APPENDIX 1
EXPERTISE OF EAP AND PROJECT TEAM (CVS)

CURRICULUM VITAE

STUART HEATHER-CLARK

TECHNICAL DIRECTOR
AFRICA POWER SECTOR LEAD

Environmental Management Planning & Approvals, Africa

QUALIFICATIONS

Masters	1996	Environmental Science
BSc (Hons)	1992	Civil Engineering

EXPERTISE

- Environmental and Social Impact Assessment
- Environmental Management Plans/Programmes
- Public Participation & Facilitation
- Environmental & Social Due Diligence
- Environmental & Social Screening & Site Selection
- Training and Capacity Building
- Strategic Environmental Assessment

Stuart has over 24 years of environmental and social consulting experience in Africa. Having worked on over 100 development projects in Africa, his key strength is identifying and managing ESG risks for major capital projects from the concept phase through to the pre-feasibility, feasibility and implementation phases.

Through leading Environmental & Social Screening Studies, Environmental & Social Impact Assessments and Environmental & Social Due Diligences for major capital project in over 13 African countries; Stuart has developed a deep appreciation of key sustainability challenges facing development in Africa. He has excellent project management skills with the ability to manage projects from the concept phase through to project completion.

Stuart has worked for and with a number of IFI's, DFI's and PE firms to identify and managing ESG risks of their investments in Africa. He has an integral knowledge of the Equator Principles and IFC Performance Standards and understands the expectations of lenders and financial institutions when it comes to managing ESG risks.

Stuart has worked across various sectors including O&G, mining, infrastructure and power. Over the past eight years he has focussed on the power sector leading projects for wind farms, solar PV plants, hydropower plants and gas to power plants. He has an integral understanding of the Independent Power Producers (IPP) process in South Africa and several other African counties.

PROJECTS

	All projects
Environmental and Social Impact Assessment for a 20MW solar PV plant and transmission line, Gigawatt Global, Liberia, (2020)	Project Director for the ESIA a 20MW solar PV plant and associated transmission line. The ESIA includes biodiversity, social and heritage baseline studies, stakeholder engagement and compilation of an ESIA Report and ESMP. The ESIA will be aligned with the IFC Performance Standards.
ESIA for an 80-200 MW wind farm development, Mphepo Power, Zambia (2019-20)	Project Director for the ESIA for the development of a wind farm in Zambia. The ESIA included terrestrial and aquatic, social, heritage, noise and visual baseline studies, stakeholder engagement and compilation of an ESIA Report and ESMP. The ESIA was aligned with the IFC Performance Standards.

Environmental and Social Impact Assessment for a Road Upgrade, QGMI, Ghana, (2019-20)	Project Director for the Scoping Phase of the Environmental and Social Impact Assessment process for the proposed Winneba Obetsebi-Lamptey Flyover (Phase 2) project in Accra, Ghana in collaboration with local consultants. The project included additional visual impact assessment, air quality modelling and noise modelling. All work undertaken to IFC Performance Standards.
Environmental and Social Impact Assessment (ESIA) for the Gamsberg Mine Zinc Smelter, Black Mountain Mine (Vedanta), South Africa (2019-20)	Project Director for the ESIA for a new zinc smelter and associated infrastructure to beneficiate the 250 000 to 300 000 tpa of zinc concentrate produced at the Gamsberg Zinc Mine Phase-1 concentrator plant. The ESIA included extensive baseline studies including biodiversity, social, air quality, noise, visual, hydrology, geohydrology, and climate change. The process included extensive stakeholder engagement during the scoping and impact assessment phase.
ESIA Scoping Phase for the desalination plant and water carrier system, NamWater, Windhoek Namibia (2019-20)	Team member for the ESIA Scoping Phase for the proposed desalination plant and water carriage system to secure water supply to the central coast, Windhoek and en-route users. The Scoping Process included extensive stakeholder engagement and the Scoping Report was aligned with the KfW Sustainability Guidelines and World Bank Environmental and Social Standards.
Environmental & Social Due Diligence for 5MW solar PV plant, Confidential Client, Namibia (2019)	Project Director for an Environmental and Social (E&S) Due Diligence (Red Flags only) of a 5 MW solar PV facility located near Outapi, Namibia.
Environmental & Social Screening Study for 20MW solar PV plant, CIGenCo, Eswatini (2019)	Project Director for an Environmental and Social (E&S) Screening Study of two potential sites for development of solar PV projects as part of CIGenCo's bid as part of the Eswatini Independent Power Producers Policy (ESIPPP).
Permitting Strategy and Planning for the Rovuma LNG Project in Mozambique, ExxonMobil, Mozambique (2018-2019)	Team member supporting Exxon with the permitting strategy and plans for the Rovuma LNG Project in northern Mozambique.
Environmental and Social Impact Assessment (ESIA) Gap Analysis for a 50MW solar PV Plant, Volt Renewable, Zimbabwe (2018)	Environmental lead for the review of the locally approved EIA against the IFC Performance Standards. Gaps were identified and an Environmental and Social Action Plan (ESAP) developed to close the gaps.
Environmental and Social Impact Assessment (ESIA) Gap Analysis for a 5-star hotel development, Motal-Engil, Zimbabwe (2018)	Environmental lead for the review of the locally approved EIA against the IFC Performance Standards. Gaps were identified and an Environmental and Social Action Plan (ESAP) developed to close the gaps.

Environmental and Social Screening Study for a 100MW hybrid HFO and Solar PV Power Plant for a mine in Mali, Confidential client (2018)	Environmental lead for the screening of environmental and social risks for the development of a solar PV plant on a mine in Mali.
Environmental and Social Screening Study for 3 x 40MW solar PV plants, Confidential Client, GETFiT Zambia (2018)	Project Manager for an environmental and social screening study for 3 x solar PV sites in Zambia. The Screening Study included the review of desk top information and site visits to assess environmental and social risks. A comparative analysis was undertaken to select the site with the least environmental and social risks. This was combined with the technical analysis to select the preferred site to be taken into more detailed studies.
Environmental and Social Impact Assessment for a 40MW solar PV farm, Enel Green Power, South Africa (2017)	Project Director for an Environmental and Social Impact Assessment for a 40MW solar PV plant in South Africa. The study included scoping and stakeholder engagement, various specialist studies and the compilation of an ESIA Report and ESMP.
Environmental and Social Impact Assessment for 2 run-of-river Hydropower Plants and associated transmission lines in Northern Zambia, Globeleq, Zambia (2017)	Project Director for an Environmental and Social Impact Assessment for 2 run-of-river hydropower plants and associated transmission lines on the Kalungwishi River in Northern Zambia. The study included scoping and stakeholder engagement, various specialist studies including environmental flow, heritage, social, biodiversity, visual, noise and other studies. All work was undertaken to IFC Performance Standards. The project was put on hold after the baseline and Scoping Phase.
Environmental and Social Screening Study for an 212MW HFO Power Plant, Confidential Client, Angola (2017)	Project Director for an Environmental and Social Screening Study for a 212MW HFO Power Plant in Angola. The study included noise and air quality baseline sampling, soil and groundwater baseline sampling, community health screening, and the compilation of a detail legal register and compliance road map.
Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon (2017)	Environmental and Social Screening Study for a Hydropower Plant in Gabon, Confidential Client, Gabon, 2017
Environmental and Social Due Diligence (ESDD) for two Solar PV and two Wind Farm Projects South Africa, Confidential Client, South Africa (2017)	Project Director for the ESDD for two Solar PV and two Wind Farm Projects in South Africa.
Environmental, Health and Safety Risk assessment of four Solar PV sites in South Africa, Enel Green Power, South Africa (2017)	Project Director for the EHS Risk Assessments.
Environmental and Social Impact Assessment for a 100MW to 250MW solar PV Plant, Globeleq, Zambia (2016-17)	Project Director for an Environmental and Social Impact Assessment for a 100MW to 250MW solar PV plant in Zambia. The study included the analysis of key environmental and social impacts, compilation of an ESIA and ESMP reports and stakeholder engagement.

Environmental and Social Screening Study for a solar PV Plant, Confidential client, Zambia (2016)	Project Director for an Environmental and Social Screening Study for the establishment of solar PV power plant in Zambia. The study included the analysis of key environmental and social risks including regulatory, biodiversity and social risks.
Environmental and Social Due Diligence, Six Solar PV Farms, Confidential Client, South Africa (2016)	Project Director for an ESDD for six solar pv farms is South Africa. The ESDD was undertaken against SA Legislation and Regulations and IFC Performance Standards.
Environmental and Social Impact Assessment for a CCGT Power Plant, ArcelorMittal, South Africa (2016)	Project Director for an Environmental and Social Impact Assessment study for the establishment of a CCGT power plant for ArcelorMittal in Saldanha Bay, South Africa. The ESIA includes detailed specialist studies including air emissions modelling, noise modelling, biodiversity and heritage assessment. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Management Plans, Wind Farm Development, Confidential Client, Kenya (2016)	Project Director and involved in advising the client on various strategies including vantage point bird monitoring and management plan development.
Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast (2016)	Environmental and Social Screening Study of potential solar PV sites, Confidential Client, Ivory Coast, 2016
Environmental and Social Impact Assessment for the Tete-Macuse Railway Line and Macuse Power Development, Italthai, Mozambique (2015-17)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Tete-Macuse railway line and Macuse Port development for the export of coal from Tete Province in Mozambique. The project included the development of over 700km of railway line and a new port development.
Strategic Environmental Assessment for the supporting infrastructure for the Baynes Hydropower Project, Baynes PJTC, Namibia/Angola (2014-15)	Project Director for the Strategic Environmental Assessment of the associated infrastructure for the Baynes hydropower project. The SEA covered the assessment of access roads for construction, transmission lines routing in Angola and Namibia and locations of an airfield.
Cumulative Impact Assessment of the development of numerous hydropower plants on the Kwanza River, Odebrecht, Angola (2014-15)	Project Director for the Cumulative Impact Assessment of the development of a number of hydropower plants on the Cuanza River in Angola.
Environmental and Social Impact Assessment for the Batoka Gorge Hydropower Project, ZRA, Zambia/Zimbabwe (2014-15)	Advisor to the ESIA team undertaking the Environmental and Social Impact Assessment (ESIA) for the proposed Batoka Gorge Hydropower Plant on the Zambezi River below the Victoria Falls. The project includes the construction of a dam wall, hydropower plants, transmission lines and associated infrastructure. The ESIA is being conducted in alignment with the IFC Performance Standards and the World Bank Safeguard Policies.
Environmental and Social Impact Assessment for the Rehabilitation of the Kariba Dam Wall, ZRA, Zambia/Zimbabwe (2014-15)	Project Director for the Environmental and Social Impact Assessment (ESIA) for the proposed Kariba Dam Rehabilitation Project. The project includes the rehabilitation of the plunge pool and spillway of the dam wall. The project is being funded by the World Bank, African Development Bank and the EU.

Environmental and Social Due Diligence (ESDD) for a 98 MW wind farm in South Africa, Confidential Client, South Africa (2015)	Project Director for the ESDD.
Environmental and Social Due Diligence (ESDD) for a 2 x 75 MW solar pv farm in South Africa, Confidential Client, South Africa (2015)	Project Director for the ESDD.
Environmental and Social Due Diligence (ESDD) for a 74 MW wind farm in South Africa, Confidential Client (2015)	Project Director for the ESDD.
Environmental and Social Screening Study for a CCGT Power Plant, Confidential Client, South Africa (2015)	Project Director for an Environmental and Social Screening study for the establishment of a gas power plant in Saldanha Bay, South Africa. The screening study outputs included a permitting strategy, environmental opportunities and constraints maps, and input into the site selection process.
Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa (2015-16)	Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Richards Bay in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for Floating Power Plants in the Port of Richards Bay, Department of Energy IPP Office, South Africa, (2015-16)	Project Director for the ESIA for the establishment of Floating Power Plants in the Ports of Saldanha in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for LNG Import Terminal in the Port Richards Bay for the Gas to Power Programme, Department of Energy IPP Office, South Africa (2015-16)	Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE's Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Impact Assessment for LNG Import Terminal in the Port Saldanha for the Gas to Power Programme, Department of Energy IPP Office, South Africa, (2015-16)	Project Director for the ESIA for the establishment of LNG Import Terminals as part of the DoE's Gas to Power Programme in South Africa. The ESIA includes detailed specialist studies including marine outfall modelling, air emissions modelling and marine ecology studies. Full stakeholder engagement is also part of the scope of work.
Environmental and Social Screening study for the establishment of an CCGT power plant in the Ports of Richards Bay, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Richards Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.

Environmental and Social Screening study for the establishment of an CCGT power plant in the Port of Saldanha, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of a CCGT power plant in Saldanha Bay, South Africa. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing and compares the opportunities and constraints associated with the two locations.
Environmental and Social Screening study for the establishment of an SCGT power plant in the Ports of Saldanha, Confidential client, South Africa (2015)	Project Director for an Environmental and Social Screening Study for the establishment of an SCGT power plant in the Port of Saldanha. The study included the analysis of key environmental and social risks including air emissions, effluent emissions, biodiversity (terrestrial and marine) and social issues. The assessment applies to the power plant site, transmission line routing and pipeline routing.
Environmental and Social Impact Assessment for the Burgan Oil Fuel Storage Deport in the Port of Cape Town, Burgan Oil, South Africa (2014-15)	Project Director for the ESIA for the Burgan Oil Fuel Storage Deport in the Port of Cape Town.
Millennium Challenge Account – Malawi: Infrastructure Development Project – Energy Sector (hydropower plants, transmission and distribution lines and substations), MCC, Malawi (2014-15)	Environmental Lead for the Independent Engineer to review all the Contracting Engineers environmental and social studies associated with the Infrastructure Development Project. The project includes the upgrade and development of new power infrastructure including hydropower plants, transmission lines, distribution lines and substations.
Strategic Environmental Assessment of the New Town Integrated Development Zone, TFM Mining, Katanga Province, DRC (2014)	Project Director for the Strategic Environmental Assessment of the New Town Integrated Development Zone undertaken for Tenke Fungurume Mining (TFM) in Katanga Province, DRC.
Environmental and Social Impact Assessment (ESIA) for the Gamsberg Zinc Mine, South Africa, Black Mountain Mine (Vedanta) (2012-13)	Project Director for the Environmental and Social Impact Assessment for a new Zinc Mine in the Northern Cape Province in South Africa. The ESIA includes the assessment of the mine and all associated infrastructure including waste rock dumps, tailing dams, processing plant, transmission lines, a new township development, upgrade of a water pipeline and associated water treatment facilities, and transport options to the Port of Saldanha via both road and rail. The ESIA is being undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act. The process includes various specialist studies, full stakeholder engagement as well as integration with a Biodiversity Off-sets process.
Environmental and Social Impact Assessment for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure, South Africa (2012)	Project Director for the ESIA for the Expansion of Transnet's existing Manganese Ore Export Railway Line and Associated Infrastructure in the Northern and Eastern Cape, South Africa.

Ore Line Expansion Project for the Sishen-Saldanha Ore Line and Port of Saldanha, various Mining Companies and Transnet, South Africa (2011-2012)	Project Director for the Environmental and Social Screening Study for the Pre-feasibility Phase of the Ore Line Expansion Project. This included compiling a detail Environmental and Social Design Criteria Report together with initial Stakeholder Engagement. A detailed multi-criteria assessment for various port and stockpile options was undertaken. The project included upgrading over a 1000 km of railway line and upgrading the port facilities including stockpiles, stacker-reclaimers, conveyors and ship loading facilities. The stakeholder engagement process was specifically designed to obtain buy-in from stakeholder who were strongly opposed some components of the port and rail expansion.
Strategic Environmental Assessment for the Mozambican Regional Gateway Programme, MRGP, Mozambique, Malawi, Zambia, Zimbabwe (2012)	Project Director for the SEA of the MRGP. The MRGP aims to support the improvement of the Southern African transport (roads, rail and ports), regional infrastructure network, which uses Mozambique as a gateway for international trade. The MRGP geographic scope encompasses the Beira and Nacala Transport Corridors and the respective links to the Maputo and Limpopo Corridors. The SEA identified environmental and social issues that need to be considered in the long terms planning an implementation of the rail and port infrastructure that makes up the Beira and Nacala Transport Corridors.
Strategic Environmental Assessment (SEA) for the coastline of Mozambique, MICOA, Mozambique (2012)	Adviser on the SEA for the coast of Mozambique. The SEA aims to identify potential conflicts between various uses of the coastal zone and to recommend strategic interventions to facilitate sustainable development within the coastal zone. Various users of the coastal zone that are being considered include off-shore oil and gas operations, coastal mining, tourism, conservation and artisanal and industrial fishing.
Environmental and Social Screening Study for port options in Pemba Bay, Anadarko, Mozambique (2012)	Project Lead for an Environmental and Social Screening Study for various port options in Pemba Bay. The screening study includes a multi-criteria assessment of various port locations taking into account marine and terrestrial ecology, social issues, land ownership, legal aspects and physical marine conditions.
Environmental and Social Impact Assessment for a LPG import and distribution facility, Sunrise Energy, South Africa (2011-2012)	Project Director for the Scoping/EIA for a LPG importation, storage and distribution facility which includes a marine offloading facility in Saldanha Bay, a pipeline and a storage facility. The environmental permitting process required the liaison with local and provincial environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
Environmental and Social Screening Study for a Mine development in Angola, Confidential Client, Angola (2011-2012)	Project Director for the Environmental and Social Screening Study for the Concept Phase for a new mine development in Angola. The study included identifying environmental and social risks to the project and costing a full ESIA according to IFC Performance Standards and Equator Principles.
Equator Principles and IFC Performance Standards Training, Vedanta Resources Plc, Zambia (2012)	Lead facilitator of a 5-day training course on the implementation of the Equator Principles and IFC Performance Standards for a number of Vedanta's mining operations across Southern Africa, Europe and Australia.
Environmental and Social Impact Assessment for the upgrade of the Principe Airport, HBD, Principe (2011-2012)	Project Director for the Environmental and Social Impact Assessment for the upgrade of the airport in Principe.
EIA for a 380MW renewable energy facility north of Touwsrivier in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.

EIA for a 170MW renewable energy facility east of Touwsrivier in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 670MW renewable energy facility south of Sutherland in the Western and Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process requires the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 500MW renewable energy facility south of Beaufort West in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 120MW renewable energy facility south east of Victoria West in the Northern Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW wind farm in the Richtersveld, Western Cape (2011)	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 750MW wind farm in the Roggeveld, Western Cape and Northern Cape (2011) **Director**	Project Director for the Scoping/EIA for a proposed wind farm. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
EIA for a 225MW renewable energy facility between Vredenburg and Velddrif in the in the Western Cape (2010-2011)	Project Director for the Scoping/EIA for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies, public participation and impact assessment.
Environmental and Social Impact Assessment for the Lesotho Highland 150 MW Wind Power Project, Breeze Power, Lesotho (2011)	Project Director for the Scoping Phase of the Environmental and Social Impact Assessment for a 150MW wind farm development in Lesotho. The Scoping Phase included the analysis of available information to identify key environmental and social risks associated with the siting of the wind farm.
Environmental Screening Study for a Wind Farm Development in the Southern Cape, South Africa (2011)	Project Director for the Environmental Screening Study for a wind farm development in the Southern Cape.
Environmental and Social Due Diligence for a Wind Farm Development in Coega, Electrawinds, South Africa (2011)	Project Director for the Environmental and Social Due Diligence for a wind farm development in the Coega.

Environmental and Social Impact Assessment for Venetia Diamond Mine, De Beers, South Africa (2011)	Project Director for the Scoping and ESIA for the proposed new underground mine and EMP consolidation for existing mining activities. The ESIA was undertaken as an integrative process to meet various environmental legal requirements including National Environmental Management Act (NEMA): EIA Regulations, NEM: Waste Act, NEM: Air Quality Act, NEM: Biodiversity Act, National Heritage Resource Act, National Water Act and the Minerals Petroleum Resources Development Act.
Environmental and Social Impact Assessment for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2010-2011)	Project Director for the project which includes the assessment of environmental and social impacts associated with dredging over 500km of the Zambezi River. The project includes full stakeholder engagement, coordination of various specialist studies with extensive field work and the integration of all information into an ESIA report and ESMP.
EIA for two solar PV plant development, South Africa (2010)	Project Director of the EIA for the development of two solar PV plants in the Northern Cape and Free State Provinces of South Africa. ERM undertook the required studies to obtain environmental approval for these developments, including specialist studies such as landscape and visual and cultural heritage assessments, and stakeholder engagement.
Basic Assessment for the installation of wind measuring masts on six sites in the Western Cape and two sites in the Northern Cape (2010)	Project Director for the Basic Assessments to install wind measuring masts at eight sites in South Africa. The scope of work included the submission of the application, public participation, preparation of an EMP and submission of the Basic Assessment report.
EIA for a 100MW renewable energy facility north of Velddrif in the in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required the liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
EIA for a 300MW renewable energy facility east of Lambert's Bay in the Western Cape (2010)	Project Director for the Scoping process for a proposed renewable energy facility incorporating wind and photovoltaic power generating technologies. The environmental permitting process required liaison with local, provincial and national environmental authorities, co-ordination of specialist studies and public participation.
External adviser and reviewer for an ESIA for a wind farm development in the Eastern Cape, Confidential Client, South Africa (2010)	Adviser and reviewer for an EIA for the development of a wind farm in the Eastern Cape.
Environmental Advisor Environmental and Social Impact Assessment for the Mphanda Nkuwa Hydropower Project in Mozambique (2010)	Advisor for the ESIA for the Mphanda Nkuwa Hydropower Project in Mozambique. The core service was to advise the project team on international standards such as the IFC Performance Standards and World Commission on Dams.
Environmental Sensitivity Study of the Durban Airport Site Expansion Project , South Africa, Transnet (2010)	Project Director for the Environmental Sensitivity Study for the proposed dig-out port currently being considered by Transnet at the Durban International Airport Site. The aim of this assessment was to determine the biophysical, natural and social opportunities and constraints to the development of the dig-out port, as well as provide a strategic overview of the environmental context of the site. In addition, the sensitivity study provided strategic guidance in terms of the environmental due process and licensing requirements with respect to the National Environmental Management Act, and associated legislation.

ESIA for a new high voltage overhead transmission power line in Cameroon, AES Sonel, Cameroon (2007- 2009)	Project Director for the Environmental and Social Impact Assessment and a full Resettlement Action Plan for a new electricity distribution project, comprising a 113km overhead power line, for AES Sonel. As Project Director, Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.
Advisor to the Environmental and Social Impact Assessment for the Baynes Hydropower Project in Namibia and Angola (2009)	Project Advisor for the Environmental and Social Impact Assessment for the proposed Baynes Hydropower Project on the Kunene River. The ESHIA process is being conducted in accordance to the Angolan EIA Regulations, the Namibian EIA Regulations, the World Bank Safeguard Policies and the IFC performance standards.
Environmental and Social Impact Assessment for the upgrade of a 1100 km railway line in South Africa, Transnet (2008- 2009)	Project Director for the Environmental and Social Impact Assessment for the upgrade of a commodities railway line across South Africa. The project included a number of specialist studies, managing subcontractors, interfacing with the railway engineering team, report writing, managing an extensive stakeholder consultation process, client liaison and management of project finances.
Environmental and Social Impact Assessment for the services corridor associated with the development of a greenfield CTL Plant, Sasol, South Africa (2009)	Project Director for an ESIA of a services corridor to support the development of a greenfield CTL plant development in South Africa. The ESHIA process was conducted in accordance to the South African EIA Regulations and the IFC performance standards.
Environmental and Social Impact Assessment for 2D seismic exploration project in the Rovuma Basin, Petronas, Mozambique (2009)	Project Director for the ESIA for the offshore seismic exploration activities in Blocks 3 & 6, situated in the Rovuma Basin off the coast of Mozambique. The exploration activities comprise 2D seismic surveys in deepwater.
Environmental and Social Screening Study for a river barging project on the Zambezi River, Riversdale Mining, Mozambique (2009)	Project Director for the project which included the assessment of environmental and social risks associated with dredging over 500km of the Zambezi River. The project included reviewing existing information, mapping key sensitivities and facilitating a specialist workshop in order to develop Terms of Reference for detailed baseline studies that will be required should the project proceed to a full ESIA.
Equator Principled and IFC Performance Standards Review and Training, African Housing Solutions, South Africa (2009)	Lead reviewer for the ESIA and Resettlement Policy Framework, for a housing development in Nigeria, against the Equator Principles and IFC Performance Standards. Mr Heather-Clark was responsible for reviewing the ESIA Report and for presenting a 2 ½ day training course on the Equator Principles and IFC Performance Standards.
Environmental Assessment for the dredging and disposal of dredge spoil at the Port of Saldanha, Transnet, South Africa (2008)	Project Director for this project and was responsible for guidance of technical studies which included dredging studies and marine sediment contamination characterization. The study included the assessment of dredge spoil dumping alternatives. Stakeholder engagement included an important component of the project.
Environmental and Social Screening Study, Port of Saldanha, Transnet, South Africa (2008)	Project Director for the screening study which included an assessment of alternative berth options for the export of iron ore at the iron ore terminal at the Port of Saldanha, South Africa. The work included ongoing interaction with the port engineering and design teams, together with stakeholder engagement.

ESIA for an Early Production System (EPS) and Power Plant for Kaiso-Tonya Area, Exploration Area 2, Tullow Uganda Operations Pty Ltd, Uganda (2007-08)	Project Director for the project which included a full ESIA for an Early Production System and associated Power Plant in the Kaiso-Tonya area on the banks of Lake Albert, Uganda. The intent of the project is to produce oil (and small amounts of gas) which will be converted into electrical power and distillate products (kerosene and diesel) for consumption within Uganda. The electrical power will be fed into the main grid supplementing the Ugandan electrical power grid while the distilled products (diesel and kerosene) will be used to displace the currently imported fuels. The ESIA included a detailed assessment of alternative sites for the proposed EPS and power plant, together with various environmental and social baseline studies and stakeholder engagement.
ESIA monitoring studies for Sasol's Off-shore gas exploration activities in Inhambane and Sofala Provinces, Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2007-08)	Project Director for an environmental monitoring survey programme for Sasol's offshore hydrocarbon exploration activities. Monitoring studies included seismic noise modelling and monitoring, dugong surveys, artisanal fish catch monitoring, coral reef surveys and monitoring, sea turtle monitoring and tourism monitoring.
Strategic Environmental and Social Overview and ESIAs for offshore exploration well drilling activities in Blocks 2 and 3A, Lake Albert, Uganda. Tullow Oil Plc and Heritage Oil and Gas Limited (2006- 2008)	Project Director for this project. The project involved undertaking a strategic overview study of Lake Albert that provided background information on the limnological (physical, chemical and biological) features of the lake as well as environmental and socio-economic resources (such as nature reserves, tourism nodes, prime fishing areas etc). It also presented areas of environmental risk and opportunity associated with oil explorations on, and immediately adjacent to, the lake. The strategic overview provided a framework within which ESIAs were undertaken for the offshore drilling project. A site selection study was undertaken for onshore support infrastructure. Baseline studies included shoreline sensitivity mapping, oil spill modelling, water and sediment quality surveys, fish and fisheries surveys, socio-economic surveys and terrestrial ecology surveys. An extensive public participation process was undertaken as part of the ESIAs.
Environmental and Social Baseline Assessment for a green fields coal mine and CTL plant development, Sasol, South Africa (2008)	Project Director the environmental and social baseline studies to support the evaluation of sites for potential development of a green field's coal mine and associated CTL Plant in South Africa. Mr. Heather-Clark has assisted with review and quality control of the various baseline studies.
Development of guideline document for the integration of environmental and social issues into the project lifecycle for mine development, De Beers, South Africa (2008)	Team member of the project team that assisted the client in developing a detailed guideline document for the integration of social and environmental issues into mine planning. This included all phases of the planning process from Concept through to Pre-feasibility, Feasibility and Implementation. Mr Heather-Clark, as lead facilitator, presented a 2 day training course on these guidelines, to mine planners and engineers.
EIA for a Metal Recovery Plant and Slag Crushing, Screening and Weathering facility at Arcelor Mittal Saldanha Works, MultiServ, South Africa (2007 – 2008)	Project Director for the EIA, including a public consultation process and the following specialist studies: air quality, groundwater, noise impact assessment, botanical and archaeology studies and a traffic impact assessment. Mr Heather-Clark was responsible for client liaison, quality control and final review of all reports.

Implementation of the Equator Principles for Standard Bank's Project Financing Processes, Standard Bank, South Africa (2008)	Lead facilitators for Equator Principles and IFC Performance Standards training to assist Standard Bank in adopting the Equator Principles. An assessment system (based on the IFC Performance Standards) to link with Standard Bank's project finance transaction life-cycle was developed. This involved the development of "tools" and guidance documents to form a system, together with training on the use of the system for all project finance staff.
Comparative review of EIAs undertaken by ERM globally for electricity utilities, Eskom, South Africa (2007)	Project Director for this project. The project included research to provide Eskom with an overview of different EIA governance systems and approaches to managing EIAs in other countries, as well as identifying trends in EIA practice.
Environmental and Social Screening and Qualitative Risk Assessment Western Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Saldanha, Port of Cape Town and Port of Mossel Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
Environmental and Social Screening and Qualitative Risk Assessment Central Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of East London, Port of Port Elizabeth and Port of Ngqura. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
Environmental and Social Screening and Qualitative Risk Assessment Eastern Ports and Rail Corridor, Transnet, South Africa (2007)	Project Director involved in identifying environmental and social risks associated with future port development in the Port of Durban and Port of Richards Bay. The scope of the study included the review of previous EIAs, SEAs and other planning documents to identify environmental and social drivers and assess their risk to future port planning, development and operations. As the environmental team, ERM interacted on a regular basis with the port engineering and design teams to develop a port development framework for a 30 year planning period.
EIA of the Moatize Coal Mine and associated railway line and deep water port infrastructure, CVRD, Tete Province, Mozambique (2006-2007)	Project Coordinator and Cost Controller on this project. ERM was commissioned by CVRD, a Brazilian Mining Company, to undertake environmental studies related to the green fields development of a coal mine in Tete Province, Mozambique. The project included the development of a power plant, railway line and port for the export of coal.
Corporate Social Responsibility Strategy development for a leading South African retailer, South Africa (2006)	Lead facilitator for this project. The project involved identifying and prioritising the company's sustainability issues and defining a strategy to address these issues. The process was driven by the need for the company to be listed on the Johannesburg Stock Exchanges SRI Index.
Research project on the effects of water scarcity on the fresh produce supply to a major South Africa retailer, South Africa (2006)	Project Leader coordinated a group of researchers to identify water scarce areas and to plot these against the location of fresh produce suppliers for a major retailer in South Africa. This researched form a core component of the companies Sustainability Strategy.
Independent Environmental Advisers to the Financing Parties of the Gautrain Rapid Rail Link project, Bowman Gilfillan (2006)	Independent Environmental Advisers to the Financing Parties, provided review and advisory services through Bowman Gilfillan on Environmental Management Plans for the Gautrian Rapid Link project.

ESIA for seismic surveys and exploration well drilling and testing in Blocks 16 and 19 off the coast of Mozambique, Sasol Petroleum Sofala & Empresa Nacional de Hidrocarbonetos (2005 – 2006)	Project Manager for the ESIA which involved undertaking an ESIA and compiling EMPs for offshore exploration activities in Blocks 16 & 19, situated to the east of the Bazaruto Archipelago National Park, off the coast of Mozambique. The exploration activities comprised 2D and 3D seismic surveys in deepwater and shallow water as well as exploration well drilling and testing activities.
EIA for the upgrade and expansion of the existing sinter plant at Vanderbijlpark, ArcelorMittal, South Africa (2006)	Project Director for the EIA and stakeholder engagement process to meet South African requirements. This included coordination of the technology review, air quality, health and waste management specialist studies and compilation of the integrated Scoping and EIA Report.
Review of Sustainability Report and Sustainability Management System, Confidential, South Africa (2004)	Lead reviewer of the Sustainability Report of a leading retailer in South Africa and providing adhoc advice on sustainability issues. This included compiling a monthly news letter to staff on relevant sustainability issues facing the retail industry in South Africa.
EIA of a proposed expansion of the Container Terminal Stacking area at the Port of Cape Town, National Ports Authority, South Africa (2003-2004)	Project Manager for this EIA. The project included the expansion of the Cape Town container terminal into the sea though dredging 1 million m3 of material for reclamation. The project included a detailed study on alternative sources for fill material and other studies which focused on marine archaeology, coastal erosion, marine hydrodynamics and water quality, visual, noise and traffic. The EIA included full stakeholder engagement throughout the EIA process.
Environmental Site Suitability Study for a manganese smelter, Asia Minerals Limited (2004)	Part of the project team that undertook a preliminary site selection process for a manganese smelter by identifying key environmental and social issues for potential sites within Southern Africa. Sites included the Belualane Industrial Park (Mozambique) and Richards Bay, the Coega Industrial Development Zone (IDZ) and Saldanha (South Africa).
DFID funded project to assess progress towards meeting the water relater targets of the Millennium Development Goals, DIFD, Zambia (2004)	Country Coordinator for Zambia on this project. The project included detailed stakeholder surveys secondary data analysis to establish the countries progress towards meeting the Millennium Development Goals, specifically related to water supply and sanitation.
Roll-out of ISO14001 and OHSAS18001 management systems to 2 industrial sites in South Africa, Confidential, South Africa (2004)	Project Manager responsible for undertaking ISO14001 training at two industrial sites. The project formed part of a global initiative to have several industrial sites throughout Africa and Europe ISO14001 certified.
Strategic Environmental Assessment (SEA) for the Port of Cape Town, National Ports Authority of South Africa, South Africa (2003)	Project Manager for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port planning was supported by city planning and visa-versa.
Strategic Environmental Assessment (SEA) for the Port of Richards Bay, National Ports Authority of South Africa, South Africa (2003)	Project Adviser for this project and played a lead role in directing the course and outcome of the SEA. The SEA focussed on key environmental and social opportunities and constraint to the future long term development of the Port of Cape Town. A Sustainability Framework was developed to address key opportunities and constraints and to set up long terms monitoring programs. A key component of this study was to understand the Port-City linkages and developing mechanisms to ensure that port

	planning was supported by city planning and visa-versa.
E&S Due Diligence of the Phase 2 Maputo Port Revitalisation and Rehabilitation Project, Standard Corporate Merchant Bank, Mozambique (2003)	Environmental Adviser to the Standard Corporate Merchant Bank for the review of the EIA and Risk Assessment studies undertaken for the Phase 2 Maputo Port Revitalisation and Rehabilitation Project. The EIA was reviewed against the Mozambican and International Best Practice guidelines and detailed recommendation made on how to manage the environmental risks associated with the revitalisation project.
National Oil Spill Contingency Plan for Cameroon, funded by the World Bank, Cameroon Government, Cameroon (2003)	Part of the team that compiled a comprehensive Oil Spill Contingency Plan for Cameroon (OSCP). The OSCP form a core component of the Chad Cameroon Pipeline and included contingency plans for both on land and marine based spills. The OSCP was compiled according to the IPEACA guidelines and was reviewed by the World Bank.
EIA/SEA Capacity Building, Environmental Public Authority (EPA), State of Kuwait (2003)	Lead facilitator for a 2 day training course on SEA and EIA for the Environmental Public Authority (EPA) of the State of Kuwait.
Training Workshop on Strategic Environmental Assessment for South Eastern Africa and the Western Indian Ocean Island States, SEACAM, Mozambique (2003)	Lead course facilitator for the SEA training course funded by SEACAM. The training course included the principles of SEA, SEA process and case studies of SEA's in Southern Africa.
Improving the Effectiveness of EIA and the Potential of SEA in Southern Africa: Case Study on SEA of the National Commercial Ports Policy and SEA for the Port of Cape Town, World Bank/SAIEA, Namibia (2003)	Presenter of two case studies on SEA at a regional workshop funded by the World Bank and SAIEA.
Environmental Impact Assessment for the Eskom SABRE-GEN wind turbine test facility, Eskom, South Africa (2002)	Project Manager for the EIA. The EIA included stakeholder engagement throughout the process and included the following specialist studies: visual assessment, bird strike modelling and noise assessment.
Strategic Environmental Assessment: Scoping Phase Port of Richards Bay, National Ports Authority of South Africa, South Africa (2002)	Project Leader and integrative writer for the Scoping Phase of the SEA for the Port of Richards Bay. This phase included detailed stakeholder consultation to identify opportunities and constraints to long term port development at the Port of Richards Bay.
White Paper on National Commercial Ports Policy, National Ports Authority, South Africa 2002	Lead reviewer of the White Paper on National Commercial Ports Policy for South Africa. The review focussed on the integration of environmental and social issues into the port planning process. Mr Heather-Clark made a formal submission and presentation to the Portfolio Committee on Transport in the South African Parliament.

Environmental Liability and Risk Assessment for the Multi-Purpose Terminal at the Port of Saldanha, National Ports Operations, South Africa (2002)	Project Manager for the project. The purpose of the project was to identify key environmental risks associate with the material handling at the Multi-Purpose Terminal at the Port of Saldanha.
Environmental Overview of South Africa's major ports with special reference to future container terminal development, National Ports Authority Container Terminal Strategy, National Ports Authority, South Africa (2002)	Project Manager for the comparative assessment of the relative environmental sensitivity of the seven commercial ports in South Africa with reference to future container terminal development. The study included a detail review of secondary environmental information of all the ports, the identification of specific environmental criteria and the use of these criteria to rank each port in terms of its sensitivity to future container terminal development.
Review of the EIA undertaken for the Maputo Port Privatisation and Rehabilitation Project, Development Bank of Southern Africa (DBSA), South Africa (2002)	Environmental Adviser to the Development Bank of Southern Africa to review the Phase 1 EIA for the Maputo Port Privatisation and Rehabilitation Project. The review was undertaken against the Mozambican EIA Regulations and International Best Practice.
Oil Spill Contingency Plan, Agip Angola oil operations, Angola, (2002)	Team member of the team to develop an oil spill contingency plan according to the IPEICA International Guidelines.
Ecologically Sustainable Industrial Development Programme, United Nations Industrial Development Organisation (UNIDO), Tanzania (2002)	Team member of the project team appointed to review the Industrial Development Strategy for Industrial Development in Tanzania. The focus of the project was to integrate environmental and social issues into the programme.
Environmental Audit and Assessment of the Socio-economic Impacts of the Trans-Kgalagadi Highway, Botswana, Development Bank of Southern Africa, Botswana (2002)	Lead reviewer of the EIA and EMP implementation for the Trans-Kalagadi corridor in Botswana. The review included site visits, detailed interviews and review of secondary data and records.
World Bank EIA Project Management Training Course, World Bank/SAIEA, Zambia (2002)	Lead facilitator for the 5 day EIA Project Management Training Course. The course was presented to 20 African delegates from southern Africa. The course focused on the practical aspects of EIA project management including budgeting and scheduling an EIA, contract negotiations with clients, managing specialist studies, managing the public participation phase and compiling an integrated EIA report. The course formed part of a Southern Africa capacity building initiative lead by the SAIEA.
Environmental screening study for the establishment of a deep-water port at Ponta Dobela, Confidential Client, Mozambique (2001)	Team member of the project team who undertook a screening study to identify environmental, social and economic issues and show stoppers associated with the development of a deep-water port on the coast on Mozambique.
ESIA of the proposed seismic survey in licence area 2814a on the continental shelf of Namibia, Shell Exploration and Production Namibia B.V., Namibia (2001)	Team member of the ESIA for the offshore seismic exploration project. The ESIA included all issues associated with seismic surveys including seismic noise impacts on marine mammals, oil spill modelling and general environmental management issues.

Environmental Impact Review for the abandonment of the Cuntala Well Protector Platform off the coast of Angola (Block 2), Texaco Panama Inc., Angola (2001)	Team member of the project team who developed a decommissioning plan for a well protector platform off the coast of Angola.
Legal, Technical and Economic Feasibility Study for the Commercialisation of the SSF Association Milnerton Tank Farm and its links to the Port of Cape Town, SFF, Cape Town (2001)	Project Manager for this project.
ESIA of the Phase 2 expansion of the Mozal Aluminium Smelter and Matola Port Terminal in Maputo, BHP Billiton, Mozambique (2000-2001)	Project Manager and integrative writer for this ESIA. The EIA included an assessment of the expansion of the port terminal at the Port of Matola and a review of the Phase 2 expansion of the aluminium smelter. All reports together with the EIA process were reviewed and approved by the International Finance Corporation (IFC).
Scoping Phase of the Environmental Impact Assessment for the expansion of the Container Terminal at the Port of Cape Town, Portnet, South Africa (2000)	Project Manager for the EIA for the expansion of the container terminal at the Port of Cape Town. The project included the dredging of 1 million m3 dredge material to provide fill for the expansion of the port. Specialist studies that were required included coastal dynamic modelling, hydrodynamic modelling to assess water quality issues associated with dredging, marine archaeological issues, marine ecology issues, traffic, visual and noise.
Strategic Integrated Port Planning, Port of Saldanha, Transnet (1998)	Project Manager for the Strategic Integrated Port Planning process for the Port of Saldanha. The process culminated in the first Port Development Framework for the Port of Saldanha which integrated environmental and social issues into the port planning process. It included the identification and inclusion of environmental and social opportunities and constraints into the future port planning and development.
Environmental Impact Assessment for the PPC Slag Grinding Mill within the Saldanha Steel Complex, PPC (1998)	Project Manager for the EIA for PPC slag grinding mill. The EIA included a number of specialist studies and comprehensive stakeholder engagement.

MEMBERSHIPS	
CEAPSA	Certified as an Environmental Practitioner with the Interim Certification Board for Environmental Assessment Practitioners of South Africa (2006)
IAIAsa	Member of the International Association for Impact Assessment South Africa
IAIA International	Member of the International Association for Impact Assessment
PUBLICATIONS	
	Sep 2007: Co-author of case study for IIEDs 'User Guide' to effective tools and methods for integrating environment and development. South African case study: Role of environmental and social screening in informing the conceptual design and planning of large-scale projects in the pre-feasibility stage.
	Aug 2003: Author of a case study on the SEA for the Port of Cape Town, contained in "The Status and Potential of Strategic Environmental Assessment" by Barry Dalal-Clayton and Barry Saddler, DRAFT 17 September 2003.
	March 2002: Strategic Integrated Port Planning: Moving from EIA to SEA. International Conference on Coastal Zone Management and Development, Kuwait 18 to 20 March 2002.
	Nov 2000: Sustainable Port Development: Report on the preparatory seminar for Africa. 7th International Conference of the International Association for Cities and Ports, Marseilles – France.
	Mar 2000: The development of Strategic Environmental Assessment in South Africa: Journal of Impact Assessment and Project Appraisal, Vol 18, Number 3, pg 217-223. September 2000.
	April 1999: Integrating environmental opportunities and constraints into Port Planning, Development and Operation. 5th International Conference on Coastal and Port Engineering in Developing Countries, Cape Town, 19 to 23 April 1999.

CURRICULUM VITAE

LIANDRA SCOTT-SHAW

SENIOR ENVIRONMENTAL CONSULTANT

Environmental Management, Planning and Approvals, South Africa

QUALIFICATIONS

Pr.Sci.Nat	2017	Professional Natural Scientist (Ecological Science), South African Council for Natural Scientific Professions
BSc Hons.	2009	BSc Honours (Ecological Science), University of KwaZulu Natal
BSc	2008	BSc (Biological Science), University of KwaZulu Natal

EXPERTISE

- Environmental Impact Assessment
- Environmental licensing
- Environmental Compliance monitoring and auditing
- Vegetation Impacts Assessment and permitting
- Diatom Biomonitoring

Liandra joined SLR in March 2021 in her capacity as Senior Environmental Consultant and has over 8 years' experience as an Environmental Assessment Practitioner within the environmental consulting field. She has degrees in Biological and Ecological Science and has expertise in a wide range of environmental disciplines, including Environmental Impact Assessments, Environmental Management Programmes, Environmental Compliance Monitoring & Auditing and Vegetation Assessments and Diatom Biomonitoring.

She has been responsible for the management of a wide range of projects, including environmental authorisations, compliance monitoring and auditing, vegetation assessments and permitting and diatom biomonitoring.

Over the last few years Liandra's focus has been in the renewable energy sector. Specifically involved with Environmental Impact Assessments and specialist management for the Risk Mitigation Independent Power Producer Procurement and Renewable Energy Independent Power Producer Procurement Programmes (RMIPPPP and REIPPPP).

PROJECTS

A sample of Liandra's recent project experience, is provided below.

RENEWABLE ENERGY

Oya Energy Hybrid Facility EIA and Grid Connection BA (2020-2021)	Completed the Environmental Impact Assessment, Basic Assessment, and associated Amendment Processes for the 128MW facility, which included powerlines, wind energy facility (WEF), solar photovoltaic (PV), Battery Energy Storage System (BESS) and fuel-based generators (FBG). Liandra project managed the processes and assisted the client in compiling and submitting the bid for RMIPPPP. The project is a preferred bidder for the RMIPPPP
Kudusberg Wind Energy Facility (WEF) Amendment (2020-2021)	Completed the Amendment Process for getting the facility bid ready, this included finalizing layouts and EMPrs.
Droogfontein 3 PV BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.

Mierdam PV BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Dwarsrug WEF BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Platsjambok East PV BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Platsjambok West PV BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Loeriesfontein 3 PV BESS BA (2020)	Completed the Basic Assessment for Battery Energy Storage System (BESS). Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Grid connection for between the Dwarsrug WEF to Loeriesfontein PV	Completed the Basic Assessment for the Grid connection. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Tooverberg Wind Energy Facility (WEF) EIA and Grid Connection BA (2018-2019)	Assisted in completing the EIA and BA Processes for the facility. Liandra undertook technical and report writing and client liaison when the original project manager left.
Rondekop Wind Energy Facility (WEF) EIA (2018-2019)	Completed the EIA Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Umsobomvu PV Project EIAs (x3) and Grid Connections Bas (x3) near Noupoort and Middelburg, Eastern and Northern Cape Provinces (2018-2020)	Completed the Amendment Process for the facilities. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendments for the proposed development of the Hartebeest Leegte Wind Farm near Loeriesfontein, Northern Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendments for the development of the Graskoppies Wind Farm and grid near Loeriesfontein, Northern Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.

Amendments for the proposed development of the Ithemba Wind Farm near Loeriesfontein, Northern Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendments for the proposed development of the Xha! Boom Wind Farm near Loeriesfontein, Northern Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendment for the Proposed Beaufort West Wind Farm, Western Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendment for the Proposed Trakas Wind Farm, Western Cape Province (2019)	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendments for the Proposed Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Amendments for the Grid Connections for Graskoppies, Haratebeest Leegte, Itemba and !Xha Boom Wind Energy Facilties near Loeriesfontein, Northerrn Cape Province	Completed the Amendment Process for the facility. Liandra project managed the processes as well as undertaking technical and report writing, public participation, specialist team management.
Regulation 54 Audits (2019)	• Darling Wind Energy Facility, Western Cape Province • Great Kei Wind Energy Facility, Eastern Cape Province • Motherwell Wind Energy Facility, Eastern Cape Province • Ncora Wind Energy Facility, Eastern Cape Province • Nqamakwe Wind Energy Facility, Northern Cape Province • Peddie Wind Energy Facility, Eastern Cape Province • Ukomeleza Wind Energy Facility, Eastern Cape Province • Umsobomvu Wind Energy Facility, Northern and Eastern Cape Provinces

MEMBERSHIPS

SACNASP	Registered with South African Council for Natural Scientific Professions as a Professional Natural Scientist (Pr.Sci.Nat) in Environmental Science (117442)
IAIAsa	Member of the International Association of Impact Assessors (3624)

PUBLICATIONS

	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

CURRICULUM VITAE

STEPHAN JACOBS

ENVIRONMENTAL CONSULTANT

EMPA, Durban

QUALIFICATIONS

B.Sc. Hons	2014	Environmental Management and Analysis
B.Sc.	2012- 2013	Environmental Sciences

EXPERTISE

- Environmental Impact Assessments (EIAs), particularly Renewable Energy developments
- Basic Assessments (BAs), particularly Renewable Energy developments
- Environmental Compliance Monitoring

Stephan has six years of experience in undertaking Environmental Impact Assessment (EIA) and Basic Assessment (BA) processes for various types of projects. For the majority of his career he has focussed on renewable energy projects which form part of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as well as the 2020 Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP). He was one of the main consultants who worked on the EIA for a project that was chosen as a preferred bidder as part of the December 2020 RMIPPPP and which will be Africa's largest hybrid energy facility once constructed. Stephan also has experience in undertaking and facilitating public participation and stakeholder engagement processes, particularly for renewable energy developments. He has in the past undertaken 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 have acted as an Environmental Control Officer (ECO) for several infrastructure projects.

PROJECTS

BASIC ASSESSMENTS (BAs) FOR RENEWABLE ENERGY PROJECTS

BAs for four (4) Substations, Linking Substations and associated 132kV Power Lines, South Africa, South Africa, Mainstream Renewable Power Developments (2016-2018)

Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake four (4) BA processes for four (4) Substations, Linking Substations and Associated 132kV power lines to serve four (4) respective 235MW wind farms in the Northern Cape Province. The BAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, noise, geotechnical, transportation and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of BA Reports and EMPrs. EMI and RFI assessments were also undertaken.

BA for a 264MW WEF, South Africa, ENERTRAG (2017-2019)	Environmental Consultant assisting project Leader / Lead Environmental Consultant to undertake a BA process for a 264MW Wind Energy Facility (WEF) and associated infrastructure near Touws River in the Western Cape Province. Also assisted in facilitating public participation process. The BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.
BA for an On-site Eskom Substation and 132kV Power Line to serve a 264MW Wind Energy Facility (WEF), South Africa, ENERTRAG (2017-2019)	Environmental Consultant assisting project Leader / Lead Environmental Consultant to undertake a BA for an on-site Eskom substation and 132kV power line to serve a 264MW Wind Energy Facility (WEF) near Touws River, Western Cape Province. Also assisted in facilitating public participation process. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.
BA for 132kV Power Line, South Africa, G7 Renewable Energies (2020 – 2021)	One (1) of the Lead Environmental Consultants undertaking the BA process for a 132kV power line to serve renewable energy facilities near Matjiesfontein, Western and Northern Cape Provinces. Also took part in facilitating public participation process. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, noise and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.
BA for 132kV Powerlines between an authorised PV Solar Energy Facility, Wind Energy Facility and a Substation, South Africa, Mainstream Renewable Power (2020)	Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake the BA process for 132kV Powerlines between authorised PV Solar Energy and Wind Energy facilities, and from the authorised Wind Energy Facility to an authorised Substation. Project located near Loeriesfontein in the Northern Cape Province of South Africa. BA included several baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.
BAs for four (4) 9.9MW Solar PV Plants, two (2) 132kV power lines and associated infrastructure, South Africa, Confidential Client (2020-2021)	Lead Environmental Consultant and Public Participation Facilitator undertaking four (4) BA and Public Participation processes for four (4) 9.9MW Solar Photovoltaic (PV) Plants, which included two (2) 132kV power lines, and associated infrastructure near Leeudoringstad in the North West Province. BAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of BA Reports and EMPrs.
BA for 132/11kV Solar Plant Substation, South Africa, Confidential Client (2020-2021)	Lead Environmental Consultant and Public Participation Facilitator undertaking a BA and Public Participation process for 132/11kV Solar Plant Substation near Leeudoringstad in the North West Province. BA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, geotechnical, transportation, heritage and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr.

BA for 800MW Solar PV Facility, South Africa, G7 Renewable Energies (2020)	One (1) of the Lead Environmental Consultants undertaking the BA process for an 800MW Solar Photovoltaic (PV) Facility and associated Infrastructure near Matjiesfontein, Western Cape Province. Also assisted in facilitating the Public Participation process. BAs included soils & agricultural potential, air quality, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, geotechnical, transportation, glint and glare, noise, heritage, cultural landscapes and Palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of a BA Report and EMPr. A major hazardous installation assessment was also undertaken.
	ENVIRONMENTAL IMPACT ASSESSMENTS (EIAs) FOR RENEWABLE ENERGY PROJECTS
EIAs for four (4) 235MW Wind Farms South Africa, Mainstream Renewable Power Developments (2016-2018)	Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake four (4) EIA processes for four (4) 235MW wind farms near Loeriefontein in the Northern Cape Province. Also assisted in facilitating the Public Participation process. EIAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, geotechnical, transportation and heritage baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of EIA Reports and EMPrs. EMI and RFI assessments were also undertaken. EMI and RFI assessments were also undertaken.
EIA for a 325MW Wind Energy Facility South Africa, G7 Renewable Energies (2018-2019)	Environmental Consultant assisting Project Leader / Lead Environmental Consultant undertake EIA process for a 325MW Wind Energy Facility between Matjiesfontein and Sutherland, Northern Cape Province. EIA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, noise, transportation and heritage (including palaeontology, archaeology & cultural landscape) baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of an EIA Report and EMPr.
EIAs for three (3) 400MW Solar PV Energy Facilities, South Africa, EDF Renewables South Africa (2018-2020)	Project Leader / Lead Environmental Consultant and Public Participation Facilitator undertaking three (3) EIA and Public Participation processes for three (3) solar PV energy facilities, including associated infrastructure, with capacities up to 400MW respectively. EIAs included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna monitoring, visual, social, transportation, heritage and palaeontology baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of EIA Reports and EMPrs.
EIA for 301MW Hybrid Energy Facility and associated infrastructure, South Africa, G7 Renewable Energies (2020-2021)	One (1) of the Lead Environmental Consultants and main Public Participation Facilitator undertaking the EIA and Public Participation processes for a 301MW Hybrid Energy Facility. Hybrid Energy facility consists of a solar PV facility, BESS and Fuel-Based Generator Facility (FBGF). EIA included soils & agricultural potential, terrestrial and aquatic biodiversity, avifauna and bat monitoring, visual, social, transportation, geotechnical, heritage and palaeontology, glint and glare, air quality and climate change baseline studies, as well as stakeholder engagement (i.e., public participation) and the compilation of an EIA Report and EMPr. A major hazardous installation assessment was also undertaken. ***Preferred bidder project as part of December 2020 RMIPPPP and will be Africa's largest hybrid energy facility once constructed.***
	PART 1 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS

Part 1 EA Amendment Process for an authorised 140MW Wind Energy Facility, South Africa, Mainstream Renewable Power (2020-2021)	One (1) of the Lead Environmental Consultants undertaking the Part 1 EA amendment process for an authorised 140MW Wind Energy Facility near Loeriesfontein in the Northern Cape Province. Amendments were administrative and therefore only an application was required to be submitted to the Department.
Part 1 EA Amendment Process for four (4) authorised PV Solar Energy Facilities, South Africa, Mainstream Renewable Power (2020-2021)	One (1) of the Lead Environmental Consultants undertaking the Part 1 EA Amendment Processes for four (4) authorised PV Solar Energy Facilities near Loeriesfontein and Prieska in the Northern Cape Province. Amendments were administrative and therefore only an application was required to be submitted to the Department.
	PART 2 ENVIRONMENTAL AUTHORISATION (EA) AMENDMENT PROCESSES FOR RENEWABLE ENERGY PROJECTS
Part 2 EA Amendment Process for a 140MW WEF and associated infrastructure, South Africa, BTE Renewables (formally known as BioTherm Energy) (2018-2019)	Project Lead / Lead Environmental Consultant undertaking the Part 2 EA amendment process for an authorised 140MW WEF near Copperton in the Northern Cape Province. Amendment included increasing the turbine specifications (i.e., hub height and rotor diameter) and generation output. Amendments included further assessment in terms of the Path Loss and Risk Assessment which was undertaken as part of the original EIA processes. Process also included stakeholder engagement (i.e., public participation) and EMPr updates.
Part 2 EA Amendment Processes for three (3) 140 MW Wind Farms, South Africa, Mainstream Renewable Power (2018-2019)	One (1) of the Lead Environmental Consultants undertaking the respective Part 2 EA Amendment processes for two (2) authorsed 140 MW Wind Farms near Beaufort West in the Western Cape Province and one (1) authorised 140MW Wind Farm near Loeriesfontein in the Northern Cape Province. Amendments involved increasing the turbine hub height and rotor diameters. Avifauna, Bat, Noise and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.
Part 2 EA Amendment Processes for four (4) 235MW Wind Farms, South Africa, Mainstream Renewable Power (2018-2019)	One (1) of the Lead Environmental Consultants undertaking the respective Part 2 EA Amendment processes for four (4) authorised 235MW Wind Farms near Loeriefontein, Northern Cape Province. Amendments involved increasing the turbine hub height and rotor diameters. Avifauna, Bat, Noise and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.
Part 2 EA Amendment Process for a 325MW WEF and Associated Infrastructure, South Africa, G7 Renewable Energies (2020-2021)	One (1) of the Lead Environmental Consultants undertaking the Part 2 EA Amendment process for an authorised 325MW WEF and associated Infrastructure, between Matjiesfontein and Sutherland in the Western and Northern Cape Provinces. Amendments involved splitting an authorised WEF into two (2) separate WEFs, one (1) northern WEF and one (1) southern. Soils & agricultural potential, avifauna, bat, terrestrial ecology, heritage, palaeontology, noise, socio-economic, surface water, transport and Visual specialists were commissioned to assess the impacts of the proposed amendments. Process included stakeholder engagement (i.e., public participation) and EMPr updates.

	VISUAL IMPACT ASSESSMENTS (VIAs) FOR RENEWABLE ENERGY PROJECTS
VIA for a 75MW Solar PV Plant, South Africa, BTE Renewables (formally known as BioTherm Energy) (2015)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report as part of the VIA for a 75MW Solar PV Plant near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIAs for three (3) 75MW Solar PV Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports as part of the VIAs for three (3) 75MW Solar PV Energy Facilities near Vryburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for the proposed construction of a 400kV Substation and associated 400kV Power Line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for a 400kV Substation and associated 400kV power line near Vryburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for two (2) 75MW Solar PV Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 75MW Solar PV Energy Facilities near Lichtenburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIAs for two (2) 132kV Substations and associated 132kV power lines, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 132kV substations and associated 132kV power lines near Lichtenburg in the North West Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIA for a 3000MW Wind Farm, South Africa, Confidential Client (2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 3000MW Wind Farm and associated infrastructure near the town of Richmond in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the projects.

VIA for two (2) 140MW Wind Energy Facilities, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 140MW Wind Energy Facilities near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIA for a 132kV substation and associated 132kV power line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 132kV substation and associated 132kV power line near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIA for a 400kV substation and 400kV power line, South Africa, BTE Renewables (formally known as BioTherm Energy) (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 400kV Substation and 400kV power line near Copperton in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIAs for four (4) 235MW Wind Farms, South Africa, Mainstream Renewable Power (2016-2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for four (4) 235MW Wind Farms near Loeriesfontein in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
Basic VIAs for four (4) 33kV/132kV Substations, 132kV Linking Substations and associated 132kV Power Lines, South Africa, Mainstream Renewable Power (2016-2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the Basic VIAs for four (4) 33/132kV substations, 132kV linking substations and associated 132kV power lines near Loeriesfontein in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIA for a 315MW Wind Energy Facility, South Africa, Phezukomoya Wind Power (2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 315MW Wind Energy Facility near Noupoort in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIA for a 390MW Wind Energy Facility, South Africa, San Kraal Wind Power (2017)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 390MW Wind Energy Facility near Noupoort in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.

VIAs for two (2) 4.5MW Wind Energy Facilities, South Africa, Mulilo Renewable Project Developments (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the VIAs for two (2) 4.5MW Wind Energy Facilities near Kuruman in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
Basic VIA for supporting electrical infrastructure to two (2) 4.5MW Wind Energy Facilities, Mulilo Renewable Project Developments (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment reports for the Basic VIAs for supporting electrical infrastructure to two (2) 4.5MW Wind Energy Facilities near Kuruman in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA reports. Reports were reviewed and approved by the Visual specialist appointed for the projects.
VIA for a 325MW Wind WEF, South Africa, G7 Renewable Energies (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for a 325MW WEF between Matjiesfontein and Sutherland in the Northern and Western Cape Provinces. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
Basic VIA for an up to 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant, South Africa, SolarReserve SA (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the Basic VIA for an up to 132kV power line and associated infrastructure for the Rooipunt Solar Thermal Power Plant near Upington in the Northern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
Basic VIA for an up to 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant, South Africa, SolarReserve SA (2016)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the Basic VIA for an up to 132kV power line and associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly in the Free State and Northern Cape Provinces. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
	VISUAL IMPACT ASSESSMENTS (VIAs) FOR INFRASTRUCTURE PROJECTS
VIA for Nsoko Msele Integrated Sugar Project, Swaziland, Confidential Client (2015)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Nsoko Msele Integrated Sugar Project in Swaziland. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.

VIA for Tinley Manor South Banks Beach Enhancement Solution, South Africa, Tongaat Hulett Developments (2015)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Tinley Manor South Banks Beach Enhancement Solution in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIA for Mlonzi Hotel and Golf Estate Development, South Africa, Confidential Client (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Mlonzi Hotel and Golf Estate Development near Lusikisiki in the Eastern Cape Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIA for Assagay Valley Development, South Africa, Confidential Client (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for VIA for the Assagay Valley Development in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
VIA for Kassier Road North Development, South Africa, Confidential Client (2018)	Assisted Visual Specialist by undertaking fieldwork / ground-truthing and compiling impact assessment report for the VIA for the Kassier Road North Development in the KwaZulu-Natal Province. Tasks involved undertaking the desktop screening, fieldwork / ground-truthing component and compiling and updating the VIA report. Report was reviewed and approved by the Visual specialist appointed for the project.
	ENVIRONMENTAL CONTROL OFFICER (ECO) MONITORING / AUDITING PROJECTS
ECO for Polokwane IRPTS, South Africa, Polokwane Municipality (2015)	Acted as ECO for the Polokwane Integrated Rapid Public Transport System (IRPTS) project in the Limpopo Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.
ECO for Phase 1 and Phase 2 of Newmarket Retail Development, South Africa, Rejem Property Development (2015-2016)	Acted as ECO for Phase 1 and Phase 2 of the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.

ECO for NuPay Office Block at Newmarket Retail Development, South Africa, Rejem Property Development (2017-2018)	Acted as ECO for the NuPay Office Block development at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.
ECO for Decathlon Building at the Newmarket Retail Development, South Africa, Rejem Property Development (2018)	Acted as ECO for the construction of the Decathlon Building at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.
ECO for external road upgrades at the Newmarket Retail Development, South Africa, Rejem Property Development (2018)	Acted as ECO for the external road upgrades at the Newmarket Retail Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.
ECO for Netcare Alberton Hospital Development as part of the Greater Newmarket Development, South Africa, Rejem Property Development (2019-2020)	Acted as ECO for the Netcare Alberton Hospital Development as part of the Greater Newmarket Development in the Gauteng Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly site meetings with project team and reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department. Also regularly liaised with relevant environmental department.
ECO for Kwagqikazi TVET College Campus Development, South Africa, Department of Higher Education (2021)	Acted as ECO for the Kwagqikazi TVET College Campus Development in Nongoma, KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.

ECO for Greytown TVET College Campus Development, South Africa, Department of Higher Education (2021)	Acted as ECO for the Greytown TVET College Campus Development in Greytown, KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of monthly audit reports which were submitted to Project Team and relevant environmental department.
ECO for Vulamehlo Rural Housing Project, South Africa, Confidential Client (2021)	Acted as ECO for the Vulamehlo Rural Housing Project in the KwaZulu-Natal Province. Tasks involved undertaking site inspections / audits of the site camp and construction site every month as duty of care, in accordance with the National Environmental Management Act (Act No. 107 of 1998). Also reported back on environmental non-compliances (including recommendations). Also involved with the compilation of audit reports which were submitted to Project Team.
ECO for Ntuzuma D Phase 2 and 3 Housing Projects, South Africa, Confidential Client (2021)	Acted as ECO for the Ntuzuma D Phase 2 and 3 Housing Project, within the eThekwini Municipality of the KwaZulu-Natal Province. Tasks involved undertaking monthly site inspections / audits of the site camp and construction site to ensure compliance with the conditions of the EA and recommendations set out in the EMPr. Also attended monthly virtual site meetings with project team and reported back on environmental non-compliances (including recommendations). Also compiled monthly audit reports which were submitted to Project Team and relevant environmental department.
	BASIC ASSESSMENTS (BAS) FOR INFRASTRUCTURE PROJECTS
BA for a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium, South Africa, Confidential Client (2015)	Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake a BA process for a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane within the Limpopo Province. The BA included terrestrial and aquatic biodiversity, visual, social and heritage baseline studies, stakeholder engagement and compilation of a BA Report and EMPr.
BA for expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, South Africa, Twinsaver Group (2016)	Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake a BA process for the expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base in the Gauteng Province. The BA included surface water, heritage and air-quality baseline studies, stakeholder engagement and compilation of a BA Report and EMPr.
BA for new SPAR Distribution Centre in Port Elizabeth, South Africa, the SPAR Group (2018)	Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake the BA process for the construction of a new SPAR Distribution Centre at Redhouse in Port Elizabeth. The BA included surface water, heritage and air-quality baseline studies, stakeholder engagement and compilation of a BA Report and an EMPr.
	ENVIRONMENTAL SCREENING / ENVIRONMENTAL REVIEW / ENVIRONMENTAL DUE DILIGENCE PROJECTS

Environmental Review of Xakwa Coal Operations, South Africa, Confidential Client (2021)	Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake an environmental review and provide a professional opinion for the Xakwa Coal Operations, adjacent to the Eastside Junction Development. Tasks involved reviewing the activities associated with the proposed project and providing feedback (in the form of a report) whether there are any environmental constraints and/or fatal flaws preventing development.
Environmental Due Diligence for the Woodlands and Harrowdene Office Parks, South Africa, Growthpoint Properties (2016)	Graduate Environmental Consultant assisting Project Leader / Lead Environmental Consultant to undertake an environmental due diligence for the Woodlands and Harrowdene Office Parks in Woodmead within the Gauteng Province. Tasks involved undertaking a site visit at the Woodlands and Harrowdene Office Parks and providing feedback / confirmation whether there are any non-compliance issues from an environmental perspective. Also involved reviewing future planned activities within office parks and providing feedback whether there are any environmental constraints and/or fatal flaws preventing future development.
	SURFACE WATER ASSESSMENTS FOR INFRASTRUCTURE PROJECTS
Surface Water Assessment for Steve Thswete Local Municipality, South Africa, Steve Thswete Local Municipality (2015)	Assisted Surface Water Specialist with undertaking Surface Water Assessment for the Steve Thswete Local Municipality within the Mpumalanga Province. Tasks involved undertaking the desktop screening and assisting with the compilation of a surface water impact assessment report.
Surface Water Delineation and Assessment for a coal Railway Siding and associated road upgrade, South Africa, Confidential Client (2015)	Assisted Surface Water Specialist with undertaking a Surface Water Delineation and Assessment for a coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade within the Ekurhuleni Metropolitan Municipality. Tasks involved undertaking the desktop screening and assisting with the compilation of a surface water impact assessment report.

METHOD STATEMENT

CONTRACT: …… **DATE: ……**

PROPOSED ACTIVITY (give title of method statement and reference number from the EMPr)

WHAT WORK IS TO BE UNDERTAKEN (give a brief description of the works):

WHERE ARE THE WORKS TO BE UNDERTAKEN (where possible, provide an annotated plan and a full description of the extent of the works):

WHAT MATERIALS WILL BE USED?

WHAT TYPE OF EQUIPMENT/MACHINERY WILL BE USED?

START AND END DATE OF THE WORKS FOR WHICH THE METHOD STATEMENT IS REQUIRED:

START DATE:	**END DATE:**

HOW ARE THE WORKS TO BE UNDERTAKEN (provide as much detail as possible, including annotated sketches and plans where possible)

Note: Please attach extra pages if more space is required.

DECLARATION

1) CONTRACTOR

I understand the contents of this Method Statement and the scope of the works required of me. I further understand that this Method Statement may be amended on application to other signatories and that the ER will audit my compliance with the contents of this Method Statement:

_____ _____

(Signed) (Print Name)

Dated: _____

2) ENVIRONMENTAL CONTROL OFFICER

The work described in this Method Statement, if carried out according to the methodology described, is satisfactorily mitigated to prevent avoidable environmental harm:

_____ _____

(Signed) (Print Name)

Dated: _____

3) SITE ENGINEER

The works described in this Method Statement are approved:

_____ _____

(Signed) (Print Name)

Dated: _____

Example of Environmental Awareness Course Content – Hoogland Wind Farms

1. What is the environment?
    - Soil
    - Water
    - Plants
    - People
    - Animals
    - Air we breathe
    - Buildings, cars & houses

2. Why must we look after the Environment?
    - It affects us all as well as future generations
    - We have a right to a healthy environment
    - A contract has been signed
    - Disciplinary action (e.g. stop works or fines issued)

3. How do we look after the environment?
    - Report problems to your supervisor/ foreman
    - Team work
    - Follow the rules in the EMPr

4. Working Areas
    - Workers & equipment must stay inside the site boundaries at all times

5. Rivers and Streams
    - Do not swim in or drink from streams
    - Do not throw oil, petrol, diesel, concrete or rubbish in any stream
    - Do not work in streams without direct instruction
    - Do not damage the banks or vegetation of any stream

6. Animals
    - Do not injure or kill any animals on the site (if you see a snake, remain still)
    - Manager to arrange that animals on site are removed as per the requirements of the EMPr

7. Trees and Flowers
    - Do not damage or cut down any trees or plants without permission
    - Do not pick flowers

8. Smoking and Fire
    - Put cigarette butts in a rubbish bin
    - Do not smoke near gas, paints or petrol
    - Do not light any fires
    - Know the positions of fire- fighting equipment
    - Report all fires

9. Petrol, Oil and Diesel
    - Work with petrol, oil & diesel in marked areas
    - Report any petrol, oil & diesel leaks or spills to your supervisor
    - Use a drip tray under vehicles & machinery
    - Empty drip trays after rain
    - Throw away contents

10. Dust
    - Try to avoid producing dust as far as practically possible
    - Use water or chemicals as instructed by the engineer to decrease dust generation

11. Noise
    - Do not make loud noises around the site, especially near homes
    - Report or repair noisy vehicles

12. Toilets
    - Use the toilets provided
    - Report full or leaking toilets

13. Eating
    - Only eat in demarcated eating areas
    - Never eat near a river or stream
    - Put packaging & leftover food into rubbish bins

14. Rubbish
    - Do not litter put all rubbish (especially cement bags) into the bins provided
    - Report full bins to your supervisor
    - The responsible person should empty bins regularly

15. Trucks and Driving
    - Always keep to the speed limit
    - Drivers - check & report leaks and vehicles that belch smoke

- Ensure loads are secure & do not spill especially when crossing the river

16. Emergency Phone Numbers
    - Know all the emergency phone numbers
    - See front of EMPr for a list

17. Fine and Penalties
    - Fines and penalties can be issued by the engineer (in consultation with the ECO) for serious and repetitive environmental misconduct

18. Problems – what must you do?
    - Do not ignore small issues
    - Report any problems or issues to your supervisor or manager who will liaise with the engineer and ECO
    - Don't be afraid to ask questions
    - Don't make assumptions
    - If you doubt, rather don't, and get clarification from the appropriate staff members

PALAEONTOLOGICAL CHANCE FOSSIL FINDS PROTOCOL

<table>
<tr><th colspan="3">HOOGLAND NORTHERN WIND FARM CLUSTER and GRID CONNECTION south of Loxton, Western Cape</th></tr>
<tr><td>Province & region:</td><td colspan="2">Wind Farms and Grid Connections: Western Cape (Central Karoo District): Beaufort West Local Municipality
Offsite watercourse crossing upgrades applicable to the Northern Wind Farm Cluster only: Northern Cape (Namakwa and Pixley Ka Seme Districts): Karoo Hoogland and Ubuntu Local Municipalities</td></tr>
<tr><td rowspan="2">Responsible Heritage Resources Agency</td><td colspan="2">Western Cape:
Heritage Western Cape (Contact details: Heritage Western Cape. 3rd Floor Protea Assurance Building, 142 Longmarket Street, Green Market Square, Cape Town 8000. Private Bag X9067, Cape Town 8001. Tel: 021 483 5959 Email: ceoheritage@westerncape.gov.za)</td></tr>
<tr><td colspan="2">Northern Cape:
SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za</td></tr>
<tr><td>Rock unit(s)</td><td colspan="2">Abrahamskraal & Teekloof Formations (Lower Beaufort Group), Late Caenozoic alluvium</td></tr>
<tr><td>Potential fossils</td><td colspan="2">Fossil vertebrate bones, teeth, trace fossils including burrows, trackways, petrified wood, plant-rich beds in the Lower Beaufort Group bedrocks. Fossil mammal bones, teeth, horn cores, freshwater molluscs, plant material in Late Caenozoic alluvium.</td></tr>
<tr><td rowspan="5">ECO/ESO protocol</td><td colspan="2">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="2">2. Record key data while fossil remains are still in situ:
Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo
Context – describe position of fossils within stratigraphy (rock layering), depth below surface
Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td>3. If feasible to leave fossils in situ:
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency fo work to resume</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):
Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)
Photograph fossils against a plain, level background, with scale
Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags
Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation</td></tr>
<tr><td colspan="2">4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.</td></tr>
<tr><td colspan="2">5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency</td></tr>
<tr><td>Specialist palaeontologist</td><td colspan="2">Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (e.g. museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.</td></tr>
</table>

HOOGLAND 3 WIND FARM:

PLANT RESCUE & PROTECTION PLAN

PRODUCED BY RED CAP HOOGLAND 3 (PTY) LTD

AUGUST 2022

MANAGEMENT PLAN OBJECTIVES

The purpose of the Hoogland 3 Wind Farm plant rescue and protection plan is to implement avoidance and mitigation measures to reduce the impact of the development of the Hoogland 3 Wind Energy Facility on listed and protected plant species and their habitats during construction and operation. This subplan is a requirement of the EIA process and is also required in order to ensure compliance with national and provincial legislation for vegetation clearing and any required destruction or translocation of provincially and nationally protected species within the footprint of the Wind Farm.

The Plan first provides some legislative background on the regulations relevant to listed and protected species, followed by a summary of the protected species and genera as listed by the relevant legislation and then an identification of species present at the site and actions that should be implemented to minimise impact on these species and comply with legislative requirements.

IDENTIFICATION OF SPECIES OF CONSERVATION CONCERN

Plant species are protected at the national level as well as the provincial level and different permits may be required for different species depending on their protection level. At the national level, protected trees are listed by DAFF under the National List of Protected Trees, which is updated on a regular basis. Any clearing of nationally protected trees requires a permit from DAFF. Based on the results of the field assessment and EIA for the Hoogland 3 Wind Farm, there are however no protected tree species within the development footprint.

At the provincial level, all species red-listed under the Red List of South African plants (http://redlist.sanbi.org/) are protected and a clearing permit is required from CapeNature before any vegetation clearing can be conducted at the site.

The DFFE Screening Tool lists four sensitive plant species as potentially present within the site, which has medium sensitivity for these species. None of these species were observed within the site and as a result, the site is considered low sensitivity for these species. Some of these species are however cryptic and it is possible that given the large extent of the Hoogland 3 site, that some of these species may have been missed.

It is important to note that a preconstruction walk-through survey of the site would be required before construction to inform the site clearing permit.

MITIGATION & AVOIDANCE OPTIONS

The primary mitigation and avoidance measure that must be implemented at the preconstruction phase is the Preconstruction Walk-Through of the development footprint. This defines which and how many individuals of listed and protected species are found within the final development footprint. While some turbine and road micrositing at this stage is possible, some impact on protected and listed species is generally inevitable. The walk-through should provide a reliable estimate of the number of listed and protected species that occur within the development footprint and which cannot be avoided. This information is required for the DAFF (if required) and CapeNature Flora permits which must be obtained before construction can commence.

Where listed plant species fall within the development footprint and avoidance is not possible, then it may be possible to translocate the affected individuals outside of the development footprint. However, not all species are suitable for translocation as only certain types of plants are able to survive the disturbance. Suitable candidates for translocation include most geophytes and succulents. Although there are exceptions, the majority of woody species do not survive translocation well and it is generally not recommended to try and attempt to translocate such species. Recommendations in this regard would be made following the walk- through of the facility footprint before construction, where all listed and protected species within the development footprint will be identified and located.

RESCUE AND PROTECTION PLAN

Preconstruction

- Identification of all listed species which may occur within the site, based on the SANBI SIBIS database as well as the specialist EIA studies for the site and any other relevant literature.

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

- A walk-through of the final development footprint by a suitably qualified botanist/ecologist to locate and identify all listed and protected species which fall within the development footprint. This should happen during the flowering season at the site which depending on rainfall is likely to be during late summer or potentially spring as well (March-April or September- October). The important point is that the preconstruction walk-through should take place under acceptable conditions that allows for the location and identification of species of concern.

- A walk-through report compiled following the walk-through which identifies areas where minor deviations to roads and other infrastructure can be made to avoid sensitive areas and important populations of listed species. The report should also contain a full list of localities where listed species occur within the development footprint and the number of affected individuals in each instance, so that this information can be used to comply with the permit conditions.

- A permit to clear the site and relocated species of concern is required from CapeNature before construction commences.

- Once the required permits have been issued, there should be a search and rescue operation of all listed species which have been identified in the walk-through report as being suitable for search and rescue within the development footprint that cannot be avoided. Affected individuals should be translocated to a similar habitat outside of the development footprint and marked for monitoring purposes. Those species suitable for search as rescue should be identified in the walk-through report. It is important to note that a permit is required to translocate or destroy any listed and protected species even if they do not leave the property.

- It is generally not recommended to house rescued plants within a nursery or similar facility. Plants should ideally be translocated directly from their current location to their final destination.

Construction

- Vegetation clearing should take place in a phased manner, so that large cleared areas are not left standing with no activity for long periods of time and pose a wind and water erosion risk. This will require coordination between the contractor and ECO, to ensure that the ECO is able to monitor activities appropriately.

- All cleared material should be handled according to the Revegetation and Rehabilitation Plan and used to encourage the recovery of disturbed areas.

- ECO to monitor vegetation clearing at the site. Any deviations from the plans that may be required should first be checked for listed species by the ECO and any listed species present which are able to survive translocation should be translocated to a safe site.

- All areas to be cleared should be demarcated with construction tape, survey markers or similar. All construction vehicles should work only within the designated area.

- Plants suitable for translocation or for use in rehabilitation of already cleared areas should

be identified and relocated before general clearing takes place.

- Any listed species observed within the development footprint that were missed during the preconstruction plant sweeps should be translocated to a safe site before clearing commences.

- Many listed species are also sought after for traditional medicine or by collectors and so the EO should ensure that all staff attend environmental induction training in which the legal and conservation aspects of harvesting plants from the wild are discussed.

- The ECO should monitor construction activities in sensitive habitats such as in dune areas carefully to ensure that impacts to these areas are minimized.

Operation

- Access to the site should be strictly controlled and all personnel entering or leaving the site should be required to sign and out with the security officers.

- The collecting of plants of their parts should be strictly forbidden and signs stating so should be placed at the entrance gates to the site.

MONITORING & REPORTING REQUIREMENTS

The following reporting and monitoring requirements are recommended as part of the plant rescue and protection plan:

- Preconstruction walk-through report detailing the location and distribution of all listed and protected species. This should include a walk-through of all infrastructure including all new access roads, turbine locations, turbine service areas, underground cables, power line routes, buildings and substations. The report should include recommendations of route adjustments where necessary, as well as provide a full accounting of how many individuals of each listed species will be impacted by the development.

- Permit application to CapeNature as required. This requires the walk-through report as well as the identification and quantification of all listed and protected species within the development footprint. The permit is required before and search and rescue can take place. Where large numbers of listed species are affected a site inspection and additional requirements may be imposed by CapeNature or DEFF as part of the permit conditions. All documentation associated with this process needs to be retained and the final clearing

permit should be kept at the site.

- Active daily monitoring of clearing during construction by the ECO to ensure that listed species and sensitive habitats are avoided. All incidents should be recorded along with the remedial measures implemented.

- Post construction monitoring of plants translocated during search and rescue to evaluate the success of the intervention. Monitoring for a year post-transplant should be sufficient to gauge success.

Hoogland South Wind Farms

Alien Plant Species Management Plan

August 2022

PURPOSE

The purpose of the Hoogland South Wind Farms Alien Plant Management Plan is to provide a framework for the management of alien and invasive plant species during the operation of the construction and operation of the wind energy facility. The broad objectives of the plan include the following:

- Ensure alien plants do not become dominant in parts or the whole site through the control and management of alien and invasive species presence, dispersal & encroachment.
- Initiate and implement a monitoring and eradication programme for alien and invasive species.
- Promote the natural recovery and re-establishment of indigenous species where possible in order to retard erosion and alien plant invasion.

PROBLEM BACKGROUND & LEGISLATIVE CONTEXT

Alien plants require management because they replace indigenous vegetation leading to loss of biodiversity and change in landscape function. Potential consequences include loss of biodiversity, loss of grazing resources, increased fire risk, increased erosion, loss of wetland function, impacts on drainage lines, increased water use etc. In recognition of these impacts, South Africa has legislation in place which requires landowners to clear or prevent the spread of certain declared weeds from their properties.

NEMBA provides the invasive status classification, as outlined in the Alien and Invasive Regulations and Species list (2014), for all identified alien invasive plant species. These plants can be classified as Category 1a, 1b, 2 or 3 species. The description of the abovementioned classifications are:

Category 1a plants

Category 1a Listed Invasive Species are those species listed in terms of section 70(1)(a) of NEMBA as species which must be combatted or eradicated.

A person in control of a Category 1a Listed Invasive Species must-

- Comply with the provisions of section 73(2) of NEMBA;
- Immediately take steps to combat or eradicate listed invasive species in compliance with sections 75(1), (2) and (3) of NEMBA; and
- allow an authorised official from the Department to enter onto land to monitor.

Category 1b plants

Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of NEMBA as species which must be controlled.

A person in control of a Category 1 b Listed Invasive Species must control the listed invasive species in compliance with sections 75(1), (2) and (3) of the Act:

- 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.
- A person must allow an authorised official from the Department to enter onto the 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.

Category 2 plants

Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of NEMBA 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.

- 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.
- 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.
- 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.
- Unless otherwise specified in the Notice, any species listed as a Category 2 Listed Invasive Species that occurs outside the specified area, must, for purposes of these regulations, be considered to be a Category 1 b Listed Invasive Species and must be managed according to Regulation 3 of NEMBA.
- 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.

Category 3 plants

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 Act, as specified in the Notice.

- 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 of NEMBA.

- If an Invasive Species Management Programme has been developed in terms of section 75(4) of NEMBA, a person must control the listed invasive species in accordance with such programme.

ECOLOGICAL CONTEXT

Alien species are adept at taking advantage of disturbance and many of their traits are linked to this ability. This usually includes the ability to produce large amounts of seed or being flexible in terms of their size, growth form or reproductive strategy. Alien plant control strategies therefore need to focus on these key attributes while management practices need to ensure that they do not create circumstances under which alien species are encouraged or can thrive. Perhaps the most important aspects in this regard are minimizing disturbance and ensuring the retention and recovery of indigenous vegetation as far as possible.

While the site is currently largely free of alien species it is not possible or practical to prevent alien species from entering the site as seed or spreading into disturbed areas from existing localized infestations. As such, some alien infestation is almost certain to occur, at least in some places and by some species. The disturbance created during construction will render the site vulnerable to invasion for some time thereafter and it is likely that many alien species from the local species pool will invade the site during or immediately after construction.

In the short-term, soil disturbance is likely to be the dominant driver of alien invasion at the site. While, in the long-term the distribution of runoff is likely to be a key driver as those areas which receive water will be wetter and likely to contain a higher alien abundance. As disturbance is the major initial driver of alien species invasion, keeping the disturbance footprint to a minimum is a key element in reducing alien invasion risk and severity. Wherever possible, the indigenous vegetation should be left intact as this will significantly reduce the likelihood of alien invasion as well as other degradation problems such as erosion.

Certain habitats and environments are more vulnerable to alien plant invasion and are likely to bear the brunt of alien plant invasion problems at the site. In addition, construction activities and changes in water distribution at the site following construction are also likely to increase and alter the vulnerability of some parts of the site to alien plant invasion. Areas at the site which are likely to require specific attention include the following:

- Wetlands, drainage lines and other mesic areas;
- Cleared and disturbed areas such as road verges, areas of cut and fill along roads, crane pads and construction footprints etc.;
- Construction camps and lay-down areas which are cleared or are active for an extended period; and
- Areas which receive runoff from roads, crane pads and other hardened areas.

General Clearing and Guidance Principles

- Alien control programs are long-term management projects and should include a clearing plan which includes follow up actions for rehabilitation of cleared areas. Alien problems at the site should be identified during pre-construction surveys of the development footprint. This may occur simultaneously to other required searches and surveys. The clearing plan should then form part of the pre-construction reporting requirements for the site.
- The plan should include a map showing the alien density & indicating dominant alien species in each area.
- Lighter infested areas should be cleared first to prevent the build-up of seed banks.
- Pre-existing dense mature stands ideally should be left for last, as they probably won't increase in density or pose a greater threat than they do currently.
- Collective management and planning with neighbours may be required in the case of large woody invaders as seeds of aliens are easily dispersed across boundaries by wind or water courses.
- All clearing actions should be monitored and documented to keep track of which areas are due for follow-up clearing.

Clearing Methods

- Different species require different clearing methods such as manual, chemical or biological methods or a combination of both.
- However, care should be taken that the clearing methods used do not encourage further invasion. As such, regardless of the methods used, disturbance to the soil should be kept to a minimum. Fire is not a natural phenomenon in the area and fire should not be used for alien control or vegetation management at the site.
- The best-practice clearing method for each species identified should be used. The preferred clearing methods for most alien species can be obtained from the Working for Water Website. http://www.dwaf.gov.za/wfw/Control/

Use of Herbicides for Alien Control

Although it is usually preferable to use manual clearing methods where possible, such methods may create additional disturbance which stimulates alien invasion and may also be ineffective for many woody species which re-sprout. Where herbicides are to be used, the impact of the operation on the natural environment should be minimised by observing the following:

- Area contamination must be minimised by careful, accurate application with a minimum amount of herbicide to achieve good control.
- All care must be taken to prevent contamination of any water bodies. This includes

due care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures.

- Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site.
- To avoid damage to indigenous or other desirable vegetation, products should be selected that will have the least effect on non-target vegetation.
- Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation.
- The appropriate health and safety procedures should also be followed regarding the storage, handling and disposal of herbicides.

ALIEN MANAGEMENT ACTIONS & ACTIVITIES

In order to maintain the site free of alien weeds and trees, the following plan should be implemented during construction and operation.

Construction Phase Activities

The following management actions are aimed at reducing soil disturbance during the construction phase of the development, as well as reducing the likelihood that alien species will be brought onto site or otherwise encouraged.

Construction Phase Actions/Activities	Frequency
The ECO is to provide permission prior to any vegetation being cleared for development.	Daily
Clearing of vegetation should be undertaken in stages or sections as the work front progresses – mass clearing should not occur unless the cleared areas are to be surfaced or prepared immediately afterwards.	Weekly
Where cleared areas will be exposed for some time, these areas should be protected with packed brush, or appropriately battered with fascine work. Alternatively, jute (Soil Saver) may be pegged over the soil to stabilise it.	Weekly
Cleared areas that have become invaded can be sprayed with appropriate herbicides provided that these are such that break down on contact with the soil. Residual herbicides should not be used.	Monthly
Although organic matter is frequently used to encourage regrowth of vegetation on cleared areas, no foreign material for this purpose should be brought onto site. Brush from cleared areas should be used as much as possible. The use of manure or other soil amendments is likely to encourage invasion.	Weekly
Clearing of vegetation is not allowed within 32 m of any wetland, 80 m of any wooded area, within 1:100 year floodlines, in conservation servitude areas or on slopes steeper than 1:3, unless permission is granted by the EO for	Weekly

specifically allowed construction activities in these areas. The work area should be clearly marked with construction or similar tape to demarcate the area to which vegetation disturbance and construction activity is to be confined.	
Care must be taken to avoid the introduction of alien plant species to the site and surrounding areas. (Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment.) Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
Alien vegetation regrowth on areas disturbed by construction must be controlled throughout the entire site during the construction period. The alien plant removal and control methods used should adhere to best-practice for the species involved. Such information can be obtained from the Working for Water website.	Monthly
Pesticides may not be used. Herbicides may be used to control listed alien weeds and invaders only	Monthly
Clearing activities must be contained within the affected zones and may not spill over into demarcated No Go areas. Wetlands and other sensitive areas should remain demarcated with appropriate fencing or hazard tape and signage indicating their no-go status posted. These areas are no-go areas (this must be explained to all workers) that must be excluded from all development activities.	Daily

Monitoring Actions - Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indicator	Frequency/Period
Document alien species present at the site	List of alien plant species	Pre-construction
Document alien plant distribution	Alien plant distribution map	Bi-annually
Document & record alien control measures implemented	Record of clearing activities	Bi-annually
Review & evaluation of control success rate	Decline in documented alien abundance over time	Bi-annually

Operational Phase Activities

The following management actions are aimed at reducing the abundance of alien species within the site and maintaining non-invaded areas clear of aliens.

Operational Phase Action/Activity	Frequency
Surveys for alien species should be conducted regularly. Every 6 months for the first two years after construction and annually thereafter. All aliens identified should be cleared.	Every 6 months for 2 years and annually thereafter
Where areas of natural vegetation have been disturbed by construction activities, revegetation with indigenous, locally occurring species should take place where the natural vegetation is slow to recover or where repeated invasion has taken place following disturbance.	Biannually, but revegetation should take place at the start of the rainy season
Areas of natural vegetation that need to be maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected, such as using a weed-eater to mow above the soil level.	When necessary
No alien species should be cultivated on-site. If vegetation is required for aesthetic purposes, then non-invasive, water-wise locally-occurring species should be used.	When necessary

Monitoring Actions - Operational Phase

The following monitoring actions should be implemented during the operational phase of the development.

Monitoring Action	Indicator	Frequency/Period
Document alien plant distribution and abundance	Alien plant distribution map	Annually
Document & record alien control measures implemented	Records of control measures and their success rate. A decline in alien distribution and cover over time at the site	Annually

Document rehabilitation measures implemented and success achieved in problem areas	Decline in vulnerable bare areas over time	Annually

Appendix 1. Recommended Alien Plant Clearing & Control Protocols

a) The appropriate alien management strategy pertinent to the situation/environment should be identified and implemented.

b) The Alien Plant Management Plan for alien vegetation includes three phases:

   I. **Initial control:** drastic reduction of the existing population;

   II. **Follow-up control:** reduction of seedlings, root suckers and coppice growth;

   III. **Maintenance control:** sustain low alien plant numbers/density with low annual costs. At this phase, alien plants must no longer be considered a problem. Monitor the situation two-three times each year (spring, mid-summer and autumn) to avoid alien plant re-infestation, spread and densification, and thereby avoid increased control costs.

Initial Control

1. Fell trees - control stumps - plant grass

a) Fell trees, treat stumps, remove wood and if necessary, rehabilitate. This strategy is suitable where infestations are easily accessible and can be harvested (i.e. for firewood, charcoal, building materials, mulch production). It is also suitable for trees that need removal for utility or aesthetic purposes or where they pose a potential hazard to waterways, building structures, etc.

b) Control Method for trees: Use chainsaws, bow-saws, brush cutters or cane knives to fell trees and saplings. Stump height should be less than 15 cm. Apply a registered herbicide mix with hand sprayers, paint brushes or knapsack sprayers at low pressure, using solid cone nozzles. Use a suitable dye to ensure that stumps are not missed.

   I. **Cut stump treatment:** Apply the recommended herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of stumps. Apply herbicide mix up to one hour after felling or the cut wood will seal.

   II. **Total Stump treatment:** Apply the recommended herbicide mixed in diesel to the cut surface, down the sides of stumps and to any exposed roots. The herbicide mix can be applied even several days after felling. Ensure herbicide can be mixed with diesel.

   III. **Stump treatment with herbicide plugs:** After felling, make holes in the stumps and insert plugs containing the herbicide, which is released into the stumps.

c) Control method for seedlings, saplings and coppice: In a mixed age stand, where there are young plants and coppice growth, cut the plants with a brush cutter and treat the stumps. Hand pull seedlings. Do not spray foliage as many plants may be

damaged during felling and may not absorb enough of the herbicide for effective control. Untreated plants can be controlled with foliar herbicide during follow-up work.

d) Disposal of brushwood: Where wild fires are a potential hazard, spread out the brushwood evenly over a large area. Avoid large heaps as this is a fire hazard and burning will cause breakdown of the soil structure. Trees that cannot be utilised should be controlled standing to avoid burning large amounts of wood lying on the soil surface.

e) Rehabilitation: Sow grass and/or shrubs in the bare soil around the stumps immediately after the first reliable rains. Spread brushwood over the buried seed to aid seedling establishment. Brushwood can be used as fences/barriers and pegged to stabilise slopes where necessary.

a) ***Control for shrubs*** Alien shrubs less than 1 m tall

I. Foliar application of a registered herbicide is required.

II. When dense seedling growth of uniform height is present use knapsack sprayers with flat fan nozzles.

III. Use solid cone nozzles for seedlings of uneven height, coppice growth, root suckers and short saplings.

IV. Rehabilitate cleared areas with locally-occurring species if necessary.

b) Alien shrubs taller than 1 m

I. **Mechanical Control pre-treatment:** Where shrubs are taller than 1.5 m, the height must be reduced by cutting, using sharpened hoes, cane knives or motorised brush cutters. For large areas of dense growth, use a tractor-mounted gyro-mower (set as low as possible) after slashing or cutting plants, either treat the freshly cut stumps or allow re-growth to knee height and then spray with a suitable registered herbicide.

I. **Cutting for stump treatment:** This is suitable for low - medium density infestations but is usually not practical for high density infestations. Slash plants below 15 cm in height for stump application. Control the stumps immediatelyafter cutting the plants. Stump application is best during the active growing season.

II. **Cutting from coppice treatment:** This is suitable for medium - high density infestations. Slash plants at a convenient height (e.g. knee height for foliar application to coppice re-growth. Cutting dense plants is good winter work but is tiring so must be well organised. Spray coppice re-growth during the active growing season, when there is enough leaf cover to absorb the herbicide.

III. **Flattening:** Roll empty 200L metal drums or place large pieces of corrugated iron

to make paths through dense thickets of plants (e.g. Bramble). This increases access for foliar or stump application.

IV. **Cut pathways:** This increases access for control work.

V. **Mechanical uprooting:** Uprooting of shrubs with mattocks results in soil disturbance, especially where large plants are present in dense thickets. Use only where not susceptible to erosion or where soil can be stabilised effectively.

c) **Disposal of small amounts of cut material:** Small amounts of cut top growth material do not impede access for follow-up control work. Leave the material to act as a mulch and to decompose, or spread over planted grass seed to aid seedling establishment. This adds organic material to the soil.

d) **Disposal of large amounts of cut material:** Cut the plants and use long poles/branches to roll the material away from stumps. Where cut material hampers access for follow-up control, roll into heaps and burn. Alternatively, spread large amounts of cut material over a large area for a cool burn. This avoids hot intense fires that would destroy the soil surface. Burn during the wet season for a cooler burn.

Rehabilitation: Avoid sowing on compacted soil or soil with a 'crust' as the seed will be washed away after the first rains. In such cases light soil disturbance is necessary e.g. using rakes for broadcast sowing or sharp-pointed hoes for row sowing. Sow suitable grass species on bare soil. Cover the buried seed with small amounts of cut top growth material to aid grass establishment. The material retains moisture in the soil, traps soil after heavy rains, and by rotting contributes organic material to the soil to aid seedling establishment.

1 Chemical control of alien herbs:

a) There are many herbaceous alien (soft/non-woody) species present and likely to occur sporadically throughout the operational phase of the development.

b) Alien herbs are called *broadleaf weeds* and some have pre- and post-emergent herbicides registered for their control.

c) However, where alien herbs are associated with woody alien plants, herbicides registered for control of woody aliens are often also used for control of broadleaf weeds.

d) Alternatively, glyphosate is used, as this is often registered for both woody and non-woody species. Glyphosate is a post-emergent (foliar applied) herbicide that is inactivated by soil.

Rehabilitation: Alien herbs usually occur in disturbed areas, where rehabilitation is not generally a high priority. However, in some situations, rehabilitation with grass or shrubs is required for control of alien herbs. However, only indigenous grasses and/or shrubs growing in the study area should be used for such rehabilitation.

Perennial grasses are often planted after a disturbance to stabilise the soil and suppress

alien herbs. Alternatively creeping species (such as *Cynodon dactylon*) that have good soil binding ability to prevent erosion. Planting a quick-growing grass on bare soil results in a dense rapid cover that successfully competes with establishing alien herbs.

Follow-up control

Follow up control of alien seedlings, saplings and coppice re-growth is essential to achieve and sustain the progress made with initial control work. If this phase is neglected, the cleared area will soon become infested with dense alien vegetation again, arising either from re-invasion by the original species or from invasion/encroachment by another species. Follow-up control is essential to prevent alien seedlings suppressing planted or colonizing grasses. Before starting initial control operations in new infestations, all required follow-up control and rehabilitation work must be completed or in progress in areas initially prioritised for clearing and rehabilitation.

Follow-up control should combine the following methods:

a) Chemical control methods (always use registered herbicides);

b) Mechanical control methods, and

c) Available biological control agents

Evaluate and select methods for follow-up control work according to species, and the type and density of re-growth.

2. Control methods for dense re-growth

Dense re-growth may arise after initial control operations, as seedlings, root suckers or stump coppices. For example, wattle seedlings are stimulated to germinate after fire or seedlings may arise from a high seed bank in the soil.

a) Do not uproot or hoe out dense seedlings. This would result in soil disturbance that promotes germination and flushes of alien seed growth.

b) Do not cut plants to control stumps where stump density is high. Stump application would be impractical with many untreated stumps.

c) Instead cut tall dense re-growth with brush cutters or bush knives. Remove top growth to allow access for foliar spray of coppice re-growth.

3. Control methods for low-medium density re-growth

Areas with low-medium density re-growth are considered high priority for control as neglect of these areas will result in densification and spread that is more costly to control. Large areas of low-density growth can be controlled rapidly

a) **Cut plants and control the stumps:** Stump height should be less than 15 cm. Use a

recommended registered herbicide. Apply the herbicide mix with hand sprayers, paint brushes of knapsack sprayers at low pressure, using solid con nozzles. Use a suitable dye to ensure no stumps are missed. For cut stump treatment, apply the herbicide mixed in water to the cut surface of stumps. Do NOT spray the sides of the stumps. Apply the herbicide within 1 hour of cutting the plants before the wound seals. For total stump treatment, apply a herbicide mixed with diesel to the cut surface, down the sides of stumps and to exposed roots. The herbicide mix can be applied up to several days after cutting the plants.

b) Foliar spray on coppice re-growth and saplings: Re-growth can be sprayed up to a height of 1 m. Apply the herbicide in knapsack sprayers using solid cone nozzles with a suitable dye to avoid over- or under-spraying.

c) Mechanical control options:

I. Hand pull seedlings when the soil is wet, using gloves to protect the hands.

Maintenance Control

Aim to keep the area stabilised by maintaining a good grass or shrub cover. Prevent further soil disturbance. Annual inspection of vegetation cover and alien plant re-growth is essential. Follow-up and maintenance control work each year will protect the planted plant cover. If this is neglected, the rehabilitated area will revert to dense patches of alien plants,resulting in increased control costs and loss of indigenous cover.

Integrated Control

Areas should be ranked into high, medium and low priority work areas, where high priority areas would be controlled first.

1. High Priority Areas for control

a) Low density infestations

I. Start maintenance control in areas with low alien plant numbers, targeting especially mature seed-producing trees (identifiable by the presence of flowers during the flowering season and/or presence of seed), or parent trees that are a source of seed to the site. This may include trees outside of the site, within a minimum of 100 m from the site boundary.

II. Maintenance control is rapid and cost effective.

III. This will protect the natural vegetation that is already there, prevent formation of thickets, and halt encroachment (spread) of alien plants into surrounding areas.

b) Areas near the top of slopes, water courses, steep bare slopes or long bare slopes

I. Start control at the top end of water courses or at the top of slopes.

II. This prevents seed spreading downstream or downhill to infest new areas.

III. Plant grasses and/or shrubs on bare soil, especially on steep slopes or long bare slopes, to prevent erosion.

c) Areas where initial control work is completed and re-growth is present

I. Complete major follow-up control and rehabilitation work in all areas before starting initial control in new infestations.

II. Control of seedlings protects newly planted vegetation.

III. Failure to control re-growth results in densification and spread of infestations, with increased control and loss of vegetation cover.

IV. Continued maintenance is a long-term on-going exercise to prevent re-infestation.

d) Newly disturbed areas

I. Areas where mechanical disturbance (such as removal of alien plants) or loss of vegetation cover has occurred provides an ideal seed bed for pioneer alien plant seedling establishment.

II. This re-growth should be controlled while still less than 0.5 m tall.

III. If this is neglected, re-growth will become taller and more dense, resulting in more costly control work and loss of vegetation cover.

e) Edges of dense spreading infestations

I. Confine infestations when there are insufficient funds to control the whole infestation and where the alien plants are likely to spread and invade neighbouring areas.

II. To prevent spread, control trees, saplings, seedlings, coppice re-growth or shrubs in a 5 - 10 m wide strip around the edges of such infestations to confine them.

III. Move inwards from the edges with control work as funds become available.

f) Low density areas inside dense infestations

I. Thin inside infestations to prevent densification (i.e. control all low-density areas inside the infestations to encourage grass growth. This will break up the large infestations into several smaller infestations that are more easily controlled.

II. Natural vegetation will gradually spread into the controlled areas as the alien plants die or are removed. The direction of grass spread therefore follows the control work, as thealien plants die. Sow seed in bare soil for a more rapid ground cover, especially on steep slopes or on easily eroded soil.

III. Monitor confined and thinned infestations 2 - 3 times each year. Repeat follow-up control operations as required, to ensure the controlled areas remain clear of re-growth and that the planted vegetation has established and remains healthy. Seedling re-growth will be evident in spring and early summer while re-growth and

coppice will be easily observed in summer. When a re-infestation is observed it should be controlled immediately.

4. Low priority areas for control

a) Stabilised areas where there is a healthy dense vegetation cover, and any alien plants are very sparse, difficult to detect and with little or no impact at present. Monitor alien plant growth and grass cover 2-3 times a year to ensure timely maintenance work.

b) Areas where dense infestation could become worse. Confine these dense infestations to prevent spread into new areas.

c) Areas where alien plants have little or no impact.

Thus, ***high priority*** areas are identified where resources should be concentrated to achieve the desired aims. Control in these areas gives the greatest total benefit, and allows the best use of the limited available resources.

The ***low priority*** areas would consume resources with little benefit, and should therefore be ignored or re-evaluated each year for attention at a later date.

Mitigation Action Plan

to minimise and monitor bat mortalities during the operational phase

For the proposed Hoogland 3 & 4 Wind Farms (Hoogland Southern Cluster), Western Cape

Compiled by

Werner Marais

29 July 2022

PREPARED FOR:

RED CAP HOOGLAND 1 & 2 (PTY) LTD
Reg No. 2020/886390/07
Unit B2, Mainstream Centre
Main Road,
Hout Bay,
7806
TEL: 021 790 1392

By

2015/364493/07
Somerset West
Cape Town
7130

www.animalia-consult.co.za

Ref: R-2207-25

1 INTRODUCTION

This Mitigation Action Plan must be immediately implemented once the Hoogland 3 or Hoogland 4 wind farm is operational, and must be consulted during the bat mortality monitoring study and for the operational lifetime of the facility. The bat specialist conducting the operational bat monitoring may overwrite this Mitigation Plan only if more applicable bat activity and climate data are available for specific problematic turbines or areas of the site.

The levels of mitigation and its specifications may need to be adjusted according to the results of the operational monitoring, based on robust scientific data. This is an adaptive management approach, and it is crucial that any changes to this initial proposed mitigation schedule that are recommended by the appointed bat specialist be implemented as soon as practically possible.

2 RECOMMENDED MITIGATION OPTIONS

The following options are recommended to minimise bat mortalities:

2.1 Minimisation of light pollution

A mitigation to consider in the design of the Hoogland 3 and Hoogland 4 facilities is to keep artificial lighting to a minimum on the infrastructure (OHM buildings and on wind turbines), while still adhering to safety and security requirements. For example, this can be achieved by having floodlights down-hooded, installing passive motion sensors onto lights around buildings and possibly utilising lights with lighting colours (also referred to as lighting temperatures) that attract fewer insects. Light pollution will impact bat feeding habits and species compositions negatively, by artificially discouraging photophobic (light averse) species and favouring species that readily forage around insect-attracting lights.

The likelihood of bats being killed by moving turbine blades increases significantly when they are attracted to their proximity when it has become an improved foraging airspace, due to the presence of artificial light.

2.2 Curtailment to prevent freewheeling

Freewheeling occurs when the turbine blades are rotating in wind speeds below the generator cut-in speed (also called the **manufacturer's cut-in speed**), thus no electricity is being produced and only some blade momentum is maintained.

Since bat activity tends to be negatively correlated with wind speed, it means that high numbers of bats are likely to be flying and impacted on in low wind speeds where freewheeling will be occurring. If turbine blades are feathered below the generator cut-in speed to prevent freewheeling, it can result in a very significant reduction of bat mortalities with minimal energy production loss.

2.3 Curtailment that increases the cut-in speed

The activity levels of South African bats generally decrease in weather conditions with increased wind speeds. However, in scenarios where above sustainable numbers of bats are being killed, and these bats fly in wind speeds above the turbine manufacturer's cut-in speed, the turbine's computer control system (referred to as the Supervisory Control and Data Acquisitions or SCADA system) can be programmed to a cut-in speed higher than the manufacturer's set speed. The new cut-in speed will then be referred to as the **mitigation cut-in speed** and can be determined from studying the relationship between preconstruction or operational long term (12-month) bat activity patterns on site and wind speed. This sustainable threshold of bat mortalities will be calculated according to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018).

Turbines are curtailed in this manner by means of blade feathering, to render the blades motionless in wind speeds below the mitigation cut-in speed.

2.4 Acoustic bat deterrents

This technology is developed well enough to be tested on site and may be recommended during operational monitoring, if mortality data indicate bat mortalities above the sustainable threshold for the wind farm. This threshold will be calculated according to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018). Initial experiments with this technology on wind farms in South Africa are yielding positive results that may indicate the effectiveness of the devices in the correct scenarios.

Current data on the South African trials is still limited to a small sample set, and the technology will not necessarily be effective in all mitigation scenarios and for all bat species. Therefore, it should be considered and tested on a case-by-case basis, and it is highly recommended that adequate monitoring continues concurrently, to assess the effectiveness of the devices in reducing bat mortalities.

3 MITIGATION ACTION PLAN

3.1 Step 1: Minimisation of light pollution (refer to Section 2.1)

During the planning phase for the Hoogland 3 and Hoogland 4 wind farms it must become mandatory to only use lights with low sensitivity motion sensors that switch off automatically when no persons are nearby, to prevent the creation of regular insect gathering pools. This applies to the turbine bases (if applicable) and other infrastructure/buildings. Aviation lights should remain as required by aviation regulations. Floodlights should be down-hooded and where possible, lights with a colour (lighting temperature) that attract less insects should be used. This mitigation Step is a simple and cost-effective strategy to effectively decrease the chances of bat mortality on site.

Bi-annual visits to the facility at night must be conducted for the operational lifetime of the facility, to assess the lighting setup and whether the passive motion sensors are functioning correctly. The bat specialist conducting the operational bat mortality monitoring must conduct these visits to site during nighttime to assess the placement and setup of outside lights on the facility. When lights are replaced and maintenance on lights is conducted, this Mitigation Action Plan must be consulted.

3.2 Step 2: Appointment of bat specialist to conduct operational bat mortality monitoring

As soon as the Hoogland 3 or Hoogland 4 wind farm facility becomes operational, a bat specialist must be appointed to conduct a minimum of 2 years of operational bat mortality monitoring. The methodology of this monitoring must comply with the *South African Good Practice Guidelines for Operational Monitoring for Bats at Wind Energy Facilities - 2nd Edition June 2020* (Aronson *et al.* 2020), or any newer version of the applicable guidelines that may be in force at the start of operation of the facility.

The results of the bat mortality study may be used to develop mitigation measures focused on specific problematic turbines.

3.3 Step 3: Curtailment to prevent freewheeling (refer to Section 2.2)

Based on high bat activity detected during the 12-month preconstruction study, from 1 September to 31 March every night for the lifetime of the facility, curtailment must be applied to all turbines by ninety-degree feathering of blades below the **manufacturer's cut-in speed**, so it is exactly parallel to the wind direction and minimises freewheeling blade rotation as much as possible without locking the blades. This can significantly lower probability of bat mortalities. Influence on productivity is minimal since no power is generated below the manufacture's cut-in speed.

3.4 Step 4: Additional mitigation by curtailment or acoustic deterrents (refer to Sections 2.3 and 2.4)

If mitigation steps 1 – 3 are followed, and the bat mortality monitoring study detects bat mortalities that are above the sustainable threshold for the Hoogland 3 or Hoogland 4 wind farm, then additional mitigation will need to be implemented to bring bat mortalities to or below the sustainable threshold. According to the *South African Bat Fatality Threshold Guidelines* (MacEwan, *et al.*, Edition 2, October 2018), this threshold is calculated by considering the hectare size of the wind farm area of turbine influence and the value of 2% of bats/10ha/year for the ecoregion that the wind farm is located in, to give an annual number of sustainable bat mortalities that is acceptable for the wind farm. The area of turbine influence of a wind farm is dictated by the turbine layout and is a tight fitting polygon around the turbine layout. In this version of the guidelines the acceptable sustainable threshold is calculated as 0.2 bats/10ha/annum for the Nama Karoo ecoregion which both Hoogland 1 and Hoogland 2 wind farms are located in. The calculated annual acceptable sustainable threshold of bat mortalities for each wind farm is indicated in **Table 3-1** below. Note that a newer version of the Threshold Guidelines or another similar applicable document may be adopted during the operation of the wind farm.

Table 3-1: The sustainable acceptable mortality thresholds of the proposed Hoogland South wind farms.

	Area of influence of wind turbines (hectares)	**Acceptable annual mortality of bats**
Hoogland 3	4 942	0.2 x (4942/10) = 0.2 x 494.2 = **99 bats**
Hoogland 4	5 666	0.2 x (5666/10) = 0.2 x 566.6 = **113 bats**
Hoogland 3 & 4	10 608	0.2 x (10608/10) = 0.2 x 1060.8 = **212 bats**

Such additional mitigation measures may be to curtail problematic turbines according to the **mitigation cut-in speed** (Section 2.3), and/or to utilise acoustic deterrents on problematic turbines (Section 2.4).

Preliminarily, it is advised that any additional mitigation measures that may be required be applied during the months of September to March, and must be applied to any turbines or group of turbines identified as causing the wind farm's mortalities to be above the sustainable threshold levels. This time period is based on high bat activity months as detected during the 12-month preconstruction study.

The bat specialist conducting the operational bat monitoring may recommend other time periods for additional mitigation, based on robust mortality data. If required, the bat specialist may make use of climatic data to allow for an active and adaptable mitigation schedule.

3.5 Step 5: Auditing of bat mortalities for the lifetime of the facility

During the implementation of mitigation Steps 1 – 4, itis crucial for the facility to determine and monitor bat mortalities in order to implement, maintain and adapt mitigations as efficiently as possible. For the duration of the lifetime of the facility, the impacts on bats must be audited/monitored by reliable methods of carcass searching and/or electronic devices capable of automatically counting bat mortalities. Such auditing should occur every 5 years (after the end of the initial 2-year operational study) for all turbines on site, and continuously for turbines where mitigations discussed in Step 4 (Sections 2.3 and 2.4) are implemented.

HOOGLAND WIND FARMS

1 DURING & POST CONSTRUCTION BIRD MONITORING FRAMEWORK (extracted from Wildskies' Avifaunal Impact Assessment, 2022)

The work done to date on the proposed site has established a baseline understanding of the distribution, abundance and movement of key bird species on and near the site. However this is purely the 'before' baseline and aside from providing input into turbine micro-siting, it is not very informative until compared to post construction data. The following programme has therefore been developed to meet these needs. It is recommended that this programme be implemented by the wind farm if constructed. The findings from operational phase monitoring should inform an adaptive management programme to mitigate any impacts on avifauna to acceptable levels. In particular, any Verreaux's Eagle fatalities should be reported to Dr Megan Murgatroyd in order to close the feedback loop back to the VERA modelling performed for this site.

During construction monitoring

It will be necessary to monitor the breeding status and productivity of the nesting raptors during all breeding seasons during construction. This can be done by a minimum of 3 specialist visits to the nest site per breeding season, or close enough to observe the birds without disturbing them. Detailed requirements as follows:

- Independent avifaunal specialist to make 3 visits to nest site in each breeding season (May to October) during construction.
- Breeding status & productivity to be determined.
- Any response by eagles to construction disturbance to be documented.

Operational phase monitoring

The intention with operational phase bird monitoring is to repeat as closely as possible the methods and activities used to collect data pre-construction. This work will allow the assessment of the impacts of the proposed facility and the development of active and passive mitigation measures that can be implemented in the future where necessary. One very important additional component needs to be added, namely mortality estimates through carcass searches under turbines. The following programme has therefore been developed to meet these needs, and should start as soon as possible after the operation of the first phase of turbines (not later than 3 months):

Note that this framework is an interim draft. The most up to date version of the best practice guidelines (Jenkins *et al* 2015) should inform the programme design at the time.

Live bird monitoring

Note that due to the construction of the wind farm and particularly new roads it may be necessary to update the location of the below monitoring activities from those used pre-construction.

- The 24 walked transects of 1km each that have been done during pre-construction monitoring on the site should be continued.

- The 4 vehicle based road count routes on the site should be continued, and conducted twice on each site visit.

- The focal sites on the site should be monitored. If any sensitive species are found breeding on site in future these nest sites should be defined as focal sites.

- All other incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area should be carefully plotted and documented.

- The 14 Vantage Points already established on the overall site should be used to continue data collection post construction. The exact positioning of these may need to be refined based on the presence of new turbines and roads. A total of 72 hours direct observation per Vantage Point should be conducted per year.

- The activities at the control site should be continued, i.e. 2 Vantage Points, 3 Walked Transects, 1 Vehicle Based transects, and Focal Sites.

Bird Fatality estimates

This is now an accepted component of the post construction monitoring program and the newest guidelines (Jenkins *et al*, 2015) will be used to design the monitoring program. It is important that in addition to searching for carcasses under turbines, an estimate of the detection (the success rate that monitors achieve in finding carcasses) and scavenging rates (the rate at which carcasses are removed and hence not available for detection) is also obtained (Jenkins *et al*, 2015). Both of these aspects can be measured using a sample of carcasses of birds placed out in the field randomly. The rate at which these carcasses are detected and the rate at which they decay or are removed by scavengers should also be measured.

Fatality searches should be conducted as follows:

- The area surrounding the base of turbines should be searched (up to a radius equal to 75% of the maximum height of turbine) for collision victims.

- All turbines on the wind farm should be searched at least once a week (Monday to Friday).

- Any suspected collision casualty should be comprehensively documented (for more detail see Jenkins *et al*, 2015).

- A team of carcass searchers will need to be employed and these carcass searchers will work on site every day searching the turbines for mortalities.

- It is also important that associated infrastructure such as power lines and wind masts be searched for collision victims according to similar methods. This should be done seasonally.

The most up to date version of the best practice guidelines (Jenkins *et al*, 2015) should inform the programme design at the time.

The above programme should be reported on quarterly to the wind farm operator, who should submit these reports to the DFFE and BirdLife South Africa. These reports should include a comparison of actual measured fatality rates with those predicted by this study.

2 ADAPTIVE MANAGEMENT PLAN FOR AVIFUANA (extracted from Wildskies' Avifaunal Impact Assessment, 2022)

The adaptive management plan aims to manage the impact of the proposed facility on birds to the extent that the impacts are acceptable and sustainable for the species populations.

It is important to for each project to have an adaptive management plan in place before operations, so that once operational, managements' response to any bird fatalities is clearly structured. Fatalities of Red Listed birds are typically rare events, but each with high consequence. As a result trends and patterns are often not evident at a level useful for decision making. At the proposed projects, fatality thresholds have been set for the high risk bird species. Adaptive management will be triggered when these thresholds are exceeded.

Adaptive management strategies should follow a set of clear sequential actions, specifically:

1. Conduct a review to determine the primary reasons why a threshold was exceeded.
2. Review the effectiveness of existing mitigation in light of the findings and determine whether a revised mitigation strategy is required and if so design revised mitigation.
3. If needed, define a revised threshold or limit of acceptable change.
4. Define the actions that will be taken if the new threshold or limit of acceptable change is exceeded.

This process is iterative, and the breaching of successive thresholds should be matched by an increase in the measures to protect and promote the viability of priority bird populations. If thresholds are repeatedly exceeded, despite mitigation efforts, off set options will need to be considered. Adaptive management responses are not limited to exceeded thresholds and may be triggered in response to other events such as:

- Evidence of an increased risk to a population from other non-project sources. For example, evidence of increased persecution during the operational phase of the wind farm may lead to reassigning a priority bird with an annual fatality threshold to a zero fatality threshold.

- An elevated risk situation, such as a temporary and unforeseen abundance of a risk species on site. For example, increased livestock/wildlife around turbines may result in an observed increase in raptor activity in the area.

- A near-miss incident, in which no fatality occurred but existing mitigation failed to prevent the risk. For example a raptor present on site and observed flying through rotor airspace.

The Adaptive Management Plan for the project described here provides a clear procedure and timeframe for evaluating fatalities and responding to exceeded thresholds. Following the framework allows the project to clearly demonstrate its' safeguarding record for priority birds.

Fatality thresholds at the project fall into four different categories:

1. Zero fatality thresholds for priority birds
2. Annual fatality thresholds for priority birds (threshold >zero)
3. Extreme event thresholds – for unforeseen once off situations
4. Elevated risk situations

Adaptive management response strategies for each threshold category are described below.

Table 1: Adaptive management response strategies for threshold categories

Species Category	Species	Annual Fatality Threshold	Reporting process for recorded fatality	Management response
Zero fatality threshold species	Verreaux's Eagle Martial Eagle Ludwig's Bustard	0	Fatality reported by field search team to avifaunal specialist within 24hrs of discovery. Incident Report compiled by specialist & submitted to site management within 48hrs.	Meeting/call held within 1 week of incident. Details & timing of any adaptive management response agreed & documented.
Annual Fatality Threshold species	Jackal Buzzard Karoo Korhaan	10	Thresholds assessed at 6-months and 12 months based on species specific corrected fatality rate estimate results.	Appropriate adaptive management for an exceeded threshold agreed at management meeting within 1 month of the completing of a semi-annual report.
Extreme Event Thresholds	Any species	For practical reasons, such as the need for a quick decision in the field to minimize the scale of this type of extreme event the threshold is set to a single fatality event that exceeds 10 individuals of one or more species.	A threshold is set to manage the risk of multiple-fatalities occurring as a single fatality event e.g. resulting from migratory activity or extreme weather. This type of event may be particularly relevant to species that occur in flocks.	The Adaptive management protocol for exceeding extreme event thresholds follows the same procedure as for zero-fatality thresholds.
Elevated Risk Situations	Any species	If site staff observe an increase in priority bird activity that could result in exceeded thresholds, even if no fatalities have occurred For e.g. a severe hailstorm kills numerous lambs and attracts raptors to feed.	Site should inform Avifaunal specialist immediately. Specialist should assess the maximum number of birds at risk and estimate how long the risk is likely to persist and likelihood of fatalities during this period. Specialist should then arrange a call/meeting with site management within 48 hours of the event.	Meeting to agree on any necessary action necessary to reduce immediate risk of fatalities along with a timescale for implementing the action. In this situation (even if no fatalities occurred) an incident report should be completed to document details of the elevated risk situation, the action taken and the outcome of the action
Near-miss Incidents	Any species	All near-miss incidents involving a priority species observed by fatality search teams or any site staff should be reported to site management/avifaunal specialist following the same procedure and timescales as for Elevated Risk Situations.		

HOOGLAND 3 WIND FARM:

REHABILITATION AND REVEGETATION PLAN

PRODUCED BY RED CAP HOOGLAND 3 (PTY) LTD

August 2022

Background & Purpose

The purpose of the Hoogland 3 Wind Farm revegetation and rehabilitation plan is to ensure that areas cleared or impacted during construction activities of the proposed facility are rehabilitated with a plant cover that reduces the risk of erosion from these areas as well as restores ecological function to these areas as far as possible. The intention of the plan is not to provide a fully operational plan with detailed method statements and approaches, but rather to outline the principles that should underpin the operational implementation plan with rehabilitation actions that the appointed contractor would apply at the site during and immediately after construction.

Rehabilitation Goals

It is important to define a rehabilitation benchmark and end-goal against which relative rehabilitation success at a site can be measured. The Society for Ecological Restoration (2002) provides eight objectives for a restored ecosystem:

- It should contain characteristic species that occur in the reference system;
- It should comprise largely of indigenous species;
- The functional groups necessary for continued stability must be present or have the potential to colonise;
- The physical environment must be conducive for the establishment of species that will lead to stability;
- It functions normally for its stage of development;
- It is integrated into a larger ecological matrix;
- Potential threats to the system's stability are eliminated;
- It is self-sustaining to the same degree as the reference system.

The above goals are fairly broad and the discussion that follows will provide details on how these goals can be achieved and what indicators can be used to measure progress towards these goals.

Rehabilitation Targets

Although the overall goal of rehabilitation is provided above, it is common practice to set measurable targets against which progress can be measured and evaluated. Parameters that are usually measured include indicators of plant community structure and composition such as similarity to a reference area, species richness, species diversity, vegetation cover, species dominance, vertical structure and functional diversity of the vegetation. Important considerations with regards to setting such targets include ensuring that they are achievable, and secondly, that they change appropriately over time. In other words, there should be different targets for a parameter based on the time since rehabilitation. Targets for vegetation cover should be set as follows in reference to the baseline cover of the undisturbed vegetation:

- Year 1: 20%
- Year 2: 40%
- Year 3: 60%

Assuming that the background vegetation cover is 40% as typically occurs in the study area, the actual plant cover that would represent the above targets are as follows:

- 8% Cover
- 16% Cover
- 24% Cover

These targets must be closely tied into the monitoring schedule to provide references against which the effectiveness of monitoring can be measured. The ultimate goal should be to achieve approximately 80% of the background perennial plant cover.

Much has been made of species richness targets for rehabilitation. However, in most situations, these are not directly relevant as the emphasis should be on restoring ecological function. It is not practical or cost effective to attempt to restore high levels of plant biodiversity within a short time frame. Once some ecological function is restored, species richness will slowly increase and ultimately the effectiveness of rehabilitation in restoring species richness can only be evaluated after 10 or more years after rehabilitation. However, it is important to note that rehabilitation with a variety of species provides increased resilience to drought and other pressures. As a result, rehabilitation with single-species stands is not recommended and at least 3-4 species should be used in any area.

Plant Species Suitable for Rehabilitation at Hoogland 3

No alien species should be used for rehabilitation within areas of natural vegetation. Although some of these are easy to establish, in the long-run, they retard the return of the indigenous species and do not contribute to meeting rehabilitation goals. Although the species selected for use in rehabilitation should come from the local indigenous species pool, not all species are equally suitable for use in rehabilitation. The primary criteria for selection are practical and economic which usually dictate the ease with which species can be established. This includes survival rates, with establishment success being measured in the field at least a year after planting, once plants can be considered established and self-sustaining. Although there are not large numbers of species which are suitable for rehabilitation, it is important to select a mix of functional types or growth forms (i.e. a mix of grasses, low shrubs and tall shrubs) as this adds structural diversity to the rehabilitated areas and also increases resilience. Within the context of the Hoogland 3 site, the selection of species is complicated by the variety of vegetation types present and the large differences in composition that occur between these types.

In terms of which species are considered suitable for use in rehabilitation and revegetation at the site, it is useful to consider what attributes such species should or should not have. For example, species which grow tall or which might quickly generate a high fire danger are considered unsuitable for use near infrastructure due to the risks and management problems

they may cause. In addition, annual species which flourish only after rains are also considered unsuitable as these would be absent in dry periods, leaving the soil exposed and vulnerable to erosion. The following general criteria have been identified as being important or useful in the selection of species for use in revegetation and rehabilitation. Some of these are considered essential criteria and others are considered desirable.

Essential Criteria:

- **Only perennial species should be used**. Short-lived species may flourish after rains but die out shortly thereafter. In addition, such species may function to keep more desirableperennial species out through depressing their growth and establishment.
- **Only naturally occurring species are considered.** Species which do not naturally occur in thearea are not considered viable options for use at the site.
- **No toxic or weedy species to be used.** Any species which are considered toxic to animals orpeople are not suitable candidates for use.

Desirable Criteria:

- **Commercial availability of seed**. Ideally a species should have seed commercially available so that large quantities of seed can be purchased and used to establish the species acrossthe site.
- **Ease of propagation**. For species that cannot be easily propagated from seed or for which seed is not commercially available, it is important that these species can be easily propagated vegetatively or by other means using standard nursery propagation techniques.
- **Ease of establishment.** Species used should be relatively easy to establish on-site, preferably using methods that be used across a broad area, such as standard agricultural planters or seed spreaders.
- **Ease of management.** Species used should be relatively easy to manage and should not pose a risk of become a problem at the site through establishing dense thickets, producing excessive biomass or otherwise hindering the daily operation of the plant.

Suitable Plant Species

A variety of species are identified below as potential candidates for use in rehabilitation and revegetation at the site. It is important to note that in practice several of these species should be used in conjunction to increase establishment success and account for differences in establishment between species that are likely to occur on different soil substrates and moisture conditions. In addition, there are likely to be different requirements and management objectives for different parts of the site. For example, in some areas the vegetation may need to be kept and controlled at a shorter level than other areas where taller vegetation may be acceptable. There are also likely to be places where it is desirable to establish taller woody species for landscaping, visual mitigation or other purpose. As such, a variety of species have been recommended, ranging from prostrate- growing grasses to large trees, which can all be

used depending on the specific area and required purpose. For each species identified, some background on the species is provided as well as possible uses and advantages and disadvantages of each species. For ease of interpretation, these have been categorised into the following growth forms: Grasses, Low Shrubs and Tall Shrubs.

Table 1. Table of species identified as being indigenous to the site and considered suitable for rehabilitation and revegetation purposes. This list is intended as a guide and additional species can also be used if available.

Low Shrubs	Tall Shrubs	Perennial Grasses
• *Pentzia incana* • *Pentzia globosa* • *Tripteris sinuate* • *Hermannia cuneifolia* • *Eriocephalus ericoides* • *Ruschia spinescens*	• *Lycium cinereum* • *Salsola aphylla* • *Diospyros austroafricana*	• *Eragrostis lehmanniana* • *Cynodon dactylon* • *Themeda triandra* • *Digitaria eriantha* • *Cenchrus ciliarus* • *Eragrostis obtuse* • *Stipagrostis ciliata*

If this requires an update

Monitoring and Evaluation

The primary purpose of monitoring should be to inform and enable adaptive management interventions and improve rehabilitation outcomes. As such, monitoring must be linked to targets, their associated measurement intervals as well as what actions are triggered when a target has not been met. There should thus be a clearly defined feedback between monitoring outcomes and consequent rehabilitation actions. A critical component of monitoring is detailed record keeping and associated data management.

There are various approaches to monitoring and parameters that can be measured. It is however important that these are relevant and practical to measure. Simple indicators such as plant cover and species richness are usually the most simple and reliable to measure, with a variety of published and well-known sampling methods.

As rehabilitation success is unpredictable in arid environments, monitoring and follow-up actions are important to achieve the desired cover and soil protection. The following basic monitoring schedule with associated remedial actions is recommended:

- Re-vegetated areas should be monitored every 6 months for the first 18 months following construction. Thereafter, monitoring should be conducted annually until such time as the target areas have attained the desired benchmark vegetation cover.
- Re-vegetated areas showing inadequate surface coverage (less than 20% within 12 months after re-vegetation) should be prepared and re-vegetated;
- Any areas showing erosion, should be re-contoured and seeded with indigenous

shrubs or succulents present in the local area.

Conclusions & Recommendations

When selecting species for revegetation and rehabilitation it is important to select species that are readily available or which can be readily propagated for this purpose. In addition, the primary determinant of revegetation success is survival of plants early on after germination or establishment. As such it is essential to select species which have a high probability of survival and which are naturally adapted to the conditions of the area. Timing is also likely to be important as rehabilitation during or immediately prior to the dry season is likely to result in significantly less success than rehabilitation early on during the wet season. The sandy soils of the site are generally poorly developed sandy soils with the result that soil limitations on rehabilitation success are likely to be relatively low and natural regeneration of vegetation on cleared areas is likely to be relatively rapid. As in most environments, the natural regeneration of vegetation can be significantly enhanced and reduce the need for active rehabilitation if effective topsoil management is implemented during the construction phase of the project. However, especially within the areas of dune fynbos, alien invasion is likely to be a problem within the cleared areas and as such, the rehabilitation plan needs to be closely allied and aligned with the alien management plan.

It is important to note that there is no single choice of plant species which can meet all rehabilitation and revegetation requirements. A mix of species provides for greater resilience in the face of an unpredictable environment where rainfall and climate vary substantially and affect different species in a different manner. In general 3-4 species should be used in any areas requiring rehabilitation and preferably, these should include a variety of growth forms such that greater vegetation structural diversity is achieved. Finally, it is important that monitoring be used firstly to check progress towards the identified rehabilitation targets and secondly be used to inform and trigger actions that may need to be implemented where these targets are not being met.

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Hoogland 3 WIND FARM – OPEN SPACE MANAGEMENT PLAN

PRODUCED BY RED CAP HOOGLAND 3 (PTY) LTD

August 2022

OPEN SPACE MANAGEMENT PLAN - PURPOSE

The purpose of the Hoogland 3 Wind Farm Open Space Management Plan is to provide a framework for the integrated management of the natural and semi-natural areas within and adjacent to the Hoogland 3 Wind Farm during the daily operational activities. The footprint of the facility will occupy a small proportion of the site, but impacts resulting from the construction and operational activities of the facility may extend beyond the required footprint and impact biodiversity within the site more generally. The goal of the Open Space Management Plan is to reduce the ecological footprint of the Wind Energy Facility through ensuring that the facility operates in a biodiversity-compatible manner and does not have a long-term negative impact on the local environment.

PROBLEM OUTLINE

The Wind Farm is located within a matrix of intact natural vegetation with a variety of free-roaming wildlife as well as livestock. Alien plant invasion, soil erosion, motor vehicle impacts, noise and disturbance generated by operational activities and human disturbance are potential impacts that may occur on an on-going basis at the site and extend beyond the actual footprint of the development. The purpose of the plan is therefore to ensure that the facility operates in a biodiversity compatible manner and does not have a long-term negative impact on the local environment.

RELATION TO OTHER SUBPLANS

During construction, there are a variety of subplans developed as part of the EMPr for the development that are aimed at ensuring that construction occurs in a responsible and biodiversity-compatible manner. This includes the Plant Rescue and Protection Plan, Revegetation and Rehabilitation Plan and Alien Management Plan. The purpose of the Open Space Management Plan is to ensure that all the different plans are aligned, and that additional measures are implemented during the operation of the facility to ensure that negative environmental impacts of the development are minimised.

OPEN SPACE MANAGEMENT SUBPLAN

The following elements are considered part of the Open Space Management Subplan:

<u>Access Control:</u>

- Access to the facility should be strictly controlled.
- All visitors and contractors should be required to sign-in.
- Signage at the entrance should indicate that disturbance to fauna and flora is strictly

prohibited.

- If there are fenced-off parts of the facility such as substations, O&M buildings etc., these should be fenced with a single fence with electrified strands only on the inside of the fence and not the outside, if required at all.

Prohibited Activities:

The following activities should not be permitted within the facility by anyone except as part of the other management programmes of EMPr for the development.

- No fires within the site.
- No hunting, collecting or disturbance of fauna and flora, except where required for the safe operation of the facility and only by the Environmental Officer on duty and with the appropriate permits and landowner permission.
- No driving off of demarcated roads.
- No interfering with wildlife or livestock.

Alien Plant Control

- Alien invasive plants should be controlled according to the Alien Invasive Management Plan.
- No non-locally occurring or alien plants should be established or brought onto the site.

Erosion Management

The facility should be inspected every 6 months for erosion problems or more frequently in the event of exceptional rainfall events. All erosion problems should be rectified according to the Erosion Management Subplan.

Faunal Management

The site will remain a semi-natural environment with a full complement of resident natural fauna, including a variety of mammals, reptiles and frogs that may be impacted by day-to-day activities at the site. The management of the facility should be aimed at trying to minimise interactions between wildlife and the facility in terms of its staff, infrastructure and activities.

- Bird monitoring and mitigation should occur according to the Avifauna Monitoring Programme.
- Snakes & Reptiles

- There are likely to be a variety of snakes present at the site including venomous species such as Puff Adder and Cape Cobra. They may be attracted to certain features such as buildings if these provide shelter or contain an abundance of prey species such as rodents.
- Snakes encountered within the facility may pose a danger to staff and should be allowed to move off on their own in the case of snakes encountered on roads or other areas within the 'veld' or be removed unharmed to safety by a suitably qualified person in the case where these pose a danger to humans.
- All vehicles should give way to snakes and tortoises crossing roads. There are a lot of access roads at the site and reptiles will be crossing these on a regular basis and the potential for mortality resulting from being 'run over' is high. All vehicles entering the site must adhere to reduced speed limits for heavy (30km/h) and light vehicles (40km/h).

- Mammals
  - Resident fauna should not be habituated by feeding them scraps or other foodstuffs and it is not necessary to provide such species with water either as most arid fauna are independent of water. As such, it is also important that all waste at the site is handled appropriately and kept in closed bins not accessible to fauna.
  - Some species are vulnerable to being hit by motor vehicles including Steenbok, Bat-eared Fox and Hares and Riverine Rabbits. All vehicles on the site should adhere to a low speed limit heavy (30km/h) and light vehicles (40km/h) and give way to any mammals on the roads, especially if there is any driving on the site at night.
  - All incidents should be recorded on a log maintained by the Environmental Officer, so that additional mitigation measures can be implemented if there are any specific areas where regular incidents occur.
  - Any Riverine Rabbits accidentally killed, or fatalities encountered should be collected and provided with the location they were found to the EWT officer in Loxton.
  - If there is any post-construction trenching or similar activity at the site, any trenches and holes excavated should not be left open for extended periods as fauna can fall in a become trapped. Trenches should have ramps of soil present where fauna can escape or should be excavated incrementally so that they are used only as required and do not stand open for extended periods.
- General Faunal Mitigation
  - Night-lighting at the site should be kept to a minimum. Artificial lights affect invertebrates and migrating birds and also attract bats and birds. If any parts of the site need to be lit at night for security or other reasons, then all lighting should be downward-directed low-UV type lights (such as most LEDs and HPS bulbs), which are less attractive to insects.
  - Any chemical, fuel, oil or other spills should be cleaned in the appropriate manner as related to the nature and extent of the spill. Contaminated soil should be removed from the site.

Integrated & Adaptive Management

The management of the facility should meet with the landowner and other relevant local managers to review the management of the facility on a regular basis. Records of such meetings should be maintained including decisions and management outcomes resulting from such meetings. The Open Space Management plan should be reviewed annually for the first three years post-construction to evaluate the effectiveness of management actions so that these can be adapted as appropriate.

Monitoring & Evaluation

- As the integrating framework for the environmental management of the site, the Open Space Management Plan should ensure that all monitoring and associated record keeping is conducting according to the schedules of the respective subplans.
- As the issues at the site are likely to change over time, the Open Space Management Plan should be evaluated on an annual basis for the first three years of operation and then every 3 years or more regularly if required. Where specific problems arise, persons with relevant expertise should be brought in to advise the management of the site and update the Open Space Management Plan.

HOOGLAND WIND FARMS & GRID CONNECTIONS

STORMWATER MANAGEMENT PLAN

June 2022

CONTENTS

STORMWATER MANAGEMENT PLAN

1 SCOPE

This report deals with the management and control of stormwater and soil erosion the Hoogland Wind Farm North and South Clusters near Beaufort West, located in the Western Cape Province. This report must be updated with all relevant conditions related to Storm Water Management contained in the Environmental Authorisation (if authorised) and Water Use License (if authorised), as well as any site specific conditions that result from the micro-siting walk through with relevant specialists. Note where relevant this will also apply to any associated works, such as substations, access along grid connections or road upgrades needed within the greater region, that will be carried out by the respective project.

2 GENERAL SITE CONDITIONS

Rainfall for the sites ranges from 122mm per annum (Loxton) to 392 (Beaufort West) (https://en.climate-data.org) with peak rainfall occurring the warm summer months. The microsited access roads and associated infrastructure as well as the hardstand areas will be overlaid on the topography for the site prior to the start of construction and will be detailed in the final design process.

Due to the nature of the soil (shales and clays) as well as the steep topography in parts of the site, there is a risk of erosion, opposed to the fact that some areas are dominated by flat plains created by alluvial fans and floodplains / depressions, which tend accumulate water. Thus stormwater management will need to cater for diversion of runoff in some areas or prevent accumulation of standing water in others.

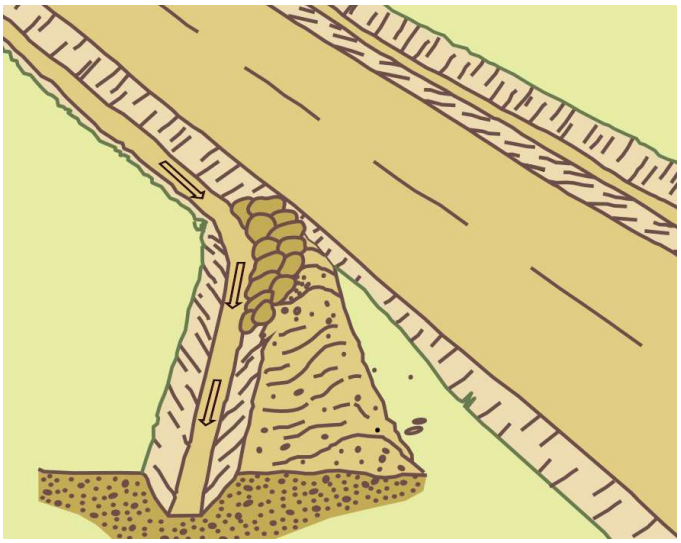
In areas of sensitive vegetation, watercourses and near wetlands, special care must be taken to minimize the impact of construction activities.

High rates of infiltration are not expected which will result in high run-off volumes, coupled to the fact that vegetation is sparse, which will increase run-off rates if not controlled.

3 ROAD CONSTRUCTION AND STORMWATER MANAGEMENT

The site access roads have been designed with a 6 m wide gravelled travelling surface and 2% crossfall across the width of the road. Typically a 450 mm deep side drain is to be constructed on the lower side of the road where required. Mitre drains (or off-shoot drains) lead water from the side drains away to lower lying areas next to the road.

A typical mitre drain is shown in the figure below:



These types of drains must be provided at regular intervals along the roads to disperse accumulated water away from the road. Typical spacing of mitre drains is as per the table below:

Mitre Drain Intervals		
Road gradient (%)	Interval should not exceed (m)	When discharging the water into farmlands
12	40	20 to 50 metres, wherever possible into the boundaries between farmlands
10	80	
8	120	
6	160	
4	200	
1-2	50 if excessive silting may occur	

Steep topography in parts of the site and maximum road gradient specification of 8% above may require some deep cuts and high fills to ensure accessibility for the delivery vehicles to all turbine locations. Banks in cut and fill scenarios should have slopes of minimum 1:2 (V:H) to limit erosion and improve slope stability. In these areas special attention is required to minimize erosion. Storm water drains should be utilised along the tops of high fills to limit runoff down these slopes.

Straw and / or local vegetation (mulch) produced during the clearing phase as stabilization is proposed for all the disturbed construction areas. This limits wind and (to a limited extent) water erosion and promotes quick re-growth.

Stone pitching and gabions and further methods allowed for steep slopes and energy dissipation (where required) to assist in breaking the energy of the water and to limit erosion in the site.

Stormwater pipe crossings are to be installed at low points in the roads to accommodate runoff effectively in areas where construction will interfere with the natural watercourses. For work on the stream crossings bidim geotextile will be utilised on either side of the crossing during construction to prevent excessive levels of silt and any potential contaminants entering the adjacent wetland.

Headwalls and erosion protection should be provided. Please refer to the Roads and Excavation Method Statements in **Appendix C1 & C2** for specific detail.

A proposed typical cross section of the roads is attached as **Appendix A**.

4 TURBINE PLATFORMS AND FOUNDATIONS

Platforms are to be created at each turbine location to facilitate the erection of the turbines. These platforms will be approximately 80 m long and 40 m wide with a maximum slope of 1% in any direction. Turning shunts and laydown areas are also to be provided where required. The final levels of these platforms should be within 1,1 m of the top of the foundation pedestal level to ensure sufficient crane height during the turbine erection process. The platform areas and turning shunts are to be gravelled in a similar way to that of the roads. Side drains with mitre drains should be provided along the edges of these to deal with stormwater runoff in these areas. Erosion protection similar to what is required along the roads should also be provided as and where required. The drainage and erosion protection at these locations are site specific and should best be approved on site by the Engineer. Please refer to Roads, Excavation and Concrete & Blinding Method Statements in **Appendix C1, C2 & C3** for specific detail

A proposed general layout and cross section of the platforms is attached as **Appendix B**.

5 GROUND AND SURFACE WATER CONTAMINATION PREVENTION

Pollution of ground and/or surface water as a result of construction activities should be prevented.

Pollution could result from:

- Contaminated runoff from construction camps, released by accident or otherwise.
- Discharge of contaminated construction water, chemicals, oils, fuels, sewage, runoff from stockpiles, solid waste and general litter.
- Use of paint, cold galvanizing or washing of paint brushes

Runoff from the site camp should be accommodated overland and not be accumulated to promote appropriate infiltration into the soil. All polluted runoff should be contained and treated by providing designated and properly designed and constructed washing areas for all equipment.

This water should be collected to a specific point and treated as hazardous waste. This should not take place in close proximity to any natural watercourses or sensitive areas.

For work on any stream crossings, bidim geotextile will be utilised on either side of the crossing during construction to prevent excessive levels of silt and any potential contaminants entering the adjacent wetland. Please refer to the Roads Method Statement in **Appendix C1** for specific detail.

Ablution facilities should be properly maintained and managed as per the requirements of the Environmental Management Programme (EMPr) and WUL (if authorised).

6 GENERAL EROSION CONTROL

All areas where erosion can occur should be provided with proper erosion protection and/or stabilization methods. Rip-rap, straw / mulch (preferred) stabilization, gabions and stone pitching should be provided where deemed necessary. Frequent monitoring and repairing of erosion prone areas should be undertaken during and after construction.

Topsoil stockpiles should conform to the required height and slope restrictions to reduce the risk of erosion in these areas, as detailed in the EMPr

Preventative measures should be taken to ensure that no material is washed into and/or deposited in watercourses and/or sensitive areas. Mitre drains should be kept clean and free of any solid waste or debris.

7 TRAINING

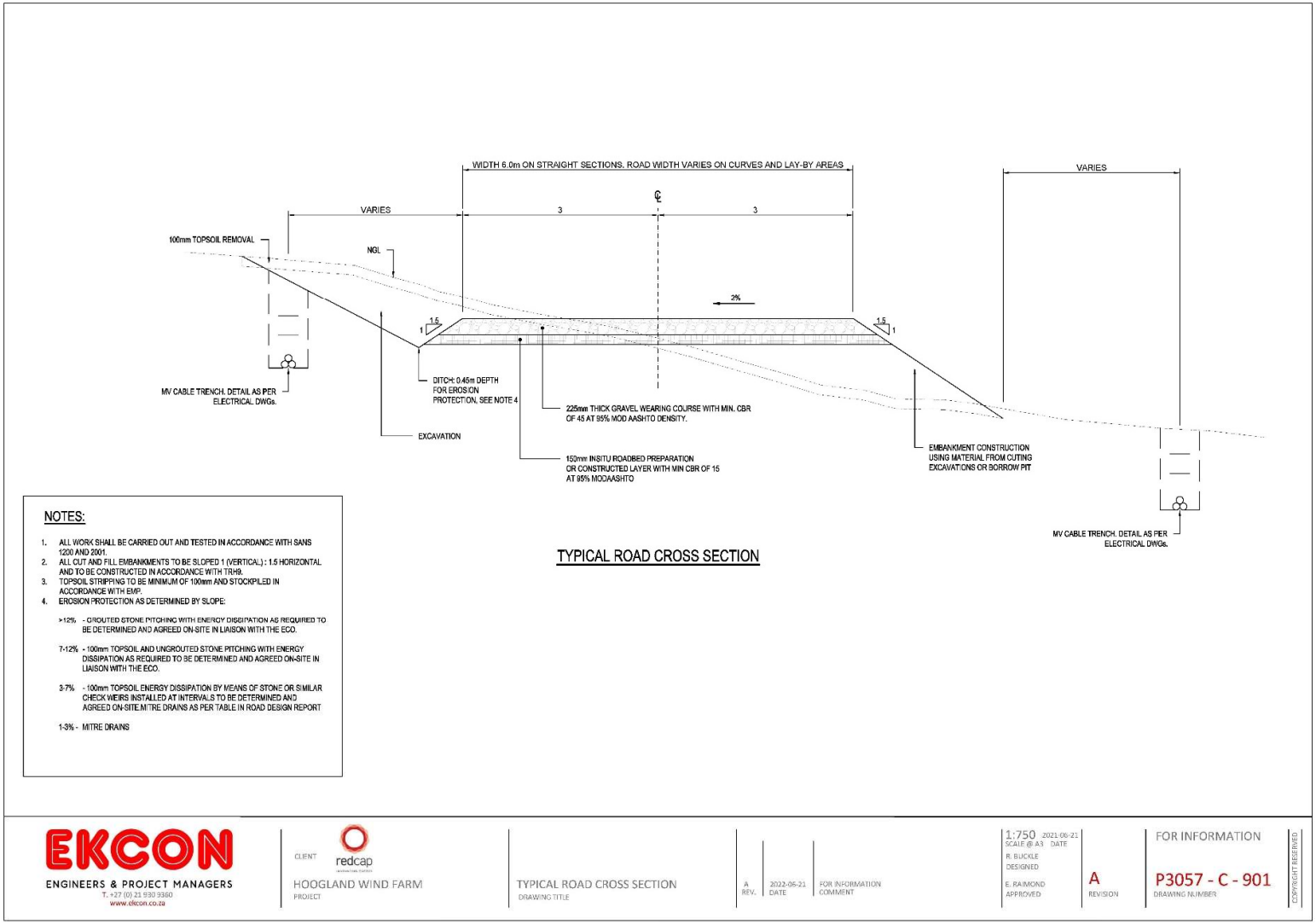
As part of their induction training, all workers on site should be made aware of the importance of stormwater management and the minimization of erosion. This should form part of the environmental awareness training and be included in the induction training material distributed to them.

8 MONITORING AND REPORTING

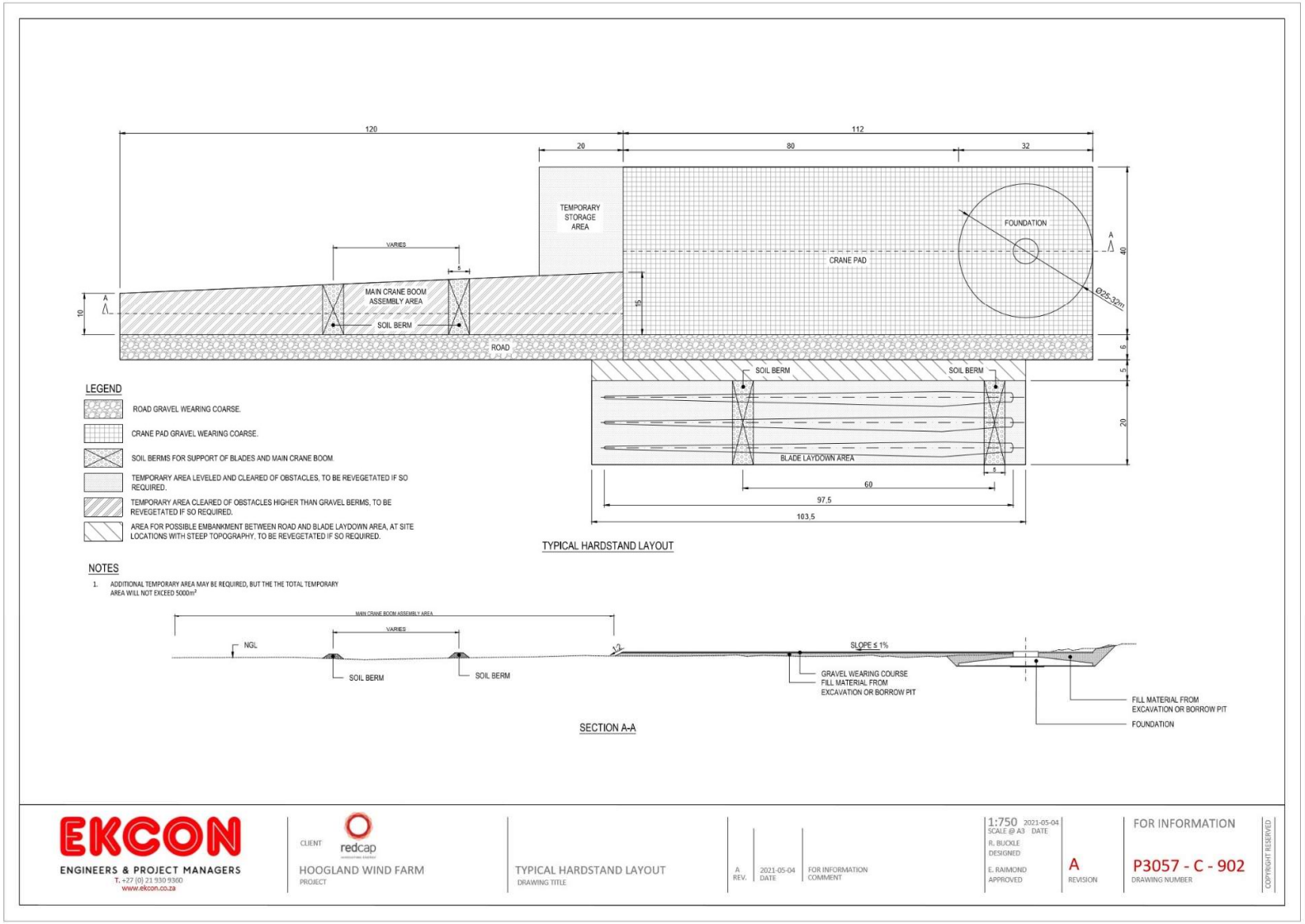
The Environmental Control Officer should monitor the implementation of the stormwater management plan on a daily basis. This includes all stormwater management features such as mitre drains, discharge areas, pipe culverts, water crossing and all erosion protection measures. This should be audited during routine site audits to ensure compliance to the stormwater management plan.

This document may be updated and amended as required during preconstruction, construction and post construction phases.

APPENDIX A – TYPICAL ROAD CROSS SECTION



APPENDIX B – TYPICAL PLATFORM LAYOUT AND CROSS SECTION



APPENDIX C – METHOD STATEMENTS

1. ROADS

DRAFT

Method Statement - Access Road Construction

1. Applicability

This Method Statement covers the construction of Access Routes and Roads necessary for the development, including upgrading and resurfacing of existing roads.

2. Type of construction activity

Excavation, construction and maintenance of access roads to the wind turbines (WTGs), site camp, laydown areas,

3. Timing of Activities

Throughout the construction period

4. Materials to be used

- Top soil
- Suitable in-situ material
- Imported G5/G6 gravel wearing course and G7 selected layer
- Water
- Crushed stone, geotextile materials, wire gabion/reno matrass boxes for erosion protection, straw stabilisation, mulch from chipping

5. Equipment and staffing requirements

- TLB's
- excavators
- dumpers
- tippers
- water carts
- graders
- rollers
- compactor
- Drivers
- foreman
- survey staff
- general workers

6. Methodology and or specifications to prevent impacts

6.1 Access Road Specifications

- The roads within the wind farm site will take the routes agreed in the approved final microsited layout plan.
- The design requirements are for a road capable of carrying large vehicles approximately 70 to 80 m long with axle weights of up to 20t.
- The surface will be an imported and compacted G5/G6 gravel wearing course.
- The roads will not be surfaced but would be designed to standards that ensure control of water and integrity of the road materials with limited maintenance.
- The road width will be increased proportionately for bends and passing/turning places.
- The road alignment and gradients will be set out to fit existing landforms as far as possible and shall be marked out prior to commencement of the works.
- Roadside drains shall have a depth of approximately 450 mm below the edge or roadway and a minimum longitudinal gradient of about 0,5%.
- Settlement ponds and barriers will be provided in and adjacent to the drains to avoid pollution and sedimentation of watercourses.
- Erosion protection will be implemented in disturbed areas with steep gradients to limit ground erosion in these areas.
- Direct drainage from roadside drains into watercourses will be minimized if and where applicable
- Cut–and-fill operations will be designed to achieve a good balance where possible and will be designed to cause the minimum amount of impact to the area.
- Topsoil will be used to dress the slopes and verges if required.

6.2 Existing Road-Track Widening

- Widening will be undertaken in line with National/Provincial/Municipal specifications.
- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Sections of road requiring minor widening will be excavated to a suitable formation.
- Several sections of track will require widening in areas with steep cross falls. Areas requiring fill to be placed to comply with longitudinal gradients will be designed to minimise the overall footprint of the embankment.
- Site-won material will be placed and compacted in layers to the required profiles. Areas in cuttings will be designed to cut more into the high side to minimise the impact of the road widening.
- Additional G5/G6 gravel wearing course might be required and will be imported as/when needed

6.3 New Access Track Construction

- The new access road construction will follow the same design principle as the road widening.
- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the roads for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Drainage ditches will be provided on either side of the tracks, where and if required, and culverts crossings will be provided if and where necessary to optimize stormwater flow.

6.4. Existing Roads- Stream Crossings

- A walk-over will be conducted and any soft or rutted areas identified and dealt with prior to any large construction plant arriving.
- Activity is to be strictly limited to existing road width. “No Go” demarcations are to be erected on either side of track.
- 1.5 m wide bidim geotextile to be spanned along the length of road on either side to prevent any material entering wetlands/streams.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.
- Bidim geotextile containing trapped material to be carefully removed by hand from site and content disposed of at facility approved by ECO.

6.5 Turbine hardstands

- Areas of cut-and-fill will be designed to achieve a suitable balance.
- Track footprints will be designed to cause the minimum of disruption.
- Where the removal of trees is required, the area will be felled according to the Vegetation and Landscaping Plan and in line with standard procedures, and where appropriate, the stumps will be removed. In areas clear of trees the area will be cleared of all vegetation. All topsoil will be stockpiled in windrows along the edges of the hardstands for use during reinstatement. Material removed from cuttings will be hauled to fill areas where suitable.
- Suitable material from cut or quarry/borrow pit will be spread and compacted in layers to the designed levels. An imported layer of compacted G5/G6 gravel wearing course will be constructed as the surfacing layer.

- Drainage ditches will be provided on either side of the hardstands, where and if required.

6.6 Dust Control

- Refer to specifications in the Dust Control Method Statement.

6.7 Rehabilitation

- Rehabilitation activities will take place in accordance with the Rehabilitation Method Statement.
- Following the completion of the earthworks phase, the edges of the access roads will be top-soiled with topsoil material from site to permit the establishment of vegetation along the side of the track. The vegetation will start to green the edges of the tracks, reducing future scour.
- As the track will have limited use during the operational phase, impact during operational phase will negligible.

7. Compliance

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

8. Water

All water required (dust suppression, etc.) will be drawn from temporary storage tanks.

9. Emergency or disaster incident and reaction procedures

Refer to Emergency Incident Method statement

10. Additional Information

Nil.

2. EXCAVATION

DRAFT

Method Statement – Excavation, Trenching & Backfilling

1. Applicability

This Method Statement covers the excavation requirements for the development of the Hoogland Wind Farms.

2. Type of construction activity

Excavation, construction, installation activities including access roads to the wind turbines (WTGs), site camp, laydown areas, substation and associated infrastructure.

3. Timing of Activities

Throughout the construction period

4. Materials to be used

- Top Soil
- Subsoil
- Stockpiles
- Layerworks
- Borrow material

5. Equipment and staffing requirements

- TLB's
- Excavators
- Dumpers
- Rollers
- Tippers
- Water trucks
- Compactors
- Drivers
- Foreman,
- Survey staff
- General workers

6. Methodology and or specifications to prevent impacts

6.1 Stormwater Management

During construction with a particular focus on excavation the Contractor shall protect areas susceptible to erosion by installing all the necessary temporary and permanent drainage works as soon as possible.

6.2 Clearing and Stockpiling of Topsoil and Vegetation

- Clearing and grubbing of topsoil will be carried out to a depth of approximately 150 mm, where applicable.
- Topsoil will be pushed into stockpiled in windrows adjacent to the particular works activity and maintained for reuse during rehabilitation.
- Topsoil stockpile will be free-draining and protected from erosion.
- Topsoil stockpiles will not exceed 2 m in height.
- Topsoil will not be mixed with other materials, such as building rubble, rock etc.
- Topsoil is to be handled twice only – once during clearing and stockpiling and once during rehabilitation
- The stockpiles shall be monitored, and dampened when necessary to control dust.
- No driving of vehicles on the topsoil stockpiles will be permitted.
- No blanket clearing of vegetation will permitted.
- All "no go" areas will be avoided as not to disturb the existing vegetation/natural features.

6.3 Earthworks/Roadworks

- On completion of the removal of the topsoil, the existing material shall be excavated to boxcut level.
- Material will be excavated using an excavator which will be operated by a competent person and transported with trucks to the stockpile areas on site.
- Layerworks will then be imported and tipped within the roadway.
- Road layers will be processed using a grader, and will be operated by a competent operator.

6.4 Trenching

- The trenches shall be excavated by an excavator.
- Topsoil and subsoils will be placed separately
- The excavated material will be placed one side of the trench.
- The same side of the trench will be utilized for access to the trench for materials.
- Once the construction is completed the trenches shall be backfilled utilizing the excavated material.
- Excess material shall be removed and spoiled at approved site.
- Dimensions of trench are typically 1 m deep and 0.6 m wide
- Trenching to occur only within existing road over stream crossings
- Trenching over any stream crossings to be supervised by ECO
- Ensure trench is demarcated, signed and safe if left unattended

6.5. Backfilling

- Backfilling to commence once cable has been installed, inspected and signed off by client.
- Ensure the trench is free from any objects that can cause damage to the cable or equipment.
- Install bedding soil and spread evenly across the trench

- Install blanket soil and spread soil evenly across cable. Care must be taken not to damage the cable.
- Install first layer of backfill. Spread evenly and stamp down
- Install danger warning tape according to specifications and drawing
- Install remainder of backfill and ensure it is spread evenly.
- Compact backfill at layers of approximately 300 mm
- Install topsoil and make good the area of excavation
- All unsuitable backfill material to be removed to approved spoil site

7. Water

Any water requirements to be supplied from temporary storage tanks on site.

8. Rehabilitation

Refer to Rehabilitation Method Statement.

9. Compliance

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

10. Emergency or disaster incident and reaction procedures

Refer to Emergency Incident Method Statement.

11. Additional Information

Nil.

3. CONCRETE & BLINDING

DRAFT

Method Statement – Concrete & Blinding

1. Introduction

This Method Statement covers the procedures of structural concrete and blinding activities for the WTG foundation for the development of the Hoogland Wind Farms. This method statement must be updated prior to the commencement of the relevant construction activities.

The proposed construction activities will in general consists of the following:

- Concrete Pumping
- Formwork
- Placing of Concrete

2. Applicable Specifications and Standards

- Environmental Management Programme
- Environmental Authorization
- ISO 14001
- SABS 1200
- Waste Management Plan
- Emergency Procedure Plan

3. Timing of Activities

Throughout the construction period

4. Resources

- Supplier Concrete Trucks
- Flow master PC 709 D Static pump with all its pipes
- Stationery planet Booms
- Water
- Poker vibrators - Electrical vibrating equipment
- Generator with drip tray
- Light stands. (Night Work if needed)
- Small power tools
- Drip trays
- Spill kits

5. Identification of activities and resultant impacts that may result from the activity

Activity	Impacts

Concrete, fuel and oil spillages	Contamination of surface water features, erosion, siltation, increased turbidity
Hazardous substance handling	Health hazard to workers

6. Plant inspection and operator training

All plant will be inspected as per safety procedures prior to the start of the work. Operator medical and competency certificates from an approved training institution must be provided prior to the start of the work.

7. Methodology and or specifications to prevent impacts

7.1. Structural Concrete

Concrete Pumping

- The approved ready mix concrete from our supplier will be delivered to the specific WTG foundation of the day.
- A concrete boom pump will be used to distribute the pump mix in to the structure to ensure proper distribution of the product throughout the base.

Formwork

- Type 1 & Type 2 Steel shutters will be installed according to their design.

Placing of Concrete

- The delivery of concrete will be continuous and of suitable design to allow for pumping as well as ease of passage through the rebar.
- High frequency electrical vibrator equipment of sufficient quantity will be used to compact concrete.
- Temporary false forms will be will installed for level control on the slopes.
- Concrete placed on slopes will be placed from the bottom to the top to avoid concrete shearing from slipping.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Sufficient standby equipment will be available during the proposed poor dates.
- Heat of hydration will be monitored by means of thermocouples' in the concrete.
- Special thermal blankets will be placed for 7 days after initial set to control the heat of hydration
- Thermal blankets will also assist with the curing of the concrete

7.2 Blinding

Preparation for concrete blinding

- All loose material present should be removed by means of a broom.
- If required by the Engineer water can be sprayed on the surface to suppress dust prior to activity.
- Once approval for blinding is given (after inspection by the Geotechnical Engineer) the operation may commence.

Formwork

- Dimensions of the area of blinding will be controlled by means of flexi steel shutter sections at the appropriate height.

Placing Blinding

- Blinding will be discharged directly at designated area.
- The concrete truck will reverse down the constructed ramp and discharged it contents starting from the furthest point.
- The concrete will be compacted using the appropriate vibrating equipment.
- Concrete will be struck off using conventional rake floats and possible power floats.
- Finishing and curing of concrete will occur as per specification.

8. Training Requirements

Induction Training

- All personnel relevant to the operation will be inducted and the methodology will be discussed. Task planners to be signed

Specific Training

- The relevant personal will receive training on the different small plant which will be used during the operation.

Safety Toolbox

- All employees relating to the activity shall be made aware of the possible risks that may occur during the operation as per approved Risk Assessment.
- A circle meet will be held with all the responsible parties prior to the operation.

9. Water

- All water required (batching, etc.) will be drawn from temporary storage tanks.

10. Control of Substances Hazardous to Health

The goal is to identify possible risks and implement a safe system by means of developing a standard safety procedure for this specific operation. Site specific risk assessments identify the potential hazards, associated risks and mitigating controls relating to casting of concrete will be compiled. Staff will be trained on the content of this risk assessment prior to the commencement of the activity and records are retrained on site.

In addition to risk assessment training, all employees will receive site specific Site, health, safety and environmental induction prior to commencement of work.

All employees will be issued and be required to use the necessary PPE as determined by the activity risk assessment for example Eye protection, Safety Harnesses if required, Gumboots, Hard hats and Plastic Gloves.

Standard Procedures

- A checker will control the movement of the all ready mix trucks supplying the concrete pump.
- Employees working on heights are required to wear a harness.
- All employees working at heights should be cleared medically.
- The relevant PPE will be worn at all times.
- Base stations will be present at the relevant WTG foundations. This should include a toilet, first aid kit, drinking water, smoking area and communication radio.
- Concrete mixer trucks will deliver and discharged the ready mix concrete.
- Shutter oil will be stored in clearly marked containers.
- Diesel will be transported in diesel bowser / drip trays to be used when filling plant.
- All concrete spills will be cleaned and returned to the concrete batch plant and placed in the designated waste area
- Shutter oil spills to be cleaned using spill kits
- Diesel spills to be cleaned using spill kits
- Ready Mix trucks to be cleaned or washed out at designated cleaning area

11. Emergency Procedures

Refer to Emergency Response Method Statement and Health and Safety Management Plan

Emergency Incidence Avoidance

- Environmental awareness induction will be given to all employees
- Only trained personnel will handle dangerous substances and goods
- All dangerous goods will be stored in secure areas

Spillages

In the event that a spill occurs on site, the following immediate action will be taken to limit the amount of spill by isolating and controlling/stopping the source.

- Appropriate actions will be undertaken to prevent/contain contamination of ecologically sensitive area.
- The spill will be contained by applying absorbent material and, in the case of spillage to a watercourse, by the use of booms.
- A spill kit which contains absorbent pads, bags, etc. will be carried on every refueling vehicle.
- All spills should be treated with a matter of urgency.
- In the event of an oil spillage contaminated soil must be removed and stored in a skip dedicated to hazardous waste. The soil will then be disposed of at a registered hazard waste disposal site by the appointed waste disposal service provider.
- The Site Agent, ESO and ECO will be informed of the incident as soon as possible and a spill/incident report will be made out.

12. Compliance Monitoring and Record Keeping

The tasks carried out during that day will be summarised in the daily diary and sent to the Site Agent for approval.

Awareness to this method statement will be established through training sessions at the beginning of each day and keeping of attendance registers.

Concrete will be checked and signed off by the Resident Engineer on completion.

Equipment necessary to test the concrete quality will be available at the site laboratory. Results from the concrete supplier will thus be verified.

Delivery notes from the supplier will be kept at the site office for record keeping.

Compliance to the specifications will be monitored by the Environmental Site Officer on a daily basis. Any non-compliance will be reported to the Site Agent and will further be recorded in the daily site environmental diary and reported to the Environmental Control Officer in terms of weekly reporting.

HOOGLAND 3 WIND FARM EROSION MANAGEMENT PLAN

PRODUCED BY RED CAP HOOGLAND 3 (PTY) LTD

August 2022

PURPOSE

The purpose of the Hoogland 3 Wind Farm erosion management plan is to implement avoidance and mitigation measures to reduce the erosion potential and the likely impact of erosion associated with the construction and operational phases of the proposed development. As part of the management plan, measures to protect hydrological features from erosion damage are included.

SCOPE & LIMITATIONS

This plan is intended at introducing measures aimed at reducing the negative impacts of erosion on biodiversity as well as reducing the vulnerability of the site to erosion problems during the construction and operational phases of the development. The focus is on managing runoff and reducing the construction phase impact on ecologically sensitive areas. The plan does not cover engineering-side issues which are of relevance to soil management and erosion. Therefore, issues such as the potential presence of heaving clays, compressible soils, perched water tables, dispersive soils and corrosive groundwater at the site are beyond the general scope of this study and are not directly dealt with. These issues would need to be addressed and their relevance assessed during detailed geotechnical investigation of the site.

RELEVANT ASPECTS OF THE SITE

Hoogland 3 is located in an area where the topography is characterized by two prominent cliff-lines. The first is located in the extreme southwest of the site and generally runs north-south. The difference in elevation across this feature ranges up to approximately 80m. The second cliff-line runs east-southeast and just clips the extreme northeast of this site. Elevation differences of up to approximately 50m occur across this feature. A north-flowing stream with associated alluvial deposits occurs along the western margin of the site and a river occurs along the eastern margin, first passing into a dam then into a local agricultural area. Undulating topography with local ridges and scattered kopjes and irregular ground occurs in other parts of this site.

The project is situated at approximately 1 400 to 1 500 meters above sea level (mamsl).

The land type data shows the dominant soils to be shallow soils on underlying rock or hard-pan carbonate with low to medium agricultural sensitivity.

BACKGROUND

Types of Erosion

Erosion comes in several forms, some of which are not immediately obvious. The major types of erosion are briefly described below:

Raindrop impact

This is the erosion that occurs due to the "bomb blast" effect of raindrop impact. Soil particles can be blasted more than a meter into the air. Apart from loosening soil particles, the effect can also break soil aggregates apart and form a clay seal on the surface which resists infiltration and results in increased levels of runoff. This effect is most important when large areas of exposed soils are present. If the site is cleared, then this effect will play an important role as it results in the soil surface becoming sealed which reduces infiltration and increases runoff, leading to erosion.

Sheet erosion

This is the removal of a shallow and uniform layer of soil from the surface. It is caused initially by raindrop splash and then by runoff. Sheet erosion is often difficult to see as no perceptible channels are formed. Accumulated sediment at the bottom of the slope is often the only indicator. This is likely to be an important erosion type at the site given the gently sloping nature of the site and the susceptible soils.

Rill erosion

This is the removal of soil from the surface whereby small channels or rills up to 300mm are formed. It is caused by runoff concentrating into depressions, wheel tracks etc. This type of erosion usually occurs on lower slopes and at the site, it is likely to occur on the deeper soils which occur towards the drainage line which forms the southern boundary of the site.

Gully erosion

This is the removal of soil from the surface and sub-surface caused by concentrated runoff eroding channels greater than 300mm deep. Gully erosion often begins as rill erosion which is not addressed. As with rill erosion, the southern boundary of the site is likely to pose the greatest risk for gully erosion.

Wind erosion

Wind erosion results from soil particles being picked up, bounced or moved by the wind. Wind erosion is primarily a problem in arid areas and may affect sands soils as well as fine-textured soils. Vegetation cover is usually an effective barrier to wind erosion, but large soils losses or degradation

can occur in disturbed areas or on croplands. Given the high clay fraction in the soils at the site, it is not likely that wind erosion will be a significant influence at the site, except perhaps in disturbed areas where there is exposed soil.

Erosion at the site

Given the slope and other characteristics of the site, the major types of erosion likely to be apparent at the site are sheet erosion and rill erosion, which if unchecked would lead to gully erosion.

Promoting Factors

Rainfall characteristics

High-intensity, short-duration storm events have much greater erosion potential than low intensity, longer duration storm events with the same runoff volume. Intense storms produce larger raindrops, and are more likely to break up the soil and dislodge particles. Rainfall for the site is ~300mm per year with a high degree of variability and with rainfall distributed throughout the year.

Soil erodibility

Soil erodibility is determined by the soils ability to resist detachment and transport due to rainfall, runoff and infiltration capacity. Well-structured soils with a high clay content are generally least erodible. Some clays are dispersible meaning that they break down when wet and become highly erodible. Silts and fine sands are highly erodible.

Length and steepness of slope

Steeper slopes cause runoff flow velocities to increase, resulting in increased erosion. As the slope length increases the opportunity for runoff to concentrate and achieve an erosive velocity also increases. Given the steep slopes in parts of the site, there is opportunity for flow from different sources to accumulate and increase in erosive power.

Soil surface cover

Soil surface cover such as vegetation and mulch protect the soil surface from raindrop impact, reduce flow velocity, disperse flow, and promote infiltration and the deposition of sediment. This is a basic principle underlying many erosion-control approaches which aim to modify the surface characteristics in order to reduce the flow velocity and reduce the potential for erosion. In this regard it is important to note that many of the practices which are used to enhance rehabilitation potential are also useful in reducing erosion potential.

EROSION AND SEDIMENT CONTROL PRINCIPLES

The goals of erosion and sediment control during and after construction at the site should be to:

- Protect the land surface from erosion.
- Intercept and safely direct run-on water from undisturbed upslope areas without allowing it to cause erosion within the site or become contaminated with sediment.
- Progressively revegetate or stabilise disturbed areas.
- Prevent damage to hydrological features such as drainage lines or wetlands, either within or adjacent to the site.

These goals can be achieved by applying the following principles:

- Integrate project design with site constraints.
- Plan and integrate erosion and sediment control with construction activities.
- Minimise the extent and duration of disturbance.
- Control stormwater flows onto, through and from the site in stable drainage structures.
- Use erosion controls to prevent on-site damage.
- Use sediment controls to prevent off-site damage.
- Control erosion and sediment at the source.
- Stabilise disturbed areas promptly.
- Inspect and maintain control measures.

ON-SITE EROSION MANAGEMENT

Exposed and unprotected soils are the main cause of erosion in most situations. Therefore, the erosion management plan and the revegetation and rehabilitation plan should be closely linked to one another and should not operate independently, but should rather be seen as complementary activities within the broader environmental management of the site and should therefore be managed together.

General factors to consider regarding erosion risk at the site includes the following:

- Soil loss will be greater during wet periods than dry periods. Intense rainfall events outside of the wet season, such as occasional unseasonal showers can also however cause significant soil loss. Therefore, precautions to prevent erosion should be present throughout the year.
- Soil loss is related to the length of time that soils are exposed prior to rehabilitation or stabilization. Therefore, the gap between construction activities and rehabilitation should be minimized. Allied to this the fact that topsoil does not store well and should preferably be used within a month or at most within 3 months to aid in the revegetation and rehabilitation of

disturbed areas.

- Phased construction and progressive rehabilitation are important elements of the erosion control strategy.
- The extent of disturbance will influence the risk and consequences of erosion. Therefore, large areas should not be cleared at a time, especially in areas such as slopes where the risk of erosion is higher.

SPECIFIC RECOMMENDATIONS TO REDUCE EROSION POTENTIAL AND DEGRADATION OF WETLANDS AND DRAINAGE SYSTEMS

The construction of access roads, other infrastructure as well as cable trenching may impinge on wetlands and drainage systems and thus precautions should be taken in these situations to reduce their potential impact.

Concentration of flows into downstream areas

- Road crossings over drainage lines, streams and wetlands can impact downstream ecosystems. Crossings that result in narrowing of the downstream system can concentrate flows and channel water downstream. This may result in a loss of wetland function, and result in the drying out and shrinkage of the wetland area. Erosion and increased vulnerability to invasion of drier banks by alien vegetation may occur.
- Culverts should be adequately spaced such that they do not result in shrinkage of downstream wetlands. Where roads cross minor drainage channels, a single culvert may be adequate, aligned with the downstream drainage line. Where more substantial wetland systems are intercepted by a road, sufficient culverts should be provided such that downstream shrinkage of wetland width does not occur. Moreover, culverts should be aligned, as far impossible, with existing, natural channels.
- All crossings of drainage systems should ensure that both surface and shallow subsurface flows can be accommodated where appropriate and that unnatural channelisation does not occur downstream.

Runoff concentration

The increase in hardened surfaces associated with the hardstands, roads and other infrastructure, will lead to a significant increase in the volume and velocity of flow generated from these areas during large rainfall events.

- Runoff from road surfaces is usually channeled off of the road surface towards the downslope side of the road. On steep slopes, the volumes and velocity of runoff generated may result in erosion of the surrounding areas. Therefore, specific measures to curb the speed of runoff water is usually required in such areas, such as rock beds or even gabions. In addition, these areas should be monitored for at least a year after construction to ensure that erosion is not being initiated in the receiving areas. Once erosion on steep slopes has been initiated, it can be very difficult to arrest.

Diversion of flows

Diversion of flows from natural drainage channels may occur when roads interrupt natural drainage lines, and water is forced to run in channels along the manipulated road edge to formalized crossing

points. Even slight diversion from the natural drainage line can result in excessive downstream erosion, as the new channel cuts across the slope to reach the valley bottom. Should the access roads to the site traverse any major drainage lines, the following principles should apply.

- Adequate culverts should be provided along the length of all roads to prevent diversion of flow from natural drainage lines.
- Culverts should be carefully located, such that outlet areas do in fact align with drainage lines.
- The downstream velocity of runoff should be managed, such that it does not result in downstream erosion – on steep slopes, where roads have been constructed on cut areas, allowance should be made for culverts to daylight sufficiently far down the slope that their velocities are managed and erosion does not occur.
- Where necessary, anti-erosion structures should be installed downstream of road drains – these may comprise appropriate planting, simple riprap or more formal gabion or other structures.
- Roads and their drainage system should be subject to regular monitoring and inspection, particularly during the wet season, so that areas where head cut erosion is observed can be addressed at an early stage.

MONITORING REQUIREMENTS

Construction Phase

The following monitoring actions should be implemented during the construction phase of the development.

Monitoring Action	Indictor	Time frame
Identify all river and drainage line crossings affected by the development	Map of sites of potential concern	Preconstruction
Monitor cleared areas forerosion problems	Record of monitoring site, problemsencountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise.
Monitor vegetation clearing activities near sensitive areassuch as wetlands or drainage lines	Activity log of monitoring actions andany mitigation and avoidance measures implemented	Monthly during the rainy season and following significant rainfall events otherwise.

Monitor revegetated and stabilised areas	Record of monitoring site, problems encountered and remedial actions implemented	Monthly during the rainy season and following significant rainfall events otherwise.

Operational Phase

The following monitoring actions should be implemented during the operational phase of the development.

Monitoring Action	Indictor	Time frame
Monitor for the development of new erosion problems across the site, with a focus on areas where water has been diverted or collected from upslope onto downslope areas	Map of erosion problem areas	Bi-Annually
Document erosion control measures implemented	Records of control measures and their success rate.	Bi-Annually
Document the extent of erosion at the site and the remedial actions implemented	Decline in erosion and vulnerable bare areas over time	Bi-Annually

HOOGLAND WIND FARMS

HOOGLAND SOUTHERN WIND FARMS: NOISE MONITORING PLAN

(extracted from Enviro Acoustic Research's Noise Impact Assessment, 2022)

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

Because the projected noise levels do not exceed 42 dBA, routine noise monitoring is not recommended or required. However, should a reasonable and valid noise complaint be registered, the holder of the EA should investigate the noise complaint as per the guidelines below. These guidelines should be used as a rough guideline as site specific conditions may require that the monitoring locations, frequency or procedure be adapted.

1 MEASUREMENT LOCALITIES AND FREQUENCY

Should there be a noise complaint, once-off noise measurements must be conducted at the location of the person that registered a valid and reasonable noise complaint (NSR staying within 2 000 m from construction, operational or decommissioning activities). The measurement location should consider the direct surroundings to ensure that other sound sources cannot influence the reading.

2 MEASUREMENT PROCEDURES

Ambient sound measurements should be collected as defined in SANS 10103:2008, though measurements in terms of ETSU-R97 are highly recommended. Due to the variability that naturally occurs in sound levels at most locations, it is recommended that semi-continuous measurements are conducted over a period of at least 120 hours, covering at least five night-time (22:00 – 06:00) periods. When a noise complaint is being investigated, measurements should be collected during a period or in conditions similar to when the receptor experienced the disturbing noise event.

RED CAP ENERGY
HOOGLAND SOUTHERN WIND FARM CLUSTER
PROJECT TRAFFIC MANAGEMENT PLAN

Report prepared for:

Red Cap Energy (Pty) Ltd
of
Unit B2, Mainstream Centre,
Main Road,
Hout Bay
7806

Phone: +27 (0) 21 790 1392

Email: *kirsten@red-cap.co.za*

Report prepared by:

Athol Schwarz
of
45 Raven St,
West Beach,
Table View
7441

Mobile: +27 (0) 82 777 1961

Email: *schwarzathol@gmail.com*

Project TMP (Rev 2) – 20th June 2022

CONTENT

LIST OF TABLES

LIST OF FIGURES

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1 INTRODUCTION

1.1 GENERAL

A Traffic Management Plan (TMP) for roadwork sites provide a means of planning and implementing how all likely road users will be safely and efficiently guided through a roadworks site and ensure the network performance is not unduly impacted, for the duration of the works.

Road users are not limited to motorists - they include construction personnel, pedestrians, cyclists and emergency vehicles. Management of work on roads requires consideration of all road user needs and obligations and attention should not focus just on the management of vehicular traffic through, past or around the work site.

Traffic Management is the management of occupational safety and network performance risks associated with work activities undertaken in a traffic environment. Risk management and the elements of the risk management process form the basis of this guideline. TMPs are prepared in advance of the works being conducted and should be subject to reviewing and/or auditing before and after implementation.

A traffic management plan is a "living document" and needs to be continually reviewed and updated as operational requirements and site conditions change, all changes to the document will be communicated to all affected parties.

This document has been prepared for the exclusive use on the Hoogland Southern Wind Farms project. ***This document forms the platform from which the Contractor shall, together with all other relevant site-specific documents, develop the necessary traffic management plan for the various works to be undertaken.***

The successful implementation of a TMP requires time, effort, common sense and a lot of commitment by the contract management team.

1.2 PURPOSE AND OBJECTIVES

This TMP is an overarching document covering proposals to be adopted for accommodation of traffic and the management of construction transport/traffic during construction works of this development.

The purpose of this management plan is to ensure the safety of construction personnel, the general public, pedestrians and traffic, by undertaking the following:

- *Provide, maintain and update an effective TMPs,*
- *Meet the requirements of the client and project site,*
- *Ensure traffic is accommodated for optimal flow and safety during the construction phase of this project,*
- *Aim to achieve zero incidents,*
- *Aim to achieve zero environmental incidents,*
- *Define clear tasks, authorities and responsibilities with regard to the control of hazards,*
- *Ensure compliance with legal and other project site requirements,*
- *Keep traffic delays to a minimum,*
- *Maintain satisfactory property access,*
- *Minimise disruption to businesses,*

- *Minimise disturbance to the environment, and*
- *Provide accessibility to Emergency Rescue Vehicles*

The overall objectives of the plan are to ensure that optimal and safe flow of traffic is maintained during construction, and to reduce road accidents during all the phases of the project and to minimize personal exposure and property damage. It must be noted that this plan is a living document and will be updated when necessary and in particular during construction to reflect new developments on the project.

This document should be developed in conjunction with the South African Road Traffic Signs Manuals (Volume 1 to 5), together with all other relevant site-specific documents.

The Contractor responsible for all construction activities which interacts, in any way with traffic on private or public roads shall be required to compile and submit to the Client for acceptance, a detailed TMP for each area work is to be undertaken, which includes but is not limited to the following:

- *Working at intersections on public road network, i.e., at the entrances of the developments,*
- *Detours of the public road network, i.e., when the public road needs to be realigned,*
- *When stringing cables over public roads,*
- *Road construction on the development itself, and*
- *Management of the traffic within the development.*

2 PROJECT DESCRIPTION

2.1 SITE LOCATION

Red Cap Energy (Pty) Ltd aims to develop four Wind Farms north of Beaufort West within the Central Karoo District Municipality of the Western Cape. The proposed wind farms are the Hoogland Wind Farm 1 and Hoogland 2 Wind Farm, constituting the Northern Cluster, and Hoogland 3 Wind Farm and Hoogland 4 Wind Farm, constituting the Southern Cluster. Collectively referred to as the Hoogland Wind Farms.

The Southern Cluster is approximately 60 km north-north-west of Beaufort West and about 55 km south-south-west of Loxton. The total area of the Northern Cluster is in the order of approximately 34 300 ha.

The DR02314 and OP08870 form the western boundary of Hoogland 3 Wind Farm, the center portion of Hoogland 3 straddles the DR02312, while the DR02312 forms the northern boundary of Hoogland 3 Wind Farm over the eastern half.

The DR02312 forms the southern boundary of most of Hoogland 4 Wind Farm. Both the OP08869 and OP08871 (North South orientation) forms part of the access routes onto Hoogland 4 Wind Farm.

The road network of the public roads in this area is shown in Figure 1.

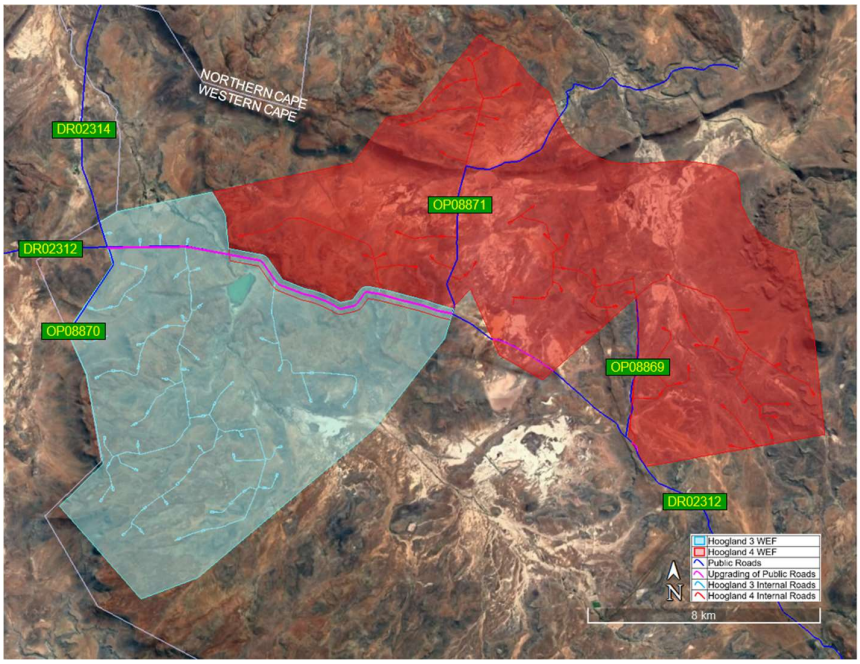

Figure 1 - Site Location

2.2 EXTENT OF THE WORKS

The temporary road works on the public road network associated with this development, include;

- *upgrading of the entrances from the public road network to Hoogland 3 and Hoogland 4 Wind Farms,*
- *upgrading of the sections of the public road DR02312, within the boundaries of the developments, and*
- *upgrading various sections of the public road network and intersection for the delivery of abnormal loads.*

The construction of roads, platforms, terraces, laydown areas, on the construction site are on private property and shall also be subjected to the requirements of this TMP.

2.3 SPECIFICATIONS FOR TMP

The Contractor is to submit a detailed TMP to the Engineer for approval, for each area where the relevant works is to be undertaken.

Specifications will be strictly in accordance with the South African Road Traffic Signs Manual Volume 2, Chapter 13 and in accordance with the relevant specifications of the contract documents, specifically sections of the contract document relating to Traffic Accommodation.

The Contractor must ensure that provision is made for access by emergency vehicles, at all times.

2.4 STATUTORY REQUIREMENTS

Traffic management is risk management and the principals, employers and persons in control of workplaces have a statutory duty under the Occupational Health and Safety Act, and Mine Health and Safety Act; to identify hazards, assess risks and consider means to mitigate the risk exposure.

Due to the size of the components to be delivered to site, it is envisaged that these loads will be classified as abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989). Thus, the necessary permit will have to obtained from the relevant authority, in advance. All vehicles must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads.

Legal and other provisions

The current versions of the following documents and legislative provisions apply for those planning to conduct work within the road reserve of any public road, or to manage traffic for an event:

- *National Road Traffic Act (Act No 93 of 1996),*
- *Local Government: Municipal Systems Act (Act 32 of 2000),*
- *Occupational Health and Safety Act (Act 85 of 1993),*
- *Mine Health and Safety Act (Act 29 of 1996),*
- *Compensation for Occupational Diseases Act (Act 130 of 1993), and*
- *NEMA (Act 107 of 1998).*

3 TRAFFIC MANAGEMENT

As each roadwork site is unique, individual TMPs are required for each site and may also be required for individual work activities during the term of the works (Note: for some routine/repetitive type works a generic TMP may be appropriate). It needs to be remembered that the TMP is a Risk Management Plan and consists of:

- *Documentation of the risk assessment for the project and the procedures and practices that will be utilised to manage the risk exposure. Importantly, the risk assessment process should be undertaken as the first step in the preparation of a TMP and the outcomes from the risk assessment used to develop appropriate strategies for managing and mitigating risks.*
- *Traffic control diagrams (TCD's) which outline signage and devices and their placement. TCD's should be drawn clearly and unambiguously indicate all traffic controls required for each and every stage of the works.*

Traffic management measures are to be adopted at road works. In order to have efficient and safe site operations, a systematic break-down of a site into standardised sub-components is necessary. This will allow the Site Construction Manager to understand the traffic operation on the site. These sub-components could be hundreds of meters in length at major sites, or a few meters in length at localised sites. These standardised sub-components are discussed in detail below.

3.1 WARNING AREA

An area of the construction site, in this case a portion of the road, which is utilised to alert motorists of any impending temporary conditions that will require particular care other than what would normally be expected.

When the construction site is on or directly adjacent to a road, a stepped reduction in speed will inevitably be required within this area. This stepped reduction should occur in 20 km/h decrements and at reasonable intervals (minimum 200 meters) until the speed for which the traffic control is designed is indicated. This final speed limit should be repeated at least once within the area of the traffic accommodation as good practice.

The length of the advance warning area should relate directly to measured approach speeds, and a reasonable distance must be allowed for speed reduction. In situations of high traffic volumes, a generous length will be required as more time is needed to take in the sign message and to react accordingly. The advance warning area will become longer in the event of a combination of higher approach speeds and high traffic volumes.

3.2 TRANSITION AREA

This is the area in which the motorist is required to take an action.

This area of the construction site can be defined as where there is a shift of position on the roadway without a reduction in the number of lanes (diversion), the merge of two lanes into one (lane drop), crossing of the central median (crossover), or entering a detour that is completely separate from the construction works.

The transition area must be clearly demarcated using delineator plates and should confirm to the layout, if any, depicted on the guidance signs preceding it. In more complex road works, these should be broken down into a number of standard transition areas. Care should be taken that no signage for subsequent transition conditions is included within a specific transition area. The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition.

3.3 STABILISING AREA

The purpose of a stabilising area is to allow traffic flow to stabilise after negotiating a transition area, and before reaching another change of condition. In the instance of where more than one transition area is required to achieve the final traffic configuration, the signing of subsequent transitions should be located within the stabilising area(s). The stabilising area is normally defined by delineator plates.

3.4 BUFFER ZONE

The buffer zone is normally located between a transition area and the actual work area. In a situation involving more than one transition area, the buffer zone will occur after the transition area closest to the work area. The buffer zone can be relatively short, but should be a minimum of 50 meters.

The principal function of a buffer zone is to separate traffic from the workers at the site in the interests of worker safety. The provision of a longitudinal buffer zone, together with a lateral buffer zone, should be considered as fundamental to effective worker safety.

3.5 WORK AREA

The work area can be adequately defined by delineators in less complex conditions. However, where there is a risk to traffic or workers for vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration should be put in place. In the event that traffic is located well away from the work area, then little action is required along the length of the work area other than to protect the workers and construction vehicles. All work directly adjacent to the road shall be adequately barricaded to provide protection to the Contractor's personnel.

3.6 TERMINATION AREA

This area involves the return of traffic to normal flow conditions. For simple cases, a relatively short taper or delineator signs will suffice. In more complex situations, a

reverse crossover may be required. This should follow the same principles given for such conditions at the commencement of the construction works.

4 RESPONSIBILITIES

This section outlines the responsibilities of the key construction personnel with regarding to the TMP, to ensure the safety of construction personnel and the road users that pass through the work areas. The roles defined below will need to be amended, as applicable, to suit the Contractors construction organogram for the project..

4.1 SITE CONSTRUCTION MANAGER

The Site Construction Manager shall be ultimately responsible for the TMP and its compliance with the Road Traffic Act. The Site Construction Manager will ensure that the TMP is suitably resourced with people, equipment, facilities and systems and be responsible for the co-ordination of the engineering, procurement and construction activities, relevant policies, methods and the implementation of the TMP. The Site Construction Manager shall

- *ensure that all rules and procedures defined in the TMP are adhered to.*
- *encourage sound work practices and avoid those that are off a high-risk nature.*
- *ensure all employees comply with the TMP.*

4.2 PROJECT ENGINEER

The Project Engineer is responsible for the development of the Traffic Management Plan for all elements of the project.

4.3 SITE SUPERVISORS

The Supervisors will continuously liaise with the Developer and the Health, Safety, Environment and Quality (HSEQ) department during the construction phase to ensure the required equipment are in place, and are safe to use.

4.4 HSE OFFICER

The Health, Safety and Environment (HSE) Officer will be responsible for all issues related to health, safety and environment and to see that employees conform to the requirements as laid down by the South African Occupational Health and Safety and Environmental Acts, and/or those acts applicable to South Africa.

4.5 TRAFFIC SAFETY OFFICER

The Contractor shall appoint a suitably trained and experienced person as the project Traffic Safety Officer (TSO). The TSO will be the responsible person for the arrangements and maintenance of all accommodation of traffic measures required for the duration of the contract. The TSO will liaise daily with the Project Engineer in order to maintain acceptance of the traffic arrangements.

The traffic safety officer will perform the following duties:

- *responsible for ensuring that temporary traffic accommodation measures on site meet requirements during the time that there is Traffic Accommodation on site,*
- *compile and maintain a daily record of traffic signs installed and the traffic sign sequences during the execution of the contract,*

- *control traffic safety to ensure the safe movement of personnel, visitors and plant on site including the wearing of high visibility clothing, the operation of amber flashing lights, and the display and cleanliness of "construction vehicle" signs,*
- *responsible for keeping all road signs, barriers and delineators clean and visible at all times,*
- *maintain a daily traffic management site diary,*
- *undertake at least 2 daily inspections,*
- *submit layout diagrams to the Project Engineer detailing location of half-width/shoulder closures, signage, barriers, etc.,*
- *train flagmen and labourers, and/or arrange for external SETA-approved training, as required,*
- *ensure the road is clear at the end of each day of work,*
- *determine provisions for breakdown assistance and emergency response on site,*
- *compile records of traffic accidents which are in any way connected with construction activities,*
- *handle complaints from stakeholders with regard to traffic safety and report on such matters to the Project Engineer,*
- *ensure that all road signs, barricades, delineators, flagmen and speed controls are maintained, clean and effective and that courtesy is extended to vehicles and pedestrians at all times, and*
- *ensure that traffic and pedestrian management requirements, layouts, diagrams and drawings will be available on site as a source of reference and to assist with daily inspections and enforcement.*

4.6 STOP/GO TRAFFIC CONTROLLERS

The Contractor shall appoint traffic controllers which are suitably qualified and trained, and shall

- *control traffic at control points,*
- *maintain contact with opposite Stop/Go controller,*
- *ensure smooth flow of traffic, and*
- *ensure no danger to construction personnel or pedestrians.*

4.7 FLAG PERSONS

The primary function of a Flag Person is to guide the flow of traffic (general public vehicles, loaders, dozers, trucks, excavators, etc.) safely and expeditiously through or around work areas or where traffic lanes are intermittently blocked. Flag Persons play an imperative role in the awareness of road user and therefore must always be observant of the traffic flow. A Flag Person needs to be constantly vigilant and aware of their surroundings. The use of cell-phones by Flag Persons whilst on duty is strictly forbidden. Failing to comply with this procedure will result in disciplinary action.

The duties of a Flag Person shall include, inter alia

- *responsible for ensuring approaching traffic is clearly warned of the restrictions/change of environment,*
- *Flag Persons will be deployed individually and will take up positions on the shoulder of the road being controlled and with sufficient lateral clearance to ensure their safety and eliminate the possibility of being struck by passing vehicles, and*

- *Flag Persons will never be permitted to stand in a live lane. Those found doing so will face disciplinary action and may be removed from the site. This will constitute a near miss under the health and safety system on site.*

5 RECOMMENDED MITIGATION MEASURES

5.1 GENERAL SAFETY MEASURES

Traffic management during construction and operation is essential. To address potential risks, the following measures are recommended:

- *Impose and enforce speed limits of all vehicles operating on internal routes, taking into account any other specialist recommendations in the EMPr.*
- *All employees and Contractors are required to wear the appropriate Personal Protective Equipment (PPE) for their areas of operation,*
- *Establishment of safe sight distances, including within construction areas and construction camp sites,*
- *Prepare a detailed plan for signage around the construction areas to facilitate traffic movement, provide directions to various components of the works, and provide safety advice and warnings,*
- *Provide details regarding maximum permissible vehicular speeds on each section of the site,*
- *Plan to move as far as possible heavy, wide or slow-moving loads at times when traffic volume on the roads concerned is at its lowest,*
- *Employ haulage vehicles, which are suitable in all respects for the intended purpose, and are not overloaded,*
- *Regularly inspect the access roads conditions and, whenever necessary, repair damages related to construction traffic,*
- *Personnel authorised to the construction areas shall be briefed on traffic regulations applicable to the construction areas,*
- *Provide training and undertake testing of heavy equipment operators and drivers, including vision tests, with records kept of all training,*
- *Create traffic awareness to the local people and inform parents to keep children from exposing themselves to traffic in the construction area,*
- *Maintain records of all accidents involving project vehicles and implement a traffic complaint and corrective action procedure, and*
- *Define operation times for various construction activities on the public road networks, taking into account any other specialist recommendations in the EMPr.*

5.2 CONSTRUCTION VEHICLE MAINTENANCE AND SAFETY

The following mitigation measures are recommended in terms of vehicle safety standards:

- *All vehicles shall be road worthy and licensed,*
- *Vehicles shall be subject to daily inspections,*
- *The name of the company employing the workers should be visibly placed on the vehicle,*
- *Smoking inside the vehicle is prohibited as clearly stated by "No Smoking" signs,*
- *A contact number should be clearly placed on the vehicle for remarks and complaints,*

- *Vehicles should be driven according to the speed signs on the road,*
- *All the seats should have safety belts,*
- *All vehicles are to be fitted with a first aid kit with easy access. The kit should be placed in a visible place,*
- *All vehicles are to be fitted with one fire extinguisher of at least 5 kg each, placed at the back of the vehicle, and*
- *All other requirements for construction vehicles shall be complied with in terms of the project specifications of the contract document.*

5.3 TYRE SELECTION AND REPLACEMENT

The life of tyres depends to a large extent on the manner in which the vehicle is driven. Excessive speed, braking or acceleration will cause tyres to deteriorate. If tyres are repeatedly driven against kerbs or large stones the walls of these tyres gradually weaken. Similarly, if tyres are not maintained at the manufacturer's recommended pressures, accelerated wear will occur. All tyres should be regularly checked and evidence of inspections available if requested.

All tyres should be maintained as per the manufacturer's specifications and/or recommendations. Each driver is responsible for daily checks of tyres conditions. Daily check sheets are to be completed and recorded, and worn tyres to be reported immediately following inspection.

5.4 MONITORING

The following guidelines are to be followed for completing daily/weekly checks.

Daily

- *Check tyres visually,*
- *Ensure that all lights, indicators, flashing light as operating correctly. It is an offence to drive if vehicle lights are not functioning properly,*
- *Ensure horn and revers horn (if applicable) is operating correctly,*
- *Ensure that the vehicle has sufficient fuel,*
- *Clean the windscreen, all windows, mirrors, headlamps and all other light lenses, and*
- *Check the engine oil level daily and before setting out on a long journey.*

Weekly

- *Check and correct the tyre pressure and tread wear including the spare wheel. Keep to the pressures recommended in the manufacturer's handbook,*
- *Check the battery. Keep the terminals clean and ensure that all connections are secure,*
- *Check the radiator water - anti-freeze mixture level weekly and/or before setting out on a long journey,*
- *Top up the windscreen washer reservoir at least once a week. Check the action of the windscreen wipers and the condition of the wiper blades at the same time, and*
- *Check the clutch fluid and brake fluid reservoirs (where fitted).*

General Service and Maintenance

- *Preventative maintenance through inspection and regular servicing can reduce the defect rate and help improve reliability. It is, therefore, important that all vehicles are properly maintained, and*

- *Vehicles must be serviced in line with the manufacturer's recommendations. These are outlined in the service book, which accompanies each vehicle.*

Seat Belts

- *All seats in vehicles shall be fitted with seat belts,*
- *The operability of all seat belts shall be checked on a daily basis, and*
- *The wearing of seat belts is compulsory and is the responsibility of the driver.*

Drivers

- *All escort and light vehicle drivers must meet the national driving requirements and hold a valid driving license for the type and class of vehicle being driven or operated,*
- *The heavy-duty drivers must meet the national driving requirements and hold a valid driving license for the heavy-duty vehicles being driven or operated,*
- *Each driver is responsible for the condition of their own vehicle (fines/penalties and bans will be administered internally), and*
- *Drivers must meet the minimum national driving standards and any additional project or site requirements must be followed and adhered to.*

5.5 VIOLATIONS AND ACCIDENTS

The aim of reporting and investigating incidents is to determine the cause and prevent reoccurrence. It is the responsibility of all employees and Contractors to report accidents, incidents and near misses at any place of work to their immediate Site Manager/Supervisor or Foreman. It is then the duty of that Manager/Supervisor or Foreman to ensure that appropriate entries are made in the Accident Book and, at the earliest opportunity, to inform the construction manager of the incident and, where applicable, the client's representative. It is the responsibility of the construction manager to initially investigate incidents or delegate the responsibility for such investigation to another competent person. If the incident is major or there is a fatality, then the Regional HSQE Department shall also be involved. It is the responsibility of the construction manager to ensure that recommendations arising from investigations are implemented.

6 EMERGENCY PLANNING

Contact details of emergency services will be conveyed to all necessary personnel, thus ensuring that in the event of an incident occurring, the necessary service/s are informed immediately. Provision will be made to ensure that in the event of an incident occurring, access to the site will be available and accessible to emergency services to travel through the site where the incident occurred.

Table 1 provides a list of contact numbers for emergency services in the vicinity of the site. At the commencement of the contract the Contractor shall confirm the contact numbers and jurisdiction of the services, since both Loxton and Victoria West fall within the Northern Cape, while the construction site falls within the Western Cape.

Table 1 - Emergency Numbers

Name	Beaufort West	Loxton	Victoria West
Ambulance Services	10177		053 621 0196 10177 or 1022
Community Response			
Disaster Management	023 449 1000 023 414 4467		
Department of Roads Infrastructure Services	Mr Koopman 023 449 1000 andre@skdm.co.za		
Eskom			
ER24	084 124		
Fire Department	023 414 8176		10177
Hospitals	023 414 8200		053 621 0610
Police Services	10111 023 414 8800		10111 053 621 2000
Municipality	023 414 8100	053 381 3091 083 384 8223	053 621 0026
Netcare 911	082 911		
Snake/Scorpion/Spider Bite Hotline	021 931 6129		
Traffic Department (local)	023 414 3409		
Traffic Department (provincial)			

7 REVIEW OF THIS PLAN

The Contractor must, on a regular basis, monitor the effectiveness of traffic management during the contract against the specifications in the approved traffic management plan, and initiate appropriate amendments/corrective measures should they be required. To this end, the local roads authorities will be involved in regular discussion with the Engineer and Contractor to continuously improve on the Traffic Management Plan, so as to minimise travel delays to the public, maintain a safe traffic way and minimise the risk of pedestrian/motor vehicle accidents.

Hoogland South Wind Farms

Fire Management Plan

August 2022

Background & Context

The National Veld and Forest Fires Act states that it is the landowner's responsibility to ensure that the appropriate equipment as well as trained personnel are available to combat fires. While fires are not a regular occurrence within the Hoogland South Wind Farms sites, fires may occasionally occur because of lightning strikes, electrical shorts or inadvertent runaway fires of human origin. In addition, fuel load is to some degree dependent on recent climatic conditions and fire risk may increase significantly following exceptionally wet summers, whereas in most years, there is insufficient fuel load to carry a fire for any extended distance. Although the presence of personnel on the wind farm and some of the infrastructure present would function to increase fire risk due to anthropogenic causes, the wind farm also reduces the risk of fires spreading due to the turbine access roads which represent effective barriers to most fires and also provide effective access to the area for fire-fighting.

The purpose of the Hoogland South Wind Farms Fire Management Plan is to:

- Minimise the risk of anthropogenic fires within the wind farm.
- Ensure that adequate measures are taken to reduce the risk of fire starting from project infrastructure.
- Ensure that adequate equipment is available to combat fires when they occur and ensure that there are staff present with the appropriate training to use such equipment safely and effectively.

The requirement risk management and mitigation measures are outlined below, for the construction and operational phases of the development.

Construction

a) No burning of waste will be permitted on site.

b) Suitable precautions will be taken when working with welding or grinding equipment near potential sources of combustion.

c) All staff on site will be made aware of general fire prevention and control methods, and the name of the responsible person to be alerted to the presence of a fire.

d) Have on site fire-fighting equipment and ensure that designated personnel are educated how to use it and the procedures to be followed in the event of a fire.

e) Identify the relevant authorities and structures responsible for fighting fires in the area if present, and shall liaise with them regarding procedures should a fire commence.

f) Ensure that all the necessary telephone numbers etc. are posted at conspicuous and

relevant locations in the event of an emergency.

g) Should a contractor be found responsible for the outbreak of a fire, he shall be liable for any associated costs.

h) No open fires shall be allowed on site for the purpose of cooking or warmth. Bona fide braai fires (such braai fires shall be limited to the traditional “month end” braais and not individual daily cooking fires) may be lit within the construction camp or site.

i) The Contractor shall take all reasonable steps to prevent the accidental occurrence or spread of fire. The Contractor shall appoint a fire officer who shall be responsible for ensuring immediate and appropriate action in the event of a fire. The Contractor shall ensure that all site personnel are aware of the procedure to be followed in the event of a fire. The appointed fire officer shall notify the Fire and Emergency Services in the event of a fire and shall not delay doing so until such time as the fire is beyond his / her control.

j) The Contractor shall ensure that there is basic fire-fighting equipment on site at all times. This equipment shall include fire extinguishers and beaters. The Contractor shall pay the costs incurred by organizations called to put out fires started by himself/herself, his/her staff or any sub-contractor. The Contractor shall also pay the costs incurred to reinstate burnt areas as deemed necessary by the RE.

k) Any work that requires the use of fire may only take place at that designated area and as approved by the RE. Fire-fighting equipment shall be available in these areas.

l) The Contractor shall ensure that the telephone number of the local Fire and Emergency Service are displayed at the site offices.

The Contractor is to ascertain the fire requirements and shall submit a fire contingency plan Method Statement to the ECO.

Operation

Extensive firebreaks are not recommended as a fire risk management strategy at the site. The aridity of the site and the low vegetation cover means that fires are not a common occurrence and firebreaks would generate more negative impact through erosion risk than warranted by the fire risk reduction they would entail. Rather targeted risk management should be implemented around vulnerable or sensitive elements of the facility such as substations or other high-risk components, that are vulnerable to fires themselves or which pose a potential ignition source risk. Within such areas, the extent over which management action needs to be applied is relatively limited and it is recommended that firebreaks are created by mowing/brush-cutting and that burning to create firebreaks is not used as this in itself poses a risk of runaway fires. Where such firebreaks need to be built such as around substations, guard stations and other sensitive areas, a strip of vegetation 5 - 10 m wide can be cleared manually and maintained relatively free of vegetation through manual clearing on an annual basis. However, if alien species colonise these areas, more regular clearing should be implemented.

The following actions and activities are recommended for the operational phase:

Any requirements of the local Fire Protection Association must be adhered to in consultation with the relevant landowners as per the requirements of the National Veld and Forest Firelegislation which may include:

a) Formation of a Fire Protection Association (FPA);

b) Duty to prepare and maintain firebreaks;

c) Requirements for firebreaks;

d) Readiness for fire-fighting;

e) Actions to fight fires.

f) Cleared firebreaks are to be positioned and prepared in such a way as to cause the least disturbance to soil and biodiversity. Firebreaks should be largely free from combustible material, e.g. prunings and leaf litter. The removed material should be removed from the site or used in rehabilitation efforts to combat erosion or encourage revegetation in low-risk areas away from infrastructure.

g) Ensure fire-fighting equipment is maintained and in good working order before the start of each fire season.

h) Smoking outside of designated safe areas must not be permitted. Flicking of cigarette butts into adjacent vegetation must not be permitted.

i) Suitable signage must be provided on site, including entrance warning of fire risk and warnings not to flick cigarette butts into vegetated areas.