with the specialists involved in the preparation of the WRMP. Should the environmental manager feel that the requirements of this WRMP are not being met by the contractor(s), the environmental manager has been given the authority by the Proponent to stop work if in his/her opinion there is/may be a serious threat to or impact on the surrounding environment and instruct the contractor(s) on suitable rectification and remediation actions that must be implemented immediately.
Environmental Control Officer (ECO)	• The ECO is the person responsible for the monitoring of the implementation of the WRMP during the implementation of the activities and for reporting on the degree of compliance. The ECO should ideally be appointed at the start of construction activities and be responsible for ensuring that all rehabilitation activities are implemented. The ECO is mandated to do the following: · Ensure that all contractors/ subcontractors/ employees/ construction workers are fully aware of their environmental responsibilities. This should take the form of an initial environmental awareness-training program in which requirements of this document will be explained; · Monitor site activities on a regular basis to ensure that there is minimal environmental impact due to construction activities. A monitoring report should be submitted to the Contractor, the Civil Engineer (should there be any design changes required) and the Project Manager; · Ensure that a 'hotline' exists for reporting incidents and resolving any problems rapidly; · The ECO must regularly audit the operation and establish whether the measures in the WRMP are applied, where after the ECO reports to the lead project manager; · All reports compiled by the ECO must be submitted to the relevant compliance office within the DWS and DEFF; · The ECO has the authority to stop works if in his/her opinion there is/may be a serious threat to or impact on the environment caused directly by the construction operations; and · Conduct a final environmental audit and a review of management and rehabilitation measures. • Should the appointed ECO not have any freshwater ecological experience, a suitably qualified Freshwater Ecologist should be appointed to assist the ECO as and when needed.
Independent Auditor	The independent auditor must be suitably qualified with relevant experience to undertake external audits of the findings of the on-site ECO/Environmental manager, in line with the conditions stipulated within the Environmental Authorisation (EA) and relevant Water Use Authorisation (WUA). The independent auditor will: • Conduct all audits in line with the relevant authorisation requirements and a review of management and rehabilitation measures; • Undertake a site visit to discuss the findings with the on-site ECO and ensure that the rehabilitation activities are complaint; and

	• Compile a relevant audit and monitoring report which is to be submitted to the relevant provincial authorities.

5.2 Action 1: Site Investigation and Literature Review

A site investigation of the proposed Oya WEF development was undertaken by FEN Consulting 22nd and 23rd of September 2020 (early spring season) and on the 22nd to the 24th of October (early summer season) to determine site limitations and rehabilitation requirements. Available literature and scientific assessments referenced in Section 7 were also reviewed to further gain background and support the determination of the required rehabilitation activities and future monitoring needs.

The project site has remained relatively unchanged over the last few decades, being that its utilised for small scale farming activities, with minor land use changes overall. Existing risks to the watercourse noted during the site assessment an on review of the historical imagery is related to informal road crossings and instream impoundments (within the smaller episodic drainage lines). No other significant anthropogenic impacts were noted on the watercourses. Table 7 provides a summary of the existing risks identified to the watercourses associated with the proposed Oya WEF development.

Table 7: Existing and historical risks to the area associated with the proposed Oya WEF development.

1. Existing watercourse road crossings.

On review of the digital satellite imagery, distinct small informal watercourse road crossings are evident (Figure 12). During the site assessment, these watercourse road crossings were investigated (Figure 13). The road crossings are predominately over areas of the watercourse having a solid bed rock base, thus not causing any negative impacts to the active channel of the watercourse. Despite the road crossing resulting in the clearing of vegetation, the vegetation component directly adjacent to the road crossings are considered intact, whit now extensive invasion of alien or invasive plant species. Due to the solid bed rock and rocky ridges associated with the watercourse vegetation is in some areas naturally sparse.

Figure 12: Digital satellite imagery depicting informal road crossings through watercourses. Image on the left displays a watercourse with a distinct solid rock bed base.

Figure 13: Various existing informal road crossings in and surrounding the proposed WEF development site through watercourses (blue dashed line), most of which are hosting a solid bed rock base. The orange arrow in the top left photograph depicts raised embankments, with minor erosion. Orange arrow in bottom right photograph depicts that despite not having any throughflow structures, the road crossing still allows for flow over the crossing.

2. Instream impoundments

Small instream impoundments can be identified on digital satellite imagery (Figure 14). Due to the ephemeral nature of the watercourses, it is assumed that these impoundments were created to collect surface water runoff for agricultural purposes. During the site assessments the presence of these impoundments were confirmed (Figure 15), however it is not considered to be used for any purposes than to collect water utilised by small game and sheep within the property.

Figure 14: Digital satellite images depicting small instream impoundments located within episodic drainage lines.

Figure 15: Photographs of instream impoundments identified within the proposed Oya WEF development site.

5.3 Action 2: Planning

The intention of this WRMP is to achieve the rehabilitation objectives as listed in Table 5 above in the most economical and feasible manner by maintaining the ecological condition and function of the watercourses associated with the proposed WEF development. In order to achieve the rehabilitation objectives and increase the rehabilitation success rate, cogent conceptual planning is essential to provide clear and concise requirements to orient the rehabilitation and management activities to achieve the desired final results. Table 8 provides requirements to be considered during planning and before implementing the WRMP.

Table 8: Planning requirements to be considered prior to the implementation of the WRMP measures.

Planning Requirements to be considered prior to the implementation of the watercourse rehabilitation and management measures.
1.1 Obtaining all relevant authorisations and permits Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to: ➢ Environmental Authorisation (as applicable); and ➢ Water Use Authorisation (either through a Water Use License (WUL) or General Authorisation (GA), whichever is applicable to the project). ***Note: If any plants or seeds will be harvested from the surrounding area for revegetation purposes, a permit may be required from the DEFF and/or CapeNature prior to plant harvesting.*** **1.2. Appointment of a Contractor and all required specialists** During the planning phase certain aspects need to be considered in order to effectively implement this plan. This includes: ➢ Appointment of a suitably qualified Contractor(s) to undertake the required work; ➢ Appointment of an Environmental Officer to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring; ➢ Appoint any specialist consultants required for guidance, management and monitoring that may need to be retained; and ➢ The Environmental Officer is to compile a monthly audit report indicating all observations, actions and any remediation measures that were implemented and the reports are to be submitted to the competent authorises. ***Note: Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to retain a suitably qualified freshwater ecologist to oversee the implementation.*** **1.3 Budgetary Allowance** A rehabilitation budget needs to be prepared prior to the commencement of rehabilitation activities. The preparation of a budget is a crucial step in planning of a project, as it allows for the prediction and calculation of all the costs related to

Planning Requirements to be considered prior to the implementation of the watercourse rehabilitation and management measures.
implementation of the rehabilitation activities, including, but not limited to labour, material, expertise and post rehabilitation maintenance and management. **1.4 Timing** Rehabilitation of the watercourses should commence as soon as possible and should optimally be concurrent as work progress. Rehabilitation should have a fixed deadline for completion. **1.5 Planning for on-site requirements** **Establishment and Access** ➢ Site access must be gained only utilising the existing access roads. New road crossings may only be established where authorised. ➢ At no point should construction equipment/vehicles extend past the designated construction site (unless for the required rehabilitation works). All vehicles may only make use of the existing informal road up to the point where authorised roads and watercourse road crossings are established. No indiscriminate movement of vehicles will be tolerated in the delineated watercourses. ➢ Adequate signage (in the adequate various languages) must be placed around the watercourse crossings to indicate to the public and construction workers that access to the watercourses is prohibited (unless for authorised personnel). **Indigenous plant harvesting and propagation**. ➢ As part of the proposed rehabilitation plans, indigenous species must be re-instated within the watercourses (if considered feasible by the ECO). As such, plans should be made for where the species are to be sourced and budgetary allowances made for the purchasing of various species. ➢ Availability of species needs to be secured before rehabilitation activities commence to ensure that plants are ready and available for re-vegetation (Action 3), so as not to leave areas exposed and vulnerable to erosion and incision. **1.6 Kick-off meeting/ Environmental Induction** Before commencing with the rehabilitation activities, a kick-off session associates all the responsible persons involved in the implementation of the WRMP. The key aims of the meeting are: ➢ Agreeing on the timeline for rehabilitation activities; ➢ Identifying the rehabilitation expectations and limitations; and ➢ Validating the WRMP rehabilitation strategies and the involvement of all the responsible persons in the implementation process. **1.5 Training of Contractors** All contractors involved in the implementation of this WRMP must receive basic training in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity, as well as fauna and flora with a no poaching policy, management of waste and prevention of water pollution.

5.4 Action 3: Watercourse Rehabilitation and Management Implementation

A site-specific WRMP has been developed to provide step-by-step implementation measures to rehabilitate direct disturbance to the watercourses due to the proposed road crossings as well as measures to mitigate any impacts arising from infrastructure components located at least 32 m from the delineated extent of the watercourses. The implementation of these measures is the core of the WRMP, as this entails putting rehabilitation and management activities into visible outputs. The success of the rehabilitation efforts is highly dependent upon cogent conceptual planning undertaken at the early stage of the construction activities associated with the proposed Oya WEF development (Section 5.2). The mitigation measures that must be adhered to during the construction and operational phases are listed in the tables that follow as well as the watercourse assessment undertaken by FEN Consulting (2020).

This WRMP includes practical rehabilitation and management methods to achieve rehabilitation objectives and a desired end result. The rehabilitation and management methods of this WRMP were grouped into three (3) tasks (Figure 16) and discussed in Section 5.3.1 – 5.3.3 to guide the implementation thereof.

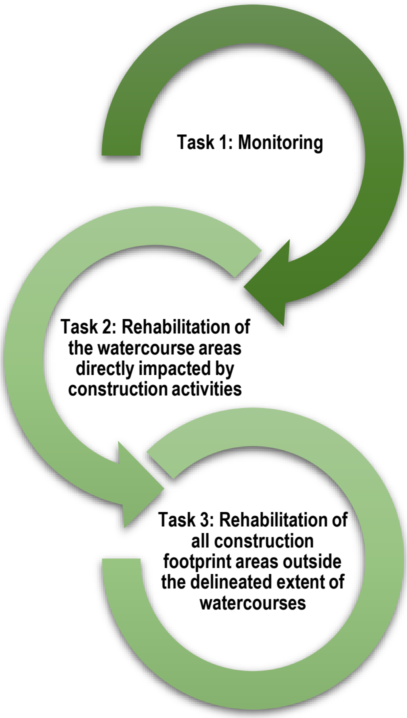


Figure 16: Grouped tasks for the rehabilitation and management method implementation.

Table 9: A summary of the description of each task, the responsible persons and applicable section of the WRMP.

Task	Description	Responsible persons	Section in the WRMP
Task 1a: Monitoring – soil erosion and siltation during all phases	Monitoring of soil erosion and siltation within watercourses.	ECO	Section 5.3.1
Task 1b: Monitoring –Alien and Invasive Plants (AIPs) (Operational & Rehabilitation phase)	Monitoring of soil erosion and siltation within watercourses or within the 32 m buffer. Monitoring of edge effects of alien and invasive proliferation from disturbed areas.	ECO	Section 5.3.2
Task 2: Rehabilitation of the watercourse areas directly impacted by construction activities.	Rehabilitation measures are provided for the construction and operational phases of the watercourse road and underground cable crossings, which entails: - Vegetation clearing as part of site preparation activities; - Excavation and subsequent compaction of soil - Concrete use (if applicable) - Rehabilitation of construction footprint area.	ECO	Section 5.3.3
Task 3: Rehabilitation of all construction footprint areas outside the delineated extent of the watercourses.	The requirements to be taken to manage edge effects resulting from construction activities outside the watercourses and 32 m from the delineated extent of the watercourses.	ECO	Section 5.3.4

5.4.1 Task 1a: Monitoring of Soil Erosion and Sedimentation

During the site assessment, minimal bank erosion was noted within the watercourses. Where bank erosion was noted e.g. within the riparian habitat of the Windheuwels River and smaller watercourses, due to informal road crossings and instream impoundments, it has resulted in the presence of alien vegetation species (albeit limited).

Removal of sediment may be required, specifically post-construction of watercourse crossings of roads and the overhead collector system powerline. Excessive sediment build-up will allow proliferation and dominance by Alien and Invasive Species (AIP) and may impact the ecology and function of the downstream reaches of the watercourses. A generalised sediment removal method statement is provided along with control measures that must be implemented during the sediment removal activities.

Although minimal erosion was noted, the following erosion control measures are deemed relevant.

Table 10: Method statement and management measures to be implemented for erosion and sediment control.

Responsible Persons	Proponent	Environmental Control Officer
	Implementing Agent	Independent Auditor
Objective/ Requirement	**Control measures**	
Monitoring of soil erosion and siltation within watercourses	<u>Erosion and revegetation</u> • Slope and stabilise banks of watercourse crossings to a 3:1 ratio; • Works should preferably be undertaken by hand; • Install suitable biodegradable materials, as recommended, to assist with vegetation growth, during revegetation activities within the watercourse; • Install protective structures, e.g. geotextiles; • Use vegetation plugs, rock packs or gabions where erosion is visible; • Only indigenous vegetation species may be utilised as part of the revegetation; and • Continual erosion monitoring should occur by a trained staff member. <u>Sedimentation</u> • Remove deposited material and soil from the crossing points that might cause a hinder or build-up and prevent flow of water; • Once all material has been removed, the watercourse embankments (where applicable) should be sloped to no greater than a 3:1 ratio, and soils ripped. It is important that the embankment of the upper and lower reaches of the watercourse tie into the resloped embankment to prevent future erosion and incision that may result; • Works should preferably be undertaken by hand; and • Dispose deposited material at a registered facility.	

5.4.2 Task 1b: Alien and Invasive Plant Management

Only some Alien and Invasive Plants (AIPs) were noted at existing road crossings and at artificial impoundments (FEN Consulting, 2020). As the project site is relatively undisturbed, no significant areas infested with AIPs were noted.

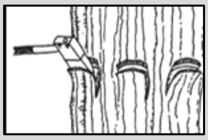
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) Section 73 requires every person to exercise a Duty of Care relating to invasive species within their property, and as such the landowner is responsible for AIP control. Category 1b species require compulsory control and must be removed and destroyed as they have high invasive potential. An AIP control plan was therefore developed as part of this WRMP, should such species establish within the project footprint area.

AIP control can be divided up into two phases, namely:

1. The initial control phase where AIPs are removed from the during the construction and post-construction phase; and
2. The follow-up control during the operational phase whereby AIPs (coppice, saplings, and seedlings) within the watercourses as well as all construction footprint area above the 32 m NEMA Zone of Regulation but below the 100m GN509 Zone of Regulation must be done once a year during spring (September – November) for a minimum period of seven (7) years to ensure that new AIP infestation does not occur, after which the follow-up period should be re-assessed based on the need.

The following definitions (Table 11) are applicable to this section relating to AIP control:

Table 11: Definitions for terminology associated with AIP removal.

Hand Pull 	Low or sparse infestations of saplings and seedlings can be pulled out by hand. All root material should be removed to avoid re-sprouting of the plant. Safe to use in the river as no chemicals are used. Hand pulling does create soil disturbance, but if the area is sparsely invaded such disturbances are unlikely to be ecologically damaging.
Frill 	The technique whereby an axe or cane knife is used to chip/cut around the base of a tree (±2mm deep) in order to place herbicide into the cuts (cutting not to be as deep as to ringbark). Herbicide to be applied within 30 minutes from frilling. Suitable for mature trees in low/sparse infestation. No contamination of water with herbicides as these are applied directly to the tree.
Ringbark 	A cane knife or axe is used to remove the bark from the tree and cambium, in a horizontal band about 30cm wide (about 50cm from the ground). Ring barking interferes with the circulation of the tree and results in it slowly dying. No contamination of water with herbicides as these are applied directly to the tree.
Tree Felling 	Complete removal of the AIP down to a stump by means of a chainsaw, hand axe, brush-cutter. Suitable for clearing dense stands. Potential for pollution as a result of bar oil in equipment and may result in blockages to infrastructure due to debris build-up.
Slashing 	The seed stalks/branches of annual plants can be slashed with a cane knife, mattock, bill hook or slasher before the seeds have matured. No contamination of water with herbicides as these are applied directly to the tree. ** Care should be taken to prevent plant material and propagules from ending up in the river. **Costs are generally low for controlling annuals in this way, as no herbicide is required.
Stumping 	The treatment of the remaining stump after felling with an appropriate herbicide (see recommended below). No contamination of water with herbicides as these are applied directly to the tree. **Stumping can also imply the treatment of the remaining stump after felling with an appropriate herbicide.
Foliar Spray 	The application of herbicides directly to the leaves. Foliar spraying can be done by using the following: a) A hose and handgun spraying the solution from a herbicide tank; b) A backpack spray unit; or c) Splatter guns which allow for larger droplets at higher concentrations – suitable for regrowth. **It must be ensure herbicide is being applied at the right concentration and rate to cover the foliage of the pest plant with fine droplets and avoid run-off. A flat-fan nozzle and low pump pressure will assist in reducing spray drift.

Soil application	The application of herbicide (see recommended below) to the soil which is taken up by the plants roots.
Stump Coppice	New shoots that regenerate from the stumps of felled trees.
Root Suckers	New vertical regrowth that arises from the base of the trunk, a new stem arising away from the main, stumped stem.

The diagram (Figure 17) as well as Table 12 below indicates the recommended control measures to be implemented as part of this WRMP. All recommended herbicides and active ingredients are listed under species specific control. It is important to note that AIP control must be done from the outer sections inwards in order to contain the existing AIP and prevent further spread.

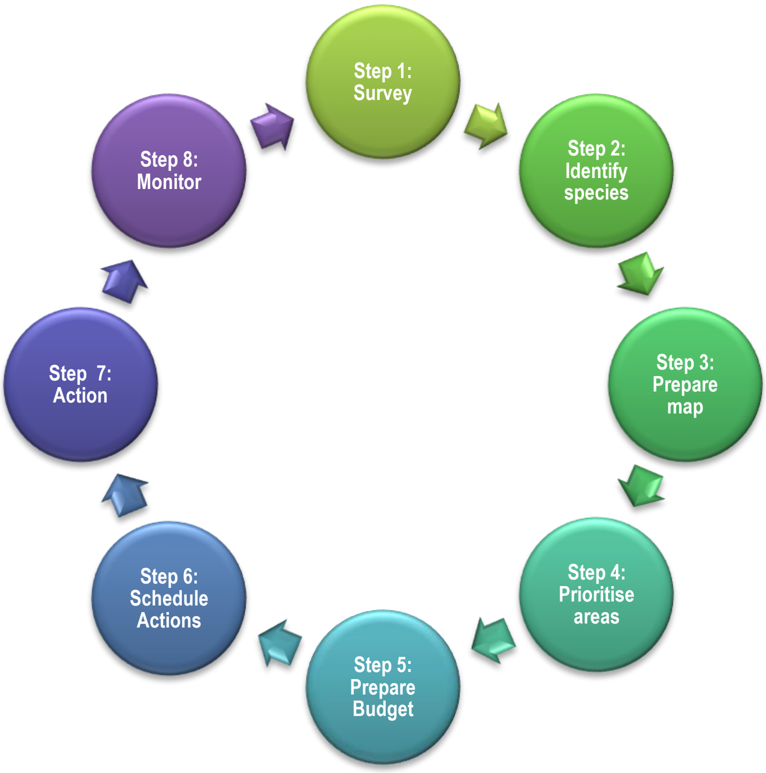


Figure 17: Schematic diagram if the required steps associated with an AIP plan.

Table 12: Relevant objectives and control measures to be implemented as part of the AIP clearing

Objectives or requirements	Control Measures
Initial Control	
General	• AIP must be removed from the watercourse and surrounding terrestrial habitat (within 32 m thereof) to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as provided in **Annexure B**; • AIP should be manually removed as far as feasibly possible and spot chemical treatment can be undertaken utilising products safe for use within the watercourse. • All herbicides used must be approved by DEA and all directions as stipulated on the proposed herbicide must be strictly adhered to.
Chemical Control	• Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle; • Suitable dye must be used to limit over- or under spray of areas; • Chemical control will entail limited usage of registered herbicides for a specific species and one must adhere to the measurements on the product label; and

	• **Label instructions may not be exceeded due to negative impacts on surrounding flora and fauna for the use of herbicides containing Glyphosate, Diquat and Paraquat in the identified watercourses associated with the rehabilitated area.**
Control within disturbed areas due to the construction of road crossings within watercourses.	• Proliferation of alien and/or invasive vegetation as a result of disturbances. Monitoring for the establishment for alien and invasive vegetation species must be undertaken, specifically at the road crossings and surface infrastructures. Should alien and invasive plant species be identified, they must be removed and disposed of as per an alien and invasive species control plan and the area must be revegetated with suitable indigenous vegetation. • The removed vegetation must be stockpiled outside of the delineated boundary of the watercourse. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m unless approved by the ECO. • Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site. • After upgrading of roads traversing watercourses, the area surrounding the road must be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring. • Post-closure monitoring of the watercourses (for a period of 3 years), with specific mention of the invasion of alien vegetation species) is recommended to be undertaken. • The operational area should regularly be inspected for alien and invasive vegetation species which might have established due to the construction activity related disturbances.
Follow-up Control	

Follow-up AIP treatment	• Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation may become worse and denser than before the eradication process started;
	• Follow-up should be quarterly after the initial AIP clearing, thereafter, annually, within the growing season (September – November) for at least seven (7) years;
	• An annual assessment before mobilisation of the clearing crew should be undertaken to determine equipment and personnel requirements in order to secure the necessary funding; and
	• After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers. The following should therefore be applied:
	  ○ Plants that are less than 1 m in height must be controlled by foliar application; and
	  ○ Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.

5.4.3 *Task 2: Rehabilitation of the watercourse areas directly impacted by construction activities*

The following section provides rehabilitation, mitigation and management measures for the proposed watercourse road crossings (those proposed to be upgraded and new road crossings) and associated underground cable crossings (direct negative impacts) associated with the proposed Oya WEF development.

Table 13: Rehabilitation interventions and control measures proposed for the direct impacts expected on the watercourses

Responsible Persons	Proponent	Environmental Control Officer
	Implementing Agent	Independent Auditor
Objective/ Requirement	**Control measures**	
General mitigation	• It is imperative that all construction works within any watercourses be undertaken during the driest period of the year when there is no flow within the watercourses, and thus no diversion of flow would be necessary; • The reaches of the watercourses where no activities are planned to occur must be considered no-go areas. These no-go areas can be marked at a maximum distance of 5 m upstream and downstream of the proposed road upgrade crossing. This 5 m buffer area would allow for	

<table>
<tr><th>Responsible Persons</th><th>Proponent</th><th>Environmental Control Officer</th></tr>
<tr><th></th><th>Implementing Agent</th><th>Independent Auditor</th></tr>
<tr><th>Objective/ Requirement</th><th colspan="2">Control measures</th></tr>
<tr><td></td><td colspan="2">construction personal, vehicles (if applicable) to enter the watercourse crossing where the road is proposed to be upgraded/developed;
• Material to be used (gravel – if applicable) as part of the upgrading of the existing roads must be stockpiled outside the 32 m NEMA ZoR of the watercourses to prevent sedimentation thereof and to avoid any other vegetation being impacted by the construction activities. These stockpiles may not exceed a height of 2 m unless approved by the ECO and should be protected from wind using tarpaulins;
• Contractor laydown areas, vehicle re-fuelling areas and material storage facilities are to remain outside of the watercourses and at least 32 m from the delineated extent.</td></tr>
<tr><td>Construction phase</td><td colspan="2">• The removed vegetation must be stockpiled outside of the delineated boundary of the watercourses. The footprint areas of these stockpiles should be kept to a minimum, and may not exceed a height of 2 m unless approved by the ECO. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site;
• Should low flow surface water be present in the watercourse, in order to prevent sedimentation of the downstream reach of the watercourses, silt traps (such as hay bales) should be installed downstream of the road crossing footprint, at 10 m intervals;
• Soils excavated from any trenching must be stockpiled immediately upstream of the trench. Once the cable is installed the trench must be infilled (backfilled to the natural ground level) with the removed material and suitably compacted to avoid any erosion and preferential flow paths from forming;
• Any remaining soils following the completion of backfilling of the trenches are to be spread out thinly in an area within the watercourses to aid in the natural reclamation process; and
• Should the road crossing need to be compacted, the footprint area must be kept as small as possible to avoid compacting adjacent watercourse areas.

No road crossing designs were available at the time of this assessment. However, it is assumed that formal culvert structures may be required at some of the watercourse crossings (specifically the rivers and ephemeral tributaries). Since concrete casting may potentially be required for such activities, the following is recommended:
• No mixed concrete may be deposited outside of the designated construction footprint;
• Concrete spilt outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site;
• Mixing of cement must done within the construction camp, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer;
• Consideration must be taken to use ready mix concrete;
• No mixed concrete shall be deposited directly onto the ground. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing;
• Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be suitably disposed of; and
• Spilled or excess concrete must be disposed of at a suitable landfill site.</td></tr>
<tr><td>Rehabilitation of construction footprint area</td><td colspan="2">• After upgrading of roads traversing watercourses, the area surrounding the road crossing must be ripped and be revegetated with suitable indigenous vegetation to prevent the establishment of alien vegetation species and to prevent erosion from occurring;
• Ripping and revegetation activities should include the road construction footprint area (5m buffer upstream and downstream of watercourse crossing). It is recommended that Ripping and vegetation be done by starting at the most upstream area towards the downstream area. This will minimise disturbance to the rehabilitated areas;
• Should watercourse embankments have been impacted by the road construction activities, the embankment must be suitably sloped (1:3) and revegetated to prevent any erosion and sedimentation;
• It is highly recommended that an alien vegetation management plan be compiled during the planning phase and implemented concurrently with the commencement of construction; and
• All existing alien and invasive vegetation should be removed (if applicable). All material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.</td></tr>
</table>

Responsible Persons	Proponent	Environmental Control Officer
	Implementing Agent	Independent Auditor
Objective/ Requirement	Control measures	
Operational Phase	• Routine maintenance of the roads must be undertaken to ensure that no concentration of flow and subsequent erosion occurs due to the road crossings. Such maintenance activities must specifically be undertaken after high rainfall events, otherwise on every 3 months; • Stormwater runoff from the road crossings should be monitored (by the Operation and Maintenance (O&M) Manager), to ensure it does not result in erosion of the watercourses. Stormwater should be allowed to diffusely spread across the landscape, by ensuring adequate surface roughness in the watercourse (through vegetation and rocky areas); • The stormwater management measures as per the Stormwater Management Plan (NatureStamp, 2020) must be maintained to ensure that stormwater from the roads does not negatively impact on the watercourses; • Maintenance vehicles must make use of dedicated access roads and watercourse road crossings and no indiscriminate movement in the watercourses may be permitted; • During periodic maintenance activities of the roads/surface infrastructure, monitoring for erosion should be undertaken (see Section 5.4); and • Should erosion be observed, caused by the road crossings, the area must be rehabilitated by infilling the erosion gully and revegetation thereof with suitable indigenous vegetation. Use can also be made of rocks collected from the surrounding area to infill any area prone to erosion, as a natural dispersal mechanism; • Should alien and invasive vegetation species be noted, these species must be suitably removed/eradicated, preferably using manual labour, and disposed of in a suitable manner (may not be left within the watercourse area).	

5.4.4 Task 3: Rehabilitation of all construction footprint areas outside the delineated extent of watercourses

Although no direct impacts are expected on the watercourses from the construction and operation of surface infrastructure components (related to the construction camp, wind turbines, crane pads and overhead power line pylons) located outside the 32m NEMA Zone of Regulation but still below the 100m GN509 Zone of Regulation, the following section lists rehabilitation measures to be applied to the areas surrounding the watercourses to prevent any edge effects from impacting on the watercourses that may contribute to the cumulative impacts of the proposed Oya WEF development. These control measures must be implemented post-construction and ongoing as part of the operational phase.

Table 14: Rehabilitation of construction footprint areas located outside the delineated extent of the watercourses

Responsible Persons	Proponent	Environmental Control Officer
	Implementing Agent	Independent Auditor
Objective/ Requirement	Control measures	
Revegetation of all construction footprint areas to ensure the smallest possible operational footprint areas (Post construction and Operational Phase)	• All areas disturbed by construction activities must be ripped, and reprofiled to mimic the natural topography; • All areas must be suitably revegetated with indigenous vegetation (terrestrial/freshwater pending on the area being rehabilitated); • All Alien and Invasive Plant species must be removed (refer to Task 1b) from these areas and disposed of in a suitable manner, but may not be burned or mulched within the project site; • All rehabilitated areas must be monitored to ensure successful establishment of vegetation and for the invasion of AIPs.; and • Should AIPs be noted, these species must be removed as per the recommended methods in Section 5.3.2 and suitably disposed off.	
Stormwater management	Large, compacted areas (construction camp, turbine cane pads) will be located at least 32 m from the delineated extent of the watercourses, as such potential edge effects may arise from the construction and operation of thee areas. The following control measures are recommended: <u>Construction phase:</u>	

	• The construction footprint areas of the construction camp and crane pads should be kept as small as possible and no vegetation should be removed beyond the footprint area. The vegetation provides surface roughness to reduce the velocity of any stormwater flows that may potentially enter the watercourses; • Silt fences must be installed on the downgradient side of the construction footprint where it is located on a steep slope close to the headwaters of a watercourse. This will prevent any sediment laden runoff from potentially entering the watercourse. Silt fences can be erected by means of a small firm plastic drift fence, pegged into the ground; and • No runoff from the construction footprint area may be released into any of the delineated watercourses. The control measures as specified in the stormwater management plan (NatureStamp, 2020) must be implemented. <u>Operational phase:</u> • Revegetation as per the requirements above • All stormwater management infrastructure must be regularly inspected to ensure optimal functioning. Should erosion be noted, the area must be infilled with in situ soil and suitably revegetated;

5.4.5 Management methods post-rehabilitation

Once the rehabilitation measures have been implemented (as described in Task 2 and 3 above), periodic maintenance of the watercourses must be undertaken. This section provides generalised method statements and control measures for certain activities which must be implemented to insure ongoing ecological and hydrological functioning of the watercourses. Additionally, the control measures as prescribed for general activities, vegetation clearing and earthworks (where applicable) and revegetation activities must also be implemented during the maintenance.

Table 15: Method statement and control measures recommended for maintenance activities.

Activity 1: Sediment removal	
Removal of sediment may be required from road crossing sections, specifically after heavy rainfall events within various watercourses. Excessive sediment build-up will allow proliferation and dominance by *Typha capensis, Phragmites australis* or *Arundo donax* (Category 1b AIP) and may impact the hydrological functionality of the systems. A generalised sediment removal method statement is provided. Additionally, control measures that must be implemented during the sediment removal activities is also provided.	
Method Statement	**Control measures**
1. Enter applicable maintenance site by means of the closest access point; 2. Remove any deposited material in the watercourses, adjacent to any road crossings from the upstream towards the downstream side; 3. Stockpile all removed material outside the watercourse; 4. Dispose of all material removed from the culvert from site.	• Sediment clearing activities must preferably be undertaken in the drier summer season; • Should sediment clearing activities be undertaken in the raining winter period (specifically due to a blocked culvert after a heavy rainfall event), a sediment trap must be installed at the outlet side of the culvert. Sediment traps must be made from geotextile wrapped hay bales or may be a material drift fence; • Removal of sediment must preferably be done through manual labour and the use of heavy machinery must be avoided; • Personnel may only enter the applicable area of the watercourses where material needs to be removed. All other areas are considered a no-go areas; • Removed material must be disposed of at a registered disposal facility as soon as all the maintenance activities is concluded.

5.5 Action 4: Aftercare and Monitoring

Prudent monitoring of the watercourse directly impacted by the proposed Oya WEF development and potentially by edge effect are of the utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage the progress of the rehabilitation interventions and any arising issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Site walk through surveys should be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
  - Erosion monitoring (every 3 months);
  - Sedimentation (every 3 months);
  - Alien and invasive vegetation proliferation (at the start and end of the growing season); and
  - Spills events (regularly at the direction of the relevant engineer)
- General habitat unit overviews should also be undertaken;
- Stability and appropriateness of stormwater controls;
- All data gathered should be measurable (qualitative and quantitative), for example by taking photographic evidence of points of interest over time to compare the physical change in the area (extent of AIP invasion or reduction thereof), physically measuring incision and/or eroded areas by means of a tape measure etc.;
- Monitoring actions should be repeatable;
- Data should be auditable; and
- Reports should present and interpret the data obtained.

The monitoring plan, as indicated in Table 15 below, comprises but is not limited to the following:

- Identification of areas of concern. These are areas that are affected by disturbances such as:
  - Erosion and sedimentation;
  - Alien vegetation species encroachment; and
  - Revegetation
- Ensuring that the management/rehabilitation measures as stipulated in Section 5 of this report are adhered to;
- Gathering all equipment required for the monitoring process; and
- Compiling a monitoring report.

Table 16: Monitoring actions proposed for the Oya WEF development

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
AIP control	1. Screening of the watercourses where road crossings are located; and 2. Logging locations of any newly coppiced species to be treated/removed.	1. Before the initial AIP clearing a baseline assessment should be taken to indicate densities and species; 2. After the initial AIP clearing densities should be re-recorded, including all methods and chemicals used; 3. Quarterly assessment during the first year post rehabilitation. Densities and locations of newly coppiced AIPs to be recorded; and 4. Annually during the growing season for the second and third year, post rehabilitation to ensure long-term maintenance measures are effective.	1. Before and after AIP clearing report should be compiled; 2. Quarterly report during the first year post AIP clearing; and 3. Annually during each growing season, for at least three (3) years post rehabilitation – report should include information from before and after mobilisation of follow-up clearing teams.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
Erosion	1. At watercourse road crossings; 2. All areas disturbed by construction activities, such as the entire road crossing footprint area	1. Weekly during rehabilitation activities; 2. After every major rainstorm and / flood for the first wet season post rehabilitation.	Monthly monitoring report compiled by the appointed ECO.
Sediment deposit	1. Within the downstream reaches of the watercourses associated with road crossings	1. Weekly during rehabilitation activities; 2. After every major rainstorm and / flood for the first wet season post rehabilitation.	Monthly monitoring report compiled by the appointed ECO.
Re-vegetation	At all watercourse road crossings.	1. Monthly for 6 months after re-instatement of vegetation; 2. Annually during the growing season for at least three (3) years post rehabilitation to ensure plant survival and to ensure that no AIPs are outcompeting indigenous species.	1. Before commencement of rehabilitation activities, a report should be compiled listing existing species. Should the Contractor not have the expertise to undertake this list, they are to appoint a suitable botanist to assist; 2. Monthly for 6 months after the re-instatement; and 3. Annually during each growing season (early spring to summer season), for at least three (3) years post rehabilitation.

This monitoring plan must be implemented by a competent person and submit the findings to the responsible authority for evaluation.

6 CONCLUSION AND RECOMMENDATIONS

FEN Consulting (Pty) Ltd was appointed to compile a Watercourse Rehabilitation and Management Plan (WRMP) for the proposed Oya WEF development, located between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces.

In accordance with the rehabilitation requirements proposed within this document, the rehabilitation actions proposed are relatively simple to implement. Although some rehabilitation activities, specifically those associated with road crossings area also located within the watercourses which may potentially also result is some type of impact to the watercourses, it must be noted that these activities are only for a short period and the long-term ecoservice provision and hydrological functioning of the watercourses will likely be maintained and, where possible, improved. These measures stipulated within this report will allow for long-term management and monitoring of the watercourses associated with the proposed Oya WEF development.

With the implementation of the WRMP procedures, the negative impacts of the proposed WEF Oya development on the watercourses can be adequately managed. This WRMP further assists in the adequate rehabilitation and erosion control within the projects site in general and to ensure the Present Ecological State of the watercourses are maintained. The information gathered through monitoring programs will assist in a better understanding of the ecology of the area in the vicinity of the proposed Oya WEF development infrastructure and ensure proactive management of risks to the watercourses.

7 REFERENCES

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Department of Water Affairs and Forestry. 2008. *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas,* prepared by M. Rountree, A. L. Batchelor, J. MacKenzie & D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

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Natural Resources Conservation Service. 2013. Pest Management – Invasive Plant Control Common

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the associated Alien and Invasive Species Regulations (GN R598 of 2014).

ANNEXURE A – SPECIALIST DETAILS

1. (a) (i) Details of the specialist who prepared the report

Christel du Preez	MSc Environmental Sciences (North West University)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	SAS Environmental Gorup of Companies		
Name / Contact person:	Christel du Preez		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville,		
Postal code:	7539	Cell:	074 580 6823
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	christel@sasenvgroup.co.za		
Qualifications	MSc Environmental Sciences (North West University)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Christel du Preez, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct

C du Preez
----

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Kim Marais, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct

KMarais

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTEL DU PREEZ

PERSONAL DETAILS

Position in Company	Senior Scientist (Watercourse ecology)
Joined SAS Environmental Group of Companies	2016

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP) (SACNASP – Reg No. 120240/19)
Member of the Western Cape Wetland Forum (WCF)
Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Sciences (North West University)	2017
BSc Hons Environmental Sciences (North West University)	2012
BSc Environmental and Biological Sciences (North West University)	2011

Short Courses

Wetland and Aquatic plant Identification presented by Carin van Ginkel (Crispis Environmental)	2019
Wetland Management: Introduction and Delineation presented by the Centre of Environmental Management University of the Free State	2018
Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2017
Basic Principles of ecological rehabilitation and mine closure presented by the Centre for Environmental Management North West University	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Limpopo, Western Cape, Northern Cape, Eastern Cape

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plan
- Freshwater Offset Plan

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Senior Scientist (Water Resource Manager)
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes

SAS ENVIRONMENTAL GROUP OF COMPANIES SPECIALIST CONSULTANT INFORMATION –

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing Member, Group CEO, Water Resource Discipline Lead, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SEGC	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health Practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

CORE FIELDS OF EXPERTISE

Legislative Requirements, Processes and Assessments
- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies
- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments
- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment
- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment
- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments

ANNEXURE B – LEGAL REQUIREMENTS

The sections below present each legislative document and the aspects, which are pertinent to water resource management including the rehabilitation of disturbed areas.

The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive normalization of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
The National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2017, refer specifically to biodiversity management in the following Clause: (4)(a) *Sustainable* development requires the consideration of all relevant factors including, (i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. This Maintenance and Management Plan has been developed in fulfilment of the requirements as defined in the Environmental Impact Assessments EIA Regulations, 2014 (as amended) (No. R. 327) where a "maintenance management plan" is defined as a management plan maintenance purposes defined or adopted by the competent authority. The following EIA Regulation triggers the need for this MMP: Activity 19, Listing Notice 1: The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (N.B. Points (d) and (e) does not apply as these activities fall within the coastal zone).
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	The objectives of this act are (within the framework of the National Environmental Management Act) to provide for: ➢ the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; ➢ the use of indigenous biological resources in a sustainable manner; ➢ the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; ➢ to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic; ➢ to provide for co-operative governance in biodiversity management and conservation; and ➢ to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

	This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) a specimen of a listed threatened or protected species; b) specimen of an alien species; or c) a specimen of a listed invasive species without a permit. Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened or protected species or prohibit the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof. ***National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Alien and Invasive Species Regulations, 2014)*** NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aim to: ➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as: (a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention. Categories according to NEMBA (Alien and Invasive Species Regulations, 2014): ➢ **Category 1a**: Invasive species that require compulsory control. ➢ **Category 1b**: Invasive species that require control by means of an invasive species management programme. ➢ **Category 2**: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread. ➢ **Category 3**: Ornamentally used plants that may no longer be planted. See **Appendix C** for further details pertaining to Alien and Invasive Vegetation control.
The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	Amendments to regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) ensures that landowners are legally responsible for the control of invasive alien plants on their properties. The CARA legislation divides alien plants into weeds and invader plants, with *weeds* regarded as alien plants with no known useful economic purpose, while *invader plants* may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature.
The National Water Act, 1998 (Act No. 36 of 1998)	The purpose of the National Water Act, 1998 (Act 36 of 1998) (NWA) is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled.

	The NWA, 1998 also provides for water use licenses which an operation will have to apply for, before commencing with any Section 21 water use activity. Various conditions may be attached to these licenses and a breach thereof will result in criminal and civil liability. The conditions attached to water use licenses will function alongside the additional protective measures, duty of care and statutory liability provisions provided by the NWA and other legislation to regulate a whole array of water issues. Accordingly, and in terms of the *Guide to the National Water Act*, "water use" refers to doing something that has an impact on the water resource, for example: ➢ The amount of water in the resource; ➢ The quality of water in the resource; and ➢ The environment surrounding the resource. Section 4 governs the entitlement to use water and states that water may only be used if it is a Schedule 1 use, a continuance of an existing lawful use (ELU), or authorised in terms of a general authorisation (GA) or license. A water use may therefore not be implemented unless it is properly authorised through one of these types of authorisations. The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i). A watercourse is defined as: a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which water flows; and d) Any collection of water which the minister may, by notice in the Gazette, declare a watercourse.
Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)	In accordance with Regulation GN509 of 2016, a regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: ➢ The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; ➢ In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or ➢ A 500 m radius from the delineated boundary (extent) of any wetland or pan. This notice **replaces GN1199** and may be exercised as follows: i) Exercise the water use activities in terms of Section 21(c) and (i) of the Act as set out in the table below, subject to the conditions of this authorisation; ii) Use water in terms of section 21(c) or (i) of the Act if it has a low risk class as determines through the Risk Matrix; iii) Do maintenance with their existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix; iv) Conduct river and storm water management activities as contained in a river management plan; v) Conduct rehabilitation of wetlands or rivers where such rehabilitation activities have a LOW risk class as determined through the Risk Matrix; and vi) Conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency protocol. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA.

Watercourse Rehabilitation and Management Plan Framework

Principles of this Wetland Rehabilitation, Implementation and Management Plan

To assist in achieving the objectives of a WRMP, a set of principles were applied which contributed to formulating action plans and specific management measures.

Loss of biodiversity puts aspects of the economy, human well-being and quality of life at risk, and reduces socio-economic options for future generations. The importance of maintaining biodiversity and intact ecosystems for ensuring the on-going provision of ecosystem services, and the consequences of ecosystem change for human well-being, were detailed in a global assessment entitled the Millennium Ecosystem Assessment (MEA, 2005), which established a scientific basis for the need for action to enhance management and conservation of biodiversity.

Sustainable development is enshrined in South Africa's Constitution and laws. The need to sustain biodiversity is directly or indirectly referred to in a number of Acts, not least the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and is fundamental to the notion of sustainable development. In addition, international guidelines and commitments, as well as national policies and strategies are important in creating a shared vision for sustainable development in South Africa.
Impacts on biodiversity can largely take place in four ways:

- **Direct impacts:** are impacts directly related to the proposed WEF development including project aspects such as site clearing and soil compaction.
- **Indirect impacts:** are impacts associated with the proposed WEF development that may occur within the zone of influence associated with the proposed WEF development, such as the surrounding terrestrial areas.
- **Induced impacts:** impacts that directly attributable to the proposed WEF development but are expected to occur due to the activities of the project. Factors included here are urban sprawl and the development of associated industries.
- **Cumulative impacts:** can be defined as the sum of the impact of a project as well as the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity resources. Examples include numerous industrial/urban developments within the same drainage catchment.

Given the limited resources available for biodiversity management and conservation, as well as the need for development, efforts to conserve biodiversity need to be strategic, focused and supportive of sustainable development. This is a fundamental principle underpinning South Africa's approach to the management and conservation of its biodiversity and has resulted in the identification of spatial biodiversity priorities or biodiversity priority areas.

'Mitigation' is a broad term that covers all components of the 'mitigation hierarchy' defined hereunder. It involves selecting and implementing measures – amongst others – to conserve biodiversity and to protect the users of biodiversity and other affected stakeholders from potentially adverse impacts as a result of anthropogenic activities. The aim is to prevent adverse impacts from occurring or, where this is unavoidable, to limit their significance to an acceptable level.

The mitigation hierarchy, as advocated by the Department of Environmental Affairs (DEA) *et al.* (2013) in general consists of the following in order of which impacts should be mitigated:

1. **Avoid/prevent impact:** can be done through utilising alternative sites, technology and scale of projects to prevent impacts. In some cases, if impacts are expected to be too high, the "no project" option should also be considered, especially where it is expected that recommended mitigations measures will not be adequate to limit environmental damage and eco-service provision to suitable levels;
2. **Minimise impact:** can be done through the utilisation of alternatives that will ensure that impacts on biodiversity and ecosystem services provision are reduced. Impact minimisation is considered an essential part of any development project;

3. **Rehabilitate impact:** is applicable to areas where impact avoidance and minimisation are unavoidable. As such, impacted areas must be returned to conditions which are ecologically similar to the pre-project condition or an agreed post project land use, for example arable land. Rehabilitation cannot, however, be considered as the primary mitigation toll as even with significant resources and effort of rehabilitation usually does not lead to adequate replication of the diversity and complexity of the natural system. Rehabilitation often only restores ecological function to some degree to avoid ongoing negative impacts and to minimise aesthetic damage to the setting of a project. Practical rehabilitation should consist of the following phases in best practice:
    a. **Structural rehabilitation** which includes physical rehabilitation of areas by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long term sustainable ecological structure;
    b. **Functional rehabilitation** which focuses on ensuring that the ecological functionality of the ecological resources associated with the project and its footprint supports the intended land uses. In this regard, special mention is made of the need to ensure the continued functioning and integrity of the wetlands throughout and after the rehabilitation phase.
    c. **Biodiversity reinstatement** which focuses on ensuring that a reasonable level of biodiversity is re-instated to a level that supports the local land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community or community suitable for supporting the intended land use.
    d. **Species reinstatement** which focuses on the re-introduction of any ecologically important species which may be important for socio-cultural reasons, ecosystem functioning reasons and for conservation reasons. Species reinstatement need only occur if deemed necessary.
4. **Offset impact:** The significance of residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss of irreplaceable biodiversity, the residual impacts should be considered to be of a *very high significance* and offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss. In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of low significance no biodiversity offset is required.

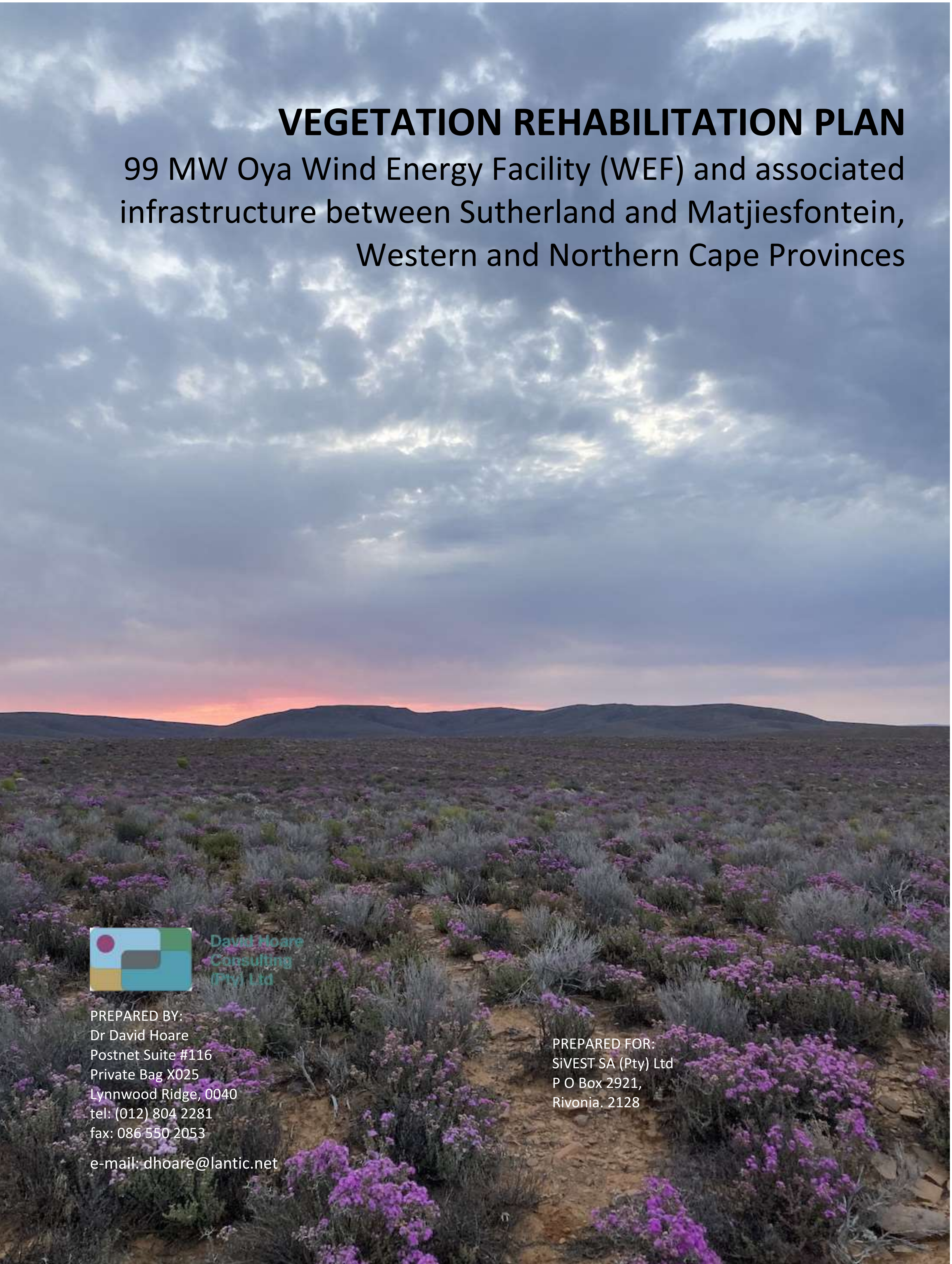
Objectives of this Watercourse Rehabilitation and Management Plan

The objectives of this WRMP are to:

- Meet the requirements of relevant local and regional authorities;
- Identify a range of mitigation measures which could reduce and mitigate the potential impacts on the receiving environment to minimal or acceptable levels;
- Manage activities to maintain and/ or improve the ecological integrity of the watercourses associated with the proposed WEF development;
- Maximise the service provision of the watercourses through extensive rehabilitation;
- Re-introduce indigenous floral species;
- Provide improved and more suitable habitat for faunal species within an urban environment;
- Detail specific actions deemed necessary to assist in mitigating the potential environmental impact on the watercourses;
- Ensure as far as is practicable that the measures contained in the report are implemented; and
- Propose mechanisms for monitoring compliance with the WRMP and reporting thereon.

ANNEXURE H

VEGETATION REHABILITATION PLAN



VEGETATION REHABILITATION PLAN

99 MW Oya Wind Energy Facility (WEF) and associated infrastructure between Sutherland and Matjiesfontein, Western and Northern Cape Provinces

David Hoare Consulting (Pty) Ltd

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PREPARED FOR:
SiVEST SA (Pty) Ltd
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Vegetation Rehabilitation Plan for the proposed 99 MW Oya Wind Energy Facility between Sutherland and Matjiesfontein in the Western and Northern Cape Provinces.

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Contents

Introduction

This document presents the Rehabilitation Plan for the proposed construction of the 99 MW Oya Wind Energy Facility (WEF) and associated infrastructure in the Western and Northern Cape Provinces.

As part of the authorisation process, a Rehabilitation Plan is required to be formulated. This is to ensure that an acceptable plan is in place before construction activities take place on site, and to ensure that affected areas are adequately rehabilitated in accordance with the sustainability

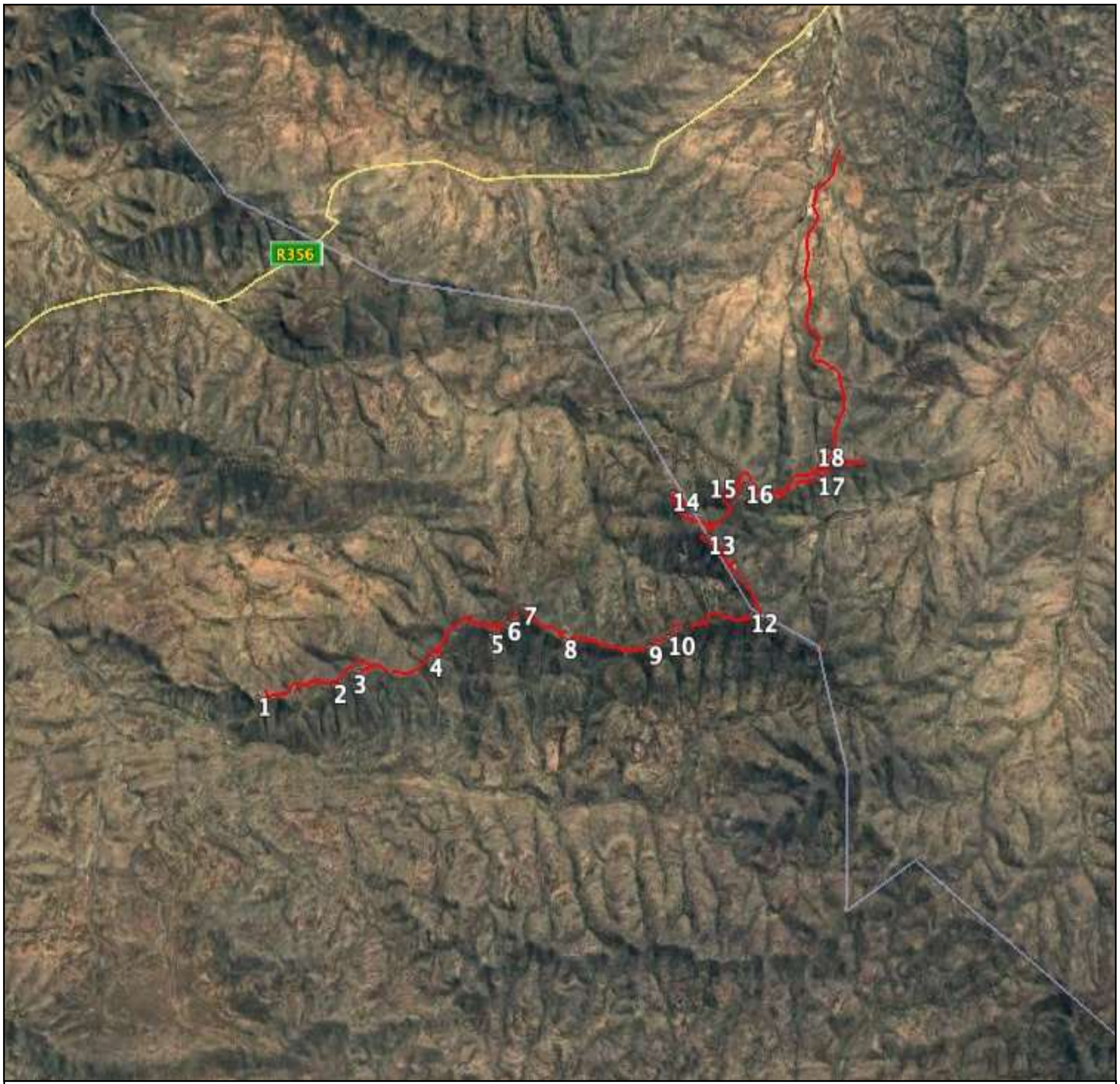

Figure 1: Location and extent of the study area.

principles of Integrated Environmental Management, promoted by the National Environmental Management Act (Act No.107 of 1998) (NEMA).

An infrastructure footprint was provided for the purposes of compiling the Rehabilitation Plan and is provided in Figure 1 below. Recommendations relating to rehabilitation have been provided here on the basis of the plans provided here. It is expected that this Vegetation Rehabilitation Plan could potentially be reviewed and updated when Project designs are finalised, should the final design deviate significantly from that shown in Figure 1.

Purpose of the Rehabilitation Management Plan

The site contains natural vegetation with moderate biodiversity value and is currently used for tourism and partially also in places for live-stock grazing purposes. The purpose of the vegetation rehabilitation plan is to ensure that any areas that will be cleared of vegetation or that will be impacted in some way by construction activities on site are rehabilitated in such a way as to achieve the following:

- Return disturbed areas to an acceptable state;
- Re-establish vegetation cover with suitable plant species so that remaining biodiversity features and prior land-use options are not compromised;
- Reduce the risk of soil erosion in order to achieve long-term stability of the landscape;
- Prevent alien plant invasion on site;
- Restore ecosystem function to areas that are to be rehabilitated; and
- Ensure that all areas are free-draining and non-polluting.

Responsible persons

Effective rehabilitation during the construction and operational phases of the project will be dependent on a number of project personnel. These are listed below.

The Developer

This refers to the project proponent/owner, Oya Energy (Pty) Ltd. They will be responsible for the following:

1. Overall accountability for rehabilitation, and setting and reviewing related targets related to this Plan;
2. Ensure that the requirements set out in this rehabilitation plan are adhered to and implemented;
3. Allocate the responsibilities assigned to the Environmental Control Officer (ECO) to an independent suitably qualified individual prior to the start of construction activities on site; and
4. Provide all principal contractors working on the project with a copy of this management plan as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts.

The Project Manager

The project manager of the proposed development will be responsible for the overall implementation of the rehabilitation plan during the construction phase of the project. To effectively implement the rehabilitation plan, the project manager must be aware of the findings, mitigation measures and conclusions of the Final BA report, the requirements of the EA, and this Rehabilitation Plan. The project manager must ensure that the contractors are aware of the specifications, legal constraints and company standards and procedures pertaining to activities taking place regarding the proposed power lines and other infrastructure. The project manager must also ensure that all commitments and conditions in the EMPr are communicated and adhered to by relevant employees and contractors involved in the proposed development, by making documents available and including the requirements into the induction programme for the proposed power line.

The Environmental Control Officer (ECO)

An ECO will be appointed to provide inputs during the construction phase of the proposed power line. These functions will be taken over by Oya Energy (Pty) Ltd during the operational phase. The ECO will be appointed by Oya Energy (Pty) Ltd and not the contractor, and will report directly to Oya Energy (Pty) Ltd. The ECO is responsible for monitoring and verifying the implementation of the management plan during the construction phases of the project. To effectively implement the management plan, the ECO must be aware of the findings, mitigation measures and conclusions of the Final BA Report, the EA, and this rehabilitation plan. The ECO has the following responsibilities:

1. Must fully understand the commitments in the EMPr and the EA for the proposed project.
2. Must familiarise him/herself and ensure compliance with the relevant legislation applicable to the project, as well as Oya Energy (Pty) Ltd, Health and Environment (SHE) Policy and procedures.
3. Must communicate the contents of the EMPr to staff members of the contractor / sub-contractors.
4. Monitor the implementation of the EMPr throughout the project, by means of site inspections, as well as reporting to Oya Energy (Pty) Ltd and the project team at progress meetings.
5. Undertake site inspections on a regular basis according to the frequency specified in the EMPr, to assess compliance with the EMPr and conditions in the EA, and to advise on appropriate action to rectify non-compliance.
6. Recommendations to Oya Energy (Pty) Ltd for the removal of personnel and/or equipment should they contravene the specifications of the EMPr.
7. Liaise with environmental statutory bodies, where this is deemed necessary in association with the project team and/or Oya Energy (Pty) Ltd personnel.
8. Compile monthly progress reports for submission to the project manager.
9. Advise the project management team on environmental issues and recommendations for the proposed power line construction activities.

The Contractor

The contractor, being any directly appointed company or individual undertaking the implementation of works, will be responsible for complying with the rehabilitation plan at all times during the construction phase. The contractor, and any sub-contractor/s, will be responsible for the implementation of the contractor specific EMPr, the SHE Plan and any other Oya Energy (Pty) Ltd Plans. The contractor and all sub-contractors will be responsible for:

1. Complying with the EMPr commitments and any other legislative requirements as applicable to the contractor's appointment for the proposed power line.
2. Drafting a method statement appropriate to the day-to-day activities under their direct control. This method statement for the activities to be undertaken by the contractor must abide by the EMPr and must be agreed upon by the project team representatives and the ECO.
3. Adhering to any instructions issued by the project manager, on advice of the Oya Energy (Pty) Ltd environmental specialist and/or ECO.
4. Submitting an environmental report at identified site meetings on any environmental incidents that have occurred within the period between site meetings, and reporting on any action to address any incidents previously identified by the contractor or the project team, the ECO or Oya Energy representatives.
5. Ensuring that all employees of the contractors receive appropriate training prior to the commencement of construction, taking cognisance of the EMPr and the conditions of the EA.

Proposed activities on site

This section provides an outline of the proposed activities on site in terms of the likely impacts expected from different project components. The purpose is to provide an indication of the type of rehabilitation activities that will be required.

Project components

The main infrastructure components to be constructed are as follows:

1. Wind turbines;
2. Access roads;
3. Construction area; and
4. Collector system.

Activities during pre-construction and construction phases

Various activities that may have an effect on the environment are expected to be undertaken during pre-construction and construction phases of the project, as follows:

1. Delineation of servitudes and/or positions for individual infrastructure components;
2. Establishment of contractor camps, site offices, change-rooms, workshops, vehicle parking, ablutions, material storage areas, waste storage areas, etc.;
3. Establishment of security measures for construction activities, including fencing and lighting for contractor's operational areas;
4. Transportation of equipment and machinery to the construction site locations;
5. Stripping and removal of surface vegetation at the sites of proposed infrastructure components;
6. Stripping and stockpiling of topsoil and subsoil to a stockpile for later use for rehabilitation and landscaping;
7. Grading and earthworks along the access road construction footprint;
8. Sourcing of construction material;
9. Construction and commissioning of the wind energy facility according to the agreed programme;
10. Development of construction environmental procedures;
11. Transportation of equipment, material and people;
12. Erosion control and pollution control;
13. Site rehabilitation following construction, of areas that have been disturbed and are not part of the ongoing operational phase of the proposed wind energy facility; and
14. Monitoring and maintenance of rehabilitated areas.

Current status of habitat on site

This section provides an outline of the existing status of the site with respect to natural vegetation. The purpose is to provide a context for the rehabilitation plan.

Ecosystem context

There are two regional vegetation types occurring in the general area, namely Koedoesberge-Moordenaars Karoo and Central Mountain Shale Renosterveld, which occur in the hills between the Great Escarpment close to Sutherland and the plains close to Laingsburg and Matjiesfontein. The vegetation on site is typical of this vegetation type that occurs on stony soils within these low mountain ranges. The vegetation is a low succulent scrub and dotted by scattered tall shrubs, patches of 'white' grass visible on plains, the most conspicuous dominants being dwarf shrubs of *Pteronia*, *Drosanthemum* and *Galenia.* Commonly occurring species on site include, in order of frequency of occurrence, *Ruschia intricata*, *Gorteria alienata*, *Pteronia glauca*, *Aizoon africanum*,

Figure 2: Typical vegetation on site

Eriocephalus ericoides, *Chrysocoma ciliata*, *Euryops lateriflorus*, *Leipoldtia schultzei*, *Euphorbia mauritanica*, and *Asparagus capensis*. The herbaceous layer contained a typical assemblage of species for this habitat, including, *Crassula deltoidea*, *Crassula subaphylla*, *Tylecodon reticulatus*, *Ehrharta calycina*, *Euphorbia rhombifolia*, *Tylecodon wallichii* and *Euphorbia multiceps*, and the smaller species such as, *Antimima hallii*, *Felicia filifolia*, *Cheiridopsis namaquensis* and *Pelargonium abrotanifolium.* Local species richness is not particularly high but there is quite strong species turnover from one site to another due to the high topographic and surface rockiness variation.

Ecosystem dynamics are driven by aridity, topographic variation and substrate conditions associated with this region. Rehabilitation methods that rely on agricultural techniques such as the application of fertilizer and the planting of cover crops are not appropriate. Seasonal rainfall characteristics can be a limiting factor (in the dry season) and can also affect the risk of soil erosion (during the wet season). The major implication is that active rehabilitation needs to take into account sparse, shallow, rocky soils and limited moisture availability.

Previously disturbed areas on site offer a glimpse into the possible species composition of recovered areas. A site adjacent to one of the cottages on site in an area that was possibly previously cleared had the following species: *Atriplex nummularia*, *Melianthus comosus*, *Pteronia* species, *Eriopcephalus ericoides*, *Ballota africana*, *Lycium cinereum*, *Searsia glauca*, *Bromus pectinatus*, *Diospyros austro-africanus*, *Ruschia intricata*, *Tetragonia microptera*, and *Aizoon africanum*. The last species is especially characteristic of and dominant in old lands in this general geographical region, indicating its suitability to colonise disturbed areas.

Possible problem areas

Some components of the landscape are more vulnerable to disturbance than others and are therefore more likely to become problematic areas with respect to rehabilitation. The most sensitive conditions are as follows:

- Steeply-sloping areas. There are numerous places where the slope inclination is moderate, sometimes steep. This introduces erosion risks and downslope effects on undisturbed areas.

Potential constraints to successful rehabilitation

This section provides an outline of key risks and constraints to successful rehabilitation. These include the following:

- Scale of clearing;
- Climate seasonality;
- Weeds;
- Seed availability;
- Soil management;
- Landform stability;
- Ecosystem connectivity; and
- Ecosystem resilience.

Scale of clearing

The scale of clearing will be very localized. The amount of rehabilitation that is required is relatively dispersed within this area and is a small area. Areas requiring rehabilitation will be adjacent to roads, as well as surrounding turbine bases and within crane pad areas. It is estimated that significantly more than 30 ha of rehabilitation will be required. The risks are therefore moderate to high especially due to the arid conditions on site.

Climate seasonality

The proposal area is in an arid area but where rainfall is relatively predictable and strongly seasonal. However, the amount of rainfall is a limiting factor. These are not expected to be significant constraints to successful rehabilitation. However, any seeding or planting that is required will have to take place from the beginning of the rainy season and not in the dry summer period.

Weeds

The project study area has low incidence of weeds on site and in neighbouring areas, although a number of invasive alien species are known to occur in the general geographical area, for example, *Prosopis glandulosa*. There are, therefore, various species from surrounding areas that could become established on site. The rehabilitated and disturbed areas are most at risk because they provide the best conditions for the establishment of weeds and invasive plants. The potential risks are considered to be moderate, but controllable with the rigorous implementation of an Alien Invasive Plant Management Plan.

Seed availability

Due to the localised scale of the required rehabilitation works, it will probably not be necessary to undertake extensive re-seeding. If necessary, indigenous seed is commercially available for various grass species. It is common practice to use a seed mix when sowing in areas for re-vegetation. The main risks associated with this approach are that the seeds available are usually for combinations of species that are not necessarily present or dominant on site. The risks are, however, considered to be relatively low for successful rehabilitation of disturbed areas since a combination of methods can be employed to encourage growth of indigenous vegetation.

Soil management

Topsoil is arguably the single most important rehabilitation resource in the project area. Topsoil and subsoil that currently occurs in areas to be cleared must be recovered to be used in rehabilitation areas. Topsoil must be carefully managed and stockpiled to ensure that it does not become degraded. The success of this process is one of the biggest risks associated with successful rehabilitation of disturbed areas. However, rehabilitation programmes have been successfully undertaken through effective soils management.

Landform stability

The existing slope of the areas that will require rehabilitation varies from flat to gently inclining. Particular attention will have to be paid to maintaining surface stability during the early stages of rehabilitation. Minimizing surface water runoff from any small catchment areas that currently exist or that will be created from construction activities will be an important strategy, especially when these occur at elevated points in the landscape. Possible strategies that can be employed include the following:

- Contouring topsoil to match the slope of the surrounding landscape;
- Spreading a thin layer of cleared vegetation debris from cleared areas over re-contoured topsoil; and
- Rapid re-instatement of soil into holes and trenches dug for infrastructure components.

Rehabilitation implementation strategy

The rehabilitation process should form an integral part of site and construction activities. The ECO, who will be responsible for ensuring that the Rehabilitation Plan is implemented, must be appointed and on-site at project inception. This person should form an integral part of the project team.

The following descriptions, in the subsections below, outline the various stages and processes of the Rehabilitation Programme.

Identification and protection of environmentally sensitive areas

Sensitive sites and habitats must be identified prior to any construction activities taking place. No vegetation clearing, levelling, excavation or plant material removal is permitted without prior consent from the ECO. Areas highlighted as being environmentally sensitive from prior studies must be identified, and the necessary fencing and protection of these areas initiated. Areas of wetland and associated buffer zones should be disturbed to the minimum extent possible. The footprint of construction within these areas should be limited to only the minimum required and no neighbouring areas are to be disturbed.

Cleared plant material

Surface plant material that is cleared during construction activities can be stockpiled and/or bagged to be used as mulch during rehabilitation. Mulching is the covering of the soil with a layer of organic matter including leaves, twigs, bark or wood chips. The main purpose of mulching is to protect and cover the soil surface, as well as serve as a source of seed for re-vegetation purposes. The following principles should be adhered to:

- During local site clearing the standing vegetation should not be cleared and mixed with the soil, but should be cleared separately, either mechanically or by hand using a brush-cutter. The cleared vegetation should be stockpiled and used whole or shredded to protect the soil in disturbed areas and promote the return of indigenous species;
- Mulch is to be harvested from areas that are to be denuded of vegetation during construction activities. No harvesting should take place outside the area to be disturbed by construction activities;
- Brush-cut mulch should be stored for as short a period as possible; and
- Seed released from stockpiles should be collected for use in the rehabilitation process.

Seed collecting

The re-application of topsoil and cleared vegetation (as mulch) will be sufficient for rehabilitation at this site. However, the ECO can consider, as an option, to collect indigenous seed to sow. This measure is therefore not required, but is a possibility, if found necessary. If needed, indigenous seed can be collected from plants present on site, and should be used immediately, or stored appropriately, and used at the start of the following wet season. Seed can be broadcast onto the soil but should preferably be applied in conjunction with measures to improve seedling survival, such as scarification of the soil surface, or simultaneous application of mulch. The following principles apply:

- Indigenous seeds may be harvested for the purposes of re-vegetation in areas that are free of alien invasive plants, either at the site or prior to clearance of vegetation from suitable neighbouring sites;
- Seed may be harvested by hand and, if necessary, dried or treated appropriately;
- Seed gathered by vacuum harvester, or other approved mass collection method, from suitable shrubs, or from plant litter surrounding the shrubs, must be kept apart from individually harvested seed; and
- No alien or foreign species seed is to be used or brought onto the site.

Commercial seeding

In some areas the natural regeneration of the vegetation may be poor, and the application of seed to enhance vegetation recovery may be required. The use of commercial seed mix is at the discretion of the ECO. Mixed seed is available from commercial suppliers. A typical seed mix varies from place to place and may depend on availability and location.

As a principle, the mixture of seeds should include the following:

1. A mixture of annual and perennial plants;
2. Includes pioneer species;
3. Selected species must be able to grow in the area where they are being used;
4. Roots must have a binding effect on the soil; and
5. The final mixture must not cause an ecological imbalance in the area.

For the current site, any of the tabulated species can be used, depending on availability.

Soil, wetland and vegetation management

The following soil, wetland and vegetation management measures are proposed to aid in limiting impacts, as well as to assist with successful rehabilitation:

1. Soil must only be stripped from areas that are to be disturbed during construction or maintenance and not from any adjacent or other areas;
2. Erosion control measures must be included in the design of linear infrastructure;
3. Vehicles must be restricted to travelling only in designated roadways to limit the ecological footprint of the proposed development activities;
4. All disturbed areas must be rehabilitated using stockpiled soils, as required;
5. Ecologically sensitive areas must be rehabilitated where they have been damaged by construction activities;
6. The extent of all local construction sites must be demarcated, and no vegetation is to be removed outside of this zone;
7. If vegetation is to be cleared on site, erosion control measures must be kept in place to ensure that excessive scarring of the landscape is reduced;
8. Adequate storm water management must be incorporated into the design of the projectin order to prevent erosion;
9. Stripping and clearing of vegetation must ideally be planned to be done during the dry season;
10. Should any construction activities occur within a 1 in 100 year flood line or within 500 m of a watercourse, the relevant authorisation should be obtained according to the National Environmental Management Act (NEMA) 107 of 1998 and Section 21 c and i of the National Water Act 36 of 1998, respectively;
11. No structures are to be constructed within the riparian areas or within the active stream channel as far as possible. If at all possible, all support structures should be developed above the 1:100 year flood line. Or, if that is not possible, above the 1:50 year flood line.
12. Sensitive areas in the vicinity of construction works must be fenced for the duration of the construction phase and designated a ‘no-go’ area;

General considerations

- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Rehabilitation of disturbed areas should therefore be carried out concurrently with construction, as far as possible. Disturbed footprint areas must be kept to a minimum;
- Once re-vegetated, areas should be protected to prevent trampling and erosion;
- No construction equipment, vehicles or unauthorized persons should be allowed onto areas that have been re-vegetated; and
- Any runnels, erosion channels or wash-aways developing after re-vegetation should be backfilled and consolidated to restore them back to a proper condition.

Construction process for tower structures and other disturbed areas

1. Topsoil and subsoil removed from foundation excavations must be stockpiled separately;
2. All excavated soil suitable for backfill must be returned to the excavation by backfilling with the subsoil first, and the topsoil last;

3. Material removed from the excavation that is not suitable or not required for backfill may be spread evenly over the disturbed area. However, spreading of subsoil is not permitted;
4. The local topography must be returned to as close to its original state as possible. If possible, sites should not be levelled;
5. If necessary, erosion control features must be constructed or any erosion control measures implemented using appropriate materials, including any remaining soil stockpiles;
6. The area to be backfilled must be done in such a way that water does not accumulate;
7. Previously cleared plant material can be used as a surface mulch to protect the soil surface;
8. Where necessary, re-vegetation can take place using seed, rescued plant material, or mulching. Where the affected area is less than 1 m across, passive re-vegetation can be employed, where natural ecological processes are relied upon to promote vegetation growth, but it is preferable to actively restore vegetation cover, as this reduces the risk of erosion; and
9. Compacted ground must be rehabilitated by ripping to a minimum depth of 600 mm.
10. Rock piles should be deployed in a heterogenous way to mimic habitat variability on site.

Rehabilitation programme

The following table has been prepared as a guideline to the various activities required. The table provides general information and is to be read in conjunction with the Rehabilitation Plan detailed in the sections above.

Preconstruction actions

Action	Responsibility	***Frequency***
Identify and protect sensitive areas	ECO	Once-off
Comprehensive photographic record of areas to be cleared	ECO	Once-off

Construction phase actions

Action	Responsibility	***Frequency***
Vegetation clearing, stockpiling of plant material & topsoil	Contractor	Ongoing
Seed collecting, if required	Contractor	Ongoing
Landscaping	Contractor	Ongoing
Fence off rehabilitation areas, if necessary	Contractor	Ongoing
Implementation of rehabilitation measures (terracing, fascine work, mulching, etc.)	Contractor	Ongoing
Soil levelling, seeding into rehabilitation areas, etc. to establish new vegetation.	Contractor	Ongoing
Photographic record of rehabilitation actions	ECO	Once-off

Post-construction phase actions

Action	Responsibility	***Frequency***
Monitor site for erosion, alien plants, vegetation growth	ECO / Rehabilitation Specialist	3-monthly and ad

		hoc for one year
Remediation in areas where rehabilitation is progressing poorly. If necessary, sow grass mix into bare patches.	Contractor	Ad hoc

Monitoring programme

In order to monitor the impact of rehabilitation activities, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide an assessment of the success of the rehabilitation activities.

The objective of monitoring is to ensure that the agreed rehabilitation process is successful, and that the prescribed rehabilitation objectives are met. There is therefore a need to monitor the progress of the physical aspects of rehabilitation during the construction, operational and closure phases, and to ensure that the desired final land use is successfully established. Maintenance of rehabilitated sites is often the difference between the ultimate success or failure of rehabilitation – monitoring of rehabilitation will determine whether rehabilitation objectives and requirements are being achieved, and that there are no residual impacts.

During the construction phase, the ECO will be responsible for monitoring and inspecting contractor's written records to illustrate compliance with the EMPr. The aim of compliance monitoring is to verify that the responsible parties are adhering to the procedures, management conditions and specifications contained in the EMPr, and the conditions set out in the EA. Monitoring by the ECO will also include regular monitoring of:

1. Control of alien vegetation associated with the infrastructure; and
2. Rehabilitation of construction sites after construction.

Note: Monitoring requirements of the Alien Invasive Management Programme are also applicable but are not repeated here.

Pre-construction and construction phase monitoring

The following monitoring is required during the construction phase of the project:

Monitoring action	*Indicator*	*Timeframe*
Photographs of area prior to construction	Baseline condition / pre-construction state	Pre-construction

Operational phase monitoring

The following monitoring is optional during the operational phase of the project:

Monitoring action	Indicator	Timeframe
Document rehabilitation measures implemented, and success achieved in problem areas	Decline in vulnerable bare areas over time	Annually

Concluding remarks

The information in this document is intended to provide various options that can be adapted for specific situations on the ground. The exact approach adopted for rehabilitation is dependent on local conditions and situations, and is not meant to adhere strictly to a formula. The experience of the ECO and the construction crew are important for ensuring that a successful rehabilitation programme is implemented.

References / further reading

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ANNEXURE I

STORM WATER MANAGEMENT & EROSION CONTROL PLAN

HYDROLOGICAL ASSESSMENT, STORM WATER MANAGEMENT & EROSION CONTROL PLAN

FOR THE PROPOSED DEVELOPMENT OF THE 325 MW OYA WIND ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE, WITZENBERG & KAROO HOOGLANDLOCAL MUNICIPALITY
CAPE WINELANDS & NAMAKWA DISTRICT MUNICIPALITY
WESTERN CAPE & NORTHERN CAPE

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October 2020
FINAL REPORT

NatureStamp
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Acronyms

SWMP	Storm Water Management Plan
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
UPD	Utility Programme for Drainage

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Specialist Details & Declaration

This report has been prepared in accordance with Section 13: General Requirements for Environmental Assessment Practitioners (EAPs) and Specialists as well as per Appendix 6 of GNR 982 – Environmental Impact Assessment Regulations and the National Environmental Management Act (NEMA, No. 107 of 1998 as amended 2017) and Government Notice 704 (GN 704). It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows –

Table 1 Details of Specialist

Specialist	Task	Qualification and accreditation	Client	Signature
Bruce Scott-Shaw NatureStamp SACNASP:118673	Fieldwork, modelling & report	PhD, Hydrology	Kudusberg Wind Farm (Pty) Ltd	Date: 20/10/2020
Nick Davis Isikhungusethu Environmental Services	Design & GIS	BSc, BSc Hon, MSc Hydrology	Kudusberg Wind Farm (Pty) Ltd	Date: 20/10/2020

Details of Authors:

Bruce is a hydrologist, whose focus is broadly on hydrological perspectives of land use management and climate change. He completed his MSc under Prof. Roland Schulze in the School of Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, South Africa. Throughout his university career he has mastered numerous models and tools relating to hydrology, soil science and GIS. Some of these include ACRU, SWAT, ArcMap, Idrisi, SEBAL, MatLab and Loggernet. He has some basic programming skills on the Java and CR Basic platforms. Bruce completed his PhD at the Center for Water Resources Research (UKZN), which focused on rehabilitation of alien invaded riparian zones and catchments using indigenous trees. Bruce is currently affiliated to the University of KwaZulu-Natal where he is a post-doctoral student where he runs and calibrates hydrological and soil erosion models. Bruce has presented his research around the world, including the European Science Foundation (Amsterdam, 2010), COP17 (Durban, 2011), World Water Forum (Marseille, 2012), MatLab advanced modelling (Luxembourg, 2013), World Water Week (Singapore, 2014), Forests & Water, British Colombia, (Canada, 2015), World Forestry Congress (Durban, 2015), Society for Ecological Restoration (Brazil, 2017). Conservation Symposium (Howick, South Africa, 2018) and SWAT modelling in Siem Reap (Cambodia, 2019). As a consultant, Bruce is the director and principal hydrologist of NatureStamp (PTY) Ltd. In this capacity he undertakes flood studies, calculates hydrological flows, performs general hydrological modelling, stormwater design, dam designs, wetland assessments, water quality assessments, groundwater studies and soil surveys.

Nicholas Davis is a hydrologist whose focus is broadly on hydrological perspectives of land use management, climate change, estuarine and wetland systems. Throughout his studies and subsequent work at UKZN he has mastered several models and programs such as ACRU, HEC-RAS, ArcMap, QGIS, Indicators of Hydrologic Alteration software (IHA) and Idrisi. He has moderate VBA programming skills, basic UNIX and python programming skills.

1. INTRODUCTION

1.1 Project Background and Description of the Activity

Kudusberg Wind Farm (Pty) Ltd has proposed to develop a Wind Energy Facility (WEF) with a maximum generation capacity of 325 MW (herein after referred to as "Oya WEF"), approximately 45 km south-west of Sutherland spanning between the Northern and Western Cape Provinces. The proposed WEF is located within the Witzenberg and Karoo Hoogland Local Municipalities, which fall within the Cape Winelands and Namakwa District Municipalities respectively. The site is referred to as Oya WEF here after.

The proposed project falls entirely within the Renewable Energy Zone (REDZ) 2 (i.e. Komsberg REDZ), that was Gazetted in February 2018 by the Minister of Environmental Affairs (GN 114). In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and the 2014 NEMA EIA Regulations promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017, wind and solar PV projects located within a REDZs are subject to a Basic Assessment (BA) and reduced decision-making period by the authorities. A Basic Assessment (BA) Process in terms of Appendix 1 of the Environmental Impact Assessment (EIA) Regulations (2014, as amended) has therefore been undertaken for the proposed project. The competent authority for this BA is the national Department of Environmental Affairs.

The proposed WEF consists of the following:

- Wind Turbines (3 – 6.5 MW):
  - Up to 56 turbines (140 m tall hub, rotor diameter of 180 m and blade length of 90 m)
  - Concrete foundation (30x30x5m)
  - Crane pad (25.2 ha each)
- Collector Substation:
  - 33/132 kV of 2.25 ha
  - Transformer at each turbine (between 2x2 m – 10x10 m)
  - Underground 33 kV cabling
  - Overhead 33 kV at valley crossings
- Operations and Maintenance Building (1 ha)
- Construction Camp (12.6 ha)
- Access Roads:
  - Roads up to 12 m wide including stormwater control (82.44 ha partially existing)
  - Turn areas with a 50 m radius
- Other Infrastructure:
  - Wind measuring equipment (anemometers/wind sentry)
  - Fencing around the camp
  - Stormwater channels and culverts

As part of the specialist requirements and Water Use License (WUL), a flood and storm water assessment is required. This is in part due to the potential presence of watercourse features on site and the partially impervious nature of the proposed activity (infrastructure and roads). A key component of the investigation will be potential flood areas, accommodation of peak storm events, best practice erosion control and the general impact of the development on downstream surface water resources for water users in the catchment.

The focus of the flood assessment would be on where access roads or any related WEF infrastructure traverse or encroach on a watercourse. The SWMP and erosion control plan focuses on the infrastructure footprint areas and access roads. The location of the Oya WEF site can be seen in Figure 2.

The proposed energy facility will be located on the following properties:

FARM DESCRIPTION	21-DIGIT SURVEYOR GENERAL (SG) CODE
Western Cape	
Portion 1 of 156 Gats Rivier Farm	C01900000000015600001
Portion 2 of 156 Gats Rivier Farm	C01900000000015600002
Remainder of 156 Gats Rivier Farm	C01900000000015600000
Portion 1 of 157 Riet Fontein Farm	C01900000000015700001
Portion 1 of 158 Amandelboom Farm	C01900000000015800001
Remainder of 158 Amandelboom Farm	C01900000000015800000
Portion 1 of 159 Oliviers Berg Farm	C01900000000015900001
Remainder of 159 Oliviers Berg Farm	C01900000000015900000
Portion 2 of 157 Riet Fontein Farm	C01900000000015700002
Remainder of 161 Muishond Rivier Farm	C01900000000016100000
Remainder of 395 Klipbanks Fontein Farm	C01900000000039500000
Northern Cape	
Portion 4 of 193 Urias Gat Farm	C07200000000019300004
Portion 6 of 193 Urias Gat Farm	C07200000000019300006
Remainder of 193 Urias Gat Farm	C07200000000019300000
Remainder of 194 Matjes Fontein Farm	C07200000000019400000
Remainder of 196 Karree Kloof Farm	C07200000000019600000
Road Access	
Portion 169 of Zeekoegat Farm	C07200000000016900000
Portion 1 of 170 Roodeheuvel Farm	C07200000000017000001
Rem of 170 Roodeheuvel Farm	C07200000000017000000
Rem of 190 Wind Heuvel Farm	C07200000000019000000
Portion 1 of 190 Wind Heuvel Farm	C07200000000019000001
Portion 5 of 193 Urias Gat Farm	C07200000000019300005
Rem of 171 Vink Kuil Farm	C07200000000017100000
Alkant Rem/220 Farm	C07200000000022000000
Portion 1 of 174 Lange Huis Farm	C07200000000017400001

1.2 Impact of Wind Energy Farms on Hydrology

Wind Energy Facilities (WEF) in South Africa, which are becoming more abundant, may impact on the distribution of rainfall entering a catchment. The largest impacts are during construction as the size of the turbines require large vehicle/machines to transport to their destination, require deep piled foundations and large temporary storage areas. This results in potential erosion and an increase in stormflow. This is particularly relevant where slopes are steep. Following the construction phase, the impacts of WEFs on the hydrology is relatively low as natural and/or agricultural activities can continue and the disturbed footprint can be allowed to be rehabilitated without further disturbances.

In the context of this report, the following impacts are relevant:

- Change in runoff rates due to impeding structures (excavation and installation of foundations/crane pads for turbines).
- Reduction in surface and groundwater quality through excavation for cables, foundations and crane pads leading to sedimentation and potential spills.
- Increased flood risk due to increased impervious areas.
- Potential erosion around construction areas, impervious surfaces and drip from blades.
- Potential erosion due to the widening of existing roads.

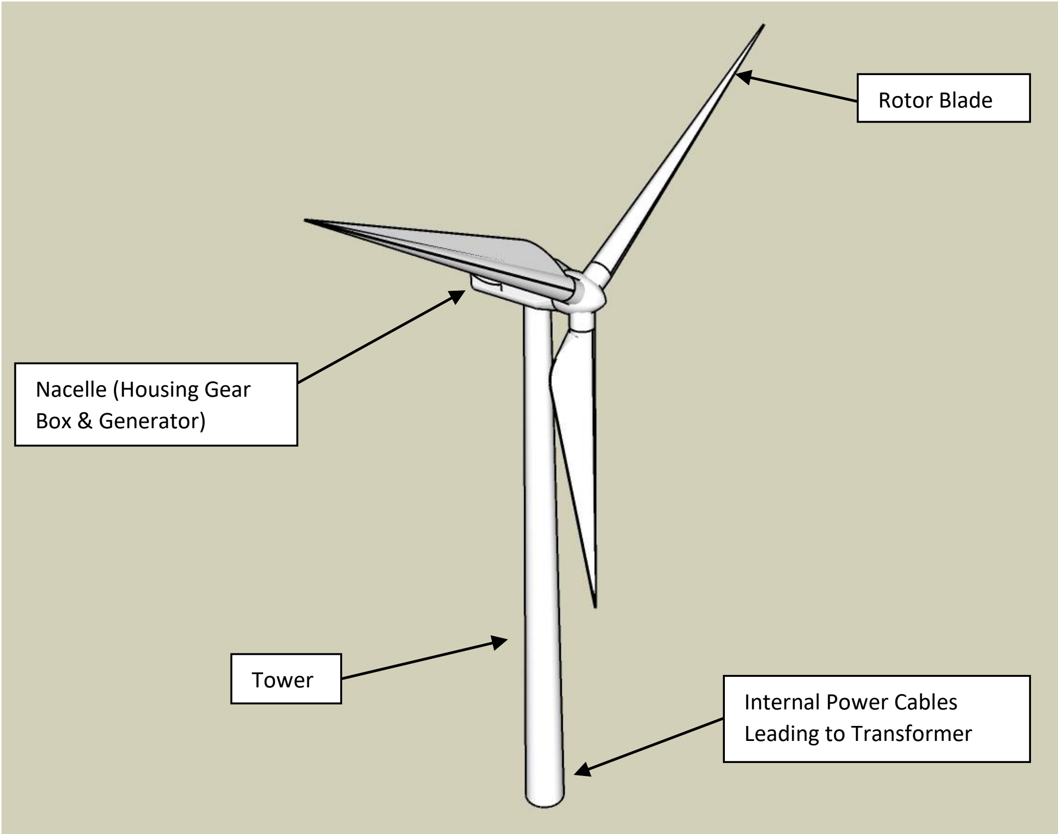


Figure 1 Typical design of a wind turbine (Suzlon model)

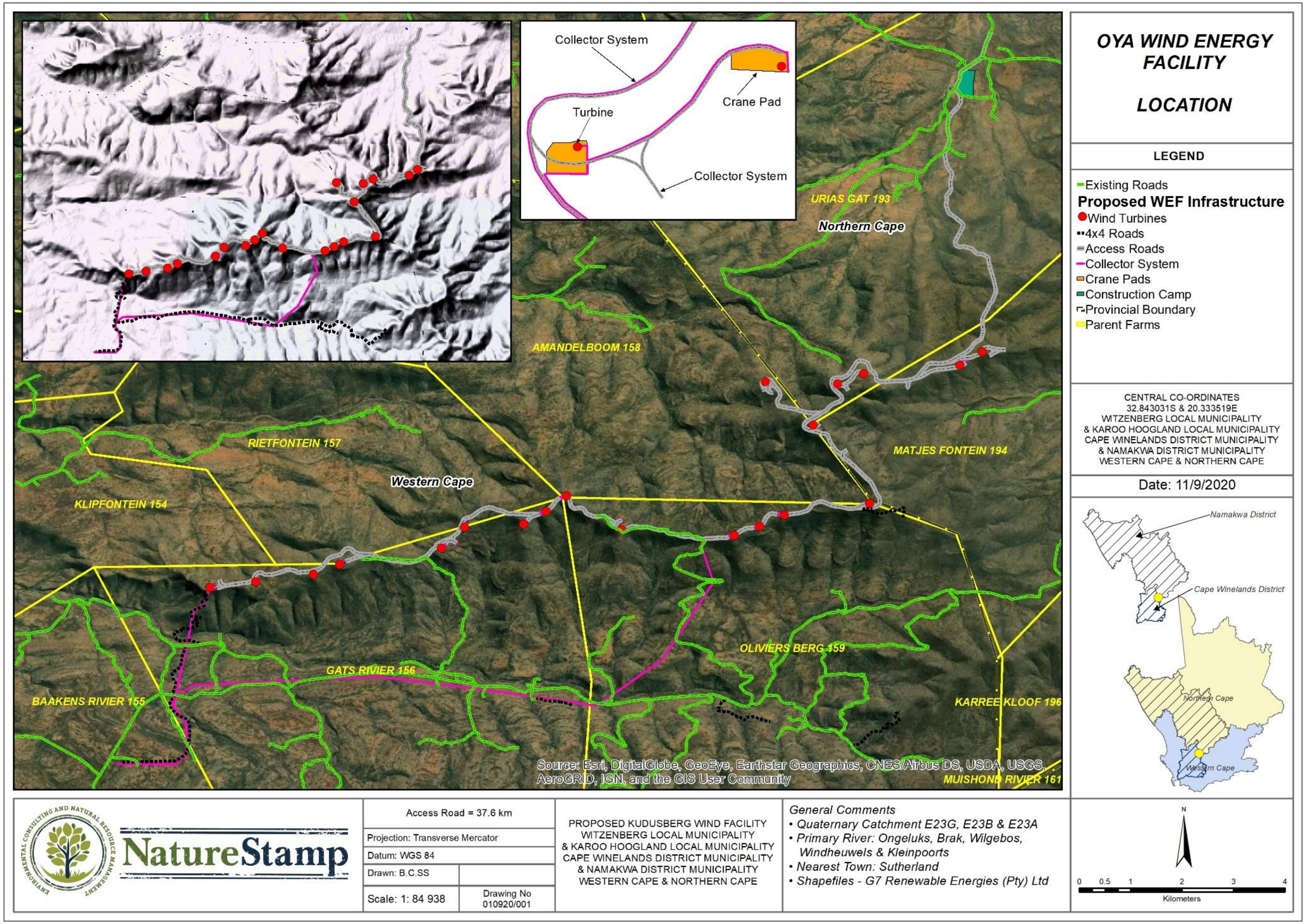


Figure 2 Locality map of the proposed Oya WEF

1.3 Terms of reference

NatureStamp has been appointed to compile a flood assessment, storm water management plan (SWMP) for the WEF and existing roads. The SWMP is in accordance with Government Notice 704 (GN 704).

The terms of reference are as follows -

i. Flood Analysis and SWMP

- Site hydrological assessment, undertaken by the:
  a. Analysis of surface areas of the site;
  b. Analysis of sensitive areas on site;
  c. Analysis of existing storm water structures on site; and
  d. Determination of areas with clean and dirty water.

- Hydraulic design analysis, illustrated by the:
  a. Determination of the design storm event (1:2, 1:10 & 1:50 year return period);
  b. Determination of the capability of proposed structures; and
  c. Recommendation of mitigation options and improvements.

- Erosion control plan
  a. Compilation of erosion control measures;
  b. Identification of high risk areas, exclusion areas and potential stockpile areas;
  c. Final erosion mitigation measures and rehabilitation objectives.

- Flood Hydrology:
  a. Hydraulic analysis, illustrated by the:
  - Compilation of the river reach model and flood line using HEC-RAS and HEC-geoRAS;
  - Determination of the flood risk and flood hazard throughout the study site; and
  - Recommendation of mitigation options associated with the hydraulic analysis.

  b. Consolidate results in a report with:
  - Flood line maps; and
  - A final flood line report.

- Water balance assessment:
  a. analysing climate data from the SAWS and other databases using nearby rainfall stations (input or known data);
  b. determining any water demands and water outputs; and
  c. determining whether water in the system is clean or contaminated.
  d. Development of a static water balance. The information gathered in the desktop assessment and during the site visit will be used to create a process water flow diagram. A series of models will be considered for use in this balance study. The Department of Water Affairs and Forestry, 2006 Best Practice Guideline G2: Water and Salt Balances was followed in this study.
  e. Produce a water balance study report with recommendations. An average annual water balance will be provided including an average dry and average wet month water balance. A set of recommendations will be provided to assist in the IWWMP and help the land owners to manage their water appropriately.

- Consolidate results in a report with:
  a. Storm water maps;
  b. CAD storm water drawings and flood extents; and
  c. A storm water management plan and flood report.

2. STUDY SITE

The site is located along the catchment divide of Quaternary Catchments E23G, E23B and E23A, falling under the Olifants/Doorn Management Area (WMA). The proposed WEF area sits on the plateau of Roggeveld mountain range that is almost entirely natural excepts for some small structures and gravel roads.

The proposed WEF is in the Witzenberg & Karoo Hooglandlocal Municipality and the Cape Winelands & Namakwa District Municipality. The properties are currently zoned as natural land with some agricultural land use with low agricultural potential, it was previously used for low intensity grazing however the properties are no longer actively used for agricultural activities, likely due to limited water.

Rainfall in the region occurs throughout the year (mostly March to August), with a mean annual precipitation of 253 mm (observed from rainfall station 0044765 W – Lynch, 2003). The reference potential evaporation (ET_o) is approximately 2 490 mm (A-pan equivalent, after Schulze, 2011) and the mean annual evaporation is between 1 800 – 2 000 mm, which exceeds the annual rainfall. This suggests a high evaporative demand and a water limited system. Summers are warm to hot and winters are cold with snow events. The mean annual temperature is approximately 22.5 °C in summer and 8.8 °C in the winter months (Table 2 – Schulze, 2003). The underlying geology of the site is sedimentary Ecca Shale of the Karoo formation (Permian period) and the soils overlain are shallow sandy-clay-loam ranging from Mispah to Glenrosa form in this particular area.

Table 2 Mean monthly rainfall and temperature observed at Gatsrivier (derived from historical data)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Rainfall (mm)	7.4	10.4	18.2	21.4	29.8	43.1	32.9	32.2	19.1	15.9	11.8	11.5	**253.8**
Average Maximum Temperature (°C)	31.9	31.7	28.9	23.9	19.1	15.2	15.2	16.7	20.2	24.2	27.3	30.0	**23.7**
Average Minimum Temperature (°C)	13.7	14.0	12.8	10.5	8.0	5.6	4.8	5.5	6.9	9.0	10.8	12.8	**9.5**

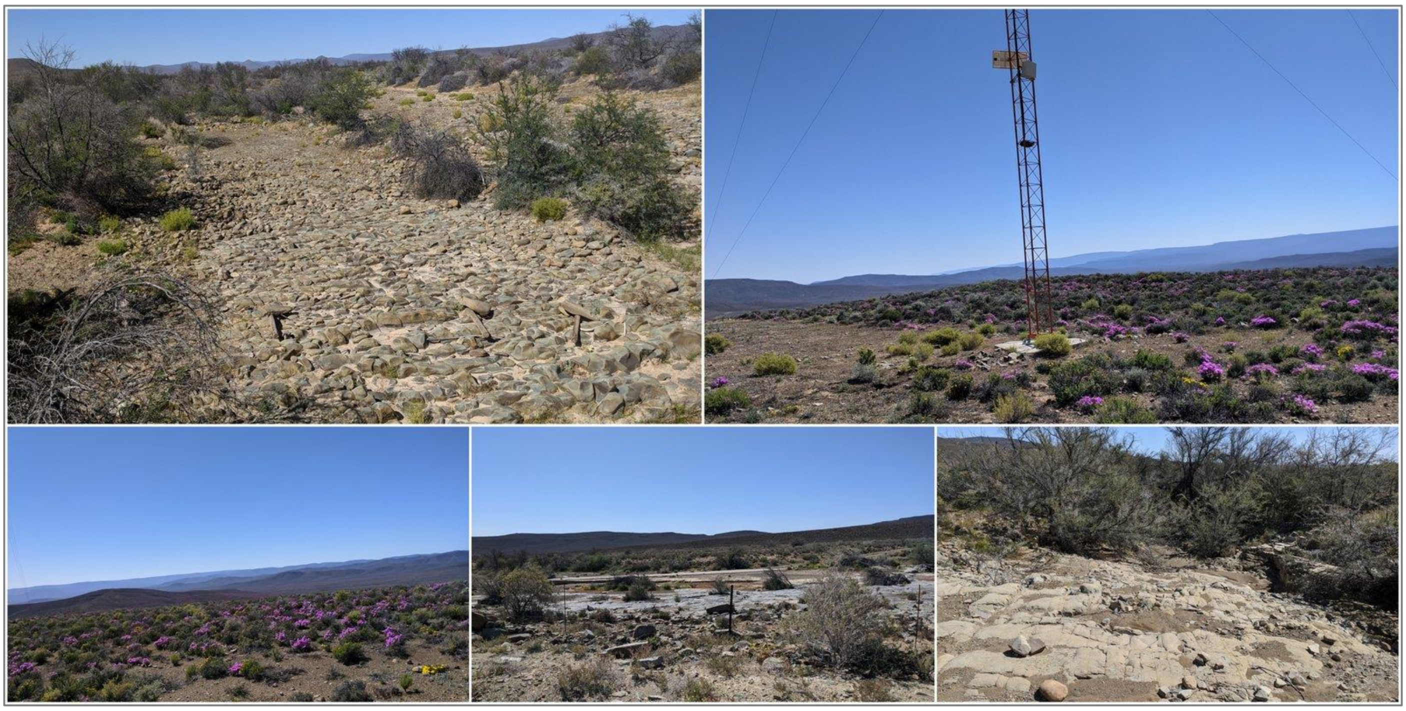


Figure 3 General setting of the proposed Oya WEF site

3. METHODOLOGY

The following methodology was followed in order to meet the objectives as detailed in the terms of reference.

Table 3 Data type and source for the hydrological assessment

Data Type	Year	Source/Reference
Aerial Imagery	2013, 2016	Surveyor General
1:50 000 Topographical	2011	Surveyor General
2& 5m Contour	2010	Surveyor General
River Shapefile	2011	NFEPA
Geology Shapefile	2011	Council of Geoscience, 2015/National Groundwater Archive
Land Cover	2015	Department of Environmental Affairs, Republic of South Africa
Water Registration	2013, 2016	WARMS - DWS

*Data will be provided on request

3.1 Catchment Assessment

The pre-development conditions were assessed as follows -

- The vegetation and surface characteristics of the watercourse were assessed for the determination of the Manning's n-values;
- The presence and dimensions of any storm water structures, such as culverts, bridges, drains, berms and gutters that would divert flow during a storm event were noted;
- The overall state of drainage channels, streams and nearby rivers was assessed;
- The slope of the study site as well as evidence of erosion around the site were noted; and
- The elevation throughout the site in order to verify contour data.

In accordance with Government Notice 704 (GN 704), the main objectives of a SWMP were:

1. To accommodate post-development storm events;
2. To keep clean and dirty water separated;
3. To contain any dirty water within a system; and
4. To prevent contamination of clean water.

A range of storm water design events were considered. 2-meter contours obtained from the Surveyor General were obtained and improved using a GPS. Rainfall data was extracted using the rainfall extraction utility tool (Kunz, 2003). Contributing catchment areas were calculated using the derived elevation model.

The critical contributing catchment area was determined for use in both the watershed delineation tool and HEC-HMS and SWAT models. The sub-catchments were delineated using the 5m contour set as an input. This was used to create a Digital Elevation Model (DEM) that was then used as an input to the watershed tool (Figure 4).

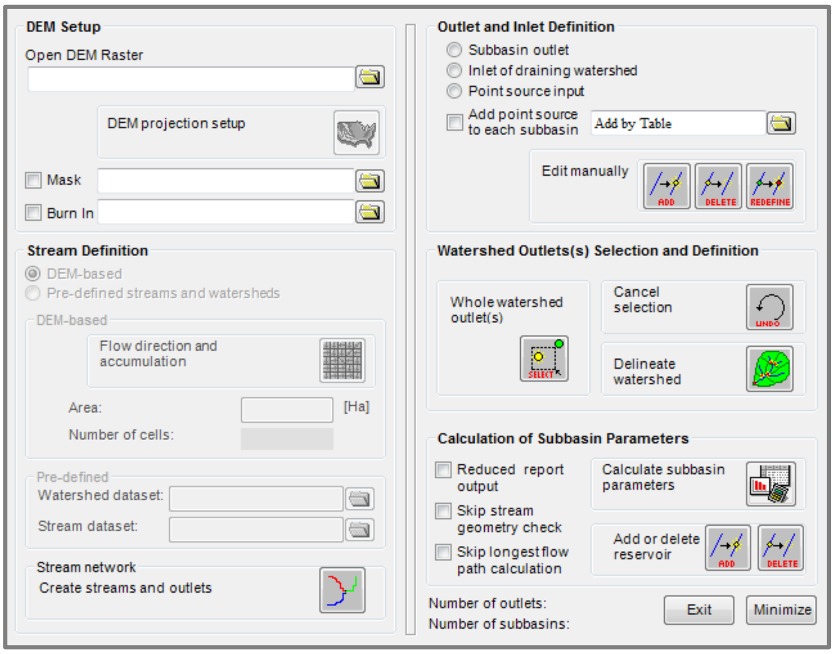


Figure 4 Soil Water Assessment Tool (*SWAT*) watershed delineation tool for sub-catchment delineation and stream network creation

3.2 Design Flood Determination

The peak flows for the 1:5, 1:10, 1:50 and 1:100 flood events were calculated for the catchments using the rational method, the SCS-SA model, the rational method and the Standard Design Flood Method as outlined in the SANRAL Drainage Manual (2013) in areas where flow data was not available. Additionally, an area corrected flow was also calculated using catchments with flow data to compare to the design rainfall/runoff calculations.

The SCS-SA model is a hydrological storm event simulation model suitable ideally for application on catchments that have a contributing catchment of less than 30 km². The model has been used widely both internationally and nationally for the estimation of flood peak discharges and volume (Schulze *et al.*, 1992). The type of surface in the drainage basin is also important.

The Rational Method becomes more accurate as the amount of impervious surface, such as pavements and rooftops, increases. As a result, the Rational Method is most often used in urban and suburban areas (ODOT Hydraulics Manual, 2014).

3.3 Flood Line Determination

Modelling of the flood lines was undertaken using the U.S. Army Corps of Engineers' HEC-RAS v4.1 programme, which is commonly used throughout South Africa. Numerous cross sections were created throughout the contributing area (Figure 5). Ineffective areas/hydraulic structures were digitized and included in the model. Land use coverage was used to determine the Manning's n-values in a GIS platform. Each cross section may have had numerous values on either side of the channel depending on the site characteristics. Manning's N-values were obtained from the HEC-RAS Hydraulic Reference Manual (2010) for the channel areas (a value of between 0.03 and 0.04 was used depending on the presence or absence of rock features and debris). Design flood values were used as an input for the relevant reaches.

Given the slope of the catchment and the distance to downstream hydrological infrastructure, some inundation within the study site would occur but not from external features on the watercourse. As such, Normal Depth was selected for the reach boundary conditions. The slope of the channel was used as the value for the backwater calculation of the initial condition. Some inundation structures were included in the cross sections where these were structures present (Figure 6). Varying reach boundary conditions were set for these sites.

Figure 5 provides an overview of one of the impeding structures along the river. A cross-section shows the delineated area with unique station variables at each site.

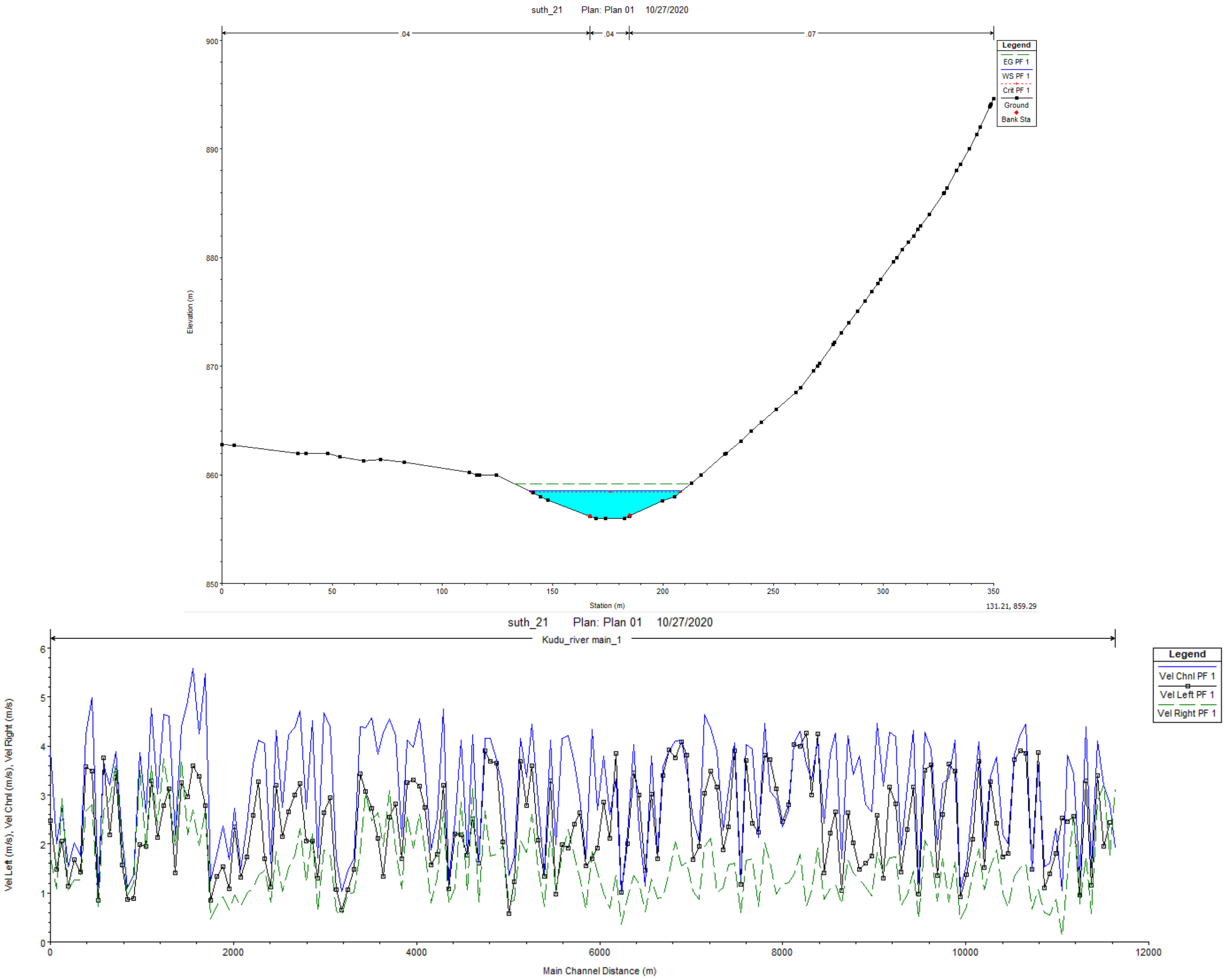


Figure 5 Channel cross sections and channel velocities developed for the relevant sections of the Ongeluks tributary

At each profile, a unique peak flow was calculated for each return period. 15 different volumes (linked to the 15 unique profiles) were calculated using either flow or design rainfall calculations.

3.4 Flood Line Determination for Minor Channels

As HEC-RAS and HEC-geoRAS are highly sensitive to the resolution of the terrain data used in the model, small non-perennial channels such as drainage lines are often not captured within the model. In most cases the flood output is not required for such channels as the flood generated would be negligible. However, it is good practice to ensure that all channels or drainage lines are adequately covered. As such, the author has developed a simple model to generate a flood depth through GIS. The model considers the flood generated for nearby smaller catchments and applies and area weighted correction. The model generates a flood height based on this estimation within the existing terrain model. Figure 6 provides a schematic of this model.

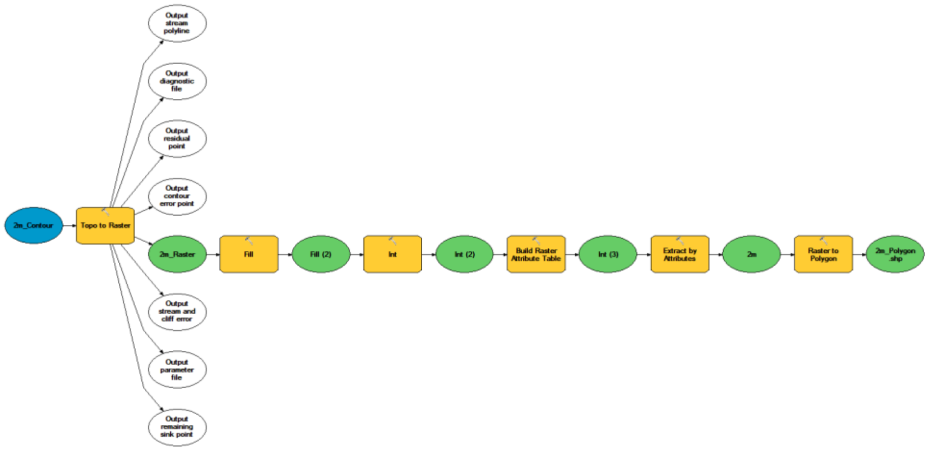


Figure 6 GIS model for flood generation in small channels

3.5 Design Storm Determination

The peak flows for the 1:2, 1:5, 1:10, 1:50 and 1:100 storm events were calculated for the catchments using the rational method as outlined in the SANRAL Drainage Manual (6th Edition, 2013). The type of surface in the drainage basin is an important component in the design calculations. The SANRAL Rational Method becomes more accurate as the amount of impervious surface, such as pavements and rooftops, increases. As a result, the Rational Method is most often used in urban and suburban areas (ODOT Hydraulics Manual, 2014). The Utility Programme for Drainage (Sinotech) was used to run the rational method, determine drainage grid and kerb drainage calculations.

It is recommendations that the 1:50 year return design for a 30-minute storm was is used as a typical event to design for. The areas of the proposed infrastructure can be seen in Table 4.

Table 4 Activity/Infrastructure areas

Activity/Infrastructure	Impervious	Area
Access Roads and culverts	Yes	338 830 m^2
4x4 Roads	Partial	134 844 m^2
Construction Camp & Operations Building	Yes	125 773 m^2
Crane Pads incl. turbine and substation	Yes	114 755 m^2
Collector System	No	119 863 m^2

3.6 Storm Water Design Principles

The objective of the Stormwater Management Plan is to control runoff flows and prevent detrimental impacts on receiving waters, considering both the quality and quantity of the stormwater runoff. As the existing site has natural impervious areas, steep slopes and shallow soils, the velocity of stormwater runoff would be considered high. However, as the site is located near the catchment divide, there are little to no upper catchment contributions.

Stormwater management design principles to be followed on site include:

- The establishment and maintenance of grass and plants adjacent to newly constructed infrastructure and graded roads.
- Hazardous or environmentally dangerous chemicals kept on site must be kept outside of the 1:00 year flood line and watercourses or appropriately bunded.
- Groundcover should be maintained during construction to ensure erosion protection.
- Flow concentration points should avoid unstable soil areas and/or stockpiles.
- All pollution from the surfaces should not flow directly into water resources.
- Ensure aesthetic designs.

The above-mentioned principles are to be used as a conceptual stormwater management guide.

3.7 Water Balance

There are three methods to consider when undertaking a water and salt balance. These are manual methods, spreadsheet-based models and standalone PC based models (after DWAF, 2006), described as follows:

3.7.1 Manual Calculation

Manual calculations are the simplest option which involves a rapid screening of a site for quick and simple once off results. This approach is more suited to very simple systems where there is a limited level of complexity in the hydrological partitions. This approach does not require any equipment (field or desktop based). However, this approach may not be suitable for moderate to complex systems and could become impractical where larger repetitive calculations are required. This approach does not present the data visually as in some models. Although the water balance of this site is relatively simple, this approach was not used.

3.7.2 Spreadsheet Based Models

Spreadsheet based models are commonly used by specialists as they allow for calculations to be undertaken quickly. These are calculations undertaken in Excel or MATLAB using recognised runoff algorithms. The user of such sheets can easily see the algorithms used in the model and can add or modify the functions according to the user requirement. However, there is a potential for greater user error and editing outputs can be time consuming.

3.7.3 Standalone PC Based or High-End Software

Many software platforms are available to users looking to compile a water and salt balance. Some of the software is specifically designed for this purpose whereas others are more general accounting models. These models can be used for larger and more complex systems. These models/tools are user friendly and can produce data is a logical and aesthetically pleasing format. The input layout can often help the user to understand the water balance process. Furthermore, it is relatively simple to change variables and quickly run scenarios. However, this approach can be confusing if the user is inexperienced and can cost a lot of money for the license. An example of one of the models considered in this study is GoldSim and HEC-HMS.

A water balance was calculated for the existing development using WR2012 data in a spreadsheet-based model and run through HEC-HMS. The output included an annual, wet month and dry month assessment.

4. LIMITATIONS AND ASSUMPTIONS

In order to apply generalized and often rigid design methods or techniques to natural, dynamic environments, a number of assumptions are made. Furthermore, a number of limitations exist when assessing such complex hydrological systems. The following constraints may have affected this assessment:

- Manning's n - values (the channels roughness coefficient) was estimated on site. However, most of these values were general assumptions as all of the flow on site would be overland flow (limited channels exist within the site).
- There were no sub-surface servitudes identified on site. It was assumed that storm water concentrations points would be undertaken at strategic locations.
- It was assumed that culverts would be partially obstructed by debris.
- It was assumed that the roads are impervious.
- It was assumed that all storm water systems on site were 90 % unblocked.
- It was assumed that all roofs and roads would have standard sized culverts and gutters.
- 2-meter and 5-meter contour interval data and Digital Elevation Models (DEMs) were used in the design flood estimation (development of the elevation model) within the greater catchment area. Within a 500 m radius of the site, a detailed topographical survey was undertaken. Given the flood proposed, this resolution was of sufficient accuracy for the flood line determination.
- Given the setting of the site (numerous rocky outcrops) it was difficult to determine which channels would be fully active in a small flood and which are remnant channels which have since been bypassed. As such, the HEC-geoRAS and HEC-RAS models cannot be used to a very high level of accuracy in certain areas as they are usually used on larger catchment areas.

5. RESULTS AND DISCUSSION

The following results were used as input to the selected models and have been provided here.

5.1 Desktop Assessment

5.1.1 National Freshwater Ecosystem Priority Areas (NFEPA) Project / Assessment

In accordance with the NFEPA guidelines CSIR (2011), the relevant reach of the Ongeluks tributary (and its associated riparian areas) have been classified as a FEPA system (Class C – Moderately Modified), which indicates that this river system is a national freshwater conservation priority but has been disturbed to some extent. More information is available from the Freshwater Ecological Report (du Preez *et al*., 2020).

Only small artificial FEPA dams were identified within the study site.

5.1.2 Terrain, Soils, Geology & Vegetation

Contour lines (2 meter) were used to calculate the slope of each of the banks. The soils and geology were obtained from GIS layers. Various vegetation databases were used to determine the likely or expected vegetation types (Mucina & Rutherford, 2006; Scott-Shaw & Escott, 2011). A number of recognized databases (*c.f.* Table 4) were utilized in achieving a comprehensive review and allowing any regional or provincial conservation and biodiversity concerns to be highlighted.

Natural vegetation of the area is Koedoesberge-Moordenaars Karoo (SKv 6, Mucina and Rutherford, 2006). This occurs within the Succulent Karoo biome. The desktop analysis revealed that the area is a least threatened area, with the potential for some flagged fauna and flora (e.g. red data species and endangered wildlife) being found from the C-plan, SEA and MINSET databases. However, this does not necessarily mean that rare or endangered species will occur in the area of interest.

- **Distribution:** Western Cape and Northern Cape (smaller portion) Provinces: Koedoesberge and Pienaar se Berg low moun-tain ranges bordering on southern Tanqua Karoo and separated by the Klein Roggeveld Mountains from the Moordenaars Karoo in the broad area of Laingsburg and Merweville. The unit also includes the Doesberg region east of Laingsburg and piedmonts of the Elandsberg as far as beyond the Gamkapoort Dam at Excelsior (west of Prince Albert).
- **Altitude:** 500–1 250 m (most of the area at 680–1 120 m).
- **Vegetation & Landscape Features:** Slightly undulating to hilly landscape covered by low succulent scrub and dotted by scat-tered tall shrubs, patches of 'white' grass visible on plains, the most conspicuous dominants being dwarf shrubs of Pteronia, Drosanthemum and Galenia.
- **Geology & Soils:** Mudstone mainly), shale and sandstone of the Adelaide Subgroup (Beaufort Group), accompanied by sandstone, shale and mudstone of the Permian Waterford Formation (Ecca Group) and sandstone and shale of other Ecca Group Formations as well as Dwyka Group diamictites (all of the Karoo Supergroup). This geology gives rise to shallow, skel-etal soils. Region is classified as Fc land type (to a large extent), with Ib land type playing a subordinate role.
- **Climate:** Probability of rain is given for the entire year, but it is higher in winter. MAP slightly above 200 mm. There are two slight rainfall optima: one in March and another spread from May to August. MAT close to 16°C and incidence of frost relatively high (30 days).
- **Conservation:** Least threatened. Target 19%. Only a very small portion enjoying statutory conservation in the Gamkapoort Nature Reserve. Transformed only to a very small extent. No serious alien plant invasions recorded. Erosion is moderate (88%) and only to lesser extent high or very low.

5.1.3 Site Analysis

A detailed site assessment was undertaken through the site visit (21st - 22nd September) and supported by desktop data. This is important as it assisted in determining the Manning's n values (Chow, 1959), that are used to create an additional input spatial file used in HEC-RAS.

The site is almost entirely dominated by low shrub, which was confirmed during the site visit. Basal cover is low resulting in an increase stormflow potential.

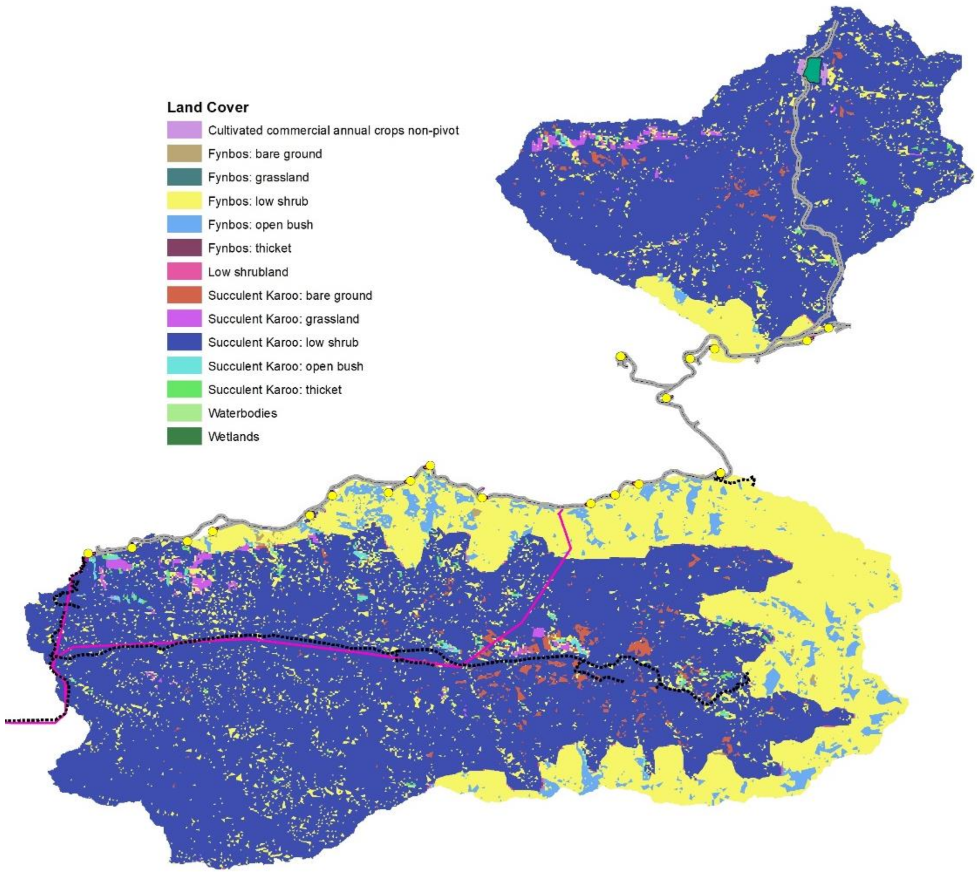


Figure 7 Land cover for the Oya WEF catchment area

Table 5 Catchment land use areas used for modelling the peak discharge

Land Use	Area (ha)	Percentage
Cultivated/Commercial	8.71	0.07
Fynbos: bare ground	13.02	0.11
Fynbos: grassland	2.93	0.02
Fynbos: low shrub	2833.95	23.87
Fynbos: open bush	325.76	2.74
Fynbos: thicket	0.36	0.00
Low Shrubland	12.07	0.10
Succulent Karoo: bare ground	147.83	1.25
Succulent Karoo: grassland	85.38	0.72
Succulent Karoo: low shrub	8354.77	70.38
Succulent Karoo: open bush	40.90	0.34
Succulent Karoo: thicket	44.63	0.38
Waterbodies	0.63	0.01
Wetlands	0.39	0.00

The catchment was divided into sub-catchments based on connections between tributaries (Figure 8). This was undertaken using the Soil Water Assessment Tool (SWAT). The catchment area of Oya is relatively small with all channels on-site being non-perennial in nature and would only have flowing water succeeding moderate to high rainfall events.

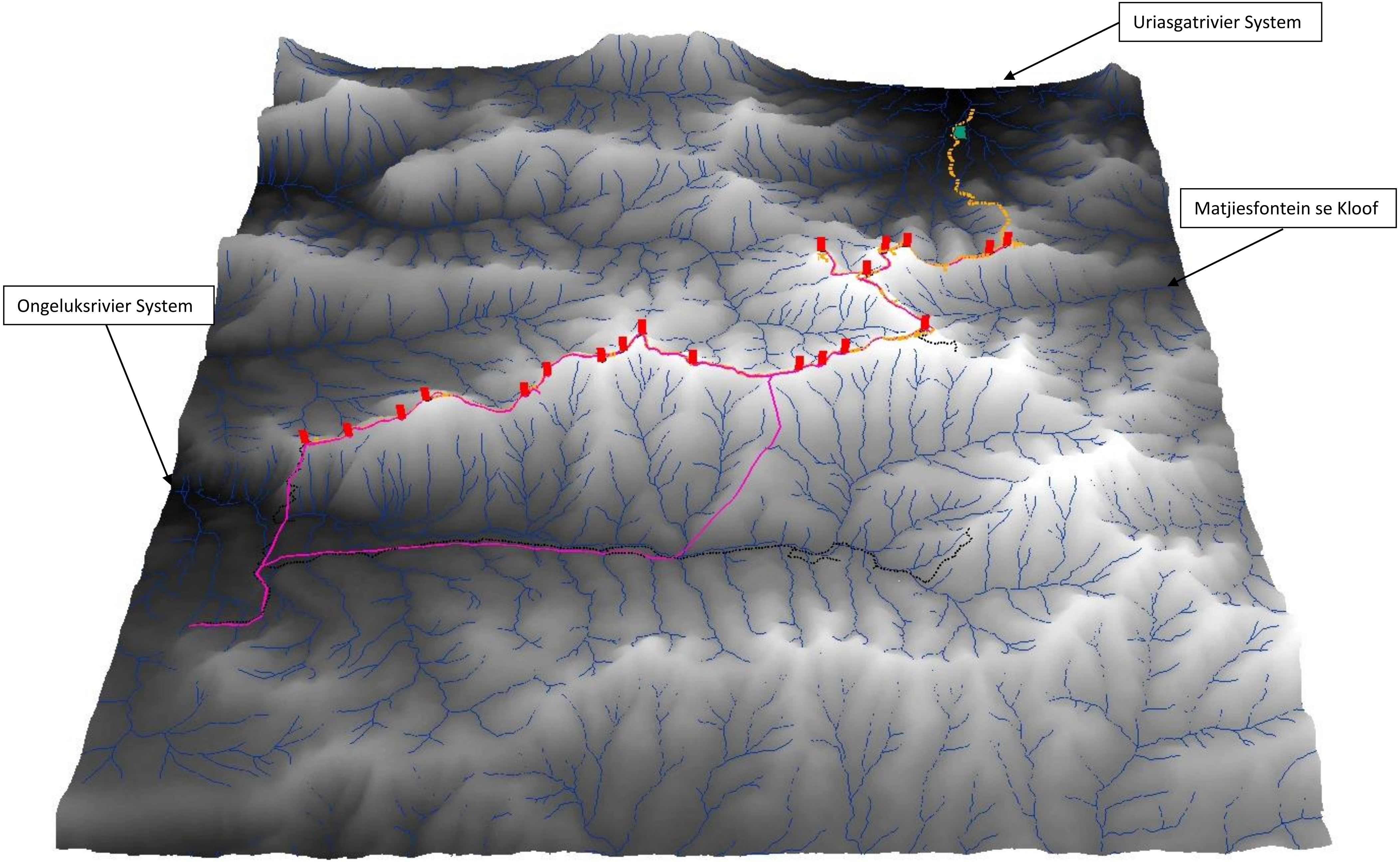


Figure 8 Terrain model for the catchment associated with the proposed Oya WEF

5.2 Climate Analysis

The long term annual rainfall data (Station 0044765 W – 35 km from the site) as well as design rainfall was sourced for the study area. The long term annual rainfall for numerous stations was extracted using the Daily Rainfall Extraction Utility (Lynch, 2003). Mean Annual Precipitation (MAP) for the study area is approximately 253 mm (Figure 9 – Lynch, 2003; Climate Forecast System Reanalysis (CFSR)). Some inconsistencies were identified in this record (e.g. some missing data in the early1900s and some large flood events not being recorded), these were verified using nearby stations and corrected as such. The best rainfall records were synthesized with the more recent data to create a new rainfall record that could be used in the design flood estimation. The station in close proximity, with similar altitude and MAP and a reliable record was selected.

Table 6 Comparison of values from some of the rainfall stations that were assessed during the data analysis

Station No.	Estimated MAP (mm)	Observed MAP (mm)	Years	Reliable	Patched	Altitude (m)	Station Name
004050 W	224	225	122	32.4	32.9	776	Touwsrivier (SAR)
0044134 W	315	314	120	16.7	82.5	836	Nooitgedag
0044765 W	252	252	120	58.7	40.5	1067	Pieter Meintjies (SAR)
0044286 W	206	207	122	41.0	58.7	866	Jan De Boers
0045134 W	170	173	120	80.3	19.3	902	Matjiesfontein (SAR)
0066027 W	259	259	120	56.5	43.1	1372	Dumure

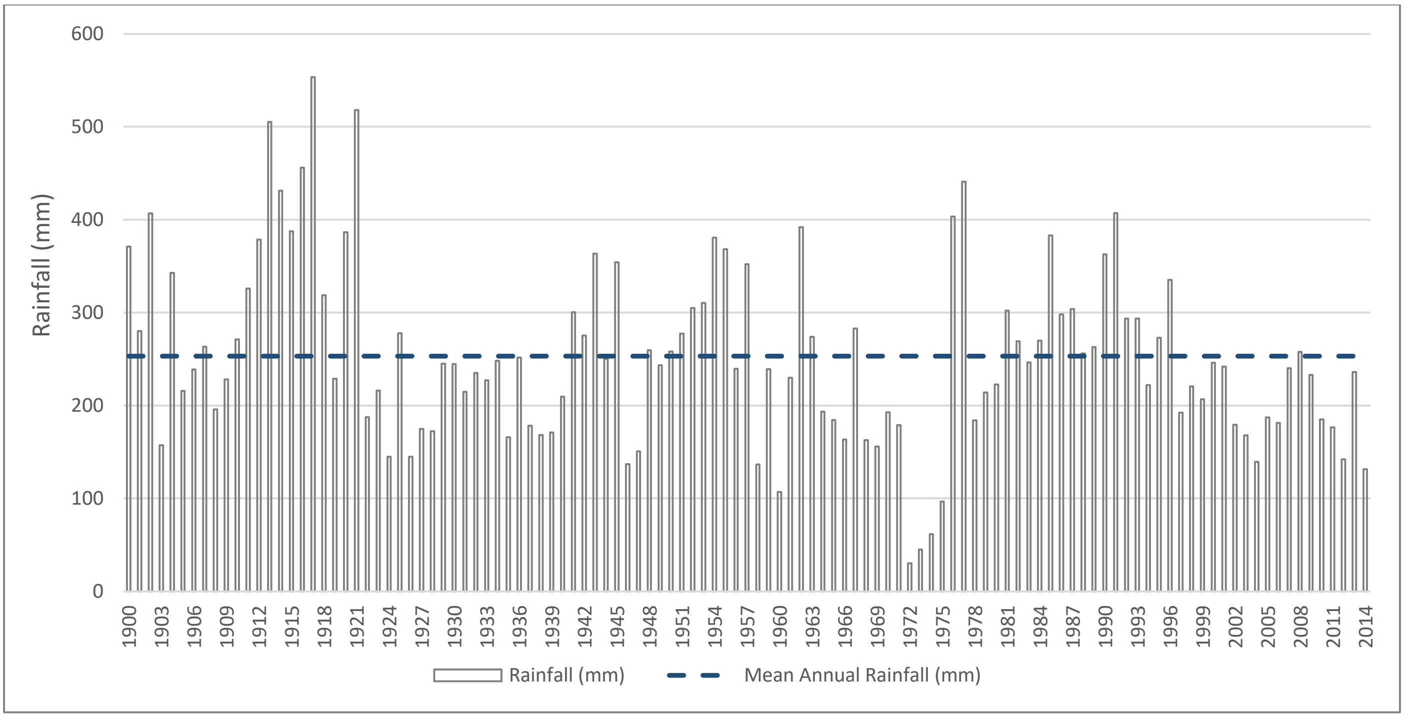


Figure 9 Long-term annual rainfall (annual in blue) near the proposed Oya WEF

5.3 Design Rainfall

Design rainfall differs from mean annual rainfall as it is rainfall associated with an events rainfall depth for a specified storm duration and a recurrence interval (frequency of occurrence). The design rainfall used is dependent on the method used to determine the peak discharge. The SCS-SA method uses 1 day-rainfall for various return periods while the Rational and SDF Methods use rainfall intensity linked to the catchments Time of Concentration (Tc) and Storm Duration. The Design Rainfall Estimation (DRE) tool which uses observed rainfall data was included for comparative purposes. The results of the design rainfall assessment have been provided in Annexure A. A summary of these results has been provided in Table 7.

Table 7 Design rainfall for the Oya WEF

Station Name & ID	Obs MAP	Years	Altitude (m)	Design Rainfall (mm)						
				2	5	10	20	50	100	200
Pieter Meintjies - 0044765 W	252	100	1067	32.0	47.0	58.2	70.2	87.5	101.9	117.7

5.4 Hydraulic Structures

An assessment was undertaken on any structures, which was populated in HEC-RAS. According to SANRAL (2016), the discharge capacity of the structures such as culverts would be determined by the following equation:

$$Q_{ideal} = CbH^{1.5}$$

where: Q = Discharge ($m^3.s^{-1}$)
C = Discharge Coefficient
G = Gravitational Constant (9.81 $m.s^{-1}$)
b = Side Width (m)
H = Headwater Depth (m)

5.5 Design Peak Discharge

The design runoff results obtained for the 1:20, 1:50 and 1:100 year flood events for the various river reaches are summarized in Table 7. The populated calculation sheets for the rational, SCS and SDF methods can be seen in Annexure B, C & D. The high contrast in values is due to the catchment size limitations of the design approaches. It is expected by the authors that the estimates from the rational and SDF are over designed. This is likely due to smaller catchment areas and rainfall value that may not be representative of the entire catchment. Furthermore, the lack of vegetation and the presence of eroded channels has resulted in a much shorter time of concentration than what would have occurred in past decades. The design values indicate that the larger design events were vastly different between models whereas the smaller more frequent events were similar between models. This is likely due to the recommended catchment areas that these models are designed for. Given the results, the SCS model was considered to be the most appropriate model if design rainfall were to be used. As such, the 1:100 year flood event would discharge a total of 172.9 $m^3.s^{-1}$ (Table 8).

Table 8 Adopted design peak discharge values (m^3.s-1) run through HEC-RAS for the catchment area

Peak Discharge ($m^3.s^{-1}$)	Return Period						
	2	5	10	20	50	100	200
Rational	147.472	231.040	303.977	388.220	510.776	626.142	723.227
SDF	23.75	76.19	124.41	178.73	259.43	327.00	398.58
SCS-SA	42.6	96.9	146.7	210.6	314.5	411.1	522.7

5.6 Hydraulic Modelling

Various hydraulic models were produced in HEC-RAS and exported to HEC-geoRAS by importing river centreline, cross sections, water surfaces and flow data from GIS layers and the hydrologic model. This allowed for inundation mapping and flood line polygons to be generated. The water surface TIN was converted to a GRID, and then actual elevation model was subtracted from the water surface grid. The area with positive results (meaning the water surface is higher than the terrain) illustrated the flood area (Figure 11), whereas the area with negative results illustrated the dry areas not inundated by the flood. Inundation can be seen along the watercourse (Figure 11). Further results are provided in Annexure B, C and D.

Any areas outside of the proposed development were not included in the flood generation model although the contributing catchment area was accurately accounted for.

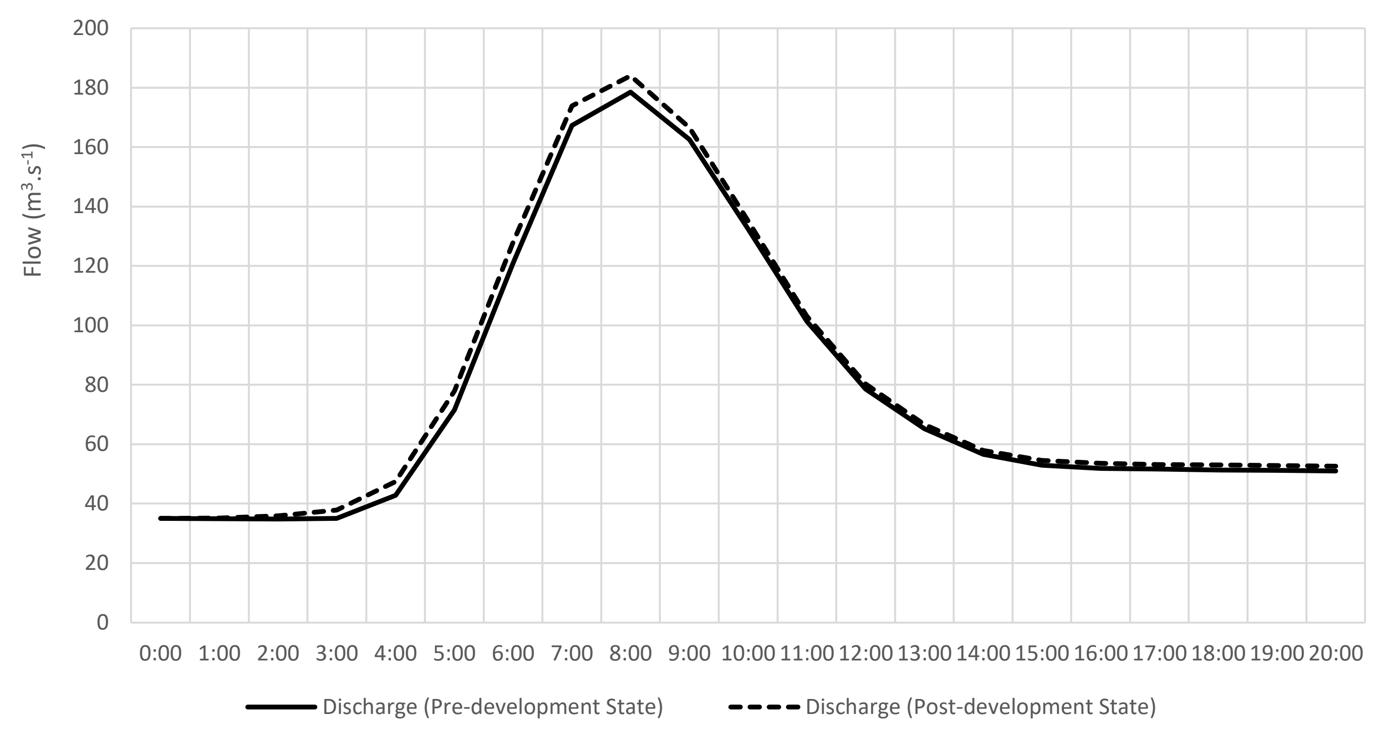


Figure 10 Pre- and post-development 1:50 year hydrograph for the proposed Oya WEF

Through the flood analysis, it is clear that the proposed infrastructure (Construction camp, crane pads and offsite Substations) will not be at risk of damage through flooding from the channels. This is largely due to the general low rainfall in the area and the small catchments on the site, resulting in less accumulated surface runoff. The post-development state will result in a very slight increased peak flow due to an increase in impervious structures and a resultant increase in storm flow. This has been accommodated through the storm water management plan. The site is also at increased risk of erosion due to areas of poor basal cover, the increase in hardened surfaces and the steep terrain. This is true for both the pre-development and post-development state. Although the crane pads are on the plateau of the mountain, they do still pose a risk of triggering erosion channels. In similar vein, the roads that traverse up steep slopes need to be secured against erosion.

Ephemeral drainage lines were not output as the catchment area was too small to derive a meaningful spatial output (although this area was still used as a model input). In such cases, the delineated watercourse and its buffer would be far greater than the derived flood extent.

The location of the existing boreholes that would potentially be used on site were confirmed. Of the boreholes identified, the most suitably located would be the Urias Gat de List borehole as it is outside of the 1:100 year flood extent and in close proximity to proposed infrastructure (Table 9 and Figure 11).

Table 9 Existing boreholes in relation to the proposed Oya WEF

Borehole	X- Coordinate	Y-Coordinate	Within 100 Year Flood (Y/N)
RE/159, Oliviers Berg, Hendrik Visser	20.30307600000	-32.89324100000	N
1/156, Gats Rivier, Hendrik Visser	20.24179300000	-32.88989600000	N
1/157, Rietfontein Spitskop Trust	20.23319166700	-32.84999722200	N/A
2/157, Rietfontein Spitskop Trust	20.26139722200	-32.84602777800	N/A
1/159, Oliviers Berg, P U Uys	20.33695477300	-32.89072418500	N
6/196 Urias Gat De List borehole	20.37005670700	-32.79803754800	N
1/190 Wind Heuvel De List Trust borehole	20.32240102800	-32.77290353700	Y

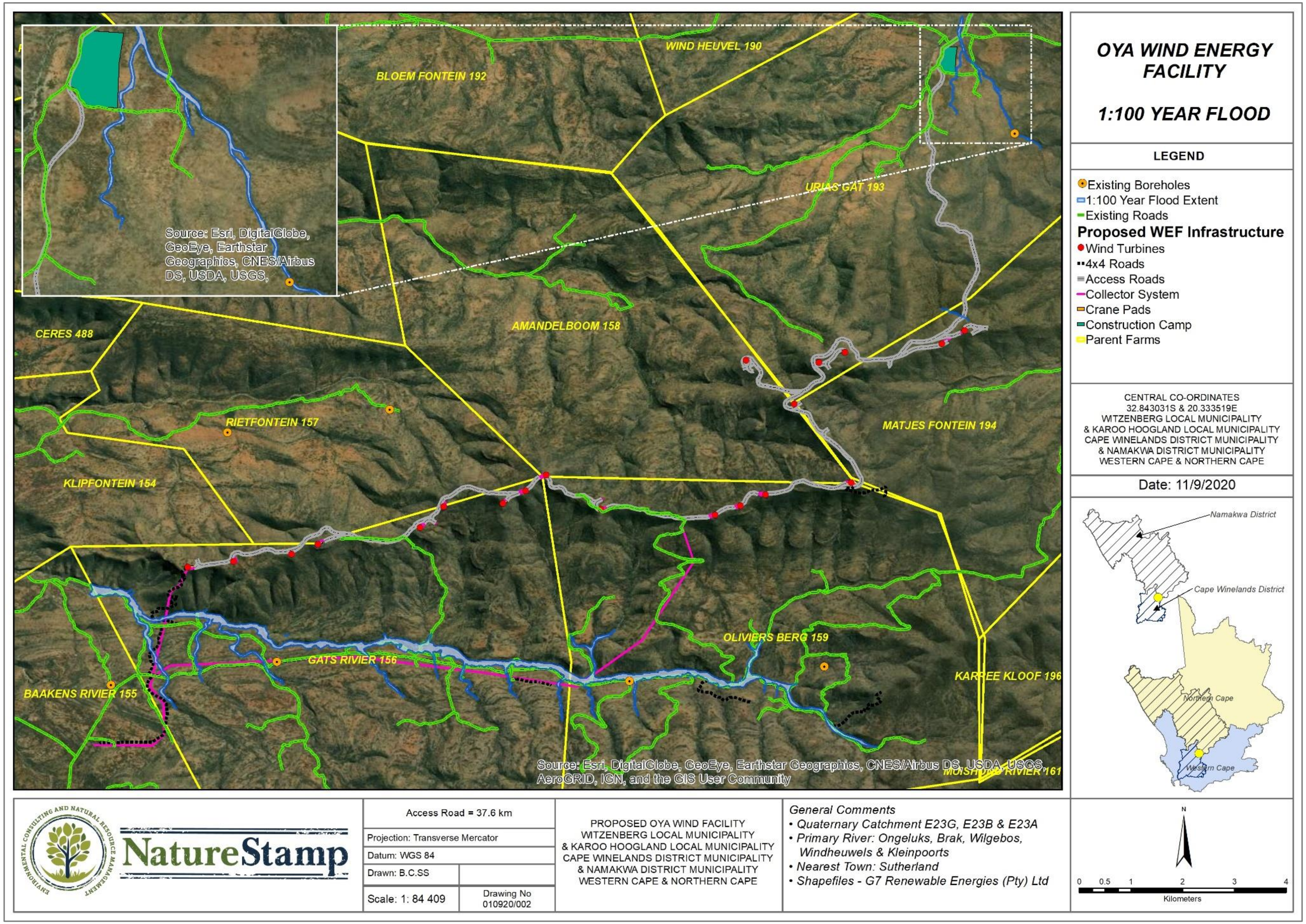


Figure 11 Steady state analysis of the 1:100 year flood event for the proposed Oya WEF

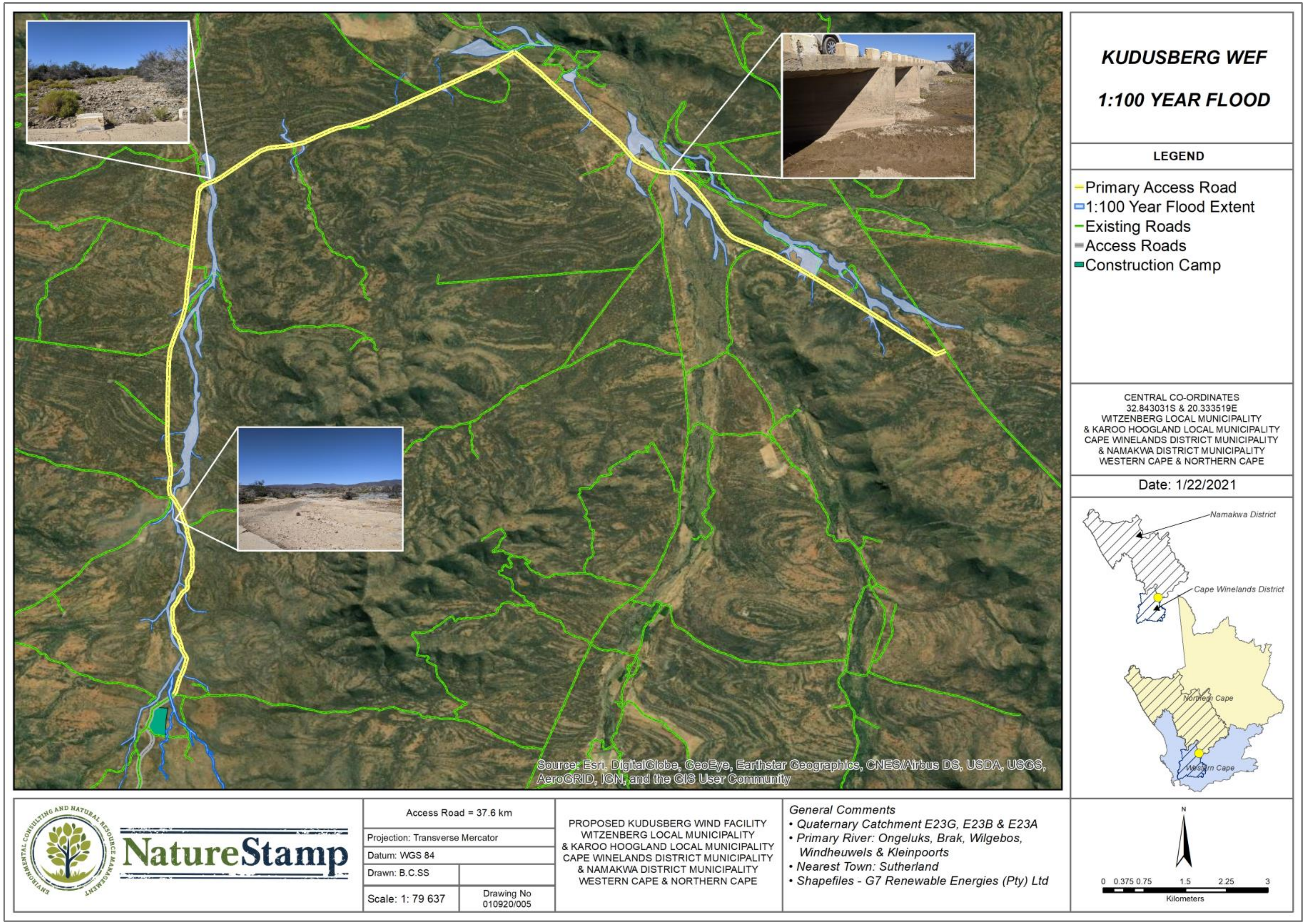


Figure 12 Steady state analysis of the 1:100 year flood event for the proposed Oya WEF primary access roads

5.7 Design Storm Determination

5.7.1 Rational Method using Surface Drainage Utility

From the rational method, used in the calculation of peak flows and rainfall intensity, based on various basic spatial and descriptive input parameters pertaining to the site in question, average rainfall intensity per hour was calculated for the 2, 5, 10, 20, 50 and 100-year 30 minute, 1 hourly and daily events. The results pertaining to this study are the 1 in 50 year, showing 85.4mm/h. Peak flows shows an increase in **0.11 m^3/s** for post-development conditions. This is low mostly as much of the roads are pre-existing. This results in an excess of **0.065 m^3/s** that needs to be attenuated per hectare of impervious surface. These outputs have then been used as inputs for the calculations in the following subsections.

5.7.2 Drainage Grid Calculations

It is assumed that the gravel roads that will be utilized will be of the open drains which are recessed into the ground. Dimensions were assumed as a typical dirt road drain (1 meters in width and recessed below the level of the culvert / kerb by approximately 0.3 meters). New roads were considered in the stormwater calculations. The roads would be between 10 to 12 meters with wide cut-off drains would be placed strategically and increased in high slope areas. Drains were assessed to determine if they could handle certain design events, the following calculation was used (SANRAL Drainage Manual 5th Edition):

$$Q = 1.77 \times A\sqrt{H}$$

Where: Q = Flow Capacity ($m^3.s^{-1}$)
A = Area of inlet (m^2)
H = Submergence (m)

Therefore A = (0.65 * 0.375) = 0.24 m^2
H = 0.2 (assumed for the site)

Drowned conditions were assumed and a blockage coefficient of 0.3 was assumed due to the small amount of debris likely on site. The equation $Q = CFA\sqrt{2gH}$ was used in this setting. Although open drains are being used, the aforementioned calculation was used as a guideline to see if the excess runoff could be accommodated. During such a storm event, the depth of flow on the surfaces would be **24.06 mm**.

The results show that each cut-off drain could handle **0.126 $m^3.s^{-1}$** after which water would exceed the channel and flows would not be attenuated. As such, if a cutoff drain is placed for every 5 ha of contributing area, there would be sufficient flow attenuation. This further shows that the excess flows on site would be accommodated by the proposed drain structures.

5.8 Storm water Control

- Cut-off drains as per the design recommendations must be installed to facilitate the control of surface water runoff velocities from roads (250 mm depth, variable width depending on site/existing road conditions);
- Any erosion caused from excess discharge adjacent to road and/or crane pad areas must be rehabilitated immediately. This would involve re-vegetation, geotextiles or rock gabions. This would be identified by the ECO;
- Stone protection structures, such as gabion baskets, would be required at any steep sections and where intersections occur;
- Runoff around the WEF infrastructure and construction camps need to be protected by erosion protection and channels to increase infiltration and promote the natural runoff regime. Runoff should not be concentrated at one point. Structures would include rainwater harvesting at the construction camp, berms and cut-off drains along steep road areas and berms around crane pads with cutoff drains with rockeries;
- Storm water discharge should be dispersed across each impervious area. Around such structures, assurance is needed that the ground remains vegetated and protected from erosion. Small rocks from construction should be placed along the edges of impervious areas; and
- Washing of equipment should avoid harmful chemicals.

Figure 13 Existing lay-down area and turbine for the nearby Perdekraal site

5.9 Storm Water Management Structures

The overall aim of the stormwater structures is to attenuate increases in flow due to the development to their predevelopment state. Any excess flow from the proposed development should not be concentrated towards one point. However, the natural flow channels as per the pre-development state should be promoted. The WEF and road grading should have structures as illustrated in Figures 14 & 15.

All runoff under the development footprint can and should be contained and managed within the site boundary of each crane pad. Temporary storm water structures should be put in place if pollution and spills are evident on site. The construction camp should be completely rehabilitated after construction through re-vegetation and erosion control. Underground cabling areas should also be completely rehabilitated once complete. Guidelines should be followed based on the wetland/riparian assessments and rehabilitation plan.

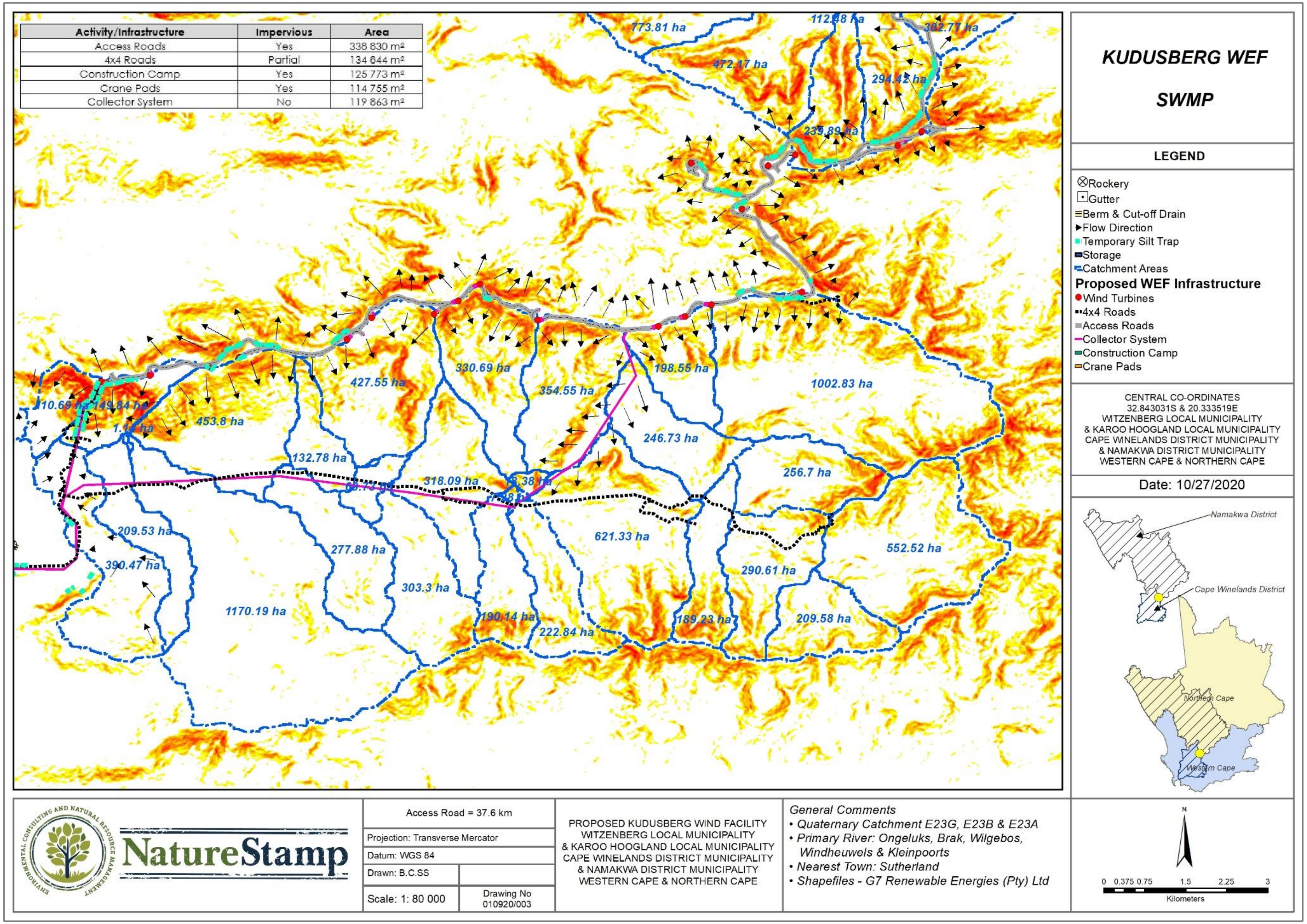
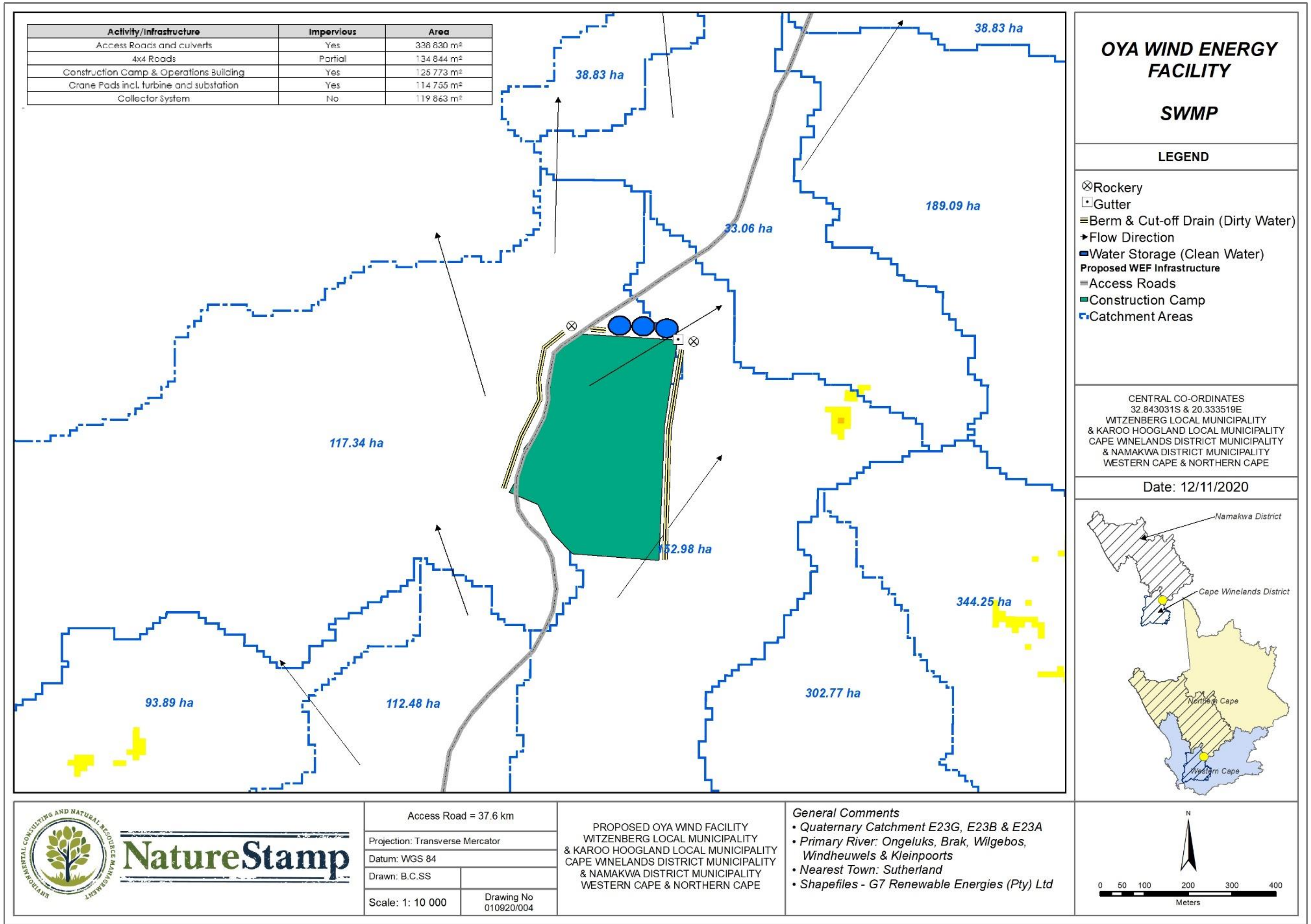


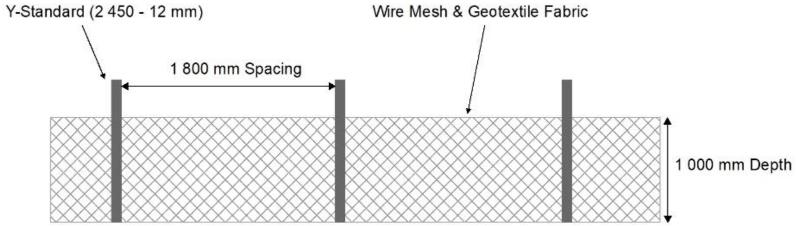
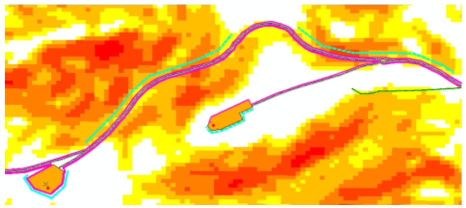
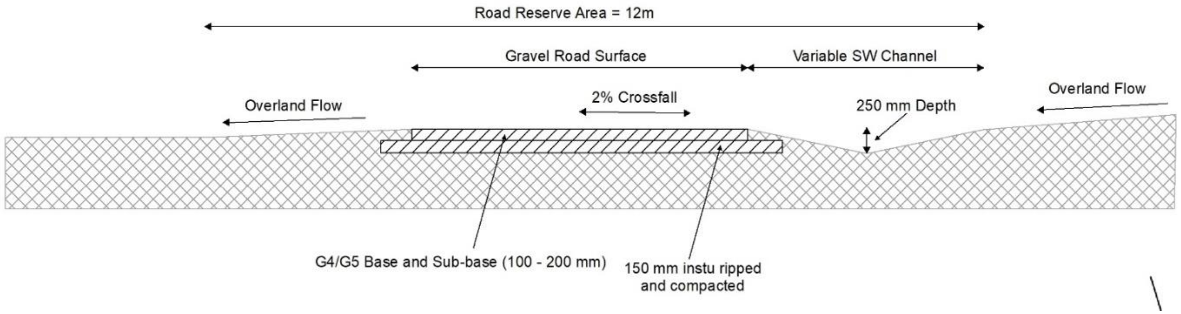
Figure 14 Storm water management plan for linear servitudes showing high risk area in red

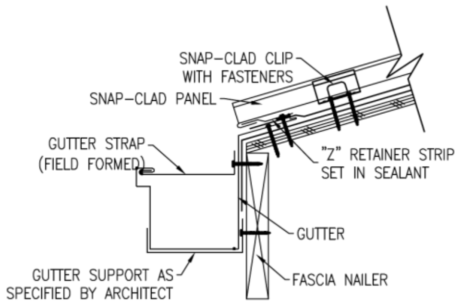
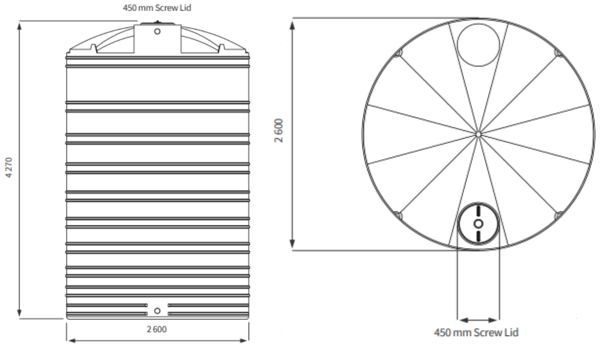
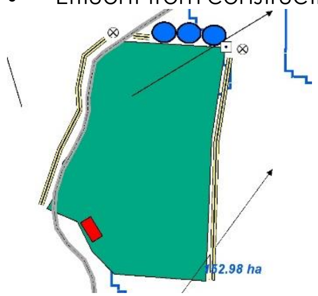


Activity/Infrastructure	Impervious	Area
Access Roads and culverts	Yes	338 830 m²
4x4 Roads	Partial	134 844 m²
Construction Camp & Operations Building	Yes	125 773 m²
Crane Pads incl. turbine and substation	Yes	114 755 m²
Collector System	No	119 863 m²

Figure 15 Storm water management plan for infrastructure showing high risk area in yellow/red

Table 10 Intervention measures per unit at Oya

Unit	Activity/Risk	Severity	Intervention
Preliminary Stage			
Access Roads	Route planning	Low	• Ensure watercourse crossings are kept to a minimum; • Ensure steep slopes are avoided where possible; • Ensure existing roads are used where possible.
Crane Pads	Site planning	Low	• Ensure sites are flat; • Ensure sites are away from watercourses; • Ensure the bearing capacity and bed rock is stable for foundations and platform weight.
Collector System	Route planning	Low	• Ensure watercourse crossings are kept to a minimum;
Construction Stage			
Access Roads	Expansion of gravel roads to between 8 to 12 meters. Grading of roads. Risk of erosion and sedimentation	Moderate	• Temporary silt traps in any development areas where the slope exceeds 12° (see design and layout in light blue below).   • Storm water runoff be directed to the lower side of the gravel roads. At this point it should then be collected in side drains and disposed of in designated places by means of suitable outlet structures (cut-off drains and rockeries) and berms.  • No dirty water must be directed into watercourses. • Roads should be constructed at-grade to allow for continued flow; • Only include side drains where inundation or damage may occur otherwise the natural flow path would be interrupted; • At crossings, stone protection walls should be constructed on either side to reduce scour;

			• all storm water runoff be directed to the lower side of the gravel roads. At this point it should then be collected in side drains and disposed of in designated places by means of suitable outlet structures and berms.
Crane Pads	Contamination from construction activities. Risk of erosion and sedimentation	Moderate	• Compounds, storage and lay-down areas must be clear of all debris, and the area must be level and free draining and have the same bearing capacity and proof testing as the Crane Pad. • No dirty water must be directed into watercourses. • Emergency pumps should be in place to remove any water at the bottom of excavated areas if needed. • Temporary silt traps and berms should be constructed around the footprint (see above)
Construction Camp	Potential pollution from staff. Potential oil spills from vehicles and equipment. Risk of erosion and sedimentation	Moderate	• Drains and berms at concentration points to manage and divert surface flow/ runoff from all structures during operation. • Gutters, downpipes and storage tanks (20 000 L) should be installed to attenuate storm events.  • No dirty water must be directed into watercourses. • Flows must be attenuated and subsequently directed towards natural flow paths. • Effluent from construction staff must be treated on-site otherwise it should be removed from the site. 
Collector System	Disturbance of soil and vegetation from collector footprint.	Low	• Temporary silt traps in any development areas where the slope exceeds 12°. • Revegetation of any disturbed areas. • Underground cabling areas should ensure sub-soil and top-soil are layered as per their natural state. • Steep areas should have additional erosion control measures put in place.
Operation Stage			

Access Roads	Operation of vehicles along roads. Potential erosion channels.	Low	• Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control systems. • Immediate rehabilitation should erosion occur. • Temporary silt traps to continue for 1 year during operation in any areas where the slope exceeds 12°.
Crane Pads	Increased stormflow from surface Risk of erosion and sedimentation	Low	• Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control systems. • Immediate rehabilitation should erosion occur.
Collector System	Continued disturbance of soil and vegetation from collector footprint.	Low	• Undertake a periodic site inspection to verify and inspect the effectiveness and integrity of the storm water run-off control systems. • Immediate rehabilitation should erosion occur.

5.10 Potential Spill Scenarios

Due to the nature of the activity, there is a chance of potential spills occurring on site (equipment etc.). This is largely due to the fuel based generation facility, storage and battery storage. The potential spill scenarios are outlined as follows:

1. Spills and leaks from vehicles. These incidents are likely to be the smallest and least concerning spills to take place on site. Regular removal of spills and leaks should be undertaken on-site. Eco-friendly detergents should be used.

2. The potential for contamination from battery storage or fuel generation.

3. A storm or flood event occurs during construction, resulting in structures being exceeded. All activities should stop and a spill management plan be executed. Furthermore, erosion control actions should be initiated.

5.11 Mitigation Measures and Recommendations (Spill Management Plan)

The Oya WEF and road grading should employ best stormwater management practises, as outlined below –

- Construction should take place during the dry season wherever possible. Construction should stop during heavy rains.
- Vegetation clearing should be limited as much as possible and plants rescued for rehabilitation.
- Directing clean stormwater towards natural drainage lines, contours and dispersing over grassed, flat areas (preferably the existing watercourses).
- Vehicles and equipment must be kept outside of watercourse buffers (du Preez *et al*., 2020) and flood lines.
- Vehicles and equipment must be kept clean and serviced off site.
- Staff/workers on-site must be educated on identifying potential erosion areas and best practice guidelines.
- Energy dissipating measures with regards to stormwater management should be installed where necessary to prevent soil erosion.
- The engineer or contactor must ensure that only clean stormwater runoff enters the environment.
- Drainage should be controlled to ensure that runoff from the project area does not culminate in off-site pollution, flooding or result in any damage to properties downstream, of any stormwater discharge points.
- Infrastructure must have the following:
    - Completely lined infrastructure (concrete bunded area), with the capacity to contain 120% of the total amount of petrochemicals stored within a specific tank. This excludes partially pervious areas that do not store chemicals;
    - Spills must be completely removed from the site unless an oil separator is installed;
    - Valves / taps to contain or release any spillage collected from storage tanks; and
    - Fire extinguisher equipment installed within each facility.

Furthermore, as guided by the DWS, the following soil erosion measures would be put into place –

- Erosion control measures should be put in place to minimize erosion along the construction areas. Extra precautions must be taken in areas where the soils are deemed to be highly erodible.
- Soil erosion onsite should be prevented at all times, i.e. post- construction activities.
- Erosion measures should be implemented in areas prone to erosion such as near water supply points, edges of slopes etc. These measures could include the use of sand bags, hessian sheets, retention or replacement of vegetation if applicable and in accordance with the EMPR and the biodiversity impact assessment.
- Where the land has been disturbed during construction, it must be rehabilitated and re-vegetated back to its original state after construction.
- Stockpiling of soil or any other material used during the construction phase must not be allowed on or near slopes, near a watercourse or water body. This is to prevent pollution of the impediment of surface runoff (further details are provided in the EMPr).

In order to reduce the potential impact of spills on site the following must be adhered to:

- Emergency numbers are provided on site – e.g. Spilltech, fire department, ambulance, etc.;
- Spill cleaning kits such as a Drizit kit are available on site;
- All chemicals on site are recorded in the inventory of hazardous substances;
- Equipment, machinery and vehicles are regularly checked and maintained in good order;
- Machinery and equipment maintenance is undertaken in designated areas;
- Drip trays are to be placed underneath machinery and equipment during maintenance;

In the instance of a spill on site the following procedure must be followed:
1. Locate the source of the spill;
2. Stop the spill and prevent further spreading;
3. The appropriate oil sponge, absorbent or spill kit (e.g. DriZit) can then be used to clean and remove the spilled substance(s);
4. Spills from trucks/tractors must be contained within a concreted site area and prevented from spreading;
5. Spilled petrochemicals can then be cleaned up and removed using the appropriate oil sponge, absorbent or spill kit (e.g. DriZit);
6. The spill must be reported to the site manager / supervisor and ECO;
7. Depending on the significance of the spill, the incident may also need to be reported to the DEDTEA and DWS.

5.12 Erosion Control Plan

There is an overlap between the storm water management and erosion control. The erosion control is particularly relevant during construction and at certain locations during operation. The removal of vegetation also leaves the site at a higher risk.

- Immediately rehabilitate eroded areas:
  - Install protective structures, e.g. geotextiles;
  - Ensure the slope remains gentle and stable;
  - Use vegetation plugs, rock packs or gabions where erosion is visible;
  - Immediately revegetate the area.
- Ensure that steeper areas are avoided and that the vegetation remains at these sites.
- Continual erosion monitoring should occur by a trained staff member.

The site should take into account the following erosion control mechanisms:
- Geotextiles;
- Gabion baskets;
- Soil binding chemicals;
- Hydroseeding techniques;
- Vegetation plugs;
- mulch

To ensure rehabilitation is effective, it is vital that the working area is managed correctly during the construction phase. An important part of this management will be that careful preservation and management of soil stockpiles should be implemented from the start of the site. The following points have been provided for use with the rehabilitation actions:

- Top- and subsoil stockpiles (used for road levelling and bank lifting) must not be stockpiled within 100m or within the 1:100 year floodplain of a watercourse.
- Naturally occurring vegetation removed by site clearance operations may be grubbed in with the topsoil for stockpiling.
- The topsoil shall not be buried or rendered in any other way inappropriate for rehabilitation use.
- Topsoil stripping (in widening and realignment areas) shall not occur in wet weather and during stripping and stockpiling, the topsoil shall not be subject to a compaction force greater than 1 500kg/m² and shall not be pushed for more than 50m.
- Topsoil shall also only be handled twice, once to strip and stockpile, and secondly to replace, level, shape and scarify if necessary.

- Top soil stockpiles must be protected against erosion and a record kept of all top soil quantities and should there be shortfalls of topsoil required for rehabilitation, adequate replacement material from commercial sources should be obtained as approved by the Engineer (preferably from areas identified with sourced excess topsoil).
- Equally, excess topsoil shall be landscaped and stabilized in accordance to the requirements of the Engineer and in consultation with the Contractor's Land Rehabilitation Specialist.
- Topsoil stockpiles should not be stockpiled for longer than 6 months. If this can't be avoided, the stockpiles will need to be enriched or upgraded prior to rehabilitation. The Contractor shall consult with the Engineer with regards to matching preconstruction conditions or existing adjacent conditions.
- All stockpiles left for extended periods of time shall be stabilized using approved vegetation cover or other erosion control measures.
- Any excess subsoil must be removed from the road fringe once back filling is completed, and spoiled at an agreed spoil site (spoil sites to be agreed between landowner, ECO and Engineer).

5.13 Water Balance

5.13.1 WR2012 Analysis (Sami, 2016)

The data obtained for the site showed a mean annual evaporation of 1 810 mm, 1 895 mm and 1 870 mm for the three QCs. The naturalized flow mean annual runoff for the greater catchment is 4.86 million m^3 for the E23G catchment area of 747 km^2, 16.58 million m^3 for the E23A catchment area of 762 km^2 and 16.58 million m^3 for the E23B catchment area of 705 km^2

Table 11 WR2012 data relevant to the Oya WEF

								NATURALISED FLOW MARs			
	BASIC INFORMATION							1920 - 1989	1920 - 2004	1920 - 2009	Change in MAR
	Catchment area		S-pan evaporation			Rainfall		MAR (WR90)	MAR (WR2005)	MAR (WR2012)	WR2005 to WR2012
Quaternary	Gross	Net	evap	MAE WR2005	MAE WR90	Rainfall	MAP	Net	Net	Net	(percent)
catchment	(km2)	(km2)	zone	(mm)	(mm)	zone	(mm)	(mcm)	(mcm)	(mcm)	(percent)
E23G	747	747	23B	1810	1810	E2B	190	3.2	4.97	4.86	-2.2
E23A	762	762	15B	1895	1895	E2A	254	7.70	15.22	16.58	8.9
E23B	705	705	15B	1870	1870	E2A	240	5.90	15.22	16.58	8.9

5.13.2 Water Balance

Data from the developers was provided to the specialists. This data allowed for an assessment of the proposed structures and the expected water usage/requirements (Figure 16 & 17). The proponent requires water for construction activities (concrete mixing etc.), water for staff (potable and ablutions) and water for general maintenance. The key goal of the water balance assessment is to determine the runoff from structures. The greatest runoff was from the access roads as these will be widened to allow for large vehicle access. However, overall, the volumes of water are very small and this is a low intensive water use activity, particularly during operation.

Further details regarding the source of water will be confirmed. This water balance assumes the following:

- Water will be obtained from groundwater abstraction and a small amount from rainwater harvesting.
- Storage facilities (20 000 L tanks x 3) have been accounted for and would also act as attenuation structures.
- Clean water would be directed into JoJo tanks from any building infrastructure.
- All sewage will be removed from the site by a suitable waste disposal company.

Oya WEF Conceptual Water Balance ANNUAL				
IN			**OUT**	
From: Borehole Abstraction/Storage	5,592.00 m^3/yr	Storage for Staff drinking/wastewater Usage & Maintenance	To: Wastewater (removed from site) & Human Consumption	31,756 m^3/yr
From: External (Trucked in)	95,262.90 m^3/yr			
From: Rainwater Storage	5,000 m^3/yr		To: Channel Discharge (excess from construc activities)	74,098 m^3/yr
From: Runoff from Crane Pads	29,113 m^3/yr	Crane Pads, Construction Camp & Roads	To: Channel Discharge	102,888 m^3/yr
From: Runoff from Construction Camp	31,909 m^3/yr		To: Infiltration	44,095 m^3/yr
From: Runoff from Access Roads/Servitudes	85,961 m^3/yr			
TOTAL	**252,838 m^3/yr**		**TOTAL**	**252,838 m^3/yr**

KEY	
Measured Values	(green)
Calculated Values	(yellow)
Assumed Values	(red)

Figure 16 Annual water balance for the construction of the proposed Oya WEF

Oya WEF Conceptual Water Balance ANNUAL				
IN			**OUT**	
From: Borehole Abstraction/Storage	5,592.00 m^3/yr	Storage for Staff drinking/wastewater Usage & Maintenance	To: Wastewater (removed from site) & Human Consumption	3,178 m^3/yr
From: External (Trucked in)	- m^3/yr			
From: Rainwater Storage	5,000 m^3/yr		To: Channel Discharge (excess from storage facilities)	7,414 m^3/yr
From: Runoff from Crane Pads	29,113 m^3/yr	Crane Pads, Maintenance buildings	To: Channel Discharge	88,986 m^3/yr
From: Runoff from Maintenance Structures	12,048 m^3/yr		To: Infiltration	38,137 m^3/yr
From: Runoff from Access Roads/Servitudes	85,961 m^3/yr			
TOTAL	**137,715 m^3/yr**		**TOTAL**	**137,715 m^3/yr**

KEY	
Measured Values	(green)
Calculated Values	(yellow)
Assumed Values	(red)

Figure 17 Annual water balance for the operation of the proposed Oya WEF

6. CONCLUSION

The work undertaken for this report provides information on the flood and storm water components for the proposed Oya WEF facility. The areas associated with the development are relatively small. However, the contributing catchment area is large as the development is distributed along a catchment divide. The site has existing roads. The site has a low vegetation cover and an undulating terrain indicating that it is at higher risk of erosion. As such, it essential that storm water and erosion control measures are strictly adhered to. Pollution control measures should also be appropriately implemented for the construction and operational phase. Temporary silt traps must be placed as recommended in this SWMP during construction. Additional structures such as cut-off drains, natural rockeries, rainwater harvesting and storage have been recommended for the operation of the site. Roads that cross watercourses require open drains and natural rockeries.

The flood component showed that the proposed infrastructure is not at risk of flood damage. Additionally, the boreholes identified on site are outside of the 1:100 year flood line and would be at very low risk of inundation/damage. The overall risk to watercourses is moderate during construction but low during operation, assuming that control measures and rehabilitation is adhered to and successful.

Through the SWMP, dirty water was identified as water containing sediments around cleared areas during construction and potential spills/leaks from chemical storage areas. During construction, water would be attenuated, passed through silt traps and rockeries to allow for the sediments to be contained. Potential spills would be contained within lined structures on site and removed. All sewage would be removed from the site. As such, there is no risk of effluent contamination apart from minor spills from the removal vehicle. However, should this happen, effluent would be removed from site and the spill contained. Clean water would be attenuated and directed into storage tanks or natural flow paths during operation.

Water requirements and usage on-site is low as shown in the water balance. The site requires 100 854 m^3/annum during construction and 5 592 m^3/annum during operation.

Regular checks should be made by the ECO and site manager. These measures should also be incorporated into the EMPr. Monitoring and follow up assessments are essential to maintaining the overall state and continued management of the watercourse system. **Monthly audits** should be undertaken by the ECO and reports submitted identifying potential/existing erosion areas should they occur. Should any erosion areas be identified, the erosion control plan should be immediately implemented. These audits should continue for two years after the start of the operation phase. Focus should be placed on maintaining the integrity of the watercourse and the impact the development may have on soil structure.

7. REFERENCES

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ANNEXURE A Design Rainfall Values for Oya WEF

Design Rainfall in South Africa: Ver 3 (July 2012)

User selection has the following criteria:

Coordinates: Latitude: 32 degrees 54 minutes; Longitude: 20 degreess 10 minutes

Durations requested: 5 m, 10 m, 15 m, 30 m, 45 m, 1 h, 2 h, 4 h, 6 h, 8 h, 10 h, 24 h, 1 d

Return Periods requested: 2 yr, 5 yr, 10 yr, 20 yr, 50 yr, 100 yr, 200 yr

Block Size requested: 0 minutes

Data extracted from Daily Rainfall Estimate Database File

The six closest stations are listed

Station Name	SAWS	Distance	Record	Latitude		Longitude		MAP	Altitude	Duration	Return Period (years)																				
	Number	(km)	(Years)	(°)	(')	(°)	(')	(mm)	(m)	(m/h/d)	2	2L	2U	5	5L	5U	10	10L	10U	20	20L	20U	50	50L	50U	100	100L	100U	200	200L	200U
DUMURE	0066027_W	36.4	73	32	57	20	30	340	1341	1 d	35.1	34.9	35.2	51.5	51.2	51.7	63.8	63.2	64.3	76.8	75.8	77.9	95.8	93.3	98.1	111.6	107.6	115.7	129.0	123.1	135.1
JAN-DE-BOERS	0044286_W	39.8	49	33	16	20	8	269	866	1 d	29.3	29.2	29.4	43.0	42.8	43.2	53.2	52.8	53.7	64.2	63.3	65.1	80.0	77.9	81.9	93.2	89.8	96.6	107.7	102.8	112.8
SPES BONA	0043516_W	45.1	67	33	6	19	48	127	619	1 d	20.1	20.0	20.2	29.4	29.3	29.6	36.5	36.2	36.8	44.0	43.4	44.6	54.8	53.4	56.2	63.9	61.6	66.2	73.8	70.4	77.3
PIETER MEINTJIES (SAR)	0044765_W	47.5	75	33	15	20	26	264	1064	1 d	32.0	31.9	32.2	47.0	46.8	47.2	58.2	57.7	58.7	70.2	69.2	71.2	87.5	85.2	89.6	101.9	98.2	105.6	117.7	112.4	123.3
DWARS-IN-DIE-WEG	0045184_W	48.5	80	33	4	20	35	159	998	1 d	25.9	25.8	26.0	38.0	37.9	38.2	47.1	46.7	47.6	56.8	56.0	57.6	70.8	69.0	72.6	82.5	79.5	85.5	95.4	91.0	99.9
TOUWSRIVIER (SAR)	0044050_W	49.0	99	33	20	20	2	223	774	1 d	29.1	29.0	29.2	42.7	42.5	42.9	52.9	52.5	53.4	63.8	62.9	64.7	79.5	77.5	81.4	92.6	89.3	96.0	107.0	102.2	112.1

Gridded values of all points within the specified block

Latitude		Longitude		MAP	Altitude	Duration	Return Period (years)																				
(°)	(')	(°)	(')	(mm)	(m)	(m/h/d)	2	2L	2U	5	5L	5U	10	10L	10U	20	20L	20U	50	50L	50U	100	100L	100U	200	200L	200U
32	54	20	10	270	933	5 m	6.7	5.9	7.6	9.9	8.7	11.1	12.3	10.8	13.8	14.8	12.9	16.7	18.4	15.9	21.0	21.5	18.3	24.8	24.8	21.0	29.0
						10 m	9.8	8.5	11.0	14.3	12.5	16.2	17.7	15.4	20.2	21.4	18.4	24.4	26.7	22.7	30.8	31.1	26.2	36.3	35.9	29.9	42.3
						15 m	12.1	10.5	13.8	17.8	15.3	20.2	22.0	18.9	25.2	26.5	22.7	30.5	33.1	28.0	38.4	38.6	32.2	45.3	44.5	36.9	52.9
						30 m	15.4	13.3	17.6	22.6	19.5	25.8	28.1	24.0	32.2	33.8	28.8	39.0	42.2	35.5	49.1	49.1	40.9	57.8	56.8	46.8	67.5
						45 m	17.8	15.3	20.3	26.1	22.4	29.8	32.3	27.6	37.1	39.0	33.1	45.0	48.6	40.8	56.6	56.6	47.0	66.7	65.4	53.8	77.9
						1 h	19.7	16.9	22.5	28.9	24.7	33.0	35.8	30.5	41.1	43.1	36.6	49.8	53.7	45.1	62.7	62.6	51.9	73.9	72.3	59.4	86.3
						2 h	25.1	21.4	28.7	36.8	31.4	42.2	45.6	38.8	52.5	54.9	46.5	63.6	68.4	57.2	80.1	79.8	66.0	94.4	92.2	75.5	110.2
						4 h	29.0	23.6	34.4	42.6	34.6	50.5	52.8	42.7	62.9	63.6	51.2	76.2	79.3	63.1	95.9	92.4	72.7	113.0	106.8	83.2	132.0
						6 h	31.7	25.0	38.3	46.5	36.6	56.1	57.6	45.2	69.8	69.4	54.2	84.6	86.5	66.7	106.6	100.8	76.9	125.6	116.4	88.0	146.7
						8 h	33.7	26.0	41.2	49.4	38.1	60.5	61.2	47.1	75.3	73.7	56.4	91.2	91.9	69.5	114.8	107.1	80.1	135.4	123.8	91.7	158.1
						10 h	35.3	26.8	43.7	51.8	39.3	64.1	64.2	48.6	79.8	77.3	58.2	96.7	96.4	71.7	121.7	112.4	82.6	143.4	129.8	94.6	167.5
						24 h	42.5	30.3	54.9	62.4	44.5	80.5	77.3	54.9	100.2	93.2	65.8	121.4	116.2	81.1	152.8	135.4	93.4	180.1	156.4	106.9	210.3
						1 d	33.8	24.1	43.6	49.5	35.3	63.9	61.4	43.6	79.5	74.0	52.3	96.4	92.2	64.3	121.3	107.5	74.2	143.0	124.2	84.9	167.0

ANNEXURE B Rational Method for Oya WEF

Description of Catchment	**Ongeluks/Gatsrivier**		
River detail	**Ongeluks/Gatsrivier**		
Calculated by	**B. Scott-Shaw**	**Date**	**10-Oct-20**

Physical characteristics					
Size of catchment (A)	87	km²	Rainfall Region		
Longest Watercourse	16.5	km	**Area Distribution Factors**		
Average slope (S_{av})	0.028	m/m	Rural (α)	Urban (β)	Lakes (γ)
Dolomite Area ($D_{\%}$)	0	%	1	0	0
Mean Annual Rainfall (MAR)	253	mm			
Catchment Characteristics	Steep/impermeable	%			
r - look up from Table 3C.3	Medium grass cover	0.4			

Rural (1)				**Urban** (2)			
Surface Slope	**%**	**Factor**	**C_s**	**Description**	**%**	**Factor**	**C_2**
Vleis and Pans	5	0.05	0.003	**Lawns**			
Flat Areas	15	0.11	0.017	Sandy, flat (<2%)		0.075	-
Hilly	65	0.2	0.130	Sandy, steep (>7%)		0.175	-
Steep Areas	15	0.3	0.045	Heavy soil, flat (<2%)		0.15	-
Total	100	-	0.194	Heavy soil, steep (>7%)		0.3	-
Permeability	**%**	**Factor**	**C_p**	**Residential Areas**			
Very Permeable	0	0.05	-	Houses		0.4	-
Permeable	35	0.1	0.035	Flats		0.6	-
Semi-permeable	55	0.2	0.110	**Industry**			
Impermeable	10	0.3	0.030	Light industry		0.65	-
Total	100	-	0.175	Heavy Industry		0.75	-
Vegetation	**%**	**Factor**	**C_v**	**Business**			
Thick bush and plantation	0	0.05	-	City Centre		0.825	-
Light bush and farm-lands	42	0.15	0.063	Suburban		0.6	-
Grasslands	55	0.25	0.138	Streets		0.825	-
No Vegetation	3	0.3	0.009	Maximum flood		1.00	-
Total	100	-	0.210	Total	0	-	0.000

Time of concentration (T_c)	**Defined Watercourse**	Notes:		
Overland flow	Defined watercourse	*Pre-development Run-off*		
			Latitude:	*29°38'*
		Tc =	*Longitude:*	*30°17'*
		2.27521 115		

$$T_c = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467} \qquad T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0.385}$$

3.4	Hours	2.3	Hours

Run-off coefficient							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Run-off coefficient, C_1 ($C_1 = C_s + C_p + C_v$)	0.579	0.579	0.579	0.579	0.579	0.579	0.5785
Adjusted for dolomitic areas, C_{1D} ($= C_1(1-D_{\%})+C_1D_{\%}(\Sigma(D_{factor} \times C_{s\%}))$)	0.5785	0.5785	0.5785	0.5785	0.5785	0.5785	0.5785

Adjustment factor for initial saturation, F_t	0.75	0.8	0.85	0.9	0.95	1	1
Adjusted run-off coefficient, C_{1T} ($= C_{1D} \times F_t$)	0.433875	0.4628	0.491725	0.52065	0.549575	0.5785	0.5785
Combined run-off coeffiecient C_T ($= \alpha C_{1T} + \beta C_2 + \gamma C_3$)	0.433875	0.4628	0.491725	0.52065	0.549575	0.5785	0.5785
Rainfall							
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Point Rainfall (mm), P_T	32.0	47.0	58.2	70.2	87.5	101.9	117.7
Point Intensity (mm/hour), P_{iT} ($=P_T/T_C$)	14.1	20.7	25.6	30.9	38.5	44.8	51.7
Area Reduction Factor (%), ARF_T	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Average Intensity (mm/hour), I_T ($= P_{iT} \times ARF_T$)	14.1	20.7	25.6	30.9	38.5	44.8	51.7
Return period (years), T	**2**	**5**	**10**	**20**	**50**	**100**	**Max**
Peak flow (m^3/s),	147.472	231.040	303.977	388.220	510.776	626.142	723.227

ANNEXURE C SDF Method for the Oya WEF

Description of catchment		**Ongeluks/Gatsrivier**						
River detail		**Ongeluks Tributary**						
Calculated by		**BCSS**				**Date**	**10 October 2020**	
Physical characteristics								
Size of catchment (A)	**87**	km²	Time of Concentration (T_C)	$T_c = \left(\frac{0,87 L^2}{1000 S_{av}}\right)^{0,385}$			**2.28**	hours
Longest watercourse (L)	**16.5**	km						
Average slope (S_{av})	**0.028**	m/m						
SDF basin (0)#	**19**		Time of concentration, t (= 60 T_C)				**137**	minutes
2-year return period rainfall (M)	**34**	mm	Days of thunder per year (R)				**16**	days/year
TR102 n-day rainfall data								
Weather Service station	**Letjiesbos**		Mean annual precipitation (MAP)				**160**	mm
Weather Service station number	**69 483**		Coordinates					

Duration (days)	Return period (years)						
	2	5	10	20	50	100	200
1	**34**	**55**	**72**	**92**	**124**	**152**	**185**
2	**38**	**64**	**87**	**112**	**153**	**190**	**233**
3	**40**	**68**	**93**	**121**	**166**	**206**	**254**
7	**45**	**79**	**110**	**145**	**202**	**254**	**315**

Rainfall							
Return period (years), T	2	5	10	20	50	100	200
Point precipitation depth (mm) $P_{t,T}$	**22.36**	**37.73**	**49.35**	**60.97**	**76.34**	**87.96**	**99.58**
Area reduction factor (%), ARF (= $(90000-12800\ln A+9830\ln t)^{0,4}$)	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Average intensity (mm/hour), I_T (= $P_{t,T}$ x ARF / T_C)	**9.83**	**16.58**	**21.69**	**26.80**	**33.55**	**38.66**	**43.77**

Run-off coefficients							
Calibration factors	C_2 (2-year return period) (%)		**10**	C_{100} (100-year return period) (%)			**35**
Return period (years)	2	5	10	20	50	100	200
Return period factors (Y_T)	0	0.84	1.28	1.64	2.05	2.33	2.58
$C_T = \frac{C_2}{100} + \left(\frac{Y_T}{2,33}\right)\left(\frac{C_{100}}{100} - \frac{C_2}{100}\right)$ Run-off coefficient (C_T),	**0.10**	**0.19**	**0.24**	**0.28**	**0.32**	**0.35**	**0.38**
Peak flow (m³/s), $Q_T = 0.278 \times C_T I_T A$	**23.75**	**76.19**	**124.41**	**178.73**	**259.43**	**327.00**	**398.58**

ANNEXURE D SCS Results for the Oya WEF

```
CATCHMENT NAME                     :  Ongeluks
 PROJECT NO                        :  Oya WEF
 RUN NO                            :  1
 TOTAL CATCHMENT AREA (km^2)       :  87.00
 STORM INTENSITY DISTRIBUTION TYPE :  2
 CATCHMENT LAG TIME (h)            :  1.42
 COEFFICIENT OF INITIAL ABSTRACTION:  0.10

 CURVE NUMBERS:           Initial    Final
   Sub-catchment 1         79        73.2
   Sub-catchment 2         79        75.4
   Sub-catchment 3         75        71.8
   Sub-catchment 4         82        75.7

 RETURN PERIOD (YEARS)               2      5     10     20     50    100    200

 DESIGN DAILY RAINFALL DEPTH (mm)     39     56     69     84    106    125    146

 DESIGN STORMFLOW DEPTH (mm)
   Sub-catchment 1                  7.2   15.6   23.3   33.2   49.2   64.1   81.3
   Sub-catchment 2                  8.3   17.5   25.7   36.2   52.9   68.3   86.0
   Sub-catchment 3                  6.5   14.5   21.9   31.5   47.1   61.6   78.4
   Sub-catchment 4                  8.5   17.7   26.0   36.6   53.4   68.9   86.7

 TOTAL RUNOFF DEPTH (mm)            7.7   16.4   24.4   34.6   50.9   66.0   83.4

 DESIGN STORMFLOW VOLUME
 (millions m^3)
   Sub-catchment 1                  0.2    0.4    0.5    0.8    1.2    1.5    1.9
   Sub-catchment 2                  0.2    0.3    0.5    0.7    1.1    1.4    1.7
   Sub-catchment 3                  0.1    0.3    0.4    0.5    0.8    1.1    1.4
   Sub-catchment 4                  0.2    0.5    0.7    1.0    1.4    1.8    2.3

 TOTAL STORMFLOW VOLUME             0.7    1.4    2.1    3.0    4.4    5.7    7.3
 (millions m^3)

 COMPUTED CURVE NUMBER             74.2   74.2   74.2   74.2   74.2   74.2   74.2

 PEAK DISCHARGE (m^3/s)            42.6   96.9  146.7  210.6  314.5  411.1  522.7


 *******************************************************************
RETURN PERIOD (years)    =      2
DESIGN RAINFALL    (mm)  =     39
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  =  42.56
 *******************************************************************
    TIME                 DISCHARGE
  (minutes)       (cubic metres/sec)      (litres/sec)

     650.              0.000                 0.
     666.              0.016                16.
     681.              0.084                84.
     697.              0.290               290.
     712.              0.976               976.
     728.              5.555              5555.
     743.             11.638             11638.
     759.             18.552             18552.
     774.             25.996             25996.
     790.             33.692             33692.
     805.             41.056             41056.
     821.             42.564             42564.
     837.             41.965             41965.
     852.             40.324             40324.
     868.             37.980             37980.
     883.             35.105             35105.
     899.             31.802             31802.
     914.             28.146             28146.
     930.             24.210             24210.
     945.             20.081             20081.
     961.             15.993             15993.
     976.             14.013             14013.
     992.             12.740             12740.
    1007.             11.780             11780.
    1023.             11.010             11010.
    1039.             10.369             10369.
    1054.              9.823              9823.
    1070.              9.349              9349.
    1085.              8.933              8933.
    1101.              8.564              8564.
    1116.              8.232              8232.
    1132.              7.933              7933.
```

1147.	7.660	7660.
1163.	7.411	7411.
1178.	7.183	7183.
1194.	6.971	6971.
1209.	6.776	6776.
1225.	6.594	6594.
1241.	6.424	6424.
1256.	6.265	6265.
1272.	6.116	6116.
1287.	5.975	5975.
1303.	5.843	5843.
1318.	5.718	5718.
1334.	5.600	5600.
1349.	5.488	5488.
1365.	5.381	5381.
1380.	5.280	5280.
1396.	5.183	5183.
1411.	5.091	5091.
1427.	5.003	5003.
1443.	4.904	4904.
1458.	4.717	4717.
1474.	4.443	4443.
1489.	4.083	4083.
1505.	3.639	3639.
1520.	3.111	3111.
1536.	2.524	2524.
1551.	2.001	2001.
1567.	1.541	1541.
1582.	1.143	1143.
1598.	0.805	805.
1613.	0.528	528.
1629.	0.310	310.
1645.	0.150	150.
1660.	0.047	47.

```
 *******************************************************************
RETURN PERIOD (years)   =      5
DESIGN RAINFALL   (mm)  =     56
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  =  96.91
 *******************************************************************
```

TIME (minutes)	DISCHARGE (cubic metres/sec)	(litres/sec)
557.	0.000	0.
572.	0.007	7.
588.	0.034	34.
603.	0.096	96.
619.	0.216	216.
635.	0.423	423.
650.	0.758	758.
666.	1.276	1276.
681.	2.070	2070.
697.	3.358	3358.
712.	6.003	6003.
728.	17.403	17403.
743.	31.694	31694.
759.	47.403	47403.
774.	63.844	63844.
790.	80.336	80336.
805.	95.371	95371.
821.	96.911	96911.
837.	94.085	94085.
852.	89.156	89156.
868.	82.848	82848.
883.	75.528	75528.
899.	67.432	67432.
914.	58.737	58737.
930.	49.611	49611.
945.	40.275	40275.
961.	31.324	31324.
976.	27.263	27263.
992.	24.684	24684.
1007.	22.749	22749.
1023.	21.203	21203.
1039.	19.920	19920.
1054.	18.831	18831.
1070.	17.888	17888.
1085.	17.061	17061.
1101.	16.327	16327.
1116.	15.670	15670.
1132.	15.078	15078.
1147.	14.540	14540.
1163.	14.049	14049.
1178.	13.598	13598.

```
    1194.             13.183             13183.
    1209.             12.798             12798.
    1225.             12.440             12440.
    1241.             12.107             12107.
    1256.             11.796             11796.
    1272.             11.504             11504.
    1287.             11.229             11229.
    1303.             10.971             10971.
    1318.             10.727             10727.
    1334.             10.496             10496.
    1349.             10.278             10278.
    1365.             10.070             10070.
    1380.              9.873              9873.
    1396.              9.685              9685.
    1411.              9.506              9506.
    1427.              9.334              9334.
    1443.              9.143              9143.
    1458.              8.789              8789.
    1474.              8.275              8275.
    1489.              7.602              7602.
    1505.              6.772              6772.
    1520.              5.788              5788.
    1536.              4.694              4694.
    1551.              3.721              3721.
    1567.              2.864              2864.
    1582.              2.124              2124.
    1598.              1.497              1497.
    1613.              0.981               981.
    1629.              0.576               576.
    1645.              0.278               278.
    1660.              0.087                87.


 ****************************************************************
RETURN PERIOD (years)   =     10
DESIGN RAINFALL   (mm)  =     69
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  = 146.73
 ****************************************************************
    TIME                      DISCHARGE
  (minutes)       (cubic metres/sec)      (litres/sec)

     495.              0.000                 0.
     510.              0.006                 6.
     526.              0.029                29.
     541.              0.081                81.
     557.              0.178               178.
     572.              0.338               338.
     588.              0.584               584.
     603.              0.936               936.
     619.              1.412              1412.
     635.              2.043              2043.
     650.              2.876              2876.
     666.              3.992              3992.
     681.              5.540              5540.
     697.              7.876              7876.
     712.             12.366             12366.
     728.             30.007             30007.
     743.             51.707             51707.
     759.             75.287             75287.
     774.             99.713             99713.
     790.            123.934            123934.
     805.            145.576            145576.
     821.            146.731            146731.
     837.            141.558            141558.
     852.            133.383            133383.
     868.            123.265            123265.
     883.            111.743            111743.
     899.             99.165             99165.
     914.             85.798             85798.
     930.             71.897             71897.
     945.             57.808             57808.
     961.             44.469             44469.
     976.             38.585             38585.
     992.             34.866             34866.
    1007.             32.084             32084.
    1023.             29.865             29865.
    1039.             28.026             28026.
    1054.             26.466             26466.
    1070.             25.117             25117.
    1085.             23.935             23935.
    1101.             22.888             22888.
    1116.             21.951             21951.
    1132.             21.106             21106.
    1147.             20.340             20340.
    1163.             19.640             19640.
```

1178.	18.999	18999.
1194.	18.408	18408.
1209.	17.861	17861.
1225.	17.353	17353.
1241.	16.880	16880.
1256.	16.438	16438.
1272.	16.023	16023.
1287.	15.634	15634.
1303.	15.268	15268.
1318.	14.922	14922.
1334.	14.595	14595.
1349.	14.285	14285.
1365.	13.991	13991.
1380.	13.712	13712.
1396.	13.446	13446.
1411.	13.193	13193.
1427.	12.951	12951.
1443.	12.681	12681.
1458.	12.187	12187.
1474.	11.471	11471.
1489.	10.536	10536.
1505.	9.384	9384.
1520.	8.019	8019.
1536.	6.503	6503.
1551.	5.154	5154.
1567.	3.968	3968.
1582.	2.941	2941.
1598.	2.073	2073.
1613.	1.359	1359.
1629.	0.797	797.
1645.	0.385	385.
1660.	0.120	120.

```
******************************************************************
RETURN PERIOD (years)   =     20
DESIGN RAINFALL   (mm)  =     84
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  = 210.60
******************************************************************
```

TIME (minutes)	DISCHARGE (cubic metres/sec)	(litres/sec)
448.	0.004	4.
464.	0.022	22.
479.	0.066	66.
495.	0.150	150.
510.	0.289	289.
526.	0.501	501.
541.	0.801	801.
557.	1.196	1196.
572.	1.698	1698.
588.	2.321	2321.
603.	3.086	3086.
619.	4.024	4024.
635.	5.180	5180.
650.	6.626	6626.
666.	8.483	8483.
681.	10.983	10983.
697.	14.659	14659.
712.	21.546	21546.
728.	47.208	47208.
743.	78.368	78368.
759.	111.953	111953.
774.	146.482	146482.
790.	180.415	180415.
805.	210.234	210234.
821.	210.596	210596.
837.	202.185	202185.
852.	189.668	189668.
868.	174.523	174523.
883.	157.506	157506.
899.	139.103	139103.
914.	119.696	119696.
930.	99.654	99654.
945.	79.488	79488.
961.	60.584	60584.
976.	52.430	52430.
992.	47.300	47300.
1007.	43.471	43471.
1023.	40.419	40419.
1039.	37.895	37895.
1054.	35.754	35754.
1070.	33.906	33906.
1085.	32.287	32287.
1101.	30.853	30853.

1116.	29.572	29572.
1132.	28.418	28418.
1147.	27.371	27371.
1163.	26.416	26416.
1178.	25.540	25540.
1194.	24.733	24733.
1209.	23.988	23988.
1225.	23.295	23295.
1241.	22.651	22651.
1256.	22.048	22048.
1272.	21.484	21484.
1287.	20.955	20955.
1303.	20.456	20456.
1318.	19.986	19986.
1334.	19.541	19541.
1349.	19.121	19121.
1365.	18.721	18721.
1380.	18.342	18342.
1396.	17.981	17981.
1411.	17.637	17637.
1427.	17.309	17309.
1443.	16.944	16944.
1458.	16.279	16279.
1474.	15.320	15320.
1489.	14.069	14069.
1505.	12.529	12529.
1520.	10.705	10705.
1536.	8.681	8681.
1551.	6.879	6879.
1567.	5.295	5295.
1582.	3.925	3925.
1598.	2.766	2766.
1613.	1.813	1813.
1629.	1.063	1063.
1645.	0.513	513.
1660.	0.160	160.

```
 *****************************************************************
RETURN PERIOD (years)   =     50
DESIGN RAINFALL   (mm)  =    106
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  = 314.55
 *****************************************************************
```

TIME (minutes)	DISCHARGE (cubic metres/sec)	(litres/sec)
370.	0.000	0.
386.	0.008	8.
401.	0.035	35.
417.	0.094	94.
433.	0.202	202.
448.	0.373	373.
464.	0.626	626.
479.	0.970	970.
495.	1.407	1407.
510.	1.944	1944.
526.	2.586	2586.
541.	3.342	3342.
557.	4.224	4224.
572.	5.250	5250.
588.	6.442	6442.
603.	7.834	7834.
619.	9.473	9473.
635.	11.436	11436.
650.	13.844	13844.
666.	16.896	16896.
681.	20.961	20961.
697.	26.877	26877.
712.	37.773	37773.
728.	76.437	76437.
743.	122.784	122784.
759.	172.331	172331.
774.	222.875	222875.
790.	272.079	272079.
805.	314.548	314548.
821.	313.156	313156.
837.	299.186	299186.
852.	279.413	279413.
868.	255.972	255972.
883.	229.957	229957.
899.	202.079	202079.
914.	172.898	172898.
930.	142.970	142970.
945.	113.075	113075.

961.	85.334	85334.
976.	73.647	73647.
992.	66.327	66327.
1007.	60.876	60876.
1023.	56.538	56538.
1039.	52.955	52955.
1054.	49.919	49919.
1070.	47.299	47299.
1085.	45.007	45007.
1101.	42.979	42979.
1116.	41.167	41167.
1132.	39.536	39536.
1147.	38.058	38058.
1163.	36.710	36710.
1178.	35.474	35474.
1194.	34.337	34337.
1209.	33.286	33286.
1225.	32.311	32311.
1241.	31.403	31403.
1256.	30.555	30555.
1272.	29.762	29762.
1287.	29.017	29017.
1303.	28.316	28316.
1318.	27.655	27655.
1334.	27.030	27030.
1349.	26.439	26439.
1365.	25.878	25878.
1380.	25.346	25346.
1396.	24.839	24839.
1411.	24.357	24357.
1427.	23.896	23896.
1443.	23.386	23386.
1458.	22.463	22463.
1474.	21.135	21135.
1489.	19.405	19405.
1505.	17.278	17278.
1520.	14.761	14761.
1536.	11.969	11969.
1551.	9.483	9483.
1567.	7.299	7299.
1582.	5.410	5410.
1598.	3.812	3812.
1613.	2.498	2498.
1629.	1.465	1465.
1645.	0.707	707.
1660.	0.220	220.

```
 *******************************************************************
RETURN PERIOD (years)   =    100
DESIGN RAINFALL   (mm)  =    125
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  = 411.10
 *******************************************************************
```

TIME (minutes)	DISCHARGE (cubic metres/sec)	(litres/sec)
339.	0.006	6.
355.	0.031	31.
370.	0.091	91.
386.	0.202	202.
401.	0.380	380.
417.	0.646	646.
433.	1.010	1010.
448.	1.474	1474.
464.	2.040	2040.
479.	2.711	2711.
495.	3.492	3492.
510.	4.388	4388.
526.	5.408	5408.
541.	6.564	6564.
557.	7.872	7872.
572.	9.355	9355.
588.	11.047	11047.
603.	13.001	13001.
619.	15.291	15291.
635.	18.023	18023.
650.	21.361	21361.
666.	25.574	25574.
681.	31.158	31158.
697.	39.236	39236.
712.	53.962	53962.
728.	104.698	104698.
743.	165.035	165035.
759.	229.204	229204.
774.	294.338	294338.

```
     790.             357.356             357356.
     805.             411.104             411104.
     821.             407.724             407724.
     837.             388.353             388353.
     852.             361.673             361673.
     868.             330.414             330414.
     883.             295.975             295975.
     899.             259.270             259270.
     914.             221.026             221026.
     930.             181.969             181969.
     945.             143.131             143131.
     961.             107.324             107324.
     976.              92.465              92465.
     992.              83.185              83185.
    1007.              76.284              76284.
    1023.              70.798              70798.
    1039.              66.269              66269.
    1054.              62.435              62435.
    1070.              59.129              59129.
    1085.              56.237              56237.
    1101.              53.680              53680.
    1116.              51.396              51396.
    1132.              49.341              49341.
    1147.              47.479              47479.
    1163.              45.781              45781.
    1178.              44.227              44227.
    1194.              42.796              42796.
    1209.              41.473              41473.
    1225.              40.247              40247.
    1241.              39.105              39105.
    1256.              38.040              38040.
    1272.              37.042              37042.
    1287.              36.106              36106.
    1303.              35.226              35226.
    1318.              34.396              34396.
    1334.              33.612              33612.
    1349.              32.870              32870.
    1365.              32.166              32166.
    1380.              31.498              31498.
    1396.              30.862              30862.
    1411.              30.257              30257.
    1427.              29.679              29679.
    1443.              29.040              29040.
    1458.              27.890              27890.
    1474.              26.238              26238.
    1489.              24.088              24088.
    1505.              21.446              21446.
    1520.              18.320              18320.
    1536.              14.853              14853.
    1551.              11.768              11768.
    1567.               9.057               9057.
    1582.               6.713               6713.
    1598.               4.729               4729.
    1613.               3.099               3099.
    1629.               1.817               1817.
    1645.               0.877                877.
    1660.               0.273                273.


 ******************************************************************
RETURN PERIOD (years)    =    200
DESIGN RAINFALL   (mm)  =    146
STORM DISTRIBUTION TYPE =      2
CURVE NUMBER (computed) =   74.2
LAG TIME (h)            =    1.4
PEAK DISCHARGE (m^3/s)  = 522.70
 ******************************************************************
    TIME                    DISCHARGE
  (minutes)        (cubic metres/sec)      (litres/sec)

     293.               0.001                  1.
     308.               0.016                 16.
     324.               0.062                 62.
     339.               0.156                156.
     355.               0.317                317.
     370.               0.565                565.
     386.               0.922                922.
     401.               1.391               1391.
     417.               1.972               1972.
     433.               2.664               2664.
     448.               3.470               3470.
     464.               4.391               4391.
     479.               5.430               5430.
     495.               6.594               6594.
     510.               7.890               7890.
     526.               9.330               9330.
     541.              10.927              10927.
     557.              12.712              12712.
```

572.	14.723	14723.
588.	17.012	17012.
603.	19.647	19647.
619.	22.726	22726.
635.	26.387	26387.
650.	30.846	30846.
666.	36.452	36452.
681.	43.853	43853.
697.	54.504	54504.
712.	73.757	73757.
728.	138.469	138469.
743.	214.903	214903.
759.	295.827	295827.
774.	377.606	377606.
790.	456.298	456298.
805.	522.699	522699.
821.	516.711	516711.
837.	490.880	490880.
852.	456.057	456057.
868.	415.645	415645.
883.	371.391	371391.
899.	324.441	324441.
914.	275.710	275710.
930.	226.126	226126.
945.	177.012	177012.
961.	131.986	131986.
976.	113.544	113544.
992.	102.056	102056.
1007.	93.522	93522.
1023.	86.744	86744.
1039.	81.152	81152.
1054.	76.421	76421.
1070.	72.343	72343.
1085.	68.778	68778.
1101.	65.626	65626.
1116.	62.813	62813.
1132.	60.281	60281.
1147.	57.989	57989.
1163.	55.900	55900.
1178.	53.987	53987.
1194.	52.226	52226.
1209.	50.600	50600.
1225.	49.092	49092.
1241.	47.689	47689.
1256.	46.379	46379.
1272.	45.154	45154.
1287.	44.004	44004.
1303.	42.922	42922.
1318.	41.903	41903.
1334.	40.940	40940.
1349.	40.029	40029.
1365.	39.166	39166.
1380.	38.346	38346.
1396.	37.566	37566.
1411.	36.823	36823.
1427.	36.115	36115.
1443.	35.332	35332.
1458.	33.929	33929.
1474.	31.916	31916.
1489.	29.297	29297.
1505.	26.081	26081.
1520.	22.278	22278.
1536.	18.062	18062.
1551.	14.310	14310.
1567.	11.013	11013.
1582.	8.162	8162.
1598.	5.750	5750.
1613.	3.768	3768.
1629.	2.209	2209.
1645.	1.066	1066.
1660.	0.332	332.

ANNEXURE E **Surface drainage calculations**

Utility Programs for Drainage
Surface drainage calculations

Sinotech

Project:	**Sutherland**
Designer:	**ND/BCSS**
Date:	**14 October 2020**
Description:	**Gravel roads at Sutherland WEFs site**
Filename:	**E:\Work\2020\Sutherland_Raod_surafce Calcs\Sutherland.sdp**

SURFACE DRAINAGE CALCULATIONS

DEPTH OF FLOW ON ROAD SURFACE

INPUT DATA

Road crossfall (n1):	0.1 %
Road gradient (n2):	15 %
Width of road way (w):	10 m
Rainfall intensity (I):	85.4 mm/h

RESULTS

Slope of flow path (Sf):	15.00 %
Length of flow path (lf):	1500.03 m
Flow depth of water (d):	24.06 mm
Comments:	The flow depth is greater than 6.0 mm.

Calculated using Utility Programs for Drainage 1.1.0

ANNEXURE J

EMERGENCY RESPONSE PLAN

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

The purpose of the Emergency Preparedness and Response Plan is:

- To assist contractor personnel to prepare for and respond quickly and safely to emergency incidents, and to establish a state of readiness which will enable prompt and effective response to possible events.
- To control or limit any effect that an emergency or potential emergency may have on site or on neighbouring areas;
- To facilitate emergency response and to provide such assistance on the site as is appropriate to the occasion;
- To ensure communication of all vital information as soon as possible;
- To facilitate the reorganisation and reconstruction activities so that normal operations can be resumed;
- To provide for training so that a high level of preparedness can be continually maintained.

This plan outlines response actions for potential incidents of any size. It details response procedures that will minimise potential health and safety hazards, environmental damage, and clean-up efforts. The plan has been prepared to ensure quick access to all the information required in responding to an emergency event. The plan will enable an effective, comprehensive response to prevent injury or damage to the construction personnel, public, and environment during the project. Contractors are expected to comply with all procedures described in this document. A Method Statement should be prepared at the commencement of construction detailing how this plan is to be implemented as well as details of relevant responsible parties for the implementation. The method statement must also reflect conditions of the International Finance Corporation (IFC) performance Standard (PS) 1 and include the following:

- Identification of areas where accidents and emergency situations may occur;
- Communities and individuals that may be impacted;
- Response procedure;
- Provisions of equipment and resources;
- Designation of responsibilities;
- Communication; and
- Periodic training to ensure effective response to potentially affected communities.

PROJECT-SPECIFIC DETAILS

The Applicant proposes to construct and operate an 86MW Wind Energy Facility (WEF), known as the Oya WEF, and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. The proposed Oya WEF will be developed on the following land portions:

Number	Farm name and number	21-Digit Surveyor General (SG) Code
Western Cape:		
1	Portion 1 of the Farm Gats Rivier No 156	C01900000000015600001
2	Portion 2 of the Farm Gats Rivier No 156	C01900000000015600002
3	Remainder of the Farm Gats Rivier No 156	C01900000000015600000
4	Portion 1 of the Farm Riet Fontein No 157	C01900000000015700001
5	Portion 2 of the Farm Riet Fontein No 157	C01900000000015700002
6	Portion 1 of the Farm Amandelbloom No 158	C01900000000015800001
7	Remainder of the Farm Amandelboom No 158	C01900000000015800000
8	Portion 1 of the Farm Oliviers Berg No 159	C01900000000015900001
9	Remainder of the Farm Oliviers Berg No 159	C01900000000015900000
Northern Cape:		
10	Portion 4 of the Farm Urias Gat No 193	C07200000000019300004
11	Portion 6 of the Farm Urias Gat No 193	C07200000000019300006
12	Remainder of the Farm Urias Gat No 193	C07200000000019300000
13	Remainder of the Farm Matjies Fontein No 194	C07200000000019400000
14	Portion 5 of the Farm Urias Gat No 193	C07200000000019300005

Properties affected by access road:		
15	169 Zeekoegat Farm	C07200000000016900000
16	Portion 1 of 170 Roodeheuvel Farm	C07200000000017000001
17	Remainder of 170 Roodeheuvel Farm	C07200000000017000000
18	Remainder of 190 Wind Heuvel Farm	C07200000000019000000
19	Portion 1 of 190 Wind Heuvel Farm	C07200000000019000001
20	Portion 5 of 193 Urias Gat Farm	C07200000000019300005
21	Remainder of 171 Vinke Kuil Farm	C07200000000017100000
22	Alkant Re/220 Farm	C07200000000022000000
23	Portion 1 of 174 Lange Huis Farm	C07200000000017400001

Due to the scale and nature of this development, it is anticipated that the following risks could potentially arises during the construction and operational phases:

- Fires;
- Leakage of potentially hazardous substances used during construction;
- Storage of flammable materials and substances;
- Flood events;
- Accidents; and
- Natural disasters.

EMERGENCY RESPONSE PLAN

There are three (3) levels of emergency as follows:

- **Local Emergency:** An alert confined to a specific locality.
- **Site Emergency:** An alert that cannot be localised and which presents danger to other areas within the site boundary or outside the site boundary.
- **Evacuation:** An alert when all personnel are required to leave the affected area and assemble in a safe location.
- If there is any doubt as the whether any hazardous situation constitutes an emergency, then it must be treated as an Evacuation.

Every effort must be made to control, reduce or stop the cause of any emergency provided it is safe to do so. For example, in the event of a fire, isolate the fuel supply and limit the propagation of the fire by cooling the adjacent areas. Then confine and extinguish the fire (where appropriate) making sure that re-ignition cannot occur; for a gas fire it is usually appropriate to isolate the fuel and let it burn itself out but keep everything around the fire cold.

EMERGENCY SCENARIO CONTINGENCY PLANNING

1) ***Scenario:*** *Spill which would result in the contamination of land, surface or groundwater*

- **Spill Prevention Measures**

Preventing spills must be the top priority at all operations which have the potential of endangering the environment. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Manager. In order to reduce the risk of spills and associated contamination, the following principles should be considered during construction and operation activities:

- All equipment refuelling, servicing and maintenance activities should only be undertaken within appropriately sealed designated areas.
- All maintenance materials, oils, grease, lubricants, etc. should be stored in a designated area in an appropriate storage container.
- No refuelling, storage, servicing, or maintenance of equipment should take place within 50m of drainage lines or sensitive environmental resources in order to reduce the risk of contamination by spills.
- No refuelling or servicing should be undertaken without absorbent material or drip pans properly placed to contain spilled fuel.
- Any fluids drained from the machinery during servicing should be collected in leak-proof containers and taken to an appropriate disposal or recycling facility.

- If these activities result in damage or accumulation of product on the soil, the contaminated soil must be disposed of as hazardous waste. Under no circumstances shall contaminated soil be added to a spoils pile and transported to a regular disposal site.
- Chemical toilets used during construction must be regularly cleaned. Chemicals used in toilets are also hazardous to the environment and must be controlled. Portable chemical toilets could overflow if not pumped regularly or they could spill if dropped or overturned during moving. Care and due diligence should be taken at all times.
- Contact details of emergency services and HazMat Response Contractors are to be clearly displayed on the site. All staff are to be made aware of these details and must be familiar with the procedures for notification in the event of an emergency.

- **Procedures**

The following action plan is proposed in the event of a spill:

1. Spill or release identified.
2. Assess person safety, safety of others and environment.
3. Stop the spill if safely possible.
4. Contain spill to limit entering water bodies and surrounding areas.
5. Identify substance spilled.
6. Quantify spill (under or over guideline/threshold levels).
7. Notify Site Manager and emergency response crew and authorities (in event of major spill).
8. Inform users (and downstream users) of potential risk.
9. Clean up of spill using spill kit or by HazMat team.
10. Record of spill incident on company database.

a) Procedures for containing and controlling the spill (i.e. on land or in water)

Measures can be taken to prepare for quick and effective containment of any potential spills. Each contractor must keep sufficient supplies of spill containment equipment at the construction sites, at all times during and after the construction phase. These should include specialised spill kits or spill containment equipment. Other spill containment measures include using drip pans underneath vehicles and equipment every time refuelling, servicing, or maintenance activities are undertaken. Specific spill containment methods for land and water contamination are outlined below.

<u>Containment of Spills on Land</u>

Spills on land include spills on rock, gravel, soil and/or vegetation. It is important to note that soil is a natural sorbent, and therefore spills on soil are generally less serious than spills on water as contaminated soil can be more easily recovered. It is important that all measures be undertaken to avoid spills reaching open water bodies. The following methods could be used:

- **Dykes**

  Dykes can be created using soil surrounding a spill on land. These dykes are constructed around the perimeter or down slope of the spilled substance. A dyke needs to be built up to a size that will ensure containment of the maximum quantity of contaminant that may reach it. A plastic tarp can be placed on and at the base of the dyke such that the contaminant can pool up and subsequently be removed with sorbent materials or by pump into barrels or bags. If the spill is migrating very slowly, a dyke may not be necessary and sorbents can be used to soak up contaminants before they migrate away from the source of the spill.

- **Trenches**

Trenches can be dug out to contain spills. Spades, pick axes or a front-end loader can be used depending on the size of trench required. Spilled substances can then be recovered using a pump or sorbent materials.

Containment of Spills on Water

Spills in water can negatively impact water quality and aquatic life. All measures need to be undertaken to contain spills on open water. The following methods could be used:

- **Weirs**

  Weirs can be used to contain spills in streams and to prevent further migration downstream. Plywood or other materials found on site can be placed into and across the width of the stream, such that water can still flow under the weir. Weirs are however only effective for spilled substances which float on the water surface.

- **Barriers**

  In some situations, barriers made of netting or fence material can be installed across a stream, and sorbent materials placed at the base to absorb spilled substance. Sorbents will need to be replaced as soon as they are saturated. Water will be allowed to flow through.

b) Procedures for transferring, storing, and managing spill related wastes

Used sorbent materials are to be placed in plastic bags for future disposal. All materials mentioned in this section are to be available in the spill kits. Following clean up, any tools or equipment used must be properly washed and decontaminated, or replaced if this is not possible.

Spilled substances and materials used for containment must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

c) Procedures for restoring affected areas

Criteria that may be considered include natural biodegradation of oil, replacement of soil and revegetation. Once a spill of reportable size has been contained, the ECO and the relevant Authority must be consulted to confirm that the appropriate clean up levels are met.

2) ***Scenario:*** *Fire (and fire water handling)*

- **Action Plan**

The following action plan is proposed in the event of a fire:

1. Quantify risk
2. Assess person safety, safety of others and environment
3. If safe – attempt to extinguish fire using appropriate equipment
4. If not safe to extinguish, contain fire
5. Notify Site Manager and emergency response crew and authorities
6. Inform users (and downstream users) of potential risk of fire
7. Record of incident on company database

- **Procedures**

Because large scale fires may spread very fast in the environment it is most advisable that the employee/contractor not put his/her life in danger in the case of an uncontrolled fire.

Portable firefighting equipment must be provided in line with the Building Code of South Africa and the relevant provincial building code. All emergency equipment including portable fire extinguisher, hose reels, hydrants must be maintained and inspected by a qualified contractor in accordance with the relevant legislation and National standards.

Current evacuation signs and diagrams for the building or site that are compliant to relevant state legislation must be provided in a conspicuous position, on each evacuation route. Contact details for the relevant emergency services should be clearly displayed on site and all employees should be aware of procedures to follow in the case of an emergency.

a) Procedures for initial actions

Persons should not fight the fire if any of the following conditions exist:

- They have not been trained or instructed in use of a fire extinguisher.
- They do not know what is burning.
- The fire is spreading rapidly.
- They do not have the proper equipment.
- They cannot do so without a means of escape.
- They may inhale toxic smoke.

b) Reporting procedures

- Report fire immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
- The site manager must have copies of the Report form to be completed.

3) ***Scenario:*** *Flood events and overflow of water retention dam*

- **Action Plan**

The following action plan is proposed in the event of a flood or overflow of water retention dam:

1. Identify flood state or overflow
2. Assess personal safety, safety of others and environment
3. Identify source
4. Stop the source of water(waste) causing overflow if safely possible
5. Contain overflow water to limit it entering surrounding water bodies
6. Quantify overflow
7. Notify Site Manager and emergency response crew and authorities
8. Inform users (and downstream users) of potential risk
9. Record of incident on company database

- **Flood/overflow Effect Prevention Measures**

  Preventing flood / overflowing of retention dams (if applicable) must be a top priority. The responsibility to effectively prevent and mitigate any scenario lies with the Contractor and the Environmental Manager. All parties are expected to:

  - Always conduct proper maintenance and inspections on the area and machinery/vehicles.
  - Never allow for the risk of over flowing, especially in or near sensitive areas.
  - Know the limits of the wastewater dam/s.
  - Store all materials in protected areas.
  - Restrictions must be placed on amounts of wastewater to be pumped into the dam. All technical detail as to capacity and limitations of the facility must be made extremely clear to reduce the potential of contamination.

- **Procedures**

  Although attempts can be made to minimise the effects of flooding, it is impossible to prevent floods altogether. Being prepared for flooding and having emergency plans must therefore be a priority.

a) Procedures for initial actions

- Ensure safety of all personnel.
- Assess hazards and risks.
- Stop the flood/overflow if safely and physically possible, e.g. shut off pump.
- No matter what the volume is, notify site manager.
- Contain the wastewater.

b) Reporting procedures

- Report immediately to the site manager, who will determine if it is to be reported to the relevant emergency services and authorities.
- The site manager, will have copies of the Report form to be completed.

c) Procedures for containing and controlling overflow of wastewater retention dam

Measures can be taken to prepare for quick and effective containment of any potential overflow.
Initiate overflow containment by first determining what will be affected by the incident.

- Assess speed and direction of overflow and cause of movement (water, wind and slope).
- Determine best location for containing wastewater, avoiding any water bodies.
- Have a contingency plan ready in case event worsens beyond control or if the weather or topography impedes containment.

d) Procedures for transferring, storing, and management.

Following clean up, any tools or equipment used will be properly washed and decontaminated, or replaced if this is not possible. All materials used for containment of spilled wastewater must be placed into empty waste oil containers and sealed for proper disposal at an approved disposal facility.

SUMMARY: RESPONSE PROCEDURE

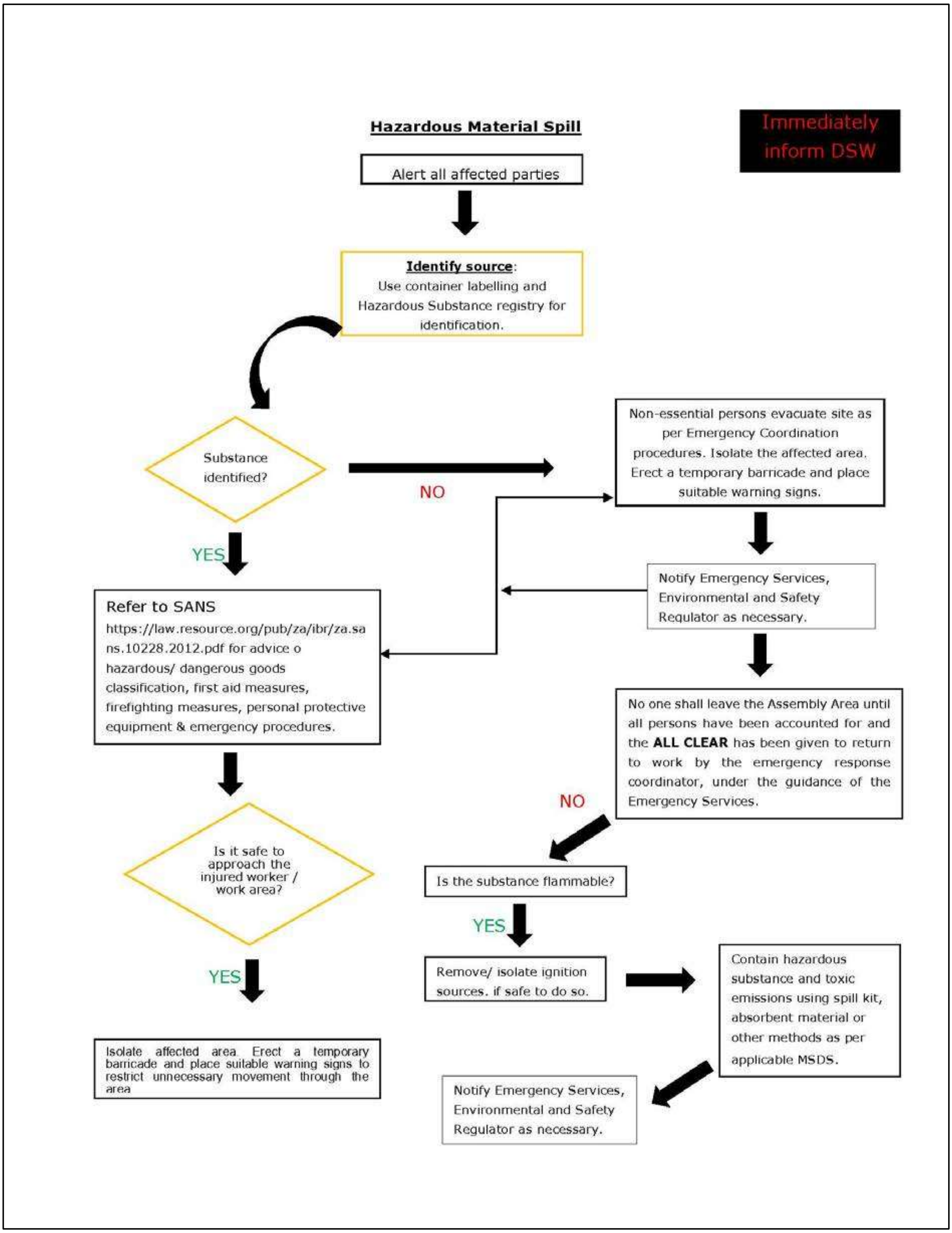


Figure 1: Hazardous Material Spill

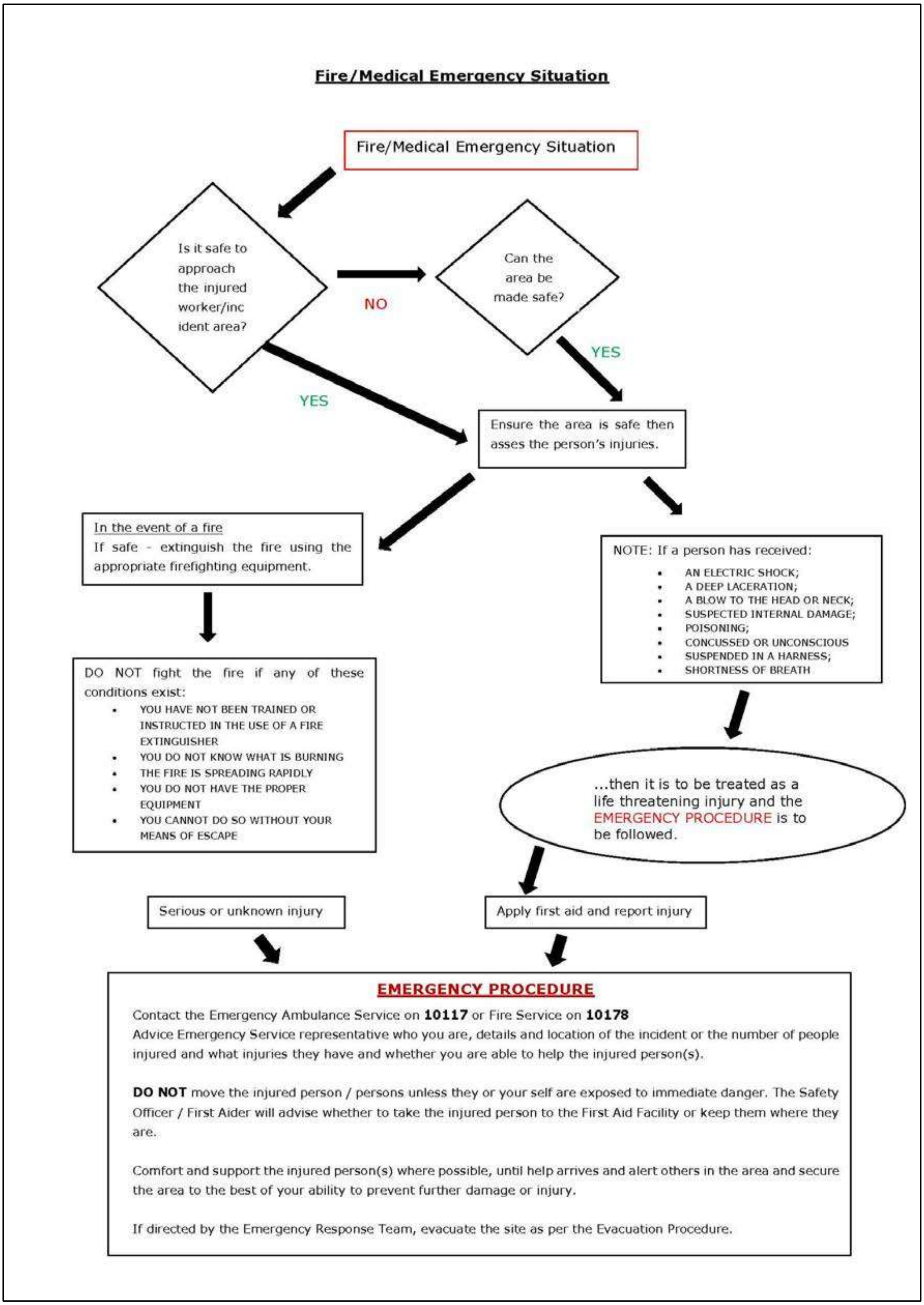


Figure 2: Emergency Fire/Medical

ANNEXURE K

HERITAGE MANAGEMENT PLAN

HERITAGE CONSERVATION MANAGEMENT PLAN

for the 86MW Oya Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces

CTS HERITAGE

Prepared by CTS Heritage

November 2020

CTS HERITAGE

CONTENTS

APPENDICES

1. INTRODUCTION

Oya Energy (Pty) Ltd is proposing the development of the Oya Wind Energy Facility (WEF) with a maximum generation capacity of 86 MW at Kudusberg, a site approximately 45 km south-west of Sutherland (hereafter referred to as the 'proposed WEF'). The proposed WEF is located within the Witzenberg and Karoo Hoogland Local Municipalities, which fall within the Cape Winelands and Namakwa District Municipalities respectively. It falls within the Northern and Western Cape Provinces.

In their final comment for this application issued on 19 December 2018, SAHRA required that "To allow for the clear management of the large amount of heritage resources identified within the development area, a Heritage Management Plan (HMP) must be compiled as a condition of the EA. The HMP clearly differentiate between the relevant heritage authorities involved i.e. HWC and SAHRA. The HMP must be submitted to SAHRA regarding the Northern Cape section prior to the construction phase for comment. No construction may commence without comments from SAHRA in this regard;". This management plan is submitted to SAHRA in order to satisfy this requirement.

1.1 Location of Site

The Oya WEF is proposed for an area straddling the border of the Western and Northern Cape Provinces to the west of the R345 that runs between Sutherland and Matjiesfontein. The project falls within the Witzenberg Local Municipality, Cape Winelands District in the Western Cape, and the Karoo Hoogland Local Municipality, Namakwa District in the Northern Cape.

The proposed development area is located towards the southwest of the main Karoo region, with the centre of the study area some 11km south of the R356 and 22km west of the R354, the Sutherland-Matjiesfontein road.

1.2 Ownership and responsibility for site

Landowners

The land on which the WEF is located is privately owned (see Table attached as Appendix 3).

Environmental Authorisation (EA) Holder

The EA Holder would be the Project Company, Oya Energy (Pty) Ltd, who, through the EA acquires the right to develop the project (considering all other permits and consents have been acquired from all other relevant competent authorities). The Project Company does not however own the land on which it intends to develop and in this context it is important to note that all assets brought onto the properties of the landowners are seen as moveable assets and does not attach to the title of the land. The Project Company therefore acquires the tenure across the landowners' properties by means of a long term lease that is registered in the Deeds Office, affording the Project Company the security it needs to exercise its rights in terms of the EA and also to ensure that the Project Company's rights are limited to what has been contracted between itself and the landowners. As is common with leases there is consideration to be paid for this tenure from the Project Company to the landowners and as the Project Company generates profit from exercising the rights afforded in the EA, a portion thereof is paid to the landowners. Simultaneously, although one may argue alienation of the land through the lease, the landowners' rights to continued occupation of the land is protected in the lease agreements. Although the landowners benefit from the revenues generated by the Project Company and therefore by extension the EA, they do not form part of the Project Company's management structure. The benefit therefore remains financial/commercial rather than organisational.

Implementation of EA

The person responsible for the implementation of the conditions in the EA would be the contractors and EPC during the construction phase. However, any non-compliance would fall onto Oya Energy (Pty) Ltd as the holder of the EA. All non-compliance would be audited by an independent ECO which would be appointed by Oya Energy (Pty) Ltd. Oya Energy (Pty) Ltd would operate the facility. For decommissioning, the responsible parties would again be the contractors and audited by ECO but overall compliance would fall on Oya Energy (Pty) Ltd.

Heritage Authorities

Part of the site is located in the Western Cape and part of the site is located in the Northern Cape. As such, the area is subject to three different heritage management authorities. Heritage Western Cape has the delegated authority for the management of all heritage resources (archaeological, palaeontological, burial grounds and graves, built environment, cultural landscapes and intangible heritage) located within the Western Cape, except for Grade I resources. There are no Grade I resources identified within the Kudusberg WEF development area. Any impacts to heritage resources within the Western Cape must follow the recommendations and best practice processes established by HWC.

All impacts to archaeological and palaeontological heritage in the Northern Cape are managed by SAHRA. Any impacts to these resources are subject to the recommendations and best practice processes established by SAHRA for archaeology and palaeontology.

All impacts to structures that are older than 60 years in the Northern Cape are managed by Ngwao Boswa Kapa Bokoni - Northern Cape Provincial Heritage Resources Authority (NBKB). Any impacts to these resources are subject to the recommendations and best practice processes established by NBKB.

1.3 Site Description

The area is on the border of the summer and winter rainfall regions and receives some snow and precipitation in winter as well as summer thunderstorms, although precipitation is limited and the region is semi-arid. The vegetation is characteristic of the Succulent Karoo biome in the low-lying areas and the Karoo Renosterveld Fynbos in the high-lying portions (Mucina and Rutherford 2006). The development area lies within the foothills of the Great Escarpment, and is characterised by valleys located between long ridges, and flat plains surrounded by hills and mountains. The ridges are largely undeveloped, while the valleys and plains contain several farmsteads comprising varying numbers of buildings. There are local roads and tracks servicing the area, some of which lead up to the hilltops, with recently created tracks servicing the wind masts scattered across peaks in the region. Together with farm infrastructure such as wire and stone fenced stock camps and farm boundaries, wind pumps and reservoirs, these are the predominant features in an otherwise undeveloped, natural environment.

Several of the affected farms are no longer engaged in active agriculture, have changed hands in recent times and are owned by absentee landlords. Many of the farms are now relying solely on tourist accommodation for income, and high levels of predation is making sheep farming unsustainable.

CTS HERITAGE

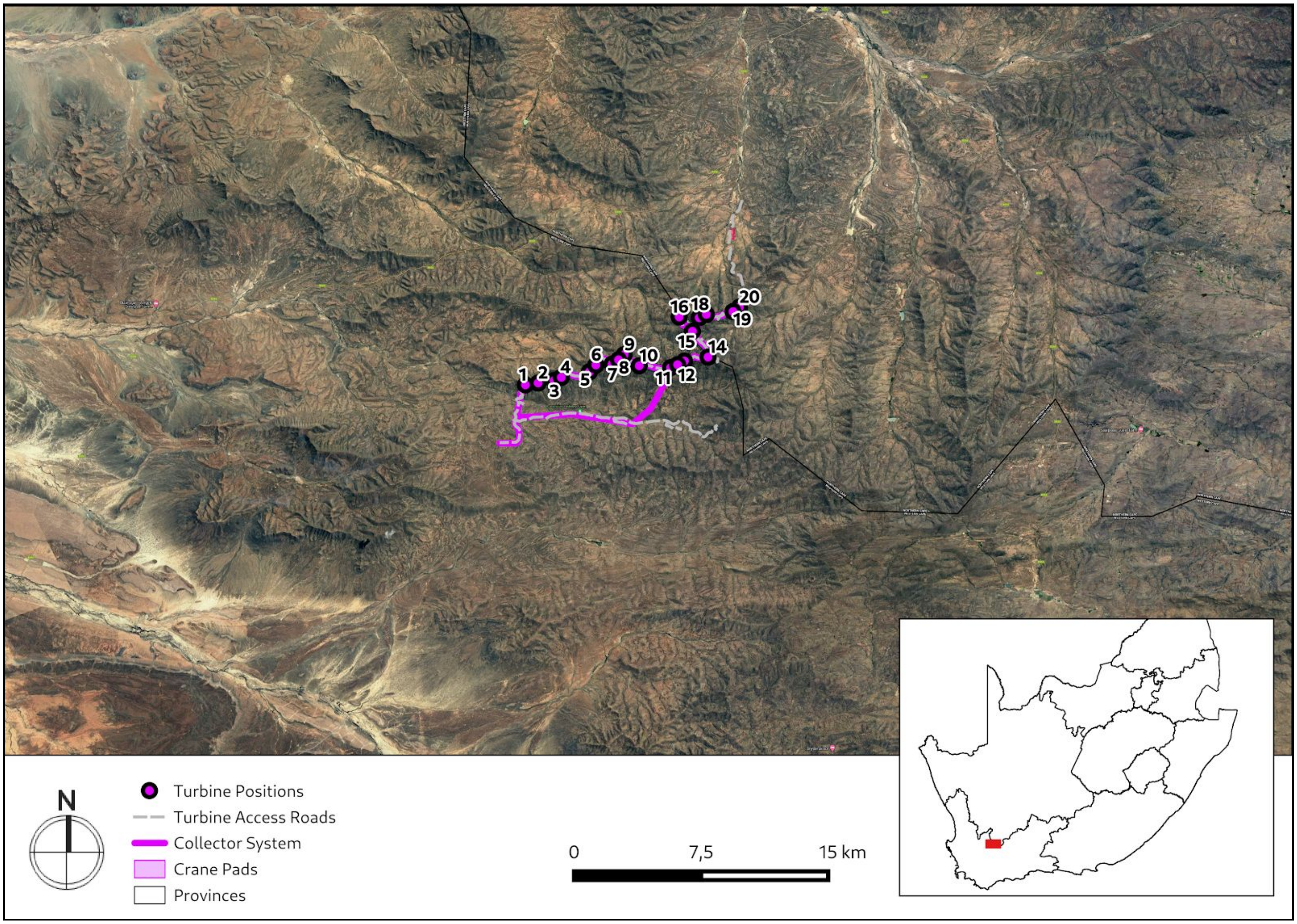


Figure 1: Location of Site

1.4 Statement of Site significance

General points on significance

The cultural significance of a site determines the appropriateness and extent to which protection measures are required. The value or importance of the site to society in general, to specific past and present groups, and to posterity, includes:

- Spiritual/social value - the traditional and consistent use of a site for religious, spiritual or social purposes, even if the religious use no longer continues
- Aesthetic/artistic value - the recognition by scholars and the general public that a cultural site represents a high point of creative achievement
- Historic value - the achievements and knowledge of the past as vehicles for enlightening the present and future
- Scientific/research value - the site, or feature within the site, providing a source of knowledge that is unobtainable elsewhere

Since cultural significance can be interpreted differently by different people, and evaluations can change with time and circumstances, it is important to assess the significance of a site in terms of:

- The importance of a particular site in relation to other sites so as to decide on the appropriate level of management
- Ascertaining what all these values are so as not to inadvertently damage one value that a site has, while preserving another.

Significance of Heritage Resources

A number of heritage resources located within the Oya WEF development area were identified through the initial Heritage Impact Assessment process and the subsequent walkdown of the final layout. All of the identified heritage resources have been graded in terms of the provisions of section 3 of the National Heritage Resources Act and the HWC Guide on the Implications of Grading (2016). As such, the grading methodology is not repeated here. These resources are listed below in Table 1 in Appendix 2.

While not exhaustive, the list of known heritage resources located within the Oya WEF development area provides insight into the nature and significance of the heritage resources common in the broader area.

As per the intentions of the NHRA, the grading of a heritage resource is indicative of its cultural significance and therefore informs its management and conservation strategies.

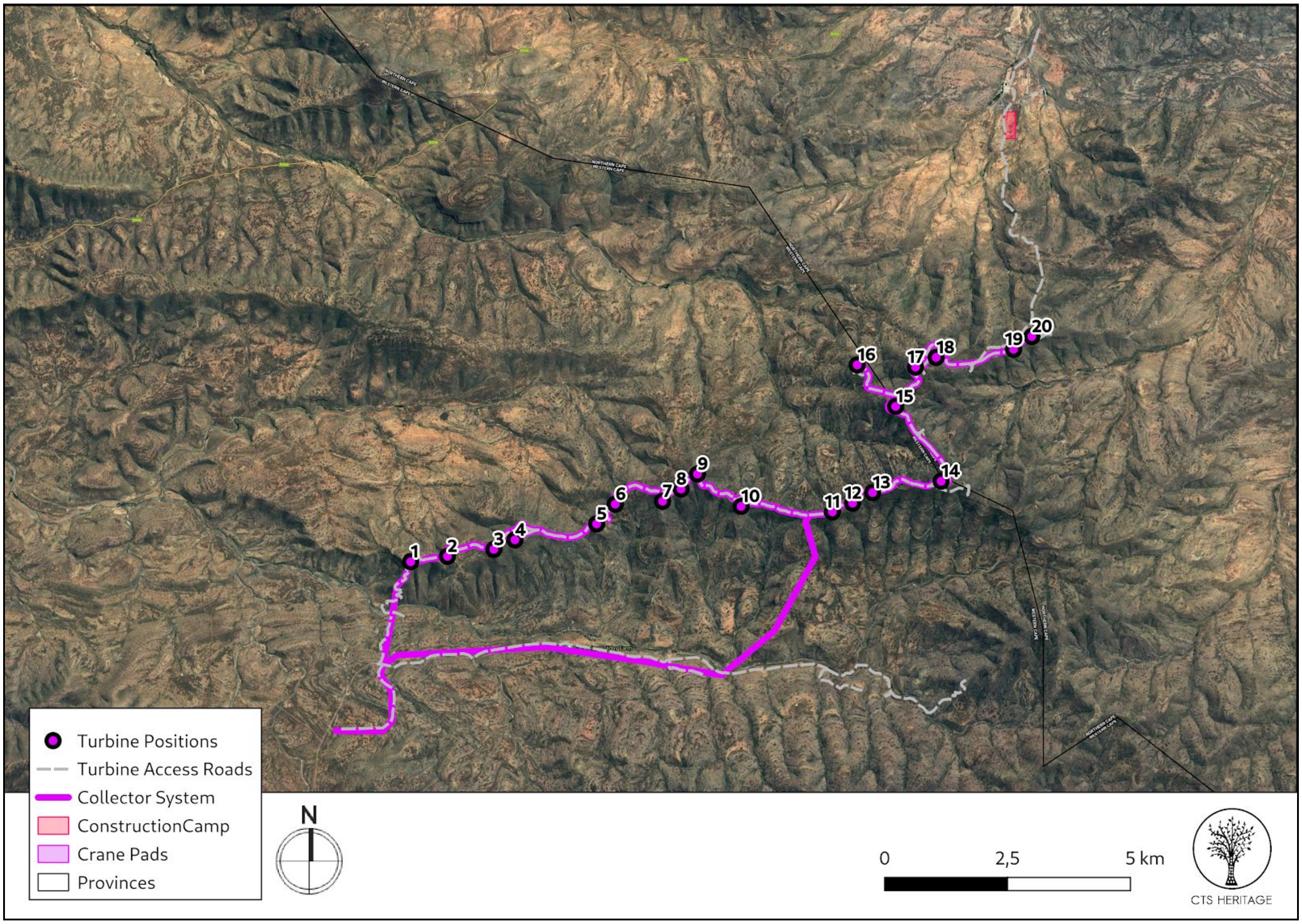


Figure 2: Final WEF Layout

1.5 Objectives of Management Plan

The purpose of this management plan is to guide the activities affecting the heritage resources to retain their significance by conserving it for future generations. A management plan is a living document in the sense that it can be updated as the situation changes and should therefore be reviewed regularly.

This management plan identifies:

- **what needs to be managed** - by surveying and recording the archaeological site in detail and summarising information on the location of sites and what they comprise;
- **who will manage the heritage resources** - by listing the people who have interests in the place and might be involved in its management;
- **the significance of the heritage** in relation to other local, provincial and national sites because the plan is designed to retain this significance;
- **key issues that must be addressed** to retain the significance through consultation with stakeholders;
- **the goals, objectives and strategies** for management and how they will be implemented; and
- **a documentation and monitoring plan** for the ruins so that any changes can be detected and the steps that have been taken can be documented.

1.6 Revision of Plan

The management plan should be revised every 5 years, or as necessary when circumstances require it. Any revisions must be submitted to Heritage Western Cape for approval.

2. RECORDING AND RESEARCH

2.1 Objectives of Recording and Research

Thorough recording of archaeological sites allows site managers and heritage authorities to manage and identify the changes taking place at a site over time. The heritage resources located within this development have been previously recorded through the Heritage Impact Assessment conducted for the Kudusberg WEF[1] (Smuts et al. 2018) and through the Heritage Walk Down reports conducted for the Oya WEF (CTS Heritage, 2020). It is anticipated that proposed clearance of vegetation and excavation associated with the construction of the turbines and their associated infrastructure may reveal additional heritage resources that are currently hidden by the vegetation and surface soil.

The heritage resources identified within this site retain potential for further academic study and as such, must be conserved with this in mind. Further academic investigation could provide insight into the evolution of settlement of the Karoo that has not yet been thoroughly documented.

Detailed research on the intangible heritage resources of the study area has not been done as this falls outside the requirements of the approvals process. Notwithstanding these risks and limitations, the potential intangible resources, identified through the review of other reports and historical literature on the area, are likely to exist in the landscape, and should be explored within a different research context to determine their full significance in terms of the NHRA. These are briefly addressed belolw.

2.2 Background context

The creation of the Komsberg REDZ, and the ensuing applications for WEFs in this area (Fourie et. al. 2015) has resulted in several HIAs having been compiled for the region since 2010. All these reports have addressed the region's archaeological and palaeontological heritage, and most have assessed the rural cultural landscape as well (see the Reference List in Section 7). The archaeological assessment completed by Smuts et al (2018) for the Kudusberg WEF provided a comprehensive background summary of the heritage of the area and is repeated below for ease of reference:

2.2.1 Palaeontological Background

The geology of the Oya WEF study area is outlined on the 1: 250 000 geology sheet 3220 Sutherland (Council for Geoscience, Pretoria; Theron 1983, Cole & Vorster 1999). Geologically, the study area lies on the gently folded northern margin of the Permo-Triassic Cape Fold Belt (CFB). The only major

[1] The Smuts et al. (2018) HIA was conducted for a larger area that was subject to part 2 split

sedimentary rock unit represented within the study area on 1: 250 000 scale geological maps is the Abrahamskraal Formation, which forms the basal subunit of the Lower Beaufort Group (Karoo Supergroup) succession of the Main Karoo Basin of South Africa (Johnson et al. 2006). The continental (fluvial and lacustrine) mudrocks and sandstones forming the lowermost portion of the very thick Abrahamskraal Formation (Lower Beaufort Group) are of Middle Permian age, approximately 265-270 million years old (Ma). The Formation is of high fossil sensitivity. Underlying basinal, prodeltaic and deltaic sediments of the Tierberg, Kookfontein and Waterford and Formations (Ecca Group) only crop out outside and to the west and south of the present study area, while the Early Jurassic Karoo Dolerite Suite (c. 182; Duncan &Marsh 2006) is not mapped within the study area and was not encountered during the present field study.

The Palaeozoic bedrocks are very extensively overlain by a wide spectrum of Late Caenozoic superficial deposits. They include slope deposits (colluvium and hillwash), river and stream alluvium (including coarse pediment gravels), down-wasted surface gravels, calcretes and various soils. These geologically youthful sediments are generally of low palaeontological sensitivity.

The Abrahamskraal Formation, as a component of the Lower Beaufort Group, has yielded one of the richest fossil records of Permo-Triassic land-dwelling plants and animals anywhere in the world. The Formation can contain therapsids, including small dicynodonts and large-bodied herbivorous and carnivorous dinocephalians, representing some of the earliest and most primitive examples of certain subgroups in the world. Fish and amphibian remains, trace fossils and plant fossils are also noted.

2.2.2 Archaeological Background

Over 10 HIAs have been compiled in the vicinity of the study area, all with respect to windfarms and their associated infrastructure, and the findings of these reports are largely congruent. The reports identified surprisingly little pre-colonial or stone age archaeology, and distinct spatial patterning to the little that was found (Booth, 2012, 2015a and 2015b; Hart and Webley, 2013; Hart and Kendrick, 2014; Hart, 2015; van der Walt, 2016). Almost all archaeological material, predominantly in the form of scatters, has been identified on the flat floodplains up to the foothills of the mountains, and within river valleys along watercourses (Booth, 2016a and 2016b). The dry, fairly desolate ridges, which are subject to high winds and therefore the proposed locations for the turbines, are generally entirely devoid of Stone Age archaeological remains (Webley and Halkett, 2017). These findings were also supported by the Heritage Scoping Assessment Report (Fourie et. al. 2015) compiled as part of the Department of Environmental Affair's (DEA) Strategic Environmental Assessment (SEA) for wind and solar energy developments (DEA, 2015). A mitigation phase excavation (Evans et al. 1985) has been undertaken at two small rock shelters in the grounds of the South African Astronomical Observatory near Sutherland in the early 1980s. More recently, changing farming methods as represented by the distribution and variety of stone-built features (walls and kraals) was assessed as part of a Master's thesis (Regensberg, 2016).

The area is known to have been inhabited since the Early Stone Age (ESA) (Hart and Miller 2011) and throughout the Middle Stone Age (MSA) (Hart et al. 2010). Later Stone Age (LSA) scatters have also been documented throughout the region, although at remarkably low density (Booth 2012, 2016a and 2016b; Hart and Webley 2013; Hart and Kendrick 2014; Hart 2015; van der Walt 2015), although excavations at cave sites near Sutherland yielded significant LSA cultural material (Evan et. al. 1985). Most tools are made on hornfels, quartzite and chert, while quartz and Karoo shale were also utilised (Hart et. al. 2010). Within the last 2 000 years, pastoralists, the Khoekhoen, arrived in the area and, in this area, there is extensive evidence for the presence of these groups in the landscape. This evidence comes in the form of circular, stone-built enclosures constructed of piled stone up to half a metre high and from 3m to 4m to 9 m in diameter (Hart et. al. 2010). These enclosures represent living spaces, which contained grass huts or Matjieshuise (mat covered houses) and kraals. The kraals are generally situated on the leeward slopes of low ridges and likely date to between 300 and 1 000 years ago (Hart et. al. 2010). The kraals sometimes form complexes of as many as 13 interlocking enclosures, often with adjoining 'lammerkraals' (lamb pens). These sites can be found with fine, red burnished pottery and OES fragments. Other evidence for herders in this area has been identified in the form of open camps situated along dry riverbeds in valley bottoms. These sites are large, measuring 80m x 80m, and are associated with fine, thin walled Cape Coastal pottery, frequent informal stone tools, stone features, grinding surfaces, ash middens, animal bone and several graves with broken grindstones atop them; colonial period artefacts have also been found in association with these sites (Ibid.).

Rock art, which can be attributed to the San hunter gatherers or the pastoralists, is known within the region, although it's not commonly identified, and more concentrated in the Cape Fold Mountains to the south of the project area (Booth, 2016a and 2016b; van der Walt, 2015). These paintings tend to be of the fine line tradition, attributed to hunter gatherers, or finger painting, which is attributed to the herders.

Early *Trekboere* entered the region in the late 1700s, moving their livestock down into the valleys and plains of the Karoo from the better watered escarpment to escape the harsh winters there. As a result of this pattern of seasonal movement of flocks the *Trekboere*usually had a loan farm on the plateau, and a stockpost (*legplaats*) in the Karoo. Conflict arose between the arriving *trekboere* and the indigenous San, which culminated in the massacre of San in the late 1770s by Boer *commandos*

(Schoeman 1986; Hart and Webley 2011). These massacres are recorded archivally and in placenames in the area, such as the farm Oorlogskloof near Sutherland where more than 30 stone cairn burials are to be found. Further mass graves might be found on Gunstfontein Farm, while there is purportedly also a cave where the San made a last stand against the *kommandos* (Ibid.).

Increasingly, as exploitation of the area became better established, and particularly after the Great Trek of the 1830s, their structures and imprint on the landscape became more permanent. The evidence for this early inhabitation of the region is to be found in historic farmhouses and associated buildings, stone cairns, stone walling, farm infrastructure such as reservoirs and, more recent wind pumps. Artefactual material from this period includes European ceramics, glass and iron fragments. The stone walling and kraals of this period are distinguished from the pre-colonial kraals as they are usually rectilinear and are faced on two sides with infill between the faces and are often mortared using locally derived clays.

The area was witness to a further period of military action during the South African War, with some skirmishes near Skietfontein in the KomsbergMountains (Hart and Webley, 2011). The threat of Boer guerrilla activities also prompted the British to build several defensive structures in the region, including redoubts, gun platforms and blockhouses (van der Walt, 2015; Hart and Webley, 2011; Orton and Halkett, 2011).

2.2.3 Cultural Landscapes and Living Heritage Background

Cultural landscapes are the interface of culture and nature, tangible and intangible heritage, and biological and cultural diversity. In contemporary society, particular landscapes can be understood by taking into consideration the way in which they have been settled and modified including overall spatial organisation, settlement patterns, land uses, circulation networks, field layout, fencing, buildings, topography, vegetation, and structures.

Research done in the last decade on the surrounding area, for input into HIAs required for other proposed WEFs, has highlighted archaeological, palaeontological and cultural landscape resources that are significant.

Other cultural landscape research for HIAs in the area have noted the possible impacts and made recommendations on cultural landscapes for each of their study areas. The visibility of proposed facilities from major transport routes and tertiary roads has been considered, particularly the R354, a scenic tourism route between Matjiesfontein and Sutherland (Hart and Webley 2011; Hart and Kendrick 2014). Predominantly, it is the negative impacts to the sense of wilderness that has been indicated as the greatest likely outcome of these developments (Hart and Webely 2011, 2013). The clustering of several proposed WEFs in the Sutherland area is considered to progressively and more negatively erode the cultural landscape (Hart and Webely 2013). Significant built environment features are variable across the landscape, and while some clusters of heritage buildings exist (Hart and Webley 2013), largely, there are few conservation-worthy buildings, and that places of celebrated heritage significance are limited (Hart and Webley 2011; Hart and Kendrick 2014). The remoteness of the area is noted, and the low visitor numbers also considered (Hart and Webley 2013; Booth 2016b). Where gradings have been proposed for the cultural landscape, these vary between Grade II and IIa (Hart and Kendrick 2014; Booth 2016b). The changes to the character of the landscape, and negative impacts on sense of place and aesthetic value which result from WEF developments – and compounded by cumulative impacts – are seen to be largely unmitigatable, with only the effective rehabilitation of the landscape after decommissioning serving as effective remedial action (Booth 2016a).

The SEA for wind and solar photovoltaic energy in South Africa (DEA 2015) does not consider intangible heritage resources, identifying only areas with material remains and previously identified natural and cultural heritage sites or protected areas, such as Karoopoort, Matjiesfontein and Touw Local Nature Reserve, as cultural landscapes in the Komsberg REDZ 2. There has not been any investigation into the living heritage of the area or intangible resources attached to the landscape, such as language or oral history. Although recognised as "Very High to High Sensitivity Zones", "no buffer" has been suggested for the sensitivity mapping application. The proposed Kudusberg WEF is in an area that has been graded as "High" in the Combined Heritage Sensitivity Map for REDZ 2 (Figure 4.3). Mitigation recommended for the impact of development on cultural landscapes in the Komsberg area is also limited to adjusting buffers and consideration of viewshed analysis, which considers only tangible heritage resources' and visual impacts.

Due to the infrequent signature of physical remains in this area, researchers in material culture tend to describe the landscape as sparse or barren, attributing lower gradings of heritage significance as a result, except where scenic value is ascribed. This low 'on the ground' visibility is however the direct result of the liminal and seasonal occupation of the area which in and of itself is part of the value and significance of the landscape, and can be considered the tangible evidence of the historic character of the landscape, a character of movement and habitation in very challenging conditions. Furthermore, the suggestion that intangible resources can be "rehabilitated after decommissioning" is unfounded: oral history, language, indigenous knowledge systems are by nature dynamic, living resources which will be impacted upon permanently by any new introductions to the landscape. While introductions or change are not always a negative impact, the impacts of proposed development on intangible heritage should be investigated and considered at least as thoroughly as the tangible heritage resources.

2.3 Heritage Resources Identified

The archaeological and palaeontological resources identified within the Oya WEF development area are listed in Appendix 2 and are recorded in detail on SAHRIS - the South African Heritage Resources Information System. Known heritage resources located within the Oya WEF development area include Middle and Later Stone Age artefacts and scatters, generally of low heritage significance as well as limited identified rock art with the potential for more rock art to be identified. Historical archaeological resources were identified, most often in conjunction with the ruins of farm werfs and kraals. A number of burial grounds and/or graves have also been identified. Human remains in this context carry a high levels of cultural significance. Very few palaeontological heritage resources have been identified, although fossil wood is known from the area.

Larger areas with specific **landscape character of cultural significance** (Cultural Landscape Areas or CLA) were identified in the Cultural Landscape Assessment (Bailey 2018) completed for the Kudusberg WEF. These are listed below:

- ***Ridges (Grade IIIA for scenic qualities)***

The cumulative visual impact of turbines located on at least 2 rows of high parallel ridges, (Oliviersberg north of Gatsrivier and Koedoesberg), on the surrounding open landscape, historic roads and scenic routes will be high This together with the additional proposed turbines for WEF's in the surrounding area, will impact negatively on the sense of "wilderness area" and the vast open character of the landscape for which it is highly valued.

- ***Gatsrivier Valley CLA (Graded IIIB for historic road and CLA)***

The road that runs through the Gatsrivier Valley CLA is evident on historic maps and considered as a Grand Trunk Road on the Lainsberg Imperial map of 1900 – 1919. The farm road runs next to the Gatsrivier entering the narrow valley from the west (off the R356) running west to east and exiting the valley to the north at the Oliviersberg farmstead. The valley floor along the Gatsrivier has archaeological evidence of continual land use over the last few centuries. Historic farmsteads (Gatsrivier and Oliviersberg), stone kraals, packed stone residential structures and evidence of water harvesting are all evident, as are remnant remains of cultivation. According to the local farm manager there are historic stone buildings that are thought to be old school buildings (across from

Springbok Cottage) which is also the site of the old Gatsrivier farmstead. No clear pre-colonial material was identified but it cannot be ruled out due to the limited time for full survey and, considering also, the relatively nearby rock shelter north of Oliviersberg farmstead that contained pre-colonial material. Considering the increased traffic that would have travelled along this valley in the past, relative to other surrounding roads, there is an increased potential for significant archaeological remains that form part of the story of the relationship between people and the land in this place.

- ***Historic Cape Town – Sutherland Route CLA (Graded IIIB)***

The farm track that passes through the Gatsrivier valley, turning north onto the Oliviersberg ridge slope at the Oliviersberg homestead, over the saddle south of Pad se Hoek, and down into the Matjiesfontein se Kloof valley to the north and beyond to Sutherland, is a noted historic road visible on the Lainsberg Imperial Map dated 1900 - 1919 as a Grand Trunk Road. Remnants of stone packed retaining walls of the old road are evident as one travels along certain areas of the current road. This road connects the historic famsteads in the area to each other and would have connected these farmsteads and communities to opportunities for trade and resources with people travelling between Cape Town and Sutherland (and beyond). The route transects and follows 4 of the 5 cultural landscape areas of the Kudusberg site, as it travels along river courses through valleys, up ridge slopes and over ridge saddles, in so doing connecting these areas in use, memory and function over space and time.

- ***Uriasgatrivier Valley CLA - Living Heritage (Graded IIIA)***

This valley contains material evidence of historic transhumant land use patterns which continue to the present day. It is "a continuing landscape which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time" (WHC, 2017). The northern entry point to Windheuwel farm and the Uriasgatrivier valley, is off the historic Karoopoort to Sutherland road (R356) that runs through the Tankwa Karoo, past Hangklip and through historic ridge saddles. Windheuwel farm is identified on historic maps, labeled as 'Wind Heuwel Station' on Burchell's map Southern Africa (Figure 7). Wider and flatter than the other two identified valley CLAs, Uriasgatrivier Valley CL has a more spread out development pattern. Many tributaries travelling downslope over more even land, resulted in more space and opportunity for habitation, cultivation and stock farming for which there is evidence over time. Aerial survey identified round kraals as well as rectangular kraals in different places within the valley, potentially indicating precolonial and colonial stock farming land use. Identified graves and graveyards, formal marble headstones and more informal cairns, were found during foot survey and add to strengthen the relationship between the landscape and its inhabitants over time. Evidence of living heritage exists in the skerms and kookskerms still present and being used by the people who live and work on the landscape. Seasonal stock labourers work on the farm during the winter months when the stock is brought down from the escarpment, as has been done for centuries. In speaking to the family members (an older lady, a younger lady and a young boy of 8 months) living in the temporary living quarters next to which they have built kookskerms and skerms for other uses, it was said that they travel with the owner of the farm, a farmer, down to Windheuwel when it gets too cold on the escarpment. It was said that the farmer has another farm on the escarpment where they stay in summer. This continued seasonal transhumant movement and the associated knowledge of building techniques, stock farming and plant harvesting, on the same landscape over time, are all significant intangible heritage resources that constitute a landscape of living heritage.

- ***Matjiesfontein se Kloof Valley CLA (Graded IIIB)***

This valley contains material evidence of historic transhumant land use patterns which continue to the present day. It is "a continuing landscape which retains an active social role in contemporary society closely associated with the traditional way of life, and in which the evolutionary process is still in progress. At the same time, it exhibits significant material evidence of its evolution over time" (WHC, 2017). Similar to the other valley landscape character areas, built structures cluster along river courses and around confluences, with the evolution of sites' development over time and space traceable at a few sites, such as Matjiesfontein werf.

The Cultural Landscape Assessment (Bailey 2018) also identified a number of **Intangible Heritage Resources** of cultural significance. These potential intangible heritage resources are elements of the cultural landscape and cannot be confined, without further investigation, to specific sites or places. These are listed below:

- ***Geographical place names***

The study area stretches across different landscape areas, which have been variously named and classified over time and discipline, in different languages by the many travellers that have moved across the landscape. The names given to places on the landscape are very descriptive and tell a story about the way people who named it felt about it, thought about it and how they navigated their way around it. The names often refer to natural features of the area or places in relation to one another, such as Kranskloof and Boplaas, perhaps by which people recognised their place on the vast open landscape. Also evident in many names are aspects of the landscape which held value to its inhabitants, such as names of wildlife which may have been hunted or avoided, such as Koedoesberg and Muishondrivier, and vegetation which may have been used, such as Matjiesgoedhoek. Some names describe the climate and weather, some the rock formations, some the herds of wildlife for which the area was valued, others, like Moordenaarskaroo, allude to the atrocities that have occured over time on the landscape, a result of the struggle for and conflict over scarce resources.

These names, in and of themselves, hold an intangible heritage value, in their ability to describe the ways in which the people, who moved through this space, used this space and lived on it, have interacted with it, navigated it and what the various landscape elements were valued for. They are intangible heritage resources that have been incribed on the land and hold the memories, nature of relationships and sense of place of the cultural landscape over time.

- ***Transhumant land use patterns and characteristics - Living heritage***

The Karoo and surrounds, which include the Kudusberg study area, was used for centuries by local indigenous pastoralists and hunter gatherer groups, their movements over this landscape organised to respond to the seasonal variations in grazing and water resources, for wild and domesticated animals; movement or mobility being essential for survival (Penn, 2005). Even after the initial movement of *trekboers* into the area, "pastoral production was the major occupation of all the societies of the frontier zone with the exception of the hunter gatherer San, and it was principally through the dynamics of pastoralism that they transformed each others' cultures while exploiting, serving or co-operating with each other" (Ibid: 15).

Although stark, vast and largely devoid of large settlements or congregated groups of people, to consider this area as only a "wilderness area" is an eerily colonial echo of the way in which the early colonists moved over and then into South African landscape, interpreting the openness and thin scattering of pastoral and hunter-gatherer groups as a sign of free and available land and resources. These areas of the Karoo that are still open and undeveloped, still used as seasonal grazing by tranhumant farmers, are rare examples of South African history and heritage which are fast being lost to development and industrialisation. These aspects of our history are part of the story of how and why South Africa is the people and country it is today, and this landscape offers an opportunity to recognise and celebrate the work, lives and lifeways of those people who inhabited these ridges and plains and the ways in which they related to their landscape and each other under difficult and trying circumstances, throughout history into the present day.

"I am like an eagle," an old farmer told me. "I look all round and see no one, not even the smoke of a neighbour's chimney. That is why I love the Great Karoo." - Green, 1955

- ***Indigenous Knowledge Systems***

"It was, intially, far more important for the *trekboers* to work together with the local Khoekhoen pastoralists whose knowledge of local conditions and skills in maintaining pastoral production in an arid environment was quite different to that of the south-western Cape" (Penn, 2005: 92). Other Indigenous Knowledge Systems (IKS) regarding the uses of the natural resources of the area could also be present, considering especially the location of the Kudusberg site in an area of exceptionally rich botanical diversity (Clark et al. 2011:which has been described as "rivalling those of rainforests" (South African National Biodiversity Institute 2006).

The IKS of the Komsberg area, including the Kudusberg landscape, could include valuable knowledge about, for instance, sustainable and low impact agricultural practices in semi-arid climates. IKS relating to the biocultural diversity of the various landscape areas may hold knowledge as of yet unrecorded or untapped and may be of various significances (WHC, 2017: 81). Without further research into these possibilities, a valuable and true assessment of the impact of the development on the cultural landscape cannot be made.

- ***Frontier Zone History - 'Khoisan' Heritage***

This area is relatively well known for being occupied by Khoekhoen and /Xam people before and during the early periods of colonial influence and then settlement. The memory and material culture of these pre-colonial people are still evident on the landscape through the IKS that is potentially still held in the stories and lifeways of current inhabitants, through the stone kraals and stone implements they used, through the seasonal land use patterns that persist to this day, through the art they left on the landscape.

The Great Karoo, including the Klein Roggeveld and Moordenaarskaroo in which the Kudusberg Study area is located, offers the potential to recognise the historic dispossession of indigenous groups of people of their lifeways, land use practices, language and culture. The fact that the precolonial stone kraals were abondoned by their initial builders and then either left to dilapidate or reused by first *trekboers* and later colonial stock farmers, does not reduce their significance, but is rather a testament to the reality of conflict, atrocity and dispossession that occurred on this landscape.

As suggested by Penn (2005: 14), "It is no exaggeration to state that the history of conquest, extermination or incorporation of the Khoisan societies of the northern frontier zone in the 18th century has not been told. Nor has the strength, scale or diversity of Khoisan resistance been adequately described" or recognised. This history, and the memory thereof, embodied by Komsberg cultural landscape and surrounding Karoo area, is significant in the identity shaping of many present-day South Africans. Recognising the cultural landscape as a significant heritage resource has the potential to encourage the recognition of a place and time in South African history that has shaped our people and country in a way that is often overlooked or blatantly ignored.

- ***Aesthetic and scenic qualities***
- ***Vast landscapes with far horizons and unbroken views***
- ***Wilderness qualities***
- ***Memory and attachment to the landscape characteristics by some South African communities***

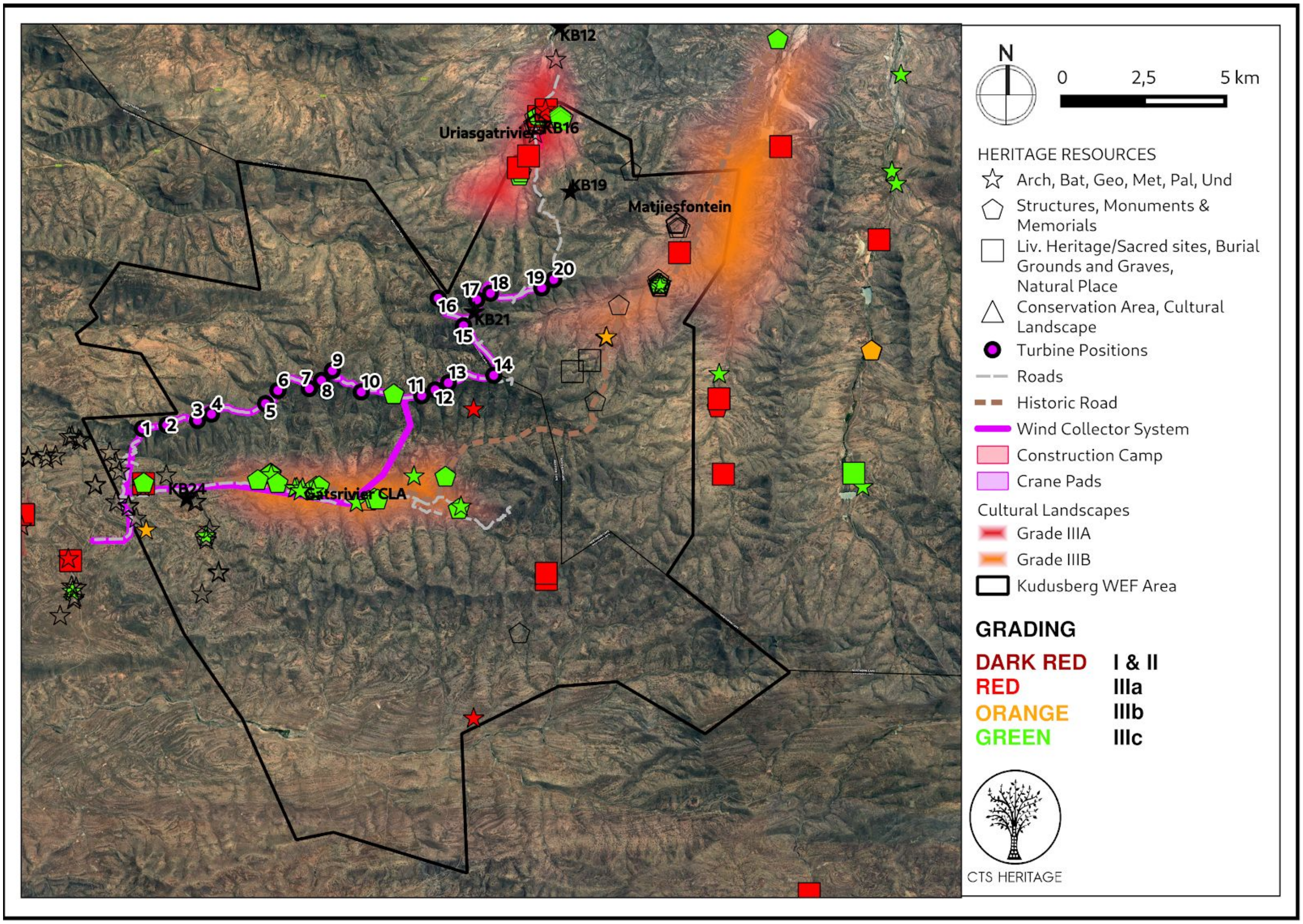


Figure 3. Map of all known heritage resources located within the Oya WEF Development area

3. SITE MANAGEMENT

3.1 Objectives of site management

The objectives of the heritage management plan for the Oya WEF are to ensure that the heritage resources identified within the area proposed for the WEF development are properly conserved and any further impacts to these heritage resources are appropriately managed.

The Heritage Management Plan identifies the steps required for the appropriate management of these heritage resources including:

- Regular monitoring of the physical integrity of the identified heritage resources
- Details regarding procedures and processes to follow in the event of negative impact to identified or new heritage resources during the construction or operational phases of the development
- Mitigation of potential impacts resulting from the construction, operational and decommissioning phases to the identified heritage resources

3.2 Potential Impacts to identified heritage resources

A. Construction Phase

- ***Palaeontology***

The final layout does not impact any known palaeontological heritage resources. The construction of any infrastructure that requires excavation into bedrock or is located at sites of surface exposures of bedrock will have **high** impacts to fossil resources and as such, the HWC Chance Fossil Finds Procedure must be implemented. However, due to the lack of irreplaceable, unique or rare fossils within the development footprint, and the extensive superficial deposit overlying the sensitive deposits, the significance of the overall impact of the development is expected to be **very low.**

- ***Archaeology***

The final layout does not impact any known archaeological heritage resources of significance. Stone Age archaeology is very sparse in this area, with only a very few, isolated artefacts found in the development footprint. The preponderance of archaeological remains in the study area are the remains of built structures, likely of historic age, but some possibly pre-colonial. These structures are predominantly easy to identify and fairly robust, but several were located in very close proximity to proposed access roads however the final layout avoids any such impact.

- ***Burial Grounds and Graves***

The final layout does not impact any known burial grounds of graves. However, unknown or unmarked burial grounds and graves remain at risk during the construction phase and are likely to be subject to **very high** direct impacts without mitigation. Should any burial grounds or graves be accidentally uncovered during this phase, HWC (in the Western Cape) and/or SAHRA (in the Northern Cape) must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Built Environment***

The final layout does not impact any known structures directly. The significance of the built environment is very low in this area, and it is likely that the significance of impacts to the built environment will be **low** provided that structures are avoided sufficiently not to cause structural damage to them.

- ***Cultural Landscapes***

Impacts to the cultural landscape are likely through the introduction of new, industrial, and disproportionately large elements into the largely uninhabited and only marginally transformed cultural landscape. The turbines themselves, as well as the laydown areas, crane pads, construction camps, substations and access roads all serve to erode the aesthetic and scenic qualities of the cultural landscape. These new intrusions also represent a dramatically new way of using, interacting with and shaping the landscape in an area that has, until now, largely resisted or been impervious to, efforts to transform it.

- ***Intangible Heritage***

Impacts to intangible heritage resources are predominantly indirect in nature, given that the resource is largely intangible. As such, no direct impacts are anticipated during the construction phase.

B. Operational Phase

- ***Palaeontology***

Operational activities will not impact any known palaeontological heritage resources and impacts are unlikely during the operational phase. Should any palaeontological heritage be accidentally uncovered during this phase, the HWC Chance Fossil Finds Procedure must be implemented.

- ***Archaeology***

Operational activities will not impact any known archaeological heritage resources of significance and impacts are unlikely during the operational phase. Should any archaeological resources be accidentally uncovered during this phase, HWC (in the Western Cape) and/or SAHRA (in the Northern Cape) must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Burial Grounds and Graves***

Operational activities will not impact any known burial grounds of graves and impacts are unlikely during the operational phase. Should any burial grounds or graves be accidentally uncovered during this phase, HWC (in the Western Cape) and/or SAHRA (in the Northern Cape) must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Built Environment***

Operational activities will not impact any known structures directly and impacts are unlikely during the operational phase. Should it be necessary that structures that have been graded or structures that are older than 60 years require alteration or demolition during this phase, HWC (in the Western Cape) and/or NBKB (in the Northern Cape) must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.

- ***Cultural Landscapes***

Impacts to the cultural landscape will be continuous throughout the operational phase as a result of the construction of the turbines along highly visible ridge lines as well as the presence of roads and associated infrastructure in the landscape. Contextual impacts will be experienced during all phases but are most problematic during the operational phase, and will be ongoing for the operational lifetime of the facility, remaining of **high** significance throughout. Indeed, the ongoing visual intrusion created by the WEF infrastructure serves to erode connections to the sense of place and the aesthetic qualities of the landscape continually and increasingly. These indirect impacts to cultural landscapes and visual qualities can only be addressed and moderated through sensitive placement of turbines, roads and infrastructure that aim to minimise the visual intrusion of this infrastructure on the landscape. While the impacts are unavoidable, sensitive design and layout can reduce the significance of these impacts.

- ***Intangible Heritage***

Impacts to sites of living heritage will be continuous throughout the operational phase as a result of vehicles and personnel on site for maintenance, and the presence of roads, turbines and associated infrastructure in the landscape.

C. Decommissioning Phase

- ***Palaeontology***

Infrastructure removal should not impact any known palaeontological heritage resources and impacts are unlikely during the decommissioning phase. Should any palaeontological heritage be accidentally uncovered during this phase, the HWC Chance Fossil Finds Procedure must be implemented.

- ***Archaeology***

Infrastructure removal should not impact any known archaeological heritage resources of significance and impacts are unlikely during the decommissioning phase. Should any archaeological resources be accidentally uncovered during this phase, HWC (in the Western Cape) and/or SAHRA (in the Northern Cape) must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Burial Grounds and Graves***

Infrastructure removal should not impact any known burial grounds of graves and impacts are unlikely during the decommissioning phase. Should any burial grounds or graves be accidentally uncovered during this phase, HWC (in the Western Cape) and/or SAHRA (in the Northern Cape) must be contacted regarding a way forward. Contact details are provided in Appendix 1.

- ***Built Environment***

Infrastructure removal should not impact any known structures directly and impacts are unlikely during the decommissioning phase. Should it be necessary that structures that have been graded or structures that are older than 60 years require alteration or demolition during this phase, HWC (in the Western Cape) and/or NBKB (in the Northern Cape) must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.

- ***Cultural Landscapes***

Impacts to significant cultural landscapes will be continuous throughout the decommissioning phase as a result of vehicles and personnel on site for turbine dismantling and removal, and the remnants of access roads, and locations of turbines and associated infrastructure in the landscape. It should be noted, however, that any resulting impacts will be of a short duration. Mitigation should only be to ensure that existing roads are used, and no previously undisturbed areas should be subject to disturbance.

- ***Intangible Heritage***

Impacts to sites of living heritage will be continuous throughout the decommissioning phase as a result of vehicles and personnel on site for turbine dismantling and removal, and the remnants of access roads, and locations of turbines and associated infrastructure in the landscape. It should be noted, however, that any resulting impacts will be of a short duration.

3.3 Conservation and management requirements

Mitigation measures to reduce the anticipated negative impacts to heritage resources and the cultural landscape during the various phases of the development include:

- Graves: no development should be permitted within 50m of graves and cemeteries; existing roads within this buffer should not be altered or widened;
- Cave site (KDB045): construction staff should not be permitted within 200m of the site;
- A fence must be erected around the Stadler Graveyard (KDB081)
- Farmsteads: no turbines should be located within 500m of farmsteads;
- Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should take place within 15m;
- Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey.
- buffers around the watercourses (100m)
- no-go areas (200m from watercourse)
- buffers around identified heritage resources (100m for stone structures and 50m for land use features such as dams, intersections, wind pumps)
- buffer around historic trunk road for any new structures (50m)
- All site crew should be informed of the heritage significance of the resources in the study area, and those sites near development infrastructure, or easily reached should be inspected by the ECO during the construction phase to ensure they are being respected;
- The R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward;
- New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape by observing appropriate buffers around these features;
- If supported in consultation with local inhabitants (of permanent or seasonal habitation, owners or labourers), the negative impact of non-local inhabitants on cultural lifeways and language, employees associated with the new WEF should be reduced by housing the employees away from the CLAs;
- Impact of the proposed WEF on local inhabitants (of permanent and seasonal habitation, owners and labourers) should be monitored by the Holder of the Environmental Authorisation through a grievance mechanism described in the EMP. Such a grievance mechanism should

take into account economic and social inequality and be made accessible and known to all inhabitants of the CLAs, not just the land owners. Such a grievance mechanism should be in place for the duration of the development process through to the end of the decommissioning phase;

- The Chance Fossil Finds Protocol should be implemented in the event of the discovery of significant new fossils during the construction phase;
- Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, etc.) by the ECO on an on-going basis during the construction phase. Significant fossil finds to be reported to Heritage Western Cape (HWC) (Western Cape sites) or the South African Heritage Resources Agency (SAHRA) (Northern Cape sites) for recording and sampling by a professional palaeontologist;
- If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted at once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.

These mitigation measures are mapped in Appendix 4.

3.4 Consultation

The main stakeholders for the site currently are the owners of the property (Appendix 3), the Local Authorities, the managers of the WEF and the heritage authority for the Western Cape, Heritage Western Cape (HWC) and Northern Cape (SAHRA and NBKB).

4. MONITORING

4.1 Objectives of Monitoring

The following recommendations are made for long-term management of the identified heritage resources to conserve the significance of the place as part of the irreplaceable history and shared cultural heritage of the landscape. The following management goals provide guidelines for use and maintenance of the heritage, acceptable physical protection and conservation, visitor education, monitoring and research.

4.2 Monitoring and Site Maintenance

Action	Responsible party	Performance Indicators	Evidence
CONSTRUCTION PHASE			
All site crew should be informed of the heritage significance of the resources in the study area	ECO	Once-off meeting held with site crew	Minutes of meeting
Sites near development infrastructure, or easily reached should be inspected by the ECO during the construction phase to ensure they are being respected	ECO	Site inspections conducted at all sites at regular intervals	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
New construction work, construction camps, substations or access roads should not impact negatively or threaten any of the historic built form, which is part of the history and land use evolution of the cultural landscape by observing appropriate buffers around these features	ECO	No unplanned impact or unplanned impact halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
Monitoring of all major surface clearance and deeper (> 1m) excavations for fossil material (bones, teeth, petrified wood, etc.) by the ECO on an on-going basis during the construction phase.	ECO	No unplanned impact or unplanned impact halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
Significant fossil finds to be reported to Heritage Western Cape (HWC) (Western Cape sites) or the South African Heritage Resources Agency (SAHRA) (Northern Cape sites) for recording	ECO	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding

and sampling by a professional palaeontologist;			and minutes of relevant meetings
Implementation of the Chance Fossil Finds Procedure	ECO	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
Establishment and management of a grievance mechanism for local inhabitants impacted by the WEF development	EA Holder	Grievance mechanism process in place with contact information easily available	Annual report on grievances received and how these were dealt with to be sent to SAHRA and HWC
Construction of the final approved layout including implementation and enforcement of the identified buffer areas and no-go areas: 1. Graves: no development should be permitted within 50m of graves and cemeteries; existing roads within this buffer should not be altered or widened; 2. Cave site (KDB045): construction staff should not be permitted within 200m of the site; 3. Farmsteads: no turbines should be located within 500m of farmsteads; 4. Kraals, stone walling and ruins > 100 years: construction staff should not be permitted within 100m of these sites and no development should take place within 15m; 5. Archaeological finds: no buffers are recommended for the isolated artefacts identified in this survey. 6. buffers around the watercourses (100m) 7. no-go areas (200m from watercourse) 8. buffers around identified heritage resources (100m for stone structures and 50m for land use features such as dams, intersections, wind pumps) 9. buffer around historic trunk road for any new structures (50m)	ECO	Final layout adhered to in the final construction	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
If any archaeological material or human burials are uncovered during the course of development, then work in the immediate area should be halted at once. The find should be reported to the heritage	ECO		Written correspondence with relevant heritage authority regarding

authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.			and minutes of relevant meetings
OPERATIONAL PHASE			
Use existing roads for maintenance purposes	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
Keep all disturbance within existing development footprint and ensure identified buffers and no-go areas are adhered to	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
All site crew should be informed of the heritage significance of the resources in the study area	Site Manager	Meeting held with site crew	Minutes of meeting
Implementation of the Chance Fossil Finds Procedure	Site Manager	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
Establishment and management of a grievance mechanism for local inhabitants impacted by the WEF development	EA Holder	Grievance mechanism process in place with contact information easily available	Annual report on grievances received and how these were dealt with
If any archaeological material or human burials are uncovered during the course of operations, then work in the immediate area should be halted at once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.	Site Manager	No unplanned impact or unplanned impact halted within 4 hours	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
Should it be necessary that structures that have been graded or structures that are older than 60	Site Manager	Section 34 permit application to HWC	Permit issued in terms of section 34 from the

years require alteration or demolition during this phase, HWC (in the Western Cape) and/or NBKB (in the Northern Cape) must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.		(Western Cape) or NBKB (Northern Cape)	relevant heritage authority or correspondence in this regard.
DECOMMISSIONING PHASE			
Use existing roads for maintenance purposes	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
Keep all disturbance within existing development footprint and ensure identified buffers and no-go areas are adhered to	Site Manager	No unplanned impact or unplanned impact managed halted within 4 hours	Bi-Annual Site Inspection and Monitoring Report to be submitted to SAHRA and HWC
All site crew should be informed of the heritage significance of the resources in the study area	Site Manager	Meeting held with site crew	Minutes of meeting
Implementation of the Chance Fossil Finds Procedure	Site Manager	Implementation of the HWC Chance Fossil Finds Procedure	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
Establishment and management of a grievance mechanism for local inhabitants impacted by the WEF development	EA Holder	Grievance mechanism process in place with contact information easily available	Annual report on grievances received and how these were dealt with
If any archaeological material or human burials are uncovered during the course of operations, then work in the immediate area should be halted at once. The find should be reported to the heritage authorities (SAHRA in the Northern Cape and HWC in the Western Cape) and may require inspection by an archaeologist to determine whether mitigation should take place and what form that mitigation should take.	Site Manager	No unplanned impact or unplanned impact halted within 4 hours	Written correspondence with relevant heritage authority regarding and minutes of relevant meetings
Should it be necessary that structures that have been graded	Site Manager	Section 34 permit application to HWC	Permit issued in terms of section 34 from the

or structures that are older than 60 years require alteration or demolition during this phase, HWC (in the Western Cape) and/or NBKB (in the Northern Cape) must be contacted regarding permission in terms of section 34 of the NHRA. Contact details are provided in Appendix 1.		(Western Cape) or NBKB (Northern Cape)	relevant heritage authority or correspondence in this regard.
Long Term Management			
The R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward	HWC and/or SAHRA	Placement of the R356 on the Heritage Register as a Scenic Route heritage resource in terms of section 30 of the NHRA	Gazette notice listing for the R356

5. APPLICABLE LEGISLATION

The development of the Oya WEF triggers sections 38(1) and 38(8) of the National Heritage Resources Act (Act 25 of 1999) as this proposed development constitutes a change of character to a site exceeding 5000m^2 and a the associated roads constitute a linear development exceeding 300m and this proposed development requires an evaluation of impacts to heritage resources in terms of other legislation (NEMA). This section states that the consenting authority (DEADP in the Western Cape and DENC in the Northern Cape) must ensure that the assessment completed for impacts to heritage satisfies the requirements of the relevant heritage authority in terms of section 38(3) of the NHRA (HWC in the Western Cape and SAHRA in the Northern Cape), and that the recommendations of the relevant heritage authority must be taken into consideration prior to the granting of consent.

Section 38(3) of the NHRA details the information that MUST be included in a Heritage Impact Assessment drafted in terms of section 38 of the NHRA. Furthermore, HWC has published guidelines on their minimum requirements for Heritage Impact Assessments and SAHRA has published Minimum Standards for Archaeological and Palaeontological Impact Assessments. All such guidelines and minimum standards have been complied with in the HIA that was conducted for the Kudusberg WEF development (Smuts et al. 2018).

In terms of section 38(10) of the NHRA, if the applicant complies with the recommendations and requirements of the relevant heritage authority issued in terms of section 38(8) of the NHRA, then the applicant MUST be exempted from compliance with all other (general) protections included in the NHRA. As such, as long as the requirements of the heritage authority are satisfied, no permit application is required for the destruction of or impact to any heritage resource ***that has been identified in the HIA.***

Should any heritage resources be newly uncovered during excavation activities ie. heritage resources that were not identified in the HIA, then as per the monitoring table above, work must cease in that area and the relevant heritage authority must be contacted regarding a way forward. Any alteration or destruction to or of heritage resources NOT anticipated in the HIA remain subject to the general protections and require permission from the relevant heritage authority.

- Impacts to any structures older than 60 years require a permit from HWC (Western Cape) or NBKB (Northern Cape) in terms of section 34 of the NHRA

- Impacts to archaeological or palaeontological heritage not anticipated in the HIA requires a permit from HWC (Western Cape) or SAHRA (Northern Cape) in terms of section 35 of the NHRA
- Impacts to burial grounds or graves that are older than 60 years requires a permit from HWC (Western Cape) or SAHRA (Northern Cape) in terms of section 36 of the NHRA

It is recommended in the HIA that the R356 should be put forward for recognition as a scenic route to afford its scenic qualities and historic significance some measure of protection going forward. This recommendation requires that the relevant heritage authority formally protect this route as a significant scenic route. As this route has been graded IIIA, the appropriate formal protection mechanism for this resource would be placement on the Heritage Register in terms of section 30 of the NHRA. As yet, no regulations have been published by either SAHRA or HWC regarding how such a resource should be nominated for placement on the Heritage Register, nor have the appropriate regulations been published by either authority to establish the Heritage Register. As such, the responsibility for such formal protection falls to the heritage authority, but as yet, cannot be actioned.

6. DOCUMENTATION AND MONITORING

All site record sheets, digital photos and mapping have been loaded securely to SAHRIS so that the EA holder, site manager and ECO are able to access the information online. Access to the database is governed by SAHRA and certain categories of information are not freely available to the general public without special permission such as GPS coordinates of archaeological sites.

Please see the following links for information:

- Case Application on SAHRIS (Case ID 13208)
  https://sahris.sahra.org.za/cases/basic-assessment-kudusberg-wind-farm-near-sutherland
- Heritage Reports (HIA)
  https://sahris.sahra.org.za/heritage-reports/hia-kudusberg
- Sites recorded in the HIA
  https://sahris.sahra.org.za/node/514990/linked-sites-to-reports
- Heritage Report (Walkdown)
  TBD

It is important that any new or previously unrecorded heritage resources identified during the course of the Construction, Operational or Decommissioning Phases are recorded on SAHRIS.

7. REFERENCES

Heritage Impact Assessments				
Nid	**Report Type**	**Author/s**	**Date**	**Title**
8180	AIA Phase 1	Jayson Orton	01/02/2006	ARCHAEOLOGICAL IMPACT ASSESSMENT FOR THE CONSTRUCTION OF A DAM ON THE VERLORENVLEI FARM (VERLORENVALLEY 344) NEAR TOUWSRIVIER
8181	AIA Phase 1	Jayson Orton	29/09/2009	HERITAGE STATEMENT FOR THE PROPOSED VERLORENVLEI DIVERSION CANAL, CERES MAGISTERIAL DISTRICT, WESTERN CAPE
6644	AIA Phase 1	Jonathan Kaplan	29/09/2009	ARCHAEOLOGICAL IMPACT ASSESSMENT PROPOSED DEVELOPMENT ERF 660 DE DOORNS, WESTERN CAPE PROVINCE
186697	Desktop AIA	Foreman Bandama, Shadrack Chirikure	01/08/2014	An Archaeological Scoping and Assessment report for the proposed Gamma (Victoria West, Northern Cape) - Kappa (Ceres – Western Cape) 765Kv (2) Eskom power transmission line
329647	HIA Phase 1	Dave Halkett	15/06/2012	HERITAGE IMPACT ASSESSMENT OF THE IMPACTS RESULTING FROM THE RAISING OF THE EXISTING KEEROM DAM, SITUATED BETWEEN MONTAGU AND TOUWS RIVER, WESTERN CAPE
35948 8	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	09/03/2016	Brandvalley Wind Energy Facility
53187	HIA Phase 1	Timothy Hart, Lita Webley	01/03/2011	HERITAGE IMPACT ASSESSMENT PROPOSED WIND ENERGY FACILITY
337370	PIA Phase 1	Duncan Miller	01/03/2011	Palaeontological Impact Assessment Proposed Roggeveld Wind Energy Facility
356316	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	02/02/2016	Heritage Screener CTS15_015b EOH Brandvalley Wind Energy Facility
356318	Heritage Screener	Mariagrazia Galimberti, Kyla Bluff, Nicholas Wiltshire	01/02/2016	Heritage Screener CTS15_015a EOH Rietkloof Wind Energy Facility
364162	PIA Phase 1	John E Almond	01/04/2016	PALAEONTOLOGICAL HERITAGE ASSESSMENT: COMBINED DESKTOP & FIELD-BASED STUDY - PROPOSED BRANDVALLEY WIND ENERGY FACILITY LAINGSBURG, WESTERN & NORTHERN CAPE PROVINCES
364163	AIA Phase 1	Celeste Booth	01/04/2016	A PHASE 1 ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) FOR THE

				PROPOSED BRANDVALLEY WIND ENERGY FACILITY (WEF) SITUATED IN THE KAROO HOOGLAND LOCAL MUNICIPALITY (NAMAKWA DISTRICT MUNICIPALITY), THE WITZENBURG LOCAL MUNICIPALITY (CAPE WINELANDS DISTRICT MUNICIPALITY) AND LAINGSBURG LOCAL MUNICIPALITY (CENTRAL KAROO DISTRICT MUNICIPALITY).
4843	AIA Phase 1	Hilary Deacon	28/03/2008	Archaeological Impact Assessment: Proposed Breede Valley De Doorns Housing Project
514990	HIA Phase 1	Katie Smuts, Emmylou Bailey, Madelon Tusenius, John Almond	29/10/2018	HERITAGE IMPACT ASSESSMENT Basic Assessment for the Proposed Development of the 325MW Kudusberg Wind Energy Facility and associated infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces: BA REPORT
375379	AIA Phase 1	Hugo Pinto, Katie Smuts	24/10/2011	Preliminary Archaeological Survey of Karoopoort Farm

Additional References:

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KOLKIES WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN TANKWA KAROO.** (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Hart, T. et al. (2016). **HERITAGE IMPACT ASSESSMENT (SCOPING) FOR THE PROPOSED KAREE WIND ENERGY FACILITY AND ASSOCIATED GRID CONNECTION TO BE SITUATED IN THE SOUTHERN TANKWA KAROO.** (Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25 of 1999) as part of an EIA). For Arcus Consulting. Unpublished and not submitted.

Shaw, Matthew & Ames, Christopher & Phillips, Natasha & Chambers, Sherrie & Dosseto, Anthony & Douglas, Matthew & Goble, Ron & Jacobs, Zenobia & Jones, Brian & Lin, Sam & Low, Marika & Mcneil, Jessica-Louise & Nasoordeen, Shezani & O'driscoll, Corey & Saktura, Rosaria & Sumner, T. & Watson, Sara & Will, Manual & Mackay, Alex. (2020). **The Doring River Archaeology Project: Approaching the Evolution of Human Land Use Patterns in the Western Cape, South Africa.**

Smith, Andrew B., and Michael R. Ripp. "**An Archaeological Reconnaissance of the Doorn/Tanqua Karoo.**" The South African Archaeological Bulletin, vol. 33, no. 128, 1978, pp. 118–133

APPENDICES

APPENDIX 1:

A Summary of the SAHRA Minimum Standards for Archaeological Site Museums and Rock Art Sites open to the Public

The archaeological heritage of South Africa is unique and it is non-renewable. Archaeological sites, including those with rock paintings or rock engravings, are especially vulnerable to damage caused by visitors. All such sites are protected by the National Heritage Resources Act (Act No. 25 of 1999). Anyone opening a site to the public, either as a formal site museum or simply as a place of interest, must take basic precautions to ensure the safety of the site and its contents.

Expert advice should be sought from the South African Heritage Resources Agency (SAHRA) or HWC and/or from one of the museums or university departments listed below. Interventions should be reversible and the integrity of the site should be maintained as far as possible. No site should be opened to the public without a prior professional investigation that includes a conservation management plan approved by the appropriate heritage agency and, for rock art sites, complete documentation in case of later damage.

Remember that a permit is required for ANY disturbance at an archaeological site and this includes erecting noticeboards, boardwalks, fences, etc. Liaison with the local publicity office and regional services council is recommended.

THE FOLLOWING MINIMUM STANDARDS MUST FORM PART OF THE MANAGEMENT PLAN:

1. Notify HWC or SAHRA of intention to open site

2. Engage a professional with specialist knowledge to document the site, draw up a conservation management plan and advise on interpretation of the site.

3. Approach to the Site

3.1 Arrangements for visiting

* if the site is open at all times, there should be adequate signposting;
* if the site is kept locked, there should be clear arrangements for the collection and return of a key;
* if it is open only by appointment, there should be a specialist guide or a specially trained local guide who has had clear instructions on what to do and say.

3.2 Provision for vehicles

* there should be an adequate and well-maintained road, preferably paved to limit dust, with off-road parking;
* the parking should not encroach on the site: vehicles should not park closer than about 100 m from the edge of the site;
* the parking area should be marked by a barrier between it and the start of the path.

3.3 Facilities

* there should be a litter bin at the parking lot and it should he emptied regularly;
* consider the need for toilets and the supply of refreshments and other facilities such as a shop, public telephone, restroom, etc., depending on the number of visitors expected;
* consider the need to establish an interpretive centre separate from the site, where people can see displays and where you may be able to store material, provide accommodation, etc. Remember that a permit from HWC is required to collect any archaeological material and so displays are best done in collaboration with a professional or institution.

3.4 Design of the path

* make sure that the path to the site is distinct;
* the path should follow the contours to avoid unnecessary erosion of any hill slope;
* make sure there are discreet signs to indicate direction where the path crosses a rocky area;
* the path should not enter the site at a position where the deposits or the rock art can be damaged;
* the introductory notice board should be displayed at the end of the path and the beginning of the site, where it will not interfere with good photographic views.

4. Provision of Information

* at least an introductory notice board explaining that the site is protected by law;
* where appropriate, a display with more detailed information on what can be seen at the site and what it means;
* a visitors' book in a container to protect it from the weather, or at a farmhouse or other convenient place (copies of these can be sent to HWC for record purposes);
* a leaflet or pamphlet explaining visitor etiquette.
* an explanatory leaflet or pamphlet that is specific to the site.

5. Guides

* specialist guides or specially trained local guides ensure that the meaning of the rock art or, in the case of archaeological sites, the story of the people who used the site is interpreted and so enhance the experience for the visitor. They also teach appropriate visitor etiquette and contribute to the safety of the site.

6. Protection of the Site

* measures used to protect archaeological deposits should be effective, reversible and recognisable, yet harmonious. It is important that visitors appreciate that the site is being well looked after, so it should be clean and as natural as possible. Remember that a permit is required for any disturbance or intervention at a site.

7. Protection of the Art

* a psychological or physical barrier should be set up between the visitor and the rock art, or display area, in the form of anything from a low wooden railing to a fence that encloses the entire site, depending on the vulnerability of the site or precautions necessary for the safety of the visitor;
* boardwalks are recommended and may include railings. They must be of treated wood or non-flammable material,
* every effort should be made to remove graffiti from the site, as it attracts more graffiti. A permit is required to remove graffiti at a rock art site.

8. Protection of the Surface and Deposits

* an effective cover should be put on the floor of the site to prevent dust being kicked up and damaging rock art and to stop people picking up material on the surface. Cover can be provided by a boardwalk, geotextile, or medium to large slabs of natural rock from the surrounds of the site.
* excavated sections should be backfilled, in consultation with HWC

9. Regular Maintenance

* arrangements should be made with the appropriate heritage agency or museum for a monitoring programme.
* provision should be made for regular visits to the site by the manager or property owner to check on litter, damage, graffiti, etc., which should be reported to the heritage agency.
* there should be regular monitoring of vegetation around the site so that, if necessary:
    - measures can be taken to protect it against trampling,

- potentially dangerous plants such as those with thorns can be controlled,
- dead wood can be removed so that damage by veld fires can be avoided,
- firebreaks can be maintained.

10. Avoid having:

* a litter bin on site unless very large groups are catered for;
* braai or picnic places on the site or right next to it;
* camping places within 500 m of an archaeological site;
* plastic sheeting or plastic bags exposed to view unless there is no other option;
* concrete barriers or surfaces;
* metal poles or wire in contact with rock shelter or cave walls as they rust and stain the rock;
* a sandy surface on the outer side of a fence as this will be eroded by people walking there and the fence will be under-cut.

11. Contact Information

Heritage Western Cape (HWC)
Contact Person: Mrs C. Scheermeyer (Deputy DIrector)
Tel: 021 483 5959
Email: colette.scheermeyer@westerncape.gov.za or ceoheritage@westerncape.gov.za
Website: www.hwc.org.za

South African Heritage Resources Agency (SAHRA)
Contact Person: Mr Phillip Hine
Tel: 021 462 4502
Email: phine@sahra.org.za
Website: www.sahra.org.za

Ngwao Boswa Kapa Bokoni - Northern Cape Provincial Heritage Resources Authority (NBKB)
Contact Person: Mr Ratha Timothy
Tel: 079 036 9695
Email: rtimothy@nbkb.org.za
Website: http://www.nbkb.org.za/

Iziko South African Museums

Contact Person: Dr Wendy Black

Tel: 021 481 3883

Email: wblack@iziko.org.za

Website: www.iziko.org.za

University of Cape Town: Archaeology Department

Contact Person: Prof. John Parkington

Tel: 021 650 2353

Email: john.parkington@uct.ac.za

Website: http://www.archaeology.uct.ac.za/

APPENDIX 2:

Known heritage resources within the Kudusberg WEF Development Area

SAHRIS ID	Site No	Site Name	Description (Detailed descriptions on SAHRIS)	Co-ordinates		Grading
130988	KDB019	Kudusberg	Structures	-32,893434	20,300591	
130989	KDB020	Kudusberg	Structures	-32,886809	20,325772	Grade IIIc
130990	KDB021	Kudusberg	Transport infrastructure	-32,866028	20,374972	Grade IV
130991	KDB022	Kudusberg	Building	-32,833555	20,396091	Grade IIIc
130992	KDB023	Kudusberg	Stone walling	-32,848361	20,378583	Grade IIIb
130719	OYPV-01	Matjiesfontein Oya Solar	Stone walling	-32,903047	20,247122	Grade IIIc
130993	KDB024	Kudusberg	Stone walling	-32,848417	20,378417	Grade IIIb
130720	OYPV-02	Matjiesfontein Oya Solar	Stone walling	-32,913278	20,251203	
130994	KDB025		Stone walling	-32,848333	20,378611	Grade IIIb
130995	KDB026	Kudusberg	Stone walling	-32,848333	20,378611	Grade IIIb
130996	KDB027	Kudusberg	Stone walling	-32,848194	20,378694	Grade IIIb
130998	KDB029	Kudusberg	Transport infrastructure	-32,839528	20,38275	Grade IV
130725	OYPV-05	Matjiesfontein Oya Solar	Stone walling, Burial Grounds & Graves	-32,888592	20,226611	Grade IIIa
130999	KDB030	Kudusberg	Structures	-32,833472	20,3955	Grade IV
130727	OYPV-06	Matjiesfontein Oya Solar	Artefacts	-32,889661	20,226439	
131001	KDB032	Kudusberg	Structures	-32,832472	20,39575	Grade IV
131002	KDB033	Kudusberg	Artefacts, Deposit	-32,833528	20,396639	Grade IV
131003	KDB035	Kudusberg	Structures	-32,833722	20,396194	Grade IV
131004	KDB036	Kudusberg	Structures	-32,834528	20,396167	Grade IV
131005	KDB037	Kudusberg	Structures	-32,834278	20,395889	Grade IV
130732	OYPV-11	Matjiesfontein Oya	Artefacts	-32,9015	20,227469	Grade IIIb

		Solar				
131006	KDB038	Kudusberg	Stone walling	-32,834167	20,396194	Grade IV
131007	KDB039	Kudusberg	Structures	-32,824806	20,402889	Grade IV
130734	OYPV-13	Matjiesfontein Oya Solar	Artefacts	-32,898217	20,224189	
130735	OYPV-14	Matjiesfontein Oya Solar	Artefacts	-32,885239	20,218722	
130736	OYPV-15	Matjiesfontein Oya Solar	Artefacts	-32,886306	20,234069	
131010	KDB042	Kudusberg	Artefacts, Deposit	-32,824611	20,403056	Grade IV
131011	KDB043	Kudusberg	Burial Grounds & Graves	-32,824889	20,402667	Grade IIIa
131013	KDB045	Kudusberg	Structures	-32,816806	20,401667	Grade IV
131014	KDB046	Kudusberg	Structures	-32,816972	20,401528	Grade IV
131015	KDB047	Kudusberg	Structures	-32,817083	20,401611	Grade IV
131016	KDB048	Kudusberg	Structures	-32,817083	20,401694	Grade IV
131019	KDB051	Kudusberg	Structures	-32,818278	20,401722	Grade IV
130749	BKRN012	Baakens Rivier	Structures	-32,90325	20,246933	
130750	BKRN013	Baakens Rivier	Stone walling	-32,91305	20,251267	
131021	KDB053	Kudusberg	Structures	-32,818194	20,402694	Grade IV
131022	KDB054	Kudusberg	Natural	-32,854611	20,373167	
131023	KDB055	Kudusberg	Natural	-32,857667	20,367417	
131024	KDB056	Kudusberg	Structures	-32,789667	20,354861	Grade IV
130754	BKRN017	Baakens Rivier 155	Deposit	-32,888917	20,210806	
130755	BKRN018	Baakens Rivier 155	Deposit	-32,889139	20,210639	
131026	KDB057	Kudusberg	Building	-32,80375	20,350111	Grade IIIc
131027	KDB058	Kudusberg	Structures	-32,802889	20,350556	Grade IV
130758	BKRN021	Baakens Rivier 155	Deposit	-32,894722	20,221722	
130759	BKRN022	Baakens Rivier 155	Deposit	-32,894972	20,221528	

131030	KDB061	Kudusberg	Burial Grounds & Graves	-32,801444	20,349722	Grade IIIa
130760	BKRN023	Baakens Rivier 155	Deposit	-32,893528	20,243944	
131031	KDB062		Burial Grounds & Graves	-32,798167	20,353056	Grade IIIa
130761	BKRN024	Baakens Rivier 155	Palaeontological	-32,893694	20,243444	
130762	BKRN025	Baakens Rivier 155	Palaeontological	-32,901278	20,248306	
130763	BKRN026	Baakens Rivier 155	Palaeontological	-32,904194	20,247167	
130764	BKRN027	Baakens Rivier 155	Deposit	-32,919139	20,245806	
131035	KDB066		Stone walling	-32,789944	20,355194	Grade IV
130765	BKRN028	Baakens Rivier 155	Deposit	-32,89375	20,217528	
130766	BKRN029	Baakens Rivier 155	Palaeontological	-32,882806	20,2175	
131036	KDB067	Kudusberg	Structures	-32,789472	20,355556	Grade IV
130767	BKRN030	Baakens Rivier 155	Deposit	-32,880108	20,215539	
131037	KDB068	Kudusberg	Burial Grounds & Graves	-32,78725	20,356417	Grade IIIa
131038	KDB069	Kudusberg	Building	-32,787194	20,356111	Grade IIIc
131039	KDB070	Kudusberg	Structures	-32,78775	20,355222	Grade IV
131044	KDB070	Kudusberg	Artefacts	-32,789611	20,356528	Grade IV
131045	KDB071	Kudusberg	Structures	-32,786528	20,357639	Grade IV
131046	KDB072	Kudusberg	Burial Grounds & Graves	-32,785556	20,358833	Grade IIIa
131047	KDB073	Kudusberg	Burial Grounds & Graves	-32,785528	20,358917	Grade IIIa
131048	KDB074	Kudusberg	Burial Grounds & Graves	-32,7855	20,358889	Grade IIIa
131049	KDB075	Kudusberg	Burial Grounds & Graves	-32,7855	20,358861	Grade IIIa
131050	KDB076	Kudusberg	Burial Grounds & Graves	-32,785444	20,358861	Grade IIIa
131051	KDB077	Kudusberg	Burial Grounds & Graves	-32,785417	20,358889	Grade IIIa
131052	KDB078	Kudusberg	Stone walling	-32,785444	20,358611	Grade IV
131058	KDB084	Kudusberg	Artefacts	-32,792083	20,355333	Grade IV
131059	KDB085	Kudusberg	Structures	-32,789364	20,355633	Grade IV

131060	KDB086	Kudusberg	Structures	-32,789411	20,355494	Grade IV
131061	KDB087	Kudusberg	Structures	-32,789522	20,355591	Grade IV
131062	KDB088	Kudusberg	Structures	-32,789631	20,355891	Grade IV
131063	KDB089	Kudusberg	Structures	-32,789487	20,355724	Grade IV
131064	KDB090	Kudusberg	Structures	-32,789504	20,355792	Grade IV
131065	KDB091	Kudusberg	Structures	-32,789405	20,355552	Grade IV
131066	KDB092	Kudusberg	Structures	-32,787903	20,359372	Grade IV
131067	KDB093	Kudusberg	Structures	-32,788384	20,363416	Grade IV
131068	KDB094	Kudusberg	Structures	-32,787274	20,363537	Grade IV
131069	KDB095	Kudusberg	Structures	-32,787839	20,364278	Grade IV
131072	KDB098	Kudusberg	Rock Art, Artefacts, Deposit	-32,953333	20,335028	Grade IIIa
131074	KDB100	Kudusberg	Structures	-32,864056	20,308778	Grade IIIc
131075	KDB101	Kudusberg	Building	-32,895703	20,330119	Grade IIIc
131076	KDB102	Kudusberg	Artefacts	-32,894958	20,330869	Grade IIIc
131085	KDB110	Kudusberg	Burial Grounds & Graves	-32,915	20,358917	Grade IIIa
131086	KDB111	Kudusberg	Burial Grounds & Graves	-32,913333	20,358889	Grade IIIa
131087	KDB112	Kudusberg	Burial Grounds & Graves	-32,913333	20,358861	Grade IIIa
131096	KDB121	Kudusberg	Structures	-32,802417	20,386667	Grade IV
131099	KDB124	Kudusberg	Structures	-32,802417	20,386667	Grade IV
131100	KDB125	Kudusberg	Structures	-32,93	20,350056	Grade IV
131103	KDB128	Kudusberg	Structures	-32,789472	20,355556	Grade IV
131151	KDB131	Kudusberg	Artefacts	-32,8413	20,33519	
131152	KDB132	Kudusberg	Structures	-32,89313	20,30349	Grade IIIc
131153	KDB133	Kudusberg	Structures	-32,88774	20,26414	Grade IIIc
131154	KDB134	Kudusberg	Artefacts	-32,89265	20,24085	
131155	KDB135	Kudusberg	Structures	-32,88854	20,22665	Grade IIIc

130963	KDB001	Kudusberg	Artefacts	-32,885889	20,268444	
130964	KDB002	Kudusberg	Structures	-32,885889	20,268389	
130965	KDB003	Kudusberg	Structures	-32,886083	20,268333	Grade IIIc
130966	KDB004	Kudusberg	Stone walling	-32,88625	20,268528	Grade IIIc
130967	KDB005	Kudusberg	Structures	-32,888556	20,270611	Grade IIIc
130968	KDB006	Kudusberg	Stone walling	-32,889778	20,276917	Grade IIIc
130969	KDB006a	Kudusberg	Stone walling	-32,889895	20,276256	Grade IIIc
130970	KDB007	Kudusberg	Stone walling	-32,889917	20,278861	Grade IIIc
130972	KDB008a	Kudusberg	Structures	-32,890576	20,282364	Grade IIIc
130973	KDB008b	Kudusberg	Structures	-32,88961	20,283268	Grade IIIc
130974	KDB008c	Kudusberg	Structures	-32,889472	20,284282	Grade IIIc
130978	KDB009	Kudusberg	Geological	-32,89075	20,282472	
130979	KDB010	Kudusberg	Rock Art, Deposit, Artefacts	-32,868111	20,335028	Grade IIIa
130980	KDB011	Kudusberg	Artefacts	-32,886583	20,315417	Grade IIIc
130981	KDB012	Kudusberg	Structures	-32,864056	20,308778	Grade IIIc
130982	KDB013	Kudusberg	Stone walling	-32,893901	20,296531	Grade IIIc
130985	KDB016	Kudusberg	Stone walling	-32,890699	20,278101	Grade IIIc
130986	KDB017	Kudusberg	Building	-32,895704	20,330119	Grade IIIc
130987	KDB018	Kudusberg	Structures	-32,892834	20,302446	Grade IIIc
	KB1	Kudusberg WEF_1	Historical graveyard contains multiple graves; adjacent to the main farm road	-32.75276	20.36311	IIIa
	KB3	Kudusberg WEF_3	Smaller rectangular stone kraal (+-20mx30m) attached to larger kraal (KB2)	-32.75205	20.36413	IIIC
	KB4	Kudusberg WEF_4	Stone Kraal	-32.75301	20.36333	IIIC
	KB5	Kudusberg WEF_5	Dumping sites (holes)	-32.75309	20.36280	NCW
	KB6	Kudusberg WEF_6	Stone ruin	-32.75342	20.36279	IIIC

	KB7	Kudusberg WEF_7	Stone house consists of three rooms and a fireplace.	-32.75393	20.36296	IIIC
	KB8	Kudusberg WEF_8	Modern Homestead	-32.75397	20.36359	NCW
	KB11	Kudusberg WEF_11	Chert flake	-32.75990	20.36430	NCW
	KB12	Kudusberg WEF_12	Possible quartzite artefact	-32.76279	20.36333	NCW
	KB14	Kudusberg WEF_14	Stone walling?	-32.78738	20.36327	NCW
	KB15	Kudusberg WEF_15	Historical rubbish scatter (next to KB16)	-32.78747	20.36341	IIIC
	KB16	Kudusberg WEF_16	Stone house consists of 4 rooms and chimney	-32.78773	20.36357	IIIC
	KB18	Kudusberg WEF_18	Stone House consists of three rooms	-32.78854	20.36370	IIIC
	KB19	Kudusberg WEF_19	Chert flake	-32.80815	20.36676	NCW
	KB20	Kudusberg WEF_20	Possible greywacke artefact	-32.88588	20.35886	NCW
	KB21	Kudusberg WEF_21	Chert adze, single piece no other artefacts evident	-32.8413	20.33519	NCW
	KB24	Kudusberg WEF_24	Chert core, Only minor flaking around edges	-32.89265	20.24085	NCW

APPENDIX 3:

Kudusberg Landowner Details

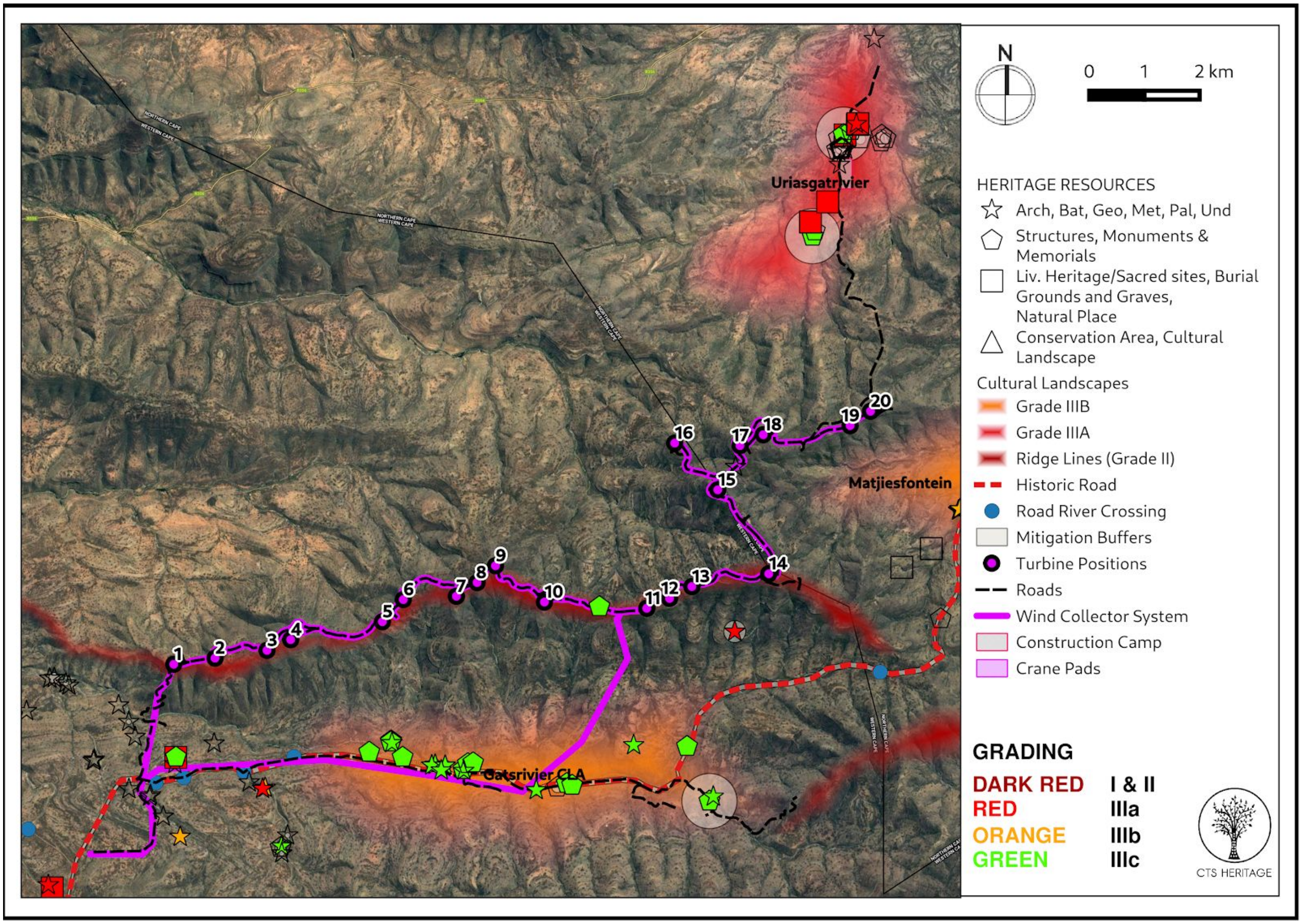
<table>
<tr><th>Owner / Lessor</th><th>Properties</th><th>c/o (main contact)</th><th>Landline</th><th>Cell</th><th>Fax</th><th>Postal Addr</th><th>Physical Addr</th><th>Email address</th></tr>
<tr><td>Frans Du Toit Trust</td><td>RE/158 Amandelboom</td><td>Francois du Toit (Snr)</td><td>023 5511704</td><td>084 5811063
Fanie: the son.</td><td></td><td>PO Box 1
Laingsburg
6900</td><td>Exelsior
Laingsburg
6900</td><td>adutoit8@gmail.com</td></tr>
<tr><td>De List Trust</td><td>6/193 Urias Gat</td><td>Dirkie Bothma / Son - Klein Dirkie (084 585 8424)</td><td>023 571 2010 (Sutherland)
023 572 1074 (site/winter)</td><td>082 744 8087
083 2188 185</td><td>n/a</td><td>Posbus 91,
Sutherland
6920</td><td>Voelfontein,
Sutherland</td><td>dirkiebotha@gmail.com</td></tr>
<tr><td>Koedoesfontein Trust</td><td>4/193 Urias Gat
1/158 Amandelboom</td><td colspan="7">See above</td></tr>
<tr><td rowspan="2">Hendrik Jakobus Visser</td><td rowspan="2">RE/156 Gats Rivier
1/156 Gats Rivier
RE/159 Oliviers Berg</td><td>Hennie Visser</td><td>023 231 0876 (w)
023 231 1872 (home/Wolseley)
087 802 8440(Gatsrivier)</td><td>082 578 0940</td><td rowspan="2">086 606 8297</td><td rowspan="2">PO Box 125,
6830
Wolseley</td><td rowspan="2">Twistniet.,
Wolseley</td><td rowspan="2">anetenhenni@worldonline.co.za</td></tr>
<tr><td>Anet Boltman (partner)</td><td>023 231 0976</td><td>082 875 9016</td></tr>
<tr><td>P U UYS Familie Trust</td><td>1/159 Oliviers Berg</td><td>Pieter Uys</td><td>023 358 1218 (site)</td><td>081 270 8965</td><td></td><td>Posbus 327
Gordons Bay
7151</td><td>14 kalben (lizandra somerset wes)</td><td>pietmika@gmail.com</td></tr>
<tr><td>Spitskop Trust</td><td>2/157 Riet Fontein
2/156 Gats Rivier
1/157 Riet Fontein</td><td>Thinus (Marthinus) van der Merwe</td><td>023 317 0703 (w)</td><td>083 444 9752</td><td>023 317 0774
086 721 3765 (w)</td><td>PO Box 13,
6836
Kouebokkeveld</td><td>Ceres Fonteintjie Boerdery,
Kouebokkeveld</td><td>admin@fonteintjie.co.za</td></tr>
<tr><td>Johan Le Roux</td><td>RE/193 Urias Gat</td><td>n/a</td><td>023 551 1730</td><td>071 001 6887 / Irene: 062 588 6389</td><td></td><td></td><td>Boesmansfontein,
Laingsburg</td><td>boesmansfontein@gmail.com / ireneleroux6@gmail.com</td></tr>
<tr><td rowspan="2">D.R VD Walt and J.H Hamman</td><td rowspan="2">395 Kilpbanks Fontein</td><td>Daneel Rousseau van der Walt</td><td>021 913 4606 (defunct)
012 664 6664 (Hear Us)</td><td>0832706347 (Hear Us)</td><td></td><td></td><td></td><td></td></tr>
<tr><td>John Hamman</td><td>00264 81 143 9607
021 912 2960 (Durbanville Office)</td><td>+264 81 143 9607
079 250 4106 (SA)</td><td>+26 461 378 844</td><td></td><td></td><td>john@pointbreak.com.na
susanjohnhamman@gm</td></tr>
</table>

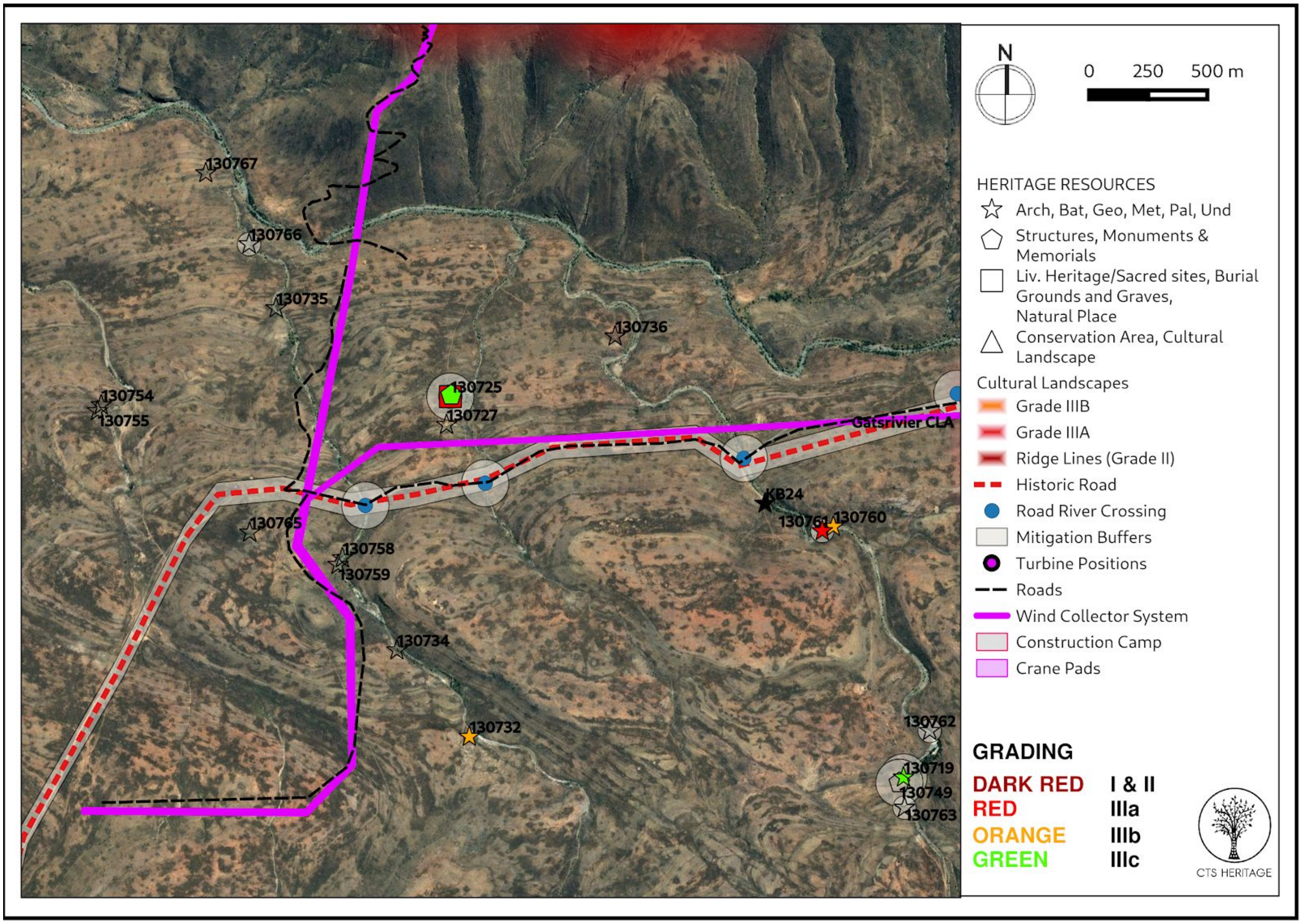
								ail.com
M M Esterhuyse Trust	RE/194 Matjiesfontein	Carli du Plessis (main trustee)		082 442 5354		stasieweg 163, Brackenfell, 7560		carlie@sun.ac.za stefanievzyl@gmail.com
		Duppie du Plessis (husband / main contact)	hartebeesfontein@roggeveld.co.za, dehoop@roggeveld.co.za - *two tenants on farm Carlie asked that we keep them informed of any site visit related activity*	082 467 5635				
J & B Trust	RE/196 Karree Kloof	Jaapie Bothma	021 919 2254	083 447 8874	086 276 1460		12 Raphael Crescent, Stellenberg, Durbanville	bothma1966@gmail.com
		Bernise Bothma		083 457 5756				berniseph@gmail.com
Van Der Vyver (CJ) Trust	RE/161 Muishond Rivier	Dawie vd Vyver (son)		084 381 7281		P.O.Box 39, Laingsburg, 6900		svdv@lantic.net / dvdv@lantic.net
Charl Gerhardus du Plessis	1/196 Karre Kloof		023 5511 222	082 651 7465		39 Soutkloof Street, Laingsburg 6900	39 Soutkloof Street, Laingsburg 6900	charl@agrisell.co.za

CTS HERITAGE

APPENDIX 4:

Mitigation Maps





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HERITAGE RESOURCES
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Structures, Monuments & Memorials
Liv. Heritage/Sacred sites, Burial Grounds and Graves, Natural Place
Conservation Area, Cultural Landscape
Cultural Landscapes
Grade IIIB
Grade IIIA
Ridge Lines (Grade II)
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Road River Crossing
Mitigation Buffers
Turbine Positions
Roads
Wind Collector System
Construction Camp
Crane Pads
GRADING
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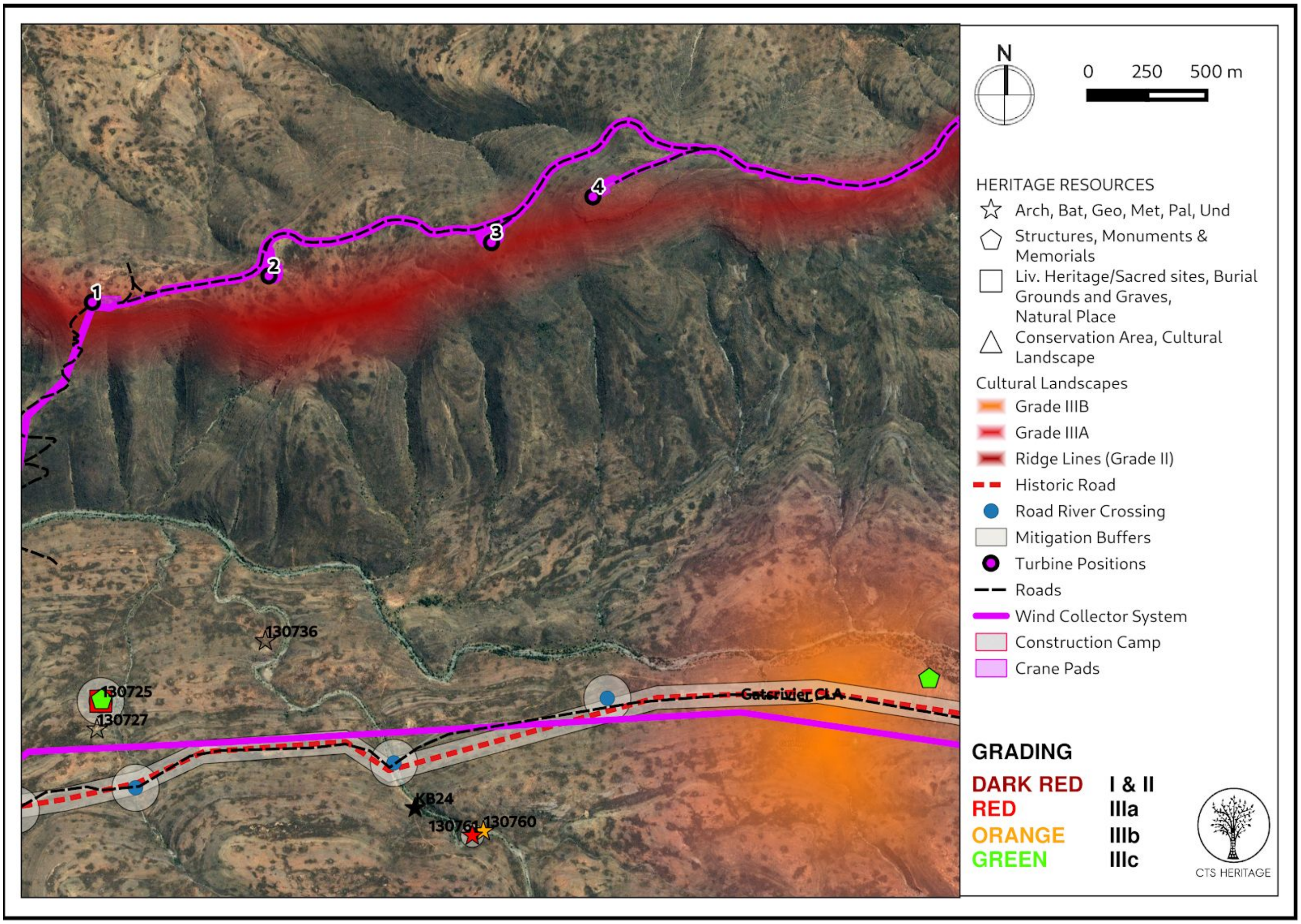
RED IIIa
ORANGE IIIb
GREEN IIIc
CTS HERITAGE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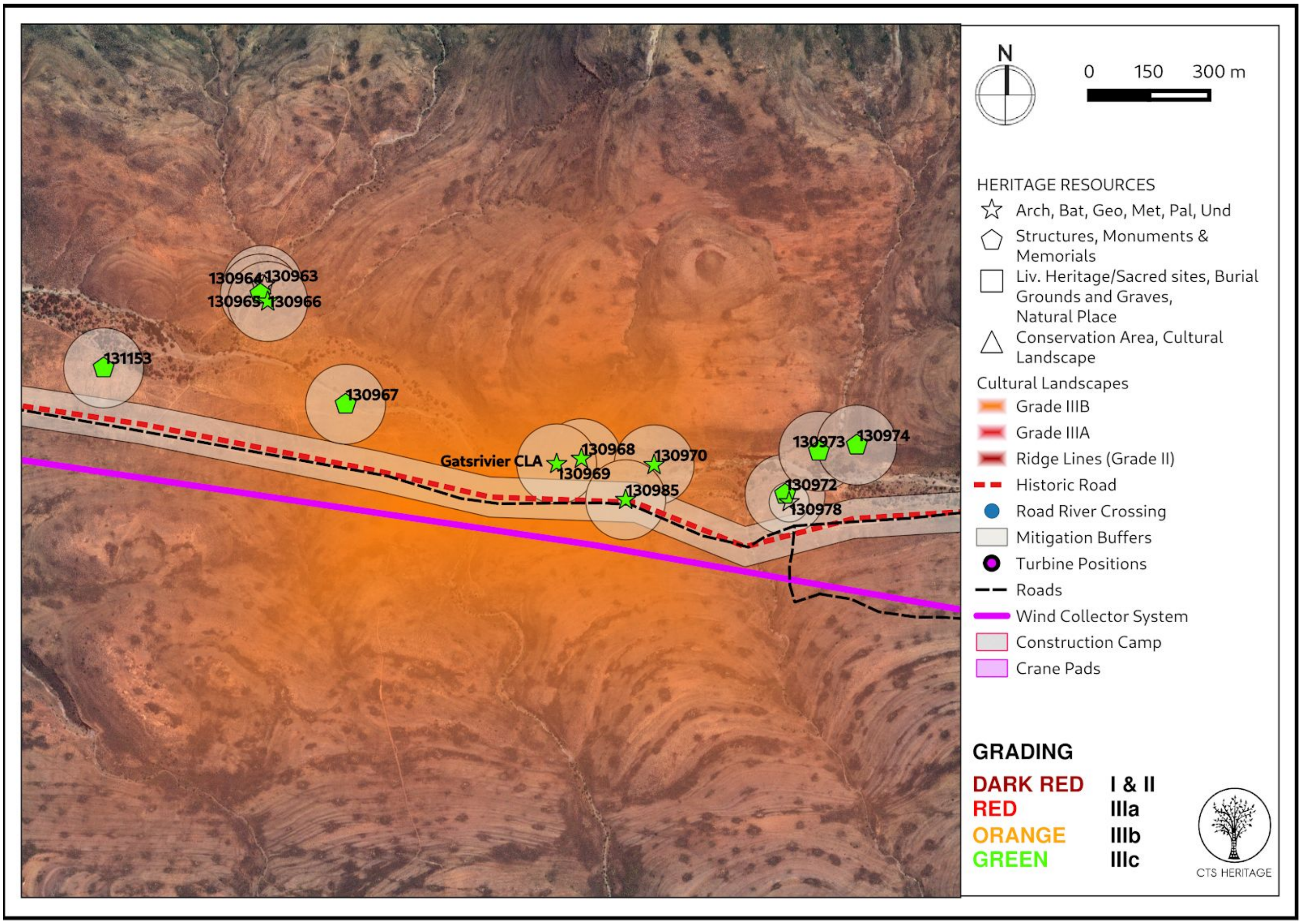

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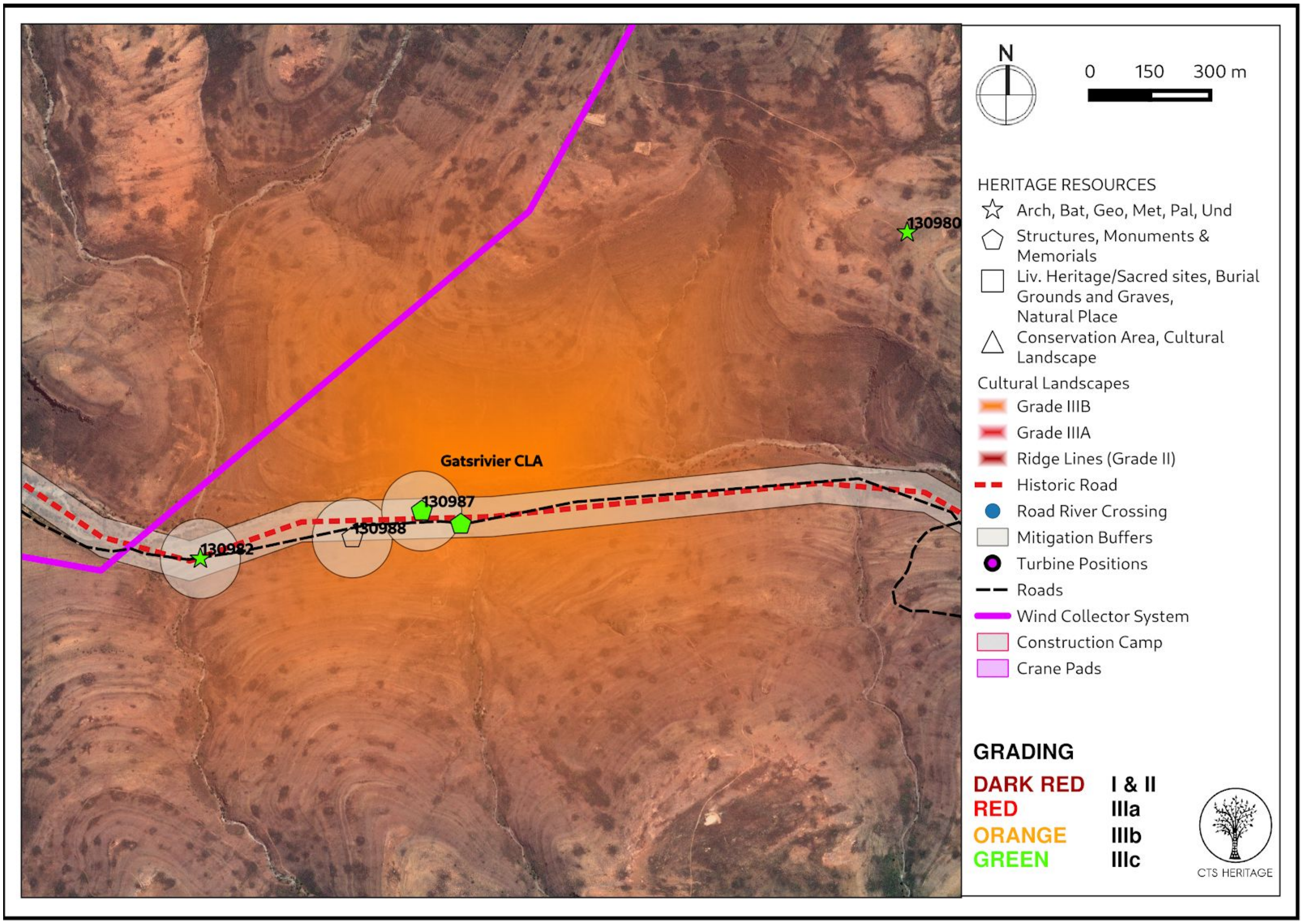

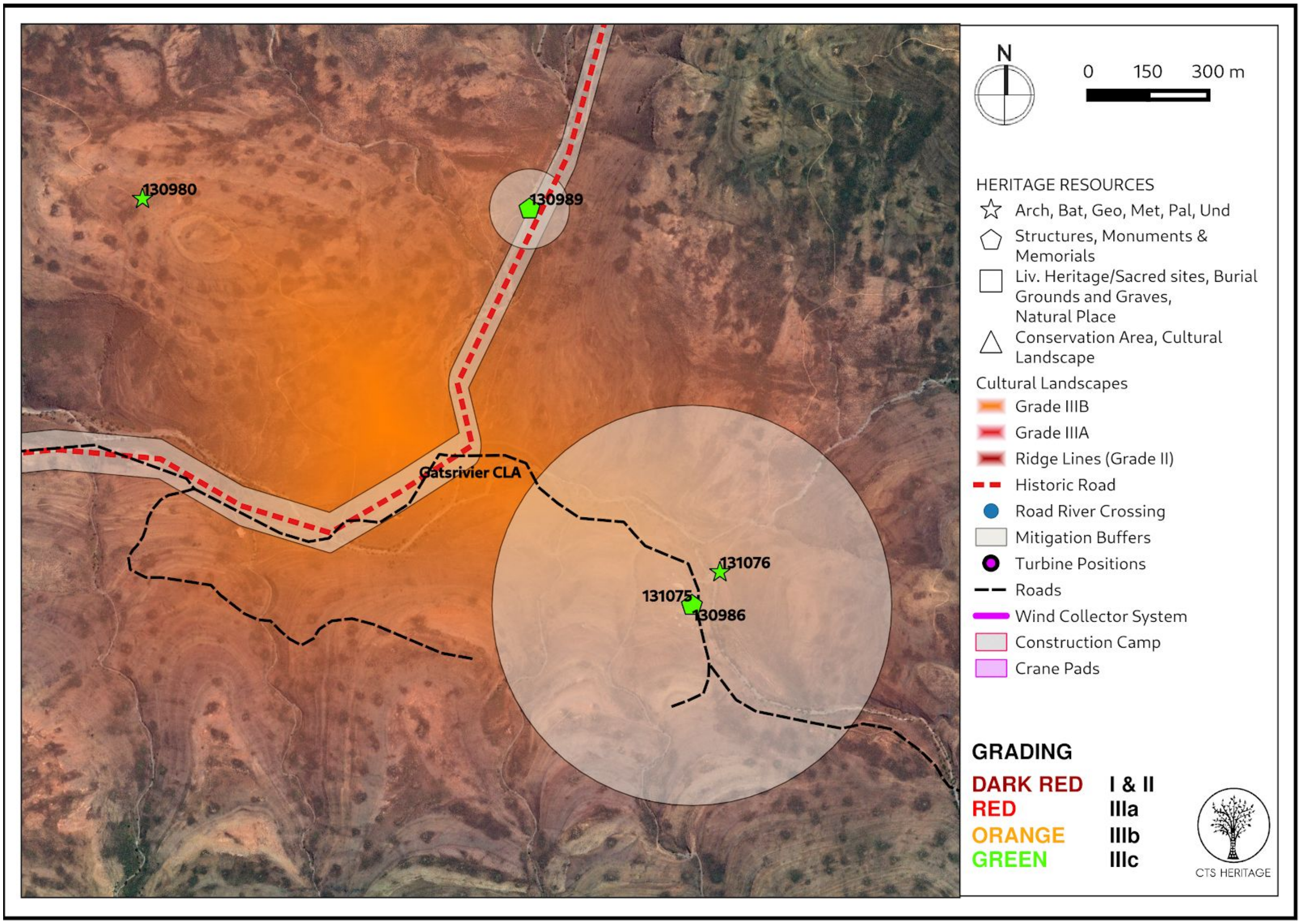
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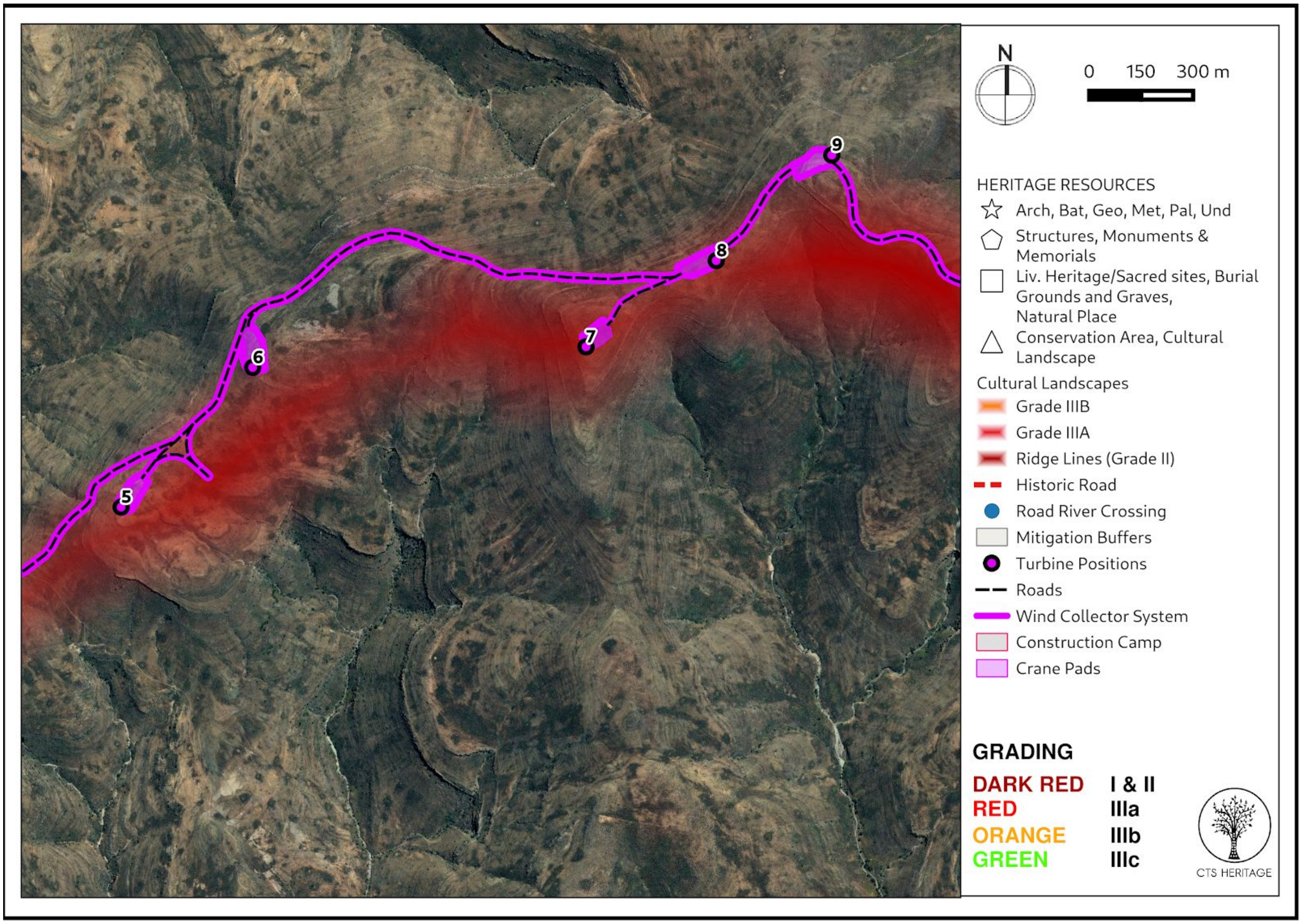

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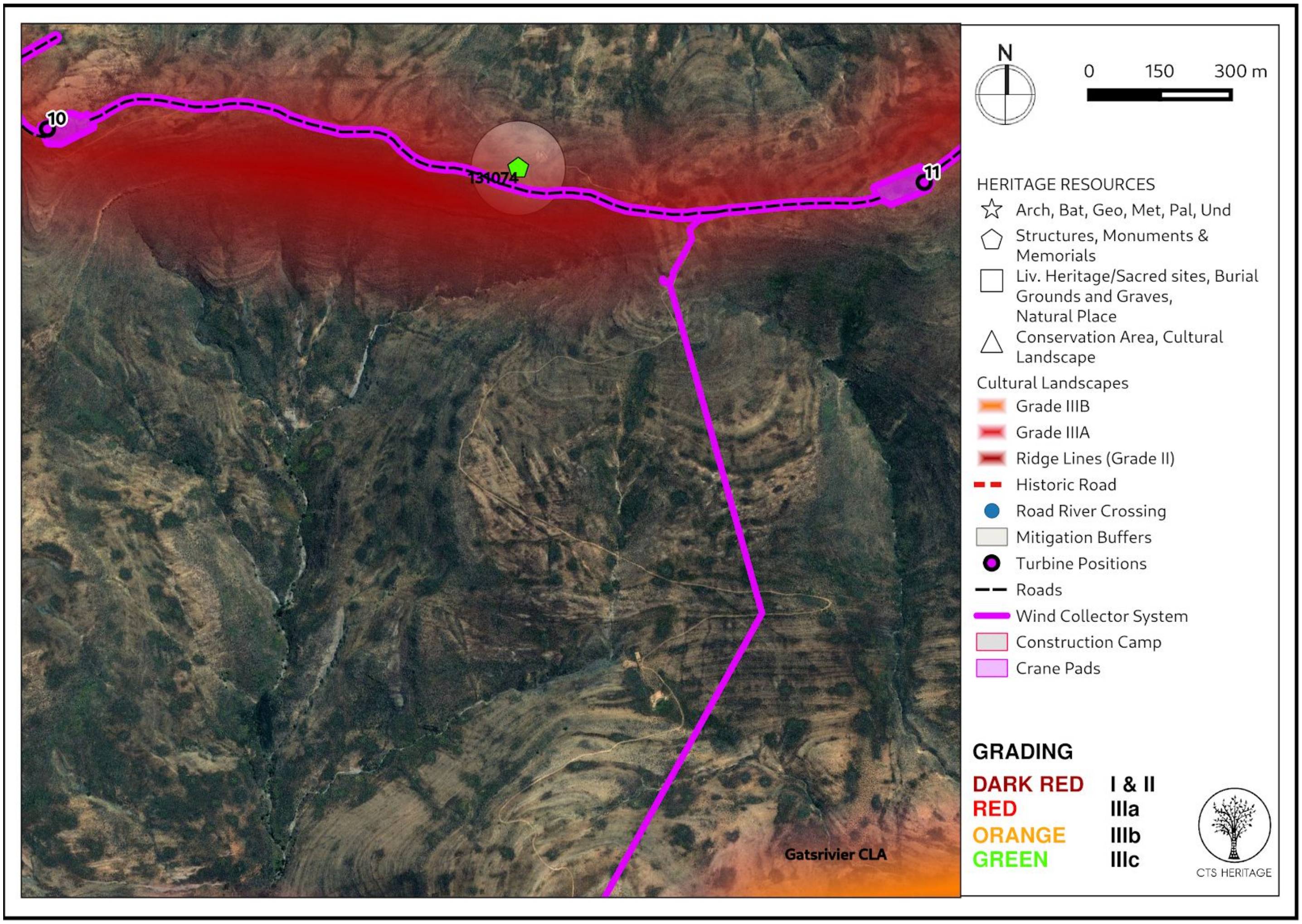

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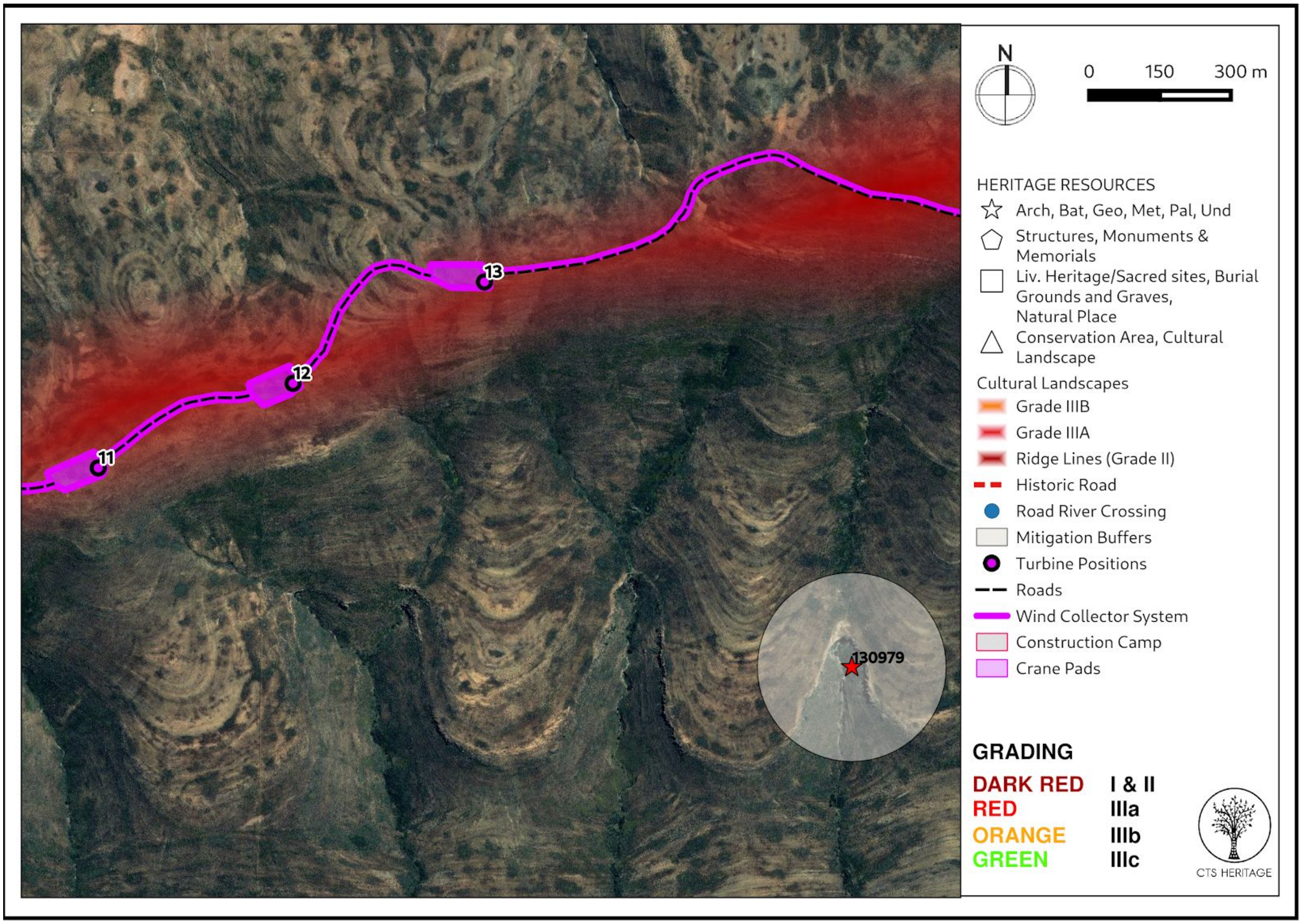

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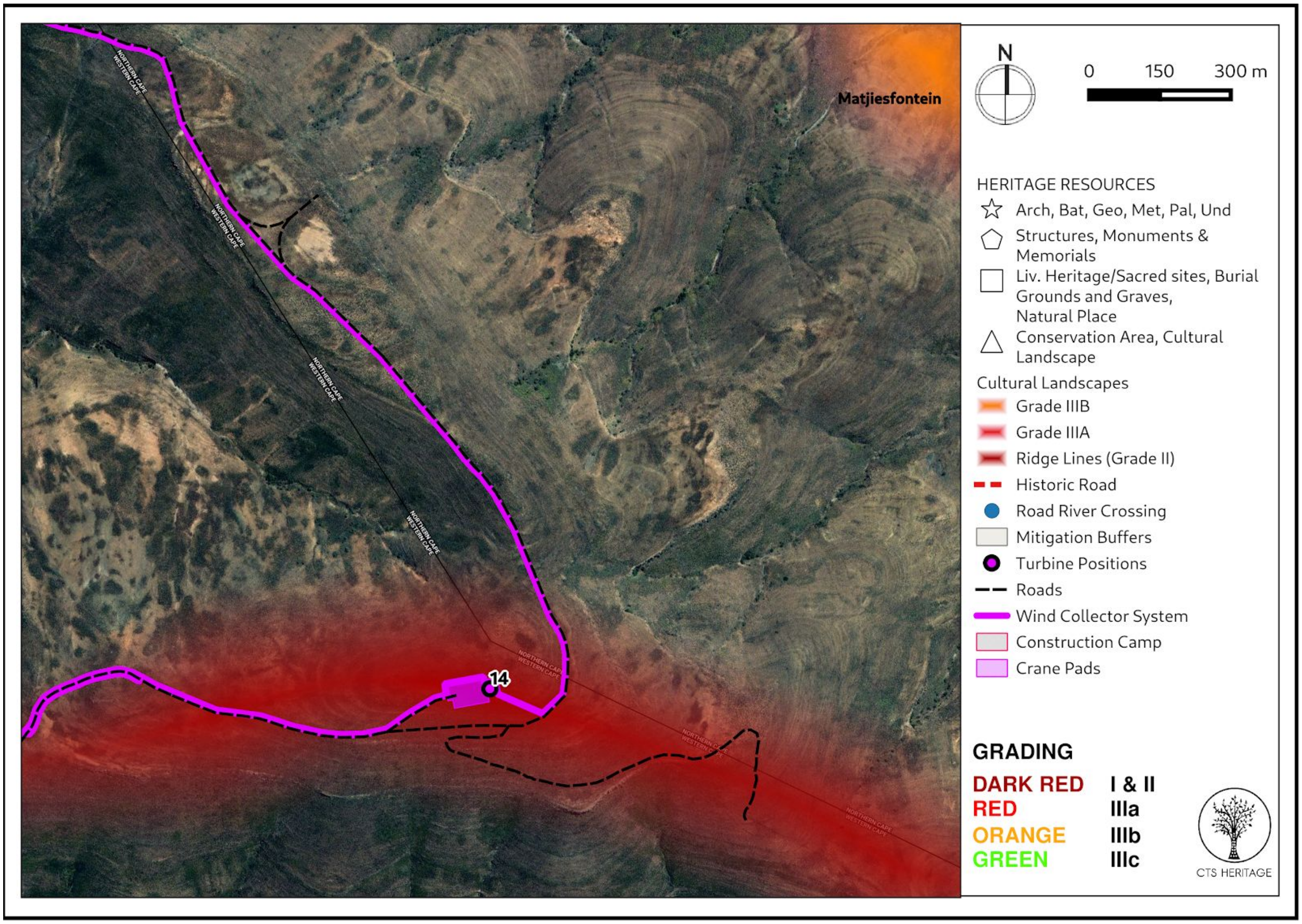

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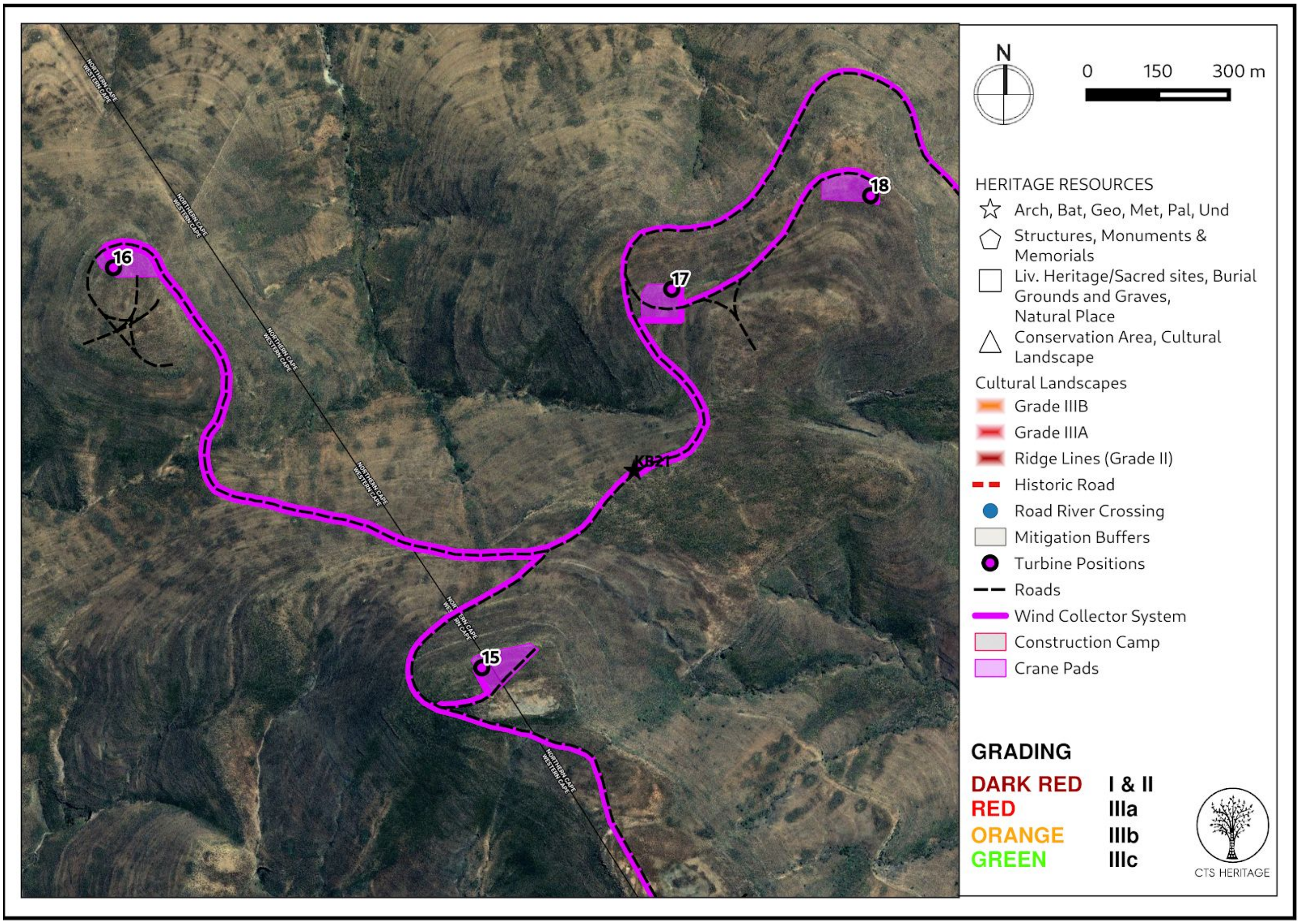

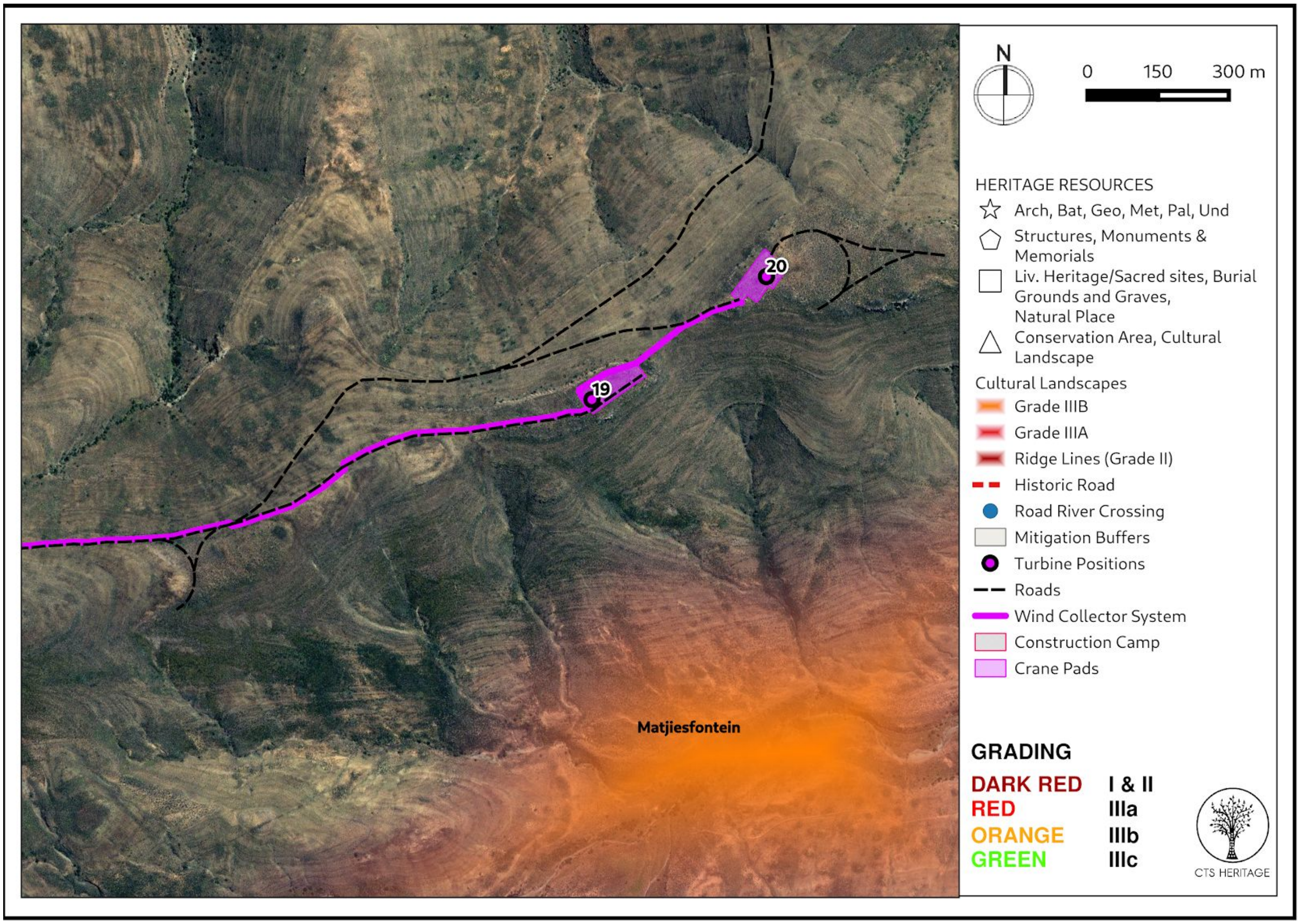
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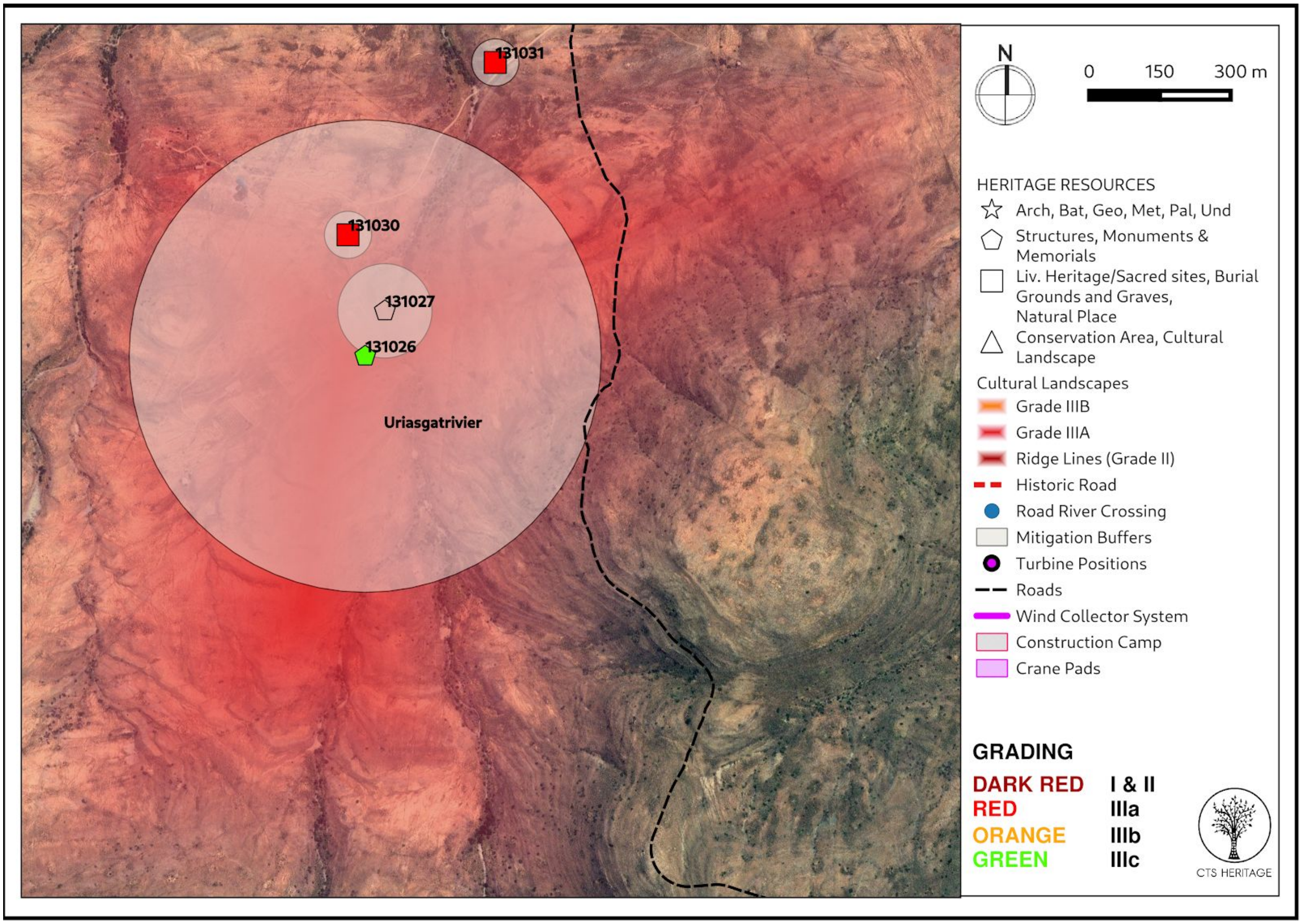
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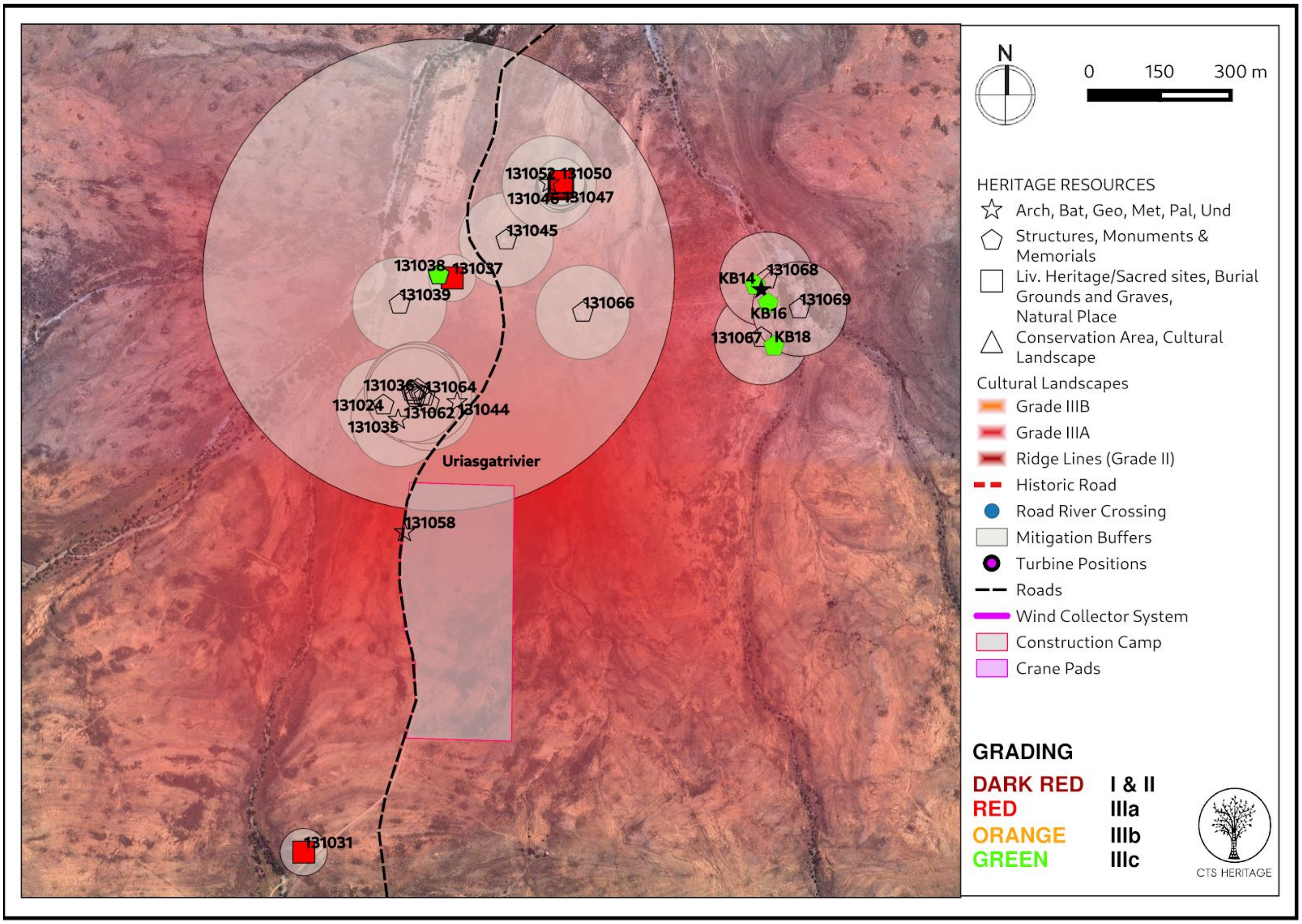

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