Appendix 1

IFC Handbook

Performance Standards on Environmental and Social Sustainability

January 1, 2012

Overview of Performance Standards on Environmental and Social Sustainability

1. IFC's Sustainability Framework articulates the Corporation's strategic commitment to sustainable development, and is an integral part of IFC's approach to risk management. The Sustainability Framework comprises IFC's Policy and Performance Standards on Environmental and Social Sustainability, and IFC's Access to Information Policy. The Policy on Environmental and Social Sustainability describes IFC's commitments, roles, and responsibilities related to environmental and social sustainability. IFC's Access to Information Policy reflects IFC's commitment to transparency and good governance on its operations, and outlines the Corporation's institutional disclosure obligations regarding its investment and advisory services. The Performance Standards are directed towards clients, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations of the client in relation to project-level activities. In the case of its direct investments (including project and corporate finance provided through financial intermediaries), IFC requires its clients to apply the Performance Standards to manage environmental and social risks and impacts so that development opportunities are enhanced. IFC uses the Sustainability Framework along with other strategies, policies, and initiatives to direct the business activities of the Corporation in order to achieve its overall development objectives. The Performance Standards may also be applied by other financial institutions.

2. Together, the eight Performance Standards establish standards that the client[1] is to meet throughout the life of an investment by IFC:

Performance Standard 1:	Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 2:	Labor and Working Conditions
Performance Standard 3:	Resource Efficiency and Pollution Prevention
Performance Standard 4:	Community Health, Safety, and Security
Performance Standard 5:	Land Acquisition and Involuntary Resettlement
Performance Standard 6:	Biodiversity Conservation and Sustainable Management of Living Natural Resources
Performance Standard 7:	Indigenous Peoples
Performance Standard 8:	Cultural Heritage

3. Performance Standard 1 establishes the importance of (i) integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and (iii) the client's management of environmental and social performance throughout the life of the project. Performance Standards 2 through 8 establish objectives and requirements to avoid, minimize, and where residual impacts remain, to compensate/offset for risks and impacts to workers, Affected Communities, and the environment. While all relevant environmental and social risks and potential impacts should be considered as part of the assessment, Performance Standards 2 through 8 describe potential environmental and social risks and impacts that require particular attention. Where environmental or social risks and impacts

[1] The term "client" is used throughout the Performance Standards broadly to refer to the party responsible for implementing and operating the project that is being financed, or the recipient of the financing, depending on the project structure and type of financing. The term "project" is defined in Performance Standard 1.

are identified, the client is required to manage them through its Environmental and Social Management System (ESMS) consistent with Performance Standard 1.

4. Performance Standard 1 applies to all projects that have environmental and social risks and impacts. Depending on project circumstances, other Performance Standards may apply as well. The Performance Standards should be read together and cross-referenced as needed. The requirements section of each Performance Standard applies to all activities financed under the project, unless otherwise noted in the specific limitations described in each paragraph. Clients are encouraged to apply the ESMS developed under Performance Standard 1 to all their project activities, regardless of financing source. A number of cross-cutting topics such as climate change, gender, human rights, and water, are addressed across multiple Performance Standards.

5. In addition to meeting the requirements under the Performance Standards, clients must comply with applicable national law, including those laws implementing host country obligations under international law.

6. The World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) are technical reference documents with general and industry-specific examples of good international industry practice. IFC uses the EHS Guidelines as a technical source of information during project appraisal. The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. For IFC-financed projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC, become project- or site-specific requirements. The General EHS Guideline contains information on cross-cutting environmental, health, and safety issues potentially applicable to all industry sectors. It should be used together with the relevant industry sector guideline(s). The EHS Guidelines may be occasionally updated.

7. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site-specific environmental assessment. This justification should demonstrate that the choice for any alternative performance level is protective of human health and the environment.

8. A set of eight Guidance Notes, corresponding to each Performance Standard, and an additional Interpretation Note on Financial Intermediaries offer guidance on the requirements contained in the Performance Standards, including reference materials, and on good sustainability practices to help clients improve project performance. These Guidance/Interpretation Notes may be occasionally updated.

Performance Standard 1
Assessment and Management of Environmental and Social Risks and Impacts

January 1, 2012

Introduction

1. Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders.[1] Drawing on the elements of the established business management process of "plan, do, check, and act," the ESMS entails a methodological approach to managing environmental and social risks[2] and impacts[3] in a structured way on an ongoing basis. A good ESMS appropriate to the nature and scale of the project promotes sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

2. At times, the assessment and management of certain environmental and social risks and impacts may be the responsibility of the government or other third parties over which the client does not have control or influence.[4] Examples of where this may happen include: (i) when early planning decisions are made by the government or third parties which affect the project site selection and/or design; and/or (ii) when specific actions directly related to the project are carried out by the government or third parties such as providing land for a project which may have previously involved the resettlement of communities or individuals and/or leading to loss of biodiversity. While the client cannot control these government or third party actions, an effective ESMS should identify the different entities involved and the roles they play, the corresponding risks they present to the client, and opportunities to collaborate with these third parties in order to help achieve environmental and social outcomes that are consistent with the Performance Standards. In addition, this Performance Standard supports the use of an effective grievance mechanism that can facilitate early indication of, and prompt remediation for those who believe that they have been harmed by a client's actions.

3. Business should respect human rights, which means to avoid infringing on the human rights of others and address adverse human rights impacts business may cause or contribute to. Each of the Performance Standards has elements related to human rights dimensions that a project may face in the course of its operations. Due diligence against these Performance Standards will enable the client to address many relevant human rights issues in its project.

Objectives

- To identify and evaluate environmental and social risks and impacts of the project.
- To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize,[5] and, where residual impacts remain, compensate/offset for risks and impacts to workers, Affected Communities, and the environment.

[1] Other stakeholders are those not directly affected by the project but that have an interest in it. These could include national and local authorities, neighboring projects, and/or nongovernmental organizations.

[2] Environmental and social risk is a combination of the probability of certain hazard occurrences and the severity of impacts resulting from such an occurrence.

[3] Environmental and social impacts refer to any change, potential or actual, to (i) the physical, natural, or cultural environment, and (ii) impacts on surrounding community and workers, resulting from the business activity to be supported.

[4] Contractors retained by, or acting on behalf of the client(s), are considered to be under direct control of the client and not considered third parties for the purposes of this Performance Standard.

[5] Acceptable options to minimize will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate. The risk and impact mitigation hierarchy is further discussed and specified in the context of Performance Standards 2 through 8, where relevant.

- To promote improved environmental and social performance of clients through the effective use of management systems.
- To ensure that grievances from Affected Communities and external communications from other stakeholders are responded to and managed appropriately.
- To promote and provide means for adequate engagement with Affected Communities throughout the project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.

Scope of Application

4. This Performance Standard applies to business activities with environmental and/or social risks and/or impacts. For the purposes of this Performance Standard, the term “project” refers to a defined set of business activities, including those where specific physical elements, aspects, and facilities likely to generate risks and impacts, have yet to be identified.[6] Where applicable, this could include aspects from the early developmental stages through the entire life cycle (design, construction, commissioning, operation, decommissioning, closure or, where applicable, post-closure) of a physical asset.[7] The requirements of this Performance Standard apply to all business activities unless otherwise noted in the specific limitations described in each of the paragraphs below.

Requirements

Environmental and Social Assessment and Management System

5. The client, in coordination with other responsible government agencies and third parties as appropriate,[8] will conduct a process of environmental and social assessment, and establish and maintain an ESMS appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts. The ESMS will incorporate the following elements: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review.

Policy

6. The client will establish an overarching policy defining the environmental and social objectives and principles that guide the project to achieve sound environmental and social performance.[9] The policy provides a framework for the environmental and social assessment and management process, and specifies that the project (or business activities, as appropriate) will comply with the applicable laws and regulations of the jurisdictions in which it is being undertaken, including those laws implementing host country obligations under international law. The policy should be consistent with the principles of the Performance Standards. Under some circumstances, clients may also subscribe

[6] For example, corporate entities which have portfolios of existing physical assets, and/or intend to develop or acquire new facilities, and investment funds or financial intermediaries with existing portfolios of assets and/or which intend to invest in new facilities.

[7] Recognizing that this Performance Standard is used by a variety of financial institutions, investors, insurers, and owner/operators, each user should separately specify the business activities to which this Performance Standard should apply.

[8] That is, those parties legally obligated and responsible for assessing and managing specific risks and impacts (e.g., government-led resettlement).

[9] This requirement is a stand-alone, project-specific policy and is not intended to affect (or require alteration of) existing policies the client may have defined for non-related projects, business activities, or higher-level corporate activities.

to other internationally recognized standards, certification schemes, or codes of practice and these too should be included in the policy. The policy will indicate who, within the client's organization, will ensure conformance with the policy and be responsible for its execution (with reference to an appropriate responsible government agency or third party, as necessary). The client will communicate the policy to all levels of its organization.

Identification of Risks and Impacts

7. The client will establish and maintain a process for identifying the environmental and social risks and impacts of the project (see paragraph 18 for competency requirements). The type, scale, and location of the project guide the scope and level of effort devoted to the risks and impacts identification process. The scope of the risks and impacts identification process will be consistent with good international industry practice,[10] and will determine the appropriate and relevant methods and assessment tools. The process may comprise a full-scale environmental and social impact assessment, a limited or focused environmental and social assessment, or straightforward application of environmental siting, pollution standards, design criteria, or construction standards.[11] When the project involves existing assets, environmental and/or social audits or risk/hazard assessments can be appropriate and sufficient to identify risks and impacts. If assets to be developed, acquired or financed have yet to be defined, the establishment of an environmental and social due diligence process will identify risks and impacts at a point in the future when the physical elements, assets, and facilities are reasonably understood. The risks and impacts identification process will be based on recent environmental and social baseline data at an appropriate level of detail. The process will consider all relevant environmental and social risks and impacts of the project, including the issues identified in Performance Standards 2 through 8, and those who are likely to be affected by such risks and impacts.[12] The risks and impacts identification process will consider the emissions of greenhouse gases, the relevant risks associated with a changing climate and the adaptation opportunities, and potential transboundary effects, such as pollution of air, or use or pollution of international waterways.

8. Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

- The area likely to be affected by: (i) the project[13] and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;[14] (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

[10] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

[11] For greenfield developments or large expansions with specifically indentified physical elements, aspects, and facilities that are likely to generate potential significant environmental or social impacts, the client will conduct a comprehensive Environmental and Social Impact Assessment, including an examination of alternatives, where appropriate.

[12] In limited high risk circumstances, it may be appropriate for the client to complement its environmental and social risks and impacts identification process with specific human rights due diligence as relevant to the particular business.

[13] Examples include the project's sites, the immediate airshed and watershed, or transport corridors.

[14] Examples include power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, construction camps, and contaminated land (e.g., soil, groundwater, surface water, and sediments).

- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.[15]
- Cumulative impacts[16] that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

9. In the event of risks and impacts in the project's area of influence resulting from a third party's actions, the client will address those risks and impacts in a manner commensurate with the client's control and influence over the third parties, and with due regard to conflict of interest.

10. Where the client can reasonably exercise control, the risks and impacts identification process will also consider those risks and impacts associated with primary supply chains, as defined in Performance Standard 2 (paragraphs 27–29) and Performance Standard 6 (paragraph 30).

11. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate environmental and social impacts, the identification of risks and impacts will take into account the findings and conclusions of related and applicable plans, studies, or assessments prepared by relevant government authorities or other parties that are directly related to the project and its area of influence.[17] These include master economic development plans, country or regional plans, feasibility studies, alternatives analyses, and cumulative, regional, sectoral, or strategic environmental assessments where relevant. The risks and impacts identification will take account of the outcome of the engagement process with Affected Communities as appropriate.

12. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, and as part of the process of identifying risks and impacts, the client will identify individuals and groups that may be directly and differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status.[18] Where individuals or groups are identified as disadvantaged or vulnerable, the client will propose and implement differentiated measures so that adverse impacts do not fall disproportionately on them and they are not disadvantaged in sharing development benefits and opportunities.

Management Programs

13. Consistent with the client's policy and the objectives and principles described therein, the client will establish management programs that, in sum, will describe mitigation and performance improvement measures and actions that address the identified environmental and social risks and impacts of the project.

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[15] Associated facilities may include railways, roads, captive power plants or transmission lines, pipelines, utilities, warehouses, and logistics terminals.

[16] Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities. Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

[17] The client can take these into account by focusing on the project's incremental contribution to selected impacts generally recognized as important on the basis of scientific concern or concerns from the Affected Communities within the area addressed by these larger scope regional studies or cumulative assessments.

[18] This disadvantaged or vulnerable status may stem from an individual's or group's race, color, sex, language, religion, political or other opinion, national or social origin, property, birth, or other status. The client should also consider factors such as gender, age, ethnicity, culture, literacy, sickness, physical or mental disability, poverty or economic disadvantage, and dependence on unique natural resources.

14. Depending on the nature and scale of the project, these programs may consist of some documented combination of operational procedures, practices, plans, and related supporting documents (including legal agreements) that are managed in a systematic way.[19] The programs may apply broadly across the client's organization, including contractors and primary suppliers over which the organization has control or influence, or to specific sites, facilities, or activities. The mitigation hierarchy to address identified risks and impacts will favor the avoidance of impacts over minimization, and, where residual impacts remain, compensation/offset, wherever technically[20] and financially feasible.[21]

15. Where the identified risks and impacts cannot be avoided, the client will identify mitigation and performance measures and establish corresponding actions to ensure the project will operate in compliance with applicable laws and regulations, and meet the requirements of Performance Standards 1 through 8. The level of detail and complexity of this collective management program and the priority of the identified measures and actions will be commensurate with the project's risks and impacts, and will take account of the outcome of the engagement process with Affected Communities as appropriate.

16. The management programs will establish environmental and social Action Plans,[22] which will define desired outcomes and actions to address the issues raised in the risks and impacts identification process, as measurable events to the extent possible, with elements such as performance indicators, targets, or acceptance criteria that can be tracked over defined time periods, and with estimates of the resources and responsibilities for implementation. As appropriate, the management program will recognize and incorporate the role of relevant actions and events controlled by third parties to address identified risks and impacts. Recognizing the dynamic nature of the project, the management program will be responsive to changes in circumstances, unforeseen events, and the results of monitoring and review.

Organizational Capacity and Competency

17. The client, in collaboration with appropriate and relevant third parties, will establish, maintain, and strengthen as necessary an organizational structure that defines roles, responsibilities, and authority to implement the ESMS. Specific personnel, including management representative(s), with clear lines of responsibility and authority should be designated. Key environmental and social responsibilities should be well defined and communicated to the relevant personnel and to the rest of the client's organization. Sufficient management sponsorship and human and financial resources will be provided on an ongoing basis to achieve effective and continuous environmental and social performance.

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[19] Existing legal agreements between the client and third parties that address mitigation actions with regard to specific impacts constitute part of a program. Examples are government-managed resettlement responsibilities specified in an agreement.

[20] Technical feasibility is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment, and materials, taking into consideration prevailing local factors such as climate, geography, demography, infrastructure, security, governance, capacity, and operational reliability.

[21] Financial feasibility is based on commercial considerations, including relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating, and maintenance costs, and on whether this incremental cost could make the project nonviable to the client.

[22] Action plans may include an overall Environmental and Social Action Plan necessary for carrying out a suite of mitigation measures or thematic action plans, such as Resettlement Action Plans or Biodiversity Action Plans. Action plans may be plans designed to fill in the gaps of existing management programs to ensure consistency with the Performance Standards, or they may be stand alone plans that specify the project's mitigation strategy. The "Action plan" terminology is understood by some communities of practice to mean Management plans, or Development plans. In this case, examples are numerous and include various types of environmental and social management plans.

18. Personnel within the client's organization with direct responsibility for the project's environmental and social performance will have the knowledge, skills, and experience necessary to perform their work, including current knowledge of the host country's regulatory requirements and the applicable requirements of Performance Standards 1 through 8. Personnel will also possess the knowledge, skills, and experience to implement the specific measures and actions required under the ESMS and the methods required to perform the actions in a competent and efficient manner.

19. The process of identification of risks and impacts will consist of an adequate, accurate, and objective evaluation and presentation, prepared by competent professionals. For projects posing potentially significant adverse impacts or where technically complex issues are involved, clients may be required to involve external experts to assist in the risks and impacts identification process.

Emergency Preparedness and Response

20. Where the project involves specifically identified physical elements, aspects and facilities that are likely to generate impacts, the ESMS will establish and maintain an emergency preparedness and response system so that the client, in collaboration with appropriate and relevant third parties, will be prepared to respond to accidental and emergency situations associated with the project in a manner appropriate to prevent and mitigate any harm to people and/or the environment. This preparation will include the identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted, response procedures, provision of equipment and resources, designation of responsibilities, communication, including that with potentially Affected Communities and periodic training to ensure effective response. The emergency preparedness and response activities will be periodically reviewed and revised, as necessary, to reflect changing conditions.

21. Where applicable, the client will also assist and collaborate with the potentially Affected Communities (see Performance Standard 4) and the local government agencies in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to ensure effective response. If local government agencies have little or no capacity to respond effectively, the client will play an active role in preparing for and responding to emergencies associated with the project. The client will document its emergency preparedness and response activities, resources, and responsibilities, and will provide appropriate information to potentially Affected Community and relevant government agencies.

Monitoring and Review

22. The client will establish procedures to monitor and measure the effectiveness of the management program, as well as compliance with any related legal and/or contractual obligations and regulatory requirements. Where the government or other third party has responsibility for managing specific risks and impacts and associated mitigation measures, the client will collaborate in establishing and monitoring such mitigation measures. Where appropriate, clients will consider involving representatives from Affected Communities to participate in monitoring activities.[23] The client's monitoring program should be overseen by the appropriate level in the organization. For projects with significant impacts, the client will retain external experts to verify its monitoring information. The extent of monitoring should be commensurate with the project's environmental and social risks and impacts and with compliance requirements.

23. In addition to recording information to track performance and establishing relevant operational controls, the client should use dynamic mechanisms, such as internal inspections and audits, where relevant, to verify compliance and progress toward the desired outcomes. Monitoring will normally

[23] For example, participatory water monitoring.

include recording information to track performance and comparing this against the previously established benchmarks or requirements in the management program. Monitoring should be adjusted according to performance experience and actions requested by relevant regulatory authorities. The client will document monitoring results and identify and reflect the necessary corrective and preventive actions in the amended management program and plans. The client, in collaboration with appropriate and relevant third parties, will implement these corrective and preventive actions, and follow up on these actions in upcoming monitoring cycles to ensure their effectiveness.

24. Senior management in the client organization will receive periodic performance reviews of the effectiveness of the ESMS, based on systematic data collection and analysis. The scope and frequency of such reporting will depend upon the nature and scope of the activities identified and undertaken in accordance with the client's ESMS and other applicable project requirements. Based on results within these performance reviews, senior management will take the necessary and appropriate steps to ensure the intent of the client's policy is met, that procedures, practices, and plans are being implemented, and are seen to be effective.

Stakeholder Engagement

25. Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project's environmental and social impacts.[24] Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism, and ongoing reporting to Affected Communities. The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project's risks and adverse impacts, and the project's phase of development.

Stakeholder Analysis and Engagement Planning

26. Clients should identify the range of stakeholders that may be interested in their actions and consider how external communications might facilitate a dialog with all stakeholders (paragraph 34 below). Where projects involve specifically identified physical elements, aspects and/or facilities that are likely to generate adverse environmental and social impacts to Affected Communities the client will identify the Affected Communities and will meet the relevant requirements described below.

27. The client will develop and implement a Stakeholder Engagement Plan that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities. Where applicable, the Stakeholder Engagement Plan will include differentiated measures to allow the effective participation of those identified as disadvantaged or vulnerable. When the stakeholder engagement process depends substantially on community representatives,[25] the client will make every reasonable effort to verify that such persons do in fact represent the views of Affected Communities and that they can be relied upon to faithfully communicate the results of consultations to their constituents.

28. In cases where the exact location of the project is not known, but it is reasonably expected to have significant impacts on local communities, the client will prepare a Stakeholder Engagement Framework, as part of its management program, outlining general principles and a strategy to identify Affected Communities and other relevant stakeholders and plan for an engagement process

[24] Requirements regarding engagement of workers and related grievance redress procedures are found in Performance Standard 2.

[25] For example, community and religious leaders, local government representatives, civil society representatives, politicians, school teachers, and/or others representing one or more affected stakeholder groups.

compatible with this Performance Standard that will be implemented once the physical location of the project is known.

Disclosure of Information

29. Disclosure of relevant project information helps Affected Communities and other stakeholders understand the risks, impacts and opportunities of the project. The client will provide Affected Communities with access to relevant information[26] on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism.

Consultation

30. When Affected Communities are subject to identified risks and adverse impacts from a project, the client will undertake a process of consultation in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them. The extent and degree of engagement required by the consultation process should be commensurate with the project's risks and adverse impacts and with the concerns raised by the Affected Communities. Effective consultation is a two-way process that should: (i) begin early in the process of identification of environmental and social risks and impacts and continue on an ongoing basis as risks and impacts arise; (ii) be based on the prior disclosure and dissemination of relevant, transparent, objective, meaningful and easily accessible information which is in a culturally appropriate local language(s) and format and is understandable to Affected Communities; (iii) focus inclusive[27] engagement on those directly affected as opposed to those not directly affected; (iv) be free of external manipulation, interference, coercion, or intimidation; (v) enable meaningful participation, where applicable; and (vi) be documented. The client will tailor its consultation process to the language preferences of the Affected Communities, their decision-making process, and the needs of disadvantaged or vulnerable groups. If clients have already engaged in such a process, they will provide adequate documented evidence of such engagement.

Informed Consultation and Participation

31. For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation (ICP) process that will build upon the steps outlined above in Consultation and will result in the Affected Communities' informed participation. ICP involves a more in-depth exchange of views and information, and an organized and iterative consultation, leading to the client's incorporating into their decision-making process the views of the Affected Communities on matters that affect them directly, such as the proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues. The consultation process should (i) capture both men's and women's views, if necessary through separate forums or engagements, and (ii) reflect men's and women's different concerns and priorities about impacts, mitigation mechanisms, and benefits, where appropriate. The client will document the process, in particular the measures taken to avoid or minimize risks to and adverse impacts on the

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[26] Depending on the scale of the project and significance of the risks and impacts, relevant document(s) could range from full Environmental and Social Assessments and Action Plans (i.e., Stakeholder Engagement Plan, Resettlement Action Plans, Biodiversity Action Plans, Hazardous Materials Management Plans, Emergency Preparedness and Response Plans, Community Health and Safety Plans, Ecosystem Restoration Plans, and Indigenous Peoples Development Plans, etc.) to easy-to-understand summaries of key issues and commitments. These documents could also include the client's environmental and social policy and any supplemental measures and actions defined as a result of independent due diligence conducted by financiers.

[27] Such as men, women, the elderly, youth, displaced persons, and vulnerable and disadvantaged persons or groups.

Affected Communities, and will inform those affected about how their concerns have been considered.

Indigenous Peoples

32. For projects with adverse impacts to Indigenous Peoples, the client is required to engage them in a process of ICP and in certain circumstances the client is required to obtain their Free, Prior, and Informed Consent (FPIC). The requirements related to Indigenous Peoples and the definition of the special circumstances requiring FPIC are described in Performance Standard 7.

Private Sector Responsibilities Under Government-Led Stakeholder Engagement

33. Where stakeholder engagement is the responsibility of the host government, the client will collaborate with the responsible government agency, to the extent permitted by the agency, to achieve outcomes that are consistent with the objectives of this Performance Standard. In addition, where government capacity is limited, the client will play an active role during the stakeholder engagement planning, implementation, and monitoring. If the process conducted by the government does not meet the relevant requirements of this Performance Standard, the client will conduct a complementary process and, where appropriate, identify supplemental actions.

External Communications and Grievance Mechanisms

External Communications

34. Clients will implement and maintain a procedure for external communications that includes methods to (i) receive and register external communications from the public; (ii) screen and assess the issues raised and determine how to address them; (iii) provide, track, and document responses, if any; and (iv) adjust the management program, as appropriate. In addition, clients are encouraged to make publicly available periodic reports on their environmental and social sustainability.

Grievance Mechanism for Affected Communities

35. Where there are Affected Communities, the client will establish a grievance mechanism to receive and facilitate resolution of Affected Communities' concerns and grievances about the client's environmental and social performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project and have Affected Communities as its primary user. It should seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the stakeholder engagement process.

Ongoing Reporting to Affected Communities

36. The client will provide periodic reports to the Affected Communities that describe progress with implementation of the project Action Plans on issues that involve ongoing risk to or impacts on Affected Communities and on issues that the consultation process or grievance mechanism have identified as a concern to those Communities. If the management program results in material changes in or additions to the mitigation measures or actions described in the Action Plans on issues of concern to the Affected Communities, the updated relevant mitigation measures or actions will be communicated to them. The frequency of these reports will be proportionate to the concerns of Affected Communities but not less than annually.

Performance Standard 2
Labor and Working Conditions

January 1, 2012

Introduction

1. Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental[1] rights of workers. For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize a project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly and providing them with safe and healthy working conditions, clients may create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

2. The requirements set out in this Performance Standard have been in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN).[2]

Objectives

- To promote the fair treatment, non-discrimination, and equal opportunity of workers.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labor laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- To avoid the use of forced labor.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1.

4. The scope of application of this Performance Standard depends on the type of employment relationship between the client and the worker. It applies to workers directly engaged by the client (direct workers), workers engaged through third parties to perform work related to core business

[1] As guided by the ILO Conventions listed in footnote 2.

[2] These conventions are:
ILO Convention 87 on Freedom of Association and Protection of the Right to Organize
ILO Convention 98 on the Right to Organize and Collective Bargaining
ILO Convention 29 on Forced Labor
ILO Convention 105 on the Abolition of Forced Labor
ILO Convention 138 on Minimum Age (of Employment)
ILO Convention 182 on the Worst Forms of Child Labor
ILO Convention 100 on Equal Remuneration
ILO Convention 111 on Discrimination (Employment and Occupation)
UN Convention on the Rights of the Child, Article 32.1
UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families

processes[3] of the project for a substantial duration (contracted workers), as well as workers engaged by the client's primary suppliers (supply chain workers).[4]

Direct Workers

5. With respect to direct workers, the client will apply the requirements of paragraphs 8–23 of this Performance Standard.

Contracted Workers

6. With respect to contracted workers, the client will apply the requirements of paragraphs 23–26 of this Performance Standard.

Supply Chain Workers

7. With respect to supply chain workers, the client will apply the requirements of paragraphs 27–29 of this Performance Standard.

Requirements

Working Conditions and Management of Worker Relationship

Human Resources Policies and Procedures

8. The client will adopt and implement human resources policies and procedures appropriate to its size and workforce that set out its approach to managing workers consistent with the requirements of this Performance Standard and national law.

9. The client will provide workers with documented information that is clear and understandable, regarding their rights under national labor and employment law and any applicable collective agreements, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur.

Working Conditions and Terms of Employment

10. Where the client is a party to a collective bargaining agreement with a workers' organization, such agreement will be respected. Where such agreements do not exist, or do not address working conditions and terms of employment,[5] the client will provide reasonable working conditions and terms of employment.[6]

11. The client will identify migrant workers and ensure that they are engaged on substantially equivalent terms and conditions to non-migrant workers carrying out similar work.

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[3] Core business processes constitute those production and/or service processes essential for a specific business activity without which the business activity could not continue.

[4] Primary suppliers are those suppliers who, on an ongoing basis, provide goods or materials essential for the core business processes of the project.

[5] Working conditions and terms of employment examples are wages and benefits; wage deductions; hours of work; overtime arrangements and overtime compensation; breaks; rest days; and leave for illness, maternity, vacation or holiday.

[6] Reasonable working conditions and terms of employment could be assessed by reference to (i) conditions established for work of the same character in the trade or industry concerned in the area/region where the work is carried out; (ii) collective agreement or other recognized negotiation between other organizations of employers and workers' representatives in the trade or industry concerned; (iii) arbitration award; or (iv) conditions established by national law.

12. Where accommodation services[7] are provided to workers covered by the scope of this Performance Standard, the client will put in place and implement policies on the quality and management of the accommodation and provision of basic services.[8] The accommodation services will be provided in a manner consistent with the principles of non-discrimination and equal opportunity. Workers' accommodation arrangements should not restrict workers' freedom of movement or of association.

Workers' Organizations

13. In countries where national law recognizes workers' rights to form and to join workers' organizations of their choosing without interference and to bargain collectively, the client will comply with national law. Where national law substantially restricts workers' organizations, the client will not restrict workers from developing alternative mechanisms to express their grievances and protect their rights regarding working conditions and terms of employment. The client should not seek to influence or control these mechanisms

14. In either case described in paragraph 13 of this Performance Standard, and where national law is silent, the client will not discourage workers from electing worker representatives, forming or joining workers' organizations of their choosing, or from bargaining collectively, and will not discriminate or retaliate against workers who participate, or seek to participate, in such organizations and collective bargaining. The client will engage with such workers' representatives and workers' organizations, and provide them with information needed for meaningful negotiation in a timely manner. Workers' organizations are expected to fairly represent the workers in the workforce.

Non-Discrimination and Equal Opportunity

15. The client will not make employment decisions on the basis of personal characteristics[9] unrelated to inherent job requirements. The client will base the employment relationship on the principle of equal opportunity and fair treatment, and will not discriminate with respect to any aspects of the employment relationship, such as recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, job assignment, promotion, termination of employment or retirement, and disciplinary practices. The client will take measures to prevent and address harassment, intimidation, and/or exploitation, especially in regard to women. The principles of non-discrimination apply to migrant workers.

16. In countries where national law provides for non-discrimination in employment, the client will comply with national law. When national laws are silent on non-discrimination in employment, the client will meet this Performance Standard. In circumstances where national law is inconsistent with this Performance Standard, the client is encouraged to carry out its operations consistent with the intent of paragraph 15 above without contravening applicable laws.

17. Special measures of protection or assistance to remedy past discrimination or selection for a particular job based on the inherent requirements of the job will not be deemed as discrimination, provided they are consistent with national law.

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[7] Those services might be provided either directly by the client or by third parties.

[8] Basic services requirements refer to minimum space, supply of water, adequate sewage and garbage disposal system, appropriate protection against heat, cold, damp, noise, fire and disease-carrying animals, adequate sanitary and washing facilities, ventilation, cooking and storage facilities and natural and artificial lighting, and in some cases basic medical services.

[9] Such as gender, race, nationality, ethnic, social and indigenous origin, religion or belief, disability, age, or sexual orientation.

Retrenchment

18. Prior to implementing any collective dismissals,[10] the client will carry out an analysis of alternatives to retrenchment.[11] If the analysis does not identify viable alternatives to retrenchment, a retrenchment plan will be developed and implemented to reduce the adverse impacts of retrenchment on workers. The retrenchment plan will be based on the principle of non-discrimination and will reflect the client's consultation with workers, their organizations, and, where appropriate, the government, and comply with collective bargaining agreements if they exist. The client will comply with all legal and contractual requirements related to notification of public authorities, and provision of information to, and consultation with workers and their organizations.

19. The client should ensure that all workers receive notice of dismissal and severance payments mandated by law and collective agreements in a timely manner. All outstanding back pay and social security benefits and pension contributions and benefits will be paid (i) on or before termination of the working relationship to the workers, (ii) where appropriate, for the benefit of the workers, or (iii) payment will be made in accordance with a timeline agreed through a collective agreement. Where payments are made for the benefit of workers, workers will be provided with evidence of such payments.

Grievance Mechanism

20. The client will provide a grievance mechanism for workers (and their organizations, where they exist) to raise workplace concerns. The client will inform the workers of the grievance mechanism at the time of recruitment and make it easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism should also allow for anonymous complaints to be raised and addressed. The mechanism should not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

Protecting the Work Force

Child Labor

21. The client will not employ children in any manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. The client will identify the presence of all persons under the age of 18. Where national laws have provisions for the employment of minors, the client will follow those laws applicable to the client. Children under the age of 18 will not be employed in hazardous work.[12] All work of persons under the age of 18 will be subject to an appropriate risk assessment and regular monitoring of health, working conditions, and hours of work.

[10] Collective dismissals cover all multiple dismissals that are a result of an economic, technical, or organizational reason; or other reasons that are not related to performance or other personal reasons.

[11] Examples of alternatives may include negotiated working-time reduction programs, employee capacity-building programs; long-term maintenance works during low production periods, etc.

[12] Examples of hazardous work activities include work (i) with exposure to physical, psychological, or sexual abuse; (ii) underground, underwater, working at heights, or in confined spaces; (iii) with dangerous machinery, equipment, or tools, or involving handling of heavy loads; (iv) in unhealthy environments exposing the worker to hazardous substances, agents, processes, temperatures, noise, or vibration damaging to health; or (v) under difficult conditions such as long hours, late night, or confinement by employer.

Forced Labor
22. The client will not employ forced labor, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labor, such as indentured labor, bonded labor, or similar labor-contracting arrangements. The client will not employ trafficked persons.[13]

Occupational Health and Safety

23. The client will provide a safe and healthy work environment, taking into account inherent risks in its particular sector and specific classes of hazards in the client's work areas, including physical, chemical, biological, and radiological hazards, and specific threats to women. The client will take steps to prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, as far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice,[14] as reflected in various internationally recognized sources including the World Bank Group Environmental, Health and Safety Guidelines, the client will address areas that include the (i) identification of potential hazards to workers, particularly those that may be life-threatening; (ii) provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) training of workers; (iv) documentation and reporting of occupational accidents, diseases, and incidents; and (v) emergency prevention, preparedness, and response arrangements. For additional information related to emergency preparedness and response refer to Performance Standard 1.

Workers Engaged by Third Parties

24. With respect to contracted workers the client will take commercially reasonable efforts to ascertain that the third parties who engage these workers are reputable and legitimate enterprises and have an appropriate ESMS that will allow them to operate in a manner consistent with the requirements of this Performance Standard, except for paragraphs 18–19, and 27–29.

25. The client will establish policies and procedures for managing and monitoring the performance of such third party employers in relation to the requirements of this Performance Standard. In addition, the client will use commercially reasonable efforts to incorporate these requirements in contractual agreements with such third party employers.

26. The client will ensure that contracted workers, covered in paragraphs 24–25 of this Performance Standard, have access to a grievance mechanism. In cases where the third party is not able to provide a grievance mechanism the client will extend its own grievance mechanism to serve workers engaged by the third party.

[13] Trafficking in persons is defined as the recruitment, transportation, transfer, harboring, or receipt of persons, by means of the threat or use of force or other forms of coercion, abduction, fraud, deception, abuse of power, or of a position of vulnerability, or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Women and children are particularly vulnerable to trafficking practices.

[14] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances, globally or regionally.

Supply Chain

27. Where there is a high risk of child labor or forced labor[15] in the primary supply chain, the client will identify those risks consistent with paragraphs 21 and 22 above. If child labor or forced labor cases are identified, the client will take appropriate steps to remedy them. The client will monitor its primary supply chain on an ongoing basis in order to identify any significant changes in its supply chain and if new risks or incidents of child and/or forced labor are identified, the client will take appropriate steps to remedy them.

28. Additionally, where there is a high risk of significant safety issues related to supply chain workers, the client will introduce procedures and mitigation measures to ensure that primary suppliers within the supply chain are taking steps to prevent or to correct life-threatening situations.

29. The ability of the client to fully address these risks will depend upon the client's level of management control or influence over its primary suppliers. Where remedy is not possible, the client will shift the project's primary supply chain over time to suppliers that can demonstrate that they are complying with this Performance Standard.

[15] The potential risk of child labor and forced labor will be determined during the risks and impacts identification process as required in Performance Standard 1.

Performance Standard 3
Resource Efficiency and Pollution Prevention

January 1, 2012

Introduction

1. Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.[1] There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention[2] and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. These are often implemented through continuous improvement methodologies similar to those used to enhance quality or productivity, which are generally well known to most industrial, agricultural, and service sector companies.

2. This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. In addition, this Performance Standard promotes the ability of private sector companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources.

Objectives

- To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.
- To promote more sustainable use of resources, including energy and water.
- To reduce project-related GHG emissions.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

Requirements

4. During the project life-cycle, the client will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention principles and techniques that are best suited to avoid, or where avoidance is not possible, minimize adverse impacts on human health and the environment.[3] The principles and techniques applied during the project life-cycle will be

[1] For the purposes of this Performance Standard, the term "pollution" is used to refer to both hazardous and non-hazardous chemical pollutants in the solid, liquid, or gaseous phases, and includes other components such as pests, pathogens, thermal discharge to water, GHG emissions, nuisance odors, noise, vibration, radiation, electromagnetic energy, and the creation of potential visual impacts including light.

[2] For the purpose of this Performance Standard, the term "pollution prevention" does not mean absolute elimination of emissions, but the avoidance at source whenever possible, and, if not possible, then subsequent minimization of pollution to the extent that the Performance Standard objectives are satisfied.

[3] Technical feasibility is based on whether the proposed measures and actions can be implemented with commercially available skills, equipment, and materials, taking into consideration prevailing local factors such as climate, geography, infrastructure, security, governance, capacity and operational reliability. Financial feasibility is

tailored to the hazards and risks associated with the nature of the project and consistent with good international industry practice (GIIP),[4] as reflected in various internationally recognized sources, including the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines).

5. The client will refer to the EHS Guidelines or other internationally recognized sources, as appropriate, when evaluating and selecting resource efficiency and pollution prevention and control techniques for the project. The EHS Guidelines contain the performance levels and measures that are normally acceptable and applicable to projects. When host country regulations differ from the levels and measures presented in the EHS Guidelines, clients will be required to achieve whichever is more stringent. If less stringent levels or measures than those provided in the EHS Guidelines are appropriate in view of specific project circumstances, the client will provide full and detailed justification for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. This justification must demonstrate that the choice for any alternate performance levels is consistent with the objectives of this Performance Standard.

Resource Efficiency

6. The client will implement technically and financially feasible and cost effective[5] measures for improving efficiency in its consumption of energy, water, as well as other resources and material inputs, with a focus on areas that are considered core business activities. Such measures will integrate the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy, and water. Where benchmarking data are available, the client will make a comparison to establish the relative level of efficiency.

Greenhouse Gases

7. In addition to the resource efficiency measures described above, the client will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project-related GHG emissions during the design and operation of the project. These options may include, but are not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring.

8. For projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually,[6] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary,[7] as well as indirect emissions associated with the off-site

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based on commercial considerations, including relative magnitude of the incremental cost of adopting such measures and actions compared to the project's investment, operating, and maintenance costs.

[4] GIIP is defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally. The outcome of such exercise should be that the project employs the most appropriate technologies in the project-specific circumstances.

[5] Cost-effectiveness is determined according to the capital and operational cost and financial benefits of the measure considered over the life of the measure. For the purpose of this Performance Standard, a resource efficiency or GHG emissions reduction measure is considered cost-effective if it is expected to provide a risk-rated return on investment at least comparable to the project itself.

[6] The quantification of emissions should consider all significant sources of greenhouse gas emissions, including non-energy related sources such as methane and nitrous oxide, among others.

[7] Project-induced changes in soil carbon content or above ground biomass, and project-induced decay of organic matter may contribute to direct emissions sources and shall be included in this emissions quantification where such emissions are expected to be significant.

production of energy[8] used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.[9]

Water Consumption

9. When the project is a potentially significant consumer of water, in addition to applying the resource efficiency requirements of this Performance Standard, the client shall adopt measures that avoid or reduce water usage so that the project's water consumption does not have significant adverse impacts on others. These measures include, but are not limited to, the use of additional technically feasible water conservation measures within the client's operations, the use of alternative water supplies, water consumption offsets to reduce total demand for water resources to within the available supply, and evaluation of alternative project locations.

Pollution Prevention

10. The client will avoid the release of pollutants or, when avoidance is not feasible, minimize and/or control the intensity and mass flow of their release. This applies to the release of pollutants to air, water, and land due to routine, non-routine, and accidental circumstances with the potential for local, regional, and transboundary impacts.[10] Where historical pollution such as land or ground water contamination exists, the client will seek to determine whether it is responsible for mitigation measures. If it is determined that the client is legally responsible, then these liabilities will be resolved in accordance with national law, or where this is silent, with GIIP.[11]

11. To address potential adverse project impacts on existing ambient conditions,[12] the client will consider relevant factors, including, for example (i) existing ambient conditions; (ii) the finite assimilative capacity[13] of the environment; (iii) existing and future land use; (iv) the project's proximity to areas of importance to biodiversity; and (v) the potential for cumulative impacts with uncertain and/or irreversible consequences. In addition to applying resource efficiency and pollution control measures as required in this Performance Standard, when the project has the potential to constitute a significant source of emissions in an already degraded area, the client will consider additional strategies and adopt measures that avoid or reduce negative effects. These strategies include, but are not limited to, evaluation of project location alternatives and emissions offsets.

Wastes

12. The client will avoid the generation of hazardous and non-hazardous waste materials. Where waste generation cannot be avoided, the client will reduce the generation of waste, and recover and reuse waste in a manner that is safe for human health and the environment. Where waste cannot be recovered or reused, the client will treat, destroy, or dispose of it in an environmentally sound manner that includes the appropriate control of emissions and residues resulting from the handling and processing of the waste material. If the generated waste is considered hazardous,[14] the client will

[8] Refers to the off-site generation by others of electricity, and heating and cooling energy used in the project.

[9] Estimation methodologies are provided by the Intergovernmental Panel on Climate Change, various international organizations, and relevant host country agencies.

[10] Transboundary pollutants include those covered under the Convention on Long-Range Transboundary Air Pollution.

[11] This may require coordination with national and local government, communities, and the contributors to the contamination, and that any assessment follows a risk-based approach consistent with GIIP as reflected in the EHS Guidelines.

[12] Such as air, surface and groundwater, and soils.

[13] The capacity of the environment for absorbing an incremental load of pollutants while remaining below a threshold of unacceptable risk to human health and the environment.

[14] As defined by international conventions or local legislation.

adopt GIIP alternatives for its environmentally sound disposal while adhering to the limitations applicable to its transboundary movement.[15] When hazardous waste disposal is conducted by third parties, the client will use contractors that are reputable and legitimate enterprises licensed by the relevant government regulatory agencies and obtain chain of custody documentation to the final destination. The client should ascertain whether licensed disposal sites are being operated to acceptable standards and where they are, the client will use these sites. Where this is not the case, clients should reduce waste sent to such sites and consider alternative disposal options, including the possibility of developing their own recovery or disposal facilities at the project site.

Hazardous Materials Management

13. Hazardous materials are sometimes used as raw material or produced as product by the project. The client will avoid or, when avoidance is not possible, minimize and control the release of hazardous materials. In this context, the production, transportation, handling, storage, and use of hazardous materials for project activities should be assessed. The client will consider less hazardous substitutes where hazardous materials are intended to be used in manufacturing processes or other operations. The client will avoid the manufacture, trade, and use of chemicals and hazardous materials subject to international bans or phase-outs due to their high toxicity to living organisms, environmental persistence, potential for bioaccumulation, or potential for depletion of the ozone layer.[16]

Pesticide Use and Management

14. The client will, where appropriate, formulate and implement an integrated pest management (IPM) and/or integrated vector management (IVM) approach targeting economically significant pest infestations and disease vectors of public health significance. The client's IPM and IVM program will integrate coordinated use of pest and environmental information along with available pest control methods, including cultural practices, biological, genetic, and, as a last resort, chemical means to prevent economically significant pest damage and/or disease transmission to humans and animals.

15. When pest management activities include the use of chemical pesticides, the client will select chemical pesticides that are low in human toxicity, that are known to be effective against the target species, and that have minimal effects on non-target species and the environment. When the client selects chemical pesticides, the selection will be based upon requirements that the pesticides be packaged in safe containers, be clearly labeled for safe and proper use, and that the pesticides have been manufactured by an entity currently licensed by relevant regulatory agencies.

16. The client will design its pesticide application regime to (i) avoid damage to natural enemies of the target pest, and where avoidance is not possible, minimize, and (ii) avoid the risks associated with the development of resistance in pests and vectors, and where avoidance is not possible minimize. In addition, pesticides will be handled, stored, applied, and disposed of in accordance with the Food and Agriculture Organization's International Code of Conduct on the Distribution and Use of Pesticides or other GIIP.

17. The client will not purchase, store, use, manufacture, or trade in products that fall in WHO Recommended Classification of Pesticides by Hazard Class Ia (extremely hazardous); or Ib (highly

[15] Transboundary movement of hazardous materials should be consistent with national, regional and international law, including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

[16] Consistent with the objectives of the Stockholm Convention on Persistent Organic Pollutants and the Montreal Protocol on Substances that Deplete the Ozone Layer. Similar considerations will apply to certain World Health Organization (WHO) classes of pesticides.

hazardous). The client will not purchase, store, use, manufacture or trade in Class II (moderately hazardous) pesticides, unless the project has appropriate controls on manufacture, procurement, or distribution and/or use of these chemicals. These chemicals should not be accessible to personnel without proper training, equipment, and facilities to handle, store, apply, and dispose of these products properly.

Performance Standard 4
Community Health, Safety, and Security

January 1, 2012

Introduction

1. Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

2. In conflict and post-conflict areas, the level of risks and impacts described in this Performance Standard may be greater. The risks that a project could exacerbate an already sensitive local situation and stress scarce local resources should not be overlooked as it may lead to further conflict.

Objectives

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

4. This Performance Standard addresses potential risks and impacts to the Affected Communities from project activities. Occupational health and safety requirements for workers are included in Performance Standard 2, and environmental standards to avoid or minimize impacts on human health and the environment due to pollution are included in Performance Standard 3.

Requirements

Community Health and Safety

5. The client will evaluate the risks and impacts to the health and safety of the Affected Communities during the project life-cycle and will establish preventive and control measures consistent with good international industry practice (GIIP),[1] such as in the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) or other internationally recognized sources. The client will identify risks and impacts and propose mitigation measures that are commensurate with their nature and magnitude. These measures will favor the avoidance of risks and impacts over minimization.

[1] Defined as the exercise of professional skill, diligence, prudence, and foresight that would reasonably be expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally or regionally.

Infrastructure and Equipment Design and Safety

6. The client will design, construct, operate, and decommission the structural elements or components of the project in accordance with GIIP, taking into consideration safety risks to third parties or Affected Communities. When new buildings and structures will be accessed by members of the public, the client will consider incremental risks of the public's potential exposure to operational accidents and/or natural hazards and be consistent with the principles of universal access. Structural elements will be designed and constructed by competent professionals, and certified or approved by competent authorities or professionals. When structural elements or components, such as dams, tailings dams, or ash ponds are situated in high-risk locations, and their failure or malfunction may threaten the safety of communities, the client will engage one or more external experts with relevant and recognized experience in similar projects, separate from those responsible for the design and construction, to conduct a review as early as possible in project development and throughout the stages of project design, construction, operation, and decommissioning. For projects that operate moving equipment on public roads and other forms of infrastructure, the client will seek to avoid the occurrence of incidents and injuries to members of the public associated with the operation of such equipment.

Hazardous Materials Management and Safety

7. The client will avoid or minimize the potential for community exposure to hazardous materials and substances that may be released by the project. Where there is a potential for the public (including workers and their families) to be exposed to hazards, particularly those that may be life-threatening, the client will exercise special care to avoid or minimize their exposure by modifying, substituting, or eliminating the condition or material causing the potential hazards. Where hazardous materials are part of existing project infrastructure or components, the client will exercise special care when conducting decommissioning activities in order to avoid exposure to the community. The client will exercise commercially reasonable efforts to control the safety of deliveries of hazardous materials, and of transportation and disposal of hazardous wastes, and will implement measures to avoid or control community exposure to pesticides, in accordance with the requirements of Performance Standard 3.

Ecosystem Services

8. The project's direct impacts on priority ecosystem services may result in adverse health and safety risks and impacts to Affected Communities. With respect to this Performance Standard, ecosystem services are limited to provisioning and regulating services as defined in paragraph 2 of Performance Standard 6. For example, land use changes or the loss of natural buffer areas such as wetlands, mangroves, and upland forests that mitigate the effects of natural hazards such as flooding, landslides, and fire, may result in increased vulnerability and community safety-related risks and impacts. The diminution or degradation of natural resources, such as adverse impacts on the quality, quantity, and availability of freshwater,[2] may result in health-related risks and impacts. Where appropriate and feasible, the client will identify those risks and potential impacts on priority ecosystem services that may be exacerbated by climate change. Adverse impacts should be avoided, and if these impacts are unavoidable, the client will implement mitigation measures in accordance with paragraphs 24 and 25 of Performance Standard 6. With respect to the use of and loss of access to provisioning services, clients will implement mitigation measures in accordance with paragraphs 25–29 of Performance Standard 5.

[2] Freshwater is an example of provisioning ecosystem services.

Community Exposure to Disease

9. The client will avoid or minimize the potential for community exposure to water-borne, water-based, water-related, and vector-borne diseases, and communicable diseases that could result from project activities, taking into consideration differentiated exposure to and higher sensitivity of vulnerable groups. Where specific diseases are endemic in communities in the project area of influence, the client is encouraged to explore opportunities during the project life-cycle to improve environmental conditions that could help minimize their incidence.

10. The client will avoid or minimize transmission of communicable diseases that may be associated with the influx of temporary or permanent project labor.

Emergency Preparedness and Response

11. In addition to the emergency preparedness and response requirements described in Performance Standard 1, the client will also assist and collaborate with the Affected Communities, local government agencies, and other relevant parties, in their preparations to respond effectively to emergency situations, especially when their participation and collaboration are necessary to respond to such emergency situations. If local government agencies have little or no capacity to respond effectively, the client will play an active role in preparing for and responding to emergencies associated with the project. The client will document its emergency preparedness and response activities, resources, and responsibilities, and will disclose appropriate information to Affected Communities, relevant government agencies, or other relevant parties.

Security Personnel

12. When the client retains direct or contracted workers to provide security to safeguard its personnel and property, it will assess risks posed by its security arrangements to those within and outside the project site. In making such arrangements, the client will be guided by the principles of proportionality and good international practice[3] in relation to hiring, rules of conduct, training, equipping, and monitoring of such workers, and by applicable law. The client will make reasonable inquiries to ensure that those providing security are not implicated in past abuses; will train them adequately in the use of force (and where applicable, firearms), and appropriate conduct toward workers and Affected Communities; and require them to act within the applicable law. The client will not sanction any use of force except when used for preventive and defensive purposes in proportion to the nature and extent of the threat. The client will provide a grievance mechanism for Affected Communities to express concerns about the security arrangements and acts of security personnel.

13. The client will assess and document risks arising from the project's use of government security personnel deployed to provide security services. The client will seek to ensure that security personnel will act in a manner consistent with paragraph 12 above, and encourage the relevant public authorities to disclose the security arrangements for the client's facilities to the public, subject to overriding security concerns.

14. The client will consider and, where appropriate, investigate all allegations of unlawful or abusive acts of security personnel, take action (or urge appropriate parties to take action) to prevent recurrence, and report unlawful and abusive acts to public authorities.

[3] Including practice consistent with the United Nation's (UN) Code of Conduct for Law Enforcement Officials, and UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials.

Performance Standard 5
Land Acquisition and Involuntary Resettlement

January 1, 2012

Introduction

1. Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood[1]) as a result of project-related land acquisition[2] and/or restrictions on land use. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. This occurs in cases of (i) lawful expropriation or temporary or permanent restrictions on land use and (ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.

2. Unless properly managed, involuntary resettlement may result in long-term hardship and impoverishment for the Affected Communities and persons, as well as environmental damage and adverse socio-economic impacts in areas to which they have been displaced. For these reasons, involuntary resettlement should be avoided. However, where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities[3] should be carefully planned and implemented. The government often plays a central role in the land acquisition and resettlement process, including the determination of compensation, and is therefore an important third party in many situations. Experience demonstrates that the direct involvement of the client in resettlement activities can result in more cost-effective, efficient, and timely implementation of those activities, as well as in the introduction of innovative approaches to improving the livelihoods of those affected by resettlement.

3. To help avoid expropriation and eliminate the need to use governmental authority to enforce relocation, clients are encouraged to use negotiated settlements meeting the requirements of this Performance Standard, even if they have the legal means to acquire land without the seller's consent.

Objectives

- To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs.
- To avoid forced eviction.
- To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost[4] and (ii) ensuring

[1] The term "livelihood" refers to the full range of means that individuals, families, and communities utilize to make a living, such as wage-based income, agriculture, fishing, foraging, other natural resource-based livelihoods, petty trade, and bartering.

[2] Land acquisition includes both outright purchases of property and acquisition of access rights, such as easements or rights of way.

[3] A host community is any community receiving displaced persons.

[4] Replacement cost is defined as the market value of the assets plus transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account. Market value is defined as the value required to allow Affected Communities and persons to replace lost assets with assets of similar value. The valuation method for determining replacement cost should be documented and included in applicable Resettlement and/or Livelihood Restoration plans (see paragraphs 18 and 25).

that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.
- To improve, or restore, the livelihoods and standards of living of displaced persons.
- To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure[5] at resettlement sites.

Scope of Application

4. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

5. This Performance Standard applies to physical and/or economic displacement resulting from the following types of land-related transactions:

- Land rights or land use rights acquired through expropriation or other compulsory procedures in accordance with the legal system of the host country;
- Land rights or land use rights acquired through negotiated settlements with property owners or those with legal rights to the land if failure to reach settlement would have resulted in expropriation or other compulsory procedures;[6]
- Project situations where involuntary restrictions on land use and access to natural resources cause a community or groups within a community to lose access to resource usage where they have traditional or recognizable usage rights;[7]
- Certain project situations requiring evictions of people occupying land without formal, traditional, or recognizable usage rights;[8] or
- Restriction on access to land or use of other resources including communal property and natural resources such as marine and aquatic resources, timber and non-timber forest products, freshwater, medicinal plants, hunting and gathering grounds and grazing and cropping areas.[9]

6. This Performance Standard does not apply to resettlement resulting from voluntary land transactions (i.e., market transactions in which the seller is not obliged to sell and the buyer cannot resort to expropriation or other compulsory procedures sanctioned by the legal system of the host country if negotiations fail). It also does not apply to impacts on livelihoods where the project is not changing the land use of the affected groups or communities.[10]

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[5] Security of tenure means that resettled individuals or communities are resettled to a site that they can legally occupy and where they are protected from the risk of eviction.

[6] This also applies to customary or traditional rights recognized or recognizable under the laws of the host country. The negotiations may be carried out by the government or by the company (in some circumstances, as an agent of the government).

[7] In such situations, affected persons frequently do not have formal ownership. This may include freshwater and marine environments. This Performance Standard may also apply when project-related biodiversity areas or legally designated buffer zones are established but not acquired by the client.

[8] While some people do not have rights over the land they occupy, this Performance Standard requires that non-land assets be retained, replaced, or compensated for; relocation take place with security of tenure; and lost livelihoods be restored.

[9] Natural resource assets referred to in this Performance Standard are equivalent to ecosystem provisioning services as described in Performance Standard 6.

[10] More generalized impacts on communities or groups of people are covered in Performance Standard 1. For example, disruption of access to mineral deposits by artisanal miners is covered by Performance Standard 1.

7. Where project impacts on land, assets, or access to assets become significantly adverse at any stage of the project, the client should consider applying requirements of this Performance Standard, even where no land acquisition or land use restriction is involved.

Requirements

General

Project Design

8. The client will consider feasible alternative project designs to avoid or minimize physical and/or economic displacement, while balancing environmental, social, and financial costs and benefits, paying particular attention to impacts on the poor and vulnerable.

Compensation and Benefits for Displaced Persons

9. When displacement cannot be avoided, the client will offer displaced communities and persons compensation for loss of assets at full replacement cost and other assistance[11] to help them improve or restore their standards of living or livelihoods, as provided in this Performance Standard. Compensation standards will be transparent and applied consistently to all communities and persons affected by the displacement. Where livelihoods of displaced persons are land-based,[12] or where land is collectively owned, the client will, where feasible,[13] offer the displaced land-based compensation. The client will take possession of acquired land and related assets only after compensation has been made available[14] and, where applicable, resettlement sites and moving allowances have been provided to the displaced persons in addition to compensation.[15] The client will also provide opportunities to displaced communities and persons to derive appropriate development benefits from the project.

Community Engagement

10. The client will engage with Affected Communities, including host communities, through the process of stakeholder engagement described in Performance Standard 1. Decision-making processes related to resettlement and livelihood restoration should include options and alternatives, where applicable. Disclosure of relevant information and participation of Affected Communities and persons will continue during the planning, implementation, monitoring, and evaluation of compensation payments, livelihood restoration activities, and resettlement to achieve outcomes that are consistent with the objectives of this Performance Standard.[16] Additional provisions apply to consultations with Indigenous Peoples, in accordance with Performance Standard 7.

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[11] As described in paragraphs 19 and 26.

[12] The term "land-based" includes livelihood activities such as subsistence cropping and grazing of livestock as well as the harvesting of natural resources.

[13] Refer to paragraph 26 of this Performance Standard for further requirements.

[14] In certain cases it may not be feasible to pay compensation to all those affected before taking possession of the land, for example when the ownership of the land in question is in dispute. Such circumstances shall be identified and agreed on a case-by-case basis, and compensation funds shall be made available for example through deposit into an escrow account before displacement takes place.

[15] Unless government-managed resettlement is involved and where the client has no direct influence over the timing of compensation payments. Such cases should be handled in accordance with paragraphs 27–29 of this Performance Standard. Staggered compensation payments may be made where one-off cash payments would demonstrably undermine social and/or resettlement objectives, or where there are ongoing impacts to livelihood activities.

[16] The consultation process should ensure that women's perspectives are obtained and their interests factored into all aspects of resettlement planning and implementation. Addressing livelihood impacts may require intra-household analysis in cases where women's and men's livelihoods are affected differently. Women's and men's preferences in terms of compensation mechanisms, such as compensation in kind rather than in cash, should be explored.

Grievance Mechanism

11. The client will establish a grievance mechanism consistent with Performance Standard 1 as early as possible in the project development phase. This will allow the client to receive and address specific concerns about compensation and relocation raised by displaced persons or members of host communities in a timely fashion, including a recourse mechanism designed to resolve disputes in an impartial manner.

Resettlement and Livelihood Restoration Planning and Implementation

12. Where involuntary resettlement is unavoidable, either as a result of a negotiated settlement or expropriation, a census will be carried out to collect appropriate socio-economic baseline data to identify the persons who will be displaced by the project, determine who will be eligible for compensation and assistance,[17] and discourage ineligible persons, such as opportunistic settlers, from claiming benefits. In the absence of host government procedures, the client will establish a cut-off date for eligibility. Information regarding the cut-off date will be well documented and disseminated throughout the project area.

13. In cases where affected persons reject compensation offers that meet the requirements of this Performance Standard and, as a result, expropriation or other legal procedures are initiated, the client will explore opportunities to collaborate with the responsible government agency, and, if permitted by the agency, play an active role in resettlement planning, implementation, and monitoring (see paragraphs 30–32).

14. The client will establish procedures to monitor and evaluate the implementation of a Resettlement Action Plan or Livelihood Restoration Plan (see paragraphs 19 and 25) and take corrective action as necessary. The extent of monitoring activities will be commensurate with the project's risks and impacts. For projects with significant involuntary resettlement risks, the client will retain competent resettlement professionals to provide advice on compliance with this Performance Standard and to verify the client's monitoring information. Affected persons will be consulted during the monitoring process.

15. Implementation of a Resettlement Action Plan or Livelihood Restoration Plan will be considered completed when the adverse impacts of resettlement have been addressed in a manner that is consistent with the relevant plan as well as the objectives of this Performance Standard. It may be necessary for the client to commission an external completion audit of the Resettlement Action Plan or Livelihood Restoration Plan to assess whether the provisions have been met, depending on the scale and/or complexity of physical and economic displacement associated with a project. The completion audit should be undertaken once all mitigation measures have been substantially completed and once displaced persons are deemed to have been provided adequate opportunity and assistance to sustainably restore their livelihoods. The completion audit will be undertaken by competent resettlement professionals once the agreed monitoring period is concluded. The completion audit will include, at a minimum, a review of the totality of mitigation measures implemented by the Client, a comparison of implementation outcomes against agreed objectives, and a conclusion as to whether the monitoring process can be ended.[18]

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[17] Documentation of ownership or occupancy and compensation arrangements should be issued in the names of both spouses or heads of households, and other resettlement assistance, such as skills training, access to credit, and job opportunities, should be equally available to women and adapted to their needs. Where national law and tenure systems do not recognize the rights of women to hold or contract in property, measures should be considered to provide women as much protection as possible with the objective to achieve equity with men.

[18] The completion audit of the Resettlement Action Plan and/or Livelihood Restoration Plan, will be undertaken by external resettlement experts once the agreed monitoring period is concluded, and will involve a more in-depth assessment than regular resettlement monitoring activities, including at a minimum a review of all mitigation

16. Where the exact nature or magnitude of the land acquisition or restrictions on land use related to a project with potential to cause physical and/or economic displacement is unknown due to the stage of project development, the client will develop a Resettlement and/or Livelihood Restoration Framework outlining general principles compatible with this Performance Standard. Once the individual project components are defined and the necessary information becomes available, such a framework will be expanded into a specific Resettlement Action Plan or Livelihood Restoration Plan and procedures in accordance with paragraphs 19 and 25 below.

Displacement

17. Displaced persons may be classified as persons (i) who have formal legal rights to the land or assets they occupy or use; (ii) who do not have formal legal rights to land or assets, but have a claim to land that is recognized or recognizable under national law;[19] or (iii) who have no recognizable legal right or claim to the land or assets they occupy or use. The census will establish the status of the displaced persons.

18. Project-related land acquisition and/or restrictions on land use may result in the physical displacement of people as well as their economic displacement. Consequently, requirements of this Performance Standard in respect of physical displacement and economic displacement may apply simultaneously.[20]

Physical Displacement

19. In the case of physical displacement, the client will develop a Resettlement Action Plan that covers, at a minimum, the applicable requirements of this Performance Standard regardless of the number of people affected. This will include compensation at full replacement cost for land and other assets lost. The Plan will be designed to mitigate the negative impacts of displacement; identify development opportunities; develop a resettlement budget and schedule; and establish the entitlements of all categories of affected persons (including host communities). Particular attention will be paid to the needs of the poor and the vulnerable. The client will document all transactions to acquire land rights, as well as compensation measures and relocation activities.

20. If people living in the project area are required to move to another location, the client will (i) offer displaced persons choices among feasible resettlement options, including adequate replacement housing or cash compensation where appropriate; and (ii) provide relocation assistance suited to the needs of each group of displaced persons. New resettlement sites built for displaced persons must offer improved living conditions. The displaced persons' preferences with respect to relocating in preexisting communities and groups will be taken into consideration. Existing social and cultural institutions of the displaced persons and any host communities will be respected.

21. In the case of physically displaced persons under paragraph 17 (i) or (ii), the client will offer the choice of replacement property of equal or higher value, security of tenure, equivalent or better characteristics, and advantages of location or cash compensation where appropriate. Compensation

measures with respect to the physical and/or economic displacement implemented by the Client, a comparison of implementation outcomes against agreed objectives, a conclusion as to whether the monitoring process can be ended and, where necessary, a Corrective Action Plan listing outstanding actions necessary to met the objectives.

[19] Such claims could be derived from adverse possession or from customary or traditional tenure arrangements.

[20] Where a project results in both physical and economic displacement, the requirements of paragraphs 25 and 26 (Economic Displacement) should be incorporated into the Resettlement Action Plan or Framework (i.e., there is no need to have a separate Resettlement Action Plan and Livelihood Restoration Plan).

in kind should be considered in lieu of cash. Cash compensation levels should be sufficient to replace the lost land and other assets at full replacement cost in local markets.[21]

22. In the case of physically displaced persons under paragraph 17 (iii), the client will offer them a choice of options for adequate housing with security of tenure so that they can resettle legally without having to face the risk of forced eviction. Where these displaced persons own and occupy structures, the client will compensate them for the loss of assets other than land, such as dwellings and other improvements to the land, at full replacement cost, provided that these persons have been occupying the project area prior to the cut-off date for eligibility. Based on consultation with such displaced persons, the client will provide relocation assistance sufficient for them to restore their standard of living at an adequate alternative site.[22]

23. The client is not required to compensate or assist those who encroach on the project area after the cut-off date for eligibility, provided the cut-off date has been clearly established and made public.

24. Forced evictions[23] will not be carried out except in accordance with law and the requirements of this Performance Standard.

Economic Displacement

25. In the case of projects involving economic displacement only, the client will develop a Livelihood Restoration Plan to compensate affected persons and/or communities and offer other assistance that meet the objectives of this Performance Standard. The Livelihood Restoration Plan will establish the entitlements of affected persons and/or communities and will ensure that these are provided in a transparent, consistent, and equitable manner. The mitigation of economic displacement will be considered complete when affected persons or communities have received compensation and other assistance according to the requirements of the Livelihood Restoration Plan and this Performance Standard, and are deemed to have been provided with adequate opportunity to reestablish their livelihoods.

26. If land acquisition or restrictions on land use result in economic displacement defined as loss of assets and/or means of livelihood, regardless of whether or not the affected people are physically displaced, the client will meet the requirements in paragraphs 27–29 below, as applicable.

27. Economically displaced persons who face loss of assets or access to assets will be compensated for such loss at full replacement cost.

- In cases where land acquisition or restrictions on land use affect commercial structures, affected business owners will be compensated for the cost of reestablishing commercial activities elsewhere, for lost net income during the

[21] Payment of cash compensation for lost assets may be appropriate where (i) livelihoods are not land-based; (ii) livelihoods are land-based but the land taken for the project is a small fraction of the affected asset and the residual land is economically viable; or (iii) active markets for land, housing, and labor exist, displaced persons use such markets, and there is sufficient supply of land and housing.

[22] Relocation of informal settlers in urban areas may involve trade-offs. For example, the relocated families may gain security of tenure, but they may lose advantages of location. Changes in location that may affect livelihood opportunities should be addressed in accordance with the principles of this Performance Standard (see in particular paragraph 25).

[23] The permanent or temporary removal against the will of individuals, families, and/or communities from the homes and/or lands which they occupy without the provision of, and access to, appropriate forms of legal and other protection.

period of transition, and for the costs of the transfer and reinstallation of the plant, machinery, or other equipment.

- In cases affecting persons with legal rights or claims to land which are recognized or recognizable under national law (see paragraph 17 (i) and (ii)), replacement property (e.g., agricultural or commercial sites) of equal or greater value will be provided, or, where appropriate, cash compensation at full replacement cost.
- Economically displaced persons who are without legally recognizable claims to land (see paragraph 17 (iii)) will be compensated for lost assets other than land (such as crops, irrigation infrastructure and other improvements made to the land), at full replacement cost. The client is not required to compensate or assist opportunistic settlers who encroach on the project area after the cut-off date for eligibility.

28. In addition to compensation for lost assets, if any, as required under paragraph 27, economically displaced persons whose livelihoods or income levels are adversely affected will also be provided opportunities to improve, or at least restore, their means of income-earning capacity, production levels, and standards of living:

- For persons whose livelihoods are land-based, replacement land that has a combination of productive potential, locational advantages, and other factors at least equivalent to that being lost should be offered as a matter of priority.
- For persons whose livelihoods are natural resource-based and where project-related restrictions on access envisaged in paragraph 5 apply, implementation of measures will be made to either allow continued access to affected resources or provide access to alternative resources with equivalent livelihood-earning potential and accessibility. Where appropriate, benefits and compensation associated with natural resource usage may be collective in nature rather than directly oriented towards individuals or households.
- If circumstances prevent the client from providing land or similar resources as described above, alternative income earning opportunities may be provided, such as credit facilities, training, cash, or employment opportunities. Cash compensation alone, however, is frequently insufficient to restore livelihoods.

29. Transitional support should be provided as necessary to all economically displaced persons, based on a reasonable estimate of the time required to restore their income-earning capacity, production levels, and standards of living.

Private Sector Responsibilities Under Government-Managed Resettlement

30. Where land acquisition and resettlement are the responsibility of the government, the client will collaborate with the responsible government agency, to the extent permitted by the agency, to achieve outcomes that are consistent with this Performance Standard. In addition, where government capacity is limited, the client will play an active role during resettlement planning, implementation, and monitoring, as described below.

31. In the case of acquisition of land rights or access to land through compulsory means or negotiated settlements involving physical displacement, the client will identify and describe[24] government resettlement measures. If these measures do not meet the relevant requirements of this Performance Standard, the client will prepare a Supplemental Resettlement Plan that, together with

[24] Government documents, where available, may be used to identify such measures.

the documents prepared by the responsible government agency, will address the relevant requirements of this Performance Standard (the General Requirements and requirements for Physical Displacement and Economic Displacement above). The client will need to include in its Supplemental Resettlement Plan, at a minimum (i) identification of affected people and impacts; (ii) a description of regulated activities, including the entitlements of displaced persons provided under applicable national laws and regulations; (iii) the supplemental measures to achieve the requirements of this Performance Standard as described in paragraphs 19–29 in a way that is permitted by the responsible agency and implementation time schedule; and (iv) the financial and implementation responsibilities of the client in the execution of its Supplemental Resettlement Plan.

32. In the case of projects involving economic displacement only, the client will identify and describe the measures that the responsible government agency plans to use to compensate Affected Communities and persons. If these measures do not meet the relevant requirements of this Performance Standard, the client will develop an Environmental and Social Action Plan to complement government action. This may include additional compensation for lost assets, and additional efforts to restore lost livelihoods where applicable.

Performance Standard 6

Biodiversity Conservation and Sustainable Management of Living Natural Resources

January 1, 2012

Introduction

1. Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems."

2. Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Ecosystem services are organized into four types: (i) provisioning services, which are the products people obtain from ecosystems; (ii) regulating services, which are the benefits people obtain from the regulation of ecosystem processes; (iii) cultural services, which are the nonmaterial benefits people obtain from ecosystems; and (iv) supporting services, which are the natural processes that maintain the other services.[1]

3. Ecosystem services valued by humans are often underpinned by biodiversity. Impacts on biodiversity can therefore often adversely affect the delivery of ecosystem services. This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle.

Objectives

- To protect and conserve biodiversity.
- To maintain the benefits from ecosystem services.
- To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Scope of Application

4. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1.

5. Based on the risks and impacts identification process, the requirements of this Performance Standard are applied to projects (i) located in modified, natural, and critical habitats; (ii) that potentially impact on or are dependent on ecosystem services over which the client has direct management control or significant influence; or (iii) that include the production of living natural resources (e.g., agriculture, animal husbandry, fisheries, forestry).

[1] Examples are as follows: (i) provisioning services may include food, freshwater, timber, fibers, medicinal plants; (ii) regulating services may include surface water purification, carbon storage and sequestration, climate regulation, protection from natural hazards; (iii) cultural services may include natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment; and (iv) supporting services may include soil formation, nutrient cycling, primary production.

Requirements

General

6. The risks and impacts identification process as set out in Performance Standard 1 should consider direct and indirect project-related impacts on biodiversity and ecosystem services and identify any significant residual impacts. This process will consider relevant threats to biodiversity and ecosystem services, especially focusing on habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, and pollution. It will also take into account the differing values attached to biodiversity and ecosystem services by Affected Communities and, where appropriate, other stakeholders. Where paragraphs 13–19 are applicable, the client should consider project-related impacts across the potentially affected landscape or seascape.

7. As a matter of priority, the client should seek to avoid impacts on biodiversity and ecosystem services. When avoidance of impacts is not possible, measures to minimize impacts and restore biodiversity and ecosystem services should be implemented. Given the complexity in predicting project impacts on biodiversity and ecosystem services over the long term, the client should adopt a practice of adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the project's lifecycle.

8. Where paragraphs 13–15 are applicable, the client will retain competent professionals to assist in conducting the risks and impacts identification process. Where paragraphs 16–19 are applicable, the client should retain external experts with appropriate regional experience to assist in the development of a mitigation hierarchy that complies with this Performance Standard and to verify the implementation of those measures.

Protection and Conservation of Biodiversity

9. Habitat is defined as a terrestrial, freshwater, or marine geographical unit or airway that supports assemblages of living organisms and their interactions with the non-living environment. For the purposes of implementation of this Performance Standard, habitats are divided into modified, natural, and critical. Critical habitats are a subset of modified or natural habitats.

10. For the protection and conservation of biodiversity, the mitigation hierarchy includes biodiversity offsets, which may be considered only after appropriate avoidance, minimization, and restoration measures have been applied.[2] A biodiversity offset should be designed and implemented to achieve measurable conservation outcomes[3] that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity; however, a net gain is required in critical habitats. The design of a biodiversity offset must adhere to the "like-for-like or better" principle[4] and must be carried out in

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[2] Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimization and restoration measures have been taken.

[3] Measurable conservation outcomes for biodiversity must be demonstrated in situ (on-the-ground) and on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

[4] The principle of "like-for-like or better" indicates that biodiversity offsets must be designed to conserve the same biodiversity values that are being impacted by the project (an "in-kind" offset). In certain situations, however, areas of biodiversity to be impacted by the project may be neither a national nor a local priority, and there may be other areas of biodiversity with like values that are a higher priority for conservation and sustainable use and under imminent threat or need of protection or effective management. In these situations, it may be appropriate to consider an "out-of-kind" offset that involves "trading up" (i.e., where the offset targets biodiversity of higher

alignment with best available information and current practices. When a client is considering the development of an offset as part of the mitigation strategy, external experts with knowledge in offset design and implementation must be involved.

Modified Habitat

11. Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.[5] Modified habitats may include areas managed for agriculture, forest plantations, reclaimed[6] coastal zones, and reclaimed wetlands.

12. This Performance Standard applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process required in Performance Standard 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate.

Natural Habitat

13. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

14. The client will not significantly convert or degrade[7] natural habitats, unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified habitat;
- Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation;[8] and
- Any conversion or degradation is mitigated according to the mitigation hierarchy.

15. In areas of natural habitat, mitigation measures will be designed to achieve no net loss[9] of biodiversity where feasible. Appropriate actions include:

- Avoiding impacts on biodiversity through the identification and protection of set-asides;[10]

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priority than that affected by the project) that will, for critical habitats, meet the requirements of paragraph 17 of this Performance Standard.

[5] This excludes habitat that has been converted in anticipation of the project.

[6] Reclamation as used in this context is the process of creating new land from sea or other aquatic areas for productive use.

[7] Significant conversion or degradation is (i) the elimination or severe diminution of the integrity of a habitat caused by a major and/or long-term change in land or water use; or (ii) a modification that substantially minimizes the habitat's ability to maintain viable populations of its native species.

[8] Conducted as part of the stakeholder engagement and consultation process, as described in Performance Standard 1.

[9] No net loss is defined as the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project's impacts, to undertake on-site restoration and finally to offset significant residual impacts, if any, on an appropriate geographic scale (e.g., local, landscape-level, national, regional).

[10] Set-asides are land areas within the project site, or areas over which the client has management control, that are excluded from development and are targeted for the implementation of conservation enhancement measures. Set-asides will likely contain significant biodiversity values and/or provide ecosystem services of significance at the local, national and/or regional level. Set-asides should be defined using internationally recognized approaches or methodologies (e.g., High Conservation Value, systematic conservation planning).

- Implementing measures to minimize habitat fragmentation, such as biological corridors;
- Restoring habitats during operations and/or after operations; and
- Implementing biodiversity offsets.

Critical Habitat

16. Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered[11] species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

17. In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;[12]
- The project does not lead to a net reduction in the global and/or national/regional population[13] of any Critically Endangered or Endangered species over a reasonable period of time;[14] and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.

18. In such cases where a client is able to meet the requirements defined in paragraph 17, the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains[15] of those biodiversity values for which the critical habitat was designated.

[11] As listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The determination of critical habitat based on other listings is as follows: (i) If the species is listed nationally / regionally as critically endangered or endangered, in countries that have adhered to IUCN guidance, the critical habitat determination will be made on a project by project basis in consultation with competent professionals; and (ii) in instances where nationally or regionally listed species' categorizations do not correspond well to those of the IUCN (e.g., some countries more generally list species as "protected" or "restricted"), an assessment will be conducted to determine the rationale and purpose of the listing. In this case, the critical habitat determination will be based on such an assessment.

[12] Biodiversity values and their supporting ecological processes will be determined on an ecologically relevant scale.

[13] Net reduction is a singular or cumulative loss of individuals that impacts on the species' ability to persist at the global and/or regional/national scales for many generations or over a long period of time. The scale (i.e., global and/or regional/national) of the potential net reduction is determined based on the species' listing on either the (global) IUCN Red List and/or on regional/national lists. For species listed on both the (global) IUCN Red List and the national/regional lists, the net reduction will be based on the national/regional population.

[14] The timeframe in which clients must demonstrate "no net reduction" of Critically Endangered and Endangered species will be determined on a case-by-case basis in consultation with external experts.

[15] Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated. Net gains may be achieved through the development of a biodiversity offset and/or, in instances where the client could meet the requirements of paragraph 17 of this Performance Standard without a biodiversity offset, the client should achieve net gains through the implementation of programs that could be implemented in situ (on-the-ground) to enhance habitat, and protect and conserve biodiversity.

19. In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of paragraph 17.

Legally Protected and Internationally Recognized Areas

20. In circumstances where a proposed project is located within a legally protected area[16] or an internationally recognized area,[17] the client will meet the requirements of paragraphs 13 through 19 of this Performance Standard, as applicable. In addition, the client will:

- Demonstrate that the proposed development in such areas is legally permitted;
- Act in a manner consistent with any government recognized management plans for such areas;
- Consult protected area sponsors and managers, Affected Communities, Indigenous Peoples and other stakeholders on the proposed project, as appropriate; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims and effective management of the area.[18]

Invasive Alien Species

21. Intentional or accidental introduction of alien, or non-native, species of flora and fauna into areas where they are not normally found can be a significant threat to biodiversity, since some alien species can become invasive, spreading rapidly and out-competing native species.

22. The client will not intentionally introduce any new alien species (not currently established in the country or region of the project) unless this is carried out in accordance with the existing regulatory framework for such introduction. Notwithstanding the above, the client will not deliberately introduce any alien species with a high risk of invasive behavior regardless of whether such introductions are permitted under the existing regulatory framework. All introductions of alien species will be subject to a risk assessment (as part of the client's environmental and social risks and impacts identification process) to determine the potential for invasive behavior. The client will implement measures to avoid the potential for accidental or unintended introductions including the transportation of substrates and vectors (such as soil, ballast, and plant materials) that may harbor alien species.

23. Where alien species are already established in the country or region of the proposed project, the client will exercise diligence in not spreading them into areas in which they have not already been established. As practicable, the client should take measures to eradicate such species from the natural habitats over which they have management control.

Management of Ecosystem Services

24. Where a project is likely to adversely impact ecosystem services, as determined by the risks and impacts identification process, the client will conduct a systematic review to identify priority

[16] This Performance Standard recognizes legally protected areas that meet the IUCN definition: "A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values." For the purposes of this Performance Standard, this includes areas proposed by governments for such designation.

[17] Exclusively defined as UNESCO Natural World Heritage Sites, UNESCO Man and the Biosphere Reserves, Key Biodiversity Areas, and wetlands designated under the Convention on Wetlands of International Importance (the Ramsar Convention).

[18] Implementing additional programs may not be necessary for projects that do not create a new footprint.

ecosystem services. Priority ecosystem services are two-fold: (i) those services on which project operations are most likely to have an impact and, therefore, which result in adverse impacts to Affected Communities; and/or (ii) those services on which the project is directly dependent for its operations (e.g., water). When Affected Communities are likely to be impacted, they should participate in the determination of priority ecosystem services in accordance with the stakeholder engagement process as defined in Performance Standard 1.

25. With respect to impacts on priority ecosystem services of relevance to Affected Communities and where the client has direct management control or significant influence over such ecosystem services, adverse impacts should be avoided. If these impacts are unavoidable, the client will minimize them and implement mitigation measures that aim to maintain the value and functionality of priority services. With respect to impacts on priority ecosystem services on which the project depends, clients should minimize impacts on ecosystem services and implement measures that increase resource efficiency of their operations, as described in Performance Standard 3. Additional provisions for ecosystem services are included in Performance Standards 4, 5, 7, and 8.[19]

Sustainable Management of Living Natural Resources

26. Clients who are engaged in the primary production of living natural resources, including natural and plantation forestry, agriculture, animal husbandry, aquaculture, and fisheries, will be subject to the requirements of paragraphs 26 through 30, in addition to the rest of this Performance Standard. Where feasible, the client will locate land-based agribusiness and forestry projects on unforested land or land already converted. Clients who are engaged in such industries will manage living natural resources in a sustainable manner, through the application of industry-specific good management practices and available technologies. Where such primary production practices are codified in globally, regionally, or nationally recognized standards, the client will implement sustainable management practices to one or more relevant and credible standards as demonstrated by independent verification or certification.

27. Credible globally, regionally, or nationally recognized standards for sustainable management of living natural resources are those which (i) are objective and achievable; (ii) are founded on a multi-stakeholder consultative process; (iii) encourage step-wise and continual improvements; and (iv) provide for independent verification or certification through appropriate accredited bodies for such standards.[20]

28. Where relevant and credible standard(s) exist, but the client has not yet obtained independent verification or certification to such standard(s), the client will conduct a pre-assessment of its conformity to the applicable standard(s) and take actions to achieve such verification or certification over an appropriate period of time.

29. In the absence of a relevant and credible global, regional, or national standard for the particular living natural resource in the country concerned, the client will:

[19] Ecosystem service references are located in Performance Standard 4, paragraph 8; Performance Standard 5, paragraphs 5 and 25–29; Performance Standard 7, paragraphs 13–17 and 20; and Performance Standard 8, paragraph 11.

[20] A credible certification system would be one which is independent, cost-effective, based on objective and measurable performance standards and developed through consultation with relevant stakeholders, such as local people and communities, Indigenous Peoples, and civil society organizations representing consumer, producer and conservation interests. Such a system has fair, transparent and independent decision-making procedures that avoid conflicts of interest.

- Commit to applying good international industry operating principles, management practices, and technologies; and
- Actively engage and support the development of a national standard, where relevant, including studies that contribute to the definition and demonstration of sustainable practices.

Supply Chain

30. Where a client is purchasing primary production (especially but not exclusively food and fiber commodities) that is known to be produced in regions where there is a risk of significant conversion of natural and/or critical habitats, systems and verification practices will be adopted as part of the client's ESMS to evaluate its primary suppliers.[21] The systems and verification practices will (i) identify where the supply is coming from and the habitat type of this area; (ii) provide for an ongoing review of the client's primary supply chains; (iii) limit procurement to those suppliers that can demonstrate that they are not contributing to significant conversion of natural and/or critical habitats (this may be demonstrated by delivery of certified product, or progress towards verification or certification under a credible scheme in certain commodities and/or locations); and (iv) where possible, require actions to shift the client's primary supply chain over time to suppliers that can demonstrate that they are not significantly adversely impacting these areas. The ability of the client to fully address these risks will depend upon the client's level of management control or influence over its primary suppliers.

[21] Primary suppliers are those suppliers who, on an ongoing basis, provide the majority of living natural resources, goods, and materials essential for the core business processes of the project.

Performance Standard 7
Indigenous Peoples

January 1, 2012

Introduction

1. Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.

2. Private sector projects can create opportunities for Indigenous Peoples to participate in, and benefit from project-related activities that may help them fulfill their aspiration for economic and social development. Furthermore, Indigenous Peoples may play a role in sustainable development by promoting and managing activities and enterprises as partners in development. Government often plays a central role in the management of Indigenous Peoples' issues, and clients should collaborate with the responsible authorities in managing the risks and impacts of their activities.[1]

Objectives

- To ensure that the development process fosters full respect for the human rights, dignity, aspirations, culture, and natural resource-based livelihoods of Indigenous Peoples.
- To anticipate and avoid adverse impacts of projects on communities of Indigenous Peoples, or when avoidance is not possible, to minimize and/or compensate for such impacts.
- To promote sustainable development benefits and opportunities for Indigenous Peoples in a culturally appropriate manner.
- To establish and maintain an ongoing relationship based on Informed Consultation and Participation (ICP) with the Indigenous Peoples affected by a project throughout the project's life-cycle.
- To ensure the Free, Prior, and Informed Consent (FPIC) of the Affected Communities of Indigenous Peoples when the circumstances described in this Performance Standard are present.
- To respect and preserve the culture, knowledge, and practices of Indigenous Peoples.

Scope of Application

3. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System, the elements of which are outlined in Performance Standard 1.

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[1] In addition to meeting the requirements under this Performance Standard, clients must comply with applicable national law, including those laws implementing host country obligations under international law.

4. There is no universally accepted definition of "Indigenous Peoples." Indigenous Peoples may be referred to in different countries by such terms as "Indigenous ethnic minorities," "aboriginals," "hill tribes," "minority nationalities," "scheduled tribes," "first nations," or "tribal groups."

5. In this Performance Standard, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct social and cultural group possessing the following characteristics in varying degrees:

- Self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- Collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
- Customary cultural, economic, social, or political institutions that are separate from those of the mainstream society or culture; or
- A distinct language or dialect, often different from the official language or languages of the country or region in which they reside.

6. This Performance Standard applies to communities or groups of Indigenous Peoples who maintain a collective attachment, i.e., whose identity as a group or community is linked, to distinct habitats or ancestral territories and the natural resources therein. It may also apply to communities or groups that have lost collective attachment to distinct habitats or ancestral territories in the project area, occurring within the concerned group members' lifetime, because of forced severance, conflict, government resettlement programs, dispossession of their lands, natural disasters, or incorporation of such territories into an urban area.

7. The client may be required to seek inputs from competent professionals to ascertain whether a particular group is considered as Indigenous Peoples for the purpose of this Performance Standard.

Requirements

General

Avoidance of Adverse Impacts

8. The client will identify, through an environmental and social risks and impacts assessment process, all communities of Indigenous Peoples within the project area of influence who may be affected by the project, as well as the nature and degree of the expected direct and indirect economic, social, cultural (including cultural heritage[2]), and environmental impacts on them.

9. Adverse impacts on Affected Communities of Indigenous Peoples should be avoided where possible. Where alternatives have been explored and adverse impacts are unavoidable, the client will minimize, restore, and/or compensate for these impacts in a culturally appropriate manner commensurate with the nature and scale of such impacts and the vulnerability of the Affected Communities of Indigenous Peoples. The client's proposed actions will be developed with the ICP of the Affected Communities of Indigenous Peoples and contained in a time-bound plan, such as an Indigenous Peoples Plan, or a broader community development plan with separate components for Indigenous Peoples.[3]

[2] Additional requirements on protection of cultural heritage are set out in Performance Standard 8.

[3] The determination of the appropriate plan may require the input of competent professionals. A community development plan may be appropriate in circumstances where Indigenous Peoples are a part of larger Affected Communities.

Participation and Consent

10. The client will undertake an engagement process with the Affected Communities of Indigenous Peoples as required in Performance Standard 1. This engagement process includes stakeholder analysis and engagement planning, disclosure of information, consultation, and participation, in a culturally appropriate manner. In addition, this process will:

- Involve Indigenous Peoples' representative bodies and organizations (e.g., councils of elders or village councils), as well as members of the Affected Communities of Indigenous Peoples; and
- Provide sufficient time for Indigenous Peoples' decision-making processes.[4]

11. Affected Communities of Indigenous Peoples may be particularly vulnerable to the loss of, alienation from or exploitation of their land and access to natural and cultural resources.[5] In recognition of this vulnerability, in addition to the General Requirements of this Performance Standard, the client will obtain the FPIC of the Affected Communities of Indigenous Peoples in the circumstances described in paragraphs 13–17 of this Performance Standard. FPIC applies to project design, implementation, and expected outcomes related to impacts affecting the communities of Indigenous Peoples. When any of these circumstances apply, the client will engage external experts to assist in the identification of the project risks and impacts.

12. There is no universally accepted definition of FPIC. For the purposes of Performance Standards 1, 7 and 8, "FPIC" has the meaning described in this paragraph. FPIC builds on and expands the process of ICP described in Performance Standard 1 and will be established through good faith negotiation between the client and the Affected Communities of Indigenous Peoples. The client will document: (i) the mutually accepted process between the client and Affected Communities of Indigenous Peoples, and (ii) evidence of agreement between the parties as the outcome of the negotiations. FPIC does not necessarily require unanimity and may be achieved even when individuals or groups within the community explicitly disagree.

Circumstances Requiring Free, Prior, and Informed Consent

Impacts on Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use

13. Indigenous Peoples are often closely tied to their lands and related natural resources.[6] Frequently, these lands are traditionally owned or under customary use.[7] While Indigenous Peoples may not possess legal title to these lands as defined by national law, their use of these lands, including seasonal or cyclical use, for their livelihoods, or cultural, ceremonial, and spiritual purposes that define their identity and community, can often be substantiated and documented.

[4] Internal decision making processes are generally but not always collective in nature. There may be internal dissent, and decisions may be challenged by some in the community. The consultation process should be sensitive to such dynamics and allow sufficient time for internal decision making processes to reach conclusions that are considered legitimate by the majority of the concerned participants.

[5] Natural resources and natural areas with cultural value referred to in this Performance Standard are equivalent to ecosystem provisioning and cultural services as described in Performance Standard 6.

[6] Examples include marine and aquatic resources timber, and non-timber forest products, medicinal plants, hunting and gathering grounds, and grazing and cropping areas. Natural resource assets, as referred to in this Performance Standard, are equivalent to provisioning ecosystem services as described in Performance Standard 6.

[7] The acquisition and/or leasing of lands with legal title is addressed in Performance Standard 5: Land Acquisition and Involuntary Resettlement.

14. If the client proposes to locate a project on, or commercially develop natural resources on lands traditionally owned by, or under the customary use of, Indigenous Peoples, and adverse impacts[8] can be expected, the client will take the following steps:

- Document efforts to avoid and otherwise minimize the area of land proposed for the project;
- Document efforts to avoid and otherwise minimize impacts on natural resources and natural areas of importance[9] to Indigenous People;
- Identify and review all property interests and traditional resource uses prior to purchasing or leasing land;
- Assess and document the Affected Communities of Indigenous Peoples' resource use without prejudicing any Indigenous Peoples' land claim.[10] The assessment of land and natural resource use should be gender inclusive and specifically consider women's role in the management and use of these resources;
- Ensure that Affected Communities of Indigenous Peoples are informed of their land rights under national law, including any national law recognizing customary use rights; and
- Offer Affected Communities of Indigenous Peoples compensation and due process in the case of commercial development of their land and natural resources, together with culturally appropriate sustainable development opportunities, including:
    - Providing land-based compensation or compensation-in-kind in lieu of cash compensation where feasible.[11]
    - Ensuring continued access to natural resources, identifying the equivalent replacement resources, or, as a last option, providing compensation and identifying alternative livelihoods if project development results in the loss of access to and the loss of natural resources independent of project land acquisition.
    - Ensuring fair and equitable sharing of benefits associated with project usage of the resources where the client intends to utilize natural resources that are central to the identity and livelihood of Affected Communities of Indigenous People and their usage thereof exacerbates livelihood risk.
    - Providing Affected Communities of Indigenous Peoples with access, usage, and transit on land it is developing subject to overriding health, safety, and security considerations.

Relocation of Indigenous Peoples from Lands and Natural Resources Subject to Traditional Ownership or Under Customary Use

15. The client will consider feasible alternative project designs to avoid the relocation of Indigenous Peoples from communally held[12] lands and natural resources subject to traditional ownership or

[8] Such adverse impacts may include impacts from loss of access to assets or resources or restrictions on land use resulting from project activities.

[9] "Natural resources and natural areas of importance" as referred to in this Performance Standard are equivalent to priority ecosystem services as defined in Performance Standard 6. They refer to those services over which the client has direct management control or significant influence, and those services most likely to be sources of risk in terms of impacts on Affected Communities of Indigenous Peoples.

[10] While this Performance Standard requires substantiation and documentation of the use of such land, clients should also be aware that the land may already be under alternative use, as designated by the host government.

[11] If circumstances prevent the client from offering suitable replacement land, the client must provide verification that such is the case. Under such circumstances, the client will provide non land-based income-earning opportunities over and above cash compensation to the Affected Communities of Indigenous Peoples.

under customary use. If such relocation is unavoidable the client will not proceed with the project unless FPIC has been obtained as described above. Any relocation of Indigenous Peoples will be consistent with the requirements of Performance Standard 5. Where feasible, the relocated Indigenous Peoples should be able to return to their traditional or customary lands, should the cause of their relocation cease to exist.

Critical Cultural Heritage

16. Where a project may significantly impact on critical cultural heritage[13] that is essential to the identity and/or cultural, ceremonial, or spiritual aspects of Indigenous Peoples lives, priority will be given to the avoidance of such impacts. Where significant project impacts on critical cultural heritage are unavoidable, the client will obtain the FPIC of the Affected Communities of Indigenous Peoples.

17. Where a project proposes to use the cultural heritage including knowledge, innovations, or practices of Indigenous Peoples for commercial purposes, the client will inform the Affected Communities of Indigenous Peoples of (i) their rights under national law; (ii) the scope and nature of the proposed commercial development; (iii) the potential consequences of such development; and (iv) obtain their FPIC. The client will also ensure fair and equitable sharing of benefits from commercialization of such knowledge, innovation, or practice, consistent with the customs and traditions of the Indigenous Peoples.

Mitigation and Development Benefits

18. The client and the Affected Communities of Indigenous Peoples will identify mitigation measures in alignment with the mitigation hierarchy described in Performance Standard 1 as well as opportunities for culturally appropriate and sustainable development benefits. The client will ensure the timely and equitable delivery of agreed measures to the Affected Communities of Indigenous Peoples.

19. The determination, delivery, and distribution of compensation and other benefit sharing measures to the Affected Communities of Indigenous Peoples will take account of the laws, institutions, and customs of these communities as well as their level of interaction with mainstream society. Eligibility for compensation can either be individually or collectively-based, or be a combination of both.[14] Where compensation occurs on a collective basis, mechanisms that promote the effective delivery and distribution of compensation to all eligible members of the group will be defined and implemented.

20. Various factors including, but not limited to, the nature of the project, the project context and the vulnerability of the Affected Communities of Indigenous Peoples will determine how these communities should benefit from the project. Identified opportunities should aim to address the goals

[12] Typically, Indigenous Peoples claim rights and access to, and use of land and resources through traditional or customary systems, many of which entail communal property rights. These traditional claims to land and resources may not be recognized under national laws. Where members of the Affected Communities of Indigenous Peoples individually hold legal title, or where the relevant national law recognizes customary rights for individuals, the requirements of Performance Standard 5 will apply, rather than the requirements under paragraph 17 of this Performance Standard.

[13] Includes natural areas with cultural and/or spiritual value such as sacred groves, sacred bodies of water and waterways, sacred trees, and sacred rocks. Natural areas with cultural value are equivalent to priority ecosystem cultural services as defined in Performance Standard 6.

[14] Where control of resources, assets and decision making are predominantly collective in nature, efforts will be made to ensure that, where possible, benefits and compensation are collective, and take account of intergenerational differences and needs.

and preferences of the Indigenous Peoples including improving their standard of living and livelihoods in a culturally appropriate manner, and to foster the long-term sustainability of the natural resources on which they depend.

Private Sector Responsibilities Where Government is Responsible for Managing Indigenous Peoples Issues

21. Where the government has a defined role in the management of Indigenous Peoples issues in relation to the project, the client will collaborate with the responsible government agency, to the extent feasible and permitted by the agency, to achieve outcomes that are consistent with the objectives of this Performance Standard. In addition, where government capacity is limited, the client will play an active role during planning, implementation, and monitoring of activities to the extent permitted by the agency.

22. The client will prepare a plan that, together with the documents prepared by the responsible government agency, will address the relevant requirements of this Performance Standard. The client may need to include (i) the plan, implementation, and documentation of the process of ICP and engagement and FPIC where relevant; (ii) a description of the government-provided entitlements of affected Indigenous Peoples; (iii) the measures proposed to bridge any gaps between such entitlements, and the requirements of this Performance Standard; and (iv) the financial and implementation responsibilities of the government agency and/or the client.

Performance Standard 8
Cultural Heritage

January 1, 2012

Introduction

1. Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

Objectives

- To protect cultural heritage from the adverse impacts of project activities and support its preservation.
- To promote the equitable sharing of benefits from the use of cultural heritage.

Scope of Application

2. The applicability of this Performance Standard is established during the environmental and social risks and impacts identification process. The implementation of the actions necessary to meet the requirements of this Performance Standard is managed through the client's Environmental and Social Management System (ESMS), the elements of which are outlined in Performance Standard 1. During the project life-cycle, the client will consider potential project impacts to cultural heritage and will apply the provisions of this Performance Standard.

3. For the purposes of this Performance Standard, cultural heritage refers to (i) tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values; (ii) unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and (iii) certain instances of intangible forms of culture that are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

4. Requirements with respect to tangible forms of cultural heritage are contained in paragraphs 6–16. For requirements with respect to specific instances of intangible forms of cultural heritage described in paragraph 3 (iii) see paragraph 16.

5. The requirements of this Performance Standard apply to cultural heritage regardless of whether or not it has been legally protected or previously disturbed. The requirements of this Performance Standard do not apply to cultural heritage of Indigenous Peoples; Performance Standard 7 describes those requirements.

Requirements

Protection of Cultural Heritage in Project Design and Execution

6. In addition to complying with applicable law on the protection of cultural heritage, including national law implementing the host country's obligations under the Convention Concerning the Protection of the World Cultural and Natural Heritage, the client will identify and protect cultural heritage by ensuring that internationally recognized practices for the protection, field-based study, and documentation of cultural heritage are implemented.

7. Where the risk and identification process determines that there is a chance of impacts to cultural heritage, the client will retain competent professionals to assist in the identification and protection of cultural heritage. The removal of nonreplicable cultural heritage is subject to the additional requirements of paragraph 10 below. In the case of critical cultural heritage, the requirements of paragraphs 13–15 will apply.

Chance Find Procedures
8. The client is responsible for siting and designing a project to avoid significant adverse impacts to cultural heritage. The environmental and social risks and impacts identification process should determine whether the proposed location of a project is in areas where cultural heritage is expected to be found, either during construction or operations. In such cases, as part of the client's ESMS, the client will develop provisions for managing chance finds[1] through a chance find procedure[2] which will be applied in the event that cultural heritage is subsequently discovered. The client will not disturb any chance find further until an assessment by competent professionals is made and actions consistent with the requirements of this Performance Standard are identified.

Consultation
9. Where a project may affect cultural heritage, the client will consult with Affected Communities within the host country who use, or have used within living memory, the cultural heritage for long-standing cultural purposes. The client will consult with the Affected Communities to identify cultural heritage of importance, and to incorporate into the client's decision-making process the views of the Affected Communities on such cultural heritage. Consultation will also involve the relevant national or local regulatory agencies that are entrusted with the protection of cultural heritage.

Community Access
10. Where the client's project site contains cultural heritage or prevents access to previously accessible cultural heritage sites being used by, or that have been used by, Affected Communities within living memory for long-standing cultural purposes, the client will, based on consultations under paragraph 9, allow continued access to the cultural site or will provide an alternative access route, subject to overriding health, safety, and security considerations.

Removal of Replicable Cultural Heritage
11. Where the client has encountered tangible cultural heritage that is replicable[3] and not critical, the client will apply mitigation measures that favor avoidance. Where avoidance is not feasible, the client will apply a mitigation hierarchy as follows:

- Minimize adverse impacts and implement restoration measures, in situ, that ensure maintenance of the value and functionality of the cultural heritage, including maintaining or restoring any ecosystem processes[4] needed to support it;
- Where restoration in situ is not possible, restore the functionality of the cultural heritage, in a different location, including the ecosystem processes needed to support it;

[1] Tangible cultural heritage encountered unexpectedly during project construction or operation.

[2] A chance find procedure is a project-specific procedure that outlines the actions to be taken if previously unknown cultural heritage is encountered.

[3] Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.

[4] Consistent with requirements in Performance Standard 6 related to ecosystem services and conservation of biodiversity.

- The permanent removal of historical and archeological artifacts and structures is carried out according to the principles of paragraphs 6 and 7 above; and
- Only where minimization of adverse impacts and restoration to ensure maintenance of the value and functionality of the cultural heritage are demonstrably not feasible, and where the Affected Communities are using the tangible cultural heritage for long-standing cultural purposes, compensate for loss of that tangible cultural heritage.

Removal of Non-Replicable Cultural Heritage
12. Most cultural heritage is best protected by preservation in its place, since removal is likely to result in irreparable damage or destruction of the cultural heritage. The client will not remove any nonreplicable cultural heritage,[5] unless all of the following conditions are met:

- There are no technically or financially feasible alternatives to removal;
- The overall benefits of the project conclusively outweigh the anticipated cultural heritage loss from removal; and
- Any removal of cultural heritage is conducted using the best available technique.

Critical Cultural Heritage
13. Critical cultural heritage consists of one or both of the following types of cultural heritage: (i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation.

14. The client should not remove, significantly alter, or damage critical cultural heritage. In exceptional circumstances when impacts on critical cultural heritage are unavoidable, the client will use a process of Informed Consultation and Participation (ICP) of the Affected Communities as described in Performance Standard 1 and which uses a good faith negotiation process that results in a documented outcome. The client will retain external experts to assist in the assessment and protection of critical cultural heritage.

15. Legally protected cultural heritage areas[6] are important for the protection and conservation of cultural heritage, and additional measures are needed for any projects that would be permitted under the applicable national law in these areas. In circumstances where a proposed project is located within a legally protected area or a legally defined buffer zone, the client, in addition to the requirements for critical cultural heritage cited in paragraph 14 above, will meet the following requirements:

- Comply with defined national or local cultural heritage regulations or the protected area management plans;
- Consult the protected area sponsors and managers, local communities and other key stakeholders on the proposed project; and
- Implement additional programs, as appropriate, to promote and enhance the conservation aims of the protected area.

[5] Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site.

[6] Examples include world heritage sites and nationally protected areas.

Project's Use of Cultural Heritage

16. Where a project proposes to use the cultural heritage, including knowledge, innovations, or practices of local communities for commercial purposes,[7] the client will inform these communities of (i) their rights under national law; (ii) the scope and nature of the proposed commercial development; and (iii) the potential consequences of such development. The client will not proceed with such commercialization unless it (i) enters into a process of ICP as described in Performance Standard 1 and which uses a good faith negotiation process that results in a documented outcome and (ii) provides for fair and equitable sharing of benefits from commercialization of such knowledge, innovation, or practice, consistent with their customs and traditions.

[7] Examples include, but are not limited to, commercialization of traditional medicinal knowledge or other sacred or traditional technique for processing plants, fibers, or metals.

Appendix 2
Expertise of EAP and Project Team

Personal Details

Surname	:	Broughton
Names	:	Elena
Date of Birth	:	11 September 1980
Nationality	:	Russian
Residency	:	RSA Permanent Resident
Profession	:	Senior Development Economist

Key Qualifications

Elena Broughton completed her BCom (Hon) in Economics in Russia, at Nizhny Novgorod State University in 2002 specialising in regional economics. At the same time, she completed an additional degree as Translator/Interpreter in Professional Orientated Communication. After completion of her Honours degree in Economics, Elena has moved to the USA and stayed there for 1.5 years. During her stay in the USA, she completed a number of Accounting and Business courses at Parkland College, Illinois. In 2007, she obtained her BSc (Hon) in Technology Management (Cum Laude) at the University of Pretoria and later received her MSC in Technology Management (2011) from the same university.

Elena Broughton is a senior professional at Urban-Econ and has an extensive knowledge in various fields of economic development, including impact assessments, investment strategy formulation, strategic decision analysis, and monitoring and evaluation. She is experienced in developing input-output and SAM-based models, as well as development and application of other econometric techniques. Elena has a special interest in project evaluation and decision-making framework, with the later being the focus of her Master's dissertation. Over the past few years, she was able to extend her experience in these fields working on projects for both government and the private sector.

Academic Qualifications

Institution (Date from – Date to)	Degree(s) or Diploma(s) obtained:
2008-2011	MSc in Technology Management
2006 - 2007	BSc (Hon) in Technology Management
2004, Parkland College, USA	Computer Integrated Accounting
2004, Parkland College, USA	Independent Business
2003, Parkland College, USA	Intermediate Accounting
2003, Parkland College, USA	Records Management
2003, Parklands College, USA	Financial Accounting
2003, Parklands College, USA	Managerial Accounting
2002, Nizhny Novogorod University, Russia	BCom (Hon) in Economics

Language Proficiency

	Reading	Writing	Speaking
Russian	**Excellent**	**Excellent**	**Excellent**
English	**Excellent**	**Excellent**	**Excellent**

Employment Record

2004: Urban-Econ: Development Economist

Projects Undertaken

- **Go to Market Strategy for a PV Panel Manufacturer:** Urban-Econ Development Economists together with EScience Associates and Tracy Stewart Consulting was appointed by the CEF to undertake a Go-to-Market Strategy for a PV panel manufacturing facility. The project comprised of two major parts. The first components included the analysis of the market and opportunities presented in the market, as well as identification of the needs, affordability levels, and requirements by all groups of stakeholders comprising the industry's value chain. The second part of the study included the formulation of the strategic plan that outlined various target markets to be pursued, value proposition to be offered, market channels to be considered for entering the market, and activities to be implemented during the product pre-launch, launch and post-launch phases.
- **SunCorp Socio-Economic and Enterprise Development Plan formulation**: Urban-Eon Development Economists was appointed by SunCorp to develop a Socio-Economic Development and Enterprise Development Plans for a solar PV project in the Free State. The plans were devised in line with the DOE requirements outlined for the biding phase.
- **Savanna Cookware Manufacturing Facility Pre-Feasibility Study: Urban-Econ Development** Economists undertook a pre-feasibility study for a manufacturing facility planned to produce luxurious stainless steel cookware in South Africa. The pre-feasibility study focused on determining the need and desirability for the proposed manufacturing facility considering the defined primary and secondary markets; the key prerequisites for the viability of the proposed venture and the most optimal location for the proposed manufacturing facility.
- **An opportunity cost assessment for the proposed Labonte 5 mining project**: The purpose of the study was to investigate the opportunity cost of the proposed sand mining project to determine the implications on the local economy dynamics and the impact on the major infrastructure projects implemented in the Lephalale area if the proposed project is not approved.
- **Saldanha Bay Separation Plant Economic Impact Assessment**: The project involved undertaking an economic impact assessment study for the proposed construction and operation of a Rare Earth Elements (REE) Separation Plant on Portion 6 of the Farm Langeberg 188 in Saldanha, in the Western Cape Province. The study formed part of the Environmental Impact Assessment process as prescribed in the National Environmental Management Act (NEMA) of 1998 and its subsequent amendments.
- **Zandkopsdrift Rare Earth Elements (REE) Project Economic Impact Assessment**: The project involved undertaking an socio-conomic impact assessment study for the proposed the Zandkopsdrift Rare Earth Elements (REEs) Project near Garies in the Northern Cape Province of South Africa. The study formed part of the Environmental Impact Assessment process as

prescribed in the National Environmental Management Act (NEMA) of 1998 and its subsequent amendments.

- **Balmoral EIA:** The study involved undertaking a socio-economic impact assessment as an input into a Basic Impact Assessment Study for the proposed Balmoral X5 Township Development in the Ekurhuleni Metropolitan Municipality (EMM).
- **Green Building Market Entry Study:** The Embassy of the Kingdom of the Netherlands in Pretoria appointed Urban-Econ Development Economists to undertake a market entry study for the Green Building industry of South Africa. The document was compiled for the purpose of guiding the existing or prospective Dutch companies in expanding or involving themselves in the South African Green Building industry. The report contained information on the policy and regulatory environment that drives the development of this sector in the country and the broad overview of the status of the construction industry with the focus on the green building industry. The document also encompassed information on the state of development and industry maturity of selected green building sub-sectors that are aligned with the expertise of the Dutch companies. Information on doing business in South Africa as far as procurement and tendering practices, business funding and other support offered by South Africa and Netherlands was also provided.
- **Royal Bafokeng Mining Procurement Study:** The study business opportunities that can be established in the area leading to the localisation of mining inputs. It was based on a comprehensive assessment of the selected mine's contract-based procurement practices.
- **Ventersburg Business Development Concept:** The study focused on the identification of business development opportunities that could be pursued in the town of Ventersburg based on the traffic derived in the area from the N1 highway and other regional roads. The study involved a comprehensive assessment of the target markets induced by traffic, economic base of the area, current business offerings and derived opportunities. It concluded with a presentation of business development concept scenarios and associated socio-economic benefits.
- **Northern Cape Renewable Energy Strategy:** Urban-Econ Development Economists with a support from EScience Associates and Centre for Renewable and Sustainable Energy Studies (CRSES) was appointed to develop a renewable energy strategy for the Northern Cape. The objective of the study was to undertake a situational assessment of the Northern Cape economy to identify the opportunities and constraints with respect to renewable energy development, and accordingly to formulate a plan to unlock the existing potential of the province to harness renewable energy to the benefit of its communities and economy and to position the province to attract a maximum share of investment under the IRP2010 Renewable Energy Target and beyond.
- **The localisation potential of Photovoltaics and a strategy to support large scale roll-out in South Africa:** A consortium comprising of EScience Associates, Urban-Econ Development Economists and Chris Ahlfeldt (the project team was appointed to undertake the study on the localisation potential of solar PV. The specific objectives of the study included profiling of the industry, analysis of the PV industry value chain, and development of the strategy for the future roll-out of the industry in the country.
- **Feasibility study into establishing CSP component manufacturing facilities in South Africa:** The Industrial Development Corporation (the IDC) has commissioned Urban-Econ Development Economists supported by EScience Associates to undertake a feasibility study to determine the viability of the establishment of a manufacturing facility of CSP modules and components in South Africa.
- **Eskom CSP Macro-Economic Impact Assessment:** Eskom CSP (Solar 1) Macroeconomic Impact Assessment: The study involved the identification of potential localisation opportunities for various components of the project and modelling of the socio-economic impacts.

- **Proposed Exxaro IPP Coal-Powered Power Station near Lephalale, Limpopo Scoping Inputs:** Urban-Econ Development Economists was appointed to undertake a Socio-Economic Scoping Study and Land Use Impact Study for the proposed Exxaro coal-powered power station near the town of Lephalale, in the Limpopo province.
- **Mafube Nooitgedacht and Wildfontein EIA/EMP Sustainable Development Investigation Study:** Urban-Econ Development Economist was appointed to undertake an investigation into sustainable development options associated with the proposed project. The results of this study aimed at informing the decision makers of socio-economic trade-offs related to each option analysed and the most preferred alternative.
- **Thaba Metsi Sustainable Development Investigation Study:** The objective of the Thabametsi Project is to mine coal via opencast and underground mining methods for supply to the Independent Power Producer (IPP) coal-fired power station, to be developed by Exxaro north of the proposed Thabametsi project. Urban-Econ Development Economists provided a specialist input into the sustainable development Investigation that aimed to quantify and assess various options associated with the development and post-mining land uses that formed part of an input into the EIA report.
- **Eskom Sere Wind (WEF1) Macro-Economic Impact Assessment:** The project entailed the strategic assessment of the proposed facility on the macroeconomic situation with respect to the impact on the balance of payments, supply of energy, demand for water, and achievement of strategic government objectives. It also entailed the assessment of the proposed project on the regional and local economies.
- **Socio-Economic and Economic Impact Assessment Studies for Renewable Energy Projects** conducted as part of the Environmental Impact Assessment Processes
  - Arriesfontein Solar Energy Park near Danielskuil in the Northern Cape (100 MW CSP-Tower facility and 225 MW PV solar facility)
  - Humansrus Solar Energy Facility near Postmasburg in the Northern Cape (100 MW CSP-Tower facility)
  - Rooipunt Solar Energy Park near Upington in the Northern Cape (100 MW CSP-Tower facility and 215 MW PV solar facility)
  - Farm 198 PV Solar Energy Facility north of Kimberley in the Northern Cape (210 MW PV solar facility)
  - Wag'nbiekiespan PV Solar Energy Facility near Boshof, the Free State Province (75 MW PV solar facility)
- **Energy-Related Proposals Evaluation for the Department of Science and Technology:** Urban-Econ Development Economists was appointed to undertake an evaluation of six energy-related proposals submitted to the DST SBS. The objective of the evaluation is to advise the Department on whether the projects described in the proposals should be funded or not. The assessment takes into account operational and financial feasibility of projects, alignment thereof with government objectives, economic benefits derived from the project, ability of the organisations to implement the projects successfully and a risk assessment. The project also involves the development of a decision framework on the basis of a Multi-Criteria Decision Method that will be used to compares proposals and determine the one that are not only suitable for funding but those that should be prioritised above others.
- **Independent evaluation of the Wireless Mesh Network in Government Broadband:** Urban-Econ Development Economists was appointed to undertake an independent evaluation of the Community Wireless Mesh Networks in the Government Broadband project. Urban-Econ's responsibility is to evaluate the progress of the project to this date and provide recommendations that can be implemented to improve its design and execution.
- **Department of Science and Technology Economic Analysis Model:** Urban-Econ was appointed by the Department of Science and Technology (DST) to assist them in developing a

decision-making framework that would allow them to evaluate various proposals from an economic perspective and identify the ones that would create the largest economic benefits.

- **Eskom Ariadne-Eros Power Lines Economic and Agricultural Impact Assessment:** Urban-Econ was appointed to undertake an Agricultural Potential and Economic Impact Assessments for the proposed Ariadne-Eros transmission power line, and expansion and upgrade of the related substations in KwaZulu-Natal.

- **Eskom Ingula Pumped Storage Scheme Regional Economic Impact Assessment: T**he purpose of the study was to present an assessment of socio-economic impact of the Ingula Pumped Storage Scheme on the national and regional economies.

- **Gauteng Infrastructure Renewal and Investment Plan (GIRIP)**: the study involved the formulation of an infrastructure and renewal plan up until 2025 that would transform Gauteng into a competitive Global City-Region. As part of the study a regional model with necessary demographic and economic projects was developed that assisted in identifying future infrastructural needs in the Province.

- **De Hoop Dam Economic Impacts Monitoring Framework**: Urban-Econ was approached to develop and set up an integrated and coherent monitoring and evaluation reporting system which will primarily be based on a regional impact assessment model framework to monitor and evaluate the regional socio-economic impacts due to the development of the De Hoop dam

- **North West Cluster Performance Analyses**: Urban-Econ was appointed by the North West Office of the Premier to undertake the analyses of statistics tables for six clusters (Human Resource Development, Physical Assets, Resource Base, Governance and Protection, Economic, and Social), identify areas that require interventions, and proposes possible solutions to address the key challenges.

- **Mopani Investment Strategy**: Urban-Econ Development Economists was appointed by the Mopani District Municipality to formulate an investment strategy for the region with a focus of promoting integrated and sustainable development in the local economy.

- **Socio-Economic Impact Assessment Of The Proposed Route Operator Business In Mpumalanga**: The project entailed assisting with the preparation of the response to the Request for Applications in respect of Limited Payout Machine Licences in the Mpumalanga Province. The assistance requested encompassed a macro-level socio-economic analysis of the proposed route operator business in Mpumalanga with a focus on: (a) benefits to the economy in terms of gross geographical product ("GGP"), employment creation, increased household income, skills development, and small, medium, micro enterprise ("SMME") development and (b) potential social impact of gaming in the Province.

- **N3 Highway Economic Impact Assessment**: Urban-Econ was appointed to determine the Socio-Economic Impact of the proposed re-routing of the N3 highway around Harrismith and the current link with the N5 Route towards Lesotho and Mangaung.

- **The Mandela Bay Precinct Economic Impact Assessment**: The study entailed conducting an economic impact assessment of the proposed Mandela Bay Precinct Development in Port Elizabeth. The proposed project was a mixed use development with the main component being a Regional Shopping Centre that will be surrounded by high density residential property, filling stations, light industrial space, a hospital, a hotel, and office space.

- **The City of Windhoek Draft SME Policy:** Urban-Econ was appointed by the City of Windhoek (COW) Local Authority to develop a Draft SME Development Policy Directive to guide future SME promotion and development in the City of Windhoek

- **Harrismith Logistics Hub Impact Assessment**: Urban-Econ Development Economists was appointed to undertake a rapid economic impact assessment study of the proposed Harrismith Freight Logistics Hub ("HLH"). The aim of the study was to determine potential benefits that could be created by the HLH in terms of unlocking the latent development of the area. This technical memorandum presents the results of the study.

- **Megamall Economic Impact Assessment**: Urban-Econ was requested to undertake an economic impact study for the Megamall project to be developed in the Mogale City Local Municipality. The aim of the study was to determine the potential economic impacts emanating from the proposed development. This study involved assessment of socio-economic impacts the proposed project could have on the local economy which could be used in application for funding from commercial banks and government.

- **Coega Ridge Economic and Social Impact Assessments**: Urban-Econ was appointed to undertake economic and social impact assessment of the proposed Coega Ridge development. The aim of the development was to create a unique and sustainable residential enclave encompassing a "live, work, play, and shop" environment and comprising such components as affordable housing, shopping centre, office park, industrial park, community and social facilities, bulk service infrastructure, and ublic open space.

- **Amanzi Economic and Social Impact Assessments**: Urban-Econ was requested to undertake an economic and social impact studies for the proposed Amanzi Estate that included the original homestead of Sir Percy Fitzpatrick, author of Jock of the Bushveld

- **Limpopo Industrial Parks Resuscitation Assessment:** Urban-Econ was appointed to assess the feasibility of resuscitation of the selected industrial parks in the Limpopo Province. Study included analysis of the economic potential of the selected areas, development of scenarios and formulation of recommendations. Managed the team of sub-consultants.

- **North West PGDS Monitor 2007:** the study encompasses a comprehensive analysis and projections of the achievement of the PGDS targets, reviewing the performance of the Working Groups, and providing recommendations regarding actions needed to be taken to address the shortfalls.

- **Sedibelo Economic Impact Assessment:** The study involved conducting a economic impact assessment of the proposed development utilising an Input/Output model.

- **Mooifontein Coal Mine Comparative Analysis, Mpumalanga**: Urban-Econ Development Economists were appointed to undertake a sustainable development investigation exercise that includes a comparative economic analysis between the status quo, i.e. farming, and an alternative land use, i.e. mining. The study made use of the economic modelling techniques to estimate the contribution of the current activities towards the country's economy and the expected contribution of the proposed scenario. The impacts were calculated for a period of 100 years and compared to identify the most beneficial scenario from an economic perspective.
- **Hanglip Sustainability Model:** Urban-Econ was appointed to develop a model that would have assisted the decision makers in identifying the most preferred alternative/s for the Hanglip Development. The model was based on the multi-criteria decision-making process.

- **Emalahleni Investment Incentive Package:** Urban-Econ was appointed by the Emalahleni Local Municipality to update the Investment Incentive Package for the Emalahleni Local Municipality.

- **Eastern Cape Industrial Sector Study:** Urban-Econ EC was appointed by the Eastern Cape Socio-Economic Consultative Council (ECSECC) to undertake an industrial sector study for the Eastern Cape Province. The study is envisioned to provide inputs to the Provincial Industrial Strategy that is currently being prepared. The focus of the strategy is on provision of support to the sectors with the potential for job creation in the Province. In this context, this study aims at identifying the sectors that have the highest potential for uplifting the second economy in the Province and highlighting their growth barriers.

- **Socio-Economic Impact Assessment of the Proposed New Eskom Power Stations in the Witbank Geographical Area and Northern Free State:** The study involved conducting a socio-economic impact assessment of the proposed developments utilising an Input/Output model.

- **Sedibeng Investment Incentive Package:** The study encompasses a formulation of an incentive package that would enhance development and investment in the area, as well as promote economic growth. A comprehensive socio-economic analysis of the Sedibeng DM and its Local Municipalities, including growth potential was performed.

- **North West Sustainable Development Indicators Pilot Project:** After completing the North West Sustainable Development Indicators, Urban-Econ was appointed to execute of the pilot project of population the framework.

- **North West Sustainable Development Indicators:** Urban-Econ Development Economists have been appointed by the North West Province's Office of the Premier to formulate a Sustainable Development Indicator Framework for the North West Provincial Administration. The purpose of the framework is to assist the provincial government authority in the monitoring and evaluation of their progress towards achieving sustainable growth and development.

- **Polokwane Trade Hub:** Urban-Econ Development Economists, assisted by Nyeleti Consulting Engineering, were appointed by Polokwane Municipality to undertake a Polokwane Trade Hub feasibility study. The feasibility study included investigation of the potential of Polokwane to develop into a regional trade, implications associated with its development, and the initiatives, including programmes and projects, that need to be implemented to realise the vision of Polokwane as a regional trade hub.

- **Mpumalanga Job Creation Budget:** The project involved an assessment of the provincial budget with respect to its impact on job creation and identification of opportunities to enhance sustainable job creation in the Province.

- **Joburg BPO Zone:** Urban-Econ was appointed to provide an urban-economic rationale and motivation for the selection of a BPO Precinct in the Joburg Inner City.

- **The North West Barometer 2006: Economic Module Update.** Urban-Econ Development Economists have been appointed by the North West Province's Office of the Premier to formulate a Sustainable Development Indicator Framework for the North West Provincial Administration. This report details the project roll-out plan and project progress to date.

- **Bekkersdal Skills and Entrepreneurship Development Strategy.** The Bekkersdal Skills and Entrepreneurship Development Strategy provides the reader with thorough data on the existing pool of enterprises and entrepreneurs, services and products; and existing skills in

Bekkersdal, which can be utilized by public and private entities. The document includes Skills Audit and Business Audit Databases in Access format.

- **Baralink economic and market study.** Urban-Econ: Development Economists have been appointed by Urban Dynamics to undertake an economic and market study of four areas, namely, Baralink, JP's Town, Orange Farm, and Kwadzudza; and provide the feedback on potential economic activates that can be introduced to the area in regard to promotion of sustainable livelihoods. This study forms a part of a more comprehensive analysis of the abovementioned areas, the purpose of which is to compile a strategy for sustainable housing development, according to the new housing policy, in different regions of Johannesburg Metropolitan area.

- **Business Improvement District Strategy for Bekkersdal.** Due to the low levels of consumer and business confidence in the Bekkersdal CBD, this project required the formulation of a strategy for the establishment and implementation of a BID for the CBD area of Bekkersdal.

- **Expansion of Holcim Cement Plant: Economic Impact Assessment.** Urban-Econ has been appointed to assess economic impact of the expansion of Holcim Cement plant in Roodepoort.

- **Madiba Bay Leisure Park Regional Mall Market Study.** Urban-Econ: Development Economists were commissioned by East Cape Showcase (Ltd.) to conduct empirical market research and compile a specialist market study for the proposed regional retail mall within the North Gate precinct of the Madiba Bay Leisure Park project.

- **Social and Labour Plan for Brandbach Mine, Cullinan**. Mining industry is a cornerstone of the South African economy. So far it has experienced rises and downfalls. In order to insure sustainable development of the industry in the future along with the implementation of national visions on skills development, poverty alleviation, BEE and employment creation, the government has introduced a Skills and Labour Plan, preparation of which became a prerequisite for every mine in the country. Urban-Econ's suster company, Econo-Mine, has been appointed to develop such plan for the Brandbach Mine in Cullinan.

- **NIPS for POPS Economic Impact:** Urban-Econ has been appointed as part of a specialist team to undertake the economic impact assessment of Infrastructure related to Persistent Organic Pollutants (POPS) in South Africa. The focus of the assessment is to formulate clear strategic guidelines related to the impacts of POPS and or their removal/eradication for the Development of National Implementation Plans (NIPS) of the Stockholm Convention on POPS.

Ruan Fourie

Date of Birth:	16 June 1990
Designation:	Innovation & Sustainable Development - Economist
Profession:	Development Economist
Specialisation:	Economics & Research
Years within Firm:	1 Year
Nationality:	RSA
Years of Experience:	1 Year
HDI Status:	White Male

Education:			
University of Pretoria - 2012	BCom(Economics)		
University of South Africa - 2015	BComHons(Economics)		
Professional Membership:			
SAPOA (Urban-Econ Development Economists (Pty) Ltd)			
Language Proficiency:	**Reading**	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

Work Experience:

2015- current	Urban-Econ Development Economists (Pty) Ltd

Key Qualification:

Ruan Fourie has wide-ranging knowledge and experience in economic development analyses. His special field of interest relates to the development of the economy through innovation and new technologies to ensure a sustainable growth. This has included work in sustainable energy and industry development in sustainable and environmentally friendly means. He has been involved in various economic development studies, which incorporated liaison with communities to ensure local involvement. His skills have been applied in numerous socio-economic impact assessment, economic development, feasibility, infrastructure-related and database development studies. Ruan has been involved in interviews with various stakeholders from private farm owners to various institutions, such as the dti, South African Post Office, DBSA, GIZ, SALGA, Department of Energy, Department of Science and Technology, SAPOA, SANEDI, Department of Environmental Affairs, etc. Correspondence with these institutions has developed his networking and communicative skills and ensured that his knowledge is accumulated in new industries outside his educational background.

Experience Record	
Project: Year: Location: Client: Project Features: Position held: Activities Performed:	SANEDI EE Policy Review and Alignment 2015 South Africa Department of Energy and SANEDI Policy review and alignment of energy efficiency in the building sector Developmental Economist Conducting primary and secondary research. Analysis of said research as well as stakeholder engagement for better understanding of the subject matter. Report writing after completion of analysis.
Project: Year: Location: Client: Project Features:	City of Johannesburg Load-shedding Impact Assessment Study 2015 South Africa, City of Johannesburg City of Johannesburg Municipality Investigating and report on how load-shedding affects different economic sectors.

Position held: Activities Performed:	Developmental Economist Conducting primary and secondary research which include the categorisation of various business entities into their various industrial sectors according to StatsSA. Creating database in excel for use in data analysis for final report writing. Final report writing.
Project: Year: Location: Client: Project Features: Position held: Activities Performed:	Nkangala Fly-ash Industry Feasibility and Development 2015 Nkangala District, Mpumalanga, South Africa Nkangala District Municipality Feasibility study Developmental Economist Primary and secondary research collection as well as various stakeholder and specialists engagement for better understanding of the subject matter. Analysing information for final report writing and finally reporting on findings to relevant client.

Other Projects:

- Doornhoek Fluorpar Mine Socio-Economic Impact Assessment Study
- Philco Wind Energy Facility Socio-Economic Impact Assessment Study
- Kalkaar Power Lines Socio-Economic Impact Assessment Study
- Tshivhaso Coal-Fired Power Station Socio-Economic Impact Assessment Study
- Eureka and Aletta solar PV facilitates Socio-Economic Impact Assessment Studies
- Sibanya Gold Economic Impact Assessment Study
- IDC Energy Efficiency Project: The project encompassed profiling the various energy efficiency technologies available locally and abroad in an attempt to better understand the current and future market. This would allow the client to make informed decisions on funding and potential backing.
- Dti Technology Commercialisation Project: The project encompassed studying the complete process of technology commercialisation from the idea phase, through development and finally unto the end market. Information gathered could then be used to highlight current gaps and make recommendations that would address said gaps.

Countries of Work Experience:

- South Africa

References:

- Judex Oberholzer Email: judex@urban-econ.com Cell Phone: +27 (0) 82 770 8770
- Elena Broughton Email: elena@urban-econ.com Cell Phone: +27 (0) 82 463 2325

Contact Details:

- Ruan Fourie Email: fourie@urban-econ.com Cell Phone: +27 (0) 82 387 5735

Wouter Fourie
Professional Heritage Specialist and Director PGS Heritage

Summary of Experience

Specialised expertise in Cultural Resource Management and Heritage Impact Assessment Management, Archaeology, Anthropology, Applicable survey methods, Fieldwork and project management, Geographic Information Systems, including *inter alia*:

Involvement with various Heritage Impact Assessments, within South Africa, including:

- Archaeological Walkdowns for various projects
- Phase 2 Heritage Impact Assessments and EMPs for various projects
- Heritage Impact Assessments for various projects

Iron Age Mitigation Work for various projects, including archaeological excavations and monitoring
Involvement with various Heritage Impact Assessments, outside South Africa, including:

- Heritage Impact Assessments in Democratic Republic of Congo
- Heritage Impact Assessments in Mozambique, Botswana and DRC
- Grave Relocation projects in DRC

Involvement in various grave relocation projects (some of which relocated up to 1000 graves) and grave “rescue” excavations in the various provinces of South Africa

Key Qualifications

BA [Hons] (Cum laude): Archaeology and Geography
BA: Archaeology, Geography and Anthropology
Professional Archaeologist - Association of Southern African Professional Archaeologists (ASAPA) - Professional Member
Accredited Professional Heritage Specialist – Association of Professional Heritage Practitioners (APHP)
CRM Accreditation (ASAPA):

- Principal Investigator - Grave Relocations
- Field Director – Iron Age
- Field Supervisor – Colonial Period and Stone Age

Accredited with Amafa KZN and Eastern Cape PHRA

Key Work Experience

2008- current: Director –Professional Grave Solutions (Pty) Ltd t/a PGS Heritage
2007 – 2008: Project Manager – Matakoma-ARM, Heritage Contracts Unit, University of the Witwatersrand
2005-2007: Director - Professional Grave Solutions (Pty) Ltd
2000-2004: CEO– Matakoma Consultants
1998-2000: Environmental Coordinator – Randfontein Estates Limited. Randfontein, Gauteng
1997-1998: Environmental Officer – Department of Minerals and Energy. Johannesburg, Gauteng

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Practitioner and Visual Specialist: Environmental Division
Years with Firm	4.5 Years
Date of Birth	29 January 1985
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)
Coursework**:** Project Management, Environmental Risk Assessment and Management, Ecological and Social Impact Assessment, Fundamentals of Environmental Science, Impact Mitigation and Management, Integrated Environmental Management Systems & Auditing, Integrated Environmental Management, Research Methodology.
Research Proposal**:** Golf Courses and the Environment

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Coursework: Core modules focused on; design, construction, environmental science, applied sustainability, shifts in world paradigms and ideologies, soil and plant science, environmental history, business law and project management.
Awards: Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

ArcGIS Desktop 1 (ESRI South Africa December 2010)

Employment Record

Aug 2010 – to date	SiVEST Environmental Division: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Specialising in the field of Environmental Management and Visual Assessment.

Andrea joined SiVEST in August 2010 and holds the position of Environmental Practitioner in the Johannesburg Office. She has 7 years' work experience and specialises in undertaking and managing Environmental Impact Assessments (EIAs) and Basic Assessment (BAs), primarily related to energy generation and electrical distribution projects. She also specialises in undertaking visual impact and landscape assessments, by making use of ArcGIS technology and field surveys. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses. From a business and administrative side, Andrea is actively involved in maintaining good client relationships, mentoring junior staff and maintaining financial performance of the projects she leads.

<u>Skills include:</u>

- Project Management (MS Project)
- Environmental Impact Assessment (EIA)
- Basic Assessment (BA)
- Public Participation
- Visual Impact Assessment (VIA)
- Landscape Assessment
- Strategic Environmental Planning
- Documentation / Quality Control
- Project Level Financial Management

Projects Experience

<u>Aug 2010 – to date</u>

<u>ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)</u>

- EIA for the proposed construction of a 75MW Solar Photovoltaic (PV) Power Plant near Dennilton, Limpopo Province.
- EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed Construction of the SSS1 5MW Solar Photovoltaic (PV) Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Construction of the SSS2 5MW Solar Photovoltaic (PV) Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.

- Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province.
- BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province.
- BA for the proposed construction of a 132kV power line and substation associated with the 75MW Photovoltaic (PV) Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province.
- Amendment application in order to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province.
- BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province.
- BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province.
- Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province.
- EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province.
- Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.

VISUAL IMPACT ASSESSMENT (VIA)

- VIA (Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed amendment to the authorised power line route from Hera Substation to Westgate Substation, Gauteng Province.
- VIA (Impact Phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South Coast of KwaZulu Natal.
- VIA (Scoping Phase) for the proposed construction of a Coal-fired Power Station, Coal Mine and Associated Infrastructure near Colenso, KwaZulu-Natal Province.
- VIA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- VIA for the proposed construction of the Duma transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Madlanzini transmission substation and associated Eskom power lines, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Normandie substation to Hlungwane substation, Mpumalanga and KwaZulu-Natal Provinces.

- VIA for the proposed construction of the Nzalo transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Umfolozi substation to Eqwasha traction substation including an 88kV turn-in power line to Dabula traction substation, Kwazulu-Natal Province.
- VIA for the proposed construction of the new 88/25kV Vryheid traction substation with two 20MVA transforma bays and a new associated 88kV turn-in power line, KwaZulu-Natal Province.
- VIA for the proposed construction of a 132kV power line and substation associated with the 75MW Photovoltaic (PV) Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- VIA (Impact Phase) for the proposed Construction of a Solar Photovoltaic (PV) Power Plant near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the proposed construction of a 132kV power line for the Redstone Thermal Energy Plant near Lime Acres, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed 132kV power lines associated with the Photovoltaic (PV) Plants on Droogfontein Farm near Kimberley, Northern Cape Province.
- VIA (Scoping phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed development of a learning and development retreat and an executive and staff lodge at Mogale’s Gate, Gauteng Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.
- VIA the West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- VIA for the proposed construction of a wind farm and solar photovoltaic plant near Loeriesfontein, Northern Cape Province.
- Visual sensitivity mapping exercise for the proposed Mogale’s Gate Expansion, Gauteng.
- VIA (Scoping Phase) for the proposed Renosterberg Solar PV Power Plant and Wind Farm near De Aar, Northern Cape Province.
- Scoping level VIAs for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- Visual Constraints Analysis for the proposed establishment of four Wind Farms in the Eastern and Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in De Aar, Northern Cape.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in Kimberley, Northern Cape.

STRATEGIC ENVIRONMENTAL PLANNING

- Assistance with the Draft Environmental Management Framework for the Mogale City Local Municipality, Gauteng Province.
- Sensitivity Negative Mapping Analysis for the proposed Mogale’s Gate Development, Gauteng Province.

OTHER

Jan 2008 – July 2010

Environmental management, research, report writing, and landscape design for several development projects:

- Report writing, coordination and public participation for several BAs.
- Planting design (including rehabilitation) in accordance with natural ecological processes, endemic species and appropriate techniques.
- Graphic presentations and mapping for several VIAs and landscape architectural designs, including three-dimensional imagery.

Feb 2006 – Dec 2006

Landscape Architectural drafting, rendering and planting design for a variety of projects including the Oprah Winfrey Academy for girls and the New UNISA Student Entrance Building.

CURRICULUM VITAE

Dr. David Barry Hoare

B.Sc. (Hons), M.Sc., Ph.D., Pr.Nat.Sci. (Ecology, Botany), SAIE&ES (Professional member: Botany, Ecology), IAVS

Contact details
Postnet Suite #116
Private Bag X025, Lynnwood Ridge, 0040
Tel.: (012) 804 2281
Fax: 086 550 2053
Cell: 083 284 5111
E-mail: dhoare@lantic.net / dbhoare@iburst.co.za

Personal information
Date of birth: 04 November 1966, Grahamstown, South Africa
Citizenship: Republic of South Africa
ID no.: 661104 5024 088

Education
Matric - Graeme College, Grahamstown, 1984
B.Sc (majors: Botany, Zoology) - Rhodes University, 1991-1993
B.Sc (Hons) (Botany) - Rhodes University, 1994 with distinction
M.Sc (Botany) - University of Pretoria, 1995-1997 with distinction
PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Main areas of specialisation

- Vegetation ecology, primarily in grasslands, thicket, coastal systems, wetlands
- Plant biodiversity and threatened species specialist
- Remote sensing, analysis and mapping of vegetation
- Specialist consultant for environmental management projects

Membership
Professional Natural Scientist, South African Council for Natural Scientific Professions, 16 August 2005 – present. Reg. no. 400221/05 (Ecology, Botany)
Professional member: South African Institute of Ecologists and Environmental Scientists, 10 July 2001 – present. Categories: Botany, Ecology
Member, International Association of Vegetation Scientists

Employment history
1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynn East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.
1 December 2004 – present, Member, David Hoare Consulting cc no. 2001/034446/23. Consultant, specialist consultant contracted to a number of existing companies and organisations.
1January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.

Experience as consultant
Ecological consultant since 1995. Author of over 320 specialist ecological consulting reports. Wide experience in ecological studies within grassland, savanna and fynbos, as well as riparian, coastal and wetland vegetation.

Publication record:
Refereed scientific articles (in chronological order):
Journal articles:
HOARE, D.B. & BREDENKAMP, G.J. 1999. Grassland communities of the Amatola / Winterberg mountain region of the Eastern Cape, South Africa. *South African Journal of Botany* 64: 44-61.

HOARE, D.B., VICTOR, J.E., LUBKE, R.A. & MUCINA, L., 2000. Vegetation of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 87-96.

VICTOR, J.E., **HOARE, D.B.** & LUBKE, R.A., 2000. Checklist of plant species of the coastal fynbos and rocky headlands south of George, South Africa. *Bothalia* 30: 97-101.

MUCINA, L, BREDENKAMP, G.J., **HOARE, D.B** & MCDONALD, D.J. 2000. A National Vegetation Database for South Africa *South African Journal of Science* 96: 1-2.

HOARE, D.B. & BREDENKAMP, G.J. 2001. Syntaxonomy and environmental gradients of the grasslands of the Stormberg / Drakensberg mountain region of the Eastern Cape, South Africa.. *South African Journal of Botany* 67: 595 – 608.

LUBKE, R.A., **HOARE, D.B.**, VICTOR, J.E. & KETELAAR, R. 2003. The vegetation of the habitat of the Brenton blue butterfly, Orachrysops niobe (Trimen), in the Western Cape, South Africa. *South African Journal of Science* 99: 201–206.

HOARE, D.B & FROST, P. 2004. Phenological classification of natural vegetation in southern Africa using AVHRR vegetation index data. *Applied Vegetation Science* 7: 19-28.

FOX, S.C., HOFFMANN, M.T. and HOARE, D. 2005. The phenological pattern of vegetation in Namaqualand, South Africa and its climatic correlates using NOAA-AVHRR NDVI data. South African Geographic Journal, 87: 85–94.

Book chapters and conference proceedings:

HOARE, D.B. 2002. Biodiversity and performance of grassland ecosystems in communal and commercial farming systems in South Africa. Proceedings of the FAO's Biodiversity and Ecosystem Approach in Agriculture, Forestry and Fisheries Event: 12–13 October, 2002. Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla, Rome, Italy. pp. 10 - 27.

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. In: Mittermeier, R.A., Gil, P.R., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. da (eds.) *Hotspots revisited.* CEMEX, pp.218–229. ISBN 968-6397-77-9

STEENKAMP, Y., VAN WYK, A.E., VICTOR, J.E., **HOARE, D.B.**, DOLD, A.P., SMITH, G.F. & COWLING, R.M. 2005. Maputaland-Pondoland-Albany Hotspot. http://www.biodiversityhotspots.org/xp/hotspots/maputaland/.

HOARE, D.B., MUCINA, L., RUTHERFORD, M.C., VLOK, J., EUSTON-BROWN, D., PALMER, A.R., POWRIE, L.W., LECHMERE-OERTEL, R.G., PROCHES, S.M., DOLD, T. and WARD, R.A. *Albany Thickets.* in Mucina, L. and Rutherford, M.C. (eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.

MUCINA, L., **HOARE, D.B.**, LÖTTER, M.C., DU PREEZ, P.J., RUTHERFORD, M.C., SCOTT-SHAW, C.R., BREDENKAMP, G.J., POWRIE, L.W., SCOTT, L., CAMP, K.G.T., CILLIERS, S.S., BEZUIDENHOUT, H., MOSTERT, T.H., SIEBERT, S.J., WINTER, P.J.D., BURROWS, J.E., DOBSON, L., WARD, R.A., STALMANS, M., OLIVER, E.G.H., SIEBERT, F., SCHMIDT, E., KOBISI, K., KOSE, L. 2006. *Grassland Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

RUTHERFORD, M.C., MUCINA, L., LÖTTER, M.C., BREDENKAMP, G.J., SMIT, J.H.L., SCOTT-SHAW, C.R., **HOARE, D.B.**, GOODMAN, P.S., BEZUIDENHOUT, H., SCOTT, L. & ELLIS, F., POWRIE, L.W., SIEBERT, F., MOSTERT, T.H., HENNING, B.J., VENTER, C.E., CAMP, K.G.T., SIEBERT, S.J., MATTHEWS, W.S., BURROWS, J.E., DOBSON, L., VAN ROOYEN, N., SCHMIDT, E., WINTER, P.J.D., DU PREEZ, P.J., WARD, R.A., WILLIAMSON, S. and HURTER, P.J.H. 2006. *Savanna Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., RUTHERFORD, M.C., PALMER, A.R., MILTON, S.J., SCOTT, L., VAN DER MERWE, B., **HOARE, D.B.**, BEZUIDENHOUT, H., VLOK, J.H.J., EUSTON-BROWN, D.I.W., POWRIE, L.W. & DOLD, A.P. 2006. *Nama-Karoo Biome.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

MUCINA, L., SCOTT-SHAW, C.R., RUTHERFORD, M.C., CAMP, K.G.T., MATTHEWS, W.S., POWRIE, L.W. and **HOARE, D.B.** 2006. *Indian Ocean Coastal Belt.* In: Mucina, L. & Rutherford, M.C. (eds.) The vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19. South African National Biodiversity Institute, Pretoria.

Conference Presentations:

HOARE, D.B. & LUBKE, R.A. *Management effects on diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B., VICTOR, J.E. & LUBKE, R.A. *Description of the coastal fynbos south of George, southern Cape*; Paper presentation, Fynbos Forum, Bienne Donne, July 1994

HOARE, D.B. & LUBKE, R.A. *Management effects on fynbos diversity at Goukamma Nature Reserve, Southern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B. & BOTHA, C.E.J. *Anatomy and ecophysiology of the dunegrass Ehrharta villosa var. maxima*; Poster presentation, South African Association of Botanists Annual Congress, Bloemfontein, January 1995

HOARE, D.B., PALMER, A.R. & BREDENKAMP, G.J. 1996. *Modelling grassland community distributions in the Eastern Cape using annual rainfall and elevation*; Poster presentation, South African Association of Botanists Annual Congress, Stellenbosch, January 1996

HOARE, D.B. *Modelling vegetation on a past climate as a test for palaeonological hypotheses on vegetation distributions*; Paper presentation, Randse Afriakaanse Universiteit postgraduate symposium, 1997

HOARE, D.B., VICTOR, J.E. & BREDENKAMP, G.J. *Historical and ecological links between grassy fynbos and afromontane fynbos in the Eastern Cape*; Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

LUBKE, R.A., HOARE, D.B., VICTOR, J.E. & KETELAAR, R. *The habitat of the Brenton Blue Butterfly*. Paper presentation, South African Association of Botanists Annual Congress, Cape Town, January 1998

HOARE, D.B. & PANAGOS, M.D. Satellite stratification of vegetation – structure or floristic composition? Poster presentation at the 34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999.

HOARE, D.B. & WESSELS, K. Conservation status and threats to grasslands of the northern regions of South Africa, Poster presentation at the South African Association of Botanists Annual Congress, Potchefstroom, January 2000.

HOARE, D.B. Phenological dynamics of Eastern Cape vegetation. Oral paper presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B., MUCINA, L., VAN DER MERWE, J.P.H. & PALMER, A.R. Classification and digital mapping of grasslands of the Eastern Cape Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

HOARE, D.B. Deriving phenological variables for Eastern Cape vegetation using satellite data Poster presentation at the South African Association of Botanists Annual Congress, Grahamstown, January 2002.

MUCINA, L., RUTHERFORD, M.C., HOARE, D.B. & POWRIE, L.W. 2003. VegMap: The new vegetation map of South Africa, Lesotho and Swaziland. In: Pedrotti, F. (ed.) Abstracts: Water Resources and Vegetation, 46th Symposium of the International Association for Vegetation Science, June 8 to 14 – Napoli, Italy.

HOARE, D.B. 2003. Species diversity patterns in moist temperate grasslands of South Africa. Proceedings of the VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa. African Journal of Range and Forage Science. 20: 84.

Unpublished technical reports:

PALMER, A.R., HOARE, D.B. & HINTSA, M.D., 1999. Using satellite imagery to map veld condition in Mpumalanga: A preliminary report. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Grahamstown.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: methodology for mapping the vegetation communities of the South African savanna at a scale of 1:250 000. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

HOARE, D.B. 1999. The classification and mapping of the savanna biome of South Africa: size and coverage of field data that exists on the database of vegetation data for South African savanna. Report to the National Department of Agriculture (Directorate Resource Conservation). ARC Range and Forage Institute, Pretoria.

THOMPSON, M.W., VAN DEN BERG, H.M., NEWBY, T.S. & HOARE, D.B. 2001. Guideline procedures for national land-cover mapping and change monitoring. Report no. ENV/P/C 2001-006 produced for Department of Water Affairs and Forestry, National Department of Agriculture and

Department of Environment Affairs and Tourism. Copyright: Council for Scientific and Industrial Research (CSIR) and Agricultural Research Council (ARC).
HOARE, D.B. 2003. Natural resource survey of node O R Tambo, using remote sensing techniques, Unpublished report and database of field data for ARC Institute for Soil, Climate & Water, ARC Range and Forage Institute, Grahamstown.
HOARE, D.B. 2003. Short-term changes in vegetation of Suikerbosrand Nature Reserve, South Africa, on the basis of resampled vegetation sites. Gauteng Department of Agriculture, Conservation, Environment and Land Affairs, Conservation Division.
BRITTON , D. , SILBERBAUER, L., ROBERTSON, H., LUBKE, R., HOARE, D., VICTOR, J., EDGE, D. & BALL, J. 1997. The Life-history, ecology and conservation of the Brenton Blue Butterfly (*Orachrysops niobe*) (Trimen)(*Lycaenidea*) at Brenton-on-Sea. Unpublished report for the Endangered Wildlife Trust of Southern Africa, Johannesburg. 38pp.
HOARE, D.B., VICTOR, J.E. & MARNEWIC, G. 2005. Vegetation and flora of the wetlands of Nylsvley River catchment as component of a project to develop a framework for the sustainable management of wetlands in Limpopo Province.

Consulting reports:
Total of over 320 specialist consulting reports for various environmental projects from 1995 – 2010.

Workshops / symposia attended:
Workshop on remote sensing of rangelands presented by Paul Tueller, University of Nevada Reno, USA, VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.
VIIth International Rangeland Congress, 26 July – 1 August 2003, Durban South Africa.
BioMap workshop, Stellenbosch, March 2002 to develop strategies for studying vegetation dynamics of Namaqualand using remote sensing techniques
South African Association of Botanists Annual Congress, Grahamstown, January 2002.
28th International Symposium on Remote Sensing of Environment, Somerset West, 27-31 March 2000.
Workshop on Vegetation Structural Characterisation: Tree Cover, Height and Biomass, 28th International Symposium on Remote Sensing of Environment, Strand, 26 March 2000.
South African Association of Botanists Annual Congress, Potchefstroom, January 2000
National Botanical Institute Vegmap Workshop, Kirstenbosch, Cape Town, 30 September-1 October 1999.
Sustainable Land Management – Guidelines for Impact Monitoring, Orientation Workshop: Sharing Impact Monitoring Experience, Zithabiseni, 27-29 September 1999.
WWF Macro Economic Reforms and Sustainable Development in Southern Africa, Environmental Economic Training Workshop, development Bank, Midrand, 13-14 September 1999.
34th Annual Congress of the Grassland Society of South Africa, Warmbaths, 1-4 February 1999
Expert Workshop on National Indicators of Environmental Sustainable Development, Dept. of Environmental Affairs and Tourism, Roodevallei Country Lodge, Roodeplaat Dam, Pretoria, 20-21 October 1998.
South African Association of Botanists Annual Congress, Cape Town, January 1998
Randse Afriakaanse Universiteit postgraduate symposium, 1997.
South African Association of Botanists Annual Congress, Bloemfontein, January 1995.

Referees:
Michele Pfab, Scientific Co-ordinator: Scientific Authority, Applied Biodiversity Research, South African National Biodiversity Institute, (012) 843 5025, **E-mail:** M.Pfab@sanbi.org.za
Prof. Roy Lubke, Botany Department, Rhodes University, Grahamstown 6140 Tel: 0461-318 592. E-mail: r.lubke@ru.ac.za
Prof. Richard Cowling, Botany Department, Nelson Mandela Metropolitan University, Tel (042) 298 0259 E-mail: rmc@kingsley.co.za

CURRICULUM VITAE

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Graduate Environmental Consultant
Years with Firm	Joined May 2015
Date of Birth	28 May 1991
ID Number	9105285065080
Nationality	South African

Education

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

Professional Qualification

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

Employment Record

May 2015 – current	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

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

Key Experience

Stephan joined SiVEST in May 2015 and holds the position of Graduate Environmental Consultant in the Johannesburg office.

Stephan specialises in the field of Environmental Management and has been involved in the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as surface water and visual impact assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Stephan has been educated and achieved his degrees (BSc and BSc Hons) at the University of Pretoria in Environmental Sciences (Environmental Management & Analysis).

Throughout his time at SiVEST, Stephan has acquired the following skills:

- Strong computer skills (Work, excel, powerpoint etc);
- Strong Proposal and report writing skills;

- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);
- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience includes:

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

Projects Experience

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities are outlined in detail below:

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

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

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

- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.

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

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

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

ABRIDGED CV – A.W.D. JONGENS

Adrian Jongens (M.Sc. Electrical Engineering) provides a consulting service, backed by more than 40 years of experience, to government departments; defence institutions; local authorities; local and international industries; public and private bodies throughout Africa in all aspects relating to building & architectural acoustics, noise & vibration control, community noise, environmental and transportation noise, noise management policy formulation and environmental noise impact assessment.

MSc (Electrical Engineering) University of Cape Town (1993);

University of Cape Town, Electrical Engineering Department, (1971 - 2011) Senior Lecturer, retired;

Part time professor Department of Architecture, University of the Orange Free State (1998 – 1999);

Acoustical advisor to the City of Cape Town Engineer's Department, on environmental & community noise and formulation of Municipal Noise By-Laws (1973 – 1985);

Member South African Bureau of Standards (SABS) Steering Committee for Acoustics & Noise Abatement (1988 – 1993);

Member SABS technical committee for Acoustics & Noise Abatement (1993 – present);

Member Council for Scientific & Industrial Research (CSIR) National Calibration Service Special Technical Committee on Acoustics (1988 – 1992);

Acoustical advisor to Stanway Edwards Ngomane Associates (Pty) Ltd., Pretoria (1991-2000);

Member International Standards Organisation, ISO TC43 Working Group 38 (1993 – 2010);

Member specialist advisory team to Cape Town Olympic Bid Committee (1996 – 1997);

Member DEADP specialist advisory team: revision of Western Cape Noise Control Regulations (2005);

Author and co-author of more than 45 research publications;

Membership:

- Engineering Council of South Africa, Reg. Nr 805412;
- South African Institute of Electrical Engineers;
- Southern African Acoustics Institute;
- Nederlands Akoestisch Genootschap.

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Werner C. Marais

Summary of qualifications

Late 2009 *University of Johannesburg*
Started PhD (Biodiversity and Conservation) – Still in progress

2008 *University of Johannesburg*
MSc (Biodiversity and Conservation)

2006 *University of Johannesburg*
Hons (Biodiversity and Conservation)

2005 *University of Johannesburg*
BSc (Zoology and Botany)

Education

PhD (Biodiversity and Conservation)

- In-depth study of the subterranean and epiphereal ecosystems of caves and their surrounding environments in the Gauteng province, and more specifically the Carletonville Dolomite Grassland vegetation unit.
- Special reference is paid to cave dwelling bats and their specific conservation needs inside as well as outside caves, where foraging takes place.
- A thorough understanding of grassland ecology as well as mammalian biology/behavior is essential for the study.
- The impacts of urbanisation on cave bat colonies are an essential focus of the research.
- Strong ecological focus.

MSc (Biodiversity and Conservation)

- The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas – Passed with distinction
- Involved a large scale in-depth survey of the bat diversity in the Tzaneen and Waterpoort areas, Limpopo.
- Understanding and observing the biology and behavior of local bat species.

- Designing and experimenting with artificial bat roosts.

Hons Biodiversity and Conservation

- Research project: Preliminary study of the terrestrial Arthropoda associated with caves of the Cradle of Humankind World Heritage Site – Passed with distinction
- Introduction to Environmental Management
- Herpetology
- Terrestrial and conservation ecology
- Resource management (incl. forestry, fire ecology, animal behavior)
- Practical fieldwork methodology (4X4, boat training and mapping)
- Mammology
- Population genetics and biosystematics
- Philosophy and research methodology: Zoology Nature conservation
- Parasitology
- Molecular evolution

BSc Zoology and Botany

- One-year course in animal diversity and identification
- Six month course in basic and marine ecology
- Limnology and terrestrial ecology
- Coastal diversity excursion (Marine ecology)
- Introduction to SASS Freshwater pollution monitoring methodology
- Applied freshwater ecotoxicology
- Waterborne diseases
- Integrated animal physiology and processes
- General parasitology
- Cytology
- Six-month course in the identification and diversity of South African flora
- Ethno and economical plants
- Biotechnology
- Plant physiology
- Plant pathology
- Cellular and molecular biology
- Introduction to organic and physical chemistry
- General chemistry
- Mineralogy and earth dynamics

Additional:

- ***Experienced report writing skills, sufficient computer skills.***
- ***Proficient in GIS, bioacoustics analysis.***
- ***Snake Identification and Handling Course – Presented by MHB Enviro Developments.***
- ***Multiple training courses in bat related topics - Gauteng and Northern Regions Bat Interest Group (GNoRBIG; 2005-2009).***
- ***Soil Classification and Wetland Delineation Course – Presented by Terrasoil.***
- ***Fall Arrest Level 2 qualification (for working at heights).***
- ***Advanced driving course in 4x4 off-road driving.***

Affiliations to professional bodies and societies

- Pr.Sci.Nat.– SACNASP (Zoological Science; registration number 400169/10)
- Steering committee member of the SABAA (South African Bat Assessment Association).
- Bat Conservation International (BCI)
- Serving on the research committee of the Gauteng and Northern Regions Bat Interest Group (GNoRBIG).
- Serving on the steering committee of the Zoological Society of the University of Johannesburg.

Experience

i. 2008 – Current Founder of Animalia Zoological & Ecological Consultation CC. Animalia has completed more than **300 specialist reports and numerous large scale projects** under the supervision and lead of Werner Marais:

ii. 2008 University of Johannesburg Gauteng

- Sensitivity and biodiversity surveys of five caves in the Cradle of Humankind World Heritage Site (COHWHS) and Pretoria areas.
- Preliminary survey to investigate the correlation between insectivorous bats and prey insects in the Krugersdorp Game Reserve.

iii. 2007, 2008 Limpopo

1. *Bertie van Zyl (Pty) Ltd.(ZZ2 Tomato Farms)*
2. University of Johannesburg Gauteng

Two year project to research the biological pest control method of utilizing insectivorous bats in agriculture. Required to conduct an in-depth study of bat (Microchiroptera) behavior and ecologically important factors.

iv. 2006 University of Johannesburg Gauteng

Six month survey of cave dwelling arthropods in the Cradle of Humankind World Heritage Site.

Additional:

Invited by the EWT (Endangered Wildlife Trust) to deliver a presentation on current ecological issues regarding bats and wind energy.

Invited to present on current ecological issues regarding bats and wind energy for ESSA (Exploration Society of Southern Africa).

Contributing editor for the: "South African Good Practice Guidelines for Surveying Bats at Wind Energy Facility Developments – Pre-construction; 3rd Edition February 2014"

As a co-author, recieved the Dow Greeff price for best annual scientific publication: "Die karst-ekologie van die Bakwenagrot (Gauteng)" published in the Suid-Afrikaanse Tydskrif vir Natuurwetenskap en Tegnologie, Vol. 31(1), 2012.

Public and educational presentations related to bats, and presented a part of a Bat Training Course at Nylsvley Nature Reserve.

Presented the following papers at conferences:

- ***The potential of using insectivorous bats (Microchiroptera) as a means of insect pest control in agricultural areas. The Zoological Society of Southern Africa's 50th Anniversary Conference. July 2009.***
- ***Inseketende vlermuise (Microchiroptera) en vlermuishuise in landbougebiede. Suid Afrikaanse Akademie vir Wetenskap en Kuns se 100 jaar Eufees kongres. October 2009.***

Interviewed for two popular magazine articles on ecological aspects of biological pest control utilising bats; published in two consecutive issues of Farmers Weekly.

Languages

Afrikaans / English – Full professional proficiency in both.

References

Dr Francois Durand – Karst ecologist and paleontologist. Pr.Sci.Nat. (Zoology and Earth Sciences).

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(011) 559 2456
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University of Johannesburg (Auckland Park Kingsway Campus),
Auckland Park,
Department of Zoology,
PO Box 524.

Dr Wanda Markotter – Senior Lecturer, Virologist

(012) 420 4602
(012) 420 3266
wanda.markotter@up.ac.za
Website: http://web.up.ac.za/default.asp?ipkCategoryID=3557&sub=1&parentid=1436&subid=1489&ipklookid=11

University of Pretoria,
Department of Microbiology and Plant Pathology,
Faculty of Natural and Agricultural Sciences,
New Agricultural Building, Room 9-2
Pretoria
0001

Dr David Hoare (Pr.Sci.Nat.) – David Hoare Consulting CC

083 284 5111
(012) 804 2281
dbhoare@iburst.co.za

Stephan du Toit (MSc; Pr.Sci.Nat.) – Specialist: Environmental Protection; Mogale City Municipality

083 306 3441
stephant@mogalecity.gov.za

Julio Balona – Chairman of the GNoRBIG

082 359 1295
Julio.Balona@lurgi.com

Thank You

CURRICULUM VITAE: D G Paterson

SURNAME:	PATERSON
FIRST NAME(S):	David Garry
KNOWN AS:	Garry
DATE OF BIRTH:	25-08-1959 in Bellshill, Scotland
NATIONALITY:	South African
I.D. No.:	5908255258088
LANGUAGE PROFICIENCY:	English, Afrikaans (both fluent), French (poor)
MARITAL STATUS:	Married, one son

ADDRESS: Institute for Soil, Climate and Water
Private Bag X79
Pretoria 0001
Republic of South Africa

TEL.: (012) 310 2601
083 556 2458

FAX: (012) 323 1157

E-MAIL ADDRESS: garry@arc.agric.za

ACADEMIC QUALIFICATIONS:

- Matriculated: 1976, Dalziel High School, Motherwell, Scotland
- BSc (Hons) Geography, 1980, University of Strathclyde, Glasgow, Scotland
- MSc (Soil Science) *cum laude*, 1998, University of Pretoria

PROFESSIONAL CAREER:

- 1981-1987: Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1987-1992: Senior Soil Scientist: Soil and Irrigation Research Institute, Pretoria
- 1992-present: Senior Soil Scientist: ARC-Institute for Soil, Climate & Water

FIELDS OF SPECIALITY AND COMPETENCE:

- Soil classification and mapping
- Soil interpretations
- Soil survey project management
- Environmental assessment
- Soil survey and land capability course presentation
- Ground penetrating radar

PUBLICATIONS (see attached list):

- Three refereed articles (S.A. Journal of Plant and Soil)
- Nine Congress papers/posters
- S.A. Soil Classification (1991) (Member of working group)
- Seven 1:250 000 Land Type Maps
- Three Land Type Memoirs
- More than 200 soil survey reports and/or maps

COURSES COMPLETED:

- Course in Project Management (University of Stellenbosch)
- Course in Junior Personnel Management (Dept of Agriculture)
- Course in Handling of Grievances and Complaints (Dept of Agriculture)
- Course in Marketing (ARC-ISCW)
- Course in National Qualifications Framework Assessment, ARC-CO
- Training Course in Ground Penetrating Radar (GSSI, USA)
- Introduction to ArcGIS 8, GIMS, 2004

PROFESSIONAL STATUS:

- Registered Natural Scientist: Soil Science (SA National Council for Natural Scientific Professions) – registration number 400463/04
- Member of South African Soil Classification Working Group, 1990-present
- Convenor of South African Soil Classification Working Group, 2013-
- Member of Soil Science Society of South Africa (1982-present)
- President of Soil Science Society of South Africa (2005-2007)
- Member of South African Soil Survey Organisation (2000-present)
- Council Member of South African Soil Survey Organisation (2002-2003)
- Member of International Erosion Control Association
- Scientific Referee, S.A. Journal for Plant and Soil
- External Examiner, University of Pretoria, University of Witwatersrand, University of Venda

AWARDS:

Best article on Soil Science, South African Journal for Plant and Soil, 2011

MISCELLANEOUS:

- Editor, Soil Science Society newsletter, 1993-present
- Member, Clapham High School (Pretoria) Governing Body 1998-2002
- Member, Northern Gauteng Football Referee's Association
- Committee Member, Rosslyn Golf Club (Club Champion 2002 and 2007)

INTERESTS:

Sport, especially golf and soccer; wildlife; reading; music

REFEREES:

Mr T.E. Dohse, ARC-Institute for Soil, Climate and Water.
Tel: (012) 310-2504; 082 324 5389

Prof A.S. Claassens, Faculty of Plant Production and Soil Science, University of Pretoria
Tel: (012) 420-3213; 084 581 6488

Prof M.C. Laker (retired), (012) 361-2900; 082 785 5295

PUBLICATIONS LIST:

Refereed Articles:

BüHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E., 1993. Pedogenic differences between two adjacent basalt-derived profiles. 1. Textural and chemical characteristics. *S. Afr. J. Plant & Soil*, 10: 155-161

BüHMANN, C., KIRSTEN, W.F.A., PATERSON, D.G. & SOBCZYK, M.E., 1994. Pedogenic differences between two adjacent basalt-derived profiles. 2. Mineralogical characteristics. *S. Afr. J. Plant & Soil*, 11: 5-11

PATERSON, D.G. & LAKER, M.C., 1999. Using ground penetrating radar to investigate spoil layers in rehabilitated mine soils*. S. Afr. J. Plant & Soil*, 16:131-134.

PATERSON, D.G., BüHMANN, C., PIENAAR, G.M.E. & BARNARD, R.O., 2011. Beneficial effect of palm geotextiles on inter-rill erosion in South African soils and mine dam tailings: a rainfall simulator study. *S. Afr. J. Plant & Soil*, 28: 181-189.

PATERSON, D.G. & BARNARD, R.O., 2011. Beneficial effect of palm geotextiles on inter-rill erosion in South African soils**.** *S. Afr. J. Plant & Soil*, 28: 190-197.

Books:

PATERSON, D.G. & MUSHIA, N.M., 2011. Soil databases in Africa. *In: Handbook of Soil Science (2nd Edn). Ed. M.E. Sumner.* Taylor & Francis, Boca Raton FL.

SOIL CLASSIFICATION WORKING GROUP*, 1991. Soil classification. A taxonomic system for South Africa. Institute for Soil, Climate & Water, Pretoria.

* Co-author as member of Working Group

Thesis:

PATERSON, D.G., 1998. The use of ground penetrating radar to investigate subsurface features in selected South African soils. Unpublished M Sc Thesis, University of Pretoria.

Congress Papers:

PATERSON, D.G., 1987. The relationship between geology and soil type in the northern Kruger National Park. 14th Congress of the Soil Science Society of S.A. Nelspruit, 14-17 July 1987.

PATERSON, D.G., 1990. A study of black and red clay soils on basalt in the northern Kruger National Park. 16th Congress of the Soil Science Society of S.A. Pretoria, 9-12 July 1990.

PATERSON, D.G., 1992. The potential of ground penetrating radar as an aid to soil investigation. 17th Congress of the Soil Science Society of S.A. Stellenbosch, 28-30 Jan.1992.

PATERSON, D.G., 1995. The complex soil mantle of South Africa. ARC Wise Land Use Symposium, Pretoria, 26-27 Oct. 1995

PATERSON, D.G. & LAKER, M.C., 1998. Locating subsoil features with ground penetrating radar. 21st Congress of the Soil Science Society of S.A. Alpine Heath, 20-22 Jan. 1998.

PATERSON, D.G., 2000. Mapping rehabilitated coal mine soils in South Africa using ground penetrating radar. Eighth International Conference on Ground Penetrating Radar, Gold Coast, Australia, 23-26 May 2000.

PATERSON, D.G. & VAN DER WALT, M., 2003. The soils of South Africa from the Land Type Survey. 24th Congress of the Soil Science Society of S.A., Stellenbosch, 20-24 Jan. 2003

Land Type Maps:

PATERSON, D.G., 1990. 1:250 000 scale land type map 2230 Messina. Dept. Agriculture, Pretoria.

PATERSON, D.G. & HAARHOFF, D., 1989. 1:250 000 scale land type map 2326 Ellisras. Dept. Agriculture, Pretoria.

PATERSON, D.G., PLATH, B.L. & SMITH, H.W., 1987. 1:250 000 scale land type map 2428 Nylstroom. Dept. Agriculture, Pretoria.

PATERSON, D.G. & ROSS, P.G., 1989. 1:250 000 scale land type map 2330 Tzaneen. Dept. Agriculture, Pretoria.

PLATH, B.L. & PATERSON, D.G., 1987. 1:250 000 scale land type map 2426 Thabazimbi. Dept. Agriculture, Pretoria.

Land Type Memoirs:

PATERSON, D.G., PLATH, B.L. & SMITH, H.W., 1988. Field Investigation. In: *Land types of the maps 2426 Thabazimbi & 2428 Nylstroom. Mem. Agric. Nat. Res. S. Afr.* No. 10. Dept. Agriculture, Pretoria.

PATERSON, D.G., SCHOEMAN, J.L., TURNER, D.P., GEERS, B.C. & ROSS, P.G., 1989. Field Investigation. In: *Land types of the maps 2330 Tzaneen & 2430 Pilgrim's Rest. Mem. Agric. Nat. Res. S. Afr.* No. 12. Dept. Agriculture, Pretoria.

PATERSON, D.G., 1999. 1:250 000 land type survey of the former Ciskei (Unpublished). ISCW Report GW/A/99/24.

Also:

PATERSON, D.G., 1992. Ground penetrating radar applications in USA and South Africa. Report on an official study tour to USA, 13-29 July, 1991. ISCW Report GW/A/92/8

PATERSON, D.G., 2000. Report on official overseas visit to GPR2000 Conference, Broadbeach, Australia, 23-26 May, 2000. ISCW Report GW/A/2000/40

Plus ARC-ISCW Reports on:

- Ground penetrating radar investigations in: Kruger National Park; Enseleni, Natal; Weatherly, Maclear; Kleinkopje Mine

- Soil survey investigations at: Roodeplaat, Kathu, Steelpoort River, Palala River, Zeekoegat (Roodeplaat), Limpopo River, Lydenburg, Kendal, Clewer Sand (Witbank), Botha Sand (Witbank), Balmoral Colliery, Bafokeng (Rustenburg), Towoomba (Warmbaths), Hoeveld Stene (Middelburg), Quality Bricks (Witbank), Visagie Sand (Middelburg), Rosslyn, Coalbrook (Sasolburg), Stewart Coal (Delmas), Forzando Coal (Hendrina), Vaalgro (Vereeniging), Ratanda (Heidelberg), Elspark (Boksburg), Thorncliffe Mine (Steelpoort), Jan Smuts Quarry (Boksburg), Ennerdale (Phase I & II), Thokoza, North Riding, Natalspruit (Alberton), Arnot, Kroondal (Phase I & II), Ga-Rankuwa, Hartebeespoort Dam, Kosmos, Assen, Grasmere, Magalies Moot (Pretoria), Valpre (Paulpietersburg), Cargo Carriers (Sasolburg), Waterval (Rustenburg), Rayton, Bronkhorstspruit, Zwavelpoort (Pretoria), Pietersburg, Trojan Mine (Steelpoort), Platinum Highway (Rustenburg), Moutse, Centurion, Salique (Klaserie), Northam, Greenside Colliery (Witbank), South Deep Mine (Westonaria), Bank Colliery, Steelpoort Platinum, Gautrain Route (Pta/Jbg), Rietspruit Mine (Ogies), Potgietersrus Platinum, Atok Mine (Lebowa), Blue Ridge Mine (Groblersdal), Ngodwana, Estancia (Breyton), Twickenham Mine (Steelpoort), Marikana

CURRICULUM VITAE

Name	Lynsey Rimbault
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Consultant: SiVEST Environmental Division
Years with Firm	since August 2014
Date of Birth	10 April 1989
ID Number	8904100104087
Nationality	South African

Education

Matriculated 2007 (with distinction), Full Academic Colours, Hyde Park High School, Johannesburg, South Africa

Professional Qualifications

MSc Biodiversity, Conservation and Management (University of Oxford 2012-2013)
BSc (Hons) Geography (University of the Witwatersrand 2011)
BA Geography and English (University of the Witwatersrand 2008-2010)

Employment Record

Aug 2014 – to date	SiVEST Environmental Division: Trainee Environmental Consultant
Feb 2014 – July 2014	Kulima Integrated Development Solutions
Jan 2012 – June 2012	Rayten Engineering Solutions

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Specialising in the field of Environmental Management.

Lynsey joined SiVEST in August 2014 and holds the position of Environmental Consultant in the Johannesburg Office. She has 1 year of work experience and is specialising in the management and compilation of Environmental Impact Assessments (EIAs) and Basic Assessment (BAs) primarily related to energy generation and electrical distribution projects.

Lynsey has worked previously for Kulima Integrated Development Solutions conducting research for a NEPAD project on Agricultural Adaptations to Climate Change. This involved four different farming sectors in four different provinces of South Africa. Prior to this Lynsey worked at Rayten Engineering Solutions in the field of air quality consulting, primarily in the mining sector.

Her academic achievements include; full academic colours in high school, elected prefect, Grade 11 dux scholar and four distinctions in matric. She is a member of the Golden Key International Honour Society for academic achievement. In her undergraduate degree she was top student in first and second year. During her Honours year she was awarded a post graduate merit award for excellence in academic performance. Lynsey was the recipient of the Allan and Nesta Ferguson Trust Scholarship for tuition at the University of Oxford.

Computer Literacy

Proficient in Microsoft Office,
ArcGIS,
IDRISI,
QGIS.

Projects Experience

Aug 2014 – to date

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)

- Basic Assessment for the Ermelo-Richards Bay Coal Line Upgrade Project: Proposed development of the Madlanzini Main Transmission Station and Associated 88kV and 400kV turn in power lines, Mpumalanga Province.
- Environmental Impact Assessment for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- Basic Assessment for the proposed Construction of the Mookodi Integration Phase 2 132kV Power Line from the Mookodi MTS to the new proposed Ganyesa Substation, North West Province.
- Environmental Impact Assessment for the proposed construction of the Nokukhanya Solar Photovoltaic Power Plant near Dennilton, Limpopo Province.

OTHER

- Environmental Scoping and Appraisal, as part of the SMEC Consortium, during the feasibility study for the Gautrain Extensions Project
- Authority Consultation and Environmental Screening Assessment for the proposed Lombardy East Housing Development, Gauteng Province.
- Application for Flora Permits for the removal and relocation of vegetation species for the Khobab and Loeriesfontein Wind Farm power line corridors.

Feb 2014 – July 2014

Conducting research on adoption of agricultural adaptation practices to climate change in four provinces of South Africa, through primary fieldwork and qualitative data collection. Research conducted under the auspices of the Comprehensive Africa Agriculture Development Programme (CAADP), a NEPAD programme. The research objective was to integrate and implement adaptation to climate change issues into agricultural development strategies.

- Identifying through specific entry points and snowball sampling at least 20 farmers per commodity group and location
- Conducting qualitative interviews with farmers on their farms or at other mutually agreed locations
- Identifying and interviewing any relevant local stakeholders
- Providing comprehensive notes on interviews, highlighting themes explored and emerging answers
- Providing final reports on each of the commodity groups explored and scorecards elaborating each adaptation observed.

Jan 2012 – June 2012

Environmental Scientist, responsible for air quality monitoring, project management dispersion modelling and air quality impact assessments, monitoring station siting for the Department of Environmental Affairs.

Name	Kerry Lianne Schwartz
Profession	GIS Specialist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Senior GIS Consultant: Environmental Division
Years with Firm	24 Years
Date of Birth	21 October 1960
ID No.	6010210231083
Nationality	South African

Professional Qualifications

BA (Geography), University of Leeds 1982

Employment Record

`

1994 – Present	SiVEST SA (Pty) Ltd - Environmental Division: GIS/Database Specialist.
1988 - 1994	SiVEST (formerly Scott Wilson Kirkpatrick): Town Planning Technician.
1984 – 1988	Development and Services Board, Pietermaritzburg: Town Planning Technician.

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Kerry is a GIS specialist with more than 16 years experience in the application of GIS technology in various environmental, regional planning and infrastructural projects undertaken by SiVEST.

Kerry's GIS skills have been extensively utilised in projects throughout South Africa in other Southern African Countries. These projects have involved a range of GIS work, including:

- Design, compilation and management of a demographic, socio-economic, land use, environmental and infrastructural databases.
- Collection, collation and integration of data from a variety of sources for use on specific projects.
- Manipulation and interpretation of both spatial and alphanumeric data to provide meaningful inputs for a variety of projects.
- Production of thematic maps and graphics.
- Spatial analysis and 3D modelling, including visual and landscape assessments.

Projects Experience

STRATEGIC PLANNING PROJECTS

Provision of database, analysis and GIS mapping support for the following:

- Water Plan 2025: Socio-economic, Land Use and Demographic Update – Umgeni Water (KwaZulu-Natal).
- Eskom Strategic Plan – Eskom (KwaZulu-Natal).
- Umgeni Water Quality Management Plan – Department of Water Affairs and Umgeni Water (KwaZulu-Natal).
- KwaZulu-Natal Development Perspective – Department of Economic Affairs (KwaZulu-Natal).
- Indlovu Regional Integrated Plan – Department of Local Government and Housing (KwaZulu-Natal).
- Umgeni Water and Sanitation Needs Analysis – Umgeni Water (KwaZulu-Natal).
- Metro Waste Water Management Plan – Durban Waste Water management, City of Durban (KwaZulu-Natal).
- KwaZulu-Natal Electrification Prioritisation Model – Eskom (KwaZulu-Natal).
- Umzinyathi Regional Development Plan – Umzinyathi Regional Council (KwaZulu-Natal).
- GIS driven model to assess future population growth in quaternary catchments under different growth scenarios – Umgeni Water (KwaZulu-Natal).
- Ubombo Master Water Plan Study – Mhlathuze Water Board (KwaZulu-Natal).
- Development strategy for local economic development and social reconstruction of the Germiston-Daveyton Activity Corridor – Eastern Gauteng Services Council (Gauteng).
- Structure Plan for the Cities of Beira and Dondo in Mozambique – World Bank.
- Land identification study for low cost housing in the Indlovu Region – Indlovu Regional Council (KwaZulu-Natal).
- Local Development Plan for Manzini – Manzini Town Council (Swaziland).
- Indlovu Project Prioritisation Model – Indlovu Regional Council (KwaZulu-Natal).
- Structure Plans for the Cities of Ndola and Luanshya - Ministry of Local Government and Housing (Zambia).
- Database development for socio-economic and health indicators arising from Social Impact Assessments conducted for the Lesotho Highlands Development Association – Lesotho.
- Development Plan for the adjacent towns of Kasane and Kazungula - Ministry of Local Government, Land and Housing (Botswana).
- Development Plan for the rural village of Hukuntsi - Ministry of Local Government, Land and Housing (Botswana).
- Provision of data platform for the spatial analysis of water supply, demand and affordability in Bulawayo – City of Bulawayo and NORAID (Zimbabwe).
- Integrated Development Plans for various District and Local Municipalities including:
  - Nquthu Local Municipality (KwaZulu-Natal)
  - Newcastle Local Municipality (KwaZulu-Natal)
  - Amajuba District Municipality (KwaZulu-Natal)
  - Jozini Local Municipality (KwaZulu-Natal)
  - Umhlabuyalingana Local Municipality (KwaZulu-Natal)
- uMhlathuze Rural Development Initiative – uMhlathuze Local Municipality (KwaZulu-Natal).
- Rural roads identification – uMhlathuze Local Municipality (KwaZulu-Natal).
- Mapungubwe Tourism Initiative – Development Bank (Limpopo Province).
- Northern Cape Tourism Master Plan – Department of Economic Affairs and Tourism (Northern Cape Province).

- Spatial Development Framework for Gert Sibande District Municipality (Mpumalanga) in conjunction with more detailed spatial development frameworks for the 7 Local Municipalities in the District, namely:
  - Albert Luthuli Local Municipality
  - Msukaligwa Local Municipality
  - Mkhondo Local Municpality
  - Pixley Ka Seme Local Municipality
  - Dipaleseng Local Municipality
  - Govan Mbeki Local Municipality
  - Lekwa Local Municipality
- Land Use Management Plans/Systems (LUMS) for various Local Municipalities including:
  - Nkandla Local Municipality (KwaZulu-Natal)
  - Hlabisa Local Municipality (KwaZulu-Natal)
  - uPhongolo Local Municipality (KwaZulu-Natal)
  - uMshwathi Local Municipality
- Spatial Development Framework for uMhlathuze Local Municipality (KwaZulu-Natal).
- Spatial Development Framework for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).
- Local Spatial Development Framework for Brackenhurst and Brackendowns (Region 10) – Ekurhuleni Metropolitan Municipality (Gauteng).
- Housing Sector Plan – Ntambanana Local Municipality (KwaZulu-Natal).
- Land use study for the Johannesburg Inner City Summit and Charter – City of Johannesburg (Gauteng).
- Ezikhawini-Vuindlela Corridor study – uMhlathuze Local Municipality (KwaZulu-Natal).
- Port Durnford and Ezikhawini Rural Node study - uMhlathuze Local Municipality (KwaZulu-Natal).
- Port of Richards Bay Due Diligence Investigation – Transnet
- Jozini Sustainable Development Plan – Jozini Local Municipality (KwaZulu-Natal)
- Spatial Development Framework for Umhlabuyalingana Local Municipality (KwaZulu-Natal)

<u>BUILT INFRASTRUCTURE</u>

- Construction Environmental Management Plan for transmission lines from Zeus substation to Mercury substation – Eskom.
- EIA and EMP for a 9km railway line and water pipeline for manganese mine – Kalagadi Manganese (Northern Cape Province).
- EIA and EMP for 5x 440kV Transmission Lines between Thyspunt (proposed nuclear power station site) and several substations in the Port Elizabeth area – Eskom (Eastern Cape Province).
- Environmental Impact Assessment for turn in lines and substation upgrading for Malelane substation – Eskom (Mpumalanga Province).
- Initial Scoping for the proposed 750km multi petroleum products pipeline from Durban to Gauteng/Mpumalanga – Transnet Pipelines.
- Detailed EIA for multi petroleum products pipeline from Kendall Waltloo, and from Jameson Park to Langtaagte Tanks farms –Transnet Pipelines.
- Environmental Management Plan (operational management plan) including visual impact assessment, noise impact assessment and flight path determination for the commercialization of Skukuza Airport – SANParks (Mpumalaga Province).
- Environmental Management Plan for copper and cobalt mine (Democratic Republic of Congo).
- EIA and Agricultural Feasibility study for Miwani Sugar Mill (Kenya).
- EIAs for Concentrated Solar and Photovoltaic power plants (Northern Cape).

- EIAs for Wind Farms (Northern Cape).
- EIAs for 132kV Distribution Lines in North West Province.

STATE OF THE ENVIRONMENT REPORTING

- 2008 State of the Environment Report for City of Johannesburg.
- Biodiversity Assessment – City of Johannesburg.

STRATEGIC ENVIRONMENTAL ASSESSMENTS AND ENVIRONMENTAL MANAGEMENT FRAMEWORKS

- SEA for Greater Clarens – Maloti-Drakensberg Transfrontier Park (Free State).
- SEA for the Marula Region of the Kruger National Park, SANParks.
- SEA for Thanda Private Game Reserve (KwaZulu-Natal).
- SEA for KwaDukuza Local Municipality (KwaZulu-Natal).
- EMF for proposed Renishaw Estate (KwaZulu-Natal).
- EMF for Mogale City Local Municipality, Mogale City Local Municipality (Gauteng).

WETLAND STUDIES

- Rehabilitation Planning for the Upper Klip River and Klipspruit Catchments, City of Johannesburg (Gauteng).
- Wetland Delineation and Assessment for the proposed Eskom CCGT Power Plant near Majuba Power Station – Eskom (Mpumalanga).

VISUAL IMPACT ASSESSMENTS

- Visual Impact Assessment for the proposed relocation of the Skukuza Conference Centre, SANParks.
- Visual Impact Assessment for the proposed re-commercialisation of the Skukuza Airport.
- Visual Impact Assessment for the proposed development of residential apartments in Ramsgate, KZN.
- Visual Impact Assessment for the redevelopment of the Newmarket Racecourse, Alberton, Gauteng
- Visual Impact Assessment for the Thyspunt Transmission Lines Integration Project
- Visual Impact Assessments for 5 Solar Power Plants in the Northern Cape
- Visual Impact Assessments for 2 Wind Farms in the Northern Cape
- Visual Impact Assessment for Mookodi Integration Project (132kV distribution lines)
- Landscape Character Assessment for Mogale City Environmental Management Framework

CURRICULUM VITAE

Name	Shaun Taylor
Profession	Environmental Scientist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Scientist: Environmental Division
Date of Birth	02 February 1984
ID Number	8402025020082
Nationality	South African

Education

MSc	– Aquatic Health
BSc (Hons)	– Geography & Environmental Studies
BA	– Geography and Environmental Science

Professional Qualifications

MSc – Aquatic Health, Johannesburg University
Research Project: The physico-chemical and biological characteristics of selected seasonal pans in the Kruger National Park, South Africa

BSc (Hons) – Geography & Environmental Studies, Witwatersrand University (First class)
Research Project: Sitatunga Habitat Suitability in the Okavango Delta, Botswana

BA – Geography & Environmental Science, Monash University South Africa (Distinction)

Certification in Wetland Delineation and Rehabilitation Training Course from the School of Continuing Education, University of Pretoria

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Fair	Fair	Fair

Employment Record

Oct 2010 – Present	SiVEST SA (Pty) Ltd Environmental Division – Environmental Scientist
Oct 2009 – Mar 2010	Envirokey cc – Junior Environmental Consultant and GIS support
Aug 2007 – Sep 2009	Holgate, Meyer and Associates Environmental Management Services – Junior Environmental Consultant

Key Experience

Shaun joined SiVEST in October 2010 and is based in the Johannesburg office in the capacity of an Environmental Scientist.

Shaun has a passion for working in the environmental and water (wetlands) field. From an environmental management perspective, Shaun has completed a number of environmental impact assessments, basic assessments, strategic environmental assessments, environmental management programmes/plans, various exemption and amendment applications, and conducted environmental auditing. Within the water field, Shaun has undertaken water use licensing (WUL) and WUL compliance monitoring for various developments. In terms of specialist work, Shaun has completed numerous surface water (including wetlands and riparian) assessments for renewable energy projects, linear projects as well as site specific projects.

Through his time at SiVEST, Shaun has acquired the following skills:

- Strong computer skills (Word, excel, powerpoint etc.);
- Strong proposal and report writing skills
- Surface water assessment techniques;
- Environmental Impact Assessments;
- Environmental Management Programmes/Plans;
- Environmental Compliance and Auditing;
- Environmental Amendment and Exemption Applications;
- Water Use License Applications.

Projects Experience

Shaun is responsible for the following activities: conducting EIA, BA and WULA processes, undertaking amendment and exemption applications, general project management, report writing, proposal writing, invoicing, conducting specialist surface water delineation and functional assessments, environmental and water related compliance monitoring and auditing. Current and completed projects / activities are outlined in detail below:

STRATEGIC ENVIRONMENTAL ASSESSMENTS

- Molemole Local Municipality Strategic Environmental Assessment, Limpopo Province (2014/2015).

ENVIRONMENTAL IMPACT ASSESSMENTS

- Mookodi Integration Project Environmental Impact Assessment (2011/2012);
- Noupoort Wind Farm, Northern Cape Province (2011/2012);
- Loeriesfontein Wind Farm and PV Plant, Northern Cape Province (2011/2012);
- Renosterberg Wind Farm and PV Plant near De Aar, Northern Cape Province (2012).

BASIC ASSESSMENTS

- Proposed Installation of a 500m³ Bulk Storage Fuel Oil Tank at Grootvlei Power Station, Mpumalanga Province (2011/2012);
- Proposed development of a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province (2012);
- Proposed development of a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province (2012);

- Frankfort Strengthening Project: 88kV Power Line from Heilbron (via Frankfort) to Villiers, Free State Province (2013);
- Wilger 132kV Overhead Distribution Power Line, Northern Cape Province (2013/2014);
- Limestone 1 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013/2014);
- Limestone 2 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013/2014);
- Proposed Tweespruit to Welroux Power Line and Substations, Free State Province (2014/2015);
- Sir Lowry's Pass River Flood Alleviation Project, Western Cape Province (2014/2015).

ENVIRONMENTAL MANAGEMENT PLANS / PROGRAMMES

- Eskom Thyspunt Nuclear Integration Project Environmental Management Plan – Transmission Infrastructure (2011);
- Eskom Thyspunt Nuclear Integration Project Environmental Management Plan – Substations (2011);
- Mookodi Integration Project Environmental Management Plan – Transmission Infrastructure and Substations (2011/12);
- Noupoort Wind Farm Environmental Management Programme (2012);
- Environmental Management Programme for a 500m³ Bulk Storage Fuel Oil Tank at Grootvlei Power Station (2012);
- Environmental Management Programme for a 19MW Photovoltaic Solar Power Plant near Kimberley, Northern Cape Province (2012);
- Environmental Management Programme for a 19MW Photovoltaic Solar Power Plant near Danielskuil, Northern Cape Province (2012);
- Karowe Diamond Mine Environmental Management Plan Review and Update, Boteti District, Botswana (2012);
- Environmental Management Programme for the Frankfort Strengthening Project: 88kV power line from Heilbron (via Frankfort) to Villiers, Free State Province (2013);
- Environmental Management Programme for the Wilger 132kV Overhead Distribution Power Line, Northern Cape Province (2013);
- Environmental Management Programme for the Limestone 1 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013);
- Environmental Management Programme for the Limestone 2 – 132kV Overhead Distribution Power Line, Northern Cape Province (2013);
- Environmental Management Programme for the Tweespruit to Welroux Power Line and Substations, Free State Province (2014/2015).

AMENDMENT APPLICATIONS

- Loeriesfontein 140MW Wind Farm, Northern Cape Province: Substantive and Minor Amendments (2013/2014);
- Khobab 140MW Wind Farm, Northern Cape Province: Substantive and Minor Amendments (2013/2014);
- Loeriesfontein 50MW Wind Farm, Northern Cape: Environmental Authorisation Minor Amendments (2013/2014);
- Loeriesfontein 100MW Solar Photovoltaic Plant, Northern Cape: Environmental Authorisation Minor Amendments (2013/2014);
- Noupoort 188MW Wind Farm, Northern Cape: Environmental Authorisation Minor Amendments (2013/2014).

ENVIRONMENTAL CONSTRAINTS\FATAL FLAWS

- Social Housing Projects in Sasolburg and Secunda Final Environmental Constraints Analysis Report (2011);

- Establishment of Wind Farms in Northern and Eastern Cape Provinces Environmental Constraints Analysis Report (2011).

ENVIRONMENTAL AND WATER USE LICENSE COMPLIANCE AUDITING

- Environmental Compliance Auditing for the Nigel Substation to Jameson Park (Inland Terminal 2) 88kV power lines – Construction Phase (2011);
- Water Use License Compliance Auditing for Grootvlei Power Station, Mpumalanga Province, South Africa (2012);
- Environmental Compliance Auditing for the Meadow Feeds Standerton Broiler Feed Mill, Mpumalanga Province (2012/2013);
- Transnet Rail WUL Audit, (2014);
- Kusile Power Station Armcor WUL Audit (2014);
- Kusile Power Station Ash Dump WUL Audit (2014);
- Kusile Power Station Pollution Dams WUL Audit (2014);
- Kusile Power Station Stream Diversion and Water Pipeline Crossings WUL Audit (2014/2015).

WETLAND AND RIPARIAN DELINEATION AND FUNCTIONAL ASSESSMENTS (RECENT)

- Approximately 40 wetland and riparian delineations and functional assessments for renewable energy, linear and site specific developments from 2010-2013 (Full list available on request).
- Mamatwan Manganese Mine, Northern Cape Province: Surface Water Assessment (2014);
- Two 5MW Photovoltaic Plants, Free State Province: Surface Water Assessment (2014);
- Dwarsrug Wind Farm, Northern Cape Province: Surface Water Assessment (2014);
- Manzimtoti Sewer Line Project, Kwa-Zulu Natal Province: Surface Water Assessment (2014);
- Compensation Flats Developemnt, Kwa-Zulu Natal Province: Surface Water Assessment (2014);
- Tinley Manor South Road Development, Kwa-Zulu Natal Province: Surface Water Assessment (2014);
- Ntuzuma Sewer Line Project, Kwa-Zulu Natal Province: Surface Water Assessment (2014);
- Esphiva Sewer Line Project, Kwa-Zulu Natal Province: Surface Water Assessment (2014);
- Frankfort Wetland Walk-down Assessment, Free State Province (2014);
- Grootvlei Power Station Wetland Assessment, Mpumalanga Province (2014/2015).

WETLAND AND RIPARIAN REHABILIATION / POST-REHABILITATION / AUDITING ASSESSMENTS

- Post-rehabilitation Assessment of Three Wetland Crossing Sites for Chemwes (Pty) Ltd for the Re-working of a Tailings Dam Project near Stilfontein, North West Province, South Africa (2011);
- Wetland and River Rehabilitation Plan (2011);
- Post-rehabilitation Assessment of the Inland New Multi-Purpose Pipeline in the Mpumalanga and Gauteng Provinces of South Africa (2012);
- John Ross Highway Wetland Rehabilitation Plan (2014).

WATER USE LICENSES

- Integrated Water Use License Application for the Construction of a CSP and CPV/ PV Plant in De Aar, Northern Cape Province of South Africa (2010);
- Water Use License for Ga-rankuwa Substation, Gauteng Province (2013);
- Water Use License for Klevebank to Dalkieth 88kV Power Line, Gauteng Province (2013);
- Water Use License Application for the Frankfort Strengthening Project: 88kV Power Line from Heilbron (via Frankfort) to Villiers, Free State Province (2014/2015);
- Water Use Licensing for the Integrated Polokwane Rapid Public Transport Network (2014/2015).

ENVIROKEY CC - JUNIOR ENVIRONMENTAL CONSULTANT AND GIS SUPPORT - OCT 2009 – MAR 2010

Responsible for managing basic assessments, report writing, conducting specialist wetland assessments, auditing procedures and GIS mapping. Full list of activities completed available on request.

JUNIOR ENVIRONMENTAL CONSULTANT AUG 2007 – SEP 2009

Responsible for managing basic assessments, report writing, conducting specialist wetland assessments, environmental auditing procedures and GIS mapping. Full list of activities completed available on request.

Conferences and Publications

Taylor, S. R., 2008: A Critical Review of Strategic Environmental Assessment in South Africa and looking towards Future Considerations, presented at the South African Students Geography Conference, University of Cape Town, Cape Town.

Academic and Work Related Achievements

- Awarded Monash Dean's recognition award for outstanding academic results for second semester of 2006;
- Awarded Monash Dean's recognition award for outstanding academic results for first semester of 2007;
- Awarded Monash Dean's recognition award for outstanding academic results for second semester of 2007;
- Awarded Golden Key membership and certificate to the International Honours Society for outstanding academic achievements in undergraduate studies for Monash 2008;
- Awarded Study Sponsorship from Holgate, Meyer and Associates for Honours study in 2008/09;
- Awarded Certificate of Merit from University of Witwatersrand for outstanding work for the course of Honours in 2009/10;
- Awarded Merit Bursary for MSc from the University of Johannesburg 2010 for excellent academic results;
- Numerous short-course certificates (Grass identification, wildflower identification, veld management, water use licensing).

CURRICULUM VITAE – CHRIS VAN ROOYEN

Name of organisation: Chris van Rooyen Consulting
Profession: Ornithological Consultant
Position in Firm: Director/Co-owner
Date of Birth: 30 April 1964
Relevant Experience: 17 years

SPECIALIST FIELD

Ornithological consultant offering specialist advice related to the impact of industrial developments on avifauna, especially in the electricity energy sector.

TERTIARY EDUCATION

1988	B.A. (Law)	Rand Afrikaans University
1991	LLB	Rand Afrikaans University

I work under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

KEY EXPERIENCE IN ELECTRICITY INDUSTRY

WIND ENERGY SITES

- St Helena Bay, Seeland, Electrawind
- Caledon, Caledon Wind
- Caledon, Langhoogte, SAGIT
- Langebaan, Langefontein, Oelsner Group
- Darling, Kerrifontein Oelsner Group
- Jeffreys Bay, Mainstream
- Ubuntu, Windcurrent
- Bana ba pifhu, Windcurrent
- Coega, Electrawind
- Swellendam, Excelsior, Biotherm
- Vredendal, Inca Energy
- Vredendal, Electrawind
- Morreesburg, Swartberg, Electrawind
- Oyster Bay, Renewable Energies South Africa
- Laingsburg, Spitskopvlakte, Biotherm
- Port Nolloth, Kannikwavlakte, Biotherm
- Vleesbaai, Vleesbaai Independent Power Producer
- Loeriesfontein, Mainstream
- Noupoort,Mainstream
- Indwe, Biotherm
- Pofadder, Mainstream
- Namies, JUWI
- De Aar, Mulilo North
- De Aar, Mulilo South

SOLAR ENERGY SITES:

- Bokpoort, Concentrated Solar Thermal Power (CSP)
- Solar Park, Upington
- Mainstream De Aar PV
- Droogfontein (Kimberley) PV

POWER LINES:

- Chobe 33kV Distribution line
- Athene - Umfolozi 400kV
- Beta-Delphi 400kV
- Cape Strengthening Scheme 765kV
- Flurian-Louis-Trichardt 132kV
- Ghanzi 132kV (Botswana)
- Ikaros 400kV
- Matimba-Witkop 400kV
- Naboomspruit 132kV
- Tabor-Flurian 132kV
- Windhoek - Walvisbaai 220 kV (Namibia)
- Witkop-Overyssel 132kV
- Breyten 88kV
- Adis-Phoebus 400kV
- Dhuva-Janus 400kV
- Perseus-Mercury 400kV
- Gravelotte 132kV
- Ikaros 400 kV
- Khanye 132kV (Botswana)
- Moropule – Thamaga 220 kV (Botswana)
- Parys 132kV
- Simplon –Everest 132kV
- Tutuka-Alpha 400kV
- Simplon-Der Brochen 132kV
- Big Tree 132kV
- Mercury-Ferrum-Garona 400kV
- Pebble Rock 132kV
- Reddersburg 132kV
- Thaba Combine 132kV
- Nkomati 132kV
- Louis Trichardt – Musina 132kV
- Endicot 44kV
- Apollo Lepini 400kV
- Tarlton-Spring Farms 132kV
- Kuschke 132kV substation
- Bendstore 66kV Substation and associated lines
- Kuiseb 400kV (Namibia)
- Gyani-Malamulele 132kV
- Watershed 132kV
- Bakone 132kV substation
- Eerstegoud 132kV LILO lines
- Kumba Iron Ore: SWEP - Relocation of Infrastructure
- Kudu Gas Power Station: Associated power lines
- Steenberg Booysendal 132kV
- Toulon Pumps 33kV
- Thabatshipi 132kV
- Witkop-Silica 132kV
- Bakubung 132kV
- Nelsriver 132kV
- Rethabiseng 132kV
- Tilburg 132kV
- and LILO lines
- Styldrift 132kV
- Taunus – Diepkloof 132kV
- Bighorn NDP 132kV
- Waterkloof 88kV
- Camden – Theta 765kV
- Dhuva – Minerva 400kV Diversion
- Lesedi –Grootpan 132kV
- Waterberg NDP
- Bulgerivier – Dorset 132kV
- Bulgerivier – Toulon 132kV
- Nokeng-Fluorspar 132kV
- Mantsole 132kV
- Tshilamba 132kV
- Thabamoopo - Tshebela – Nhlovuko 132kV
- Arthurseat 132kV
- Borutho 132kV MTS
- Grootboom 132kV
- DWAF Steelpoort 132kV
- Chloe – Gilead 66kV
- Pietersburg – Chloe 66kV
- Tshatane – Lesideng 132kV
- Lesego – Jane Furse 132kV
- DWAF 1 – DWAF 2 132kV
- Pitso 132kV Substation
- Lebowa – Dithabaneng – Boynton LILO 132kV

- Zeus-Perseus 765kV
- Matimba B Integration Project
- Caprivi 350kV DC (Namibia)
- Gerus-Mururani Gate 350kV DC (Namibia)
- Mmamabula 220kV (Botswana)
- Steenberg-Der Brochen 132kV
- Venetia-Paradise T 132kV
- Burgersfort 132kV
- Majuba-Umfolozi 765kV
- Delta 765kV Substation
- Braamhoek 22kV
- Steelpoort Merensky 400kV
- Mmamabula Delta 400kV
- Delta Epsilon 765kV
- Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
- Giyani 22kV Distribution line
- Liqhobong-Kao 132/11kV distribution power line, Lesotho
- 132kV Leslie – Wildebeest distribution line
- A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
- Cairns 132kv substation extension and associated power lines
- Pimlico 132kv substation extension and associated power lines
- Gyani 22kV
- Matafin 132kV
- Nkomazi_Fig Tree 132kV
- GaKgapane 66kV
- Knobel Gilead 132kV
- Bochum Knobel 132kV
- Madibeng 132kV
- Witbank Railway Line and associated infrastructure
- Spencer NDP phase 2 (5 lines)
- Akanani 132kV
- Hermes-Dominion Reefs 132kV
- Cape Pensinsula Strengthening Project 400kV
- Magalakwena 132kV
- Benficosa 132kV
- Dithabaneng 132kV
- Taunus Diepkloof 132kV
- Taunus Doornkop 132kV
- Tweedracht 132kV
- Jane Furse 132kV
- Majeje Sub 132kV
- Tabor Louis Trichardt 132kV
- Riversong 88kV
- Mamatsekele 132kV
- Kabokweni 132kV
- MDPP 400kV Botswana
- Marble Hall NDP 132kV
- Bokmakiere 132kV Substation
- Thulamela 132kV
- Marang 132kV
- Thulamela 132kV
- Merensky 132kV
- Amandla – Makometsane - Moutse 132kV
- Lebathlane 132kV
- Sun City Substation and associated powerlines
- Solar Park 400kV Integration Project
- Mamatsekele 132kV
- KwaMhlanga 132kV
- Malelane – Buffelspruit 132kV
- Gutshwa 132kV
- Taung-Gold 88kV
- Bredasdorp 66kV
- Vaalkop Dam 88kV
- Freedom Park 88kV
- Winterveld 132kV
- Ohrigstad – Phiring – Lemara 132kV
- Blouwater – Uiekraal 66kV
- Houhoek 400kV substation and LILO lines
- Zandfontein – Carmona 88kV
- Bracken – Roscco 88kV
- Victor 132kV
- Gamma – Kappa 765kV
- Kappa – Omega – Aurora 765kV

POWER STATIONS:

- Open Cycle Gas Turbine Plants & The Associated Transmission Lines & Substation At Atlantis, Western Cape
- Kangra Power Station: Siting Report

OTHER PROJECTS:

- Lizard Point Golf Estate
- Lever Creek Estates
- Leloko Lifestyle Estates
- Vaaloewers Residential Development
- Clearwater Estates Grass Owl Impact Study
- Somerset Ext. Grass Owl Study
- Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
- N17 Section: Springs To Leandra –"Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek 314 Ir)
- South African Police Services Gauteng Radio Communication System: Portion 136 Of The Farm 528 Jq, Lindley.
- Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
- Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
- Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.
- Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
- Shumba's Rest Bird Impact Assessment Study
- Randfontein Golf Estate Bird Impact Assessment Study
- Zilkaatsnek Wildlife Estate
- Regenstein Communications Tower (Namibia)
- Input into Richards Bay Comparative Risk Assessment Study
- Maquasa West Open Cast Coal Mine
- Glen Erasmia Residential Development, Kempton Park, Gauteng
- Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
- Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
- Camden Ash Disposal Facility, Mpumalanga
- Proposed Desalination Project at Mile 6 near Swakopmund, Namibia

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications and experience.

Date: 17 July 2014

Nicolene Venter

Name of firm	**Zitholele Consulting**
Profession	**Senior Public Participation Practitioner**
Specialisation	**Public Participation**
No. of years with firm	**2 months**
Nationality	**South African, ID No. 600421 0065 088**
Key Experience	Nicolene has over the past 15 years established herself as an experienced and well recognized public participation practitioner, facilitator and strategic reviewer. She has project managed several high profile public participation projects and excels in not only stakeholder engagements but with humility for street level consultation. Nicolene first formed her own consultancy business in 1997 and joined SiVEST in October 2007, and returned to her own consultancy business in October 2011. She lead public participation and stakeholder engagement projects with insightful strategic thinking to ensure the delivery of highly professional and a target orientated public participation process to her clients as the project dictates. She also has sound knowledge of the Equator Principles especially in terms of the Public Participation Process required for projects that are funded internationally. Nicolene's skills base also includes the facilitation of workshops, public and focus group meetings. As the Public Participation Practitioner, her proven leadership skills ensures the managing, development and motivation of the public participation team to achieve project objectives and to maintain high quality standards.

Professional Registrations

Education	International Association for Public Practitioners (IAP2) (Modules 1 and 2)	IAPP	2009
	Diploma in Public Relations	Public Relations Institute of South Africa	1989
	Higher Secretarial Diploma	Pretoria Technikon	1979

Employment Record

2013 - Present	Zitholele Consulting	Public Participation

Project Experience

<u>Mining Projects</u>

Proposed AK6 Diamond Mine	**Boteti, Botswana**

Drafting of the Community Consultation Plan for inclusion in the Closure Plan for the updated Environmental Management Plan

Power Plants

Zimbabwe Ethenol Plant **Zimbabwe**

Consultation process undertaken for the proposed construction of an ethanol plant in Chisumbanje, Middle Sabie, Zimbabwe in terms of the Zimbabwe's Environmental Management Agency (EMA). Not only did consultation take place with Government Officials, but an intensive consultation process has taken place with the local community.

EIA: Hendrina Ash Dam Expansion **Mpumalanga Province, South Africa**

Expansion of Eskom's Hendrina Power Station's Ash Dam Facilities at Pullenshope, Mpumalanga Province

EIA: Wind farms and/or Solar Energy Facilities **Northern Cape Province, South Africa**

Proposed construction of wind farms and/or solar energy facilities as proposed by Mainstream Mainstream Renewable Power South Africa, Northern Cape Province.

Basic Environmental Assessment: Grootvlei Power Station **Mpumalanga Province, South Africa**

Proposed installation of an additional 500M3 bulk storage fuel tank at Eskom's Grootvlei power Station, Mpumalanga Province

EIA: Solar Energy Facility **Kimberly, South Africa**

(Droogfontein, Kimberley; Kaalplats, Loeriesfontein; Paarde Valley, De Aar). The proposed construction of Concentrating Solar Plants (CSP) and Concentrating/Photovoltaic (CPV/PV) Plants as proposed by Mainstream Renewable Power South Africa in the Northern Cape Province.

Linear Infrastructure

EIA: Aggeneis-Oranjemond **Northern Cape Province, South Africa**

Proposed construction of a new 400kV Eskom Transmission Power Line between Aggeneys and Oranjemund, and the expansion of the Aggeneis and Oranjemond Transmission Substations, Northern Cape Province

Impact Phase of EIA: Invubu-Theta **KwaZulu Natal, South Africa**

Proposed construction of a double circuit 400kV Eskom Transmission Power Line between Richards Bay and Empangeni, KwaZulu-Natal Province

Basic Environmental Assessment: Westrand **Gauteng Province, South Africa**

Proposed construction of a 400kV Eskom Transmission Power Line between Eskom's existing Westrand and Hera Substations, Gauteng Province.

EIA: Mookodi Integration Project **North-West Province, South Africa**

Proposed improvement of Eskom's electricity supply network around the Vryburg and Stella, and to supply the proposed Kalplats Mine with electricity, North-West Province.

EIA: Transnet Coallink **KwaZulu Natal & Mpumalanga, South Africa**

Transnet's coallink upgrade project from Ermelo to Richard's Bay - Class Application for a number of Basic Assessments and Environmental Impact Assessments (5 Applications), Mpumalanga and KwaZulu-Natal Provinces

EIA: Thyspunt Transmission lines Integration Project **Eastern Cape Province, South Africa**

Proposed construction of 5 x 400kV Eskom Transmission power lines between Thyspunt (near Oyster Bay) to Port Elizabeth – 180km in length (Eskom's existing Grassridge & Dedisa Transmission Substations), Port Elizabeth, Eastern Cape Province

EIA: Delarey-Kopela-Phahameng **South Africa**

Proposed construction of an Eskom Distribution power line from Delareyville past Kopela to Madibogo.

Basic Environmental Assessment: Malelane Substation **Mpumalanga Province, South Africa**

Proposed Construction of a New Malelane Substation and the Proposed Construction of a New Komatipoort-Marathon 275kV Eskom Transmission Power Line Turn-In of approximately 1.5km, Malelane, Mpumalanga Province

Other

Miwani Sugar Mill **Kenya**

Consultation process undertaken, under the National Environment Management Authority (NEMA) of Kenya, with the assistance of local specialists (Kenya Marine and Fisheries Research Institute) for the proposed construction of a sugar mill in Miwani, Nyanza Province in terms of Kenya's.

EIA: Middelburg Water Treatment Plant **Mpumalanga Province, South Africa**

Water reclamation scheme for BHP Billiton Energy Coal South Africa (BECSA) in the Witbank / Middelburg area, Mpumalanga Province

Strategic Management and Review of Stakeholder Engagement Process were also conducted for a number of EIAs / BAs and the completion of Stakeholder Engagement Process between 1997 to September 2007 is available on request

Facilitation responsibility only:

- Environmental Management Planfor Prospecting Right Application Process (Client: Oresund Environmental Solutions): August 2010 and September 2010
- Ariadne-Eros 400kV/132kV Multi-Circuit Transmission Power Line: July 2009 and March 2010 (Client: Acer Africa)
- Middelburg SmancorCR Chemical Plant (Client: Environmental Science Associates) – Public Meeting: October 2007
- Majuba-Venus 765kV Transmission Power Lines (Client: Acer Africa) – Public Meetings: July 2008 and March 2010

Papers, publications and presentations

None

Appendix 3
Declarations of Interest and the EAP Affirmation

SiVEST Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
Fax + 27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

SiVEST
Established 1952

Your reference:
Our reference: 13169 - Aletta
Date: 28 June 2016

AFFIRMATION BY ENVIRONMENTAL ASSESSMENT PRACTIONER IN TERMS OF APPENDIX 2 AND 3 OF THE EIA REGULATIONS, 2014

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province

Environmental Assessment Practitioner (EAP):	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

I, ____ Andrea Gibb ___________, the appointed EAP confirm through this affirmation (as required in terms of Appendix 2 subsection (2) (j) and (k) and Appendix 3 subsection (3) (s) of GN982) that –

i) To the best of my knowledge the information provided in this report is factually correct;

ii) All comments and inputs received from stakeholders / interested and affected parties, prior to submission of the report, have been included as part of the report, and addressed where necessary;

iii) All relevant inputs and recommendations from the specialist reports have been included in the report;

iv) To the best of my knowledge all relevant project information which has been provided to stakeholders and interested and affected parties is correct, and is included in the report;

v) All responses provided to comments received from stakeholders and interested and affected parties are the unbiased opinion of the EAP and are based on factually correct information;

vi) The level of agreement between the EAP and the interested and affected parties on the plan of study for the undertaking of the environmental impact assessment has been agreed upon.

____
Signature of the environmental assessment practitioner:

SiVEST SA (Pty) Ltd
Name of company:

28 June 2016
Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	ARC-Institute for Soil, Climate and Water		
Contact person:	Garry Paterson		
Postal address:	Private Bag X79, Pretoria		
Postal code:	0001	Cell:	083 556 2458
Telephone:	012 310 2601	Fax:	012 323 1157
E-mail:	garry@arc.agric.za		
Professional affiliation(s) (if any)	Soil Science Society of SA; SA Soil Surveyors Organisation; International Erosion Control Ass.; Registered Soil Scientist (SACNASP)		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, **DG PATERSON**, declare that -- General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable): ARC-Institute for Soil, Climate and Water

Date: 28th June 2016

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	Chris van Rooyen Consulting		
Contact person:	Chris van Rooyen		
Postal address:	30 Roosevelt Street, Robindale, Randburg		
Postal code:	2194	Cell:	0824549570
Telephone:	-	Fax:	-
E-mail:	Vanrooyen.chris@gmail.com		
Professional affiliation(s) (if any)	-		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, C~~hris van Rooyen declare that -- General de~~claration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Chris van Rooyen Consulting

Name of company (if applicable):

Date: 27 July 2016

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	Animalia Zoological & Ecological Consultation (Pty) Ltd		
Contact person:	Werner Marais		
Postal address:	3 Godetia str, Heldervue, Somerset West		
Postal code:	7130	Cell:	0781903316
Telephone:		Fax:	
E-mail:	werner@animalia-consult.co.za		
Professional affiliation(s) (if any)	Pr.Sci.Nat. (Zoological Science) 400169/10		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Werner Marais, declare that –

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Animalia Zoological & Ecological Consultation (Pty) Ltd

Name of company (if applicable):

28 June 2016

Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	David Hoare Consulting cc		
Contact person:	Dr David Hoare		
Postal address:	Postnet suite 116, Private Bag X025, Lynnwood Ridge		
Postal code:	0040	Cell:	083 284 5111
Telephone:	012 804 2281	Fax:	086 550 2053
E-mail:	dhoare@lantic.net		
Professional affiliation(s) (if any)	SACNASP (Pr.Sci.Nat.)		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, David Hoare, declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

David Hoare Consulting cc

Name of company (if applicable):

28 June 2016

Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	PGS Heritage (Pty) Ltd		
Contact person:	Wouter Fourie		
Postal address:	PO Box 32542, Totiusdal		
Postal code:	0134	Cell:	0828523575
Telephone:	012 3325305	Fax:	
E-mail:	wouter@pgsheritage.co.za		
Professional affiliation(s) (if any)	ASAPA, AHAP		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Wouter Fourie , declare that -- General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

PGS Heritage (Pty) Ltd
Name of company (if applicable):

28 June 2016
Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	Jongens Keet Associates		
Contact person:	Adrian Jongens		
Postal address:	8 Wingerd Avenue, Constantia, Cape Town		
Postal code:	7806	Cell:	082 772 1799
Telephone:	021 794 5643	Fax:	
E-mail:	Jongens@yebo.co.za		
Professional affiliation(s) (if any)	ECSA, SAIEE		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Adrian Jongens ______________________ , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

____
Signature of the specialist:

Jongens Keet Associates
Name of company (if applicable):

28 June 2016
Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	SiVEST SA (Pty) Ltd		
Contact person:	Shaun Taylor		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 779 4899
Telephone:	011 798 0691	Fax:	011 803 7272
E-mail:	shaunt@sivest.co.za		
Professional affiliation(s) (if any)	South African Wetland Society (SAWS)		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Shaun Taylor , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SiVEST SA (Pty) Ltd

Name of company (if applicable):

28 June 2016

Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		
Professional affiliation(s) (if any)			

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Andrea Gibb , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SiVEST SA (Pty) Ltd

Name of company (if applicable):

28 June 2016

Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	SiVEST SA (Pty) Ltd		
Contact person:	Stephan Jacobs		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 737 2114
Telephone:	011 798 0677	Fax:	011 803 7272
E-mail:	stephanj@sivest.co.za		
Professional affiliation(s) (if any)			

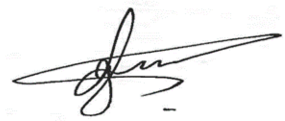
Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Stephan Jacobs , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the specialist:

SiVEST SA (Pty) Ltd

Name of company (if applicable):

28 June 2016

Date:

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Eureka 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	Urban-Econ: Socio-Economic Impact Assessment		
Contact person:	Mrs Elena Broughton		
Postal address:	1st Floor, Lake View Office Park, 137 Muckleneuk Street, Brooklyn		
Postal code:	0181	Cell:	082 463 2325
Telephone:	012 342 8686	Fax:	086 619 6911
E-mail:	elena@urban-econ.com		
Professional affiliation(s) (if any)	None		

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Elena Konstantinovna Broughton, declare that –

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Urban-Econ Development Economists

Name of company (if applicable):

29 June 2016

Date:

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed.
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

Proposed Construction of the Eureka 140MW Wind Energy Facility, near Copperton, Northern Cape Province

Specialist:	Urban-Econ: Development Economists		
Contact person:	Ruan Fourie		
Postal address:	1st Floor, Lake View Office Park, 137 Muckleneuk Street, Brooklyn		
Postal code:	0181	Cell:	0823875735
Telephone:	012 342 8686	Fax:	086 619 6911
E-mail:	fourie@urban-econ.com		
Professional affiliation(s) (if any)			

Project Consultant:	SiVEST SA (Pty) Ltd		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia, South Africa		
Postal code:	2128	Cell:	072 587 6525
Telephone:	011 798 0638	Fax:	011 803 7272
E-mail:	andreag@sivest.co.za		

4.2 The specialist appointed in terms of the Regulations_

I, Ruan Fourie, declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Urban-Econ: Development Economists
Name of company (if applicable):

29/06/2016
Date:

Appendix 4
Authority Consultation

SiVEST Environmental

51 Wessel Road, Rivonia
PO Box 2921, Rivonia
2128
Gauteng, South Africa

Phone + 27 11 798 0600
Fax + 27 11 803 7272
Email info@sivest.co.za
www.sivest.co.za

Established 1952

Department of Environmental Affairs
Environment House
473 Steve Biko
Arcadia
PRETORIA
0083

DEA Reference:
Our reference: 13169 – Aletta
Date: 30 June 2016

ATTENTION: THE DIRECTOR FOR EIA

Dear Sir/Madam

APPLICATION FOR ENVIRONMENTAL AUTHORISATION: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR THE PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND ENERGY FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

Please find attached herewith an Application Form for Environmental Authorisation for the above-mentioned proposed project.

Your review and acceptance of the attached application form will be appreciated.

Please do not hesitate to contact us should you have any queries in this regard.

Andrea Gibb
PO BOX 2921, Rivonia, 2128
Tel – (011) 798 0600
Fax – (011) 803 7272
Email – andreag@sivest.co.za

Yours sincerely,

Andrea Gibb
Environmental Consultant
SiVEST Environmental Division

Encl: 1 x Application Form for Environmental Authorisation (Including Appendices)

Appendix 5
Maps

Appendix 6
Specialist Studies

Appendix 6A

Biodiversity Assessment

SCOPING REPORT:

Ecological study on the potential impacts of the proposed BioTherm Aletta Wind Energy Facility near Copperton in the Northern Cape

Prepared by

Dr David Hoare
(Ph.D., Pr.Sci.Nat.)

David Hoare Consulting cc
41 Soetdoring Ave
Lynnwood Manor,
Pretoria

for

SiVEST Environmental Division
P O Box 2921,
Rivonia. 2128

29 February 2016

<u>DRAFT REPORT</u>: 2nd Draft

David Hoare Consulting cc
Biodiversity Assessments, Vegetation Description / Mapping, Species Surveys

DECLARATION OF INDEPENDENCE & SUMMARY OF EXPERTISE

Appointment of specialist

David Hoare of David Hoare Consulting cc was commissioned by SiVEST Environmental Division to provide specialist consulting services for the Environmental Impact Assessment process for the proposed construction of the BioTherm Aletta Wind Energy Facility near Copperton in the Northern Cape Province. The consulting services comprise an assessment of potential impacts on the general ecology in the study area by the proposed project.

Details of specialist

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Summary of expertise

Dr David Hoare:

- Has majors in Botany and Zoology with distinction from Rhodes University, Grahamstown, an Honours Degree (with distinction) in Botany from Rhodes University, an MSc (cum laude) from the Department of Plant Science, University of Pretoria, and a PhD in Botany from the Nelson Mandela Metropolitan University, Port Elizabeth with a focus on species diversity.
- Registered professional member of The South African Council for Natural Scientific Professions (Ecological Science, Botanical Science), registration number 400221/05.
- Founded David Hoare Consulting cc, an independent consultancy, in 2001.
- Ecological consultant since 1995, with working experience in Gauteng, Mpumalanga, Limpopo, North West, Eastern Cape, Western Cape, Northern Cape and Free State Provinces, Tanzania, Kenya, Mozambique and Swaziland.
- Conducted, or co-conducted, over 350 specialist ecological surveys as an ecological consultant. Areas of specialization include general ecology, biodiversity assessments, vegetation description and mapping, plant species surveys and remote sensing of vegetation. Has undertaken work in grassland, thicket, forest, savannah, fynbos, coastal vegetation, wetlands and nama-karoo vegetation, but has a specific specialization in grasslands and wetland vegetation.
- Published six technical scientific reports, 15 scientific conference presentations, seven book chapters and eight refereed scientific papers.
- Attended 15 national and international congresses & 5 expert workshops, lectured vegetation science / ecology at 2 universities and referee for 2 international journals.

Independence

David Hoare Consulting cc and its Directors have no connection with the proponent. David Hoare Consulting cc is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. David Hoare is an independent consultant to SiVEST Environmental Division and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work.

Conditions relating to this report

The findings, results, observations, conclusions and recommendations given in this report are based on the author’s best scientific and professional knowledge as well as available information. David Hoare Consulting cc and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

EXECUTIVE SUMMARY

David Hoare Consulting cc was appointed by SiVEST Environmental Division to undertake a general ecology assessment of the study area. This report provides details of the results of the Scoping Phase study, based on a desktop assessment of the study area and mapping from aerial imagery. The study area is located in the Northern Cape Province approximately 30 km to the west-south-west of Prieska.

The vegetation types that occur on site (Bushmanland Arid Grassland, Lower Gariep Broken Veld and Bushmanland Vloere and possibly floristic elements of Bushmanland Basin Shrubland and Northern Upper Karoo) are classified as Least Threatened and also have a wide distribution and extent. The natural vegetation on the sites is therefore not considered to have high conservation status. The area is not within a Centre of Plant Endemism or in areas identified in Provincial Conservation Plans to be of concern, but it does occur within an area identified as part of the National Parks Area Expansion Strategy.

Local factors that may lead to parts of the sites having elevated ecological sensitivity are the potential presence of the following:

- Presence of natural vegetation on site, although of low conservation priority.
- Potential presence of one plant species of concern, *Hoodia officinalis* subsp. *officinalis*, listed as Near Threatened.
- Potential presence of two protected plant species, *Hoodia gordonii* and *Harpagophytum procumbens.*
- Potential presence of one protected tree species, *Boscia albitrunca*.
- Presence of watercourses and drainage lines.
- Potential presence of the following animals of potential conservation concern:
    - Honey badger (NT)
    - Geoffroy's Horseshoe Bat (NT/LC)
    - Darling's Horseshoe Bat (NT)
    - Leseuer's Wing-gland Bat (NT)
    - Littledale's Whistling Rat (NT)
    - Giant Bullfrog (NT/LC)
- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features.

Potential risks (impacts) to the ecological receiving environment are as follows:

1. Loss of indigenous natural vegetation during construction;
2. Impacts on a near threatened plant species;
3. Impacts on protected plant species;
4. Impacts on a protected tree species;
5. Impacts on watercourses / drainage lines;
6. Mortality of populations of sedentary species during construction (terrestrial and aquatic);
7. Displacement of populations of mobile species (terrestrial);
8. Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats.

The report concludes that the project is unlikely to have highly significant impacts on the ecological receiving environment and impacts that will occur can be controlled and reduced to low significance. The seriousness of many of these impacts can be determined during the field

investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.

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INTRODUCTION

Terms of reference and approach

SiVEST Environmental Division was appointed to undertake an application for environmental authorisation through an Environmental Impact Assessment (EIA) for the proposed BioTherm Aletta Wind Energy Facility near Copperton in the Northern Cape Province. At this stage, it is proposed that the wind energy facility will consist of the following components:

- Between 80 and 125 wind turbines with a total generation capacity capacity of up to 140MW;
- The turbines will be connected via medium voltage cables to the proposed onsite Eureka East Substation;
- Internal access roads are proposed to be between 4 m and 6 m wide;
- A temporary construction lay down area;
- The operations and maintenance buildings, including an on-site spares storage building, a workshop an an operations building;
- Fencing (if required) will be up to 5m where required and will be either mesh or palisade.

The purpose of the EIA is to identify environmental impacts associated with the project.

On 19 February 2015 David Hoare Consulting cc was appointed by SiVEST Environmental Division to undertake a general ecology assessment of the study area. It was agreed that the study would include the following:

<u>Scoping Phase:</u>

- Conduct a desktop scoping study to broadly describe and characterise the study area in terms of:
  - Vegetation types and/or habitats;
  - National conservation status of major vegetation types;
  - Red Data (threatened and endangered) flora and fauna species;
  - The potential presence of trees protected according to the National Forests Act and fauna and flora protected under the National Environmental Management: Biodiversity Act;
  - Important Bird Areas (IBAs) and Critical Biodiversity Areas (CBAs);
  - The general status of vegetation on site; and
  - Potential impact on biodiversity, sensitive habitats and ecosystem functioning.
- Compile scoping level biodiversity report including (but not limited to) the following aspects:
  - Introduction;
  - Legislative background as applicable to the proposed activity;
  - High level description of the environmental baseline;
  - Identification of gaps in terms of the environmental baseline;
  - Methodology;
  - High level identification and mapping of biodiversity (fauna and flora) sensitive areas within the proposed application site (all sensitive areas within the development site must be provided to SiVest as shapefiles);
  - Potential anticipated impacts related to biodiversity (fauna and flora);
  - High level assessment of the significance of the proposed development on flora, fauna and ecology during the Pre-construction, Construction, Operation, Decommissioning Phases;
  - Preliminary Alternatives Assessment;

- Recommendations for further assessment; and
- Conclusion.

Impact Assessment Phase:

- Undertake field investigations to assess and confirm the patterns identified during the desktop assessment.
- Compile an impact level biodiversity report including (but not limited to) the following aspects:
  - Introduction;
  - Legislative background as applicable to the proposed activity;
  - Updated environmental baseline;
  - Methodology;
  - Identification and mapping of biodiversity (fauna and flora) sensitive areas within the application site based on field investigation and findings (all sensitive areas within the development site must be provided to SiVEST as shapefiles);
  - Assessment of the significance of the proposed development on flora, fauna and ecology during the Pre-construction, Construction, Operation, Decommissioning Phases (using SiVEST's Impact Assessment Methodology);
  - Findings (maps to be created and shapefiles submitted);
  - Alternatives Assessment (alternatives will be provided);
  - Implications of specialist findings for the proposed development (e.g. permits, licenses, etc.);
  - Cumulative impact identification and assessment;
  - Recommend mitigations measures and provide recommendations in order to minimize the impact of the proposed development on flora, fauna, ecology, etc.; and
  - Conclusion.
- Update and amend the draft report according to SiVEST's comments and resubmit final report for inclusion in the Environmental Impact Report.

This report provides details of the results of the Scoping stage assessment. The findings of the study are based on a desktop assessment of the study area, filed data collection and mapping from aerial imagery.

METHODOLOGY

The assessment is to be undertaken in two phases, a Scoping phase and an Impact Assessment phase. This report provides a Scoping level description of the site and assessment of the activity.

Assessment philosophy

Many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on the site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically <u>focus on red flags and/or potential fatal flaws</u>. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. These can be organised in a hierarchical fashion, as follows:

Species

1. threatened plant species
2. protected trees
3. threatened animal species

Ecosystems

1. threatened ecosystems
2. protected ecosystems
3. critical biodiversity areas
4. areas of high biodiversity
5. centres of endemism

Processes

1. corridors
2. mega-conservancy networks
3. rivers and wetlands
4. important topographical features

It is not the intention to provide comprehensive lists of all species that occur on site, since most of the species on these lists are usually common or widespread species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

1. Environment Conservation Act (Act 73 of 1989)
2. National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
3. National Environmental Management Biodiversity Act, 2004. (Act 10 0f 2004)

Species of conservation concern

There are two types of species of concern for the site under investigation, (i) those listed by conservation authorities as being on a Red List and are therefore considered to be at risk of extinction, and (ii) those listed as protected according to National and/or Provincial legislation.

Red List plant species

Determining the conservation status of a species is required in oder to identify those species that are at greatest risk of extinction and, therefore, in most need of conservation action. South Africa has adopted the IUCN Red List Categories and Criteria to provide an objective, rigorous, scientifically founded system to identify Red List species. A published list of the Red List species of South African plants (Raimondo et al. 2009) contains a list of all species that are considered to be at risk of extinction. This list is updated regularly to take new information into account, but these are not published in book/paper format. Updated assessments are provided on the SANBI website (http://redlist.sanbi.org/). According to the website of the Red List of Southern African Plants (http://redlist.sanbi.org/), *the conservation status of plants indicated on the Red List of South African Plants Online represents the status of the species within South Africa's borders. This means that when a species is not endemic to South Africa, only the portion of the species population occurring within South Africa has been assessed. The global conservation status, which is a result of the assessment of the entire global range of a species, can be found on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: http://www.iucnredlist.org*. The South African assessment is used in this study.

The purpose of listing Red List species is to provide information on the potential occurrence of species at risk of extinction in the study area that may be affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (http://posa.sanbi.org) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.

Protected trees

Regulations published for the National Forests Act (Act 84 of 1998) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study area. The distribution of species on this list was obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (http://sibis.sanbi.org/) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there. The site was searched for these species during the field survey and any individuals or concentrations noted.

Other protected species

National legislation was evaluated in order to provide lists of any plant or animal species that have protected status. The most important legislation is the following:

- *National Environmental Management: Biodiversity Act (Act No 10 of 2004)*

This legislation contains lists of species that are protected. These lists were scanned in order to identify any species thathave a geographical range that includes the study area and habitat requirements that are met by those found on site. These species were searched for within suitable habitats on site or, where relevant, it was stated that it was considered possible that they could occur on site.

There is additional legislation that provides lists of protected species, but the legislation to which these are attached deal primarily with harvesting or trade in listed species and do not specifically address transformational threats to habitat or individuals. This includes the following legislation:

- *CITES: Convention on the Trade in Endangered Species of Wild Fauna and Flora*.

Red List animal species

Lists of threatened animal species that have a geographical range that includes the study area were obtained from literature sources (for example, Alexander & Marais 2007, Branch 1988, 2001, du Preez & Carruthers 2009, Friedmann & Daly 2004, Mills & Hes 1997, Monadjem et al. 2010). The likelihood of any of them occurring was evaluated on the basis of habitat preference and habitats available at each of the proposed sites. The three parameters used to assess the probability of occurrence for each species were as follows:

- *Habitat requirements*: most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics within the study area were assessed;
- *Habitat status*: in the event that available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water-quality plays a major role); and
- *Habitat linkage*: movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to these surrounding habitats and adequacy of these linkages are assessed for the ecological functioning Red Data species within the study area.

Species probability of occurrence

Some species of plants may be cryptic, difficult to find, rare, ephemeral or generally not easy to spot while undertaking a survey of a large area. An assessment of the possibility of these species occurring there was therefore provided. For all threatened or protected flora that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- <u>LOW</u>: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- <u>MEDIUM</u>: habitats on site match general habitat description for species (e.g. karoo shrubland), but detailed microhabitat requirements (e.g. mountain shrubland on shallow soils overlying sandstone) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;

- HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. mountain shrubland on shallow soils overlying sandstone);
- DEFINITE: species found in habitats on site.

Habitat sensitivity

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area was derived by compiling a landcover data layer for the study area (*sensu* Fairbanks et al. 2000) using available satellite imagery and aerial photography. From this it can be seen which areas are transformed versus those that are still in a natural status.
2. Various provincial, regional or national level conservation planning studies have been undertaken in the area, e.g. the National Spatial Biodiversity Assessment (NSBA). The mapped results from these were taken into consideration in compiling the habitat sensitivity map.
3. Habitats in which various species of plants or animals occur that may be protected or are considered to have high conservation status are considered to be sensitive.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation of conservation concern, high diversity or habitat complexity, Red List organisms or systems vital to sustaining ecological functions are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

Table 1: Explanation of sensitivity ratings.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
VERY HIGH	Indigenous natural areas that are highly positive for any of the following: • presence of threatened species (Critically Endangered, Endangered, Vulnerable) and/or habitat critical for the survival of populations of threatened species. • High conservation status (low proportion remaining intact, highly fragmented, habitat for species that are at risk). • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act) And may also be positive for the following: • High intrinsic biodiversity value (high species richness and/or turnover, unique ecosystems) • High value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination,	• CBA 1 areas. • Remaining areas of vegetation type listed in Draft Ecosystem List of NEM:BA as Critically Endangered, Endangered or Vulnerable. • Protected forest patches. • Confirmed presence of populations of threatened species.

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
	refugia, food production, raw materials, genetic resources, cultural value) • Low ability to respond to disturbance (low resilience, dominant species very old).	
HIGH	Indigenous natural areas that are positive for any of the following: • High intrinsic biodiversity value (moderate/high species richness and/or turnover). • presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species). • Moderate ability to respond to disturbance (moderate resilience, dominant species of intermediate age). • Moderate conservation status (moderate proportion remaining intact, moderately fragmented, habitat for species that are at risk). • Moderate to high value ecological goods & services (e.g. water supply, erosion control, soil formation, carbon storage, pollination, refugia, food production, raw materials, genetic resources, cultural value). And may also be positive for the following: • Protected habitats (areas protected according to national / provincial legislation, e.g. National Forests Act, Draft Ecosystem List of NEM:BA, Integrated Coastal Zone Management Act, Mountain Catchment Areas Act, Lake Areas Development Act)	• CBA 2 "critical biodiversity areas". • Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records). • Confirmed habitat for species of lower threat status (near threatened, rare). • Habitat containing individuals of extreme age. • Habitat with low ability to recover from disturbance. • Habitat with exceptionally high diversity (richness or turnover). • Habitat with unique species composition and narrow distribution. • Ecosystem providing high value ecosystem goods and services.
MEDIUM-HIGH	Indigenous natural areas that are positive for one or two of the factors listed above, but not a combination of factors.	• CBA 2 "corridor areas". • Habitat with high diversity (richness or turnover). • Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).
MEDIUM	Other indigenous natural areas in which factors listed above are of no particular concern. May also include natural buffers around ecologically sensitive areas and natural links or corridors in which natural habitat is still ecologically functional.	

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
MEDIUM-LOW	Degraded or disturbed indigenous natural vegetation.	
LOW	No natural habitat remaining.	

Any natural vegetation within which there are features of conservation concern will be classified into one of the high sensitivity classes (MEDIUM-HIGH, HIGH or VERY HIGH. The difference between these three high classes is based on a combination of factors and can be summarised as follows:

1. Areas classified into the VERY HIGH class are vital for the survival of species or ecosystems. They are either known sites for threatened species or are ecosystems that have been identified as being remaining areas of vegetation of critical conservation importance. CBA1 areas would qualify for inclusion into this class.
2. Areas classified into the HIGH class are of high biodiversity value, but do not necessarily contain features that would put them into the VERY HIGH class. For example, a site that is known to contain a population of a threatened species would be in the VERY HIGH class, but a site where a threatened species could potentially occur (habitat is suitable), but it is not known whether it does occur there or not, is classified into the HIGH sensitivity class. The class also includes any areas that are not specifically identified as having high conservation status, but have high local species richness, unique species composition, low resilience or provide very important ecosystem goods and services. CBA2 "irreplaceable biodiversity areas" would qualify for inclusion into this class, if there were no other factors that would put them into the highest class.
3. Areas classified into the MEDIUM-HIGH sensitivity class are natural vegetation in which there are one or two features that make them of biodiversity value, but not to the extent that they would be classified into one of the other two higher categories. CBA2 "corridor areas" would qualify for inclusion into this class.

Limitations and exclusions

- Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.
- This study excludes invertebrates.
- Avifauna is addressed in a separate specialist study.

Impact assessment methodology

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 2.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

The impact assessment takes into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact is detailed.

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 1: Description of terms

<table>
<tr><th colspan="3">NATURE</th></tr>
<tr><td colspan="3">A brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.</td></tr>
<tr><th colspan="3">GEOGRAPHICAL EXTENT</th></tr>
<tr><td colspan="3">This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.</td></tr>
<tr><td>1</td><td>Site</td><td>The impact will only affect the site</td></tr>
<tr><td>2</td><td>Local/district</td><td>Will affect the local area or district</td></tr>
<tr><td>3</td><td>Province/region</td><td>Will affect the entire province or region</td></tr>
<tr><td>4</td><td>International and National</td><td>Will affect the entire country</td></tr>
<tr><th colspan="3">PROBABILITY</th></tr>
<tr><td colspan="3">This describes the chance of occurrence of an impact</td></tr>
<tr><td>1</td><td>Unlikely</td><td>The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).</td></tr>
<tr><td>2</td><td>Possible</td><td>The impact may occur (Between a 25% to 50% chance of occurrence).</td></tr>
<tr><td>3</td><td>Probable</td><td>The impact will likely occur (Between a 50% to 75% chance of occurrence).</td></tr>
<tr><td>4</td><td>Definite</td><td>Impact will certainly occur (Greater than a 75% chance of occurrence).</td></tr>
<tr><th colspan="3">REVERSIBILITY</th></tr>
<tr><td colspan="3">This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.</td></tr>
</table>

1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative Impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Table 2: Impact table format

IMPACT TABLE FORMAT	
Environmental parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*

Extent	
Probability	*A brief description indicating the chances of the impact occurring*
Reversibility	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*
Significance rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*

	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMPR.*	

DESCRIPTION OF STUDY AREA

Location

The study site is situated approximately 15 km north-east of Copperton and approximately 30 km west-south-west of the town of Prieska within the Northern Cape (Figure 1). The site falls within the quarter degree grids 2922CD, 2922DC and 3022BA. It falls within the Siyathemba Local Municipality that forms part of the Pixley ka Seme District Municipality. The project includes the following farms:

- Portion 1 of the farm Drielings Pan No. 101
- Portion 2 of the farm Drielings Pan No. 101
- Portion 3 of the farm Drielings Pan No. 101
- Remainder of the farm Drielings Pan No. 101

The project site near Copperton has been identified through pre-feasibility studies conducted by BioTherm based on an estimation of the solar energy resource as well as weather, dust, dirt, and surface albedo. Grid connection, competition, flat topography, land availability and site access were also important initial considerations.

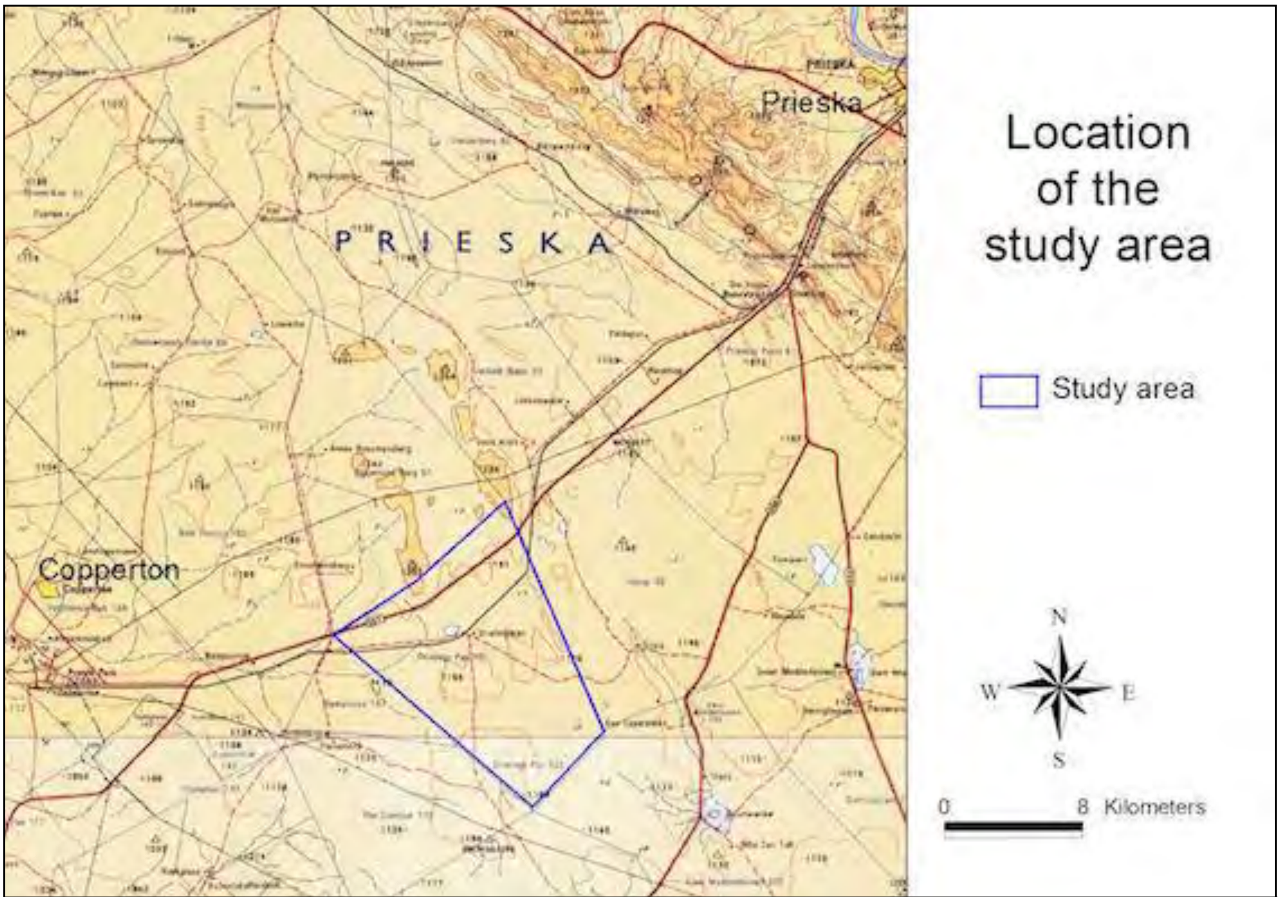

Figure 1: Location of the study area.

Topography

The study site is situated in a relatively flat landscape. The elevation varies from approximately 1122 m above sea level to approximately 1228 m above sea level. The landscape slopes towards the drainage areas. There are some low hills in the northern part of the site as well as along the eastern boundary.

There are various watercourses and drainage areas in the project study area, as well as a number of small pan depressions.

Land types and soils

Detailed soil information is not available for broad areas of the country. As a surrogate, landtype data was used to provide a general description of soils in the study area (landtypes are areas with largely uniform soils, topography and climate). There is a single main land type in the study area, the Ag landtype (Land Type Survey Staff, 1987) as well as a very small area of the Ic land type.

The A-group of land types refer to yellow and red soils without water tables belonging to one or more of the following soil forms: Inanda, Kranskop, Magwa, Hutton, Griffin, Clovelly. The Ag landtype consists of red, high base status soils, < 300 mm deep with no dunes (MacVicar et al. 1974). The soils on site are therefore expected to be relatively shallow, although probably reasonably fertile.

Figure 2: Aerial image of the study area.

The Ic land type refers to areas with exposed rock (exposed country rock, stones or boulders) covering more than 80% of the area. The rocky portions of Ic may be underlain by soil which would have qualified the unit for inclusion in another broad soil pattern were it not for the surface rockiness. The low hills fall mostly within the Ic land type.

Climate

The climate is arid to semi-arid. Rainfall occurs from November to April, but peaks in mid- to late summer (February / March). Mean annual rainfall is 140 mm to 170 mm per year. All areas with less than 400 mm rainfall are considered to be arid. The study area can therefore be considered to be arid to very arid.

Landuse and landcover of the study area

A landcover map of the study area (Fairbanks *et al*. 2000) indicates that the study consists of natural vegetation, classified as "shrubland and low fynbos" and some small fragments of "thicket and bushland". The 1:50 000 topocadastral map of the site (Figure 1) and a Google image of the site (Figure 2) show essentially the same pattern. Vegetation typical of the general study area is shown in Plate 1.

Plate 1: Typical vegetation structure within the general study area.

Broad vegetation types of the region

The sites fall within the Nama-Karoo Biome (Rutherford & Westfall 1986, Mucina & Rutherford 2006). The most recent and detailed description of the vegetation of this region is part of a national map (Mucina, Rutherford & Powrie, 2005; Mucina *et al*. 2006). This map shows six vegetation types occurring within the broad study area (Figure 3), of which only two are affected directly by the proposed project alternatives. These vegetation types are described in more detail below.

Bushmanland Arid Grassland

This vegetation type occurs on extensive, relatively flat plains and is sparsely vegetated by tussock grasses, including *Stipagrostis ciliata*, *Aristida adscensionis*, *Aristida congesta*, *Enneapogon desvauxii*, *Eragrostis nindensis*, *Schmidtia kalahariensis* and *Stipagrostis obtusa*. In some years after good rains there are abundant displays of annual herbs (Mucina et al. 2006). There are no known endemics in this vegetation type (Mucina *et al*. 2006), but does contain endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely *Aizoon asbestinum*, *Maerua gilgii*, *Ruschia muricata* and *Aloe gariepensis*. The vegetation type also contains the protected tree species, *Acacia erioloba* (camel thorn), *Acacia haematoxylon* (grey camel thorn) and *Boscia albitrunca* (shepherd's bush).

Lower Gariep Broken Veld

This consists of sparse vegetation dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs occurring in low amounts. On the slopes of koppies groups of widely scattered low trees such as *Aloe dichotoma* occur and

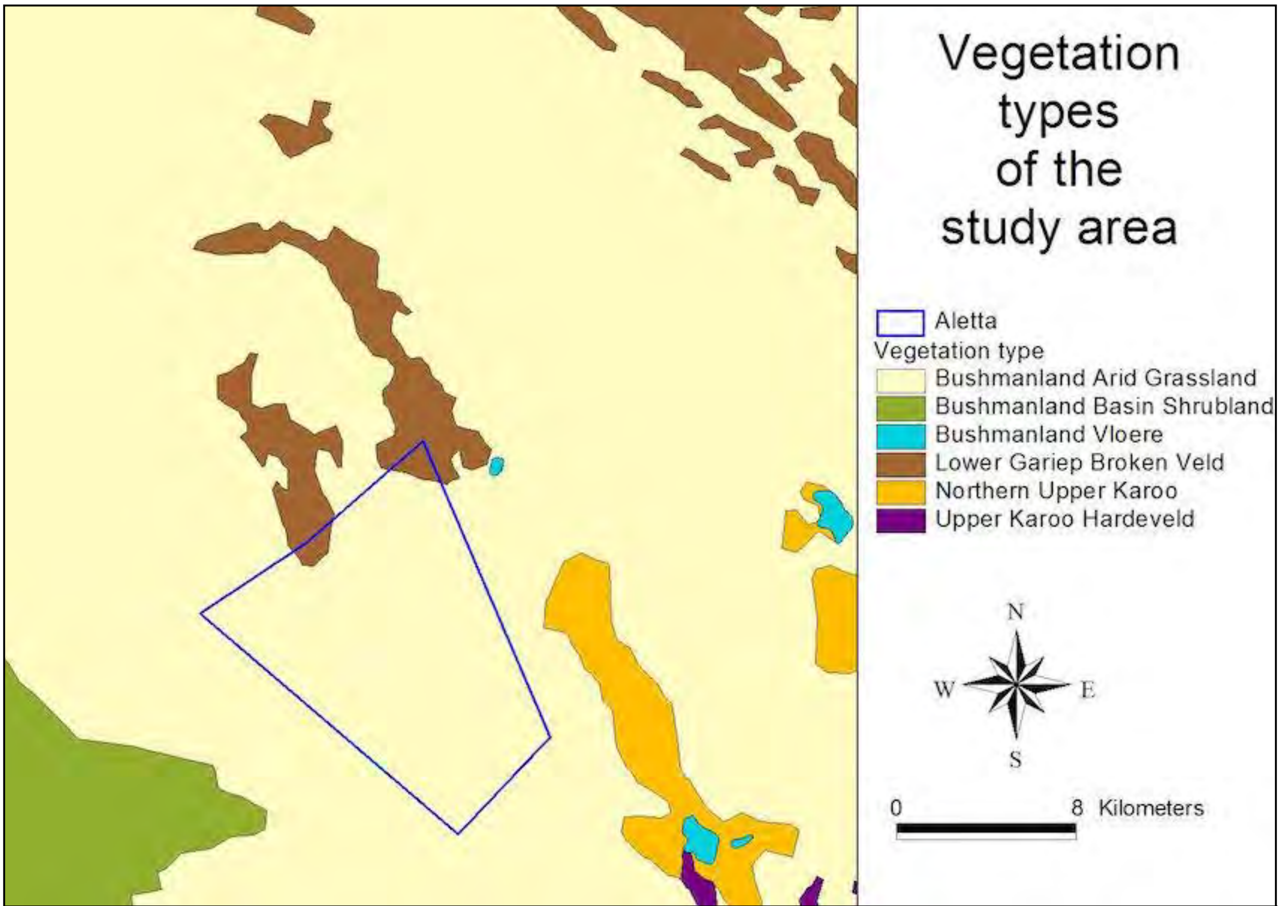

Figure 3: Vegetation types of the project study area.

the sandy soils of footslopes *Acacia mellifera* occurs. Known endemics in this vegetation include the tall shrub *Caesalpinia bracteata* and the succulent shrub *Ruschia pungens* (Mucina et al. 2006). The vegetation contains endemics belonging to the Griqualand West or Gariep Centres of Endemism (van Wyk & Smith 2001), namely *Digitaria polyphylla* and *Crassula corallina* subsp. *macrorrhiza*. At a national scale this vegetation type has been transformed only a small amount and is also conserved in Augrabies Falls National Park. It is not considered to be a threatened vegetation type (Mucina et al. 2006).

Bushmanland Basin Shrubland
This vegetation type occurs in the Northern Cape Province in the Large Bushmanland Basin centred on Brandvlei and Vanwyksvlei, from Granaatboskolk in the west to Copperton in the east and Kenhardt in the north to Williston in the south (Mucina et al. 2006). It is found on slightly irregular plains. The vegetation is a dwarf shrubland dominated by a mixture of low sturdy, spiny and sometimes succulent shrubs (*Rhigozum*, *Salsola*, *Pentzia* and *Eriocephalus*), white grasses and, in years of high rainfall, abundant annuals, such as *Gazania* and *Leysera*. In comparison to the bordering Bushmanland Arid Grasslad, the vegetation of this unit shows increased presence of shrubs and plant indicators of high salt status of soils.

Bushmanland Vloere
This is the vegetation of the salt pans and broad riverbeds of the central Bushmanland basin (Mucina et al. 2006). It occurs in areas of flat and very even surfaces of pans and broad bottoms of intermittent dry rivers. Typically, the central parts are devoid of vegetation. Around this is loosely patterned scrub dominated by *Rhigozum trichotomum* and various species of *Salsola* and *Lycium*, with a mixture of karroid dwarf shrubs. In places loose thickets of *Parkinsonia africana*, *Lebeckia linearifolia* and *Acacia karroo* may be found.

Northern Upper Karoo
This vegetation type occurs in the Northern Cape and Free State in the northern regions of the Upper Karoo Plateau from near Prieska, Vosburg and Carnarvon in the west to Philipstown, Petrusville and Petrusburg in the east. It is found on flat to gently sloping landscapes. The vegetation is a shrubland dominated by dwarf karoo shrubs, grasses and *Acacia mellifera* and some other low trees.

Upper Karoo Hardeveld
This vegetation type is found in the Northern, Western and Eastern Cape Provinces in the region from Middelpos in the west to Strydenburg, Richmond and Nieu-Bethesda in the east. Most of the crest areas and steep slopes of the Great Escarpment facing south between Teekloofpas and Graaff-Reinet are covered in this vegetation. The vegetation occurs on steep slopes of koppies, butts, mesas and parts of the Great Escarpment covered with large boulders and stones. The vegetation is a sparse dwarf Karoo scrub with drought-tolerant grasses. The vegetation unit contains a number of endemics, especially within the Great Escarpment part.

Conservation status of broad vegetation types

On the basis of a recently established approach used at national level by SANBI (Driver *et al*. 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 1, as determined by best available scientific approaches (Driver *et al*. 2005).

The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver et al. 2005).

All of the vegetation types occurring in the study area (Table 2) are classified as Least Threatened (Driver *et al*. 2005; Mucina *et al*., 2006). None of the vegetation types are flagged therefore as being of conservation concern.

Table 1: Determining ecosystem status (from Driver et al. 2005). *BT = biodiversity target (the minimum conservation requirement).

Habitat remaining (%)			
	80–100	least threatened	LT
	60–80	vulnerable	VU
	*BT–60	endangered	EN
	0–*BT	critically endangered	CR

Table 2: Conservation status of different vegetation types occurring in the study area, according to Driver *et al*. 2005 and Mucina *et al*. 2005.

Vegetation Type	**Target (%)**	**Conserved (%)**	**Transformed (%)**	**Conservation status**	
				Driver *et al*. 2005; Mucina *et al*., 2006	**Draft Ecosystem List (NEMBA)**
Bushmanland Arid Grassland	21	1	1	Least Threatened	Not listed
Lower Gariep Broken Veld	21	4	1	Least Threatened	Not listed
Bushmanland Basin Shrubland	21	0	1	Least Threatened	Not listed
Bushmanland Vloere	24	0	2	Least Threatened	Not listed
Northern Upper Karoo	21	0	4	Least Threatened	Not listed
Upper Karoo Hardeveld	21	3	0	Least Threatened	Not listed

Biodiversity Conservation Plans

There are no fine-scale biodiversity conservation plans for the study area (bgis.sanbi.org). According to SANBI, "*Presently BGIS has no Systematic Biodiversity Conservation Plan for the Northern Cape other than the Namakwa District Biodiversity Sector Plan therefore the Biodiversity Summaries Map is used in it place for land use decision support in the province.*" The Biodiversity Summary Map for the Pixley ka Seme District Municipality shows all natural vegetation within the municipal area, except along the Orange River, to be Least Threatened and no areas mapped as of particular biodiversity concern.

Proposed protected areas

According to the National Parks Area Expansion Strategy (NPAES), the central part of the site has been identified as a priority area for inclusion in future protected areas. According to the guideline description of the strategy, the "*focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and* *ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES, and were designed with strong emphasis on climate change resilience and requirements for freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES*". No description is provided of specific biodiversity features per proposed area.

Red List plant species of the study area

Lists of plant species of conservation concern previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in Appendix 1. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

There is one species that may occur in the study area, the succulent, *Hoodia officinalis* subsp. *officinalis*. This species is listed as Near Threatened (see Table 3 for explanation of categories). The species is found in Desert, Nama Karoo and Succulent Karoo and is found inside bushes in flat or gently sloping areas. The species has been recorded in two neighbouring grids and the possibility of it occurring in the study area is therefore considered to be high.

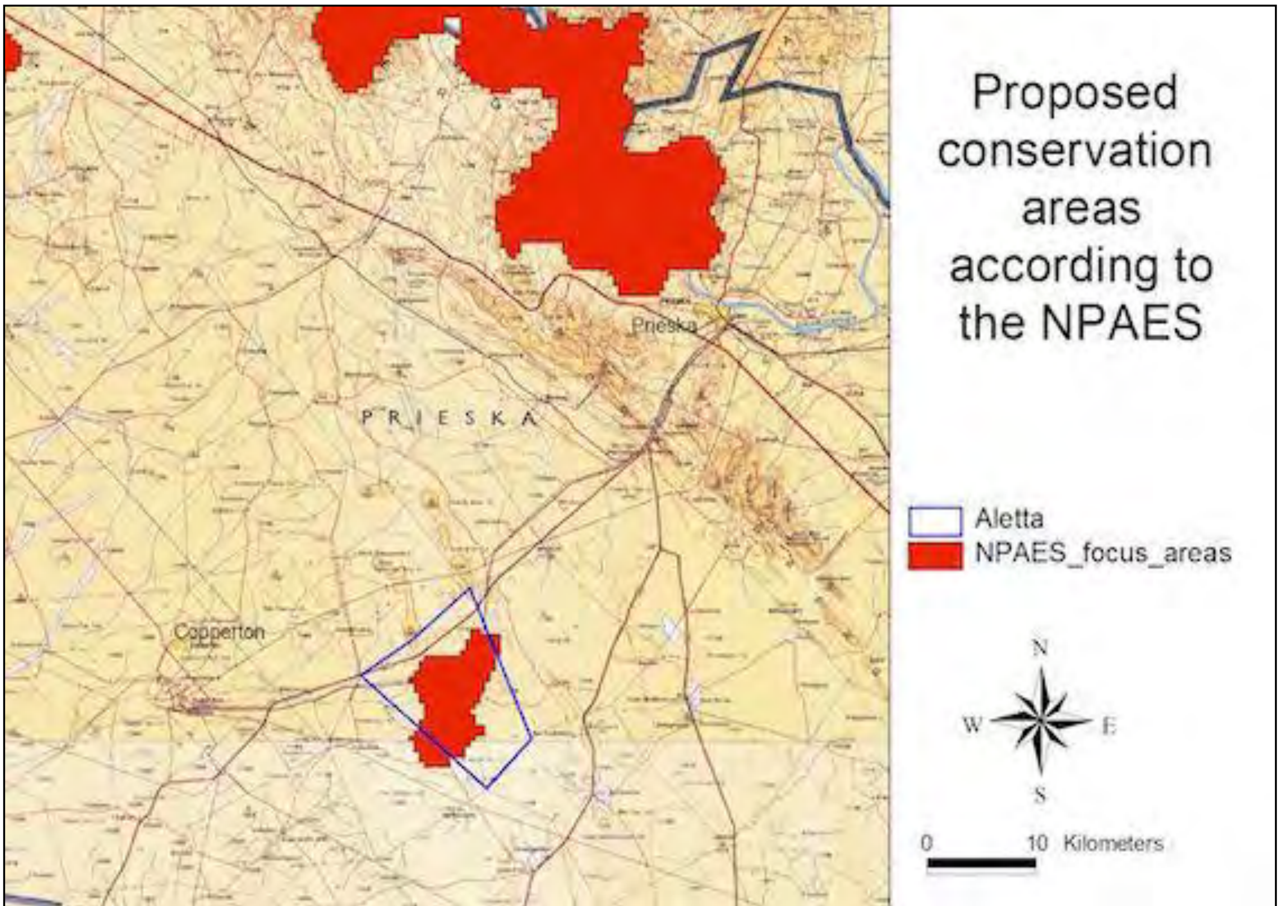

Figure 4: Proposed National Park expansion areas according to the NPAES.

There is another Near Threatened plant species that could potentially occur in the study area, namely *Drimia sanguinea*. The main occurrence of this species is, however, more to the north and north-east of the current site.

Table 3: Explanation of IUCN Ver. 3.1 categories (IUCN, 2001), and Orange List categories (Victor & Keith, 2004).

IUCN / Orange List category	Definition	Class
EX	Extinct	Extinct
CR	Critically Endangered	Red List
EN	Endangered	Red List
VU	Vulnerable	Red List
NT	Near Threatened	Orange List
Declining	Declining taxa	Orange List
Rare	Rare	Orange List
Critically Rare	Rare: only one subpopulation	Orange List
Rare-Sparse	Rare: widely distributed but rare	Orange List
DDD	Data Deficient: well known but not enough information for assessment	Orange List
DDT	Data Deficient: taxonomic problems	Data Deficient
DDX	Data Deficient: unknown species	Data Deficient

Red List animal species of the study area

All Red List vertebrates (mammals, reptiles, amphibians) that could occur in the study area are listed in Appendix 3.

There are five mammal species of low conservation concern that could occur in available habitats in the study area. These are Geoffroy's Horseshoe Bat, Darling's Horseshoe Bat, Leseuer's Wing-gland Bat, the Honey Badger and Littledale's Whistling Rat. All of these species are classified nationally as near threatened (NT), but globally as Least Concern. They are, therefore, of relatively low conservation concern in comparison to more threatened species found in other parts of the country. The Honey Badger protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit. Only the Honey Badger and Littledale's Whistling Rat were considered likely to be found on site.

The Giant Bullfrog is the only amphibian species with a distribution that includes the study area and which could occur on any of the sites. This species is classified as Least Concern globally and Near threatened in South Africa. It is, however, protected under the National Environmental Management: Biodiversity Act and any impacts on a specimen of this species or that may negatively affect the survival of the species would require a permit.

There are no reptile species of conservation concern that have a distribution that includes the study area.

Protected plants (National Environmental Management: Biodiversity Act)

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 4. Two plant species that appear on this list that could potentially occur in the general region, although thay have not previously been recorded in the grids of the study area, are *Hoodia gordonii* and *Harpagophytum procumbens*.

Hoodia gordonii is found in Namibia, Botswana, Angola and the dry margins of the summer rainfall region of South Africa, including parts of the Western Cape, Northern Cape and Free State Provinces. It occurs in a wide variety of arid habitats from coastal to mountainous, also on gentle to steep shale ridges, found from dry, rocky places to sandy spots in riverbeds. It has not been previously recorded in this grid, but has been recorded in the grid to the north-east. It is considered likely that this species could occur on site due to habitat conditions found there relative to the species requirements.

Harpagophytum procumbens occurs in Angola, Botswana, Mozambique, Namibia, South Africa, Zambia, and Zimbabwe. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces and the largest populations are found in the communally owned areas of the North West Province and the north eastern parts of the Northern Cape. The species Well drained sandy habitats in open savanna and woodlands. It has not been previously recorded in this grid, but has been recorded in the grids to the southnorth. It is considered possible, butunlikely that this species could occur on site due to habitat conditions found there relative to the species requirements.

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

The Act provides lists of protected species for the Province, which is very lengthy and includes a number of common species. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list. Based on previous experience on projects in the Northern Cape Province, it must be assumed that a permit application will need to be undertaken and that it will include a variety of species found on site, including various common species.

Protected trees

Tree species protected under the National Forest Act are listed in Appendix 3. The only one that has a geographical distribution that includes the study sites is *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi). *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi) occurs in semi-desert areas and bushveld, often on termitaria, but is common on sandy to loamy soils and calcrete soils. In the study area, it has been previously observed in the type of habitat found on the low hills that occur on site. This species could therefore potentially occur on site in areas affected by the proposed project.

Protected animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).According to this Act, "*a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7*". Such activities include any that are "*of a nature that may negatively impact on the survival of a listed threatened or protected species*". This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act.

Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 6, marked with the letter "N". This includes the following species: White Rhinoceros, Black Wildebeest, Oribi, Cheetah, Cape Clawless Otter, Black-footed Cat, Brown Hyaena, Serval, Spotted-necked Otter, Honey Badger, Leopard, Cape Fox, Southern African Hedgehog, Southern African Python and Giant Bullfrog.

Due to habitat and forage requirements and the fact that some species are restricted to game farms and/or conservation areas, only the Black-footed Cat, Honey Badger, Leopard, Cape Fox and Giant Bullfrog have a likelihood of occurring on site. All of these species are mobile animals that are likely to move away in the event of any activities on site disturbing them. They are therefore unlikely to be affected by the proposed development of the solar power facility and associated infrastructure.

Habitats on site

Aerial imagery indicates that most of the site consists of natural vegetation (karroid dwarf shrubland called Bushmanland Arid Grassland). There are drainage lines running through the site and a number of small pan depressions. There are also some low hills along the northern and eastern boundary of the site within which a low scrubby vegetation is expected to occur. The distribution of main habitats on site is shown in Figure 5.

Watercourses

The study area contains some watercourses / drainage lines. These are visible on aerial imagery and are shown in Figure 5. Wetlands, riparian zones and watercourses are defined in the National

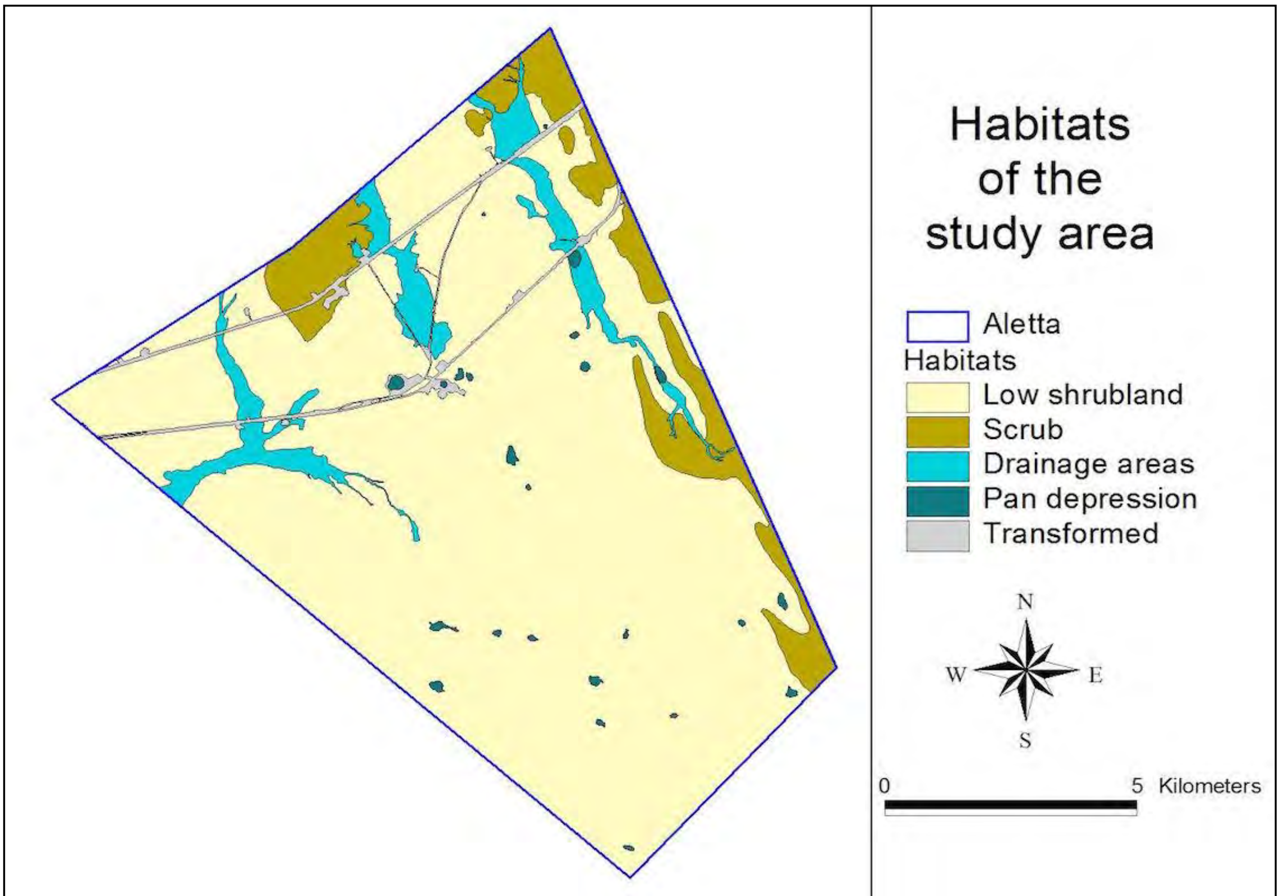

Figure 5: Main habitats of the study area.

Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). It is important that these areas are properly mapped and that impacts on them are kept to a minimum, if possible.

Sensitivity assessment

The sensitivity assessment identifies those parts of the study area that have high conservation value or that may be sensitive to disturbance. Areas of potentially high sensitivity are shown in Figure 6. The information provided in the preceding sections was used to compile a map of remaining natural habitats and areas important for maintaining ecological processes in the study area. The only features of potential concern that need to be taken into account in order to evaluate sensitivity in the study area is the presence of non-perennial watercourses and pan depressions. These represent ecological processes, including groundwater dynamics, hydrological processes, nutrient cycling and wildlife dispersal;

These factors have been taken into account in evaluating sensitivity within the study area. Watercourses are considered to be the most sensitive features on site. The sensitivity classification is as follows:

1. MEDIUM-HIGH: All of the watercourses, pans and drainage areas on site are classified as having medium-high sensitivity (see Figure 6). They are protected according to the

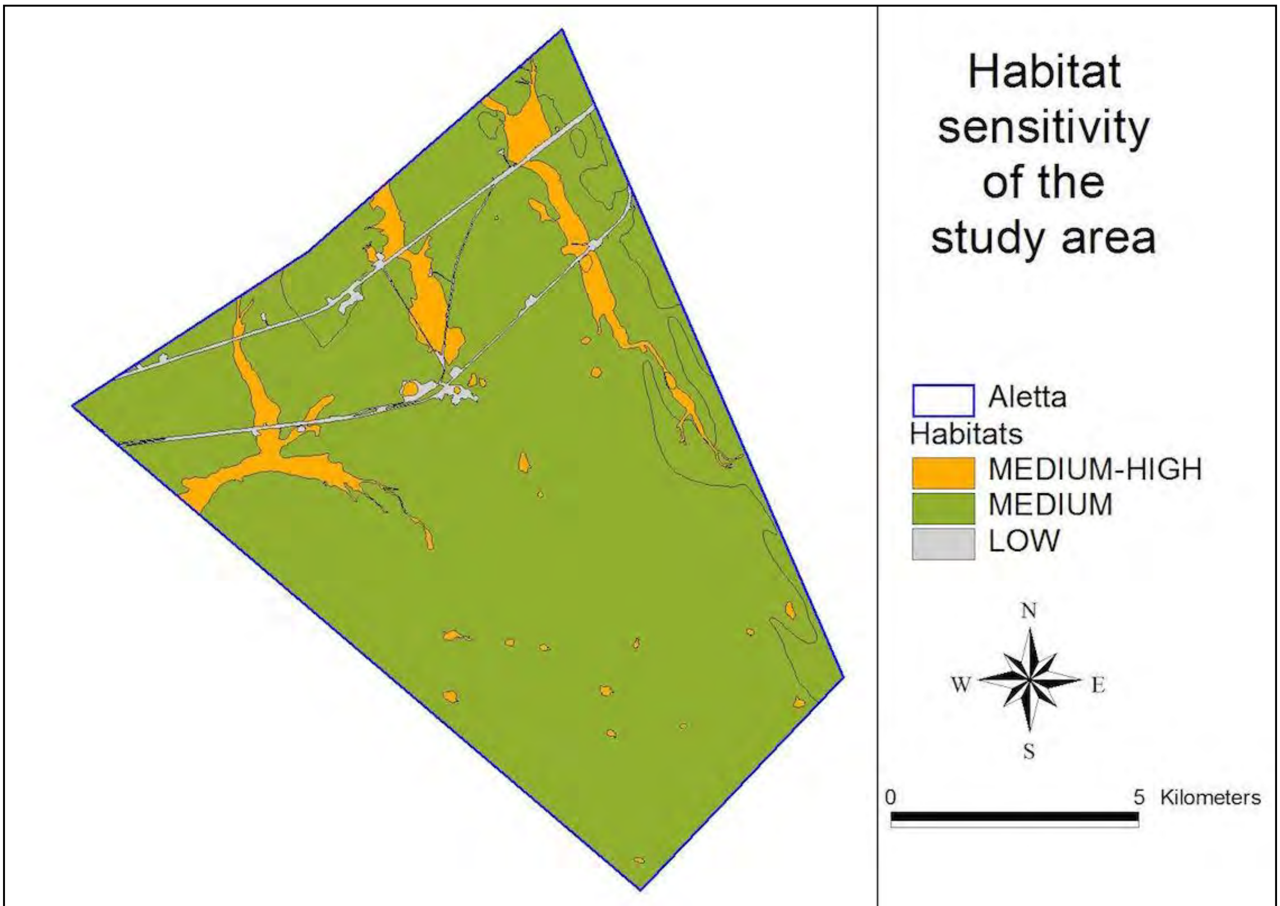

Figure 6: Potentially sensitive areas of the study area.

National Water Act (Act 36 of 1998). Ecologically, they are areas that provide moderate value ecosystem goods and services.

2. MEDIUM: The majority of the study area is classified as having medium sensitivity (see Figure 6). These are areas of natural vegetation which harbour no particular features of conservation concern, except for habitat that is potentially suitable for five near threatened animal species and one near threatened plant species (none confirmed to occur on site). There is one protected tree species that may also occur within some of these areas.
3. LOW: Trasnformed areas are classified as having low sensitivity (see Figure 6). These are areas in which no intact natural habitat still remains.

RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

Legislation

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

NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable",
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ,
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997

The ECA states that:

Development must be environmentally, socially and economically sustainable. Sustainable development requires the consideration of inter alia the following factors:

- that pollution and degradation of the environment is avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.

The developer is required to undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations in order to control activities which might have a detrimental effect on the environment. Such activities will only be permitted with written authorisation from a competent authority.

National Forests Act (Act no 84 of 1998)

Protected trees

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any *protected tree*, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.

Forests

Prohibits the destruction of indigenous trees in any natural forest without a licence.

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

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are "of a nature that may negatively impact on the survival of a listed threatened or protected species".

Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. According to Section 75 of the Act, "Control and eradication of listed invasive species":

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

Government Notice No. 1002 of 2011: National List of Ecosystems that are Threatened and in need of protection

Published under Section 52(1)(a) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). This Act provides for the listing of threatened or protected ecosystems based on national criteria. The list of threatened terrestrial ecosystems supersedes the information regarding terrestrial ecosystem status in the National Spatial Biodiversity Assessment (2004).

The Environmental Impact Assessment (EIA) Regulations include three lists of activities that require environmental authorisation:

- Listing Notice 1: activities that require a basic assessment (R544 of 2010),
- Listing Notice 2: activities that require seeping and environmental impact report (EIR) (R545 of 201 0),
- Listing Notice 3: activities that require a basic assessment in specific identified geographical areas only (R546 of 2010).

Activity 12 in Listing Notice 3 relates to the clearance of 300m^2 of more of vegetation, which will trigger a basic assessment within any critically endangered or endangered ecosystem listed in terms of S52 of the Biodiversity Act. This means any development that involves loss of natural habitat in a listed critically endangered or endangered ecosystem is likely to require at least a basic assessment in terms of the EIA regulations.

It is important to note that while the original extent of each listed ecosystem has been mapped, a basic assessment report in terms of the EIA regulations is triggered only in remaining natural habitat within each ecosystem and not in portions of the ecosystem where natural habitat has already been irreversibly lost.

GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001

Declared Weeds and Invaders in South Africa are categorised according to one of the following categories:

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

National Water Act (Act 36 of 1998)

Wetlands, riparian zones and watercourses are defined in the Water Act as a water resource and any activities that are contemplated that could affect the wetlands requires authorisation (Section 21 of the National Water Act of 1998). A "watercourse" in terms of the National Water Act (Act 36 of 1998) means:

- River or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and

Any collection of water which the Minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

National Veld and Forest Fire Act (Act No. 101 of 1998)

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

Northern Cape Nature Conservation Act, No. 9 of 2009

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:

- Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;
- Aquatic habitats may not be destroyed or damaged;
- The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

The Act provides lists of protected species for the Province. According to Northern Cape Nature Conservation officials, a permit is required for the removal of any species on this list.

Other Acts

Other Acts that may apply to biodiversity issues, but which are considered to not apply to the current site are as follows:

- National Environmental Management Protected Areas Act (Act No. 57 of 2003)
- Marine Living Resources Act (Act No. 18 of 1998)
- Sea Birds and Seals Protection Act (Act No. 46 of 1973)
- Lake Areas Development Act (Act No. 39 of 1975)
- Mountain Catchment Areas Act (Act No. 63 of 1970)
- Integrated Coastal Zone Management Act (Act No. 24 of 2008)

ASSESSMENT OF POTENTIAL IMPACTS

Description of potential impacts

Potential issues relevant to potential impacts on the ecology of the study area include the following:

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern (flora and fauna), including protected species, and on overall species richness. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Impacts on sensitive habitats: this includes impacts on any sensitive or protected habitats, including indigenous forest and/or woodland and wetland vegetation that leads to direct or indirect loss of such habitat.
- Impacts on ecosystem function: this includes impacts on any processes or factors that maintain ecosystem health and character, including the following:
    - disruption to nutrient-flow dynamics;
    - impedance of movement of material or water;
    - habitat fragmentation;
    - changes to abiotic environmental conditions;
    - changes to disturbance regimes, e.g. increased or decreased incidence of fire;
    - changes to successional processes;
    - effects on pollinators;
    - increased invasion by alien plants.

Changes to factors such as these may lead to a reduction in the resilience of plant communities and ecosystems or loss or change in ecosystem function.

- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.
- Impacts on the economic use of vegetation: this includes any impacts that affect the productivity or function of ecosystems in such a way as to reduce the economic value to users, e.g. reduction in grazing capacity, loss of harvestable products. It is a general consideration of the impact of a project on the supply of so-called ecosystem goods and services.

A number of direct risks to ecosystems that would result from **construction** of the proposed power line are as follows:

- Clearing of land for construction.
- Construction of access roads.
- Placement of power lines.
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Operation of construction camps.
- Storage of materials required for construction.

There are also risks associated with **operation** of the proposed facility, as follows:

- Maintenance of surrounding vegetation as part of management of the power line.
- Animal collisions with infrastructure, especially flying animals.
- Invasion of habitats by alien plants as a consequence of disturbance.

Potential issues for the general study area

A summary of the potential ecological issues for the study area is as follows:

- Presence of natural vegetation on site, although of low conservation priority.
- Potential presence of one plant species of concern, *Hoodia officinalis* subsp. *officinalis*, listed as Near Threatened.
- Potential presence of two protected plant species, *Hoodia gordonii* and *Harpagophytum procumbens.*
- Potential presence of one protected tree species, *Boscia albitrunca*.
- Presence of watercourses / drainage lines and pan depressions.
- Potential presence of the following animals of potential conservation concern:
    - Honey badger (NT)
    - Geoffroy's Horseshoe Bat (NT/LC)
    - Darling's Horseshoe Bat (NT)
    - Leseuer's Wing-gland Bat (NT)
    - Littledale's Whistling Rat (NT)
    - Giant Bullfrog (NT/LC).
- Potential invasion of natural habitats by alien invasive plants, thus causing additional impacts on biodiversity features.

Potential risks to the ecological receiving environment are therefore the following:

1. Loss of indigenous natural vegetation during construction;
2. Impacts on a near threatened plant species;
3. Impacts on protected plant species;
4. Impacts on a protected tree species;
5. Impacts on watercourses / drainage lines and pan depressions;
6. Mortality of populations of sedentary species during construction;
7. Displacement of populations of mobile species;
8. Introduction and/or spread of declared weeds and alien invasive plants in terrestrial habitats.

Planning Phase impacts

There are no impacts that are likely to be created as a result of project planning.

Construction Phase impacts

Impact 1: Impacts on indigenous natural vegetation

The regional terrestrial vegetation type in the broad study area is Bushmanland Basin Shrubland, listed as Least Threatened. Some loss of habitat will occur, but this will be insignificant in comparison to the total area of the vegetation type concerned.

Table 4a: Impact summary table for Impact 1.

ISSUE	**Impact4: Impacts on indigenous natural vegetation**
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.

ISSUE	Impact4: Impacts on indigenous natural vegetation
EXISTING IMPACT	Limited loss of natural vegetation in the study area and beyond and limited degradation of vegetation.
PREDICTED IMPACT	Moderate as some natural vegetation will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be low to moderate as there is some loss of habitat in the previous mining area of Copperton nearby.

Table 4b: Impact table for Impact 1.

Loss of indigenous natural vegetation		
Environmental parameter	*Indigenous natural vegetation*	
Issue/Impact/Environmental Effect/Nature	*Loss, degradation or fragmentation of vegetation.*	
Extent	*The impact will affect natural vegetation on site and possibly in immediately surrounding areas.*	
Probability	*The impact will definitely happen.*	
Reversibility	*Irreversible in human timeframes, since natural successional processes cannot compensate for complete local loss of habitat and diversity. Secondary vegetation will probably never resemble the original vegetation found on site.*	
Irreplaceable loss of resources	*Significant loss of resources will occur.*	
Duration	*The impact will be permanent (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient.)*	
Cumulative effect	*Low cumulative impact. Added to existing impacts on natural habitat from mining activities in the general region, the current project will cause additional loss of vegetation, but the cumulative effect will not be great.*	
Intensity/magnitude	*Medium. Regional vegetation will continue to function.*	
Significance rating	*Medium negative impact expected.*	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	4	4
Irreplaceable loss	3	3
Duration	4	4
Cumulative effect	2	2
Intensity/magnitude	2	2
Significance rating	-36 (medium negative)	-36 (medium negative)
Mitigation measures	*The following mitigation measures would help to limit impacts:* 1. *Restrict impact to development footprint only and limit disturbance creep into surrounding areas.*	

	2. *As far as possible, locate infrastructure within areas that have been previously disturbed or in areas with lower sensitivity scores.* 3. *Undertake detailed field surveys of the proposed footprint of infrastructure to locate any sensitive ecological features. If necessary, shift infrastructure to avoid impacts on specific features.* 4. *Compile a Rehabilitation Plan.* 5. *Compile an Alien Plant Management Plan, including monitoring, to ensure minimal impacts on surrounding areas.*

Impact 2: Impacts on near threatened plant species

Nature: Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened plant species, loss of a population or individuals could lead to a direct change in the conservation status of the species, possibly extinction. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chance of survival of the species.

The Near Threatened species, *Hoodia officinalis* subsp. *officinalis*, may occur on site, a succulent that is found in desert, Nama Karoo and succulent Karoo inside bushes in flat or gently sloping areas.

Table 5a: Impact summary table for Impact 2.

ISSUE	**Impact2: Impacts on a near threatened plant species**
DISCUSSION	There is one Near Threatened plant species that could potentially occur on site.
EXISTING IMPACT	Limited to previous mining areas off-site.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether plant species occurs on site or not)
CUMULATIVE EFFECT	Populations of species of concern, if they occur on site, will probably not be affected or can be avoided.

Table 5b: Impact table for Impact 2.

Loss of individuals of near threatened plants

Environmental parameter	*One near threatened plant species that could potentially occur on site*
Issue/Impact/Environmental Effect/Nature	*Loss of individuals.*
Extent	*The impact will affect local populations or individuals of the affected species.*
Probability	*The impact may possibly happen.*
Reversibility	*Partly reversible. Individuals can be rescued, but this is not considered an effective conservation measure.*
Irreplaceable loss of resources	*Marginal loss of resources could occur. The species that is likely to occur on site is scattered across a relatively wide geographical range.*
Duration	*The impact will be effectively permanent within the areas where it would be lost.*
Cumulative effect	*Low cumulative impact. Cumulative effects will not be significant.*
Intensity/magnitude	*Medium. Loss of some individuals will be relatively insignificant compared to the number that probably occur in surrounding areas, but this depends on whether the species occurs on site and how many individuals will be affected.*
Significance rating	*Low negative impact expected.*

	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	4	4
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-9 (low negative)
Mitigation measures	*It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required during a favourable season to locate any affected plants. Plants lost to the development can be rescued and planted in appropriate places during rehabilitation. This will reduce the irreplaceable loss of resources as well as the cumulative effect and overall intensity. Where concentrations of the plant are found, infrastructure components should be shifted to avoid such areas.*	

Impact 3: Impacts on protected plant species

Nature: Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

There are two species protected according to the National Environmental Management: Biodiversity Act, *Hoodia gordonii* and *Harpagophytum procumbens*. There are a number of species that may be protected according to the Northern Cape Nature Conservation Act. There is a high probability that one or more of these species will be affected by activities on site.

Table 6a: Impact summary table for Impact 3.

ISSUE	**Impact 3: Impacts on protected plant species**
DISCUSSION	There are two nationally protected plant species that could potentially occur on site and there is a probability that a number of Provincially protected species occur on site.
EXISTING IMPACT	Limited to previous mining areas off-site.
PREDICTED IMPACT	Moderate to Low as natural vegetation will be lost, but not sure whether species occur on site or not.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether nationally protected plant species occurs on site or not. Additionally, field surveys are required to document all species protected according to the Provincial legislation)
CUMULATIVE EFFECT	Populations of protected species have probably already been affected by nearby mining activities, but this is impossible to determine.

Table 6b: Impact table for Impact 3.

Loss of individuals of protected plants		
Environmental parameter	*Protected plants, as per NEM:BA and Northern Cape Nature Conservation Act.*	
Issue/Impact/Environmental Effect/Nature	*Loss of individuals.*	
Extent	*The impact will affect local populations or individuals of the affected species.*	
Probability	*Based on the list of species that are protected, the impact will almost certainly happen.*	
Reversibility	*Partly reversible. Individuals can be rescued or else cultivated to replace lost specimens.*	
Irreplaceable loss of resources	*Marginal loss of resources could occur. The species that are likely to occur on site are likely to be relatively common throughout their range.*	
Duration	*The impact will be medium-term.*	
Cumulative effect	*Low cumulative impact. Cumulative effects will not be significant.*	
Intensity/magnitude	*Low. Loss of some individuals will be insignificant compared to the number that probably occur in surrounding areas.*	
Significance rating	*Low negative impact expected.*	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	2	2

Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-11 (low negative)	-9 (low negative)
Mitigation measures	*It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required during a favourable season to locate any protected plants. Plants lost to the development can be rescued and planted in appropriate places in rehabilitation areas. This will reduce the irreplaceable loss of resources as well as the cumulative effect.*	

Impact 4: Loss of individuals of protected trees

There is one protected tree species that could occur on site, *Boscia albitrunca*. Whether this species occurs on site or not is unknown until a site evaluation has been undertaken.

Table 7a: Impact summary table for Impact 4.

ISSUE	Impact 4: Loss of individuals of protected trees
DISCUSSION	There is one protected tree species that could occur on site, but it is unknown whether it occurs there or not.
EXISTING IMPACT	None known.
PREDICTED IMPACT	Moderate to Low depending on numbers that occur on site.
EIA INVESTIGATION REQUIRED	Yes (field investigation required to determine whether species occurs on site or not)
CUMULATIVE EFFECT	Predicted to be low due to low number of individuals likely to be affected.

Table 7b: Impact table for Impact 4.

Loss of individuals of protected trees	
Environmental parameter	*Protected trees, as per National Forests Act.*
Issue/Impact/Environmental Effect/Nature	*Loss of individuals.*
Extent	*The impact will affect local populations or individuals of the affected species.*
Probability	*The impact may possibly happen.*
Reversibility	*Partly reversible. Individuals can be rescued or else cultivated to replace lost specimens, but this is likely to have limited value as a mitigation measure.*
Irreplaceable loss of resources	*Marginal loss of resources could occur. The species that are likely to occur on site are likely to be relatively common throughout their range.*
Duration	*The impact will be medium-term.*
Cumulative effect	*Low cumulative impact. Cumulative effects will not be significant.*
Intensity/magnitude	*Low. Loss of some individuals will be insignificant compared to the number that probably occur in surrounding areas.*
Significance rating	*Low negative impact expected.*

	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	2
Reversibility	2	2
Irreplaceable loss	2	1
Duration	2	2
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	-11 (low negative)	-9 (low negative)
Mitigation measures	*It is a legal requirement to obtain permits for specimens that will be lost. A pre-construction walk-through survey will be required to locate any protected trees. Concentrations of plants can be avoided by shifting infrastructure components, where necessary. This will reduce the irreplaceable loss of resources as well as the cumulative effect.*	

Impact 5: Impacts on watercourses / drainage lines

There is one main watercourse and one subsidiary watercourse occurring on site. There are also three small pans on site. The plant species composition within these areas is probably different to surrounding terrestrial areas, even though the site is within an arid region. Some loss of habitat will probably occur within these areas and this may possibly affect downstream areas.

Table 8a: Impact summary table for Impact 5.

ISSUE	**Impact 5: Impacts on watercourses / drainage areas and pan depressions**
DISCUSSION	Losses would be suffered where areas need to be cleared of natural vegetation.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond and limited degradation of watercourses.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (a formal impact assessment is required)
CUMULATIVE EFFECT	Predicted to be moderate as there is some loss of habitat in the previous mining area of Copperton nearby.

Table 8b: Impact table for Impact 5.

Damage to watercourses / drainage areas and pan depressions	
Environmental parameter	*Watercourses, drainage areas and pan depressions*
Issue/Impact/Environmental Effect/Nature	*Loss, degradation or fragmentation of vegetation.*
Extent	*The impact may affect watercourses / drainage areas and pan depressions on site.*
Probability	*The impact will probably happen*
Reversibility	*Irreversible in human timeframes, since natural successional processes cannot compensate for complete local loss of habitat and diversity. Secondary vegetation*

	will probably never resemble the original vegetation found on site.
Irreplaceable loss of resources	*Marginal loss of resources will occur.*
Duration	*The impact will be permanent (mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient.)*
Cumulative effect	*Medium cumulative impact. Added to existing impacts on natural habitat, the current project will cause additional loss of habitat.*
Intensity/magnitude	*Medium. Wetland systems will probably continue to function, but in a modified way.*
Significance rating	*Medium negative impact expected.*

	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	4	2
Reversibility	4	2
Irreplaceable loss	2	2
Duration	4	2
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	-30 (medium negative)	-10 (low negative)
Mitigation measures	*The following mitigation measures would help to limit impacts:* 1. *Select alternative sites for infrastructure where features of concern may be affected.* 2. *Prevent erosion impacts on wetland systems.* 3. *Rehabilitate disturbance as quickly as possible.* 4. *Prevent invasion by alien plants.* 5. *Undertake monitoring to evaluate whether further measures would be required to manage impacts.*	

Impact 6: Mortality of populations of sedentary species

There are 5 animal species of conservation concern that could potentially be affected by the proposed project:

1. Honey badger (NT)
2. Geoffroy's Horseshoe Bat (NT/LC)
3. Darling's Horseshoe Bat (NT)
4. Leseuer's Wing-gland Bat (NT)
5. Littledale's Whistling Rat (NT)
6. Giant Bullfrog (NT/LC)

Only two of these species, Littledale's Whistling Rat and the Giant Bullfrog, are relatively sedentary and therefore considered to be potentially vulnerable to habitat loss, as related to this project. The remaining species are highly mobile and will not be affected by some loss of habitat within their overall range.

Table 9a: Impact summary table for Impact 6.

ISSUE	Impact 6: Impacts on sedentary fauna
DISCUSSION	For species resident on site, loss of habitat would lead to local extinction of populations currently on site. For all other species listed, the loss of habitat would be unlikely to have any significant effect, since the species are mobile and would utilize other adjacent habitat.
EXISTING IMPACT	Limited loss of natural habitat in the study area and beyond.
PREDICTED IMPACT	Moderate as some habitat will be lost and the loss will be permanent.
EIA INVESTIGATION REQUIRED	Yes (presence or potential presence of two species vulnerable to the impact, Littledale's Whistling Rat and the Giant Bullfrog, needs to be established)
CUMULATIVE EFFECT	Predicted to be low because there is adequate habitat in surrounding areas to support displaced populations.

Table 9b: Impact summary table for Impact 6.

Mortality of individuals of sedentary fauna		
Environmental parameter	*Littledale's Whistling Rat and the Giant Bullfrog*	
Issue/Impact/Environmental Effect/Nature	*Loss of individuals.*	
Extent	*The impact will affect individuals on site and possibly in immediately surrounding areas.*	
Probability	*The impact may possibly happen.*	
Reversibility	*Partly reversible. Preventative measures could reduce mortality to below replacement levels.*	
Irreplaceable loss of resources	*Marginal loss of resources will occur.*	
Duration	*The impact will be long-term.*	
Cumulative effect	*Medium cumulative impact. Cumulative effects will be minor.*	
Intensity/magnitude	*Medium. May impact on population processes.*	
Significance rating	*Low negative impact expected.*	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	-26 (low negative)	-11 (low negative)
Mitigation measures	*Undertake field surveys to determine whether either species does or could occur on site or not. If either species occurs on site, the habitat requirements of the species on site needs to be determined. Infrastructure must then avoid sensitive areas or else measures must be put in place to minimise impacts.*	

Impact 7: Displacement of mobile fauna
Construction activities, loss of habitat, noise, dust and general activity associated with the construction phase of the project are likely to cause all mobile species to move away from the site. Mobile species of conservation concern (two sedentary species are discussed for the previous impact) that could potentially be affected by the proposed project are as follows:

1. Honey badger (NT)
2. Geoffroy's Horseshoe Bat (NT/LC)
3. Darling's Horseshoe Bat (NT)
4. Leseuer's Wing-gland Bat (NT)

Except for the Honey Badger, all of these are flying animals that have wide ranges. The Honey Badger is a highly mobile terrestrial species with a large home range and the ability to travel long distances in short periods of time. For all these species, they may be locally displaced, but this will have little effect on the overall range of any of these species nor is it expected that any overall impacts will result from local displacement.

Table 10a: Impact summary table for Impact 7.

ISSUE	**Impact 7: Displacement of mobile fauna**
DISCUSSION	Fauna may be displaced due to noise and habitat disturbances on site, as well as general activities on site.
EXISTING IMPACT	None known
PREDICTED IMPACT	Low as some individuals may be locally displaced, but it is unlikely to have any significant effect on any of the listed species.
EIA INVESTIGATION REQUIRED	No
CUMULATIVE EFFECT	Predicted to be low as populations will return to surrounding habitats after construction activities have been completed.

CUMULATIVE EFFECT	Predicted to be low because there is adequate habitat in surrounding areas to support displaced populations.

Table 9b: Impact summary table for Impact 6.

Displacement of individuals of mobile fauna		
Environmental parameter	*Mobile fauna of conservation concern*	
Issue/Impact/Environmental Effect/Nature	*Displacement of individuals.*	
Extent	*The impact will affect individuals on site and possibly in immediately surrounding areas.*	
Probability	*The impact may possibly happen.*	
Reversibility	*Partly reversible with time.*	
Irreplaceable loss of resources	*No or low loss of resources will occur.*	
Duration	*The impact will be short-term (construction phase).*	
Cumulative effect	*Low cumulative impact. Cumulative effects will be minor.*	
Intensity/magnitude	*Low. May impact on population processes.*	
Significance rating	*Low negative impact expected.*	
	Pre-mitigation impact rating	Post-mitigation impact rating

Extent	1	1
Probability	2	1
Reversibility	2	2
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	-8 (low negative)	-7 (low negative)
Mitigation measures	*Undertake field surveys to determine whether species does or could occur on site or not. If species occurs on site, the habitat requirements of the species on site needs to be determined. Infrastructure must then avoid sensitive areas or else measures must be put in place to minimise impacts.*	

Operational Phase impacts

Impact 8: Establishment and spread of declared weeds and alien invader plants

Major factors contributing to invasion by alien invader plants includes *inter alia* high disturbance (such as clearing for construction activites) and negative grazing practices (Zachariades *et al*. 2005). Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al*. 2003). Consequences of this may include:

1. loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;
8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The potential consequences may be of low seriousness for surrounding natural habitats due to the fact that little natural vegetation still remains on site. Control measures could prevent the impact from occurring.

Table 11a: Impact summary table for Impact 9.

ISSUE	**Impact 9: Establishment and spread of declared weeds**
DISCUSSION	There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures.
EXISTING IMPACT	Unknown to what extent alien invasive species currently occur on site, but existing transformation and disturbance on site has probably created conditions favourable for these species.

ISSUE	Impact 9: Establishment and spread of declared weeds
PREDICTED IMPACT	Moderate to Low due to existing conditions on site. Impact can be easily managed with control measures.
EIA INVESTIGATION REQUIRED	Yes (presence of alien plants on site and in surrounding areas to be investigated)
CUMULATIVE EFFECT	Predicted to be low due to existing impacts on site and high ability to control any additional impact.

Table 11b: Impact summary table for Impact 9.

Establishment and spread of declared weeds		
Environmental parameter	*Vegetation and habitat*	
Issue/Impact/Environmental Effect/Nature	*Loss of habitat due to invasion by alien plants*	
Extent	*The impact will affect habitat on site and possibly in immediately surrounding areas.*	
Probability	*The impact will probably happen in the absence of control measures.*	
Reversibility	*Partly reversible in the absence of control measures. Completely reversible if mitigation measures applied. Preventative measures will stop the impact from occurring.*	
Irreplaceable loss of resources	*Marginal to significant loss of resources will occur. Uncontrolled invasion can affect all nearby natural habitats.*	
Duration	*The impact will be long-term.*	
Cumulative effect	*Low cumulative impact. Cumulative effects will not be significant.*	
Intensity/magnitude	*Medium. Severe invasion can alter the functioning of natural ecosystems.*	
Significance rating	*Low negative impact expected.*	
	Pre-mitigation impact rating	Post-mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	1
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	2	1
Significance rating	-28 (medium negative)	-11 (low negative)
Mitigation measures	*Undertake surveys to determine which species occur on site and whether there are any major concentrations of alien species.* *Compile and implement an alien management plan.* *Undertake regular monitoring to detect alien invasions early so that they can be controlled. Implement control measures.*	

Decommissioning Phase impacts

It is expected that the project will operate for a minimum of twenty years or more (a typical planned life-span for a project of this nature. Decommissioning will probably require a series of steps resulting in the removal of equipment from the site and rehabilitation of footprint areas. It is possible that the site could be returned to a rural nature, but it is unlikely that natural vegetation would become established on site for a very long time. The reality is that it is not possible to determine at this stage whether rehabilitation measures will be implemented or not or what the future plans for the site would be nor is it possible at this stage to determine what surrounding land pressures would be. These uncertainties make it impossible to undertake any assessment to determine possible impacts of decommissioning.

DISCUSSION AND CONCLUSIONS

Biodiversity features in the study area

The vegetation types that occur on the sites are classified as Least Threatened and also have a wide distribution and extent. The natural vegetation on the sites is therefore not considered to have high conservation status. The area is not within a Centre of Plant Endemism or in areas identified in Provincial Conservation Plans to be of concern, but it does occur within an area identified as part of the National Parks Area Expansion Strategy.

Local factors that may lead to parts of the sites having elevated ecological sensitivity are the presence of watercourses / drainage lines on site, the potential presence of one plant species of low conservation concern and the potential presence of various animal species of conservation concern. There is also a protected tree (*Boscia albitrunca*) that possibly occurs in the general region, but whether this species occurs within the project study area is unknown. It has been previously observed in the type of habitat that occurs in the low hills on site. There are various protected plants that could occur on site.

Drainage lines and pans (wetlands) represent particularly vital natural corridors as they function both as wildlife habitat, providing resources needed for survival, reproduction and movement, and as biological corridors, providing for movement between habitat patches. Wetlands (including drainage lines) are protected under national legislation (National Water Act). Any impacts on these areas would require a permit from the National Department of Water Affairs.

There are a number of animal species of conservation concern that may occur in habitats within the study area. This includes one frog species, the Giant Bullfrog, and five mammal species (Honey Badger (NT), Geoffroy's Horseshoe Bat (NT), Darling's Horseshoe Bat (NT), Leseuer's Wing-gland Bat (NT) and Littledale's Whistling Rat (NT)). Lists and habitat requirements for these species are provided in the appendices to this report.

One protected amphibian species, the Giant Bullfrog, has a geographical distribution that includes the site. This species is protected according to the National Environmental Management: Biodiversity Act (Act No 10 of 2004). Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. It is most likely to be found near seasonal pans or water sources and is not likely to be a major issue.

Bats do not appear, from this initial assessment, to be of major concern. There are a maximum of three species of low conservation concern that could be affected. All species are listed as Near Threatened in South Africa and globally as Least Concern. The key factor is the presence of roosting habitats nearby, which is of higher concern in areas close to mountainous or rocky hillside topography. There are no such topographical features in close proximity to the project study area.

The study area consists almost entirely of natural vegetation, with the exception of the road and other linear infrastructure that passes through the site. Transformed and degraded areas in the project study area have low sensitivity and conservation value, but are localised to very small areas. Most areas have medium sensitivity and drainage areas / watercourses and pan depressions have medium-high sensitivity.

Summary of potential impacts

A summary of the potential risks to the ecological receiving environment are therefore the following:

1. Impacts on indigenous natural vegetation;
2. Impacts on a plant species of low conservation concern (if it occurs on site);
3. Impacts on protected plant species;
4. Impacts on a protected tree species;
5. Impacts on watercourses / drainage lines;
6. Mortality of sedentary animals;
7. Displacement of mobile fauna;
8. Establishment and spread of declared weeds and alien invader plants.

The displacement of mobile fauna (Impact 7) is considered to be unlikely to be important for this site and project. All other potential impacts should be investigated in the EIA phase or should be assessed using formal methodology.

Conclusions

There are some relatively minor issues related to the ecology of the site that could result in potentially significant ecological impacts. The seriousness of many of these impacts can be determined during the field investigation of the site. Some impacts require permits to be issued, either by National or Provincial authorities and field data is required for the permit applications.

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APPENDICES:

Appendix 1: Plant species of conservation importance (Threatened, Near Threatened and Declining) that have historically been recorded in the general geographical area that includes Copperton.

Sources: South African National Biodiversity Institute in Pretoria.

Family	Taxon	Status	Distribution and habitat	Likelihood of occurrence on site
APOCYNACEAE	Hoodia officinalis subsp. officinalis	NT	Southern Namibia (except winter rainfall areas and deep sands of Kalahari in the east) and from Griqualand West near Douglas to Kimberley and Jacobsdal. Free State and Northern Cape in SA. Desert, Nama Karoo, Succulent Karoo. Inside bushes in flat or gently sloping areas.	**HIGH**, within known distribution, habitat on site suitable.
HYACINTHACEAE	Drimia sanguinea	NT	Northern Cape and diagonally across to Limpopo and Mpumalanga Provinces, Namibia, Botswana and Zimbabwe. Distribution is somewhat to the north of the current area. Open veld and scrubby woodland in a variety of soil types.	**LOW**, edge of known range, although habitat on site may be suitable

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

Appendix 2: List of protected tree species (National Forests Act).

Acacia erioloba	*Acacia haematoxylon*
Adansonia digitata	*Afzelia quanzensis*
Balanites subsp. *maughamii*	*Barringtonia racemosa*
Boscia albitrunca	*Brachystegia spiciformis*
Breonadia salicina	*Bruguiera gymnhorrhiza*
Cassipourea swaziensis	*Catha edulis*
Ceriops tagal	*Cleistanthus schlectheri* var. *schlechteri*
Colubrina nicholsonii	*Combretum imberbe*
Curtisia dentata	*Elaedendron (Cassine) transvaalensis*
Erythrophysa transvaalensis	*Euclea pseudebenus*
Ficus trichopoda	*Leucadendron argenteum*
Lumnitzera racemosa var. *racemosa*	*Lydenburgia abottii*
Lydenburgia cassinoides	*Mimusops caffra*
Newtonia hildebrandtii var. *hildebrandtii*	*Ocotea bullata*
Ozoroa namaensis	*Philenoptera violacea* (*Lonchocarpus capassa*)
Pittosporum viridiflorum	*Podocarpus elongatus*
Podocarpus falcatus	*Podocarpus henkelii*
Podocarpus latifolius	*Protea comptonii*
Protea curvata	*Prunus africana*
Pterocarpus angolensis	*Rhizophora mucronata*
Sclerocarya birrea subsp. *caffra*	*Securidaca longependunculata*
Sideroxylon inerme subsp. *inerme*	*Tephrosia pondoensis*
Warburgia salutaris	*Widdringtonia cedarbergensis*
Widdringtonia schwarzii	

Boscia albitrunca has a geographical distribution that coincides with the study areas.

Appendix 3: Animal species with a geographical distribution that includes the study area.

Notes:

1. Species of conservation concern are in red lettering.
2. Species protected according to the National Environmental Management: Biodiversity Act of 2004 (Act 10 of 2000) marked with "N"

Mammals:

Springbok
[N]Black rhinoceros (arid ecotype)
Klipspringer
Gemsbok
Steenbok
Common duiker
Rock hyrax
Water mongoose
Black-backed jackal
Caracal
Yellow mongoose
[N]Black-footed cat
African wild cat
Small grey mongoose
Small-spotted genet
Striped polecat
[N]Honey badger NT
Bat-eared fox
[N]Leopard
Aardwolf
Suricate
[N]Cape fox
Leseur's wing-gland bat NT
Cape serotine bat
Egyptian slit-faced bat
Geoffroy's horseshoe bat NT
Darling's horseshoe bat NT
Egyptian free-tailed bat
Reddish-grey musk shrew
Cape/desert hare
Scrub/savannah hare
Namaqua rock mouse
Short-tailed gerbil
Hairy-footed gerbil
Spectacled dormouse
Porcupine
Large-eared mouse
Multimammate mouse
Karoo bush rat
Brant's whistling rat
Littledale's whistling rat NT
Springhare
Striped mouse
Bushveld gerbil
Cape ground squirrel
Smith's rock elephant shrew
Round-eared elephant shrew
Aardvark

Reptiles:

Puff adder
Horned adder
Cape cobra
Rinkhals
Coral snake
Dwarf beaked snake
Karoo whip snake
(Spotted skaapsteker)
(Common tiger snake)
Beetz's tiger snake
Herald snake
Brown house snake
(Aurora house snake)
(Spotted rock snake)
(Fisk's house snake)
Mole snake
Sundevall's shovel-snout
(Common slug-eater)
Common wolf snake
Common egg-eater
Delalande's beaked blind snake
Common ground agama
Anchieta's agama
Southern rock agama
Common flap-necked chameleon
Rock monitor
(Bushveld lizard)
Spotted desert lizard
Western sandveld lizard
(Plain sand lizard)
Karoo (Cape) sand lizard
(Spotted sand lizard)
Common sand lizard
Namaqua sand lizard
(Striped dwarf legless skink)
Cape skink
Western three-striped skink
(Kalahari tree skink)
Western rock skink
Variegated skink
Karoo girdled lizard
Common giant ground gecko
Bibron's gecko
Cape gecko
(Common rough gecko)

Marico gecko
Purcell's gecko
Spotted barking gecko
Marsh terrapin
(Karoo padloper)
Leopard tortoise
(Karoo tent tortoise)
Verrox's tent tortoise

Amphibians
(Bushveld rain frog)
Guttural toad
Southern pygmy toad
Karoo toad
(Bubbling kassina)
Common platanna
Boettger's caco
Common river frog
Cape river frog
[N]Giant bullfrog NT
Tremolo sand frog
Tandy's sand frog

Appendix 4: Threatened vertebrate species with a geographical distribution that includes the Copperton area.

MAMMALS

Common name	Taxon	Habitat[1]	National status	Global status[2]	Likelihood of occurrence
Black rhinoceros	*Diceros bicornis bicornis*	Wide variety of habitats, but currently only occurs in game reserves.	CR	CR	**NONE**, only occurs in game reserves
Honey badger	*Mellivora capensis*	Wide variety of habitats. Probably only in natural habitats.	NT	LC	**HIGH**, overall geographical distribution includes this area, habitat is suitable.
Leseuer's wing-gland bat	*Cistugo leseuri*	Caves and subterranean habitats; fynbos, shrubland, grassland, succulent and Nama-karoo; insectivore	NT	LC	**LOW**, overall geographical distribution includes this area, general habitat is suitable - no caves on site.
Geoffroy's horseshoe bat	*Rhinolophus clivosus*	Caves and subterranean habitats; fynbos, shrubland, grassland, succulent and Nama-karoo; insectivore	NT	LC	**LOW**, overall geographical distribution includes this area, general habitat is suitable – no caves on site.
Darling's horseshoe bat	*Rhinolophus darlingi*	Caves and subterranean habitats. Woodland savannah.	NT	LC	**LOW**, overall geographical distribution includes this area, general habitat not suitable – no caves on site.
Littledale's whistling rat	*Parotomys littledalei*	Desert, Karoo. Sandy or gravel open plains. Tends to excavate burrow beneath a shrub, but will also contruct stick nest at the base of a shrub. Herbivorous, favouring leaves of *Zygophullum* and Mesembryanthemaceae.	NT	LC	**MEDIUM**, overall geographical distribution includes this area, general habitat is suitable

[1]Distribution and national status according to Friedmann & Daly 2004.
[2]Global status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 11 September 2010.

AMPHIBIANS

Common name	Species	Habitat	Status	Likelihood of occurrence
Giant Bullfrog	*Pyxicephalus adspersus*	Widely distributed in southern Africa, mainly at higher elevations. Inhabits a variety of vegetation types where it breeds in seasonal, shallow, grassy pans in flat, open areas; also utilises non-permanent vleis and shallow water on margins of waterholes and dams. Prefer sandy substrates although they sometimes inhabit clay soils.	NT[1] LC[2] Protected (NEMBA)	**MEDIUM**, within known distribution range and partially suitable habitat occurs on site.

[1]Status according to Minter et al. 2004.
[2]Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. (www.iucnredlist.org). Downloaded on 11 September 2010.

REPTILES

Common name	Species	Habitat	Status[3]	Likelihood of occurrence
None				

[3]Distribution according to Alexander & Marais 2007.
[4]Status according to Alexander & Marais 2007.

Appendix 4: Checklist of plant species recorded during previous botanical surveys in the study area and surrounds.
(Species from quarter degree grid in which the site is located as well as surrounding grids in which similar vegetation is found. Species marked with a "1" were recorded in an Acocks site nearby.)

[1]Alternanthera pungens
[1]Amaranthus thunbergii
Aptosimum albomarginatum Marloth & Engl.
[1]Aptosimum marlothii
Aptosimum procumbens (Lehm.) Steud.
[1]Aptosimum spinescens
[1]Aristida adscensionis L.
Aristida congesta Roem. & Schult. subsp. congesta
[1]Aristida congesta subsp. barbicollis
Asparagus bechuanicus Baker
Asparagus glaucus Kies
Barleria rigida Nees
[1]Berkheya annectens
Blepharis mitrata C.B.Clarke
[1]Brachiaria marlothii
Bulbine frutescens (L.) Willd.
Calobota spinescens (Harv.) Boatwr. & B.-E.van Wyk
[1]Chamaesyce inaequilatera
Chascanum pumilum E.Mey.
Chloris virgata Sw.
Chrysocoma ciliata L.
Chrysocoma obtusata (Thunb.) Ehr.Bayer
[1]Convolvulus sagittatus
Coronopus integrifolius (DC.) Spreng.
Cucumis africanus L.f.
Cullen biflora (Harv.) C.H.Stirt.
Cullen tomentosum (Thunb.) J.W.Grimes
Cynanchum orangeanum (Schltr.) N.E.Br.
[1]Deverra denudata subsp. aphylla
Dicoma capensis Less.
Dipcadi viride (L.) Moench
[1]Enneapogon desvauxii P.Beauv.
Enneapogon scaber Lehm.
[1]Eragrostis annulata Rendle ex Scott-Elliot
Eragrostis biflora Hack. ex Schinz
Eragrostis echinochloidea Stapf
Eragrostis homomalla Nees
Eragrostis lehmanniana Nees var. lehmanniana
[1]Eragrostis lehmanniana var. chaunantha
Eragrostis nindensis Ficalho & Hiern
Eragrostis obtusa Munro ex Ficalho & Hiern
Eragrostis porosa Nees
[1]Eragrostis procumbens Nees
[1]Eragrostis truncata Hack.
Euphorbia inaequilatera Sond. var. inaequilatera
Galenia africana L.
Gazania jurineifolia DC. subsp. scabra (DC.) Roessler
Gazania krebsiana Less. subsp. arctotoides (Less.) Roessler

Geigeria acaulis (Sch.Bip.) Benth. & Hook.f. ex Oliv. & Hiern
Geigeria filifolia Mattf.
Geigeria ornativa O.Hoffm. subsp. ornativa
Gisekia pharnacioides L. var. pharnacioides
[1]Gnidia polycephala
[1]Gomphocarpus fruticosus subsp. fruticosus
Helichrysum herniarioides DC.
Helichrysum lucilioides Less.
[1]Heliotropium lineare
Hermannia bicolor Engl. & Dinter
[1]Hermannia coccocarpa
[1]Hermannia comosa Burch. ex DC.
Hermannia pulverata Andrews
Hermannia spinosa E.Mey. ex Harv.
Hoodia flava (N.E.Br.) Plowes
Hypertelis salsoloides (Burch.) Adamson var. salsoloides
[1]Indigofera alternans DC. var. alternans
Indigofera auricoma E.Mey.
Jamesbrittenia tysonii (Hiern) Hilliard
Kedrostis africana (L.) Cogn.
Kohautia cynanchica DC.
[1]Lessertia pauciflora Harv. var. pauciflora
[1]Leucas capensis
Limeum aethiopicum Burm.f. var. aethiopicum
Limeum aethiopicum Burm.f. var. glabrum Moq.
Limeum aethiopicum Burm.f. var. lanceolatum Friedrich
[1]Limeum aethiopicum subsp. aethiopicum var. aethiopicum
Limeum argute-carinatum Wawra ex Wawra & Peyr. var. argute-carinatum
Limeum myosotis H.Walter var. confusum Friedrich
Limeum myosotis H.Walter var. myosotis
Lophiocarpus polystachyus Turcz.
Lotononis platycarpa (Viv.) Pic.Serm.
[1]Lycium cinereum
Lycium horridum Thunb.
Lycium schizocalyx C.H.Wright
Mestoklema arboriforme (Burch.) N.E.Br. ex Glen
Microloma incanum Decne.
Microloma longitubum Schltr.
[1]Mollugo cerviana (L.) Ser. ex DC. var. cerviana
[1]Monechma incanum (Nees) C.B.Clarke
Monechma spartioides (T.Anderson) C.B.Clarke
Nolletia gariepina (DC.) Mattf.
[1]Oligomeris dipetala var. dipetala
Oropetium capense Stapf
Osteospermum rigidum Aiton var. rigidum
[1]Osteospermum spinescens
[1]Panicum lanipes
Panicum maximum Jacq.
Pegolettia retrofracta (Thunb.) Kies
Peliostomum leucorrhizum E.Mey. ex Benth.
Pentzia incana (Thunb.) Kuntze
Pentzia lanata Hutch.
Phymaspermum parvifolium (DC.) Benth. & Hook. ex B.D.Jacks.
Polygala leptophylla Burch. var. leptophylla

[1]Polygala seminuda Harv.
Prosopis velutina Wooton EXOTIC
Rhigozum trichotomum Burch.
[1]Rosenia humilis (Less.) K.Bremer
Salsola calluna Fenzl ex C.H.Wright
Salsola kalaharica Botsch.
[1]Salvia verbenaca L.
Schoenoplectus leucanthus (Boeck.) J.Raynal
Senecio niveus (Thunb.) Willd.
Sericocoma avolans Fenzl
Sesamum capense Burm.f.
Setaria verticillata (L.) P.Beauv.
Sisymbrium burchellii DC. var. burchellii
Solanum namaquense Dammer
[1]Sporobolus ioclados
Sporobolus nervosus Hochst.
Stipagrostis anomala De Winter
Stipagrostis ciliata (Desf.) De Winter var. capensis (Trin. & Rupr.) De Winter
Stipagrostis namaquensis (Nees) De Winter
[1]Stipagrostis obtusa (Delile) Nees
Sutherlandia frutescens (L.) R.Br.
Syringodea concolor (Baker) M.P.de Vos
Tetragonia arbuscula Fenzl
Tetragonia calycina Fenzl
[1]Thesium hystrix
Thesium lineatum L.f.
Tortula atrovirens (Sm.) Lindb.
Trachyandra karrooica Oberm.
Tragus berteronianus Schult.
[1]Tragus racemosus (L.) All.
Tribulus terrestris L.
[1]Tribulus zeyheri subsp. zeyheri
Ursinia nana DC. subsp. nana
Wiborgia monoptera E.Mey.
Xerocladia viridiramis (Burch.) Taub.
[1]Zygophyllum flexuosum
Zygophyllum lichtensteinianum Cham. & Schltdl.
[1]Zygophyllum microcarpum

Appendix 5: Flora and vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES
Flora
Adenium swazicum
Aloe pillansii
Diaphananthe millarii
Dioscorea ebutsniorum
Encephalartos aemulans
Encephalartos brevifoliolatus
Encephalartos cerinus
Encephalartos dolomiticus
Encephalartos heenanii
Encephalartos hirsutus
Encephalartos inopinus
Encephalartos latifrons
Encephalartos middelburgensis
Encephalartos nubimontanus
Encephalartos woodii

Reptilia
Loggerhead sea turtle
Leatherback sea turtle
Hawksbill sea turtle

Aves
Wattled crane
Blue swallow
Egyptian vulture
Cape parrot

Mammalia
Riverine rabbit
Rough-haired golden mole

ENDANGERED SPECIES
Flora
Angraecum africae
Encephalartos arenarius
Encephalartos cupidus
Encephalartos horridus
Encephalartos laevifolius
Encephalartos lebomboensis
Encephalartos msinganus
Jubaeopsis caffra
Siphonochilus aethiopicus
Warburgia salutaris
Newtonia hilderbrandi

Reptilia
Green turtle
Giant girdled lizard
Olive ridley turtle
Geometric tortoise

Aves
Blue crane
Grey crowned crane
Saddle-billed stork
Bearded vulture
White-backed vulture
Cape vulture
Hooded vulture
Pink-backed pelican
Pel's fishing owl
Lappet-faced vulture

Mammalia
Robust golden mole
Tsessebe
Black rhinoceros
Mountain zebra
African wild dog
Gunning's golden mole
Oribi
Red squirrel
Four-toed elephant-shrew

VULNERABLE SPECIES
Flora
Aloe albida
Encephalartos cycadifolius
Encephalartos Eugene-maraisii
Encephalartos ngovanus
Merwilla plumbea
Zantedeschia jucunda

Aves
White-headed vulture
Tawny eagle
Kori bustard
Black stork
Southern banded snake eagle
Blue korhaan
Taita falcon
Lesser kestrel
Peregrine falcon
Bald ibis

Ludwig's bustard
Martial eagle
Bataleur
Grass owl

Mammalia
Cheetah
Samango monkey
Giant golden mole
Giant rat
Bontebok
Tree hyrax
Roan antelope
Pangolin
Juliana's golden mole
Suni
Large-eared free-tailed bat
Lion
Leopard
Blue duiker

PROTECTED SPECIES
Flora
Adenia wilmsii
Aloe simii
Clivia mirabilis
Disa macrostachya
Disa nubigena
Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii
Protea odorata
Stangeria eriopus

Amphibia
Giant bullfrog
African bullfrog

Reptilia
Gaboon adder
Namaqua dwarf adder
Smith's dwarf chameleon
Armadillo girdled lizard
Nile crocodile
African rock python

Aves
Southern ground hornbill
African marsh harrier
Denham's bustard
Jackass penguin

Mammalia
Cape clawless otter
South African hedgehog
White rhinoceros
Black wildebeest
Spotted hyaena
Black-footed cat
Brown hyaena
Serval
African elephant
Spotted-necked otter
Honey badger
Sharpe's grysbok
Reedbuck
Cape fox

Appendix 6B

Avifaunal Assessment

BIRD IMPACT SCOPING STUDY

Proposed Biotherm Aletta Wind Energy Facility near Copperton in the Northern Cape Province

January 2016

Prepared by:

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DECLARATION OF INDEPENDENCE

I, Chris van Rooyen as duly authorised representative of Chris van Rooyen Consulting, and working under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003, hereby confirm my independence (as well as that of Chris van Rooyen Consulting) as a specialist and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Sivest was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Impact Assessment for the proposed Aletta Wind Energy Facility near Copperton.

____
Full Name: Chris van Rooyen
Position: Director

RELEVANT EXPERTISE

Chris van Rooyen

Chris has 19 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (EWIND TURBINES) Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWIND TURBINES Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in more than 160 power line and 30 renewable energy projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2013) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Albert Froneman (Pr.Sci.Nat)

Albert has an M. Sc. in Conservation Biology from the University of Cape Town, and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at Council for Scientific and Industrial Research (CSIR). He is a registered Professional Natural Scientist in the field of zoological science with the South African Council of Natural Scientific Professionals (SACNASP). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – Endangered Wildlife Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and they are currently jointly coordinating pre-construction monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

EXECUTIVE SUMMARY

The proposed BioTherm Aletta (Copperton) Wind Farm will have a variety of impacts on avifauna which ranges from low to high. The impacts are (1) displacement of priority species due to disturbance during construction phase (2) displacement of priority species due to habitat destruction during construction phase (3) displacement of priority species due to disturbance during operational phase (4) collisions of priority species with the turbines in the operational phase and (5) mortality of priority species with the grid connection in the operational phase.

Displacement of priority species due to disturbance during construction phase is likely to be a temporary medium negative impact, but can be reduced to low with the application of mitigation measures. Mitigation measures are the restriction of construction activities to the construction footprint area, no access to the remainder of the property during the construction period, measures to control noise and dust, maximum use of existing access roads, the implementation of a 3km no development buffer zone around a Verreaux's Eagle nest, a 200m no development buffer zone around a Southern Pale Chanting Goshawk nest and the implementation of appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring.

Displacement of priority species due to habitat destruction during construction phase is likely to be a medium negative impact and will remain so, despite the application of mitigation measures. Mitigation measures comprise strict adherence to the recommendations of the specialist ecological study and maximum use of existing access roads with the construction of new roads kept to a minimum.

Displacement of priority species due to disturbance during operational phase is likely to be of low significance and it could be further reduced through the application of mitigation measures. Mitigation measures are the restriction of operational activities to the plant area, no access to other parts of the property unless it is necessary for wind farm related work, post-construction monitoring, and if densities of key priority species are proven to be significantly reduced due to the operation of the wind farm, engagement of the wind farm management to devise ways of reducing the impact on these species.

Collisions of priority species with the turbines in the operational phase are likely to be a high negative impact but it could be reduced to medium negative through the application of mitigation measures. Mitigation measures are the implementation of pre-construction monitoring to guide the micro-siting of the turbines, the implementation of post-construction monitoring and, if actual collision rates indicate high mortality levels, curtailment of selective turbines. Lastly, the implementation of a 3km no development buffer zone around a Verreaux's Eagle nest, a 200m no development buffer zone around a Southern Pale Chanting Goshawk nest and the implementation of appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring, is recommended.

Mortality of priority species with the grid connection in the operational phase is likely to be medium negative, and although it can be reduced through the fitting of Bird Flight Diverters on selected sections, it will most likely remain at a medium negative level.

The conclusions above are preliminary and subject to the outcome of a monitoring programme which is currently underway at the site.

Contents

Appendices

1. INTRODUCTION & BACKGROUND

The proposed Aletta Wind Farm development will be located approximately 20km east of Copperton, within the Siyathemba Local Municipality of the Pixley ka Seme District Municipality in the Northern Cape Province. The study area is on the following property:

- Portion 1 of Drielings Pan No.101
- Portion 2 of Drielings Pan No.101
- Portion 3 of Drielings Pan No.101
- Remainder of Drielings Pan No.101

The project site has been identified through pre-feasibility studies conducted by BioTherm Energy (Biotherm) based on grid connection suitability, competition, flat topography, land availability and site access.

1.1 Wind Farm Technical details

The key technical details and infrastructure required is presented in the table below (Table 1).

Table 1: Aletta Wind Farm summary

Project Name	DEA Reference	Farm name and area	Technical details and infrastructure necessary for the proposed project
Alettta Wind Farm	To be announced	▪ Portion 1 of Drielings Pan No.101 ▪ Portion 2 of Drielings Pan No.101 ▪ Portion 3 of Drielings Pan No.101 ▪ Remainder of Drielings Pan No.101 Development Area: 10 000 ha	▪ Between **80 and 125 wind turbines** with a total generation capacity of up to 140MW. Turbines will have a hub height of up to 120m and a rotor diameter of up to 150m. ▪ The turbines will be connected via **medium voltage cables** to the proposed 132kV onsite Aletta Substation**.** ▪ Internal **access roads** are proposed to be between 4m to 6m wide. ▪ A temporary construction **lay down area.** ▪ The **operations and maintenance buildings**, including an on-site spares storage building, a workshop and an operations building. ▪ **Fencing** (if required) will be up to 5m where required and will be either mesh or palisade.

The key components of the project are detailed below.

1.1.1 Turbines

The total amount of developable area is 10 000 hectares. The wind turbines and all other project infrastructure will be placed strategically within the development area based on environmental constraints. The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The wind turbines will therefore likely have a hub height of up to 120m and a rotor diameter of up to 150m (see Figure 1). The blade rotation direction will be clock-wise. Each wind turbine will have a foundation diameter of up to 20m, and will be approximately 3m deep. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). The excavation area will be approximately 1 000m² in sandy soils due to access requirements and safe slope stability requirements. A hard standing area / platform of approximately 2 400m² (60m x 40m) per turbine will be required for turbine crane usage. There will be approximately 80 to 125 wind turbines constructed with a total generation capacity of up to 140MW. The electrical generation capacity for each turbine will range from 1.5 to 3.5MW depending on the final wind turbine selected for the proposed development.

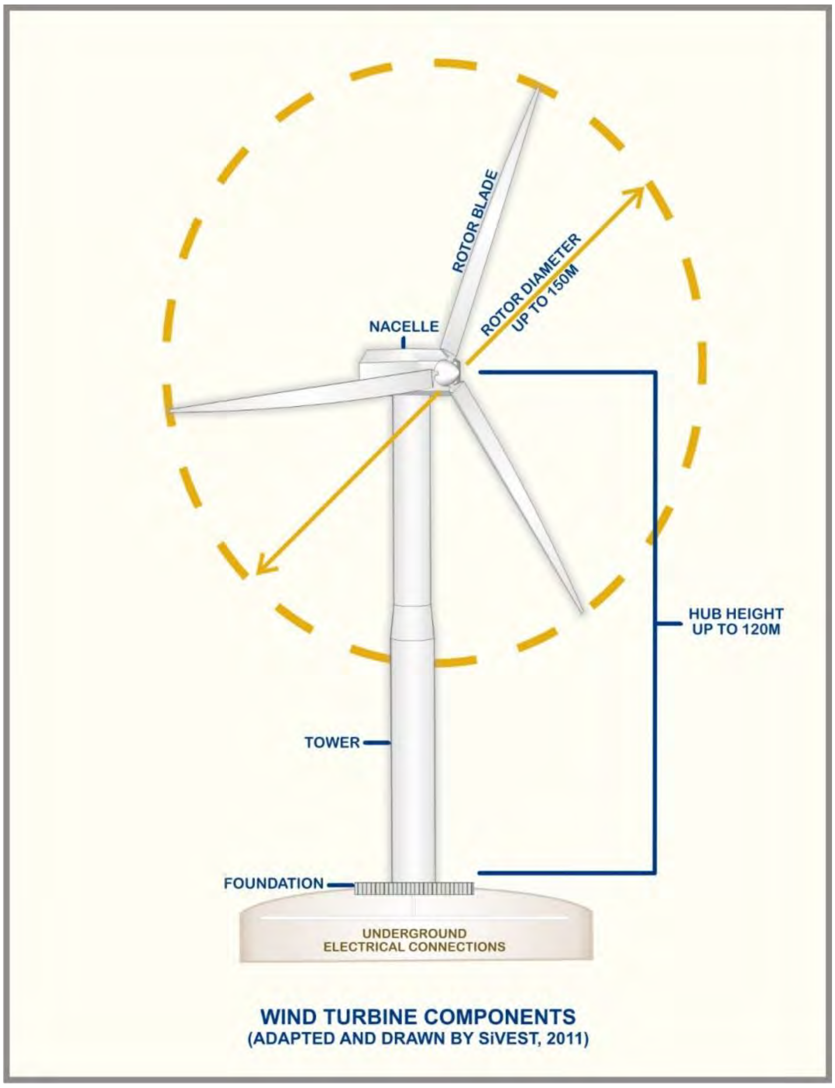

Figure 1: Typical components of a wind turbine

1.1.2 Electrical Connections

The wind turbines will be connected to the proposed onsite Aletta 132kV substation using buried (up to a 1.5m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are more appropriate such as over rivers, gullies and long runs. Where overhead power lines are to be constructed, self-supported or H-pole tower types will be used. The height will vary based on the terrain, but will ensure minimum Overhead Line (OHL) clearances with buildings, roads and surrounding infrastructure will be maintained. The dimensions of the specific OHL structure types will depend on electricity safety requirements. The exact location of the towers, the selection of the final OHL structure types and the final designs will comply with the best practise and SANS requirements.

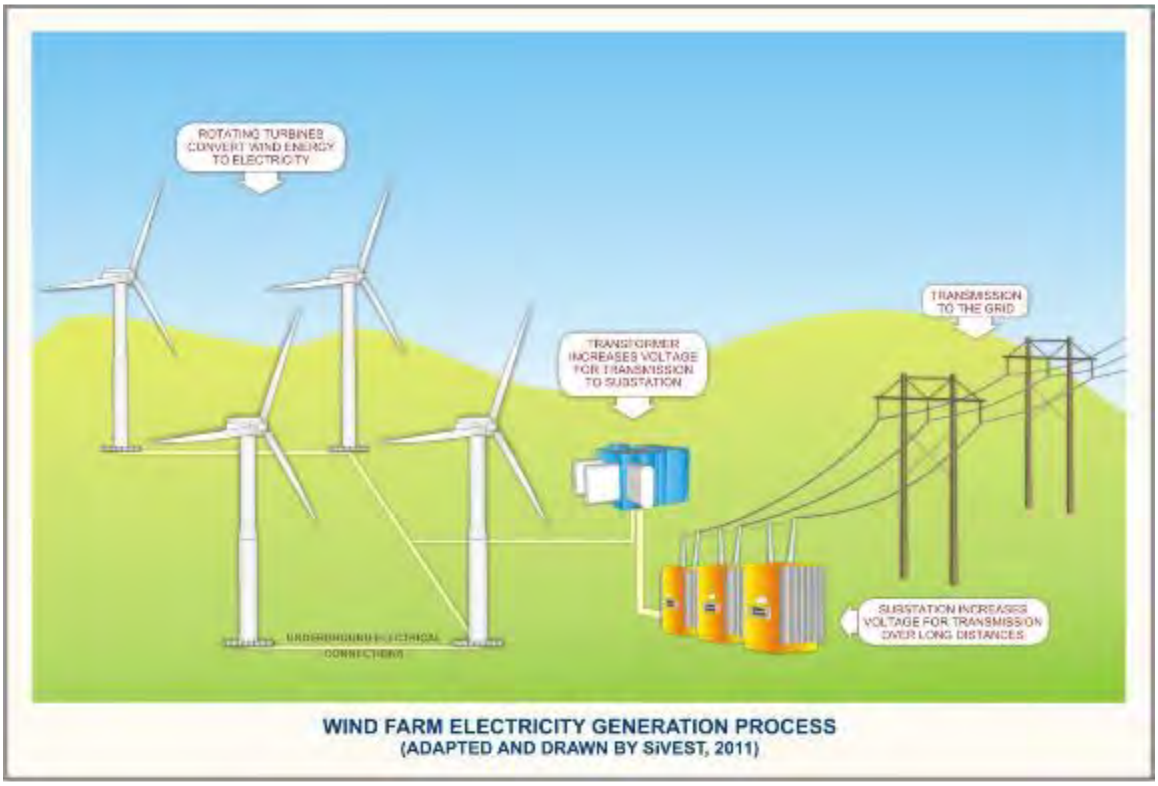

Figure 2: Conceptual wind farm electricity generation process showing electrical connections

1.1.3 Roads

The internal access roads are proposed to be between 4m to 6m wide and up to 60km each. This will include the net load carrying surface excluding any V drains that might be required. Double width roads will be required in strategic places for vehicle passing.

1.1.4 Temporary Construction Area

The temporary construction lay down area will be approximately 2 400m² (60m x 40m). The lay-down / staging area will be approximately 11 250m² whilst the lay-down area for concrete towers (only if required) will be approximately 40 000m².

1.1.5 Operation and Maintenance Buildings

The operation and maintenance buildings will include an on-site spares storage building, a workshop and operations building with a total combined footprint that will not exceed 300m^2. The operation and maintenance buildings will be situated in proximity to the wind farm substation due to requirements for power, water and access.

1.1.6 Other Associated Infrastructure

Other infrastructure includes the following:

- Fencing (if required) will be up to 5m where required and will be either mesh or palisade.

See Figures 3-5 below for maps of the study area

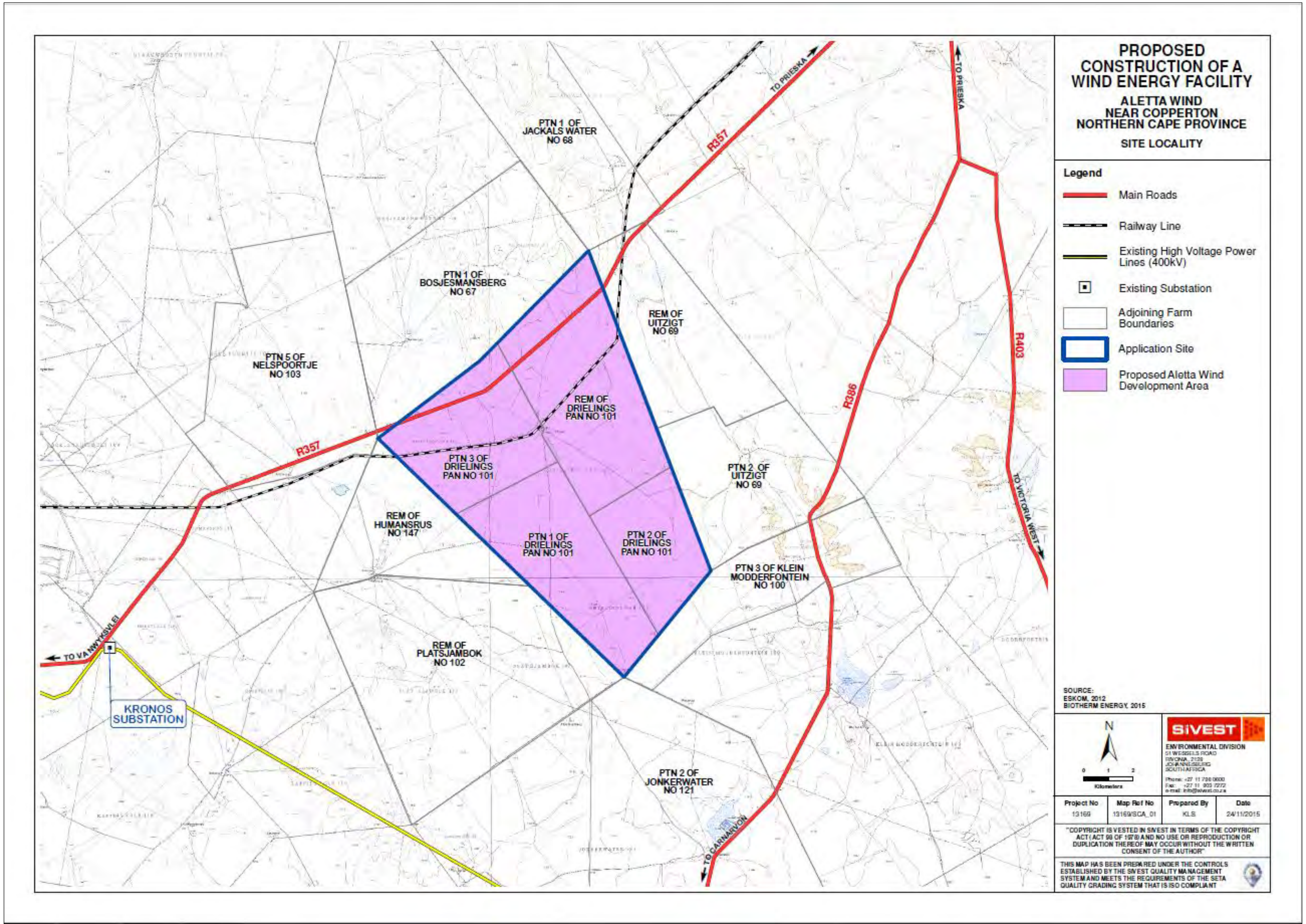

Figure 3: Map of proposed Biotherm Aletta WEF.

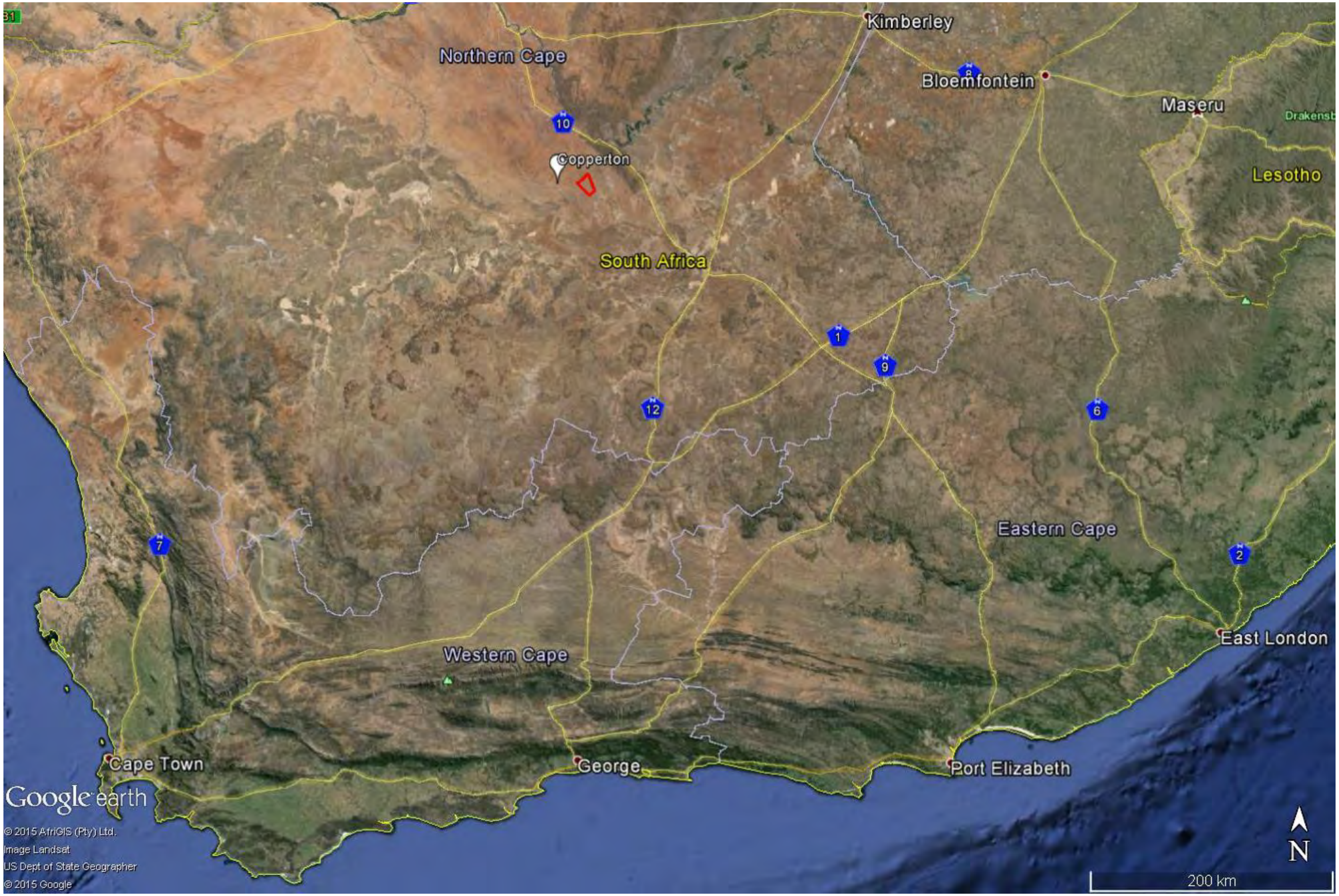

Figure 4: Regional map indicating the location of the proposed Biotherm Aletta WEF.

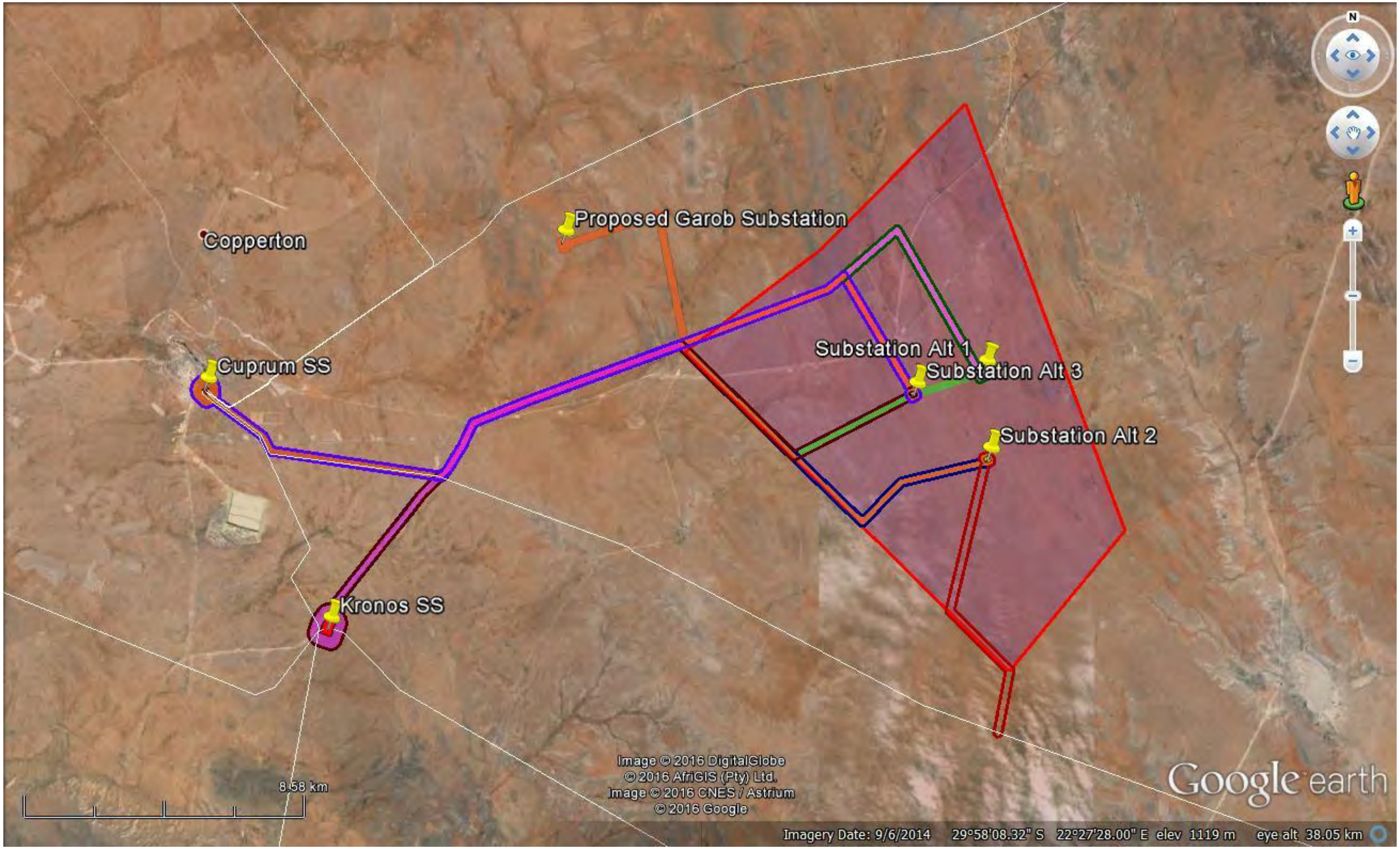

Figure 5: Close-up view of proposed Biotherm Aletta WEF study site on a background of satellite imagery, with the proposed 132kV grid connection alternatives.

2. TERMS OF REFERENCE

The terms of reference for this avifaunal scoping study are as follows:

- Describe the affected environment from an avifaunal habitat perspective.
- Discuss any applicable legislation pertaining to impacts on avifauna.
- Identify gaps in baseline data.
- Do a preliminary assessment of the expected impacts.
- Provide a preliminary sensitivity map of the proposed development site from an avifaunal perspective.
- Provide recommendations for follow – up investigations.

3. SOURCES OF INFORMATION AND METHODOLOGY

The following methods were applied to compile this report:

- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town, as a means to ascertain which species occurs within the broader area i.e. within a block consisting of nine pentad grid cells within which the proposed solar facilities are situated. The nine pentad grid cells are the following: 2950_2225, 2950_2250, 2950_2235, 2955_2225, 2955_2230, 2955_2235, 3000_2225, 3000_2230 and 3000_2235 (see Figure 6). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. From 2007 to date, a total of 29 full protocol cards (i.e. 29 surveys lasting a minimum of two hours each) have been completed for this area.
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor 2015), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all priority species was determined by consulting the latest (2015.2) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The Important Bird Areas of Southern Africa (Barnes 1998; BLSA 2015a http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on Important Bird Areas (IBAs).
- Satellite imagery was used in order to view the broader development area on a landscape level and to help identify sensitive bird habitat.
- Priority species were taken from the updated list of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Retief *et al.* 2012).
- A site visit was conducted from 13 – 17 July to record bird habitat at the site and to identify transects, vantage points and potential focal points for the 12-months pre-construction monitoring which commenced in August 2015. Two surveys have been

conducted to date, a late winter survey in August 2015 and a mid-summer survey in January 2016.

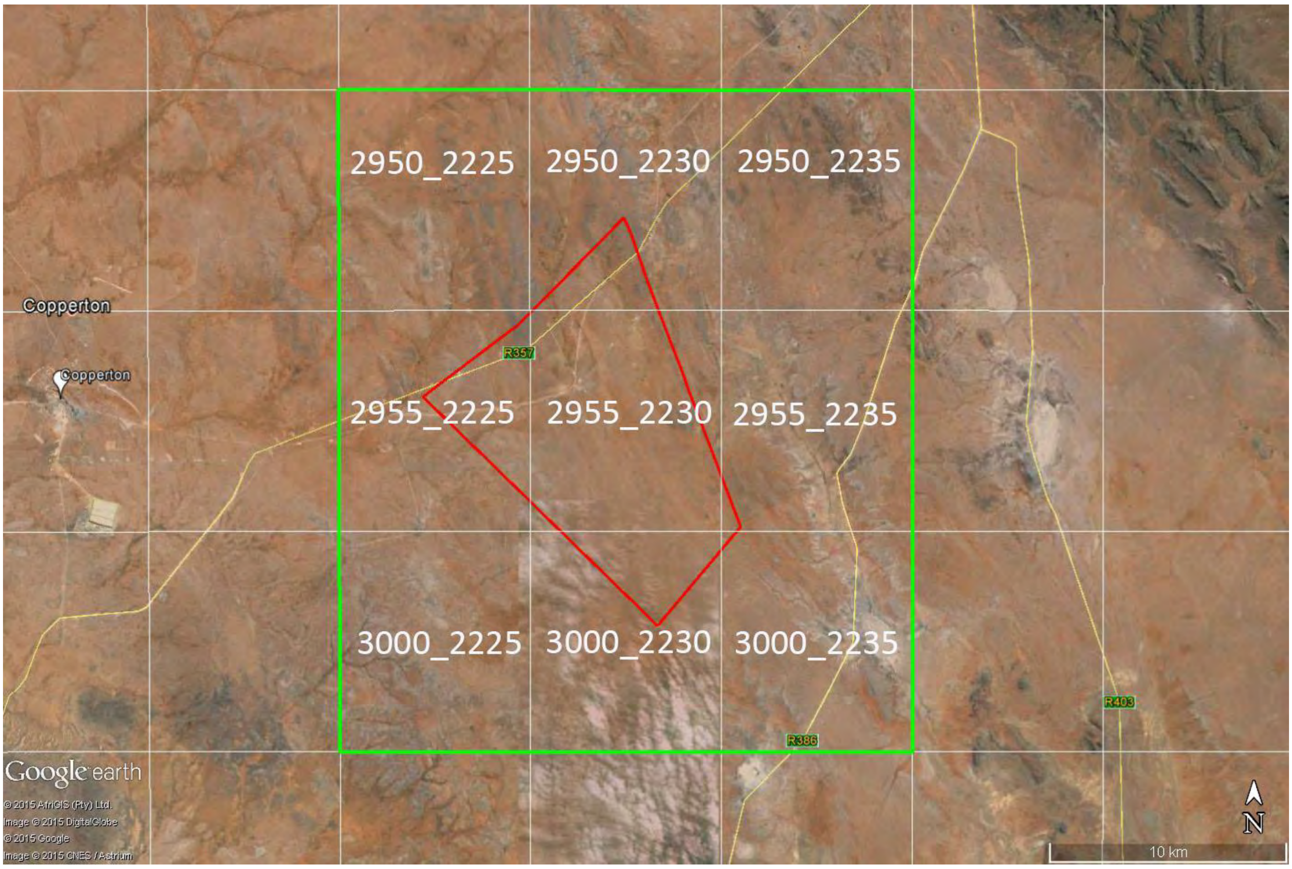

Figure 6: Area covered by the SABAP2 pentads (green square).

4. ASSUMPTIONS & LIMITATIONS

The following assumptions and limitations are applicable in this study:

- A total of 29 full protocol lists have been completed to date to date for the 9 pentads where the study area is located (i.e. lists surveys lasting a minimum of two hours each). This is a fairly comprehensive dataset which provides a reasonably accurate snapshot of the avifauna which could occur at the proposed site. For purposes of completeness, the list of species that could be encountered was supplemented with personal observations, general knowledge of the area, and SABAP1 records (Harrison *et al.* 1997).
- Conclusions in this study are based on experience of these and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances, especially for a relatively new field such as wind energy. However, power line and substation impacts can be predicted with a fair amount of certainty, based on a robust body of research stretching back over thirty years (see References Section 9).
- To date, few comprehensive studies (other than a number of environmental impact reports), and no peer-reviewed scientific papers, are available on the impacts wind farms

have on birds in South Africa. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle (http://www.unep.org). The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."

- Even in the international arena predicted mortality rates are often significantly off the mark, indicating that this is still a fledgling science in many respects, even in developed countries like Spain with an established wind industry (Ferrer *et al.* 2012).
- Priority species were taken from the updated list of priority species for wind farms compiled for the Avian Wind Farm Sensitivity Map (Retief *et al.* 2012).
- The study area was defined as the area which comprises the application site, and the proposed 132kV grid connection (see Figures 3-5).
- No comparative assessment was undertaken of the various grid connection alternatives. This will form part of a separate Environmental Impact Assessment (EIA). An overarching assessment of the grid connections was conducted in this report, with the idea that it will be further refined in the separate grid connection EIA.

5. DESCRIPTION OF AFFECTED ENVIRONMENT

5.1 Biomes and vegetation types

The proposed site is situated on a wide flat plain approximately 22km east of the mining settlement of Copperton, in the Northern Cape Province. The study area is not located in an Important Bird Area. The closest Important Bird Area (IBA), the Platberg Karoo Conservancy IBA SA037 is located approximately 300km away (Barnes 1998, Birdlife 2014).

The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. Although Mucina & Rutherford (2006) classify the vegetation as Bushmanland Arid Grassland, the dominant vegetation type leans more towards Bushmanland Basin Shrubland. Bushmanland Basin Shrubland consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum*, *Salsola*, *Pentzia*, *Eriocephalus*), 'white' grasses (*Stipagrostis*) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* and *Leysera* (Mucina & Rutherford 2006).

SABAP1 recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure,

likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. Using this classification system, the natural vegetation in the study area is classified as Nama Karoo. Nama Karoo is dominated by low shrubs and grasses; peak rainfall occurs in summer from December to May. Average daily temperatures range between 35°C in January and 18°C in July (http://www.worldweatheronline.com/Copperton-weather-averages/Northern-Cape/ZA.aspx).
Trees, e.g. *Vachellia karroo* are mainly restricted to ephemeral watercourses, but in the proposed development area, due to the extreme aridity (average annual precipitation 147mm in the 12 years from 2000 – 2012 - http://www.worldweatheronline.com) the ephemeral watercourses contain only small stunted trees and dense shrubs. In comparison with the Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover.

5.2 Habitat classes and avifauna in the study area

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

The following bird habitat classes were identified in the study area:

5.2.1 Nama Karoo

This habitat class is described above under 5.1. The Karoo vegetation types support a particularly high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks) (Harrison *et al.* 1997). Its avifauna typically comprises ground-dwelling species of open habitats. Many typical karroid species are nomads, able to use resources that are patchy in time and space, especially enhanced conditions associated with rainfall (Barnes 1998). Priority species specifically associated with Nama Karoo which could potentially occur regularly in the study area are the nomadic Ludwig's Bustard, which may occur in flocks following rainfall events, Karoo Korhaan, Double-banded Courser, Martial Eagle, Sclater's Lark, Black-chested Snake-eagle, Jackal Buzzard, Steppe Buzzard, Southern Pale Chanting Goshawk, Northern Black Korhaan, Greater Kestrel Spotted Eagle-Owl and Lanner Falcon. Kori Bustard, Secretarybird, Jackal Buzzard, and Verreaux's Eagle could occur irregularly. Black Harrier was recorded by SABAP1, but it is likely to occur only as a vagrant (see Table 1 below for a complete list of priority species which could potentially occur at the site).

5.2.2 Waterbodies

Surface water is of specific importance to avifauna in this arid study area. The study area contains at least nine boreholes and a small pan. Boreholes with open water troughs are important sources of surface water and are used extensively by various species, including large raptors, to drink and bath. Flocks of small birds congregate in large numbers around water troughs which in turn attracts priority species such as Lanner Falcon and Southern Pale Chanting Goshawk. If the small pan regularly holds water, it could attract all of the above as well as a variety of waterbirds. The Red listed Greater Flamingo could potentially be attracted to open water in this arid region, but it has not been recorded by SABAP2, which indicates that the species does not occur regularly. Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are characteristic of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m), and flooding characteristically ephemeral (Harrison *et al.* 1997). In this instance the pan is very small and unlikely to hold water regularly, which makes the occurrence of flamingos unlikely.

5.2.3 Trees

The study area is generally devoid of trees, except for isolated clumps of trees at two of the water points, where a mixture of alien and indigenous trees are growing. The trees could attract a variety of species for purposes of nesting. Priority species that could potentially use the trees in this manner are Southern Pale Chanting Goshawk, Black-chested Snake-eagle and Spotted Eagle-Owl. The trees could also serve as hunting perches / roosting substrate for several priority raptors such as Martial Eagle, Verreaux's Eagle, Steppe Buzzard, Jackal Buzzard, Lanner Falcon and Greater Kestrel. A Southern Pale Chanting Goshawk nest was recorded in a clump of trees at a water point (29°56'34.42"S 22°32'55.35"E) and will be monitored during subsequent monitoring surveys to establish if the nest is active.

5.2.4 High voltage lines and telephone lines

High voltage lines are an important potential roosting and breeding substrate for large raptors in the greater study area. There are no existing high voltage lines crossing the actual study area, but there are sub-transmission lines on 5-pole wooden structures running north and south of the site.

High voltage lines hold a special importance for large raptors (Jenkins *et al.* 2006). A Martial Eagle nest site on the Hydra-Kronos 400 kV line was initially recorded in the early 2000s in surveys of large raptors nesting on Eskom's transmission network in the Karoo (Jenkins *et al.* 2013). The presence of the nest was re-confirmed in 2013, with a pair of adults in attendance at a nest on tower 519 (30º 01.579 S, 22º 20.675 E) in May 2013, and feeding a small chick in August of the same year. This chick was successfully fledged by November, and at least one adult was present in the area, with the nest showing signs of preparation for the upcoming breeding season, in March 2014 (Jenkins & Du Plessis 2014). The nest was inspected during the site visit in June 2015, but the birds were not observed, which is an indication that the nest may not be active this year. At the time of the site visit, there was extensive activity at the Kronos MTS with continuous movements of trucks and pedestrians, which may account for the absence of the eagles at this specific nest site. The nest was again inspected in August 2015 and January 2016, but there was no sign of the birds. Although the nest is too far away to be directly impacted by the construction activity at the site, the proposed grid connection could potentially impact on the eagle nest through displacement due to disturbance associated with the construction of the power line, if the grid connection terminates in Kronos MTS. However, indications are that the birds have abandoned the nest, most likely due to disturbance.

There is also a telephone line next to the R357 tar road running through the north of the site. The poles are used extensively by Sociable Weavers *Philetairus socius* for nesting. A Verreaux's Eagle pair is breeding on a Sociable Weaver nest on one of the poles approximately 1.65km east of the western border of the site. The nest was active in June 2015.

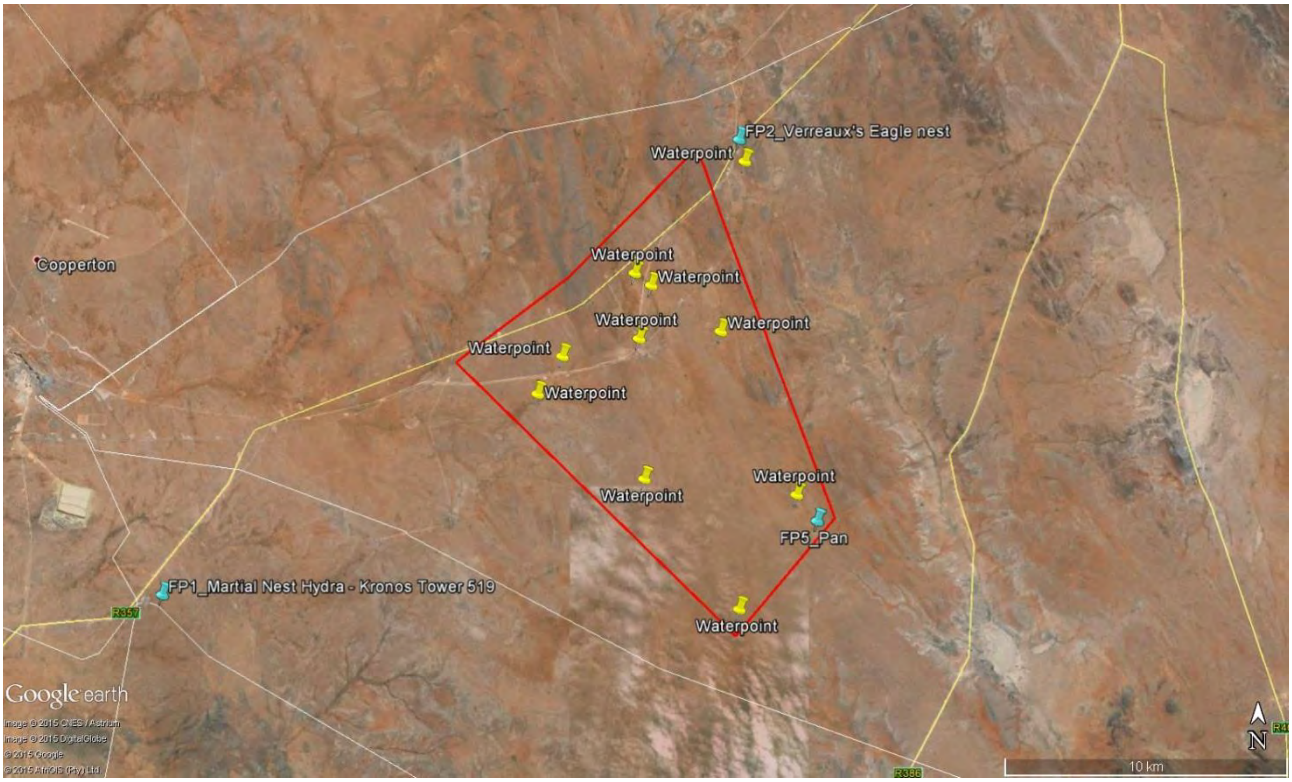

Figure 7: The location of waterpoints, high voltage lines (white lines) and large raptor nests in the study area.

5.2.5 Avifauna

An estimated 161 species could potentially occur in the study area. Of these, 56 are likely to occur only as vagrants or sporadically when conditions are optimal, i.e. after exceptionally good rains. Of the 161 species that could occur at the site, 22 are classified as priority species for wind farm developments (Retief *et al.* 2012).

See **APPENDIX 1** for a list of species potentially occurring in the study area. Potential long term impacts on priority species are listed in Table 2.

Table 2: Priority species potentially occurring in the study area

EN = Endangered

VU = Vulnerable

NT = Near-threatened

LC = Least concern

End = Southern African Endemic

N-End = Southern African near endemic

Name	Scientific name	National Red Data Status	Global status	SABAP2 reporting rate %	Priority species score	Collisions with associated power line	Collisions with turbines	Displacement through disturbance	Displacement through habitat transformation*
Double-banded Courser	*Rhinoptilus africanus*	NT	LC	13.79	204		x	x	x
Black Harrier	*Circus maurus*	EN	VU	0	345		x		
Jackal Buzzard	*Buteo rufofuscus*	End	LC	0	250		x		
Greater Flamingo	*Phoenicopterus ruber*	NT	LC	0	290	x	x		
Black-chested Snake-eagle	*Circaetus pectoralis*	-		3.45	230		x		
Chetsnut-banded Plover	*Charadrius pallidus*	NT	NT	0	230		x		x
Black Kite	*Milvus migrans*	-	-	0	220		x		
White Stork	*Ciconia ciconia*	-	-	0	220	x	x	x	x
Spotted Eagle-Owl	*Bubo africanus*	-	-	3.45	170		x		
Greater Kestrel	*Falco rupicoloides*	-	-	24.14	174		x		
Steppe Buzzard	*Buteo vulpinus*	-	-	3.45	210		x		
Karoo Korhaan	*Eupodotis vigorsii*	NT, End	LC	72.41	240		x	x	x
Kori Bustard	*Ardeotis kori*	NT	NT	13.79	260	x	x	x	x

Name	Scientific name	National Red Data Status	Global status	SABAP2 reporting rate	Priority species score	Collisions with associated power line	Collisions with turbines	Displacement through disturbance	Displacement through habitat transformation*
Lanner Falcon	*Falco biarmicus*	VU	LC	3.45	300		x		
Ludwig's Bustard	*Neotos ludwigii*	EN, N-end	EN	48.28	320	x	x	x	x
Martial Eagle	*Polemaetus bellicosus*	EN	VU	13.79	350		x	x	
Northern Black Korhaan	*Afrotis afraoides*	End	LC	82.76	180	x	x	x	x
Sclater's Lark	*Spizocorys sclateri*	NT, End	NT	10.34	240		x		
Secretarybird	*Sagittarius serpentarius*	VU	VU	3.45	320	x	x	x	x
Southern Pale Chanting Goshawk	*Melierax canorus*	N-end	LC	79.21	200		x		
Verreaux's Eagle	*Aquila verreauxii*	VU	LC	17.24	360		x		

* With smaller species this impact might result in partial but not total exclusion from the site

6. DESCRIPTION OF EXPECTED IMPACTS

The effects of a wind farm on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision):

- Collision mortality on the wind turbines;
- Displacement due to disturbance during construction and operation of the wind farm; and
- Displacement due to habitat change and loss.
- Collision with the proposed power line grid connections; and
- Displacement due to disturbance during the construction of the power line grid connection.

It is important to note that the assessment is made on the status quo as it is currently on site. The possible change in land use in the broader development area is not taken into account because the extent and nature of future developments are unknown at this stage. It is however highly unlikely that the land use will change in the foreseeable future.

6.1 Collision mortality on wind turbines[1]

Wind energy generation has experienced rapid worldwide development over recent decades as its environmental impacts are considered to be relatively lower than those caused by traditional energy sources, with reduced environmental pollution and water consumption (Saidur *et al.*, 2011). However, bird fatalities due to collisions with wind turbines have been consistently identified as a main ecological drawback of wind energy (Drewitt and Langston, 2006).

Collisions with wind turbines appear to kill fewer birds than collisions with other man-made infrastructures, such as power lines, buildings or even traffic (Calvert *et al.* 2013; Erickson *et al.* 2005). Nevertheless, estimates of bird deaths from collisions with wind turbines worldwide range from 0 to almost 40 deaths per turbine per year (Sovacool, 2009). The number of birds killed varies greatly between sites, with some sites posing a higher collision risk than others, and with some species being more vulnerable (e.g. Hull *et al.* 2013; May *et al.* 2012a). These numbers may not reflect the true magnitude of the problem, as some studies do not account for detectability biases such as those caused by scavenging, searching efficiency and search radius

[1] This section is adapted from a recent (2014) review paper by Ana Teresa Marques, Helena Batalha, Sandra Rodrigues, Hugo Costa, Maria João Ramos Pereira, Carlos Fonseca, Miguel Mascarenhas, Joana Bernardino. *Understanding bird collisions at wind farms: An updated review on the causes and possible mitigation strategies*. Biological Conservation 179 (2014) 40–52

(Bernardino *et al.* 2013; Erickson *et al.* 2005; Huso and Dalthorp 2014). Additionally, even for low fatality rates, collisions with wind turbines may have a disproportionate effect on some species. For long-lived species with low productivity and slow maturation rates (e.g. raptors), even low mortality rates can have a significant impact at the population level (e.g. Carrete *et al.* 2009; De Lucas *et al.* 2012a; Drewitt and Langston, 2006). The situation is even more critical for species of conservation concern, which sometimes are most at risk (e.g. Osborn *et al.* 1998).

High bird fatality rates at several wind farms have raised concerns among the industry and scientific community. High profile examples include the Altamont Pass Wind Resource Area (APWRA) in California because of high fatality of Golden eagles (*Aquila chrysaetos*), Tarifa in Southern Spain for Griffon vultures (*Gyps fulvus*), Smøla in Norway for White-tailed eagles (*Haliaatus albicilla*), and the port of Zeebrugge in Belgium for gulls (*Larus* sp.) and terns (*Sterna* sp.) (Barrios and Rodríguez, 2004; Drewitt and Langston, 2006; Everaert and Stienen, 2008; May *et al.* 2012a; Thelander *et al.* 2003). Due to their specific features and location, and characteristics of their bird communities, these wind farms have been responsible for a large number of fatalities that culminated in the deployment of additional measures to minimize or compensate for bird collisions. However, currently, no simple formula can be applied to all sites; in fact, mitigation measures must inevitably be defined according to the characteristics of each wind farm and the diversity of species occurring there (Hull *et al.* 2013; May *et al.* 2012b). A deep understanding of the factors that explain bird collision risk and how they interact with one another is therefore crucial to proposing and implementing valid mitigation measures.

6.1.1 Species-specific factors

- Morphological features

Certain morphological traits of birds, especially those related to size, are known to influence collision risk with structures such as power lines and wind turbines. The most likely reason for this is that large birds often need to use thermal and orographic updrafts to gain altitude, particularly for long distance flights. Thermal updrafts (thermals) are masses of hot, rising wind that form over heated surfaces, such as plains. Being dependent on solar radiation, they occur at certain times of the year or the day. Conversely, orographic lift (slope updraft), is formed when wind is deflected by an obstacle, such as mountains, slopes or tall buildings. Soaring birds use these two types of lift to gain altitude (Duerr *et al.* 2012). Janss (2000) identified weight, wing length, tail length and total bird length as being collision risk determinant. Wing loading (ratio of body weight to wing area) and aspect ratio (ratio of wing span squared to wing area) are particularly relevant, as they influence flight type and thus collision risk (Bevanger, 1994; De Lucas *et al.* 2008; Herrera-Alsina *et al.* 2013; Janss, 2000). Birds with high wing loading, such as the Griffon Vulture (*Gyps fulvus*), seem to collide more frequently with wind turbines at the same sites than birds with lower wing loadings, such as Common Buzzards (*Buteo buteo*) and Short-toed Eagles (*Circaetus gallicus*), and this pattern is not related with their local abundance (Barrios and Rodríguez, 2004; De Lucas *et al.* 2008). High wing-loading is associated with low flight manoeuvrability (De Lucas *et al.* 2008), which determines whether a bird can escape an encountered object fast enough to avoid collision.

<u>Aletta wind farm</u>

Priority species that could potentially be vulnerable to wind turbine collisions due to morphological features (high wing loading) are Northern Black Korhaan, Karoo Korhaan, Kori Bustard and Ludwig's Bustard.

- Sensorial perception

Birds are assumed to have excellent visual acuity, but this assumption is contradicted by the large numbers of birds killed by collisions with man-made structures (Drewitt and Langston, 2008; Erickson *et al.* 2005). A common explanation is that birds collide more often with these structures in conditions of low visibility, but recent studies have shown that this is not always the case (Krijgsveld *et al.* 2009). The visual acuity of birds seems to be slightly superior to that of other vertebrates (Martin, 2011; McIsaac, 2001). Unlike humans, who have a broad horizontal binocular field of 120°, some birds have two high acuity areas that overlap in a very narrow horizontal binocular field (Martin, 2011). Relatively small frontal binocular fields have been described for several species that are particularly vulnerable to power line collisions, such as vultures (Gyps *sp.*) cranes and bustards (Martin and Katzir, 1999; Martin and Shaw, 2010; Martin, 2012, 2011; O'Rourke *et al.* 2010). Furthermore, for some species, their high resolution vision areas are often found in the lateral fields of view, rather than frontally (e.g. Martin and Shaw, 2010; Martin, 2012, 2011; O'Rourke *et al.* 2010). Finally, some birds tend to look downwards when in flight, searching for conspecifics or food, which puts the direction of flight completely inside the blind zone of some species (Martin and Shaw, 2010; Martin, 2011). For example, the visual fields of vultures (Gyps *sp.*) include extensive blind areas above, below and behind the head and enlarged supra-orbital ridges (Martin *et al.* 2012). This, combined with their tendency to angle their head toward the ground in flight, might make it difficult for them to see wind turbines ahead, which might at least partially explain their high collision rates with wind turbines (Martin, 2012).

Currently, there is little information on whether noise from wind turbines can play a role in bird collisions with wind turbines. Nevertheless, wind turbines with whistling blades are expected to experience fewer avian collisions than silent ones, with birds hearing the blades in noisy (windy) conditions. However, the hypothesis that louder blade noises (to birds) result in fewer fatalities has not been tested so far (Dooling, 2002).

<u>Aletta wind farm</u>

Many of the priority species at the proposed wind farm probably have high resolution vision areas found in the lateral fields of view, rather than frontally, e.g., the bustards, korhaans and passerines. The possible exceptions to this are the raptors which all have wider binocular fields, although as pointed out by Martin (2011, 2012), this does not necessarily result in these species being able to avoid obstacles better.

- Phenology

It has been suggested that resident birds would be less prone to collision, due to their familiarity with the presence of the structures (Drewitt and Langston, 2008). However, recent studies have shown that, within a wind farm, raptor collision risk and fatalities are higher for resident than for migrating birds of the same species. An explanation for this may be that resident birds generally use the wind farm area several times while a migrant bird crosses it just once (Krijgsveld *et al.* 2009). However, other factors like bird behaviour are certainly relevant. Katzner *et al.* (2012) showed that Golden Eagles performing local movements fly at lower altitudes, putting them at a greater risk of collision than migratory eagles. Resident eagles flew more frequently over cliffs and steep slopes, using low altitude slope updrafts, while migratory eagles flew more frequently over flat areas and gentle slopes, where thermals are generated, enabling the birds to use them to gain lift and fly at higher altitudes. Also, Johnston *et al.* (2014) found that during migration when visibility is good Golden Eagles can adjust their flight altitudes and avoid the wind turbines.

At two wind farms in the Strait of Gibraltar, the majority of Griffon Vulture deaths occurred in the winter. This probably happened because thermals are scarcer in the winter, and resident vultures in that season probably relied more on slope updrafts to gain lift (Barrios and Rodríguez, 2004). The strength of these updrafts may not have been sufficient to lift the vultures above the turbine blades, thereby exposing them to a higher collision risk. Additionally, migrating vultures did not seem to follow routes that crossed these two wind farms, so the number of collisions did not increase during migratory periods. Finally, at Smøla, collision risk modelling showed that White-tailed Eagles are most prone to collide during the breeding season, when there is increased flight activity in rotor swept zones (Dahl *et al.* 2013).

The case seems to be different for passerines, with several studies documenting high collision rates for migrating passerines at certain wind farms, particularly at coastal or offshore sites. However, comparable data on collision rates for resident birds is lacking. This lack of information may result from fewer studies, lower detection rates and rapid scavenger removal (Johnson *et al.* 2002; Lekuona and Ursua, 2007). One of the few studies reporting passerine collision rates (from Navarra, northern Spain) documents higher collision rates in the autumn migration period, but it is unclear if this is due to migratory behaviour or due to an increase in the number of individuals because of recently fledged juveniles (Lekuona and Ursua, 2007).

Aletta wind farm

With the exception of White Stork, Black Kite and Steppe Buzzard, the priority species are all resident species. Greater Flamingos are nomadic, responding to weather conditions. None of the aforementioned four species are expected to be regularly encountered at the site.

- Bird behaviour

Flight type seems to play an important role in collision risk, especially when associated with hunting and foraging strategies. Kiting flight, which is used in strong winds and occurs in rotor swept zones, has been highlighted as a factor explaining the high collision rate of Red-tailed Hawks (*Buteo jamaicensis*) at APWRA (Hoover and Morrison, 2005). The hovering behaviour exhibited by Common Kestrels (*Falco tinnunculus*) when hunting may also explain the fatality levels of this species at wind farms in the Strait of Gibraltar (Barrios and Rodríguez, 2004). Kiting and hovering are associated with strong winds, which often produce unpredictable gusts that may suddenly change a bird's position (Hoover and Morrison, 2005). Additionally, while birds are hunting and focused on prey, they might lose track of wind turbine positions (Krijgsveld *et al.* 2009; Smallwood *et al.* 2009).

Collision risk may also be influenced by behaviour associated with a specific sex or age. In Belgium, only adult Common Terns (*Sterna hirundo*) were impacted by a wind farm (Everaert and Stienen, 2007) and the high fatality rate was sex-biased (Stienen *et al.* 2008). In this case, the wind farm is located in the foraging flight path of an important breeding colony, and the differences between fatality of males and females can be explained by the different foraging activity during egg-laying and incubation (Stienen *et al.* 2008). Another example comes from Portugal, where recent findings showed that the mortality of the Skylark (*Alauda arvensis*) is sex and age biased, and affecting mainly adult males. This was related with the characteristic breeding male song-flights that make them more vulnerable to collision with wind turbines (Morinha *et al.* 2014).

Social behaviour may also result in a greater collision risk with wind turbines due to a decreased awareness of the surroundings. Several authors have reported that flocking behavior increases collision risk with power lines as opposed to solitary flights (e.g. Janss, 2000). However, caution must be exercised when comparing the particularities of wind farms with power lines, as some species appear to be vulnerable to collisions with power lines but not with wind turbines, e.g. indications are that bustards, which are highly vulnerable to power line collisions, are not prone to wind turbine collisions – a Spanish database of over 7000 recorded turbine collisions contains no Great Bustards *Otis tarda* (A. Camiña 2012a). White Storks are one of the most common large soaring migratory species recorded crossing in tens of thousands from Europe into Africa at the Straits of Gibraltar, yet the species seem to be able to successfully avoid the wind turbines at the Tarifa wind farm (e.g. see Jans 2000 and De Lucas *et al.* 2004). White Storks are not mentioned in a comprehensive review by the Birdlife International of the literature on wind turbine/avian interactions spanning 10 years between 2003 and 2013 (Gove *et al.* 2013).

Several collision risk models incorporate other variables related to bird behaviour. Flight altitude is widely considered important in determining the risk of bird collisions with offshore and onshore wind turbines, as birds that tend to fly at the height of rotor swept zones are more likely to collide (e.g. Band *et al.* 2007; Furness *et al.* 2013; Garthe and Hüppop, 2004).

Aletta wind farm

The priority species at the wind farm can be classified as either terrestrial species or soaring species, with some, e.g. Secretarybird and White Stork exhibiting both types of flight behaviour. Terrestrial species spend most of the time foraging on the ground. They do not fly often and then generally short distances at low to medium altitude, usually powered flight. At the wind farm site, korhaans, bustards and larks are included in this category. Some larger species undertake longer distance flights at higher altitudes (specifically Ludwig's Bustard). Soaring species spend a significant time on the wing in a variety of flight modes including soaring, kiting, hovering and gliding at medium to high altitudes. At the wind farm site, the raptor species are included in this class. Based on the potential time spent potentially flying at rotor height, soaring species are likely to be at greater risk of collision. However, specific behaviour of some terrestrial species might put them at risk of collision, e.g. display flights of Northern Black Korhaan and Sclater's Lark might place them within the rotor swept zone.

- Avoidance behaviours

Collision fatalities are also related to displacement and avoidance behaviours, as birds that do not exhibit either of these behaviours are more likely to collide with wind turbines. The lack of avoidance behaviour has been highlighted as a factor explaining the high fatality of White-tailed Eagles at Smøla wind farm, as no significant differences were found in the total amount of flight activity within and outside the wind farm area (Dahl *et al.* 2013). However, the birds using the Smøla wind farm are mainly sub-adults, indicating that adult eagles are being displaced by the wind farm (Dahl *et al.* 2013).

Two types of avoidance have been described (Furness *et al.*, 2013): 'macro-avoidance' whereby birds alter their flight path to keep clear of the entire wind farm (e.g. Desholm and Kahlert, 2005; Plonczkier and Simms, 2012; Villegas-Patraca *et al.* 2014), and 'micro-avoidance' whereby birds enter the wind farm but take evasive actions to avoid individual wind turbines (Band *et al.* 2007). This may differ between species and may have a significant impact on the size of the risk associated with a specific species. It is generally assumed that 95-98% of birds will successfully avoid the turbines (SNH 2010). It is also important to note that there is not necessarily a direct correlation between time spent at rotor height, and the likelihood of collision.

Displacement due to wind farms, which can be defined as reduced bird breeding density within a short distance of a wind turbines, has been described for some species (Pearce-Higgins *et al.* 2009). Birds exhibiting this type of displacement behaviour when defining breeding territories are less vulnerable to collisions, not because of morphological or site-specific factors, but because of altered behaviour (see also section 6.2 below).

Aletta wind farm

It is anticipated that most birds at the proposed wind farm will successfully avoid the wind turbines. Possible exceptions might be raptors engaged in hunting which might serve to distract them and place them at risk of collision, or birds engaged in display behaviour, e.g. Northern Black Korhaan (see earlier point). Despite being potential collision candidates based on morphology and flight behaviour, bustards do not seem to be particularly vulnerable to wind turbine collisions, indicating a high avoidance rate. Complete macro-avoidance of the wind farm is unlikely for any of the priority species.

- Bird abundance

Some authors suggest that fatality rates are related to bird abundance, density or utilization rates (Carrete *et al.* 2012; Kitano and Shiraki, 2013; Smallwood and Karas, 2009), whereas others point out that, as birds use their territories in a non-random way, fatality rates do not depend on bird abundance alone (e.g. Ferrer *et al.* 2012; Hull *et al.* 2013). Instead, fatality rates depend on other factors such as differential use of specific areas within a wind farm (De Lucas *et al.* 2008). For example, at Smøla, White-tailed Eagle flight activity is correlated with collision fatalities (Dahl *et al.* 2013). In the APWRA, Golden Eagles, Red-tailed Hawks and American Kestrels (*Falco spaverius*) have higher collision fatality rates than Turkey Vultures (*Cathartes aura*) and Common Raven (*Corvus corax*), even though the latter are more abundant in the area (Smallwood *et al.* 2009), indicating that fatalities are more influenced by each species' flight behaviour and turbine perception. Also, in southern Spain, bird fatality was higher in the winter, even though bird abundance was higher during the pre-breeding season (De Lucas *et al.* 2008).

<u>Aletta wind farm</u>
The abundance of priority species at the proposed wind farm site will fluctuate depending on season of the year, and particularly in response to rainfall. This is a common phenomenon in arid ecosystems, where stochastic rainfall events can trigger irruptions of insect populations which in turn attract large numbers of birds. In general, higher populations of priority species are likely to be present when the veld conditions are good, especially in the rainy season. This could increase the risk of collisions due to heightened flight activity, especially of species such as White Stork, Karoo Korhaan and Ludwig's Bustard. Conversely, some species might be more at risk during dry conditions, e.g. Sclater's Lark which seems to increase in numbers during dry spells (Hockey *et al.* 2005).

6.1.2 Site-specific factors

- Landscape features

Susceptibility to collision can also heavily depend on landscape features at a wind farm site, particularly for soaring birds that predominantly rely on wind updrafts to fly (see previous section). Some landforms such as ridges, steep slopes and valleys may be more frequently used by some birds, for example for hunting or during migration (Barrios and Rodríguez, 2004; Drewitt and Langston, 2008; Katzner *et al.* 2012; Thelander *et al.* 2003). In APWRA, Red-tailed Hawk fatalities occur more frequently than expected by chance at wind turbines located on ridge tops and swales, whereas Golden Eagle fatalities are higher at wind turbines located on slopes (Thelander *et al.* 2003). Other birds may follow other landscape features, such as peninsulas and shorelines, during dispersal and migration periods. Kitano and Shiraki (2013) found that the collision rate of White-tailed Eagles along a coastal cliff was extremely high, suggesting an effect of these landscape features on fatality rates.

<u>Aletta wind farm</u>

The proposed site does not contain many landscape features as the majority of the development area is situated on a vast plain. There is a slight ridge to the north of the site which may be used by soaring species for declivity soaring, but this will only be established through pre-construction monitoring. There is small pan in the south of the study area, and many boreholes with water troughs. Boreholes with open water troughs are important sources of surface water and are used extensively by various species, including large raptors, to drink and bath. Apart from raptors, smaller species congregate in large numbers around water troughs which in turn attracts raptors such as Lanner Falcon and Southern Pale Chanting Goshawk exposing them to collisions when they are distracted and hunting. If the small pan regularly holds water, it could attract all of the above as well as a variety of waterbirds. Greater Flamingo could potentially be attracted to open water in this arid region, but it has not been recorded by SABAP2, which indicates that the species does not occur regularly.

- Flight paths

Although the abundance of a species per se may not contribute to a higher collision rate with wind turbines, as previous discussed, areas with a high concentration of birds seem to be particularly at risk of collisions (Drewitt and Langston, 2006), and therefore several guidelines on wind farm construction advise special attention to areas located in migratory paths (e.g. Atienza *et al.* 2012; CEC, 2007; USFWS, 2012). As an example, Johnson *et al.* (2002) noted that over two-thirds of the carcasses found at a wind farm in Minnesota were of migrating birds. At certain times of the year, nocturnally migrating passerines are the most abundant species at wind farm, particularly during spring and fall migrations, and are also the most common fatalities (Strickland *et al.* 2011).

For territorial raptors like Golden Eagles, foraging areas are preferably located near to the nest, when compared to the rest of their home range. For example, in Scotland 98% of movements were registered at ranges less than 6 km from the nest, and the core areas were located within a 2−3 km radius (McGrady *et al.* 2002). These results, combined with the terrain features selected by Golden Eagles to forage such as areas closed to ridges, can be used to predict the areas used by the species to forage (McLeod *et al.* 2002), and therefore provide a sensitivity map and guidance to the development of new wind farms (Bright *et al.* 2006). In Spain, on the other hand, a study spanning 7 provinces with an estimated Golden Eagle population of 384 individuals, with a combined total of 46 years of post-construction monitoring, involving 5858 turbines, collisions did not occur at the nearest wind farm to the nest site but occurred in hunting areas with high prey availability far from the breeding territories, or randomly. A subset of data was used to investigate, inter alia, the relationship between collision mortality and proximity to wind turbines. Data was gathered for over a 12 year period. Analysis revealed that collisions are not related with the distance from the nest to the nearest turbine (Camiña 2014).

Wind farms located within flight paths can increase collision rates, as seen for the wind farm located close to a seabird breeding colony in Belgium (Everaert and Stienen, 2008). In this case, wind turbines were placed along feeding routes, and several species of gulls and terns were found to fly between wind turbines on their way to marine feeding grounds. Additionally, breeding adults flew closer to the structures when making frequent flights to feed chicks, which potentially increased the collision risk.

<u>Aletta Wind Farm</u>

The proposed windfarm site is not located on any known or obvious flight path. It is also not located on any known migration route. The pair of Verreaux's Eagles which breeds just outside the north-eastern corner of the site may at times forage over the site, especially in the area close to the nest. Monitoring at other wind farm sites in the Karoo have indicated that the majority of flight activity is within a 2-3km radius around the nest (pers. obs). This will have to be confirmed through regular pre-construction monitoring at the site. Another area of potential dense flight activity is around water points, which could regularly attract several priority species, especially large raptors (see 5.2.2 above).

- Food availability

Factors that increase the use of a certain area or that attract birds, like food availability, also play a role in collision risk. For example, the high density of raptors at the APWRA and the high collision fatality due to collision with turbines is thought to result, at least in part, from high prey availability in certain areas (Hoover and Morrison, 2005; Smallwood *et al.* 2001). This may be particularly relevant for birds that are less aware of obstructions such as wind turbines while foraging (Krijgsveld *et al.* 2009; Smallwood *et al.* 2009). It is speculated that the mortality of three Verreaux's Eagles in 2015 at a wind farm site in South Africa may have been linked to the availability of food (Smallie 2015).

<u>Aletta Wind Farm</u>

In arid zones such as where this proposed wind farm is located, food availability is often linked to rainfall. It is a well-known fact that insect outbreaks may occur after rainfall events, which could draw in various priority species such as Ludwig's Bustard, Kori Bustard and various raptors. This in turn could heighten the risk of collisions.

- Weather

Certain weather conditions, such as strong winds that affect the ability to control flight manoeuvrability or reduce visibility, seem to increase the occurrence of bird collisions with artificial structures (Longcore *et al.* 2013). Some high bird fatality events at wind farms have been reported during instances of poor weather. For example, at an offshore research platform in Helgoland, Germany, over half of the bird strikes occurred on just two nights that were characterized by very poor visibility (Hüppop *et al.* 2006). Elsewhere, 14 bird carcasses were found at two adjacent wind turbines after a severe thunderstorm at a North American wind farm (Erickson *et al.* 2001). However, in these cases, there may be a cumulative effect of bad weather and increased attraction to artificial light. Besides impairing visibility, low altitude clouds can in turn lower bird flight height, and therefore increasing their collision risk with tall obstacles (Langston and Pullan, 2003). For wind farms located along migratory routes, the collision risk may not be the same throughout a 24-h period, as the flight altitudes of birds seem to vary. The migration altitudes of soaring birds have been shown to follow a typically diurnal pattern, increasing during the morning hours, peaking toward noon, and decreasing again in the afternoon, in accordance with general patterns of daily temperature and thermal convection (Kerlinger, 2010; Shamoun-Baranes *et al.* 2003).

Collision risk of raptors is particularly affected by wind. For example, Golden Eagles migrating over a wind farm in Rocky Mountain showed variable collision risk according to wind conditions, which decreased when the wind speed raised and increased under head- and tailwinds when compared to western crosswinds (Johnston *et al.* 2014).

<u>Aletta Wind Farm</u>

Weather conditions at the proposed wind farm are likely to influence flight behaviour in much the same manner as has been recorded elsewhere at wind farms. The flight behaviour of priority species are currently being recorded at the site, together with various environmental parameters such as weather conditions and wind speeds. Provided enough flight data is collected, this could be used to detect any statistically significant relationships between flight behaviour and various environmental parameters.

6.1.3 Wind farm-specific factors

- Turbine features

Turbine features may play a role in collision risk. Older lattice-type towers have been associated with high collision risk, as some species exhibiting high fatality rates used the turbine poles as roosts or perches when hunting (Osborn *et al.* 1998; Thelander and Rugge, 2000). However, in more recent studies, tower structure did not influence the number of bird collisions, as it was not higher than expected according to their availability when compared to collisions with tubular turbines (Barrios and Rodríguez, 2004).

Turbine size has also been highlighted as an important feature, as higher towers have a larger rotor swept zone and, consequently, a larger collision risk area. While this makes intuitive sense, the majority of published scientific studies indicate that an increase in rotor swept area do not automatically translate into a larger collision risk. Turbine dimensions seem to play an insignificant role in the magnitude of the collision risk in general, relative to other factors such as topography, turbine location, morphology and a species' inherent ability to avoid the turbines, and may only be relevant in combination with other factors, particularly wind strength and topography (see Howell 1997, Barrios & Rodriguez 2004; Barclay *et al.* 2007, Krijgsveld *et al.* 2009, Smallwood 2013; Everaert 2014). Only two studies so far found a correlation between turbine hub height and mortality (De Lucas *et al.* 2008; Loss *et al.* 2013).

Rotor speed (revolutions per minute) also seems to be relevant, as faster rotors are responsible for higher fatality rates (Thelander *et al.* 2003). However, caution is needed when analysing rotor speed alone, as it is usually correlated with other features that may influence collision risk as turbine size, tower height and rotor diameter (Thelander *et al.* 2003), and because rotor speed is not proportional to the blade speed. In fact, fast spinning rotors have fast moving blades, but rotors with lower resolutions per minute may drive higher blade tip speeds.

<u>Aletta Wind Farm</u>

Due to the fact that the turbine dimensions are constantly changing as newer models are introduced, it is best to take a pre-cautionary approach in order to anticipate any future potential changes in the turbine dimensions. The pre-construction monitoring programme is currently working on a potential rotor swept area of 30m – 220m to incorporate a wide range of models, which accommodates the current proposed turbines (see Table 1).

- Blade visibility

When turbine blades spin at high speeds, a motion smear (or motion blur) effect occurs, making wind turbines less conspicuous. This effect occurs both in the old small turbines that have high rotor speed and in the newer high turbines that despite having slower rotor speeds, achieve high blade tip speeds. Motion smear effect happens when an object is moving too fast for the brain to process the images and, as a consequence, the moving object appears blurred or even transparent to the observer. The effect is dependent on the velocity of the moving object and the distance between the object and the observer. The retinal-image velocity of spinning blades increases as birds get closer to them, until it eventually surpasses the physiological limit of the avian retina to process temporally changing stimuli. As a consequence, the blades may appear transparent and perhaps the rotor swept zone appears to be a safe place to fly (Hodos, 2003). For example, McIsaac (2001) showed that American Kestrels were not always able to distinguish moving turbine blades within a range of light conditions.

<u>Aletta Wind Farm</u>

Motion smear is inherent to all wind turbines and will therefore also be a potential risk factor at the proposed wind farm.

- Wind farm configuration

Wind farm layout can also have a critical influence on bird collision risk. For example, it has been demonstrated that wind farms arranged perpendicularly to the main flight path may be responsible for a higher collision risk (Everaert *et al.* 2002 & Isselbacher and Isselbacher, 2001 in Hötker *et al.* 2006). At APWRA, wind farms located at the ends of rows, next to gaps in rows, and at the edge of local clusters were found to kill disproportionately more birds (Smallwood and Thellander, 2004). In this wind farm, serially arranged wind turbines that form wind walls are safer for birds (suggesting that birds recognize wind turbines and towers as obstacles and attempt to avoid them while flying), and fatalities mostly occur at single wind turbines or wind turbines situated at the edges of clusters (Smallwood and Thellander, 2004). However, this may be a specificity of APWRA. For instance, De Lucas *et al.* (2012a) found that the positions of the wind turbines within a row did not influence the turbine fatality rate of Griffon Vultures at Tarifa. Additionally, engineering features of the newest wind turbines require a larger minimum distance between adjacent wind turbines and in new wind farms it is less likely that birds perceive rows of turbines as impenetrable walls. In fact, in Greece it was found that the longer the distance between wind turbines, the higher is the probability that raptors will attempt to cross the space between them (Cárcamo *et al.* 2011).

<u>Aletta Wind Farm</u>

No information is currently available on the turbine lay-out at the proposed wind farm.

6.2 Displacement due to disturbance

The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance in effect can amount to habitat loss. Displacement may occur during both the construction and operational phases of wind farms, and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. The scale and degree of disturbance will vary according to site- and species-specific factors and must be assessed on a site-by-site basis (Drewitt & Langston 2006).

Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments. Onshore, disturbance distances (in other words the distance from wind farms up to which birds are absent or less abundant than expected) up to 800 m (including zero) have been recorded for wintering waterfowl (Pedersen & Poulsen 1991 as cited by Drewitt & Langston 2006), though 600 m is widely accepted as the maximum reliably recorded distance (Drewitt & Langston 2006). The variability of displacement distances is illustrated by one study which found lower post-construction densities of feeding European White-fronted Geese *Anser albifrons* within 600 m of the turbines at a wind farm in Rheiderland, Germany (Kruckenberg & Jaene 1999 as cited by Drewitt & Langston 2006), while another showed displacement of Pink-footed Geese *Anser brachyrhynchus* up to only 100–200 m from turbines at a wind farm in Denmark (Larsen & Madsen 2000 as cited by Drewitt & Langston 2006). Indications are that Great Bustard *Otis tarda* could be displaced by wind farms up to one kilometre from the facility (Langgemach 2008). An Austrian study found displacement for Great Bustards up to 600m (Wurm & Kollar as quoted by Raab *et al.* 2009). However, there is also evidence to the contrary; information on Great Bustard received from Spain points to the possibility of continued use of leks at operational wind farms (Camiña 2012b). Research on small grassland species in North America indicates that permanent displacement is uncommon and very species specific (e.g. see Stevens *et al.* 2013, Hale *et al.* 2014). There also seem to be little evidence for a persistent decline in passerine populations at wind farm sites in the UK (despite some evidence of turbine avoidance), with some species, including Skylark, showing increased populations after wind farm construction (see Pierce-Higgins *et al.* 2012). Populations of Thekla Lark *Galerida theklae* were found to be unaffected by wind farm developments in Southern Spain (see Farfan *et al.* 2009).

The consequences of displacement for breeding productivity and survival are crucial to whether or not there is likely to be a significant impact on population size. However, studies of the impact of wind farms on breeding birds are also largely inconclusive or suggest lower disturbance distances, though this apparent lack of effect may be due to the high site fidelity and long life-span of the breeding species studied. This might mean that the true impacts of disturbance on breeding birds will only be evident in the longer term, when new recruits replace existing breeding birds. Few studies have considered the possibility of displacement for short-lived passerines (such as larks), although Leddy *et al.* (1999) found increased densities of breeding grassland passerines with increased distance from wind turbines, and higher densities in the reference area than within 80m of the turbines. A review of minimum avoidance distances of 11 breeding passerines were found to be generally <100m from a wind turbine ranging from 14 – 93m (Hötker *et al.* 2006). A comparative study of nine wind farms in Scotland (Pearce-Higgens *et al.* 2009) found unequivocal evidence of displacement: Seven of the 12 species studied exhibited significantly lower frequencies of occurrence close to the turbines, after accounting for habitat variation, with equivocal evidence of turbine avoidance in a further two. No species were more likely to occur close to the turbines. Levels of turbine avoidance suggest breeding bird densities may be reduced within a 500m buffer of the turbines by 15–53%, with Common Buzzard *Buteo buteo*, Hen Harrier *Circus cyaneus*, Golden Plover *Pluvialis apricaria*, Snipe *Gallinago gallinago*, Curlew *Numenius arquata* and Wheatear *Oenanthe oenanthe* most affected. In a follow-up study, monitoring data from wind farms located on unenclosed upland habitats in the United Kingdom were collated to test whether breeding densities of upland birds were reduced as a result of wind farm construction or during wind farm operation. Red Grouse *Lagopus lagopus scoticus*, Snipe *Gallinago gallinago* and Curlew *Numenius arquata* breeding densities all declined on wind farms during construction. Red Grouse breeding densities recovered after construction, but Snipe and Curlew densities did not. Post-construction Curlew breeding densities on wind farms were also significantly lower than reference sites. Conversely, breeding densities of Skylark *Alauda arvensis* and Stonechat *Saxicola torquata* increased on wind farms during construction. Overall, there was little evidence for consistent post-construction population declines in any species, suggesting that wind farm construction can have greater impacts upon birds than wind farm operation (Pierce-Higgens *et al.* 2012).

The effect of birds altering their migration flyways or local flight paths to avoid a wind farm is also a form of displacement. This effect is of concern because of the possibility of increased energy expenditure when birds have to fly further, as a result of avoiding a large array of turbines, and the potential disruption of linkages between distant feeding, roosting, moulting and breeding areas otherwise unaffected by the wind farm. The effect depends on species, type of bird movement, flight height, distance to turbines, the layout and operational status of turbines, time of day and wind force and direction, and can be highly variable, ranging from a slight 'check' in flight direction, height or speed, through to significant diversions which may reduce the numbers of birds using areas beyond the wind farm (Drewitt & Langston 2006). A review of the literature suggests that none of the barrier effects identified so far have significant impacts on populations (Drewitt & Langston 2006). However, there are circumstances where the barrier effect might lead indirectly to population level impacts; for example where a wind farm effectively blocks a regularly used flight line between nesting and foraging areas, or where several wind farms interact cumulatively to create an extensive barrier which could lead to diversions of many tens of kilometres, thereby incurring increased energy costs.

Aletta Wind Farm

None of the priority species are likely to be permanently displaced due to disturbance, although displacement in the short term during the construction phase is very likely. The risk of permanent replacement is larger for large species such as Kori Bustard and Ludwig's Bustard, although displacement of the closely related Denham's Bustard (*Neotis denhami*) is evidently not happening at existing wind farms in the Eastern Cape (M. Langlands pers. comm). If the wind farm follows the modern trend of fewer, larger turbines, the risk of displacement is also lower. However, this will only be stablished through a post-construction monitoring programme.

It is recommended that a 3km buffer no development zone is implemented around the Verreaux's Eagle nest as per the draft Verreaux's Eagle guidelines for wind farms produced by Birdlife SA in September 2015 (BLSA 2015b). A 200m no development buffer zone is recommended for the Southern pale Chanting Goshawk nest, should it be established that the nest is active. Appropriate buffer zones need to be implemented around any priority species nests which are discovered in the course of the pre-construction monitoring.

6.3 Displacement due to habitat loss

The scale of permanent habitat loss resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, in general it, is likely to be small per turbine base. Typically, actual habitat loss amounts to 2–5% of the total development area (Fox *et al.* 2006 as cited by Drewitt & Langston 2006), though effects could be more widespread where developments interfere with hydrological patterns or flows on wetland or peatland sites (unpublished data). Some changes could also be beneficial. For example, habitat changes following the development of the Altamont Pass wind farm in California led to increased mammal prey availability for some species of raptor (for example through greater availability of burrows for Pocket Gophers *Thomomys bottae* around turbine bases), though this may also have increased collision risk (Thelander *et al.* 2003 as cited by Drewitt & Langston 2006).

However, the results of habitat transformation may be more subtle, whereas the actual footprint of the wind farm may be small in absolute terms, the effects of the habitat fragmentation brought about by the associated infrastructure (e.g. power lines and roads) may be more significant. Sometimes Great Bustard can be seen close to or under power lines, but a study done in Spain (Lane *et al.* 2001 as cited by Raab *et al.* 2009) indicates that the total observation of Great Bustard flocks were significantly higher further from power lines than at control points. Shaw (2013) found that Ludwig's Bustard generally avoid the immediate proximity of roads within a 500m buffer. This means that power lines and roads also cause loss and fragmentation of the habitat used by the population in addition to the potential direct mortality. The physical encroachment increases the disturbance and barrier effects that contribute to the overall habitat fragmentation effect of the infrastructure (Raab *et al.* 2010). It has been shown that fragmentation of natural grassland in Mpumalanga (in that case by afforestation) has had a detrimental impact on the densities and diversity of grassland species (Alan *et al.* 1997).

Aletta Wind Farm

The direct habitat transformation at the proposed wind farm is likely to be fairly minimal. The indirect habitat transformation is likely to have a bigger impact on priority species. It is expected that the densities of most priority species will decrease due to this impact, but complete displacement is unlikely.

6.4 Mortality on associated transmission line infrastructure

Negative impacts on birds by electricity infrastructure generally take two forms namely electrocution and collisions (Ledger & Annegarn 1981; Ledger 1983; Ledger 1984; Hobbs and Ledger 1986a; Hobbs & Ledger 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn 1996; Kruger & Van Rooyen 1998; Van Rooyen 1998; Kruger 1999; Van Rooyen 1999; Van Rooyen 2000; Van Rooyen 2004; Jenkins *et al* 2010). Birds also impact on the infrastructure through nesting and streamers, which can cause interruptions in the electricity supply (Van Rooyen *et al.* 2002).

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed Helena Solar 3 PV plant, no electrocution risk is envisaged because the design of the steel mono-pole 132kV lines will not pose an electrocution threat to any of the priority species which are likely to occur at the site.

Collisions are probably the bigger threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001). In a recent PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

> *"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010).*
>
> *The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger 1998, Janss 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin et al. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al. 1987, Henderson et al. 1996).*
>
> *Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the*

prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al. 1987, Faanes 1987, Alonso et al. 1994a, Bevanger 1994)."

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (see Figure 8 below - Jenkins *et al.* 2010).

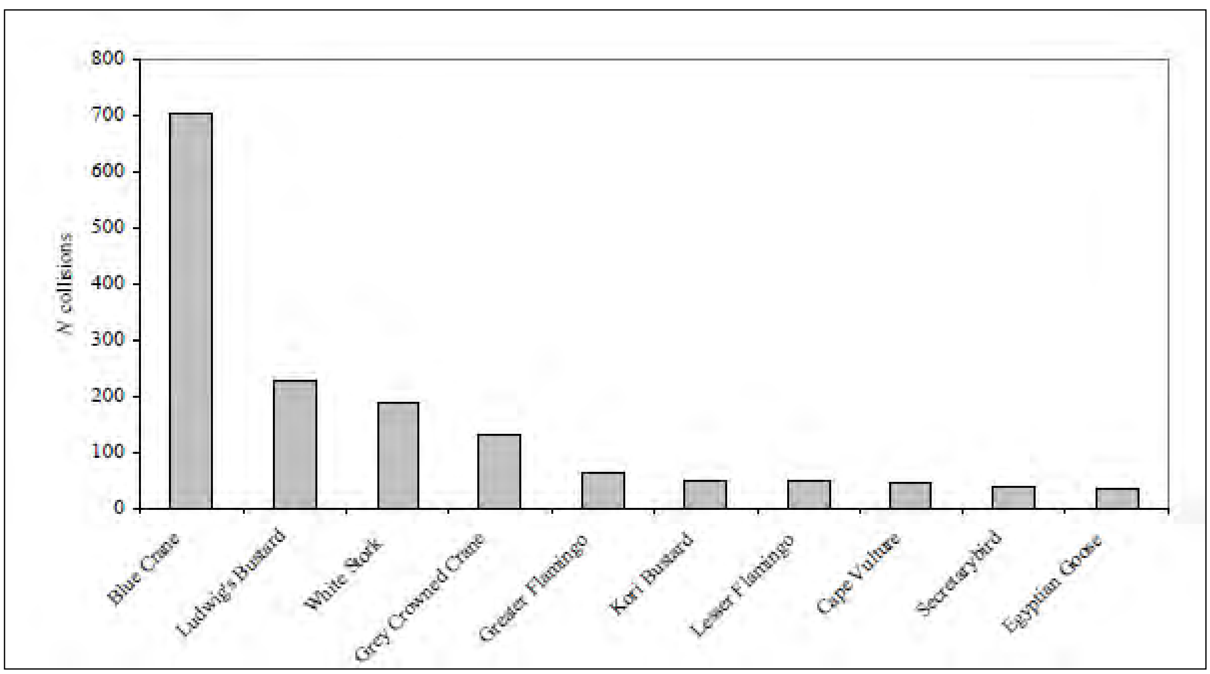

Figure 8: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 - 2008 (Jenkins *et al.* 2010)

Power line collisions are generally accepted as a key threat to bustards (Raab *et al.* 2009; Raab *et al.* 2010; Jenkins & Smallie 2009; Barrientos *et al.* 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

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

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins *et al.* 2010; Martin *et al.* 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Barrientos *et* *al.* 2011; Jenkins *et al.* 2010; Alonso & Alonso 1999; Koops & De Jong 1982), including to some extent for bustards (Barrientos *et al.* 2012; Hoogstad 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos *et al.* (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55−94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs were critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos *et al.* (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al.* 2010).

Aletta Wind Farm

Several of the priority species which occur or potentially occur at Aletta Wind Farm are power line sensitive. These include Ludwig's Bustard, Kori Bustard, Northern Black Korhaan, Secretarybird and Karoo Korhaan. All of these species, but particularly Ludwig's Bustard, could be impacted by the proposed grid connection through collision with the earthwire of the proposed 132kV line.

7. PRELIMINARY IMPACT ASSESSMENT

7.1 Impact assessment methodology

The Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

7.2 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Error! Reference source not found.**4.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

7.3 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

Where necessary, the proposal for mitigation or optimisation of an impact is detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

- Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 3: Description of terms

NATURE		
This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		

1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.

2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
Significance		

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

7.4 Impact ratings tables

IMPACT TABLE 1	
Environmental Parameter	*Avifauna*
Issue/Impact/Environmental Effect/Nature	*Displacement of priority species due to disturbance during **construction** phase*
Extent	*The impact will only affect the site.*
Probability	*Impact will certainly occur (greater than a 75% chance of occurrence) for some species, particularly the larger ones.*
Reversibility	*Partly reversible. The construction activities will inevitably cause temporary displacement of some priority species. Once the source of the disturbance has been removed, i.e. the noise and movement associated with the construction activities, most species should re-colonise the areas which have not been transformed by the footprint. However, the indirect effect of habitat fragmentation could result in lower densities of priority species.*
Irreplaceable loss of resources	*Marginal loss of resources. The displacement of priority species is likely to be partial.*
Duration	*Short term. Once the source of the disturbance has been removed, i.e. the noise and movement associated with the construction activities, priority species should re-colonise the areas which have not been transformed by the footprint, albeit possibly at a lower density.*
Cumulative effect	*Medium cumulative impact. The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges, the cumulative impact of displacement would therefore be locally significant, rather than regionally or nationally significant.*
Intensity/magnitude	*High. Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease.*
Significance Rating	*Medium significance.*

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	2

IMPACT TABLE 1		
Reversibility	2	1
Irreplaceable loss	2	2
Duration	1	1
Cumulative effect	3	2
Intensity/magnitude	3	2
Significance rating	-39 (medium negative)	-18 (low negative)
Mitigation measures	• Restrict the construction activities to the construction footprint area. • Do not allow any access to the remainder of the property during the construction period. • Measures to control noise and dust should be applied according to current best practice in the industry. • Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum. • Implement a 3km no development buffer zone around the Verreaux's eagle nest at 29°52'56.53"S 22°33'19.06"E. • Implement a 200m no development buffer zone around the Southern pale Chanting Goshawk nest at 29°56'34.42"S 22°32'55.35"E. • Implement appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring.	

Scoping Phase Impact Summary Table

ISSUE	Impact: Displacement of priority avifauna due to disturbance during construction phase
DISCUSSION	The construction activities will inevitably cause temporary displacement of priority species. Once the source of the disturbance has been removed, i.e. the noise and movement associated with the construction activities, priority species should re-colonise the areas which have not been transformed by the footprint. However, the indirect effect of habitat fragmentation could result in overall lower densities of priority species.
EXISTING IMPACT	Very little disturbance of priority species is currently happening at the site, as the major land activity is low intensity grazing.
PREDICTED IMPACT	High. Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. Most priority species will be displaced during the construction phase.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE	Medium. The priority species that occur (or are likely to occur) at the

ISSUE	Impact: Displacement of priority avifauna due to disturbance during construction phase
EFFECT	proposed site all have large distribution ranges; the cumulative impact of displacement would therefore be locally significant, rather than regionally or nationally significant.

IMPACT TABLE 2		
Environmental Parameter	*Avifauna*	
Issue/Impact/Environmental Effect/Nature	*Displacement of priority species due to habitat destruction during* ***construction*** *phase*	
Extent	*The impact will only affect the site.*	
Probability	*Impact will certainly occur (greater than a 75% chance of occurrence)*	
Reversibility	*Partly reversible. The footprint of the wind farm is an inevitable result of the development, but it is likely that priority species will still utilise the site, albeit at lower densities.*	
Irreplaceable loss of resources	*Marginal loss of resources. It is likely that priority species will still utilise the site albeit at lower densities.*	
Duration	*Long term. The habitat transformation will be permanent*	
Cumulative effect	*Medium cumulative impact. There are several renewable energy developments planned around Copperton which will result in a significant area of transformed habitat at a local scale.*	
Intensity/magnitude	*Medium. It is likely that priority species will still utilise the site albeit at lower densities.*	
Significance Rating	*Medium significance.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	3
Reversibility	2	2
Irreplaceable loss	2	2
Duration	4	4
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-32 (medium negative)	-30 (medium negative)

IMPACT TABLE 2	
Mitigation measures	• The recommendations of the specialist ecological study must be strictly adhered to. • Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.

Scoping Phase Impact Summary Table

ISSUE	Impact: Displacement of priority avifauna due to habitat destruction during construction phase
DISCUSSION	Displacement due to the footprint of the wind farm is an inevitable result of the development, but it is likely that priority species will still utilise the site, albeit at lower densities.
EXISTING IMPACT	Very little habitat transformation as the major land activity is low intensity grazing.
PREDICTED IMPACT	Medium. It is likely that priority species will still utilise the site albeit at lower densities.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium cumulative impact. There are several renewable energy developments planned around Copperton which will result in a significant area of transformed habitat at a local scale.

IMPACT TABLE 3	
Environmental Parameter	*Avifauna*
Issue/Impact/Environmental Effect/Nature	*Displacement of priority species due to disturbance during **operational** phase*
Extent	*The impact will only affect the site.*
Probability	*Probable. The impact may occur (between a 50% to 75% chance of occurrence).*
Reversibility	*Partly reversible. The operational activities could cause displacement of some priority species, but the impact is likely to be much less than during the construction phase.*
Irreplaceable loss of resources	*Marginal loss of resources. Habituation is likely for some species after the construction phase, especially smaller species.*
Duration	*Long term. Although habituation may happen in some instances, it must be assumed that in some instances the impact may be long term i.e. for the life-time of the activity.*
Cumulative effect	*Medium cumulative impact. The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges, the cumulative impact of displacement would therefore be locally significant, rather than regional or national.*

IMPACT TABLE 3		
Intensity/magnitude	*Medium. Although habituation may happen in some instances, it must be assumed that in some instances the impact may be long term i.e. for the life-time of the activity.*	
Significance Rating	*Low significance.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	2	2
Significance rating	-26 (low negative)	-24 (low negative)
Mitigation measures	• Operational activities should be restricted to the plant area. Maintenance staff should not be allowed to access other parts of the property unless it is necessary for wind farm related work. • Post-construction monitoring should be implemented to make comparisons with baseline conditions possible. • If densities of key priority species are proven to be significantly reduced due to the operation of the wind farm, the management of the wind farm must be engaged to devise ways of reducing the impact on these species.	

Scoping Phase Impact Summary Table

ISSUE	Impact: Displacement of priority avifauna due to disturbance during operational phase
DISCUSSION	The operational activities could cause displacement of some priority species, but the impact is likely to be much less than during the construction phase
EXISTING IMPACT	Very little disturbance of priority species is currently happening at the site, as the major land activity is low intensity grazing.
PREDICTED IMPACT	Medium. It is likely that priority species will still utilise the site albeit at lower densities.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium cumulative impact. The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges; the cumulative impact of displacement would therefore be locally

ISSUE	Impact: Displacement of priority avifauna due to disturbance during operational phase
	significant, rather than regional or national.

IMPACT TABLE 4		
Environmental Parameter	*Avifauna*	
Issue/Impact/Environmental Effect/Nature	*Collisions of priority species with the turbines in the operational phase*	
Extent	*The impact will affect the local area or district*	
Probability	*Definite. More than 75% chance of occurrence.*	
Reversibility	*Partly reversible. Mitigation measures could reduce the risk of collisions.*	
Irreplaceable loss of resources	*Significant loss of resources.*	
Duration	*Long term. The risk of collision will be present for the life-time of the development.*	
Cumulative effect	*Medium to high cumulative impact. The cumulative impact will depend largely on which species are killed. If Verreaux's Eagles are killed, the regional impact will be significant.*	
Intensity/magnitude	*Medium. The wind turbines could cause mortality of some priority species.*	
Significance Rating	*High significance.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	2
Reversibility	2	2
Irreplaceable loss	3	3
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	3	2
Significance rating	-51 (high negative)	-30 (medium negative)
Mitigation measures	• Pre-construction monitoring should be implemented to guide the micro-siting of the turbines. • Once the turbines have been constructed, post-construction monitoring should be implemented to compare actual collision rates with predicted collision rates. • If actual collision rates indicate high mortality levels, curtailment of selective turbines should be	

IMPACT TABLE 4	
	implemented. • A 200m no-development zone is recommended around all water points. • A 3km no development buffer zone around the Verreaux's eagle nest at 29°52'56.53"S 22°33'19.06"E is recommended.

Scoping Phase Impact Summary Table

ISSUE	Impact: Collisions of priority species with the turbines in the operational phase
DISCUSSION	The species most at risk are Verreaux's Eagle and Northern Black Korhaan.
EXISTING IMPACT	None
PREDICTED IMPACT	Medium. The wind turbines could cause mortality of some priority species.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium to high cumulative impact. The cumulative impact will depend largely on which species are killed. If Verreaux's Eagles are killed, the local impact will be significant.

IMPACT TABLE 5	
Environmental Parameter	*Avifauna*
Issue/Impact/Environmental Effect/Nature	*Mortality of priority species with the grid connection in the operational phase*
Extent	*Province/region. The impact could affect Ludwig's Bustard which move through the area on the annual migration between the Nama Karoo and the Succulent Karoo.*
Probability	*Definite. The impact will certainly occur (greater than 75% chance of occurrence).*
Reversibility	*Partly reversible. The impact could be reduced through the application of mitigation measures.*
Irreplaceable loss of resources	*Significant loss of resources.*
Duration	*Long term. The risk of collision will be present for the life-time of the development.*
Cumulative effect	*Medium impact. The cumulative impact will depend largely on which species are killed. Bustards suffer high mortality on power lines, for these species the cumulative impacts may be medium.*

IMPACT TABLE 5		
Intensity/magnitude	*Medium.*	
Significance Rating	*Medium significance. The anticipated impact will have moderate negative effects and will require moderate mitigation measures.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	4	3
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	2	2
Significance rating	-36 (medium negative)	-30 (medium negative)
Mitigation measures	• The final power line route should be assessed by way of a walk-through and those sections requiring Bird Flight Diverters (BFDs) must be identified.	

Scoping Phase Impact Summary Table

ISSUE	Impact: Collisions of priority species with the grid connection in the operational phase
DISCUSSION	The impact could affect Ludwig's Bustard which move through the area on the annual migration between the Nama Karoo and the Succulent Karoo.
EXISTING IMPACT	There are several high voltage lines which feed into Kronos MTS which are most likely a cause of avian collision mortality.
PREDICTED IMPACT	Medium. The grid connection will almost certainly cause mortality of Ludwig's Bustard.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium impact. The cumulative impact will depend largely on which species are killed. Bustards suffer high mortality on power lines, for these species the cumulative impacts may be medium.

8. CONCLUSIONS

The proposed BioTherm Aletta (Copperton) Wind Farm will have a variety of impacts on avifauna which ranges from low to high. The impacts are (1) displacement of priority species due to disturbance during construction phase (2) displacement of priority species due to habitat destruction during construction phase (3) displacement of priority species due to disturbance during operational phase (4) collisions of priority species with the turbines in the operational phase and (5) mortality of priority species with the grid connection in the operational phase.

Displacement of priority species due to disturbance during construction phase is likely to be a temporary medium negative impact, but can be reduced to low with the application of mitigation measures. Mitigation measures are the restriction of construction activities to the construction footprint area, no access to the remainder of the property during the construction period, measures to control noise and dust, maximum use of existing access roads, the implementation of a 3km no development buffer zone around a Verreaux's Eagle nest, a 200m no development buffer zone around a Southern Pale Chanting Goshawk nest and the implementation of appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring.

Displacement of priority species due to habitat destruction during construction phase is likely to be a medium negative impact and will remain so, despite the application of mitigation measures. Mitigation measures comprise strict adherence to the recommendations of the specialist ecological study and maximum use of existing access roads with the construction of new roads kept to a minimum.

Displacement of priority species due to disturbance during operational phase is likely to be of low significance and it could be further reduced through the application of mitigation measures. Mitigation measures are the restriction of operational activities to the plant area, no access to other parts of the property unless it is necessary for wind farm related work, post-construction monitoring, and if densities of key priority species are proven to be significantly reduced due to the operation of the wind farm, engagement of the wind farm management to devise ways of reducing the impact on these species.

Collisions of priority species with the turbines in the operational phase are likely to be a high negative impact but it could be reduced to medium negative through the application of mitigation measures. Mitigation measures are the implementation of pre-construction monitoring to guide the micro-siting of the turbines, the implementation of post-construction monitoring and, if actual collision rates indicate high mortality levels, curtailment of selective turbines. Lastly, the implementation of a 3km no development buffer zone around a Verreaux's Eagle nest, a 200m no development buffer zone around a Southern Pale Chanting Goshawk nest and the implementation of appropriate buffer zones around all priority species nest which are recorded in the course of the pre-construction monitoring, is recommended.

Mortality of priority species with the grid connection in the operational phase is likely to be medium negative, and although it can be reduced through the fitting of Bird Flight Diverters on selected sections, it will most likely remain at a medium negative level.

The conclusions above are preliminary and subject to the outcome of a monitoring programme which is currently underway at the site. See Figure 7 below for a preliminary sensitivity map indicating proposed buffer zones.

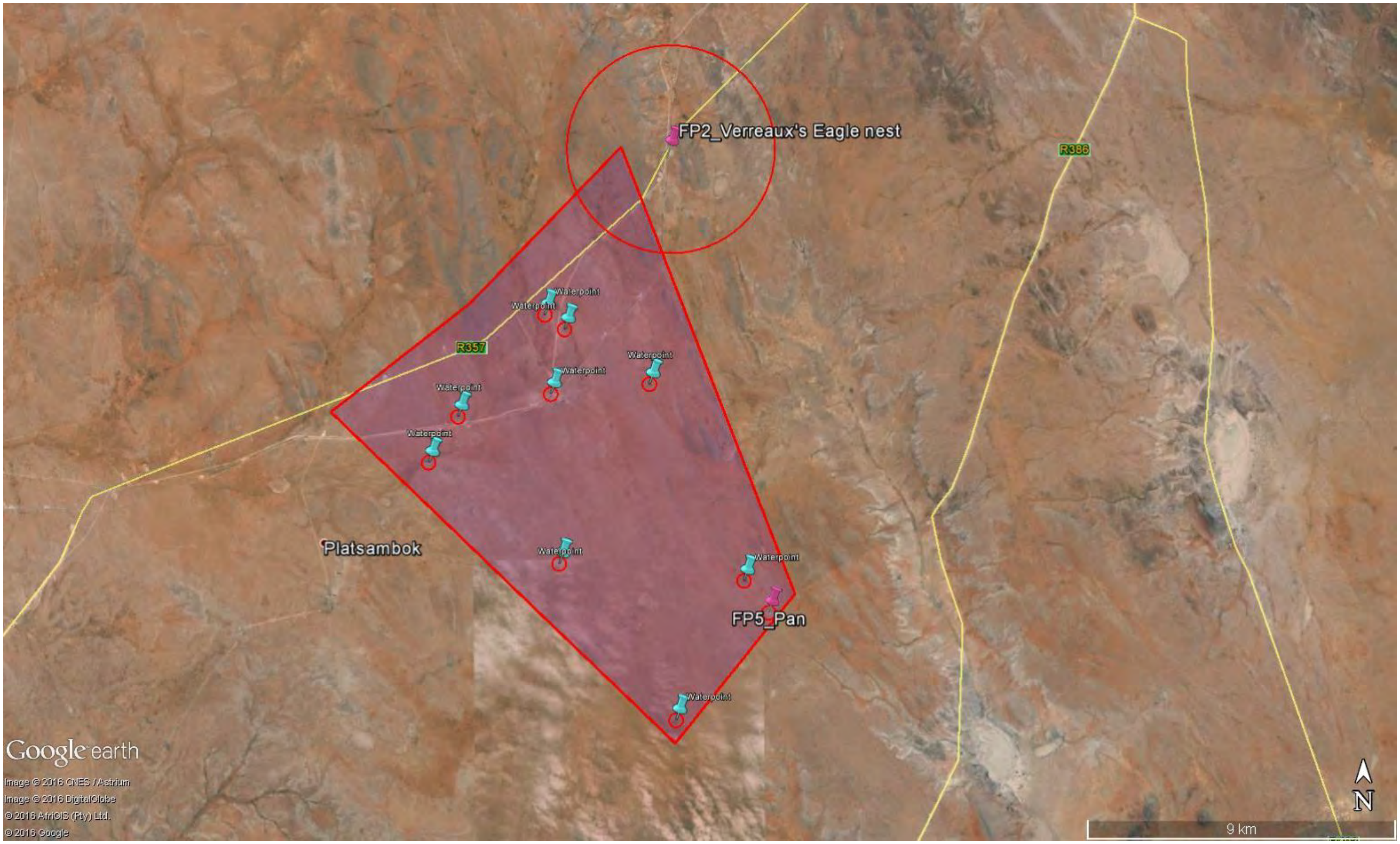

Figure 7: Sensitivity map of the study area, indicating proposed buffer zones (red circles).

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APPENDIX 1 SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 reporting rate % in 9 pentad block
Eagle-owl, Spotted	*Bubo africanus*	*170*			3.45
Kestrel, Greater	*Falco rupicoloides*	*174*			24.14
Korhaan, Northern Black	*Afrotis afraoides*	*180*			82.76
Goshawk, Southern Pale Chanting	*Melierax canorus*	*200*			79.31
Courser, Double-banded	*Rhinoptilus africanus*	*204*	NT	LC	13.79
Buzzard, Steppe	*Buteo vulpinus*	*210*			3.45
Kite, Black	*Milvus migrans*	*220*			0
Stork, White	*Ciconia ciconia*	*220*			0
Plover, Chestnut-banded	*Charadrius pallidus*	*230*	NT	NT	0
Snake-eagle, Black-chested	*Circaetus pectoralis*	*230*			3.45
Korhaan, Karoo	*Eupodotis vigorsii*	*240*	NT	LC	72.41
Lark, Sclater's	*Spizocorys sclateri*	*240*	NT	NT	10.34
Buzzard, Jackal	*Buteo rufofuscus*	*250*			0
Bustard, Kori	*Ardeotis kori*	*260*	NT	NT	13.79
Flamingo, Greater	*Phoenicopterus ruber*	*290*	NT	LC	0
Falcon, Lanner	*Falco biarmicus*	*300*	VU	LC	3.45
Bustard, Ludwig's	*Neotis ludwigii*	*320*	EN	EN	48.28
Secretarybird	*Sagittarius serpentarius*	*320*	VU	VU	3.45
Harrier, Black	*Circus maurus*	*345*	EN	VU	0
Eagle, Martial	*Polemaetus bellicosus*	*350*	EN	VU	13.79
Eagle, Verreaux's	*Aquila verreauxii*	*360*	VU	LC	17.24
Avocet, Pied	*Recurvirostra avosetta*				0
Barbet, Acacia Pied	*Tricholaema leucomelas*				48.28
Batis, Pririt	*Batis pririt*				37.93
Bee-eater, European	*Merops apiaster*				0
Bee-eater, Swallow-tailed	*Merops hirundineus*				0
Bishop, Southern Red	*Euplectes orix*				3.45

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 Reporting rate % in 9 pentad block
Bokmakierie	*Telophorus zeylonus*				62.07
Brubru	*Nilaus afer*				0
Bulbul, African Red-eyed	*Pycnonotus nigricans*				17.24
Bunting, Cape	*Emberiza capensis*				13.79
Bunting, Lark-like	*Emberiza impetuani*				72.41
Canary, Black-headed	*Serinus alario*				0
Canary, Black-throated	*Crithagra atrogularis*				17.24
Canary, White-throated	*Crithagra albogularis*				48.28
Canary, Yellow	*Crithagra flaviventris*				34.48
Chat, Anteating	*Myrmecocichla formicivora*				68.97
Chat, Familiar	*Cercomela familiaris*				13.79
Chat, Karoo	*Cercomela schlegelii*				0
Chat, Sickle-winged	*Cercomela sinuata*				10.34
Chat, Tractrac	*Cercomela tractrac*				17.24
Cisticola, Desert	*Cisticola aridulus*				65.52
Cisticola, Grey-backed	*Cisticola subruficapilla*				41.38
Cisticola, Zitting	*Cisticola juncidis*				0
Coot, Red-knobbed	*Fulica cristata*				0
Courser, Temminck's	*Cursorius temminckii*				0
Crombec, Long-billed	*Sylvietta rufescens*				24.14
Crow, Pied	*Corvus albus*				82.76
Cuckoo, Diderick	*Chrysococcyx caprius*				6.9
Cuckoo, Jacobin	*Clamator jacobinus*				0
Dove, Laughing	*Streptopelia senegalensis*				55.17
Dove, Namaqua	*Oena capensis*				37.93
Dove, Red-eyed	*Streptopelia semitorquata*				0
Dove, Rock	*Columba livia*				0
Duck, Yellow-billed	*Anas undulata*				0

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 Reporting rate % in 9 pentad block
Egret, Cattle	*Bubulcus ibis*				0
Eremomela, Yellow-bellied	*Eremomela icteropygialis*				41.38
Falcon, Pygmy	*Polihierax semitorquatus*				13.79
Finch, Red-headed	*Amadina erythrocephala*				13.79
Finch, Scaly-feathered	*Sporopipes squamifrons*				51.72
Fiscal, Common (Southern)	*Lanius collaris*				51.72
Flycatcher, Chat	*Bradornis infuscatus*				65.52
Flycatcher, Fairy	*Stenostira scita*				3.45
Flycatcher, Fiscal	*Sigelus silens*				6.9
Goose, Egyptian	*Alopochen aegyptiacus*				17.24
Goose, Spur-winged	*Plectropterus gambensis*				13.79
Grebe, Little	*Tachybaptus ruficollis*				0
Greenshank, Common	*Tringa nebularia*				0
Guineafowl, Helmeted	*Numida meleagris*				3.45
Heron, Black-headed	*Ardea melanocephala*				0
Hoopoe, African	*Upupa africana*				6.9
Ibis, African Sacred	*Threskiornis aethiopicus*				0
Ibis, Hadeda	*Bostrychia hagedash*				13.79
Kestrel, Rock	*Falco rupicolus*				13.79
Kite, Black-shouldered	*Elanus caeruleus*				0
Kite, Yellow-billed	*Milvus aegyptius*				0
Lapwing, Blacksmith	*Vanellus armatus*				0
Lapwing, Crowned	*Vanellus coronatus*				3.45
Lark, Eastern Clapper	*Mirafra fasciolata*				72.41
Lark, Fawn-coloured	*Calendulauda africanoides*				51.72
Lark, Karoo Long-billed	*Certhilauda subcoronata*				48.28
Lark, Large-billed	*Galerida magnirostris*				13.79
Lark, Pink-billed	*Spizocorys conirostris*				0

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 Reporting rate % in 9 pentad block
Lark, Red-capped	*Calandrella cinerea*				0
Lark, Sabota	*Calendulauda sabota*				79.31
Lark, Spike-heeled	*Chersomanes albofasciata*				75.86
Lark, Stark's	*Spizocorys starki*				17.24
Martin, Brown-throated	*Riparia paludicola*				0
Martin, Rock	*Hirundo fuligula*				31.03
Masked-weaver, Southern	*Ploceus velatus*				41.38
Moorhen, Common	*Gallinula chloropus*				0
Mousebird, Red-faced	*Urocolius indicus*				10.34
Mousebird, White-backed	*Colius colius*				10.34
Neddicky	*Cisticola fulvicapilla*				3.45
Nightjar, European	*Caprimulgus europaeus*				0
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*				0
Penduline-tit, Cape	*Anthoscopus minutus*				3.45
Pigeon, Speckled	*Columba guinea*				37.93
Pipit, African	*Anthus cinnamomeus*				13.79
Pipit, Buffy	*Anthus vaalensis*				3.45
Pipit, Long-billed	*Anthus similis*				13.79
Plover, Kittlitz's	*Charadrius pecuarius*				0
Plover, Three-banded	*Charadrius tricollaris*				0
Prinia, Black-chested	*Prinia flavicans*				72.41
Prinia, Karoo	*Prinia maculosa*				0
Pytilia, Green-winged	*Pytilia melba*				3.45
Quail, Common	*Coturnix coturnix*				3.45
Quailfinch, African	*Ortygospiza atricollis*				3.45
Quelea, Red-billed	*Quelea quelea*				6.9
Robin-chat, Cape	*Cossypha caffra*				0

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 Reporting rate % in 9 pentad block
Rock-thrush, Short-toed	*Monticola brevipes*				0
Ruff, Ruff	*Philomachus pugnax*				0
Sandgrouse, Namaqua	*Pterocles namaqua*				41.38
Sandpiper, Common	*Actitis hypoleucos*				0
Sandpiper, Curlew	*Calidris ferruginea*				
Sandpiper, Wood	*Tringa glareola*				0
Scrub-robin, Kalahari	*Cercotrichas paena*				62.07
Scrub-robin, Karoo	*Cercotrichas coryphoeus*				44.83
Shelduck, South African	*Tadorna cana*				17.24
Shrike, Lesser Grey	*Lanius minor*				6.9
Shrike, Red-backed	*Lanius collurio*				6.9
Sparrow, Cape	*Passer melanurus*				68.97
Sparrow, House	*Passer domesticus*				13.79
Sparrow, Southern Grey-headed	*Passer diffusus*				0
Sparrowlark, Black-eared	*Eremopterix australis*				24.14
Sparrowlark, Grey-backed	*Eremopterix verticalis*				37.93
Sparrow-weaver, White-browed	*Plocepasser mahali*				44.83
Starling, Cape Glossy	*Lamprotornis nitens*				3.45
Starling, Pale-winged	*Onychognathus nabouroup*				3.45
Starling, Pied	*Spreo bicolor*				0
Starling, Wattled	*Creatophora cinerea*				6.9
Stilt, Black-winged	*Himantopus himantopus*				0
Stint, Little	*Calidris minuta*				0
Stonechat, African	*Saxicola torquatus*				0
Sunbird, Dusky	*Cinnyris fuscus*				20.69
Swallow, Barn	*Hirundo rustica*				27.59
Swallow, Greater Striped	*Hirundo cucullata*				20.69

Species	Taxonomic name	Priority species score	National Red Data status	Global Red Data status	SABAP2 Reporting rate % in 9 pentad block
Swallow, White-throated	*Hirundo albigularis*				0
Swift, Alpine	*Tachymarptis melba*				13.79
Swift, Common	*Apus apus*				17.24
Swift, Little	*Apus affinis*				13.79
Swift, White-rumped	*Apus caffer*				10.34
Teal, Cape	*Anas capensis*				0
Teal, Red-billed	*Anas erythrorhyncha*				
Thick-knee, Spotted	*Burhinus capensis*				6.9
Thrush, Karoo	*Turdus smithi*				0
Tit, Ashy	*Parus cinerascens*				27.59
Tit-babbler, Chestnut-vented	*Parisoma subcaeruleum*				48.28
Tit-babbler, Layard's	*Parisoma layardi*				10.34
Turtle-dove, Cape	*Streptopelia capicola*				44.83
Wagtail, Cape	*Motacilla capensis*				3.45
Warbler, Garden	*Sylvia borin*				0
Warbler, Namaqua	*Phragmacia substriata*				3.45
Warbler, Rufous-eared	*Malcorus pectoralis*				72.41
Waxbill, Black-faced	*Estrilda erythronotos*				0
Waxbill, Common	*Estrilda astrild*				0
Waxbill, Violet-eared	*Granatina granatina*				3.45
Weaver, Sociable	*Philetairus socius*				82.76
Wheatear, Capped	*Oenanthe pileata*				27.59
Wheatear, Mountain	*Oenanthe monticola*				17.24
White-eye, Orange River	*Zosterops pallidus*				0

BIRD MONITORING PROGRESS REPORT 1

ALETTA WIND ENERGY FACILITY

November 2015

Chris van Rooyen &
Albert Froneman *Pr.Sci.Nat*

Avifaunal Specialist Consultants

1. Objectives

The objective of the pre-construction monitoring at the proposed Aletta Wind Project is to gather baseline data over a period of four seasons on the following aspects pertaining to avifauna:

- The abundance and diversity of birds at the wind farm site and a suitable control site to measure the potential displacement effect of the wind farm.
- Flight patterns of priority species at the wind farm site to measure the potential collision risk with the turbines.

The objective of this short progress report is to provide feedback on the first monitoring period, with a few basic descriptive analyses of the data**. In depth statistical analyses will be performed on the full dataset after the monitoring has been completed.**

2. Methods

The monitoring protocol for the site is designed according to the latest version (2012) of *Jenkins A R; Van Rooyen C S; Smallie J J; Anderson M D & Smit H A. 2011. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Endangered Wildlife Trust and Birdlife South Africa.*

The first monitoring survey was conducted at the proposed turbine site and a control site by four field monitors during August 2015.

Monitoring is conducted in the following manner:

- One drive transect was identified totalling 19.6km on the turbine site and one drive transect in the control site with a total length of 10km.
- Two observers travelling slowly (± 10km/h) in a vehicle records all species on both sides of the transect. The observers stop at regular intervals (every 500 m) to scan the environment with binoculars. Transects are counted three times per sampling session.
- In addition, seven walk transects of 1km each were identified at the turbine site, and two at the control site, and counted 8 times per sampling season. All birds are recorded during walk transects.
- The following variables are recorded:
    - Species;
    - Number of birds;
    - Date;

  - Start time and end time;
  - Distance from transect (0-50 m, 50-100 m, >100 m);
  - Wind direction;
  - Wind strength (calm; moderate; strong);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying-foraging; flying-commute; foraging on the ground); and
  - Co-ordinates (priority species only).

- Seven vantage points (VPs) were identified from which the majority of the proposed turbine area can be observed (the "VP area"), to record the flight altitude and patterns of priority species. One VP was also identified on the control site. The following variables were recorded for each flight:
  - Species;
  - Number of birds;
  - Date;
  - Start time and end time;
  - Wind direction;
  - Wind strength (estimated Beaufort scale 1-7);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Flight altitude (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m);
  - Flight mode (soar; flap; glide ; kite; hover); and
  - Flight time (in 15 second-intervals).

The aim with drive transects is primarily to record large priority species (i.e. raptors and large terrestrial species), while walk transects are primarily aimed at recording small passerines. The objective of the transect monitoring is to gather baseline data on the use of the site by birds in order to measure potential displacement by the wind farm activities. The objective of vantage point counts is to measure the potential collision risk with the turbines. Priority species were identified using the November 2014 BLSA list of priority species for wind farms.

A total of 5 potential focal points of bird activity were identified and monitored. The five focal points are a Martial Eagle nest on the Hydra – Kronos Tower 519 at Kronos Substation (FP1), a Verreaux's Eagle nest on a telephone pole just outside the proposed development area (FP2), a clump of trees at a borehole in the development area (FP3), a water trough at a borehole (FP4) and an ephemeral pan (FP5).

Figure 1 below indicates the proposed turbine area where monitoring is taking place.

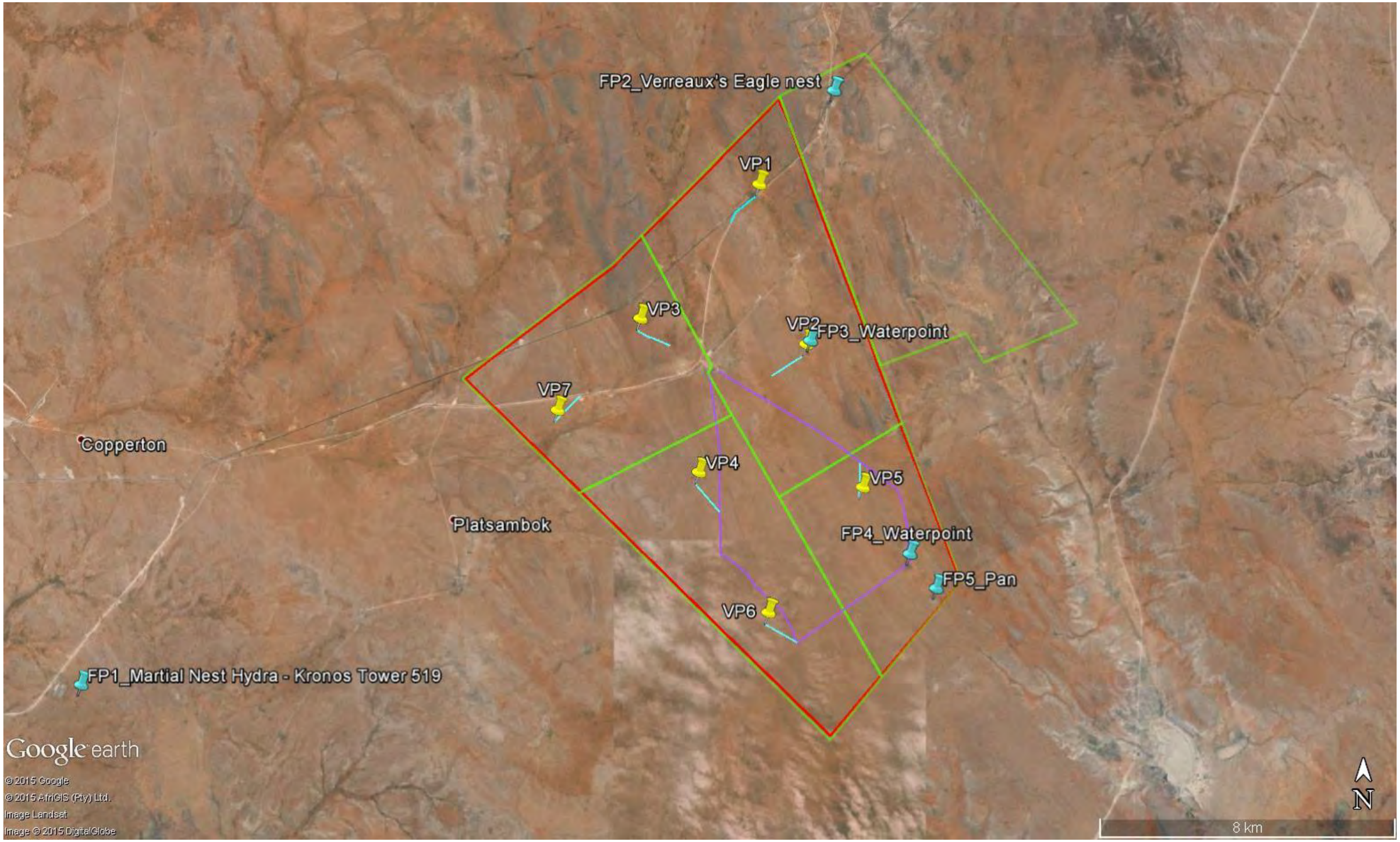

Figure 1: Area where monitoring is taking place, with position of VPs (yellow placemarks), focal points (blue placemarks), drive transects (purple line), walk transects (blue lines) and turbine assessment area (red polygon).

3. Results

3.1 Transects

The turbine and control sites are located in a transitional zone between Bushmanland Arid Grassland and Bushmanland Basin Shrubland, which are some of the most arid vegetation units of the Nama Karoo biome. The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The vegetation consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum* sp., *Salsola* sp., *Pentzia* sp., and *Eriocephalus* sp.), 'white' grasses (Stipagrostis sp.) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* sp. and *Leysera* sp. (Mucina & Rutherford 2006).

To date, a total of 47 species have been recorded at the turbine site, and 23 at the control site during transect counts. The total number of birds recorded during transect counts at the turbine site to date is 1705 and 313 at the control site.

Of the transect recorded species at the turbine site, 3 species (6.4% of recorded species) are priority species. At the control site 1 species (4.3% of recorded species) is a priority species.

Figures 2 and 3 below present the priority species transect count data for the turbine site and the control site, presented as an Index of Kilometric Abundance (IKA = birds/km).

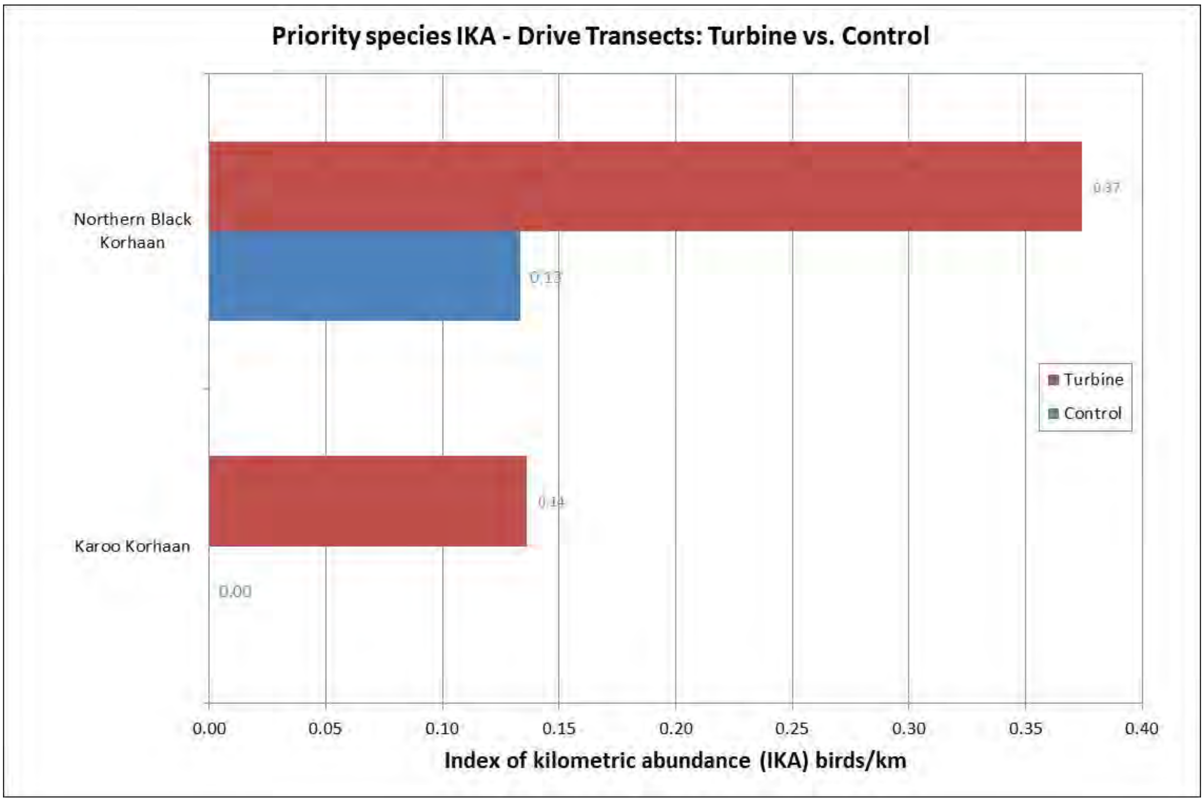

Figure 2: IKA for drive transect priority species at the turbine *vs.* control site

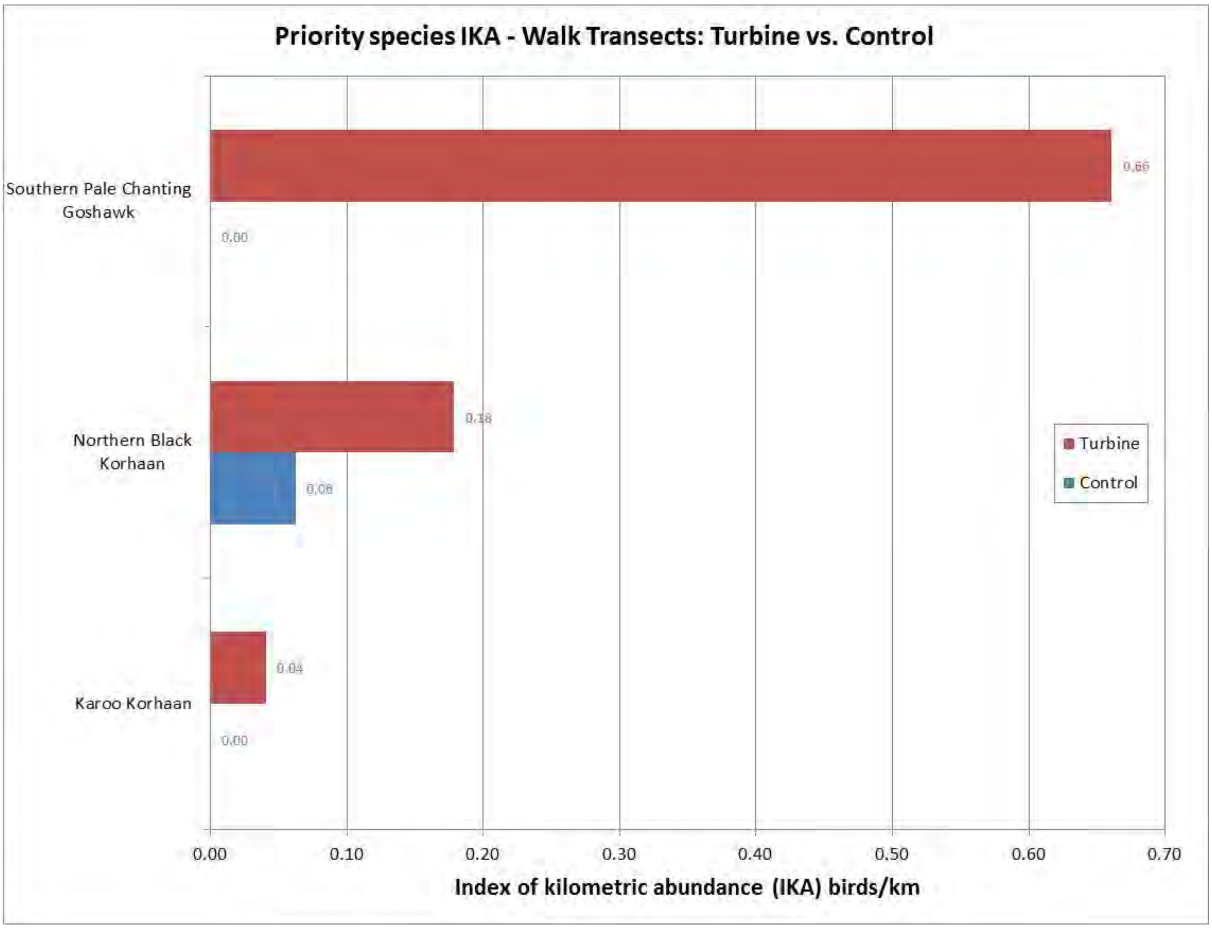

Figure 3: IKA for walk transects priority species at the turbine *vs.* control site. No priority species were recorded at the control site during walk transects.

The Martial Eagle nest at FP1 was not active. An active Verreaux's Eagle nest was recorded at FP2. No priority species were recorded at FP3, FP4 and FP5.

3.2 Vantage points

To date, flight patterns of priority species have been recorded for 84 hours (12 hours per VP) at 7 vantage points at the turbine site in three bands (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m). Approximate flight height was visually judged by an observer with the aid of binoculars. Priority species were observed for approximately 11 minutes and 15 seconds during the combined observation periods. Medium height flights i.e. within rotor height comprised 5 minutes and 15 seconds of the above total. Figure 4 presents the data gathered so far during vantage point watches at the turbine site.

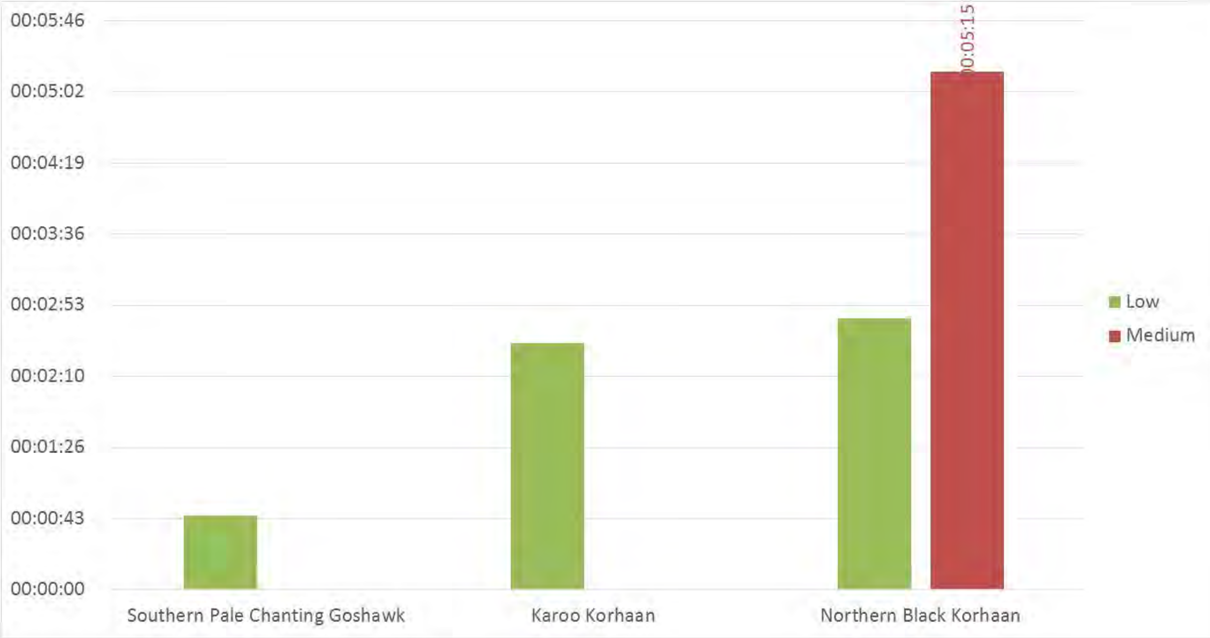

Figure 4: Flight time and height recorded for all individuals of priority species to date at the turbine site (96 hours of observation). Time is indicated in hours: minutes: seconds. Flight height is indicated as low (green/below rotor height = 0-30m) and medium (red/within rotor height = 30-220m).

4 Potential red flags

The only “red flag” issue which was identified during the first round of monitoring is the active Verreaux’s Eagle nest at FP2 (see Figure 1). The latest draft guidelines for Verreaux’s Eagle which was compiled by Birdlife SA recommends a 3km pre-cautionary no-development buffer around the nest which can be reduced to 1km if there is compelling evidence of low collision risk. So far no Verreaux’s Eagle flights have been recorded at VP1, which is approximately 3km from the nest.

Final analysis and recommendations will be done when the pre-construction monitoring is completed and statistical analyses are performed.

It is imperative that any changes to the proposed lay-out are communicated through to us immediately.

A consolidated list of all recorded species is attached as Appendix A.

APPENDIX A: Consolidated list of species recorded at the Aletta turbine and control sites during the first season of monitoring (include incidental sightings)

Priority Species	Scientific Name
Karoo Korhaan	*Eupodotis vigorsii*
Northern Black Korhaan	*Afrotis afraoides*
Secretarybird	*Sagittarius serpentarius*
Southern Pale Chanting Goshawk	*Melierax canorus*
Verreaux's Eagle	*Aquila verreauxii*

Non-Priority Species	
Acacia Pied Barbet	*Tricholaema leucomelas*
Anteating Chat	*Myrmecocichla formicivora*
Barn Swallow	*Hirundo rustica*
Black-Eared Sparrowlark	*Eremopterix australis*
Bokmakierie	*Telophorus zeylonus*
Cape Sparrow	*Passer melanurus*
Cape Turtle-Dove	*Streptopelia capicola*
Chat Flycatcher	*Bradornis infuscatus*
Common Fiscal	*Lanius collaris*
Crowned Lapwing	*Vanellus coronatus*
Eastern Clapper Lark	*Mirafra [apiata] fasciolata*
Familiar Chat	*Cercomela familiaris*
Fiscal Flycatcher	*Sigelus silens*
Grey Tit	*Parus afer*
Grey-Backed Sparrowlark	*Eremopterix verticalis*
Hadeda Ibis	*Bostrychia hagedash*
Helmeted Guineafowl	*Numida meleagris*
House Sparrow	*Passer domesticus*
Kalahari Scrub-Robin	*Cercotrichas paena*
Karoo Eremomela	*Eremomela gregalis*
Karoo Long-Billed Lark	*Certhilauda subcoronata*
Karoo Scrub-Robin	*Cercotrichas coryphoeus*
Large-Billed Lark	*Galerida magnirostris*
Lark-Like Bunting	*Emberiza impetuani*
Long-billed Crombec	*Sylvietta rufescens*
Namaqua Sandgrouse	*Pterocles namaqua*
Pied Crow	*Corvus albus*
Pygmy Falcon	*Polihierax semitorquatus*
Red-Billed Quelea	*Quelea quelea*
Red-Capped Lark	*Calandrella cinerea*
Red-Headed Finch	*Amadina erythrocephala*
Rock Martin	*Hirundo fuligula*
Rufous-Eared Warbler	*Malcorus pectoralis*
Sabota Lark	*Calendulauda sabota*
Sociable Weaver	*Philetairus socius*
Southern Masked-Weaver	*Ploceus velatus*
Speckled Pigeon	*Columba guinea*
Spike-Heeled Lark	*Chersomanes albofasciata*
Stark's Lark	*Spizocorys starki*
Tractrac Chat	*Cercomela tractrac*
White-Backed Mousebird	*Colius colius*
White-Browed Sparrow-Weaver	*Plocepasser mahali*
White-Necked Raven	*Corvus albicollis*
White-Rumped Swift	*Apus caffer*
White-throated Canary	*Crithagra albogularis*

Yellow Canary	*Crithagra flaviventris*
Yellow-Bellied Eremomela	*Eremomela icteropygialis*

BIRD MONITORING PROGRESS REPORT 2

ALETTA WIND ENERGY FACILITY

February 2016

Chris van Rooyen &
Albert Froneman *Pr.Sci.Nat*

Avifaunal Specialist Consultants

1. Objectives

The objective of the pre-construction monitoring at the proposed Aletta Wind Project is to gather baseline data over a period of four seasons on the following aspects pertaining to avifauna:

- The abundance and diversity of birds at the wind farm site and a suitable control site to measure the potential displacement effect of the wind farm.
- Flight patterns of priority species at the wind farm site to measure the potential collision risk with the turbines.

The objective of this short progress report is to provide feedback on the second monitoring period, with a few basic descriptive analyses of the data**. In depth statistical analyses will be performed on the full dataset after the monitoring has been completed.**

2. Methods

The monitoring protocol for the site is designed according to the latest version (2012) of *Jenkins A R; Van Rooyen C S; Smallie J J; Anderson M D & Smit H A. 2011. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Endangered Wildlife Trust and Birdlife South Africa.*

The second monitoring survey was conducted at the proposed turbine site and a control site by four field monitors during January 2016.

Monitoring is conducted in the following manner:

- One drive transect was identified totalling 19.6km on the turbine site and one drive transect in the control site with a total length of 10km.
- Two observers travelling slowly (± 10km/h) in a vehicle records all species on both sides of the transect. The observers stop at regular intervals (every 500 m) to scan the environment with binoculars. Transects are counted three times per sampling session.
- In addition, seven walk transects of 1km each were identified at the turbine site, and two at the control site, and counted 8 times per sampling season. All birds are recorded during walk transects.
- The following variables are recorded:
    - Species;
    - Number of birds;
    - Date;

  - Start time and end time;
  - Distance from transect (0-50 m, 50-100 m, >100 m);
  - Wind direction;
  - Wind strength (calm; moderate; strong);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying-foraging; flying-commute; foraging on the ground); and
  - Co-ordinates (priority species only).

- Seven vantage points (VPs) were identified from which the majority of the proposed turbine area can be observed (the "VP area"), to record the flight altitude and patterns of priority species. One VP was also identified on the control site. The following variables were recorded for each flight:
  - Species;
  - Number of birds;
  - Date;
  - Start time and end time;
  - Wind direction;
  - Wind strength (estimated Beaufort scale 1-7);
  - Weather (sunny; cloudy; partly cloudy; rain; mist);
  - Temperature (cold; mild; warm; hot);
  - Flight altitude (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m);
  - Flight mode (soar; flap; glide ; kite; hover); and
  - Flight time (in 15 second-intervals).

The aim with drive transects is primarily to record large priority species (i.e. raptors and large terrestrial species), while walk transects are primarily aimed at recording small passerines. The objective of the transect monitoring is to gather baseline data on the use of the site by birds in order to measure potential displacement by the wind farm activities. The objective of vantage point counts is to measure the potential collision risk with the turbines. Priority species were identified using the November 2014 BLSA list of priority species for wind farms.

A total of 5 potential focal points of bird activity were identified and monitored. The five focal points are a Martial Eagle nest on the Hydra – Kronos Tower 519 at Kronos Substation (FP1), a Verreaux's Eagle nest on a telephone pole just outside the proposed development area (FP2), a clump of trees at a borehole in the development area (FP3), a water trough at a borehole (FP4) and an ephemeral pan (FP5).

Figure 1 below indicates the proposed turbine area where monitoring is taking place.

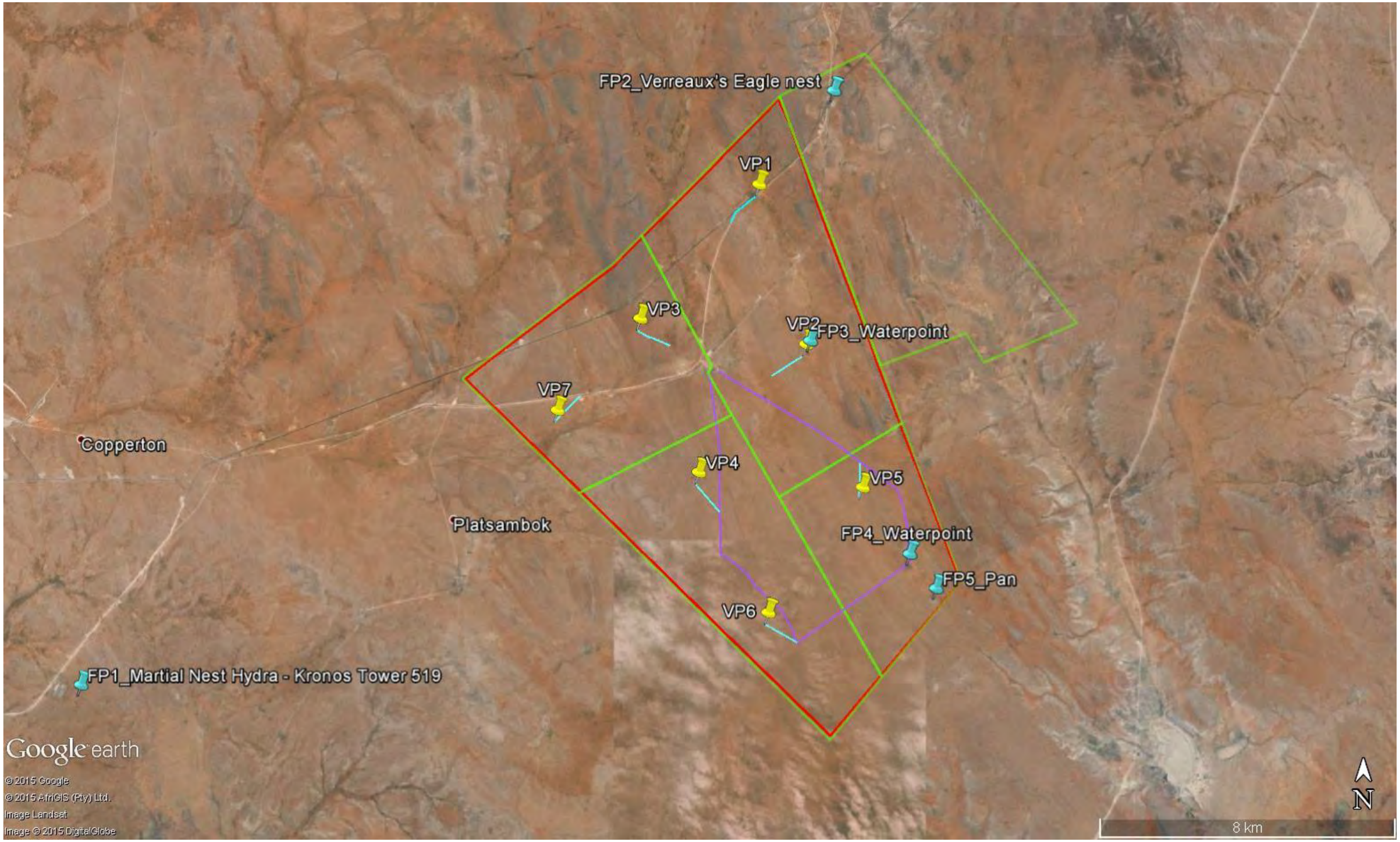

Figure 1: Area where monitoring is taking place, with position of VPs (yellow placemarks), focal points (blue placemarks), drive transects (purple line), walk transects (blue lines) and turbine assessment area (red polygon).

3. Results

3.1 Transects

The turbine and control sites are located in a transitional zone between Bushmanland Arid Grassland and Bushmanland Basin Shrubland, which are some of the most arid vegetation units of the Nama Karoo biome. The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The vegetation consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum* sp., *Salsola* sp., *Pentzia* sp., and *Eriocephalus* sp.), 'white' grasses (Stipagrostis sp.) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* sp. and *Leysera* sp. (Mucina & Rutherford 2006).

To date, a total of 67 species have been recorded at the turbine site, and 42 at the control site during transect counts. The total number of birds recorded during transect counts at the turbine site to date is 3 792 and 881 at the control site.

Of the transect recorded species at the turbine site, 7 species (10.4% of recorded species) are priority species. At the control site 8 species (19% of recorded species) are priority species.

Figures 2 and 3 below present the priority species transect count data for the turbine site and the control site, presented as an Index of Kilometric Abundance (IKA = birds/km).

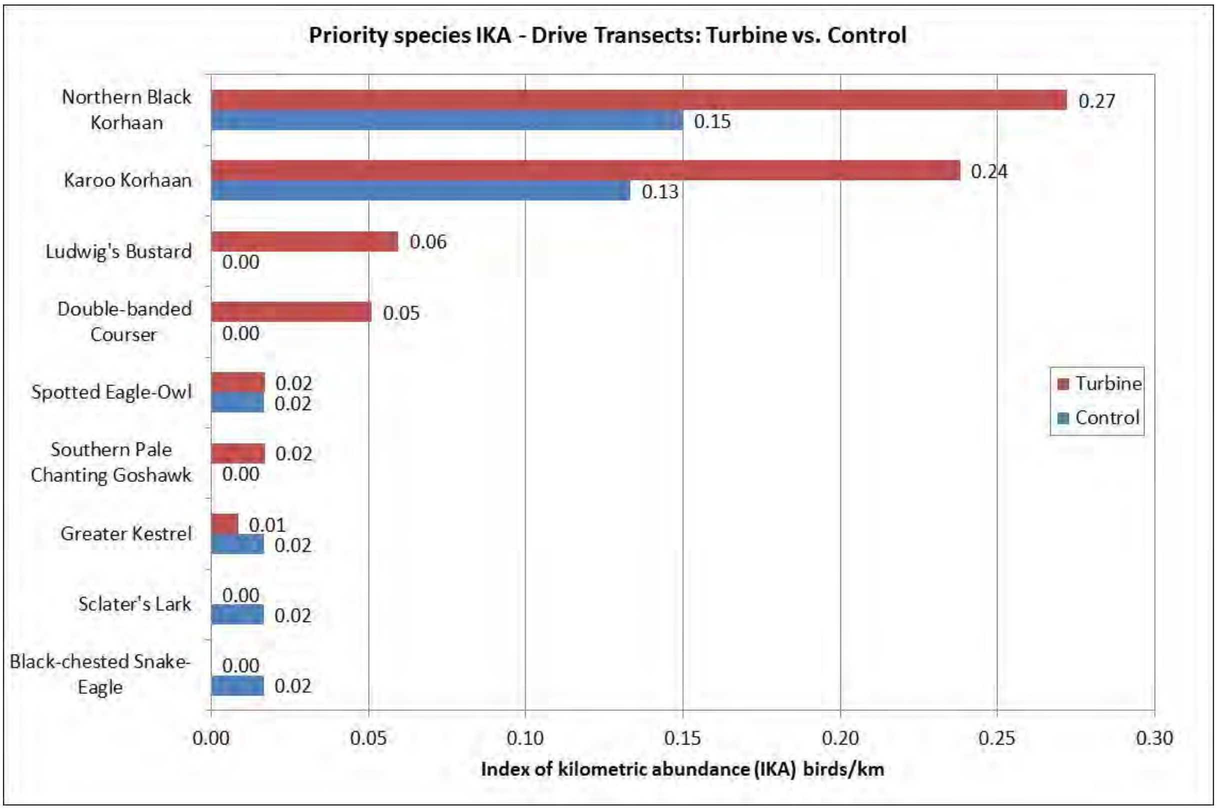

Figure 2: IKA for drive transect priority species at the turbine *vs.* control site

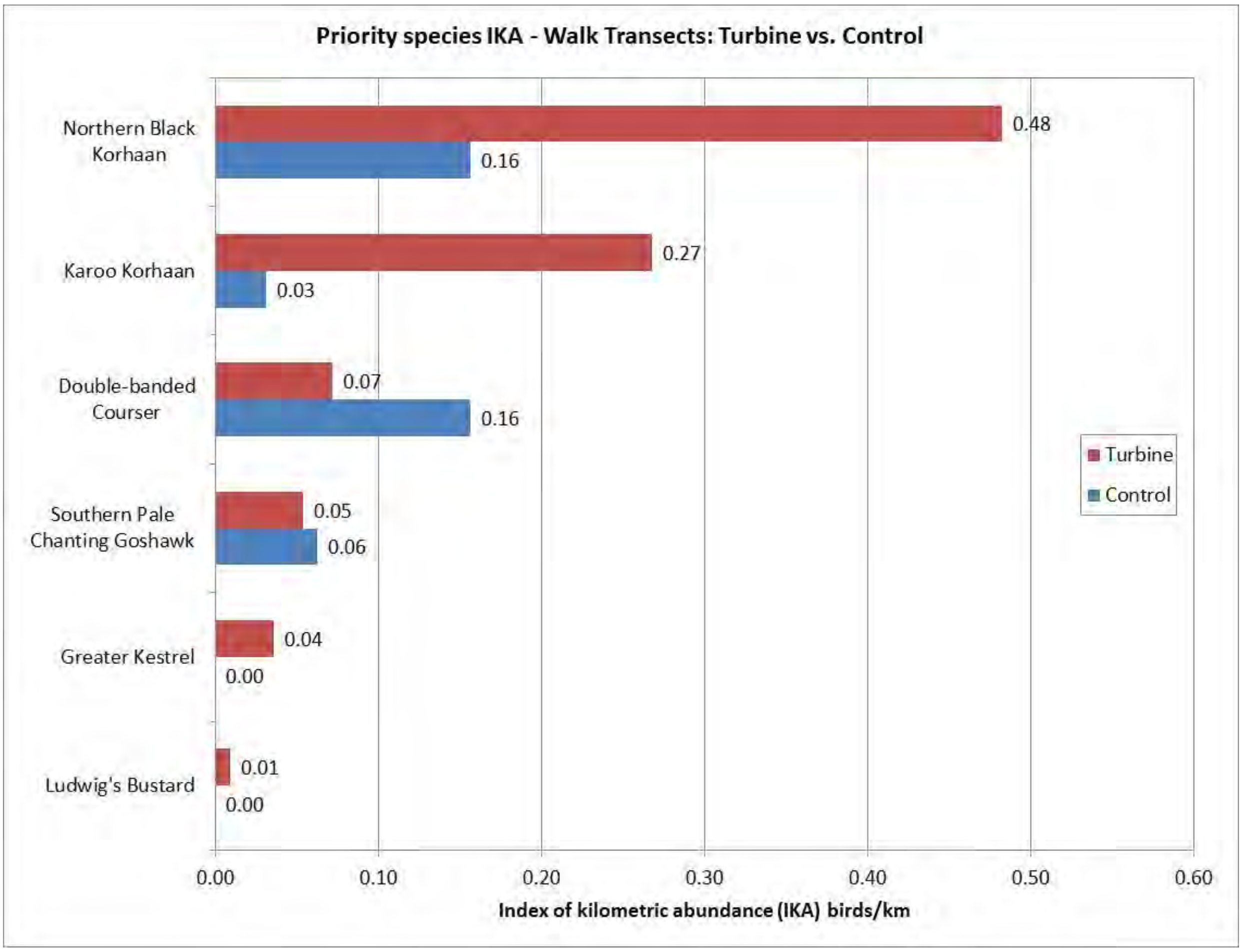

Figure 3: IKA for walk transects priority species at the turbine *vs.* control site..

The Martial Eagle nest at FP1 was not active, and is most likely abandoned. An active Verreaux's Eagle nest was recorded at FP2. The eagles were not observed at the nest in January, but that is to be expected. According to a landowner the juvenile had fledged successfully. A suspected Southern Pale Chanting Gowhawk nest was recorded at FP3, with two adult birds in attendance. A Spotted Eagle-Owl was observed at FP4, roosting in a tree. No priority species were recorded FP5 as the pan was dry during the surveys.

3.2 Vantage points

To date, flight patterns of priority species have been recorded for 168 hours (12 hours per VP) at 7 vantage points at the turbine site in three bands (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m). Approximate flight height was visually judged by an observer with the aid of binoculars. Priority species were observed for approximately 29 minutes and 45 seconds during the combined observation periods. Medium height flights i.e. within rotor height comprised 11 minutes and 45 seconds of the above total. Figure 4 presents the data gathered so far during vantage point watches at the turbine site.

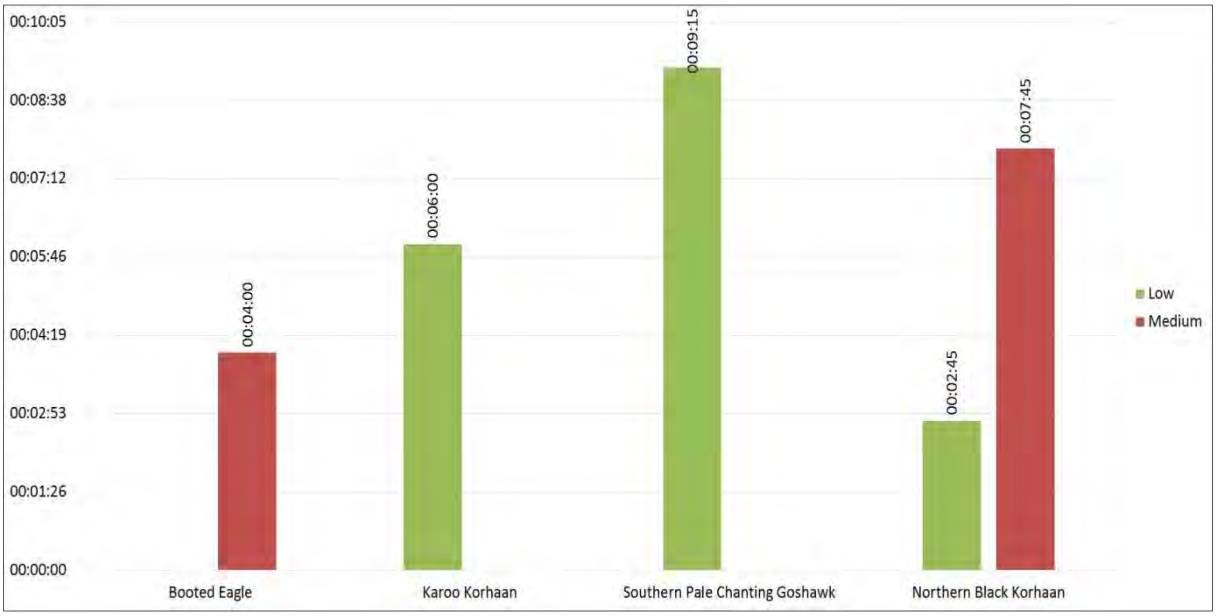

Figure 4: Flight time and height recorded for all individuals of priority species to date at the turbine site (168 hours of observation). Time is indicated in hours: minutes: seconds. Flight height is indicated as low (green/below rotor height = 0-30m) and medium (red/within rotor height = 30-220m).

4 Potential red flags

The only "red flag" issue which was identified during the first round of monitoring is the active Verreaux's Eagle nest at FP2 (see Figure 1). The latest draft guidelines for Verreaux's Eagle which was compiled by Birdlife SA recommends a 3km pre-cautionary no-development buffer around the nest which can be reduced to 1km if there is compelling evidence of low collision risk. So far no Verreaux's Eagle flights have been recorded at VP1, which is approximately 3km from the nest.

Final analysis and recommendations will be done when the pre-construction monitoring is completed and statistical analyses are performed.

It is imperative that any changes to the proposed lay-out are communicated through to us immediately.

A consolidated list of all recorded species is attached as Appendix A.

APPENDIX A: Consolidated list of species recorded at the Aletta turbine and control sites during the first season of monitoring (include incidental sightings)

Priority Species	Scientific Name	Turbine	Control	VP	FP	Incidental
Black-chested Snake-Eagle	*Circaetus pectoralis*		*			
Booted Eagle	*Aquila pennatus*			*		
Double-banded Courser	*Rhinoptilus africanus*	*	*			
Greater Kestrel	*Falco rupicoloides*	*	*			
Karoo Korhaan	*Eupodotis vigorsii*	*	*	*		*
Lanner Falcon	*Falco biarmicus*					*
Ludwig's Bustard	*Neotis ludwigii*	*				*
Martial Eagle	*Polemaetus bellicosus*					*
Northern Black Korhaan	*Afrotis afraoides*	*	*	*		*
Rock Kestrel	*Falco rupicolus*					*
Sclater's Lark	*Spizocorys sclateri*		*			
Secretarybird	*Sagittarius serpentarius*					*
Southern Pale Chanting Goshawk	*Melierax canorus*	*	*	*		*
Spotted Eagle-Owl	*Bubo africanus*	*	*			
Verreaux's Eagle	*Aquila verreauxii*				*	
Total:		**7**	**8**	**4**	**1**	**8**
Non-Priority Species		**Turbine**	**Control**	**VP**	**FP**	**Incidental**
Acacia Pied Barbet	*Tricholaema leucomelas*	*				
Anteating Chat	*Myrmecocichla formicivora*	*	*			
Barn Swallow	*Hirundo rustica*	*	*			
Black-chested Prinia	*Prinia flavicans*	*				
Black-Eared Sparrowlark	*Eremopterix australis*	*	*			
Bokmakierie	*Telophorus zeylonus*	*				
Bradfield's Swift	*Apus bradfieldi*	*				
Cape Penduline-Tit	*Anthoscopus minutus*	*				
Cape Sparrow	*Passer melanurus*	*	*			
Cape Turtle-Dove	*Streptopelia capicola*	*				
Capped Wheatear	*Oenanthe pileata*	*	*			
Chat Flycatcher	*Bradornis infuscatus*	*	*			
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	*				
Common Fiscal	*Lanius collaris*	*				
Common Swift	*Apus apus*	*	*			
Crowned Lapwing	*Vanellus coronatus*	*				
Dusky Sunbird	*Cinnyris fuscus*	*				
Eastern Clapper Lark	*Mirafra [apiata] fasciolata*	*				
Egyptian Goose	*Alopochen aegyptiaca*	*	*			
Familiar Chat	*Cercomela familiaris*	*	*			
Fawn-coloured Lark	*Calendulauda africanoides*	*	*			
Fiscal Flycatcher	*Sigelus silens*	*	*			
Greater Striped Swallow	*Hirundo cucullata*	*				
Grey Tit	*Parus afer*	*				

Non-Priority Species		Turbine	Control	VP	FP	Incidental

Grey-Backed Sparrowlark	*Eremopterix verticalis*	*	*			
Hadeda Ibis	*Bostrychia hagedash*	*				
Helmeted Guineafowl	*Numida meleagris*	*				
House Sparrow	*Passer domesticus*	*				
Kalahari Scrub-Robin	*Cercotrichas paena*	*				
Karoo Eremomela	*Eremomela gregalis*	*	*			
Karoo Long-Billed Lark	*Certhilauda subcoronata*	*	*			
Karoo Scrub-Robin	*Cercotrichas coryphoeus*	*	*			
Large-Billed Lark	*Galerida magnirostris*	*	*			
Lark-Like Bunting	*Emberiza impetuani*	*	*			
Little Swift	*Apus affinis*	*	*			
Long-billed Crombec	*Sylvietta rufescens*	*				
Namaqua Dove	*Oena capensis*	*				
Namaqua Sandgrouse	*Pterocles namaqua*	*	*			
Pied Crow	*Corvus albus*	*	*			
Pririt Batis	*Batis pririt*	*				
Pygmy Falcon	*Polihierax semitorquatus*	*				
Red-Billed Quelea	*Quelea quelea*	*				
Red-Capped Lark	*Calandrella cinerea*		*			
Red-Headed Finch	*Amadina erythrocephala*	*	*			
Rock Martin	*Hirundo fuligula*	*	*			
Rufous-Eared Warbler	*Malcorus pectoralis*	*	*			
Sabota Lark	*Calendulauda sabota*	*	*			
Sociable Weaver	*Philetairus socius*	*	*			
Southern Masked-Weaver	*Ploceus velatus*	*	*			
Speckled Pigeon	*Columba guinea*	*	*			
Spike-Heeled Lark	*Chersomanes albofasciata*	*	*			
Spotted Thick-knee	*Burhinus capensis*	*				
Stark's Lark	*Spizocorys starki*	*	*			
Tractrac Chat	*Cercomela tractrac*	*	*			
White-Backed Mousebird	*Colius colius*	*				
White-Browed Sparrow-Weaver	*Plocepasser mahali*	*				
White-Necked Raven	*Corvus albicollis*	*				
White-Rumped Swift	*Apus caffer*	*				
White-throated Canary	*Crithagra albogularis*	*	*			
Yellow Canary	*Crithagra flaviventris*	*	*			
Yellow-Bellied Eremomela	*Eremomela icteropygialis*	*	*			
Total:		**60**	**34**			
Grand Total		**67**	**42**	**4**	**1**	**8**

BIRD MONITORING PROGRESS REPORT 3

ALETTA WIND ENERGY FACILITY

June 2016

Chris van Rooyen &
Albert Froneman *Pr.Sci.Nat*

Avifaunal Specialist Consultants

1. Objectives

The objective of the pre-construction monitoring at the proposed Aletta Wind Project is to gather baseline data over a period of four seasons on the following aspects pertaining to avifauna:

- The abundance and diversity of birds at the wind farm site and a suitable control site to measure the potential displacement effect of the wind farm.
- Flight patterns of priority species at the wind farm site to measure the potential collision risk with the turbines.

The objective of this short progress report is to provide feedback after the third monitoring period, with a few basic descriptive analyses of the data**. In depth statistical analyses will be performed on the full dataset after the monitoring has been completed.**

2. Methods

The monitoring protocol for the site is designed according to the latest version (2014) of *Jenkins A R; Van Rooyen C S; Smallie J J; Anderson M D & Smit H A. 2011. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa. Endangered Wildlife Trust and Birdlife South Africa.*

The third monitoring survey was conducted at the proposed turbine site and a control site by four field monitors during March 2016.

Monitoring is conducted in the following manner:

- One drive transect was identified totalling 19.6km on the turbine site and one drive transect in the control site with a total length of 10km.
- Two observers travelling slowly (± 10km/h) in a vehicle records all species on both sides of the transect. The observers stop at regular intervals (every 500 m) to scan the environment with binoculars. Transects are counted three times per sampling session.
- In addition, seven walk transects of 1km each were identified at the turbine site, and two at the control site, and counted 8 times per sampling season. All birds are recorded during walk transects.
- The following variables are recorded:
    - Species;
    - Number of birds;
    - Date;

    - Start time and end time;
    - Distance from transect (0-50 m, 50-100 m, >100 m);
    - Wind direction;
    - Wind strength (calm; moderate; strong);
    - Weather (sunny; cloudy; partly cloudy; rain; mist);
    - Temperature (cold; mild; warm; hot);
    - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying-foraging; flying-commute; foraging on the ground); and
    - Co-ordinates (priority species only).

- Seven vantage points (VPs) were identified from which the majority of the proposed turbine area can be observed (the "VP area"), to record the flight altitude and patterns of priority species. One VP was also identified on the control site. The following variables were recorded for each flight:
    - Species;
    - Number of birds;
    - Date;
    - Start time and end time;
    - Wind direction;
    - Wind strength (estimated Beaufort scale 1-7);
    - Weather (sunny; cloudy; partly cloudy; rain; mist);
    - Temperature (cold; mild; warm; hot);
    - Flight altitude (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m);
    - Flight mode (soar; flap; glide; kite; hover); and
    - Flight time (in 15 second-intervals).

The aim with drive transects is primarily to record large priority species (i.e. raptors and large terrestrial species), while walk transects are primarily aimed at recording small passerines. The objective of the transect monitoring is to gather baseline data on the use of the site by birds in order to measure potential displacement by the wind farm activities. The objective of vantage point counts is to measure the potential collision risk with the turbines. Priority species were identified using the November 2014 BirdLife South Africa (BLSA) list of priority species for wind farms.

A total of 5 potential focal points of bird activity were identified and monitored. The five focal points are a Martial Eagle nest on the Hydra – Kronos Tower 519 at Kronos Substation (FP1), a Verreaux's Eagle nest on a telephone pole just outside the proposed development area (FP2), a clump of trees at a borehole in the development area (FP3), a water trough at a borehole (FP4) and an ephemeral pan (FP5).

Figure 1 below indicates the proposed turbine area where monitoring is taking place.

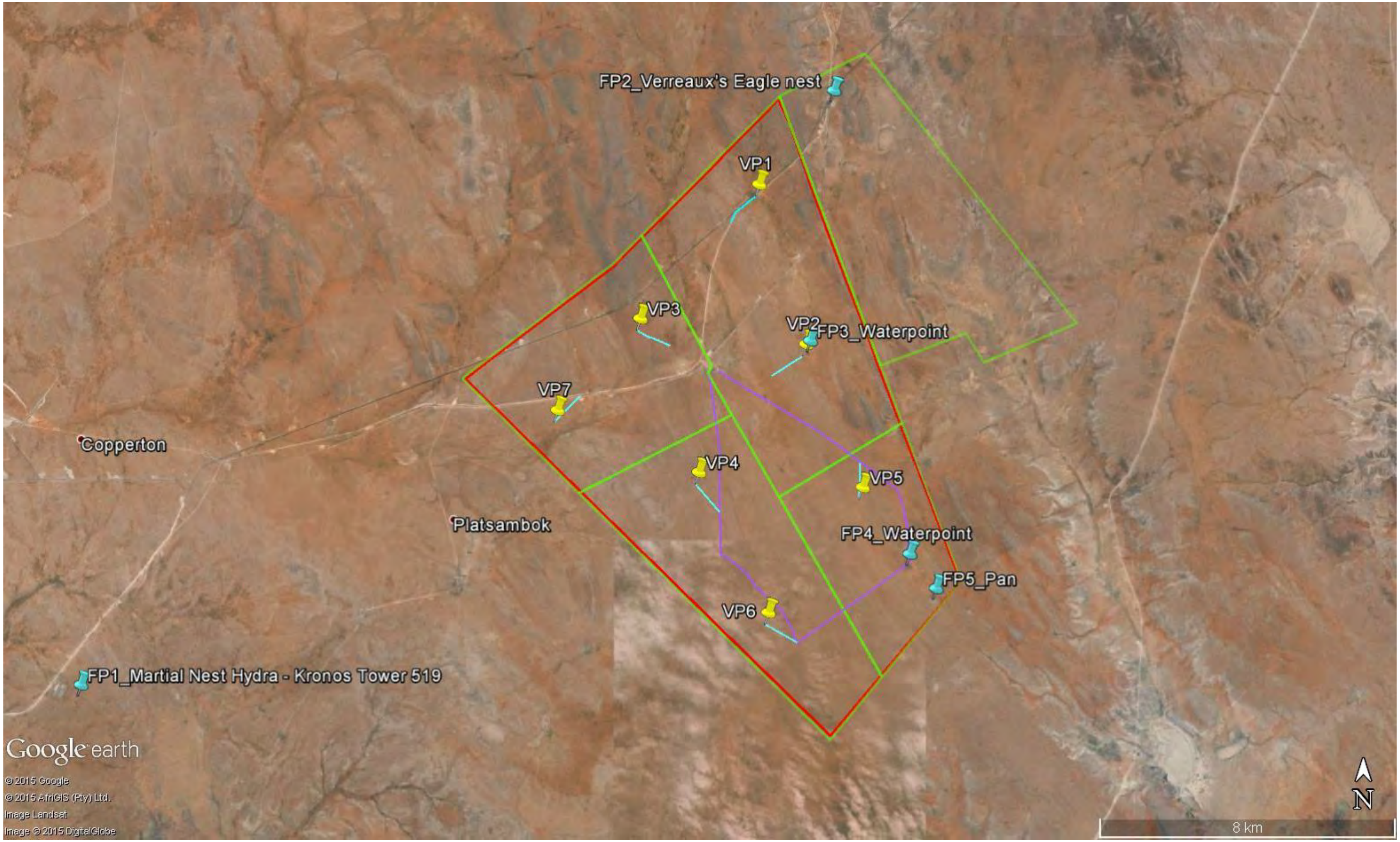

Figure 1: Area where monitoring is taking place, with position of VPs (yellow placemarks), focal points (blue placemarks), drive transects (purple line), walk transects (blue lines) and turbine assessment area (red polygon).

3. Results

3.1 Transects

The turbine and control sites are located in a transitional zone between Bushmanland Arid Grassland and Bushmanland Basin Shrubland, which are some of the most arid vegetation units of the Nama Karoo biome. The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The vegetation consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum* sp., *Salsola* sp., *Pentzia* sp., and *Eriocephalus* sp.), 'white' grasses (Stipagrostis sp.) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania* sp. and *Leysera* sp. (Mucina & Rutherford 2006).

To date, a total of 73 species have been recorded at the turbine site, and 57 at the control site during transect counts. The total number of birds recorded during transect counts at the turbine site to date is 4248 and 1417 at the control site.

Of the transect recorded species at the turbine site, 7 species (9.6% of recorded species) are priority species. At the control site 11 species (19.3% of recorded species) are priority species.

Figures 2 and 3 below present the priority species transect count data for the turbine site and the control site, presented as an Index of Kilometric Abundance (IKA = birds/km).

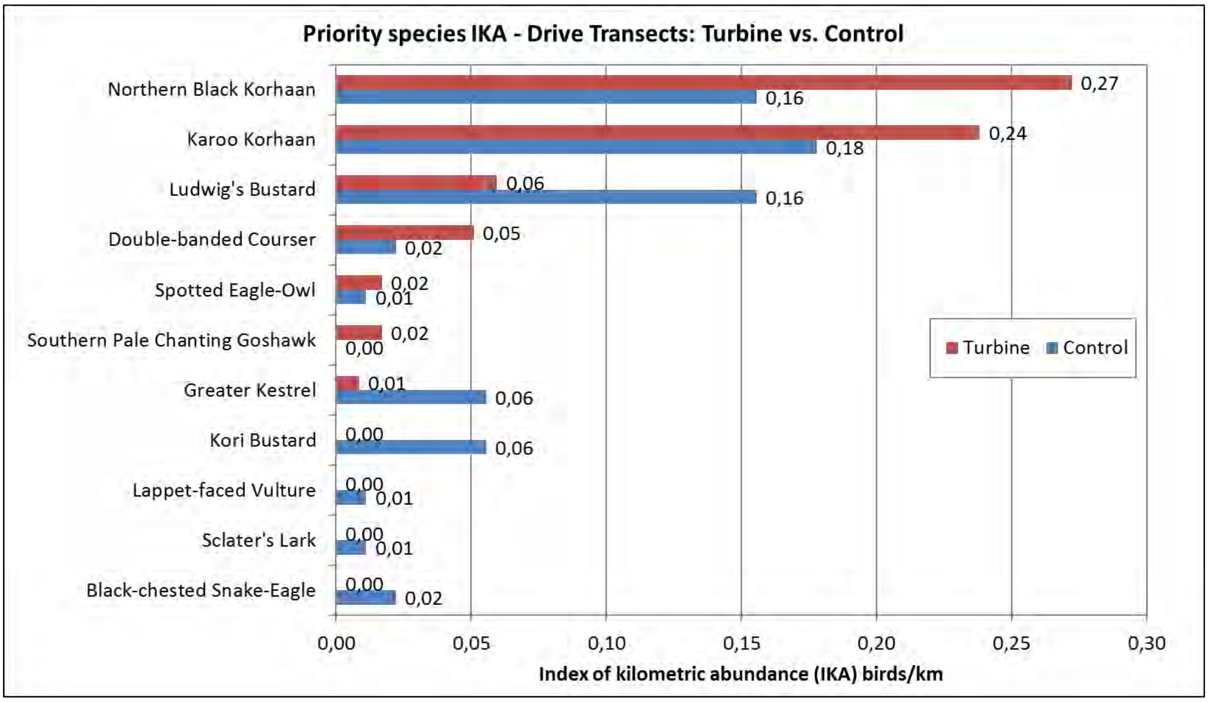

Figure 2: IKA for drive transect priority species at the turbine *vs.* control site

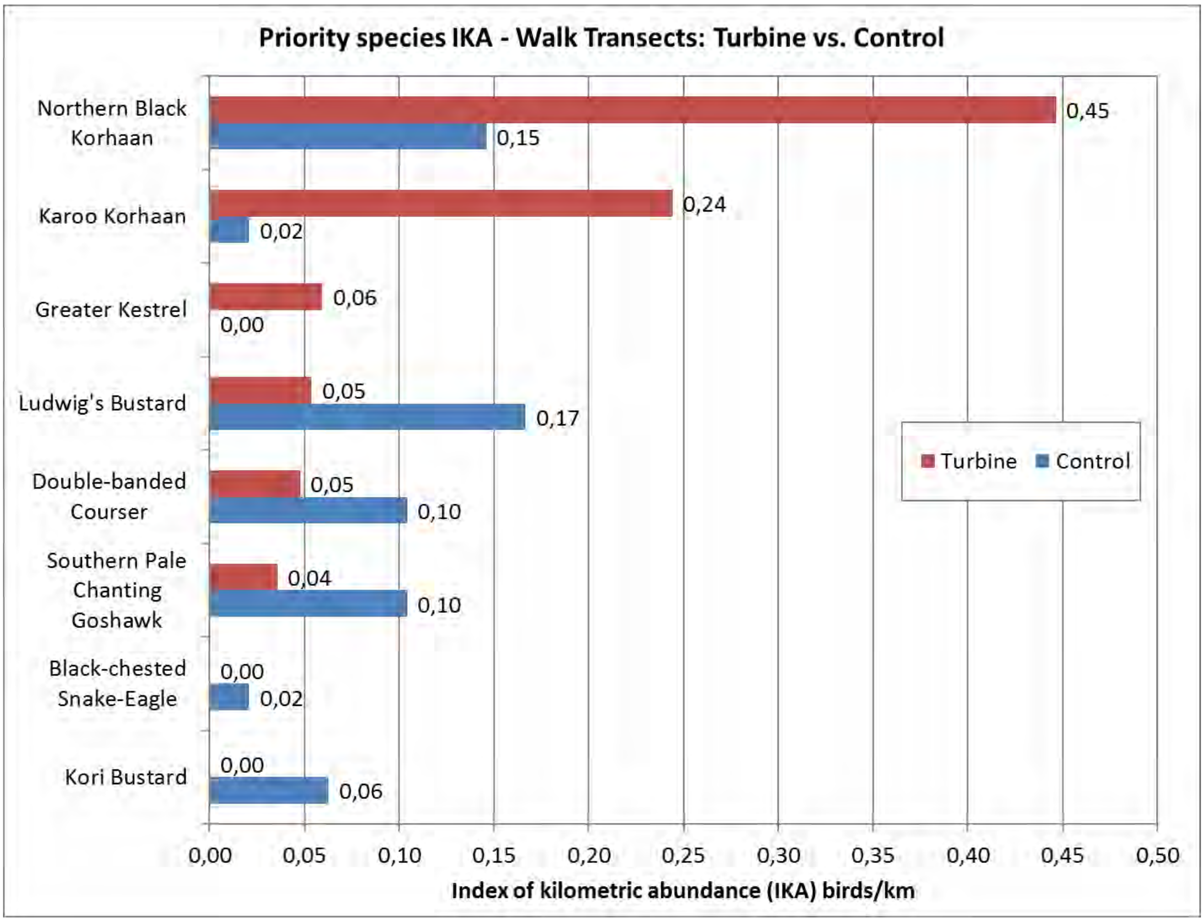

Figure 3: IKA for walk transects priority species at the turbine *vs.* control site.

The Martial Eagle nest at FP1 was not active, and is almost certainly abandoned, possibly due to disturbance associated with the construction of several solar facilities around nest. The Verreaux's Eagle nest at FP2 is active and the birds were preparing to breed again, with both birds in attendance. According to a landowner the birds had settled in to breed by end April. No priority species were recorded at the remaining three focal points during this survey.

3.2 Vantage points

To date, flight patterns of priority species have been recorded for 252 hours (12 hours per VP) at 7 vantage points at the turbine site in three bands (high i.e. >220m; medium i.e. 30m – 220m; low i.e. <30m). Approximate flight height was visually judged by an observer with the aid of binoculars. Figure 4 presents the data gathered so far during vantage point watches at the turbine site.

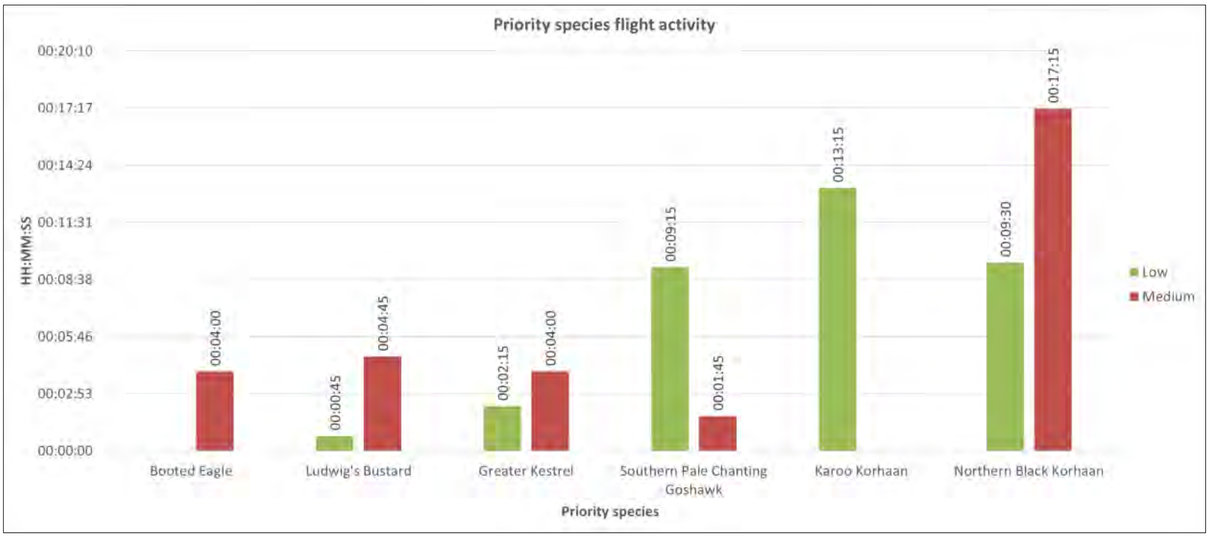

Figure 4: Flight time and height recorded for all individuals of priority species to date at the turbine site (252 hours of observation). Time is indicated in hours: minutes: seconds. Flight height is indicated as low (green/below rotor height = 0-30m) and medium (red/within rotor height = 30-220m).

4 Potential red flags

The only “red flag” issue which has been identified so far is the active Verreaux’s Eagle nest at FP2 (see Figure 1). The draft Verreaux’s Eagle guidelines compiled by BLSA in September 2015 states as follows:

“There have been few empirical studies disturbance distances for Verreaux’s Eagles and to date, specialists in South Africa have relied on expert opinion when recommending buffers. For Verreaux’s Eagles proposed buffers have ranged from 800m up to 2.5km (mean = 1.45km). Few specialist reports have provided empirical justification for the extent, although an analysis of activity around eagle nests in the Karoo found that activity was generally higher within 1km of the nest sites, marginally higher between 1 and 1.5km, with no clear pattern beyond that (Percival 2013).

BirdLife South Africa recommends a non-negotiable no-go buffer of 1km, in order to minimise risk of disturbing breeding birds and to reduce the risk of juveniles colliding with turbines. An additional precautionary buffer of 3 km is recommended around nests to reduce the risk of collisions and displacement. This precautionary buffer may be reduced (or increased) should the results of monitoring indicate that this is desirable. In the event that a change in the extent of the precautionary buffer is contemplated, it must be clearly demonstrated that there is a low risk of collisions. In order to protect areas around alternate nests and reduce any incentive to disrupt nesting and/or breeding, these buffers should be applied to all inactive nests.”

Final analysis and recommendations will be done when the pre-construction monitoring is completed and statistical analyses are performed.

It is imperative that any changes to the proposed lay-out are communicated through to us immediately.

A consolidated list of all recorded species is attached as Appendix A.

APPENDIX A: Consolidated list of species recorded at the Aletta turbine and control sites after three seasons of monitoring (include incidental sightings)

Priority Species	**Scientific Name**	**Turbine**	**Control**	**VP**	**Control VP**	**FP**	**Incidental**
Black-chested Snake-Eagle	*Circaetus pectoralis*		*				
Booted Eagle	*Aquila pennatus*			*			
Double-banded Courser	*Rhinoptilus africanus*	*	*				
Greater Kestrel	*Falco rupicoloides*	*	*	*			
Karoo Korhaan	*Eupodotis vigorsii*	*	*	*	*		*
Kori Bustard	*Ardeotis kori*		*		*		
Lanner Falcon	*Falco biarmicus*						*
Lappet-faced Vulture	*Torgos tracheliotus*		*				
Ludwig's Bustard	*Neotis ludwigii*	*	*	*	*		*
Martial Eagle	*Polemaetus bellicosus*						*
Northern Black Korhaan	*Afrotis afraoides*	*	*	*			*
Sclater's Lark	*Spizocorys sclateri*		*				
Secretarybird	*Sagittarius serpentarius*						*
Southern Pale Chanting Goshawk	*Melierax canorus*	*	*	*	*		*
Spotted Eagle-Owl	*Bubo africanus*	*	*				
Verreaux's Eagle	*Aquila verreauxii*					*	
Total:		**7**	**11**	**6**	**4**	**1**	**7**
Non-Priority Species		**Turbine**	**Control**	**VP**	**Control VP**	**FP**	**Incidental**
Acacia Pied Barbet	*Tricholaema leucomelas*	*					
African Pipit	*Anthus cinnamomeus*	*					
Anteating Chat	*Myrmecocichla formicivora*	*	*				
Ashy Tit	*Parus cinerascens*	*					
Barn Swallow	*Hirundo rustica*	*	*				
Black-chested Prinia	*Prinia flavicans*	*	*				

Black-Eared Sparrowlark	*Eremopterix australis*	*	*				
Bokmakierie	*Telophorus zeylonus*	*					
Bradfield's Swift	*Apus bradfieldi*	*					
Cape Bunting	*Emberiza capensis*	*					
Cape Penduline-Tit	*Anthoscopus minutus*	*					
Cape Sparrow	*Passer melanurus*	*	*				
Cape Turtle-Dove	*Streptopelia capicola*	*	*				
Capped Wheatear	*Oenanthe pileata*	*	*				
Chat Flycatcher	*Bradornis infuscatus*	*	*				
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	*					
Common Fiscal	*Lanius collaris*	*	*				
Common Swift	*Apus apus*	*	*				
Crowned Lapwing	*Vanellus coronatus*	*	*				
Dusky Sunbird	*Cinnyris fuscus*	*					
Eastern Clapper Lark	*Mirafra [apiata] fasciolata*	*					
Egyptian Goose	*Alopochen aegyptiaca*	*	*				
Fairy Flycatcher	*Stenostira scita*		*				
Familiar Chat	*Cercomela familiaris*	*	*				
Fawn-coloured Lark	*Calendulauda africanoides*	*	*				
Fiscal Flycatcher	*Sigelus silens*	*	*				
Greater Striped Swallow	*Hirundo cucullata*	*					
Grey Tit	*Parus afer*	*					
Grey-Backed Sparrowlark	*Eremopterix verticalis*	*	*				
Hadeda Ibis	*Bostrychia hagedash*	*					
Helmeted Guineafowl	*Numida meleagris*	*					
House Sparrow	*Passer domesticus*	*					
Kalahari Scrub-Robin	*Cercotrichas paena*	*	*				

Karoo Chat	*Cercomela schlegelii*		*				
Karoo Eremomela	*Eremomela gregalis*	*	*				
Karoo Long-Billed Lark	*Certhilauda subcoronata*	*	*				
Karoo Scrub-Robin	*Cercotrichas coryphoeus*	*	*				
Large-Billed Lark	*Galerida magnirostris*	*	*				
Lark-Like Bunting	*Emberiza impetuani*	*	*				
Laughing Dove	*Streptopelia senegalensis*	*	*				
Little Swift	*Apus affinis*	*	*				
Long-billed Crombec	*Sylvietta rufescens*	*					
Namaqua Dove	*Oena capensis*	*	*				
Namaqua Sandgrouse	*Pterocles namaqua*	*	*				
Pied Crow	*Corvus albus*	*	*				
Plain-backed Pipit	*Anthus leucophrys*	*	*				
Pririt Batis	*Batis pririt*	*					
Pygmy Falcon	*Polihierax semitorquatus*	*					
Red-Billed Quelea	*Quelea quelea*	*					
Red-Capped Lark	*Calandrella cinerea*		*				
Red-Headed Finch	*Amadina erythrocephala*	*	*				
Rock Kestrel	*Falco rupicolus*						*
Rock Martin	*Hirundo fuligula*	*	*				
Rufous-Eared Warbler	*Malcorus pectoralis*	*	*				
Sabota Lark	*Calendulauda sabota*	*	*				
Scaly-feathered Finch	*Sporopipes squamifrons*	*	*				
Sociable Weaver	*Philetairus socius*	*	*				
South African Shelduck	*Tadorna cana*		*				
Southern Masked-Weaver	*Ploceus velatus*	*	*				
Speckled Pigeon	*Columba guinea*	*	*				

Spike-Heeled Lark	*Chersomanes albofasciata*	*	*				
Spotted Thick-knee	*Burhinus capensis*	*					
Stark's Lark	*Spizocorys starki*	*	*				
Tractrac Chat	*Cercomela tractrac*	*	*				
White-Backed Mousebird	*Colius colius*	*					
White-Browed Sparrow-Weaver	*Plocepasser mahali*	*					
White-Necked Raven	*Corvus albicollis*	*					
White-Rumped Swift	*Apus caffer*	*					
White-throated Canary	*Crithagra albogularis*	*	*				
Yellow Canary	*Crithagra flaviventris*	*	*				
Yellow-Bellied Eremomela	*Eremomela icteropygialis*	*	*				
Total:		**66**	**46**				**1**
Grand Total		**73**	**57**	**6**	**4**	**1**	**8**

Appendix 6C
Bat Assessment

Bat Sensitivity Scoping Study

- **For the proposed Aletta 1 Wind Energy Facility, near Copperton, Northern Cape**

Compiled by: Monika Moir

Reviewed by: Monika Moir and Werner Marais

29 January 2016

PREPARED FOR:

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Appointment of Specialist

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Report done by:	Monika Moir
Overseen/reviewed by:	Monika Moir and Werner Marais
Appointed by:	SiVEST Environmental Division
For:	Bat Sensitivity Scoping study for Aletta 1 WEF

Independence:

Animalia Zoological & Ecological Consultation CC has no connection with the developer. Animalia Zoological & Ecological Consultation CC is not a subsidiary, legally or financially of the developer; remuneration for services by the developer in relation to this proposal is not linked to approval by decision-making authorities responsible for permitting this proposal and the consultancy has no interest in secondary or downstream developments as a result of the authorization of this project.

Applicable Legislation:

Legislation dealing with biodiversity applies to bats and includes the following:

NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 OF 2004; especially sections 2, 56 & 97)

The act calls for the management and conservation of all biological diversity within South Africa. Bats constitute an important component of South African biodiversity and therefore all species receive additional attention to those listed as Threatened or Protected.

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Figure 1: Satellite imagery of the general site location of the proposed Aletta 1 wind energy facility. All satellite images courtesy of Google Earth.

Figure 2: Satellite imagery of the site boundary of the proposed Aletta 1 wind energy facility. All satellite images courtesy of Google Earth.

1 OBJECTIVES AND TERMS OF REFERENCE FOR PRECONSTRUCTION STUDY

- Identify bat sensitive habitats and terrain features on site.
- Perform a short term study of the bat species assemblage and diversity on site.
- Study the spatial distribution of bat activity across the site.
- Delineate sensitive areas of the site to inform the developable areas for turbine placement.
- Identify the bat sensitivity risk of the site for wind farm development.

2 INTRODUCTION

This is a Bat Sensitivity Scoping report for the proposed Aletta 1 Wind Energy Facility near Copperton in the Northern Cape. This report aims to determine the degree of utilisation of bats for the different general habitat types, and thereby present a bat sensitivity map.

2.1 General Introduction

Three factors need to be present for most South African bats to be prevalent in an area: availability of roosting space, food (insects/arthropods or fruit), and accessible open water sources. However, the dependence of a bat on each of these factors depends on the species, its behaviour and ecology. Nevertheless, bat activity, abundance and diversity are likely to be higher in areas supporting all three above mentioned factors.

The study area is evaluated by comparing the amount of surface rock (possible roosting space), topography (influencing surface rock in most cases), vegetation (possible roosting spaces and foraging sites), climate (can influence insect numbers and availability of fruit), and presence of surface water (influences insects and acts as a source of drinking water) to identify bat species that may be impacted by wind turbines. These comparisons are done chiefly by studying the geographic literature of each site, available satellite imagery and observations during the study area visits. Species probability of occurrence based on the above mentioned factors are estimated for the identified study area and the surrounding larger area.

General bat diversity, abundance and activity are determined by the use of a bat detector. A bat detector is a device capable of detecting and recording the ultrasonic echolocation calls of bats which may then be analysed with the use of computer software. A real time expansion type bat detector records bat echolocation in its true ultrasonic state which is then effectively slowed down 10 times during data analysis. Thus the bat calls become audible to the human ear, but still retains all of the harmonics and characteristics of the call from which bat species with characteristic echolocation calls can be identified. Although this type of bat detection equipment is advanced technology, it is not necessarily possible to identify all bat species by just their echolocation calls. Recordings may be affected by the weather conditions (i.e. humidity) and openness of the terrain (bats may adjust call frequencies). The range of detecting a bat is also dependent on the volume of the bat call. Nevertheless, it is a very accurate method of recording bat activity.

2.2 The Bats of South Africa

Bats form part of the Order Chiroptera and are the second largest group of mammals after rodents. They are the only mammals to have developed true powered flight and have undergone various skeletal changes to accommodate this. The forelimbs are elongated, whereas the hind limbs are compact and light, thereby reducing the total body weight. This unique wing profile allows for the manipulation wing camber and shape, exploiting functions such as agility and manoeuvrability. This adaption surpasses the static design of the bird wings in function and enables bats to utilize a wide variety of food sources, including, but not limited to, a large diversity of insects (Neuweiler 2000). Species based facial features may differ considerably as a result of differing life styles, particularly in relation to varying feeding and echolocation navigation strategies. Most South African bats are insectivorous and are capable of consuming vast quantities of insects on a nightly basis (Taylor 2000, Tuttle and Hensley 2001) however, they have also been found to feed on amphibians, fruit, nectar and other invertebrates. As a result, insectivorous bats are the predominant predators of nocturnal flying insects in South Africa and contribute greatly to the suppression of these numbers. Their prey also includes agricultural pests such as moths and vectors for diseases such as mosquitoes (Rautenbach 1982, Taylor 2000).

Urban development and agricultural practices have contributed to the deterioration of bat populations on a global scale. Public participation and funding of bat conservation are often hindered by negative public perceptions and unawareness of the ecological importance of bats. Some species choose to roost in domestic residences, causing disturbance and thereby decreasing any esteem that bats may have established. Other species may occur in large communities in buildings, posing as a potential health hazard to residents in addition to their nuisance value. Unfortunately, the negative association with bats obscures their importance as an essential component of ecological systems and their value as natural pest control agents, which actually serves as an advantage to humans.

Many bat species roost in large communities and congregate in small areas. Therefore, any major disturbances within and around the roosting areas may adversely impact individuals of different communities, within the same population, concurrently (Hester and Grenier 2005). Secondly, nativity rates of bats are much lower than those of most other small mammals. This is because, for the most part, only one or two pups are born per female per annum and according to O'Shea *et al*. (2003), bats may live for up to 30 years, thereby limiting the amount of pups born due to this increased life expectancy. Under natural circumstances, a population's numbers may accumulate over long periods of time. This is due to the longevity and the relatively low predation of bats when compared to other small mammals. Therefore, bat populations are not able to adequately recover after mass mortalities and major roost disturbances.

2.3 Bats and Wind Turbines

Although most bats are highly capable of advanced navigation through the use of echolocation and excellent sight, they are still at risk of physical impact with the blades of wind turbines. The corpses of bats have been found in close proximity to wind turbines and, in a case study conducted by Johnson *et al*. (2003), were found to be directly related to collisions. The incident of bat fatalities for migrating species has been found to be directly related to turbine height, increasing exponentially with altitude, as this disrupts the migratory flight paths (Howe *et al*. 2002, Barclay *et al*. 2007). Although the number of fatalities of migrating species increased with turbine height, this correlation was not found for increased rotor sweep (Howe *et al*. 2002, Barclay *et al*. 2007). In the USA it was hypothesized that migrating bats may navigate without the use of echolocation, rather using vision as their main sense for long distance orientation (Johnson *et al*. 2003, Barclay *et al*. 2007). Despite the high incidence of deaths caused by direct impact with the blades, most bat mortalities have been found to be caused by barotrauma (Baerwald *et al*. 2008). This is a condition where low air pressure found around the moving blades of wind turbines, causes the lungs of a bat to collapse, resulting in fatal internal haemorrhaging (Kunz *et al*. 2007). Baerwald *et al*. (2008) found that 90% of bat fatalities around wind turbines involved internal haemorrhaging consistent with barotrauma. A study conducted by Arnett (2005) recorded a total of 398 and 262 bat fatalities in two surveys at the Mountaineer Wind Energy Centre in Tucker County, West Virginia and at the Meyersdale Wind Energy Centre in Somerset County, Pennsylvania, respectively. These surveys took place during a 6-week study period from 31 July 2004 to 13 September 2004. In some studies, such as that taken in Kewaunee County (Howe *et al.* 2002), bat fatalities were found to exceed bird fatalities by up to three-fold.

Although bats are predominately found roosting and foraging in areas near trees, rocky outcrops, human dwellings and water, in conditions where valleys are foggy, warmer air is drawn to hilltops through thermal inversion which may result in increased concentrations of insects and consequently bats at hilltops, where wind turbines are often placed (Kunz *et al*. 2007). Some studies (Horn *et al*. 2008) suggest that bats may be attracted to the large turbine structure as roosting spaces or swarms of insects that may get trapped in low pressure air pockets around the turbine, also encouraging the presence of bats. The presence of lights on wind turbines have also been identified as possible causes for increased bat fatalities for non-cave roosting species. This is thought to be due to increased insect densities that are attracted to the lights and subsequently encourage foraging activity of bats (Johnson *et al*. 2003). Clearings around wind turbines, in previously forested areas, may also improve conditions for insects, thereby attracting bats to the area and the swishing sound of the turbine blades has been proposed as possible sources for disorienting bats (Kunz *et al*. 2007). Electromagnetic fields generated by the turbine may also affect bats which are sensitive to magnetic fields (Kunz *et al*. 2007). It could also be hypothesized, from personal observations that the echolocation capabilities of bats are designed to locate smaller insect prey or avoid stationary objects, and may not be primarily focused on the detection of unnatural objects moving sideways across the flight path.

Whatever the reason for bat fatalities in relation to wind turbines, it is clear that this is a grave ecological problem which requires attention. During a study by Arnett *et al*. (2009), 10 turbines monitored over a period of 3 months showed 124 bat fatalities in South-central Pennsylvania (America), which can cumulatively have a catastrophic long term effect on bat populations if this rate of fatality continues. Most bat species only reproduce once a year, bearing one young per female, therefore their numbers are slow to recover from mass mortalities. It is very difficult to assess the true number of bat deaths in relation to wind turbines, due to carcasses being removed from sites through predation, the rate of which differs from site to site as a result of habitat type, species of predator and their numbers (Howe *et al*. 2002, Johnson *et al*. 2003). Mitigation measures are being researched and experimented with globally, but are still only effective on a small scale. An exception is the implementation of curtailment processes, where the turbine cut-in speed is raised to a higher wind speed. This relies on the principle that the prey of bats will not be found in areas of strong winds and more energy is required for the bats to fly under these conditions. It is thought, that by the implementation of such a measure, bats in the area are not likely to experience as great an impact as when the turbine blades move slowly in low wind speeds. However, this measure is currently not effective enough to translate the impact of wind turbines on bats to a category of low concern.

3 STUDY AREA

The proposed Aletta 1 wind energy facility is located on private farm lands approximately 11km directly east from the small town of Copperton, and approximately 30km south west from Prieska. The study area extends over approximately 127,400km^2 of land, and is primarily used for livestock farming.

3.1 Land Use, Vegetation, Climate and Topography

The study area falls over the Bushmanland Arid Grassland and Lower Gariep Broken Veld vegetation units as defined by Mucina and Rutherford (2006), the surrounding vegetation units are Northern Upper Karoo, Bushmanland Vloere, Bushmanland Basin Shrubland and Upper Karoo Hardeveld (**Figure 3**).

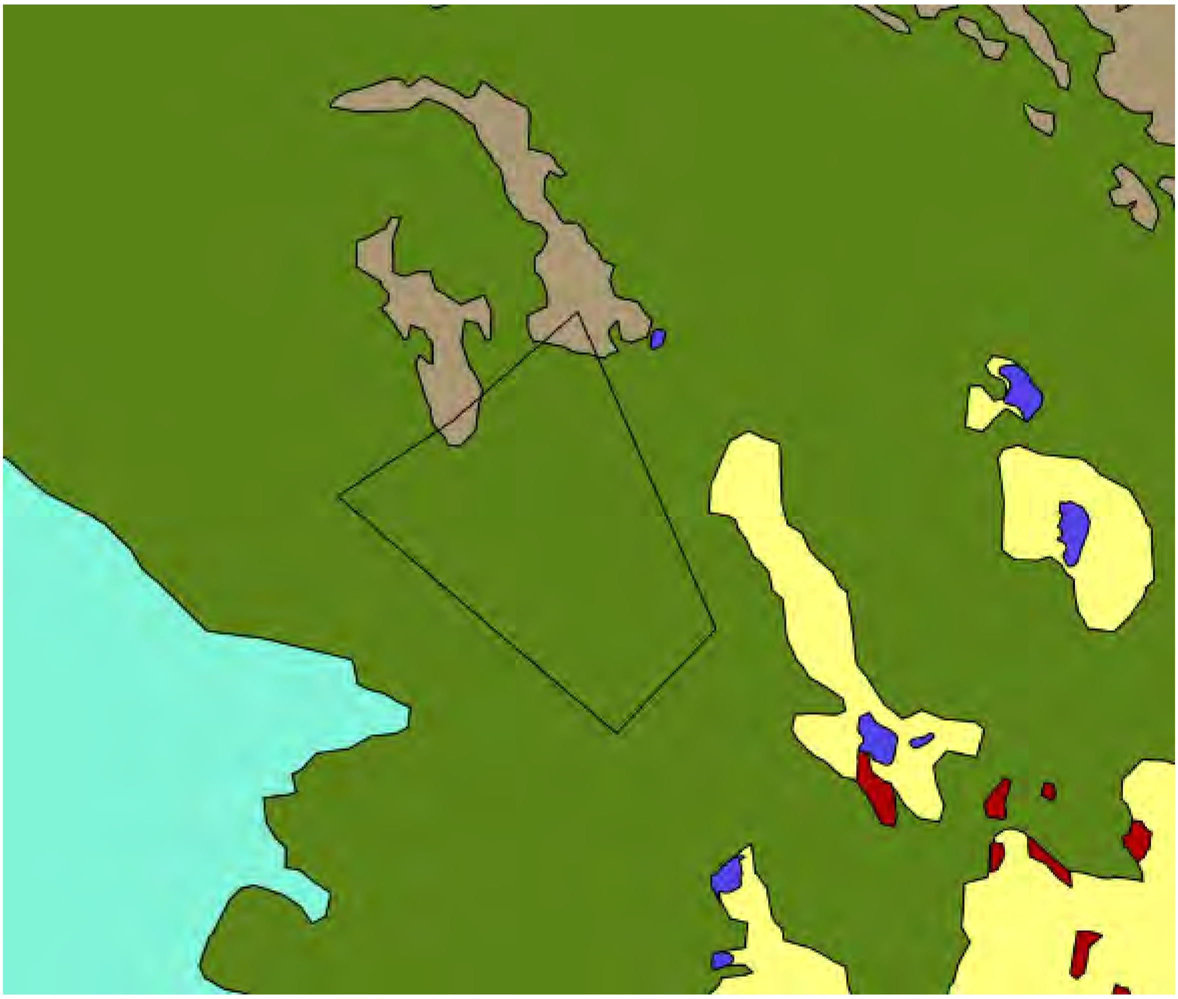
Bushmanland Arid Grassland is considered to be Least Threatened, however only less than 1% of this vegetation type is currently protected in South Africa. Tussock grasses and dwarf shrubland dominate this vegetation type with no endemic plants present. Shallow lime-rich soils support the plant life and underneath the soil are the Ecca and Beaufort geological groups. The summers are hot and dry with an average daily maximum of 36°C, while winters are icy cold with an average daily minimum of 4°C. The average annual rainfall is only 189mm with peaks in late autumn and early summer, but varies considerably from year to year (Mucina and Rutherford 2006).

The Lower Gariep Broken Veld vegetation unit consists of hills and low mountains, slightly irregular plains and some rugged terrain. The vegetation is sparse and is dominated by shrubs and dwarf shrubs with widely scattered low trees. The mean annual precipitation ranges from 70mm to 240mm, with mean maximum and minimum temperatures of 39.7°C and -4.1°C for January and July respectively. The unit has a least threatened conservation status (Mucina and Rutherford 2006).

Vegetation units and geology are of great importance as these may serve as suitable sites for the roosting of bats and support of their foraging habits (Monadjem *et al.* 2010). Houses and buildings may also serve as suitable roosting spaces (Taylor 2000; Monadjem *et al.* 2010). The importance of the vegetation units and associated geomorphology serving as potential roosting and foraging sites have been described in **Table 1 below**.

Table 1: Potential of the vegetation to serve as suitable roosting and foraging spaces for bats.

Vegetation Unit	**Roosting Potential**	**Foraging Potential**	**Comments**
Bushmanland Arid Grassland	Moderate	Low	Very little natural roosting space is available and may be limited to the higher and denser vegetation in the drainage systems. Foraging will mostly be by open space foraging bats species.
Lower Gariep Broken Veld	Low - Moderate	Low - Moderate	The vegetation unit does not present a lot of roosting potential apart from low trees and man-made structures. The unit will provide adequate foraging opportunities, especially open air foraging bat species.



Northern Upper Karoo
Bushmanland Basin Shrubland
Bushmanland Arid Grassland
Lower Gariep Broken Veld
Bushmanland Vloere
Upper Karoo Hardeveld
Site Boundary

Figure 3: Vegetation units present on the Aletta 1 WEF study area (Mucina and Rutherford 2006).

3.2 Water sources and nearby protected areas

Figure 4 below was taken from the SANBI biodiversity GIS mapping tool and shows the national rivers, river catchments and wetlands in blue. There is a small river running through the center of the study area with a number of small wetlands across the area, these water features will attract bat activity for drinking purposes and for foraging on insect prey around the water sources.

The mapping tool also shows the National Protected Area Expansion Strategy (NPAES) in orange grids. The goal of the National Protected Area Expansion Strategy (NPAES) is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change. It sets targets for protected area expansion, and identifies the most important areas for protected area expansion. The study area encompasses an area important for the NPAES. An area is considered important for the expansion of the protected area network if it contributes to meeting biodiversity thresholds for terrestrial or freshwater ecosystems, maintaining ecological processes or climate change resilience.

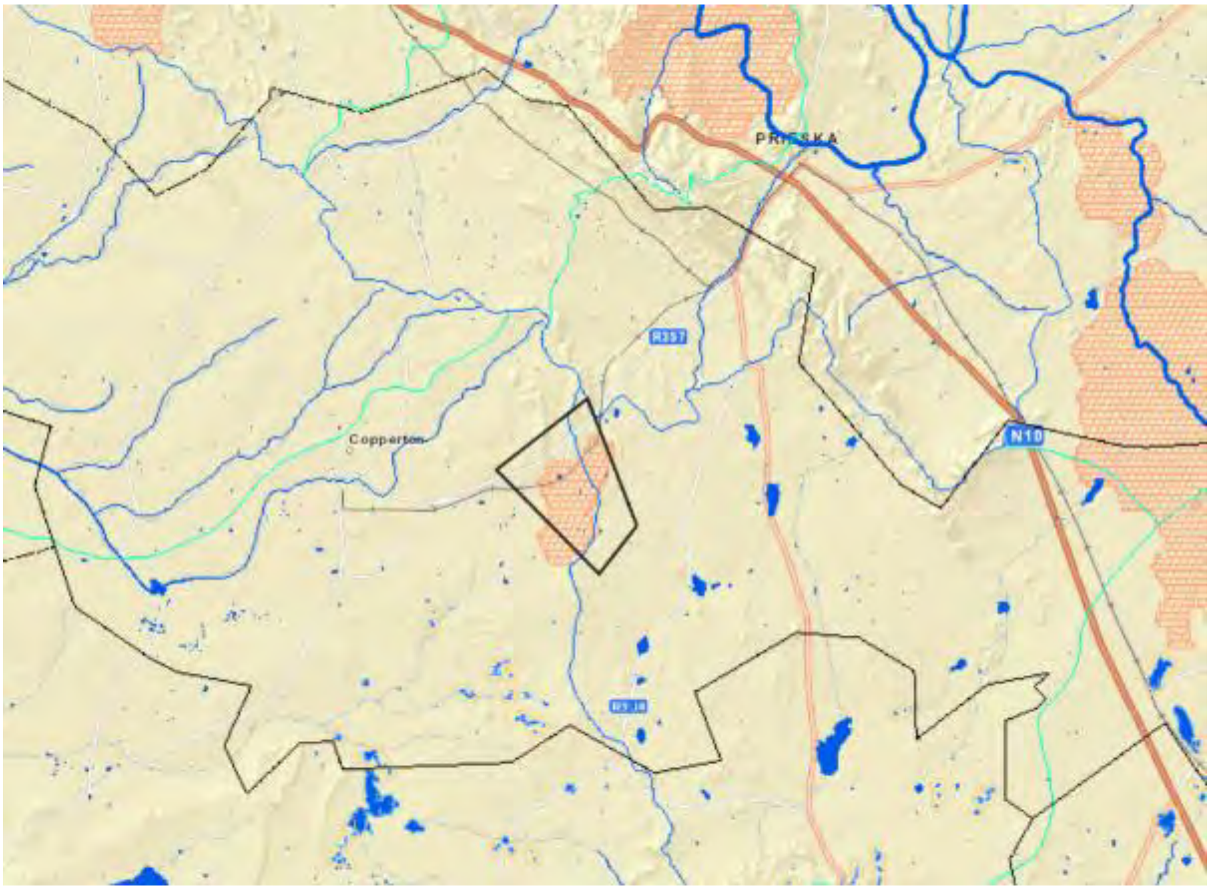


Figure 4: Map indicating national rivers and wetlands (blue features), and NPAES (orange grids)

4 METHODOLOGY

Two site visits have taken place over 20 – 25 July 2015 and 19 – 24 October 2015.

4.1 Active Monitoring Technique

Active monitoring was carried out with the use of a mobile bat detector. The bat detector was mounted on a vehicle and transects were driven across the site. Transect routes were randomly selected based on availability and accessibility of roads across the site. A SM2BAT+ bat detector was used for this monitoring technique. The specifications of the settings used are listed below.

4.2 Passive Monitoring Technique

Passive detection has commenced through the mounting of passive bat monitoring systems on monitoring masts on site (**Figure 8**).

The monitoring systems consists of SM2BAT+ time expansion type bat detectors that are powered by 12V 18Ah sealed lead acid batteries and 20W solar panels that provide recharging power to the batteries (**Figure 7**). Each system also has an 8-amp low voltage protection regulator and SM2PWR step down transformer. Four SD memory cards, class 10 speed, with a capacity of 32GB each were utilized within each SM2BAT+ detector; this is to ensure substantial memory space with high quality recordings even under conditions of multiple false wind triggers.

Two weatherproof ultrasound microphones were mounted at heights of 9.5 meters on the short 10m masts (**Figure 6**), while two microphones were mounted at 10m and 80m heights on the meteorological mast (**Figure 5**). These microphones were then connected to the SM2BAT+ bat detectors.

Each detector was set to operate in continuous trigger mode from dusk each evening until dawn (times were correlated with latitude and longitude). Trigger mode is the setting for a bat detector in which any frequency which exceeds 16 KHz and 18 dB will trigger the detector to record for the duration of the sound and 500 ms after the sound has ceased, this latter period is known as a trigger window. All signals are recorded in WAC0 lossless compression format.

Figure 5: Meteorological mast monitoring system

Figure 6: Short mast monitoring system

Figure 7: SM2BAT+ detector and supporting hardware

Table 2: Summary of equipment set up

General Comments	The microphones were mounted such that they pointed approximately 30 degrees downward to avoid excessive water damage. Measures were taken for protection against birds, without compromising effectiveness significantly. Crows have been found to peck at microphones and subsequently destroying them. The bat detectors were installed within their weatherproof containers and all peripherals attached.
Type of passive bat detector	SM2BAT+, Real Time Expansion (RTE) type
Recording schedule	Each detector was set to operate in continuous trigger mode from dusk each evening until dawn (times were automatically adjusted with latitude, longitude and season).
Trigger threshold	>16KHz, 18dB
Trigger window (time of recording after trigger ceased)	500ms
Microphone gain setting	36dB
Compression	WAC0
Single memory card size (each systems uses 4 cards)	32GB
Battery size	18Ah; 12V
Solar panel output	20 Watts
Solar charge regulator	6 - 8 Amp with low voltage/deep discharge protection

The passive bat monitoring data has been analysed by classifying (as near to species level as possible) and counting positive bat passes detected by the passive systems. A bat pass is defined as a sequence of ≥1 echolocation calls where the duration of each pulse is ≥2 ms (one echolocation call can consist of numerous pulses). A new bat pass will be identified by a >500 ms period between pulses. These bat passes were summed into 10 minute intervals which were used to calculate nocturnal distribution patterns over time. Bat activity was grouped into 10 minute periods.

Figure 8: Locations of the passive bat monitoring systems used to detect bat activity levels across the study area

4.3 Assumptions and Limitations

Distribution maps of South African bat species still require further refinement such that the bat species proposed to occur on the site (that were not detected) are assumed accurate. If a species has a distribution marginal to the study area it was assumed to occur in the area. The literature based table of species probability of occurrence may include a higher number of bat species than actually present.

The migratory paths of bats are largely unknown, thus limiting the ability to determine if the wind farm will have a large scale effect on migratory species.

The satellite imagery partly used to develop the sensitivity map may be slightly imprecise due to land changes occurring since the imagery was taken.

Species identification with the use of bat detection and echolocation is less accurate when compared to morphological identification, nevertheless it is a very certain and accurate indication of bat activity and their presence with no harmful effects on bats being surveyed.

It is not possible to determine actual individual bat numbers from acoustic bat activity data, whether gathered with transects or the passive monitoring systems. However, bat passes per night are internationally used and recognized as a comparative unit for indicating levels of bat activity in an area.

Spatial distribution of bats over the study area cannot be accurately determined by means of transects, although the passive systems can provide comparative data for different areas of the site. Transects may still possibly uncover high activity in areas where it is not necessarily expected and thereby increase insight into the site.

Exact foraging distances from bat roosts or exact commuting pathways cannot be determined by the current methodology. Radio telemetry tracking of tagged bats is required to provide such information if needed.

5 RESULTS AND DISCUSSION

5.1 Literature Based Species Probability of Occurrence

“Probability of Occurrence” is assigned based on consideration of the presence of roosting sites and foraging habitats on the site, compared to literature described preferences. The column of “Likely risk of impact” describes the likelihood of risk of fatality from direct collision or barotrauma with wind turbine blades for each bat species. The risk was assigned by Sowler and Stoffberg (2014) based on species distributions, altitudes at which they fly and distances they traverse; and assumes a 100% probability of occurrence. The ecology of most applicable bat species recorded in the vicinity of the site is discussed below.

Table 3: Table of species that may be roosting or foraging in the study area and the possible site specific roosts (Monadjem *et al.* 2010).

Species	Common name	Probability of occurrence (%)	Conservation status	Possible roosting habitat on site	Possible foraging habitat utilised on site	Likelihood of risk of fatality (Sowler & Stoffberg, 2014)
Rhinolophus clivosus	Geoffroy's horseshoe bat	10 - 20	Least Concern	Roosts in caves, mine adits and hollows (man-made and natural).	It is associated with a variety of habitats including arid savanna, woodland and riparian forest. Clutter forager that may only possibly be found in denser drainage systems. Relatively small foraging range	Low
Nycteris thebaica	Egyptian slit-faced bat	10 - 20	Least Concern	Roosts in caves, aardvark burrows, culverts under roads and the trunks of large trees and hollows (man-made or natural). Roosting space unlikely on site.	It appears to occur throughout the savanna and karoo biomes, but avoids open grasslands. May be found in denser drainage systems. Relatively small foraging range and an open space forager	Low
Sauromys petrophilus	Roberts's flat-headed bat	60 - 70	Least Concern	Roosts in narrow cracks and under slabs of exfoliating rock. Closely associated with rocky habitats in dry woodland, mountain fynbos or arid scrub.	Open space forager with relatively large foraging range.	High
Tadarida aegyptiaca	Egyptian free-tailed bat	Confirmed	Least Concern	Roost during the day, rock crevices, under exfoliating rocks, in hollow trees, and behind the bark of dead trees. The species has also taken to roosting in buildings, in particular roofs of houses. The farm buildings are the most likely roosting space.	It forages over a wide range of habitats; its preferences of foraging habitat seem independent of vegetation. It seems to forage in all types of natural and urbanised habitats with a relatively large foraging range. Open space forager	High
Miniopterus natalensis	Natal long-fingered bat	Confirmed (in very low numbers)	Near Threatened	It is cave/mine dependent and hence the availability of suitable roosting sites is a critical factor in determining its presence. It may be found in the Copperton copper mines. Have been found roosting singly or in small groups inside culverts and manmade hollows.	Forages around the edge of clutters of vegetation, and may therefore avoid most of the site and may only be found at the denser drainage systems. It is also dependant on open surface water sources.	Medium - High
Cistugo seabrae	Angolan wing-gland bat	40 - 50	Near Threatened	It is restricted to the arid western parts of southern Africa, typically in desert and semi-desert conditions. Not a common bat.	Not well known, once netted at a dry stream bed in 2006 close to Vredesvallei.	Not known

Eptesicus hottentotus	Long-tailed serotine	30 - 40	Least Concern	It is a crevice dweller roosting in rock crevices, expansion joints in bridges and road culverts	It seems to prefer woodland habitats, but has been caught in granitic hills and near rocky outcrops. Clutter edge forager	Medium
Myotis tricolor	Temmink's myotis	20 - 30	Least Concern	Roosts gregariously in caves, but have been found roosting singly or in small groups inside culverts and manmade hollows.	It is restricted to areas with suitable caves or hollows, which may explain its absence from flat and featureless terrain; its close association with mountainous areas may therefore be due to its roosting requirements.	Medium - High
Neoromicia capensis	Cape serotine	Confirmed	Least Concern	Roosts under the bark of trees, at the base of aloe leaves, and inside the roofs of houses. The farm buildings are the most likely roosting space.	It appears to tolerate a wide range of environmental conditions from arid semi-desert areas to montane grasslands, forests, and savannas. Highly adaptable species, but a clutter edge forager limiting its utilisation of the site.	Medium - High

5.2 Ecology of bat species that may be largely impacted by the proposed Aletta WEF

There are several bat species in the vicinity of the site that occur commonly in the area. These species are of importance based on their likelihood of being impacted by the proposed WEF, due to high abundances and certain behavioural traits. The relevant species are discussed below.

Tadarida aegyptiaca

The Egyptian Free-tailed Bat, *Tadarida aegyptiaca*, is a Least Concern species as it has a wide distribution and high abundance throughout South Africa, and is part of the Free-tailed bat family (Molossidae). It occurs from the Western Cape of South Africa, north through to Namibia and southern Angola; and through Zimbabwe to central and northern Mozambique (Monadjem *et al*. 2010). This species is protected by national legislation in South Africa (ACR 2010).

They roost communally in small (dozens) to medium-sized (hundreds) groups in caves, rock crevices, under exfoliating rocks, in hollow trees and behind the bark of dead trees. *Tadarida aegyptiaca* has also adapted to roosting in buildings, in particular roofs of houses (Monadjem *et al*. 2010). Thus man-made structures and large trees on the site would be important roosts for this species.

Tadarida aegyptiaca forages over a wide range of habitats, flying above the vegetation canopy. It appears that the vegetation has little influence on foraging behaviour as the species forages over desert, semi-arid scrub, savanna, grassland and agricultural lands. Its presence is strongly associated with permanent water bodies due to concentrated densities of insect prey (Monadjem *et al*. 2010).

The Egyptian Free-tailed bat is considered to have a High likelihood of risk of fatality due to wind turbines (Sowler and Stoffberg 2014). Due to the high abundance and widespread distribution of this species, high mortality rates due to wind turbines would be a cause of concern as these species have more significant ecological roles than the rarer bat species.

After a gestation of four months, a single young is born, usually in November or December, when females give birth once a year. In males, spermatogenesis occurs from February to July and mating occurs in August. Maternity colonies are apparently established by females in November.

Neoromicia capensis

Neoromicia capensis is commonly called the Cape serotine and has a conservation status of Least Concern as it is found in high numbers and is widespread over much of Sub-Saharan Africa.

High mortality rates of this species due to wind turbines would be a cause of concern as *N. capensis* is abundant and widespread and as such has a more significant role to play within the local ecosystem than the rarer bat species. They do not undertake migrations and thus are considered residents of the study area.

It roosts individually or in small groups of two to three bats in a variety of shelters, such as under the bark of trees, at the base of aloe leaves, and under the roofs of houses. They will use most man-made structures as day roosts which can be found throughout the study area and surrounding areas (Monadjem *et al*. 2010).

They are tolerant of a wide range of environmental conditions as they survive and prosper within arid semi-desert areas to montane grasslands, forests, and savannas; indicating that they may occupy several habitat types across the site, and are amenable towards habitat changes. They are however clutter-edge foragers, meaning they prefer to hunt on the edge of vegetation clutter mostly, but can occasionally forage in open spaces. They are thought to have a Medium-High likelihood of risk of fatality due to wind turbines (Sowler and Stoffberg 2014).

Mating takes place from the end of March until the beginning of April. Spermatozoa are stored in the uterine horns of the female from April until August, when ovulation and fertilisation occurs. They give birth to twins during late October and November but single pups, triplets and quadruplets have also been recorded (van der Merwe 1994 and Lynch 1989).

Miniopterus natalensis

Miniopterus natalensis, also commonly referred to as the Natal long-fingered bat and occurs widely across the country but mostly within the southern and eastern regions and is listed as Near Threatened (Monadjem *et al*. 2010).

This bat is a cave-dependent species and identification of suitable roosting sites may be more important in determining its presence in an area than the presence of surrounding vegetation. It occurs in large numbers when roosting in caves with approximately 260000 bats observed making seasonal use of the De Hoop Guano Cave in the Western Cape, South Africa. Culverts and mines have also been observed as roosting sites for either single bats or small colonies. Separate roosting sites are used for winter hibernation activities and summer maternity behaviour, with the winter hibernacula generally occurring at higher altitudes in more temperate areas and the summer hibernacula occurring at lower altitudes in warmer areas of the country (Monadjem *et al*. 2010).

Mating and fertilisation usually occur during March and April and is followed by a period of delayed implantation until July/August. Birth of a single pup usually occurs between October and December as the females congregate at maternity roosts (Monadjem *et al.* 2010 & Van Der Merwe 1979).

The Natal long-fingered bat undertakes short migratory journeys between hibernaculum and maternity roosts. Due to this migratory behaviour, they are considered to be at high risk of fatality from wind turbines if a wind farm is placed within a migratory path (Sowler and Stoffberg 2014). The mass movement of bats during migratory periods could result in mass casualties if wind turbines are positioned over a mass migratory route and such turbines are not effectively mitigated. Very little is known about the migratory behaviour and paths of *M. natalensis* in South Africa with migration distances exceeding 150 kilometres. If the site is located within a migratory path the bat detection systems will detect if there are high numbers of this species and whether it is a migratory event or high activity period. This will be examined over the course of the 12-month monitoring survey.

A study by Vincent *et al.* (2011) on the activity and foraging habitats of Miniopteridae found that the individual home ranges of lactating females were significantly larger than that of pregnant females. It was also found that the bats predominately made use of urban areas (54%) followed by open areas (19.8%), woodlands (15.5%) orchards and parks (9.1%) and water bodies (1.5%) when selecting habitats. Foraging areas were also investigated with the majority again occurring in urban areas (46%). However, a lot of foraging also occurred in woodland areas (22%), crop and vineyard areas (8%), pastures, meadows and scrubland (4%) and water bodies (4%).

Sowler and Stoffberg (2014) advise that *M. natalensis* faces a medium to high risk of fatality due to wind turbines. This evaluation was based on broad ecological features and excluded migratory information.

5.3 Active Monitoring Results

Tables 4 and 5 below display the sampling effort and weather conditions experienced over the time of transects for both site visits

Table 4: The distance and time frames over which transects were carried out

Date	Distance Travelled (km)	Duration	Start	End
22 July 2015	45.1	3 hrs 14 min	17:55	21:09
23 July 2015	55	3 hrs 50 min	18:00	21:50
20 October 2015	62.2	3 hrs 28 min	18:27	21:56
21 October 2015	51.9	3 hrs 24 min	18:10	21:35
22 October 2015	75.4	5 hrs 29 min	17:52	22:47

Table 5: Average weather conditions experienced during transect nights (Taken from www.worldweatheronline.com for Prieska, Northern Cape)

Date	Temperature (°C)	Wind (m/s)	Humidity (%)	Rain (mm)
22 July 2015	15	6 N	63	0.6
23 July 2015	12	5 WSW	63	0.0
20 October 2015	28	5 WSW	27	0.0
21 October 2015	30	5 SSW	50	0.0
22 October 2015	25	5 ESE	28	0.0

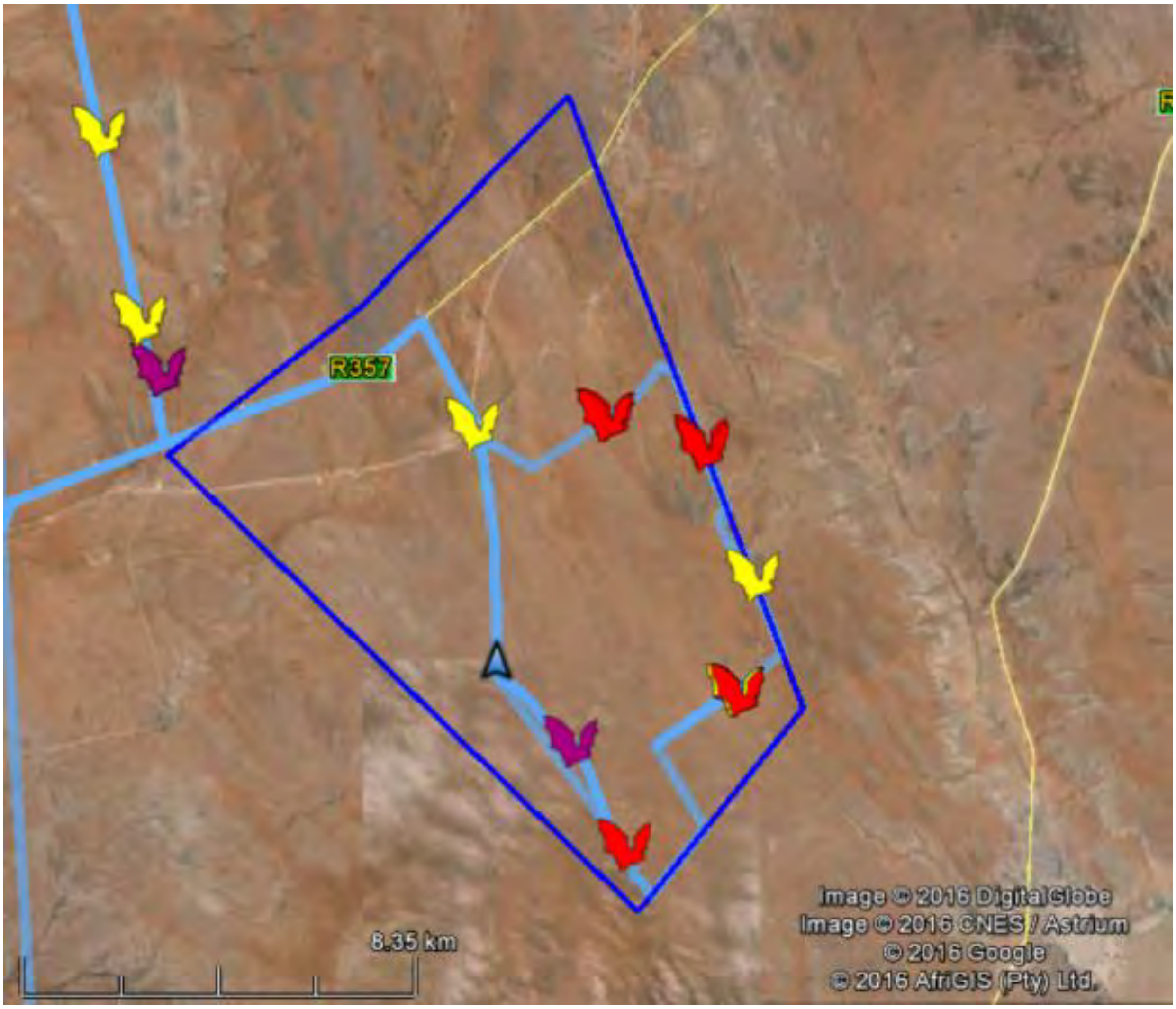
Figures 9 and 10 below display the locations and species of bat passes that were detected across the site during transects. **Table 4** displays the sampling effort in duration and distance of transects. **Table 5** lists the average weather conditions encountered over the sampling periods.

No bat passes were detected over the duration of transects of the July 2015 site visit (**Figure 9**), this is most likely due to the colder weather conditions and rain of the night of 22 July 2015. Bat activity generally declines over the winter season due to greater energy expenditure requirements in harsher weather, as well as the decline in easily available insect prey.

Several bat passes of three different bat species; *Neoromicia capensis, Tadarida aegyptiaca* and *Eptesicus hottentotus*; were detected across the Aletta study area during the transects of October 2015 (**Figure 10**). This season was more favourable for bat activity than winter. The distribution of bat passes across the study area has been factored into the compilation of the bat sensitivity map.

Transect tracks

Figure 9: Results of active monitoring transects performed in July 2105



Miniopterus natalensis *Neoromicia capensis* *Tadarida aegyptiaca*

Transect tracks

Figure 10: Bat passes detected during active monitoring transects over October 2015

5.4 Passive Monitoring Results

The results of bat activity data collected by the passive monitoring systems will be presented in the progress reports of the 12-month Preconstruction Bat Monitoring Study.

5.5 Sensitivity Map

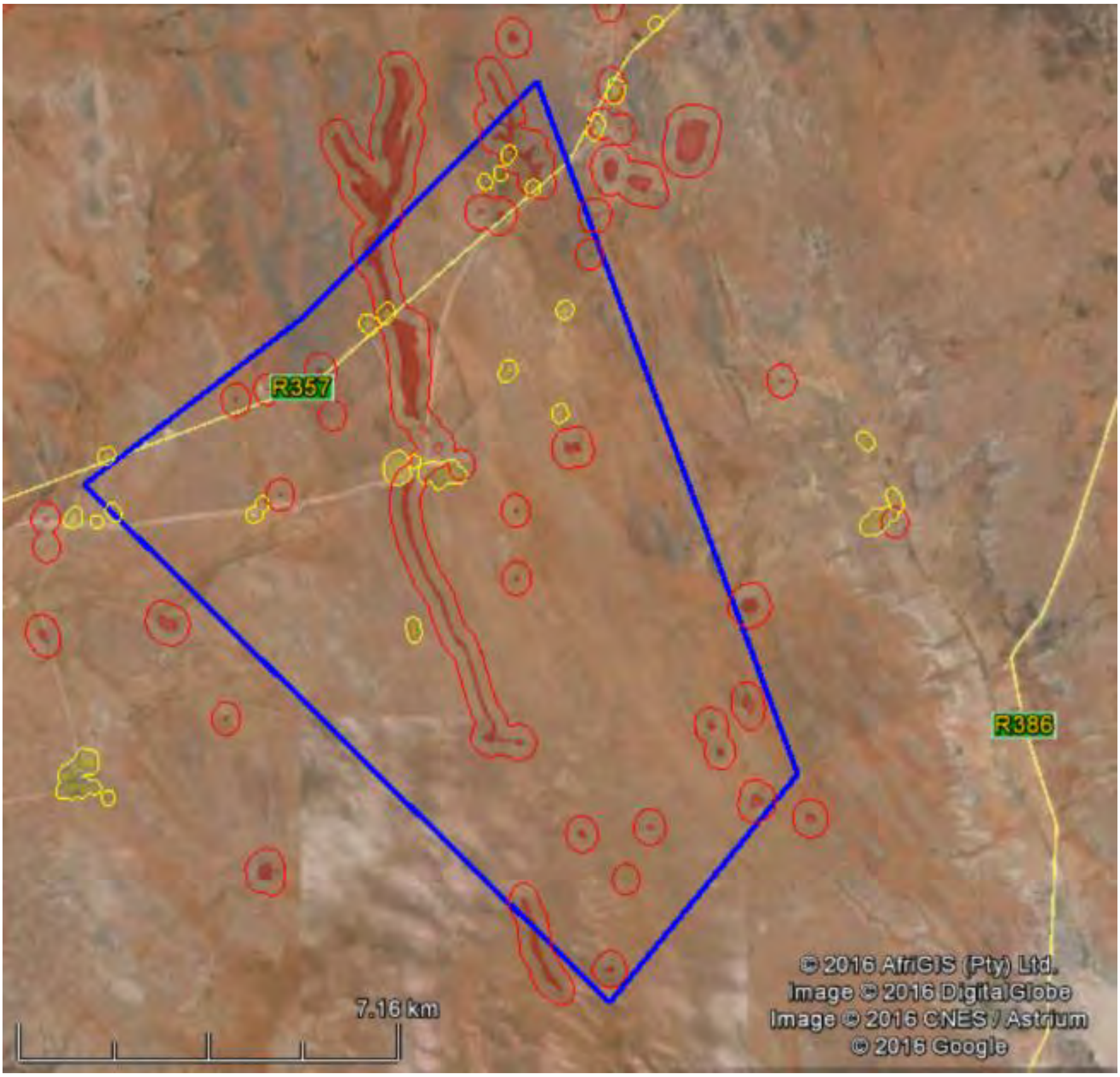
Figure 11 depict the sensitive areas of the study area, based on features identified to be important for foraging and roosting of the species. Thus the sensitivity map is based on species ecology and habitat preferences. This map can be used as a tool to improve turbine placement with regards to bat preferred habitats in the study area.

Table 6: Description of parameters used in the construction of a sensitivity map

High sensitivity buffer	250m
Moderate sensitivity buffer	100m
Features used to develop the sensitivity map	Manmade structures, such as houses, barns, sheds and road culverts, these structures provide easily accessible roosting sites.
	The presence of probable hollows/overhangs, rock faces, mountainous rocky areas and clumps of larger woody plants. These features provide natural roosting spaces and tend to attract insect prey.
	The different vegetation types and presence of riparian/water drainage habitat is used as indicators of probable foraging areas.
	Open water sources, be it man-made farm dams or natural streams and wetlands, are important sources of drinking water and provide habitat that host insect prey.
	Areas frequented often by cattle and livestock (e.g. congregation areas and kraal areas) were assigned a moderate sensitivity since large groups of animals tend to attract insects.

Table 7: Description of sensitivity categories utilized in the sensitivity map

Sensitivity	Description
Moderate Sensitivity	Areas of foraging habitat or roosting sites considered to have significant roles for bat ecology. Turbines within or close to these areas and their buffers must acquire priority (but not excluding all other turbines) during pre/post-construction studies and for application of mitigation measures.
High Sensitivity	Areas that are deemed critical for resident bat populations, capable of elevated levels of bat activity and support greater bat diversity than the rest of the site. These areas and their buffers are 'no-go' areas and turbines must not be placed in these areas. These areas and their buffers must be avoided when considering turbine placement.



High bat sensitivity area
Moderate bat sensitivity area
High bat sensitivity buffer
Moderate bat sensitivity buffer

Figure 11: Bat sensitivity map of the Aletta WEF study area

6 IMPACT ASSESSMENT

6.1 Scoping phase impact assessment

6.1.1 Construction phase

ISSUE	Impact: Artificial lighting during construction phase
DISCUSSION	Artificial lighting at storage yards and other facilities in the area of the site will ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and diversity. This is due to insect food resources being drawn out of natural habitats to lighted areas.
EXISTING IMPACT	Minimal, some farm houses and buildings have outside lighting. Very sparsely distributed.
PREDICTED IMPACT	Low as population structures should be able to recover after the construction phase
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Moderate. Assuming other WEF's in the larger area also have artificial lighting.

ISSUE	Impact: loss of foraging habitat
DISCUSSION	Foraging habitat will be lost where areas need to be cleared of natural vegetation for turbines and associated infrastructure
EXISTING IMPACT	Grazing is present however large portion of natural vegetation are evident.
PREDICTED IMPACT	Low, as the actual footprint of the facility is small in relation to the larger study area
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low, as the actual footprint of the facility is small in relation to the larger study area

6.1.2 Operational phase

ISSUE	**Impact: Mortalities due to barotrauma and direct blade impact (during foraging)**
DISCUSSION	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering foraging bats
EXISTING IMPACT	None
PREDICTED IMPACT	High as bat populations can be slow to recover, and bat activity is very high during certain summer months.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High, as it is expected that the elevated bat activity occurring during certain summer months, are due to bats spreading from the Orange River to surrounding areas including the study site. Thus bats killed on site may affect agricultural activities in the Prieska area.

ISSUE	**Impact: Mortalities due to barotrauma and direct blade impact (during migration)**
DISCUSSION	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering migrating bats
EXISTING IMPACT	None
PREDICTED IMPACT	High as bat populations can be slow to recover, and large numbers of bats can be killed in a short time span. But expected to have a low probability of occurring.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High. Since migrating bats being killed will affect other regions apart from the site that can even be in other provinces. Migrating insect eating bats are also cave dwelling, therefore cave ecosystems dependant on their guano will be adversely affected if large numbers of the migrating colony is killed.

ISSUE	**Impact: Artificial lighting during operational phase**
DISCUSSION	Artificial lighting close to turbines or at the turbine base will attract insects and therefore attract insect eating bats. This will significantly increase the likelihood of bats being killed by operating turbines. Additionally, it can ecologically favour bat species that readily forage around lights above

ISSUE	Impact: Artificial lighting during operational phase
	species that avoid lights, thereby altering local population structures and diversity.
EXISTING IMPACT	Minimal, some farm houses and buildings have outside lighting. Very sparsely distributed.
PREDICTED IMPACT	High as it significantly increases the probability of bat mortalities by turbines
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High. Assuming other WEF's in the larger area also have artificial lighting.

6.2 Preliminary EIA phase impact assessment

6.2.1 Construction phase

IMPACT TABLE FORMAT		
Environmental Parameter	Local bat diversity and population structures	
Issue/Impact/Environmental Effect/Nature	Artificial lighting at storage yards and other facilities in the area of the site will ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and diversity. This is due to insect food resources being drawn out of natural habitats to lighted areas.	
Extent	Site	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No. Bat population structures should be able to recover after the construction phase.	
Duration	Short term. For the duration of the construction phase.	
Cumulative effect	Medium. Assuming other WEF's in the larger area also have artificial lighting.	
Intensity/magnitude	Medium	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-20 (low negative)	-7 (low negative)
Mitigation measures	Use permanent lighting only where absolutely necessary for safety/security reasons. Other lights should be used with passive motion sensors and/or only switched on when needed. Utilise wavelengths/colour temperatures that attract less insects.	

IMPACT TABLE FORMAT		
Environmental Parameter	Vegetation utilised as foraging habitat by bats	
Issue/Impact/Environmental Effect/Nature	Foraging habitat will be lost where areas need to be cleared of natural vegetation for turbines and associated infrastructure	
Extent	Site	
Probability	Definite	
Reversibility	Barely reversible	
Irreplaceable loss of resources	Marginal	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	Medium.	
Intensity/magnitude	Low. The actual footprint of the facility is small in relation to the larger study area.	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	3
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	2
Intensity/magnitude	1	1
Significance rating	-16 (low negative)	-14 (low negative)
Mitigation measures	Adhere to bat sensitivity maps.	

6.2.2 Operational phase

IMPACT TABLE FORMAT		
Environmental Parameter	Foraging bats	
Issue/Impact/Environmental Effect/Nature	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering foraging bats	
Extent	District	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and bat activity is very high during certain summer months.	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	High. as it is expected that the elevated bat activity occurring during certain summer months, are due to bats spreading from the Orange River to surrounding areas including the study site. Thus bats killed on site may affect agricultural activities in the Prieska area.	
Intensity/magnitude	High	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	3	2
Significance rating	-51 (high negative)	-28 (low negative)
Mitigation measures	Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures during high bat activity periods.	

IMPACT TABLE FORMAT		
Environmental Parameter	Migrating bats	
Issue/Impact/Environmental Effect/Nature	Bat mortalities can occur with operating turbines due to direct blade impact or barotrauma. This impact is considering migrating bats	
Extent	Provincial	
Probability	Unlikely	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and large numbers of bats can be killed in a short time span.	
Duration	Long term. For the lifetime of the facility.	
Cumulative effect	High. Since migrating bats being killed will affect other regions apart from the site that can even be in other provinces. Migrating insect eating bats are also cave dwelling, therefore cave ecosystems dependant on their guano will be adversely affected if large numbers of the migrating colony is killed.	
Intensity/magnitude	Medium	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	3
Probability	1	1
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	2	2
Significance rating	-32 (medium negative)	-28 (low negative)
Mitigation measures	Apply operational mitigation such as curtailment, deterrents, and any other proven effective measures during migration periods determined by the bat assessment or by data thereafter.	

IMPACT TABLE FORMAT		
Environmental Parameter	Foraging bats. Local bat diversity and population structures.	
Issue/Impact/Environmental Effect/Nature	Artificial lighting close to turbines or at the turbine base will attract insects and therefore attract insect eating bats. This will significantly increase the likelihood of bats being killed by operating turbines. Additionally, it can ecologically favour bat species that readily forage around lights above species that avoid lights, thereby altering local population structures and diversity.	
Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Significant loss. Bat populations can be slow to recover, and bat activity is very high during certain summer months.	
Duration	Long term. For the duration of the facility.	
Cumulative effect	High. Assuming other WEF's in the larger area also have artificial lighting.	
Intensity/magnitude	High	
Significance Rating	A brief description of the importance of an impact which in turn dictates the level of mitigation required	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	2
Irreplaceable loss	3	2
Duration	3	3
Cumulative effect	4	3
Intensity/magnitude	3	2
Significance rating	-48 (high negative)	-24 (low negative)
Mitigation measures	Use permanent lighting only where absolutely necessary for safety/security reasons. Other lights should be used with passive motion sensors and/or only switched on when needed. Utilise wavelengths/colour temperatures that attract less insects.	

7 CONCLUSION

The study area was visited over the winter and spring seasons of 2015 for a bat sensitivity study. During the day, site habitats and features were investigated and long-term bat monitoring systems were installed for the purpose of the 12-month preconstruction bat sensitivity study**.** The monitoring stations consist of Wildlife Acoustics SM2BAT+ bat detectors, ultrasonic microphones and associated components. The data from the passive monitoring systems will be used to identify bat species at risk of fatality to wind turbines, and patterns in their activity and distributions (temporal and spatial).

Active monitoring, by means of transects, was carried out over July and October 2015. There was a significant contrast in the number of bat passes detected between the different seasons. Three different bat species were detected in October 2015 namely, *Neoromicia capensis, Tadarida aegyptiaca* and *Eptesicus hottentotus.* These species are commonly found within the Cape region of South Africa. The locations wherein bat passes were detected were considered when drawing up the bat sensitivity map.

A sensitivity map was drawn up indicating potential roosting and foraging areas based on the results of active monitoring techniques, passive monitoring techniques and roost searches. The bat sensitivity map delineates and buffers high and moderate sensitivity areas.

The High Bat Sensitivity areas are expected to have elevated levels of bat activity and support greater bat diversity. High Bat Sensitivity areas and their buffers are 'no – go' areas due to expected elevated rates of bat fatalities due to wind turbines. The turbines located within Moderate Bat Sensitivity areas and their respective buffers must be prioritised during pre-construction and operational monitoring programs and may most likely require mitigation measures.

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Appendix 6D
Surface Water Assessment

BIOTHERM ENERGY (PTY) LTD

Proposed Construction of the Aletta 140MW Wind Farm Facility near Copperton, Northern Cape Province

Surface Water Assessment Scoping Report

Issue Date: 10th February 2016
Revision No.: 1
Project No.: 13169

Date:	10th February 2016
Document Title:	Proposed Construction of the Aletta 140MW Wind Farm Facility near Copperton, Northern Cape Province – Surface Water Assessment Scoping Report
Author:	Shaun Taylor
Revision Number:	1
Checked by:	Lynsey Rimbault
Approved:	Andrea Gibb
Signature:	
For:	SiVEST Environmental Division

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Construction of the Aletta 140MW Wind Farm Facility near Copperton, Northern Cape Province

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The specialist appointed in terms of the Regulations

I, **Shaun Taylor**, declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

SiVEST Environmental

Name of company (if applicable)

10th February 2016

Date

BIOTHERM ENERGY (PTY) LTD

PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND FARM FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

SURFACE WATER ASSESSMENT SCOPING REPORT

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PROPOSED CONSTRUCTION OF THE ALETTA 140MW WIND FARM FACILITY NEAR COPPERTON, NORTHERN CAPE PROVINCE

SURFACE WATER ASSESSMENT SCOPING REPORT

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (hereafter referred to as “BioTherm”) are proposing the construction of the 140MW Aletta Wind Farm facility near Copperton, Northern Cape Province. A 132kV power line and a Substation will be required in order to connect the proposed wind farm facility to the Eskom grid. However, the 132kV power line and Aletta Substation will form part of a separate Environmental Impact Assessment (EIA).

In terms of the EIA Regulations (08 December 2014) promulgated under Sections 24 and 24D of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), various aspects of the proposed development are considered to fall within the ambit of listed activities which may have an impact on the environment, and therefore require environmental authorization (EA) from the National Department of Environmental Affairs (DEA) prior to the commencement of such activities.

It has been identified that an EIA process is to be followed which will require scoping and impact phase assessments for the proposed 140MW Aletta Wind Farm facility. As the first phase of the environmental authorisation process, the scoping assessment will provide high level (desktop) environmental baseline information. Accordingly, this report will provide details on the project type, the environmental baseline of the study area from a desktop level, alternatives that are to be considered and lastly, the potential environmental impacts that could be associated with the proposed development from a surface water perspective.

SiVEST Environmental Division have subsequently been appointed as the independent surface water specialist consultant to undertake the surface water scoping assessment for the proposed development. As part of the scoping assessment, specialist input with regards to the identification of surface water resources at a desktop level and potential issues and impacts that may be caused by the proposed development to existing surface water features on site will be addressed in this Scoping Report.

1.1 Legislative Context

1.1.1 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) was created in order to ensure the protection and sustainable use of water resources (including wetlands) in South Africa. The NWA recognises that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users. Bearing these principles in mind, there are a number of stipulations within the NWA that are relevant to the potential impacts on rivers, streams and wetlands that may be associated with the proposed development. These stipulations are explored below and are discussed in the context of the proposed development.

Firstly, it is important to discuss the type of water resources protected under the NWA. Under the NWA, a 'water resource' includes a watercourse, surface water, estuary, or aquifer. Specifically, a watercourse is defined as (*inter alia*):

- A river or spring;
- A natural channel in which water flows regularly or intermittently; and
- A wetland, lake or dam into which, or from which, water flows.

In this context, it is important to note that reference to a watercourse includes, where relevant, its bed and banks. Furthermore, it is important to note that water resources, including wetlands, are protected under the NWA. 'Protection' of a water resource, as defined in the NWA entails the:

- Maintenance of the quality and the quantity of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource; and
- Rehabilitation of the water resource.

In the context of the proposed development and implications towards surface water resources potentially occurring on the study site, the definition of pollution and pollution prevention contained within the NWA is relevant. 'Pollution', as described by the NWA, is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- Less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- Harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

The inclusion of physical properties of a water resource within the definition of pollution entails that any physical alterations to a water body (for example, the excavation of a wetland or changes to the morphology of a water body) can be considered to be pollution. Activities which cause alteration of the biological properties of a watercourse, i.e. the fauna and flora contained within that watercourse are also considered pollution.

In terms of **Section 19** of the NWA, owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include measures to (*inter alia*):

- Cease, modify, or control any act or process causing the pollution;
- Comply with any prescribed waste standard or management practice;
- Contain or prevent the movement of pollutants;
- Remedy the effects of the pollution; and
- Remedy the effects of any disturbance to the bed and banks of a watercourse.

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

The National Environmental Management, 1998 (Act No. 107 of 1998) (NEMA) was created essentially to establish:

- principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance; and
- procedures for co-ordinating environmental functions exercised by organs of the state to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment.

It is stipulated in NEMA *inter alia* that everyone has the right to an environment that is not harmful to his or her health or well-being. Moreover, everyone has the right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Accordingly, several of the principles of NEMA contained in **Chapter 1 Section 2**, as applicable to wetlands, stipulate that:

- Development must be socially, environmentally and economically sustainable;
- Sustainable development requires the consideration of all relevant factors including the following:
    - That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.

- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

- The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

In line with the above, **Chapter 7** further elaborates on the application of appropriate environmental management tools in order to ensure the integrated environmental management of activities. In other words, this chapter of NEMA addresses the tools that must be utilised for effective environmental management and practice. Under these auspices, the EIA Regulations (2006, 2010 and 2014 as amended) were promulgated in order to give effect to the objectives set out in NEMA. Subsequently, activities were defined in a series of listing notices for various development activities. Should any of these activities be triggered, an application for Environmental Authorisation subject to a Basic Assessment (BA) or EIA process is to be applied for. Fundamentally, applications are to be applied for so that any potential impacts on the environment in terms of the listed activities are considered, investigated, assessed and reported on to the competent authority charged with granting the relevant environmental authorisation.

The above stipulations of the NWA and NEMA have implications for the proposed development in the context of surface water resources. Accordingly, potential impacts / issues of the proposed development on potentially affected surface water resources are addressed later in this report (**Section 7 & 8**).

1.2 Definition of Surface Water Resources as Assessed in this Study

Using the definition of a surface water resource under the NWA, this study will include a river, a spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows.

1.2.1 Wetlands

For wetlands specifically, the lawfully accepted definition of a wetland in South Africa is that within the NWA. Accordingly, the NWA defines a wetland as, “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”.

Moreover, wetlands are accepted as land on which the period of soil saturation is sufficient to allow for the development of hydric soils, which in normal circumstances would support hydrophytic vegetation (i.e. vegetation adapted to grow in saturated and anaerobic conditions).

Inland wetlands can be categorised into hydrogeomorphic units (HGM units). **Ollis *et al*. (2013)** have described a number of different wetland hydrogeomorphic forms which include the following:

- Channel (river, including the banks): a linear landform with clearly discernable bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the riparian zone as a unit.
- Channelled valley-bottom wetland: a valley-bottom wetland with a river channel running through it. Channelled valley-bottom wetlands must be considered as wetland ecosystems that are distinct from, but sometimes associated with, the adjacent river channel itself, which must be classified as a “river”.
- Unchannelled valley-bottom wetland: a valley-bottom wetland without a river channel running through it.
- Floodplain wetland: a wetland area on the mostly flat or gently-sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank. Floodplain wetlands must be considered as wetland ecosystems that are distinct from but associated with the adjacent river channel itself, which must be classified as a “river”.
- Depression: a wetland or aquatic ecosystem with closed (or near-closed) elevation contours, which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates.
- Flat: a Level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench, closed elevation contours are not evident around the edge of a wetland flat.
- Hillslope seep: a wetland are located on gently to steeply sloping land and dominated by colluvial (i.e. gravity-driven), unidirectional movement of water and material down-slope.

1.2.2 Riparian Habitat

Riparian habitats may potentially occur in the study area. Riparian habitats (also known as riparian areas or zones) include plant communities usually adjacent to or along natural channels that are affected by surface and subsurface flows (**DWAF, 2005**). Riparian habitats can be found on the edges of lakes, or drainage lines but are more commonly associated with channelled flowing systems like streams and rivers. Riparian habitats can also be associated with wetlands that are similarly associated with streams and rivers. These are defined as riparian wetlands.

1.2.3 Watercourses

According to the NWA, a watercourse falls within the ambit of a 'water resource'. For watercourses however, the following is relevant:

- A river or spring; and
- A natural channel in which water flows regularly or intermittently.

Watercourses may be perennial or non-perennial in nature. Moreover, non-perennial watercourses can encompass seasonal or ephemeral watercourses (including drainage lines) depending on the climate and other environmental constraints.

Any of the above mentioned wetland forms, riparian habitats or watercourses may occur within the study area. The types of surface water resources identified are addressed later in the report (**Section 6**).

1.3 Assumptions and Limitations

This study has only focused on the identification and desktop delineation of surface water resources within the proposed development area. Aquatic studies of fish, invertebrates, amphibians etc. have not been included in this report. Nor has water quality, hydrological or groundwater studies been included.

Wetland or river health, present ecological status, ecosystem services and the ecological importance/sensitivity categories have also not been assessed for identified surface water resources.

Delineations of all surface water features using Google Earth™ are limited to the spatial accuracies inherent in the application software. No in-field investigation or delineations were undertaken for the scoping phase assessment.

2 PROJECT NEED AND DESIRABILITY

The negative environmental impacts of using fossil fuels are well documented. In addition to depleting fossil fuels, the processes often result in large pollution risks. The Government of South Africa has committed to contributing to the global effort to mitigate greenhouse emissions.

According to the White Paper on the Promotion of Renewable Energy and Clean Energy Development (2002), the Government has committed to develop the framework within which the renewable energy industry can operate, grow, and contribute positively to the South African economy and to the global environment.

Government's long-term goal is the establishment of a renewable energy industry producing modern energy carriers that will offer in future years a sustainable, fully non-subsidised alternative to fossil fuels.

In response to this goal, BioTherm are proposing to establish Wind Farm facilities near Copperton in the Northern Cape Province.

The overall objective of the project is to generate electricity to feed into Eskom's national electricity grid by means of renewable energy technologies.

3 PROJECT TECHNICAL DESCRIPTION

3.1 Project Location

The proposed development will be located approximately 14km east of Copperton, within the Pixley ka Seme District Municipality of the Northern Cape Province. More specifically, the proposed development is situated within the Siyathemba Local Municipality. The study area is on the following properties:

- Portion 1 of Drielings Pan No. 101;
- Portion 2 of Dreilings Pan No. 101;
- Portion 3 of Dreilings Pan No. 101; and
- Remainder of Drielings Pan No. 101.

The project site has been identified through pre-feasibility studies conducted by BioTherm based on grid connection suitability, competition, flat topography, land availability and site access.

The proposed development location is shown in the locality map (**Figure 1**) below.

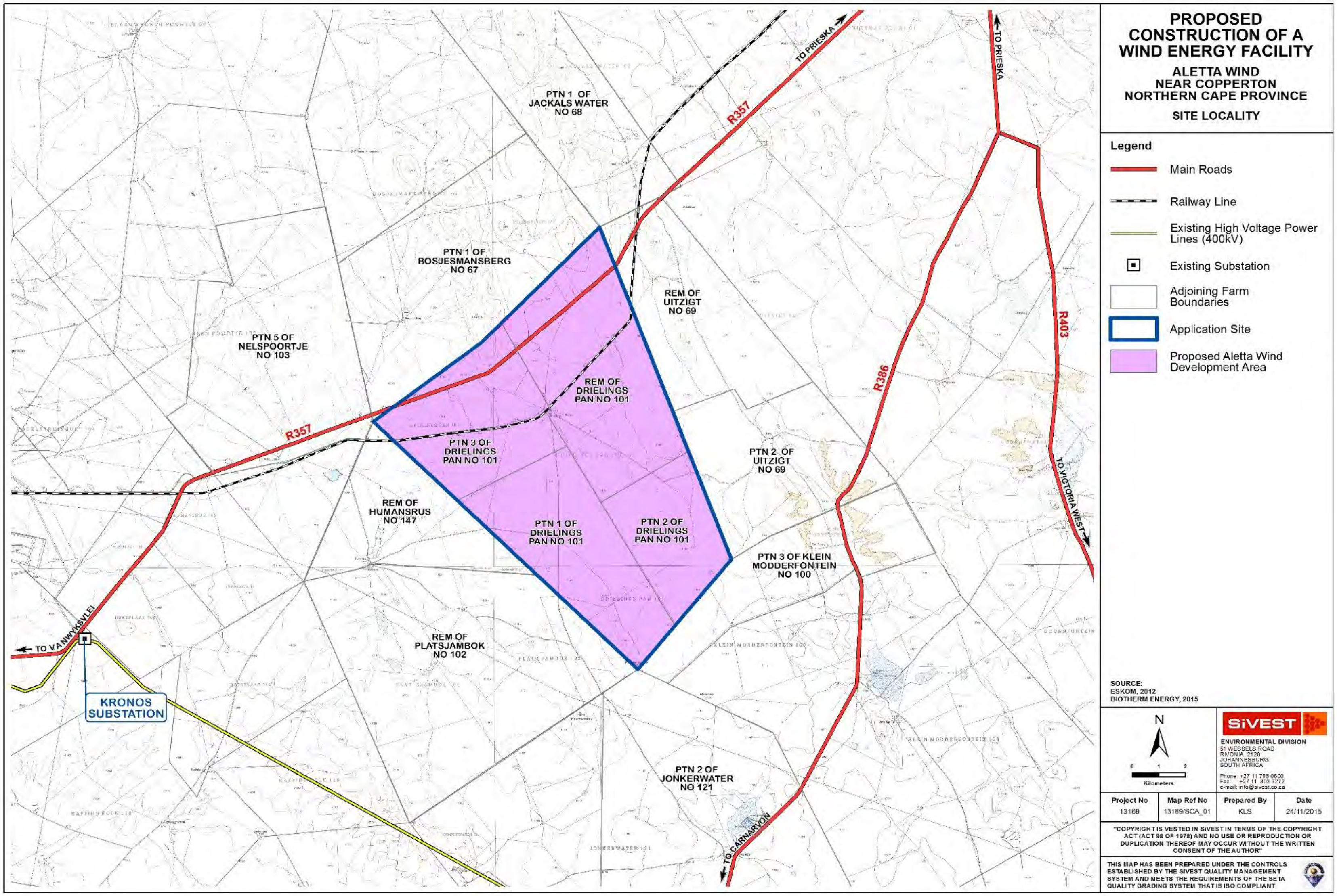

Figure 1: Proposed Development Locality map

3.2 Wind Farm Technical Details

The key technical details and infrastructure required is presented in the table below (**Table 1**).

Table 1: Aletta Wind Farm summary

Project Name	DEA Reference	Farm name and area	Technical details and infrastructure necessary for the proposed project
Alettta Wind Farm	To be announced	▪ Portion 1 of Drielings Pan No.101 ▪ Portion 2 of Drielings Pan No.101 ▪ Portion 3 of Drielings Pan No.101 ▪ Remainder of Drielings Pan No.101 Development Area: 10 000 ha	▪ Between **80 and 125 wind turbines** with a total generation capacity of up to 140MW. Turbines will have a hub height of up to 120m and a rotor diameter of up to 150m. ▪ The turbines will be connected via **medium voltage cables** to the proposed 132kV onsite Aletta Substation**.** ▪ Internal **access roads** are proposed to be between 4m to 6m wide. ▪ A temporary construction **lay down area.** ▪ The **operations and maintenance buildings**, including an on-site spares storage building, a workshop and an operations building. ▪ **Fencing** (if required) will be up to 5m where required and will be either mesh or palisade.

The key components of the project are detailed below.

3.2.1 Turbines

The total amount of developable area is 10 000 hectares. The wind turbines and all other project infrastructure will be placed strategically within the development area based on environmental constraints. The size of the wind turbines will depend on the development area and the total generation capacity that can be produced as a result. The wind turbines will therefore likely have a hub height of up to 120m and a rotor diameter of up to 150m (**Figure 2**). The blade rotation direction will be clock-wise. Each wind turbine will have a foundation diameter of up to 20m, and will be approximately 3m deep. The area occupied by each wind turbine will be up to 0.5 hectares (85m x 60m). The excavation area will be approximately 1 000m^2 in sandy soils due to access requirements and safe slope stability requirements. A hard standing area / platform of approximately 2 400m^2 (60m x 40m) per turbine will be required for turbine crane usage. There will be approximately 80 to 125 wind turbines constructed with a total generation capacity of up to

140MW. The electrical generation capacity for each turbine will range from 1.5 to 3.5MW depending on the final wind turbine selected for the proposed development.

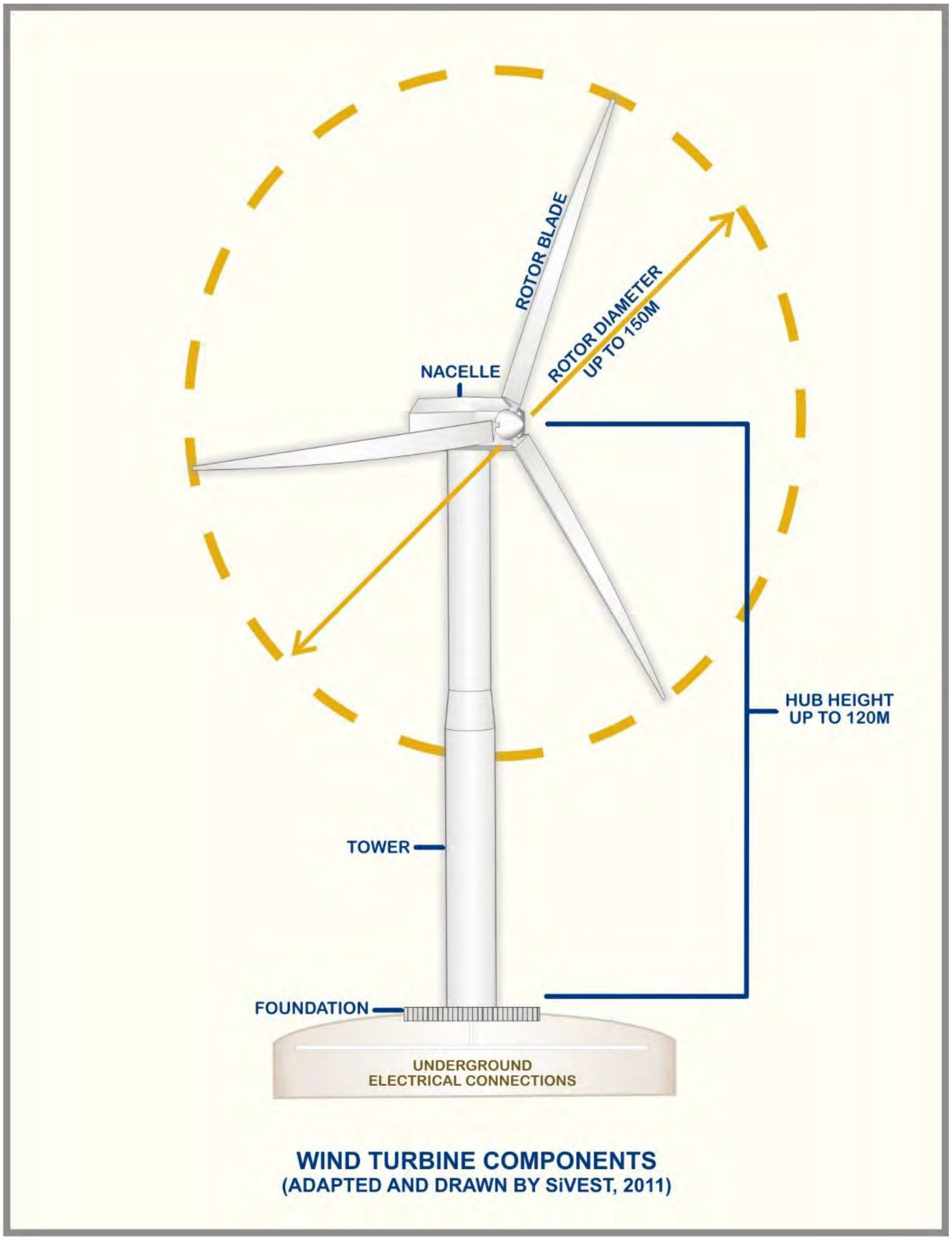

Figure 2: Typical Components of a Wind Turbine

3.2.2 Electrical Connections

The wind turbines will be connected (**Figure 3**) to the proposed onsite Aletta 132kV substation using buried (up to a 1.5m depth) medium voltage cables except where a technical assessment of the proposed design suggests that overhead lines are more appropriate such as over rivers, gullies and long runs. Where overhead power lines are to be constructed, self-supported or H-pole tower types will be used. The height will vary based on the terrain, but will ensure minimum Overhead Line (OHL) clearances with buildings, roads and surrounding infrastructure will be maintained. The dimensions of the specific OHL structure types will depend on electricity safety requirements. The exact location of the towers, the selection of the final OHL structure types and the final designs will comply with the best practise and SANS requirements.

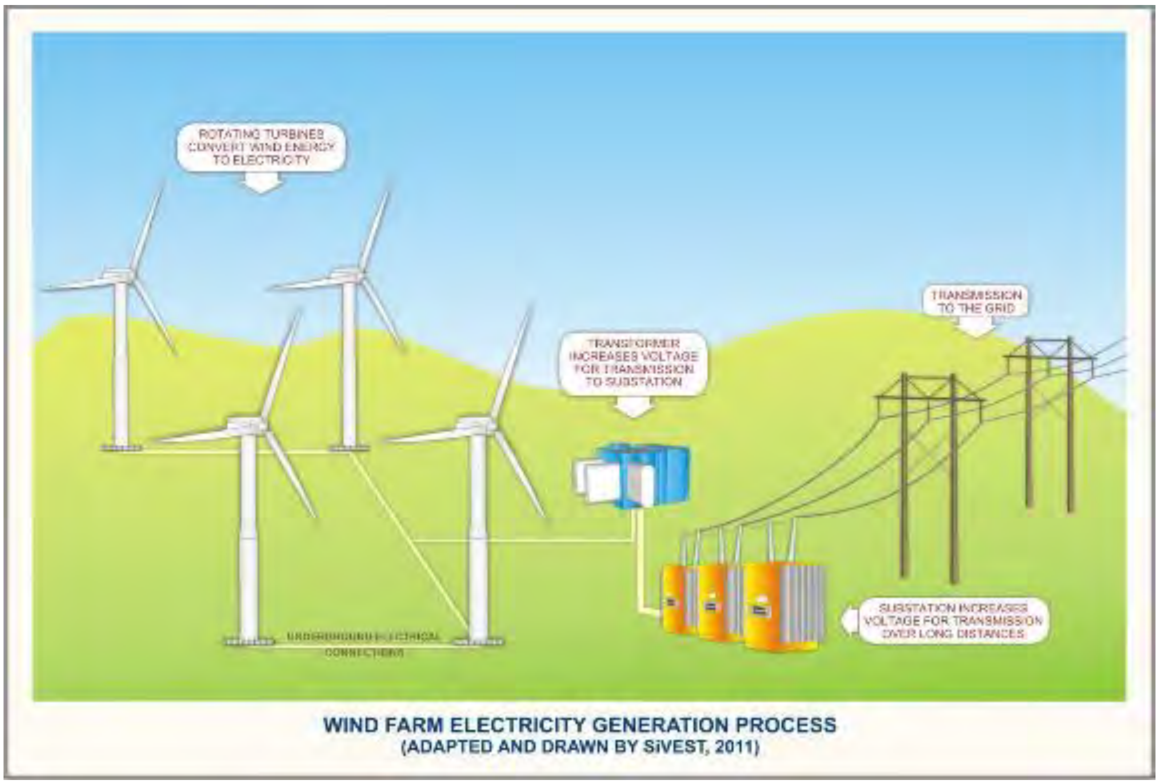

Figure 3: Conceptual Wind Farm Electricity Generation Process showing Electrical Connections

3.2.3 Roads

The internal access roads are proposed to be between 4m to 6m wide and up to 60km each. This will include the net load carrying surface excluding any V drains that might be required. Double width roads will be required in strategic places for vehicle passing.

3.2.4 Temporary Construction Area

The temporary construction lay down area will be approximately 2 400m² (60m x 40m). The lay-down / staging area will be approximately 11 250m² whilst the lay-down area for concrete towers (only if required) will be approximately 40 000m².

3.2.5 Operation and Maintenance Buildings

The operation and maintenance buildings will include an on-site spares storage building, a workshop and operations building with a total combined footprint that will not exceed $300m^2$. The operation and maintenance buildings will be situated in proximity to the wind farm substation due to requirements for power, water and access.

3.2.6 Other Associated Infrastructure

Other infrastructure includes the following:

- Fencing (if required) will be up to 5m where required and will be either mesh or palisade.

3.3 Alternatives

In terms of the NEMA and the EIA Regulations, feasible alternatives are required to be considered during the EIA Process. All identified, feasible alternatives are required to be evaluated in terms of social, biophysical, economic and technical factors. The following alternatives will be considered as part of this Scoping Report:

- Site Layout Alternatives for the proposed Aletta Wind Farm which will consider different wind turbine and building / infrastructure layout alternatives (Impact Assessment Phase);
- The No-go Alternative.

4 METHODOLOGY

4.1 Database Assessment

The first step in the scoping level surface water assessment was to identify any potential surface water resources using various database information sources. This was undertaken using Geographic Information System (GIS) software. The software ArcView developed by ESRI was used. The collection of data source information encompassed (but is not limited to) the National Freshwater Ecosystem Priority Areas **(NFEPA, 2011)** database, the Northern Cape and National Environmental Potential Atlas **(ENPAT, 2000)** database, the South African National Biodiversity Institute (SANBI): C.A.P.E. Fine-Scale Biodiversity Plan **(SANBI, 2007)** database and the SANBI Vegetation Map (**SANBI, 2006**).

4.2 Desktop Assessment

The use of Google Earth™ imagery supplemented the above-mentioned data sources. Desktop delineations of identified surface water resources from the databases were undertaken. The supplementary use of satellite imagery (**Google Earth™**) also allowed for other potentially overlooked surface water resources, not contained within the databases, to be identified and earmarked for ground-truthing in the field work component of the EIA phase, where required.

Utilising these resources, wetlands and any other surface water resources identified were mapped and highlighted for the next (in-field detailed) phase of the assessment.

4.3 Impact Assessment Methodology

Current and potential impacts were identified based on the proposed development and the potential impacts that may result for the pre-construction, construction, operation and decommissioning of the proposed development. The identified potential impacts were evaluated using an impact rating method (**Appendix A**).

5 GENERAL STUDY AREA

The Aletta Wind Farm facility is generally accessible from the R357 which leads from Prieska to Van Wyksvlei. Land uses in the area are mainly vacant land used for grazing purposes, mining, a small airport, rural residential areas and various renewable energy developments. A map indicating the land use of the general area for the proposed development are provided in **Figure 4** below.

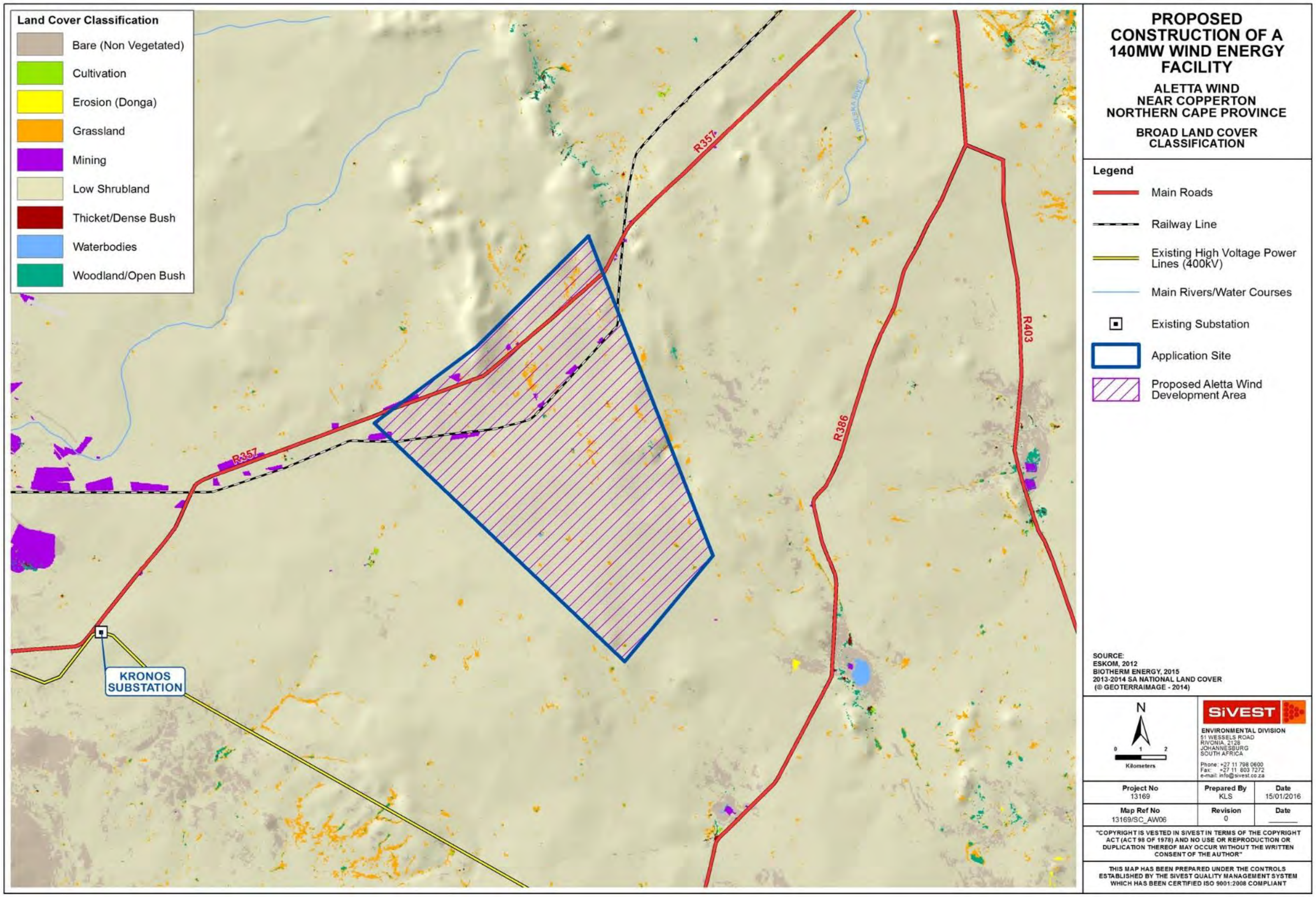

Figure 4: Land Use Map

According to **Mucina and Rutherford (2006)**, the proposed development falls within the Nama-Karoo Biome. Within a biome, smaller groupings referred to as bioregions can be found which provide more specific but general details as to the biophysical characteristics of smaller areas. The development site can be found within the Bushmanland bioregion. Going into even finer detail, vegetation units are classified which contain a set of general but more local biophysical characteristics as opposed to the entire bioregion. The proposed development can therefore be found within the Bushmanland Arid Grassland and Lower Gariep Broken Veld vegetation units (**Figure 5**). The description of Vegetation and Landscape Features, Geology and Soils, Climate and Conservation as contained in **Mucina and Rutherford (2006)** are provided below for this vegetation unit.

5.1 Bushmanland Arid Grassland Vegetation Unit

The vegetation and landscape features of the Bushmanland Aird Grassland unit is characterised by extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semi desert “steppe”. In places low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

A third of the area for this vegetation unit geology and soils is covered by recent (Quaternary) alluvium and calcrete. Superficial deposits of the Kalahari Group are also present in the east. The extensive Palaeozoic diamictites of the Dwyka Group also outcrop in the area as do gneisses and metasediments of Mokolian age. The soils of the most of the area are red-yellow apedal soils, freely drained, with high base status and <300mm deep, with about one fifth of the area deeper than 300mm, typical of Ag, and Ae land types.

Rainfall largely occurs in late summer and early autumn (major peak) and very variable from year to year. Mean Annual Precipitation (MAP) ranges from about 70mm in the west to 200mm in the east. Mean maximum and minimum monthly temperatures in for Kenhardt are 40.6ºC and -3.7ºC for January and July, respectively. Corresponding values for Pofadder are 38.3ºC and -0.6ºC. Frost incidence ranges from around 10 frost days per year in the northwest to about 35 days in the east. Whirl winds (dust devils) are common on hot summer days.

The conservation status of the vegetation unit is described as least threatened (Target 21%). Only small patches are statutorily conserved in Augrabies Falls National Park and Goegab Nature Reserve. Very little of the area has been transformed. Erosion is very low (60%) and low (33%).

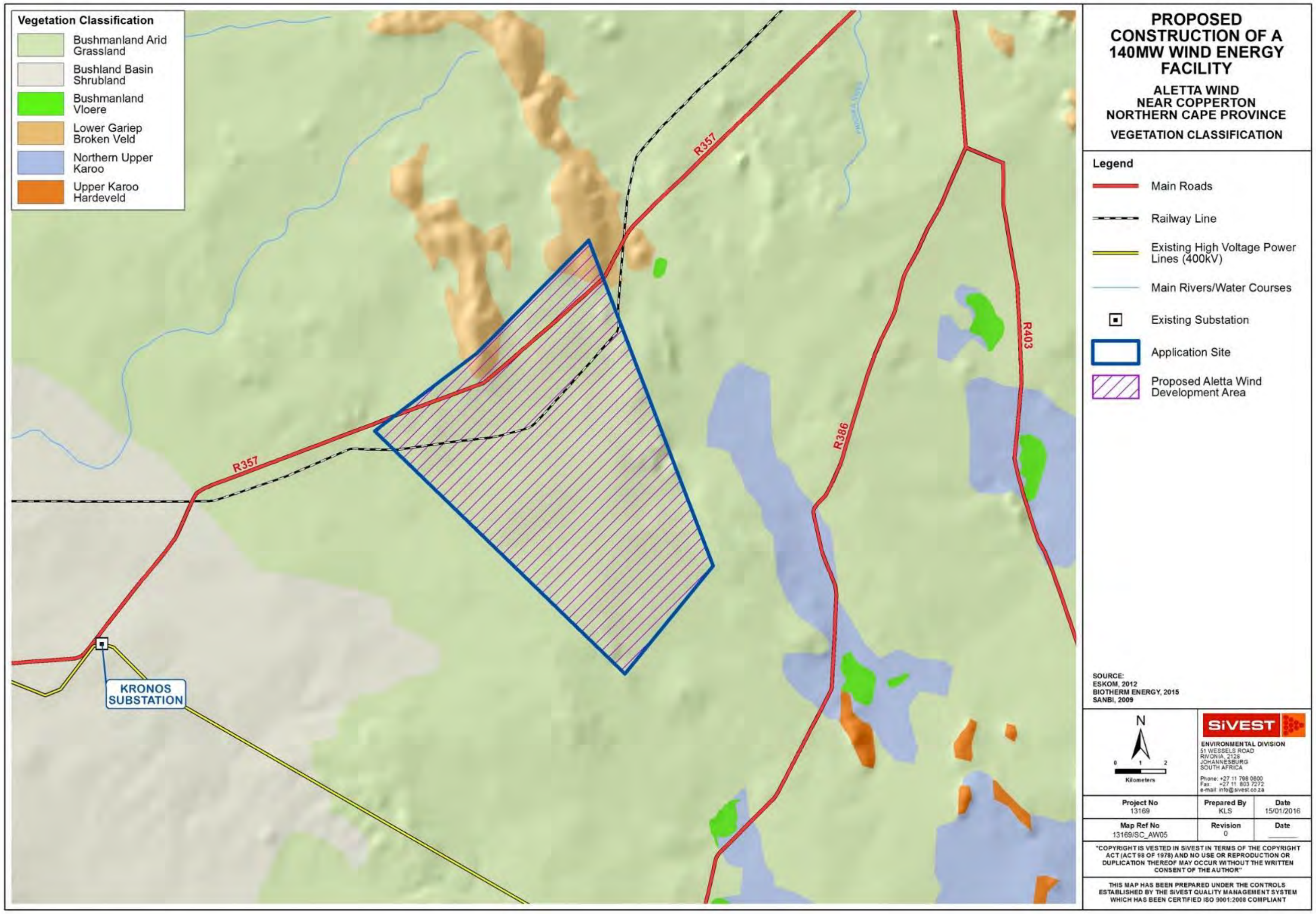

Figure 5: Vegetation Unit Map

5.2 Lower Gariep Broken Veld

The vegetation and landscape features of the Lower Gariep Broken Veld are characterised hills and low mountains, slightly irregular plains but some rugged terrain with sparse vegetation dominated by shrubs and dwarf shrubs, with annuals conspicuous, especially in spring, and perennial grasses and herbs. Groups of widely scattered low trees such as *Aloe dichotoma* var. *dichotoma* and *Acacia melifera* subsp. *detinens* occur on slopes of koppies and on sandy soils of foot slopes respectively.

The geology and soils have a complicate geology: banded iron formation and amphibolites of the Asbestos Hills Subgroup are Vaalian and carbonates and cherts the Campbell Group are of the same Era. Metamorphic rocks of the Mokolian Erathem include quartzites and gneisses of the Korannaland Supergroup as well as the Riemvasmaak gneiss. Metamorphosed clastic sediments of the Uitdraai Formation are also Mokolian. The remaining half of the area is composed of many other srtatigraphies, metamorphosed sediments and outcrops of the ultrametamorphic rocks of the Namaqualand Metamorphic Complex. The soils are shallow and skeletal (dominant soil forms are Mispah and Glenrosa), typical mainly of Ib and Ic land types, and to a lesser extent also of Fb land type.

Mean Annual Precipitation (MAP) ranges from about 70mm in the west to 240mm in the east. Mean maximum and minimum monthly temperatures for Kakamas are 41.3°C and -2°C for January and July, respectively. Corresponding values for Prieska (near the eastern extremity) are 39.7ºC and -2ºC. Frost incidence varies from less than 10 days of frost per annum in the west to around 30 days in the east.

The conservation status of the vegetation unit is described as least threatened (Target 21%). Statutorily conserved in Augrabies Falls National Park (4%). Only a very small part is transformed. Erosion is low (58%), very low (27%) and moderate (14%).

6 FINDINGS OF ASSESSMENT

6.1 Database Identified Surface Water Resource Occurrence

Database identified surface water resources occurring directly within the proposed Aletta Wind Farm site are provided in **Figure 6** below. In terms of the National **ENPAT (2000)** database, the proposed development can be found within the Lower Orange Water Management Area. Moreover, the proposed development is within the Orange Primary Catchment. At a finer level of detail, the Aletta Wind Farm site traverses two quaternary catchments including D54D and D62H. The north east boundary of the proposed development site can be found along the boundary of quaternary catchment D72A.

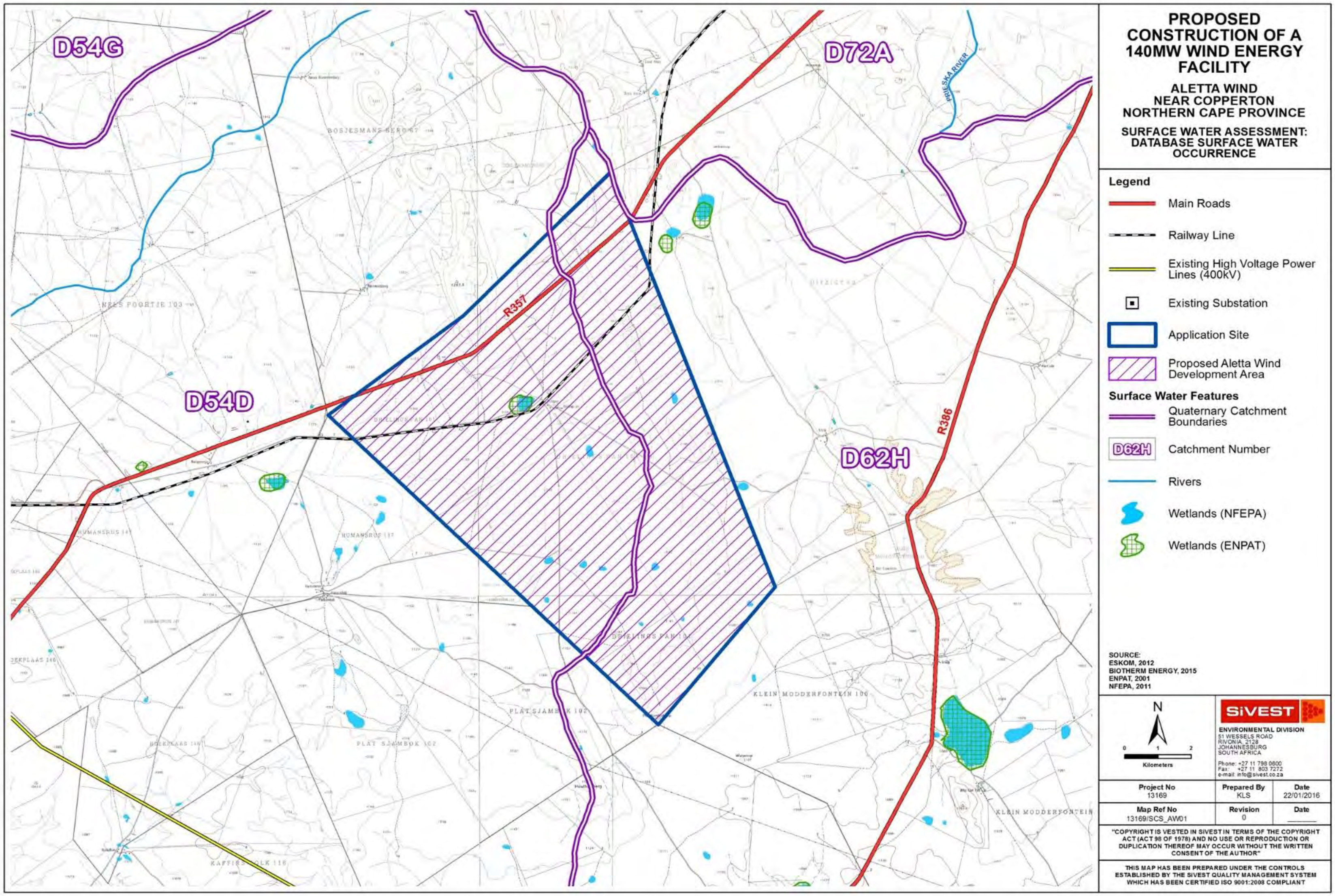

Figure 6: Database Surface Water Resources Occurrence Map

6.1.1 *Aletta Wind Farm*

Of the surface water resources identifiable, two non-perennial watercourses can be found on the proposed development site according to the **SANBI (2007)** database. No other watercourses were identified from the **NFEPA (2011)** database.

Wetlands were identifiable from the **SANBI (2007)** database and **NFEPA (2011)** database. The **SANBI (2007)** database identifies only one pan wetland, whereas the **NFEPA (2011)** database identifies eleven depression wetlands. No other surface water resources were identifiable from the available databases.

6.2 Desktop Surface Water Resource Occurrence in the Study Area

Utilising the database findings above, Google™ satellite imagery overlaid with 1:50 000 topographical images were consulted to refine/confirm surface water resources that were identified as well as to identify any possible additional surface water resources not contained in the databases. The findings for the proposed development site are shown in **Figure 7** and elaborated in the sections below.

6.2.1 *Aletta Wind Farm*

From a desktop perspective, ten watercourses (drainage lines) were delineated at a desktop level. Only one of the corresponding database identified watercourses correlate with the desktop delineated watercourses, the other could not be identified and was therefore excluded. However, a number of other watercourses were identified and delineated accordingly at a desktop level. Due to discrepancies, these findings should therefore be reconciled following groundtruthing and delineation in the field.

In terms of wetlands, twenty six depression wetlands and one man-made impoundment were identified and delineated at a desktop level. All database wetlands correspond with the desktop delineated wetlands. Additional wetlands were however identified and delineated accordingly. All wetlands identified at a desktop level were confirmed as depression wetlands with the exception of the man-made impmoundment, as identified in the databases.

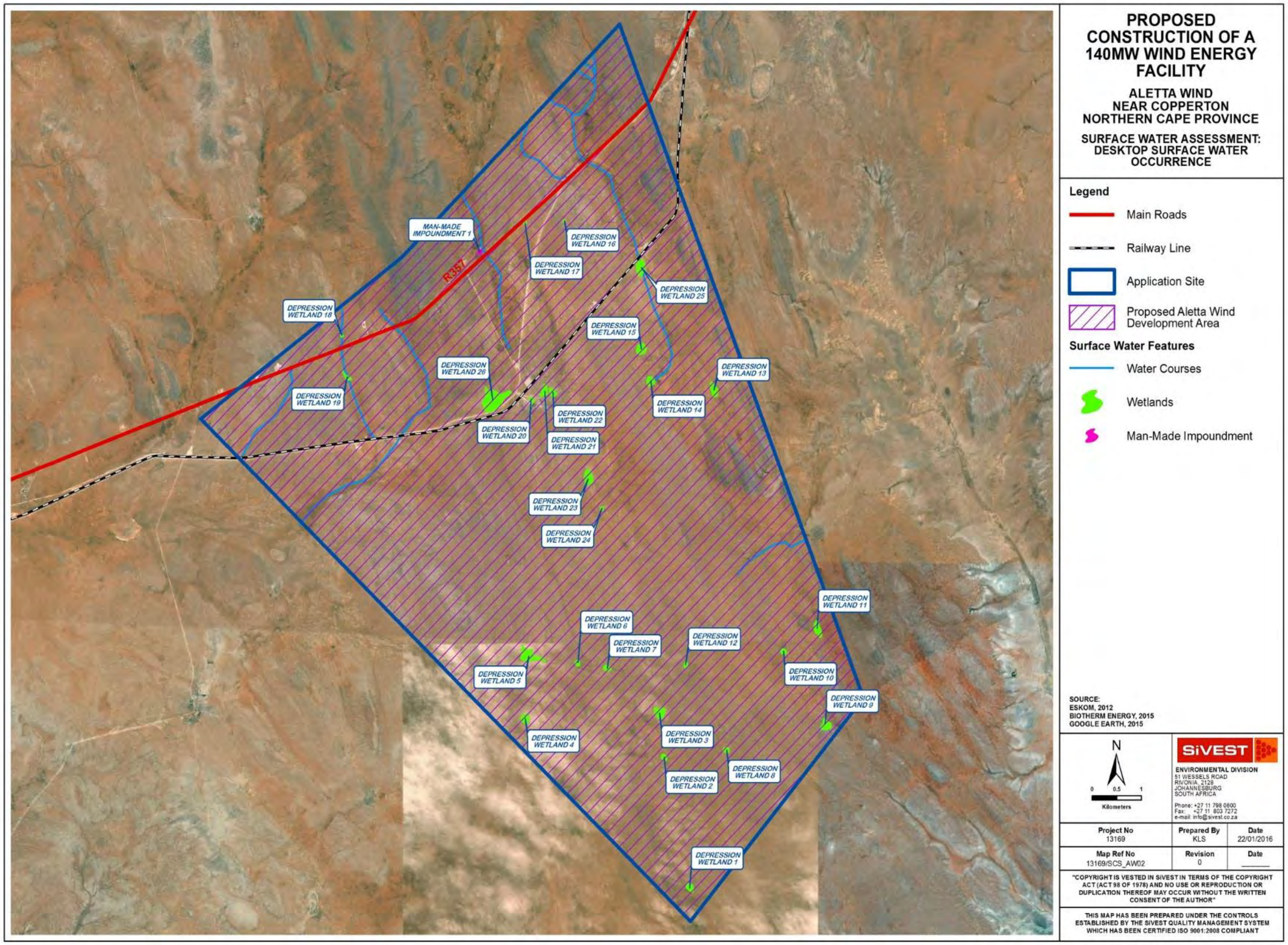

Figure 7: Desktop Surface Water Resources Occurrence Map

7 NATURE OF THE POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED WIND FARM

From a surface water perspective, there are a number of potential impacts that may result from the proposed development of the wind farm. The type of impacts varies between potential impacts associated with the pre-construction phase, construction phase and the operation phase of the proposed development. Each potential impact is scoped and elaborated on for the respective phases of the proposed development.

7.1 Pre-Construction Phase Potential Impacts

7.1.1 Impacts associated with the Construction Lay-down Area

A construction lay-down area is likely to be required for the proposed development. The location of the construction lay-down area will be important as placing this area in a wetland or any other surface water resource is likely to result in direct negative physical impacts. Direct negative impacts can include vegetation clearing and degradation, and soil compaction impacts due to temporary structures and vehicle movement. Impacts related to worker ingress and the degradation of wetlands or any other surface water resource may similarly result. Potential contamination and pollution impacts from stored oils, fuels, and other hazardous substances or materials are also a possibility. Finally, where site clearing may be required in the wetland or any other surface water resource in order for the lay-down area to be established, this will result in the clearance/removal of vegetation at the surface leaving the exposed soils of the wetland(s) or surface water resource vulnerable to erosion and sedimentation impacts. A summary of the predicted impacts and cumulative effects is provided in **Table 2** below.

Table 2. Impacts associated with the Construction Lay-down Area directly in Surface Water Resources

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Impacts associated with the construction lay-down area directly in surface water resources
Extent	*Site*
Probability	*Possible*
Reversibility	*Partly reversible*
Irreplaceable loss of resources	*Marginal loss of resources*
Duration	*Medium term*
Cumulative effect	*Low cumulative Impact*
Intensity/magnitude	*Medium*

Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the potential impact can be reduced greatly.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	2	1
Intensity/magnitude	2	1
Significance rating	- 22 (low negative)	- 6 (low negative)
Mitigation measures	**Location of the Lay-down Area** – The location of the lay-down area must not be within 50m of any of the identified surface water resources. Additionally, materials and machinery must be kept away from surface water resources as far as practically possible. **Preventing Fire Risks** – Operational fire extinguishers are to be available in the case of a fire emergency. Given the dry seasons that the study site experiences, it is recommended that a fire management and emergency plan compiled by a suitably qualified health and safety officer be compiled and implemented for the proposed development.	

7.2 Construction Phase Potential Impacts

7.2.1 Vehicle and Machinery Degradation Impacts

Construction vehicles (heavy and light) are likely to require access to the proposed development. Potential negative impacts can include the need to travel into or through surface water resources, thereby resulting in physical degradation. Moreover, leaks or spills of oils, fluids and/or fuels from vehicles and machinery in general or during re-fuelling or servicing in the surface water resources are a possibility. Should any leakage or spillage occur in and/or near the surface water resources, potential soil/water contamination can result. Fuels and oils also pose a fire risk not only to the surface water resources, but also neighbouring areas.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 3** below.

Table 3. Impact Rating for Construction Vehicle and Machinery Degradation Impacts to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Vehicle and machinery degradation to surface water resources	
Extent	*Site*	
Probability	*Probable*	
Reversibility	*Partly reversible*	
Irreplaceable loss of resources	*Marginal loss of resources*	
Duration	*Medium term*	
Cumulative effect	*Medium cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be reduced.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	- 26 (low negative)	- 6 (low negative)
Mitigation measures	**Preventing Physical Degradation of Surface Water Resources** – Surface water resources are to be designated as “highly sensitive areas”. Vehicle access is not to be allowed in the highly sensitive areas. Internal access roads are not to be routed in any surface water resources. Should this be required, environmental authorisation and a water use license will be required before construction takes place and all mitigation measures are to be implemented accordingly.	

	Limiting Damage to Surface Water Resources – Ideally, to minimise any impact to surface water resources, the proposed development (including buildings, wind turbines and all associated infrastructure) should seek to avoid all surface water resources as far as possible. Where this is not possible a single access route or "Right of Way" (RoW) is to be established through or in the desired construction area in the surface water resource(s). The environmentally authorized and license permitted construction area is to be demarcated and made visible. The establishment of the RoW likewise must be demarcated and made visible. The width of the RoW must be limited to the width of the vehicles required to enter the surface water resource (no more than a 3m width). An area around the locations of the proposed development buildings, wind turbines and any other associated infrastructure will be required in order for construction vehicles and machinery to operate/maneuver, only where required. This too must be limited to the smallest possible area and made visible by means of demarcation. Construction workers are only allowed in the designated construction areas of the proposed development and not into the surrounding surface water resources. Highly sensitive areas are to be clearly demarcated prior to the commencement of construction and no access beyond these areas is to be allowed unless in RoW areas. **Preventing Soil Contamination** – No vehicles are to be allowed in the highly sensitive areas unless authorised. Should vehicles be authorised, all vehicles and machinery are to be checked for oil, fuel or any other fluid leaks before entering the required construction areas. Should there be any oil, fuel or any other fluid leaks, vehicles are not to be allowed into surface water resources. All vehicles and machinery must be regularly serviced and maintained before being allowed to

	enter the construction areas. No fuelling, re-fuelling, vehicle and machinery servicing or maintenance is to take place in the highly sensitive areas. The study site is to contain sufficient spill contingency measures throughout the construction process. These include, but are not limited to, oil spill kits to be available, fire extinguishers, fuel, oil or hazardous substances storage areas must be bunded to prevent oil or fuel contamination of the ground and/or nearby surface water resources.

7.2.2 Human Degradation of Flora and Fauna associated with Surface Water Resources

The possibility of human degradation to the surface water resources is likely to occur during the construction phase, since construction activities will take place in close proximity to surface water resources. Human degradation can take the form of physical / direct degradation such as lighting fires (purposefully or accidentally) in or near to surface water resources. Usage of the surface water resources for sanitation purposes may take place resulting in pollution of the surface water resources. The surface water resources may also be utilised as a source of water for domestic use, building and general cleaning purposes.

Fauna and avi-fauna associated with surface water resources are often hunted, trapped, killed or eaten. This impact must be prevented. Finally, flora associated with surface water resources may need to be cleared or removed for building storage purposes which can result in a loss of resources.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 4** below.

Table 4. Impact Rating for Human Degradation of Flora and Fauna associated with Surface Water Resources

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Human degradation to fauna and flora associated with surface water resources
Extent	*Site*
Probability	*Probable*
Reversibility	*Completely reversible*
Irreplaceable loss of resources	*Marginal loss of resources*
Duration	*Short term*

Cumulative effect	*Low cumulative impact*	
Intensity/magnitude	*Low*	
Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	2	1
Intensity/magnitude	1	1
Significance rating	- 10 (low negative)	- 6 (low negative)
Mitigation measures	**Minimising Human Physical Degradation of Sensitive Areas** – Construction workers are only allowed in designated construction and RoW areas. The highly sensitive areas are to be clearly demarcated no access into these areas are to be allowed unless authorised. No animals on the construction site or surrounding areas are to be hunted, captured, trapped, removed, injured, killed or eaten. Should any party be found guilty of such an offence, stringent penalties should be imposed. The appointed Environmental Control Officer is to be contacted should removal of any fauna be required during the construction phase. No "long drop" toilets are allowed on the study site. Suitable temporary chemical sanitation facilities are to be provided. Temporary chemical sanitation facilities must be placed at least 100 meters from any surface water resource(s) where required. Temporary chemical sanitation facilities must be placed over a bunded or a sealed surface area and adequately maintained to prevent pollution impacts. No water is to be extracted unless a water use license is granted for specific quantities for a specific water resource.	

	No hazardous or building materials are to be stored or brought into the highly sensitive areas. Should a designated storage area be required, the storage area must be placed at the furthest location from the highly sensitive areas. Appropriate safety measures as stipulated above must be implemented. No cement mixing is to take place in a surface water resource. In general, any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground. Importantly, no mixing of cement directly on the surface is allowed in the highly sensitive areas.

7.2.3 Degradation and Removal of Soils and Vegetation in Surface Water Resources

It may be required that wind turbines, associated buildings and infrastructure are to be located within the identified surface water resources. As a result, foundations and hard stand areas will need to be laid for the wind turbines. Additionally, foundations will need to be established for the various buildings, structures and infrastructure. Where the placement of the foundations and hard stand areas extend into the surface water resource areas, the excavation of potential soils are likely to affect the functionality of these hydrological systems. Functionality may be affected in terms of hydrogeomorphic functionality. Moreover, the implementation of the foundations will result in a relatively permanent structure, meaning that the area occupied by the foundation will ultimately result in a degree of permanent habitat and soil loss.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 5** below.

Table 5. Impact Rating for Degradation and Removal of Vegetation and Soils associated with Surface Water Resources

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Degradation and removal of soils and vegetation associated with surface water resources
Extent	*Site*
Probability	*Possible*
Reversibility	*Barely reversible*
Irreplaceable loss of resources	*Marginal loss of resources*

Duration	*Long term*	
Cumulative effect	*Medium cumulative Impact*	
Intensity/magnitude	*Medium*	
Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	3	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	3	1
Significance rating	- 42 (low negative)	- 6 (low negative)
Mitigation measures	**Strategic Positioning of Wind Turbines, Buildings and other Infrastructure** – Preferably all wind turbines, buildings and infrastructure should be placed at least 50m from any surface water resource as far as practically possible. This will significantly reduce the potential impact on surface water resources. Where this is not possible, more intense mitigation measures will be required as stipulated below. **Obtaining Relevant Authorisations and Licenses** – Before any construction or removal of soils and vegetation in any delineated surface water resources is undertaken, the relevant water use license and environmental authorisation is to be obtained and conditions adhered to. **Limiting Damage to Surface Water Resources** – Construction must be limited to the authorized RoW areas where applicable. **Limiting Removal of Excavated Soils** – Should the necessary authorisations (water use license, environmental authorisation etc.) be obtained for the proposed development to be placed in surface water resources, excavated topsoils should be stockpiled	

	separately from subsoils so that it can be replaced in the correct order for rehabilitation purposes post-construction. Soils removed from surface water resources must only be removed if absolutely required. Furthermore, any removed soils and vegetation that are not required should be taken to a registered landfill site that has sufficient capacity to assimilate the spoil. The topsoil is to be used for rehabilitation purposes and should not be removed unless there is surplus that cannot be utilised. It is important that when the soils are re-instated, the subsoils are to be backfilled first followed by the topsoil. The topsoil contains the natural seedbank from which the affected surface water resources or the associated buffer zone can naturally rehabilitate. Where the soils are excavated from the sensitive areas, it is preferable for them to be stockpiled adjacent to the excavation pit to limit vehicle and any other movement activities around the excavation areas. **Preventing Pollution Impacts** – Any cement mixing should take place over a bin lined (impermeable) surface or alternatively in the load bin of a vehicle to prevent the mixing of cement with the ground of the surface water resource. Importantly, no mixing of cement directly on the surface is allowed in the construction and RoW areas in surface water resources. **Protection of Stockpiled Soils** – Stockpiled soils will need to be protected from wind and water erosion. Stockpiled soils are not to exceed a 3m height and are to be bunded by suitable materials. Stacked bricks surrounding the stockpiled soils can be adopted. Alternatively, wooden planks pegged around the stockpiled soils can be used. **Rehabilitation of RoW Areas** – Ideally, the affected RoW zones in the sensitive areas must be re-instated with the soils removed from the surface water

	resource(s), and the affected areas must be levelled, or appropriately sloped and scarified to loosen the soil and allow seeds contained in the natural seed bank to re-establish. However, given the aridity of the study area, it is likely that vegetation recovery will be slow. Rehabilitation areas will need to be monitored for erosion until vegetation can re-establish where prevalent. If affected areas are dry and no vegetation is present, the soil is to be re-instated and sloped.

7.2.4 Increased Run-off, Erosion and Sedimentation Impacts

Vegetation clearing will need to take place for the construction process. Excessive or complete vegetation clearance in the highly sensitive and nearby surrounding areas is likely to result in exposing the soil, leaving the ground susceptible to wind and water erosion particularly during and after rainfall events. Due to the climate of the study area (generally arid with sudden sporadic rainfall) general soil erosion, as a consequence of the proposed development, is a distinct possibility. A further impact due to erosion and storm water run-off impacts is increased sedimentation to surface water resources. Deposited sediments can smother vegetation and change flow paths and dynamics making affected areas susceptible to alien plant invasion leading to further degradation.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 6** below.

Table 6. Impact Rating for Increased Storm Water Run-off, Erosion and Sedimentation Impacts

IMPACT TABLE	
Environmental Parameter	Surface water resources
Issue/Impact/Environmental Effect/Nature	Increased storm water run-off, erosion and increased sedimentation impacting on surface water resources
Extent	*Site*
Probability	*Probable*
Reversibility	*Partly reversible*
Irreplaceable loss of resources	*Marginal loss of resources*
Duration	*Medium term*
Cumulative effect	*Medium cumulative impact*
Intensity/magnitude	*Medium*
Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be further reduced.*

	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	2	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	- 26 (low negative)	- 6 (low negative)
Mitigation measures	**Preventing Increased Run-off and Sedimentation Impacts** – Vegetation clearing should take place in a phased manner, only clearing areas that will be constructed on immediately. Vegetation clearing must not take place in areas where construction will only take place in the distant future. An appropriate storm water management plan formulated by a suitably qualified professional must accompany the proposed development to deal with increased run-off in the designated construction areas. In general, adequate structures must be put into place (temporary or permanent where necessary in extreme cases) to deal with increased/accelerated run-off and sediment volumes. The use of silt fencing and potentially sandbags or hessian “sausage” nets can be used to prevent erosion in susceptible construction areas. Grass blocks on the perimeter of the wind turbine hard stand areas and building structure footprints can also be used to reduce run-off and onset of erosion. Where required more permanent structures such as attenuation ponds and gabions can be constructed if needs be, however this is unlikely given the study area. All impacted areas are to be adequately sloped to prevent the onset of erosion.	

7.3 Operation Phase Potential Impacts

7.3.1 Vehicle Damage to Surface Water Resources

Vehicle access may be required to construction areas for the wind turbines, structures, buildings and infrastructure (such as roads, cables and power lines) that have been permitted to be constructed in or through surface water resources. It is therefore important that access routes and service roads to wind turbines, structures, buildings and infrastructure are not planned and constructed within surface water resources as far as practically possible. However, where this is required and the relevant environmental authorization and water use license is obtained, access routes and service roads for vehicles in or through surface water resources may be susceptible to soil compaction and consequent erosion impacts. Regular vehicle movement in surface water resources can compact the soil affecting the hydrology of the surface water resources. Similarly, regular movement from vehicles can flatten the ground surface making it a preferential flow path for storm water and thereby becoming susceptible to accelerated run-off which may result in progressive erosion. Compaction from vehicles can also create incisions which may induce donga erosion over time.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 7** below.

Table 7. Impact of Vehicle Damage to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Vehicle damage to surface water resources	
Extent	*Local*	
Probability	*Possible*	
Reversibility	*Partly reversible*	
Irreplaceable loss of resources	*Marginal loss of resources*	
Duration	*Long term*	
Cumulative effect	*Medium cumulative impact*	
Intensity/magnitude	*High*	
Significance Rating	*Pre-mitigation significance rating is medium and negative. With appropriate mitigation measures, the impact can be reduced to a low negative impact.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Probability	2	1
Reversibility	2	1

Irreplaceable loss	2	1
Duration	3	3
Cumulative effect	3	1
Intensity/magnitude	3	1
Significance rating	- 42 (medium negative)	- 8 (low negative)
Mitigation measures	**Minimising Vehicle Damage to the Surface Water Resources** – Potential impacts can be avoided by the planning and routing of access / service roads outside of and away from surface water resources. Where access through surface water resources are unavoidable and are absolutely required, it is recommended that any road plan and associated structures (such as stormwater flow pipes, culverts, culvert bridges etc.) be submitted to the relevant environmental and water departments for approval prior to construction. Access and services roads authorised in sensitive areas will have to be regularly monitored and checked for erosion. Monitoring should be conducted once every two months. Moreover, after short or long periods of heavy rainfall or after long periods of sustained rainfall the roads will need to be checked for erosion. Rehabilitation measures will need to be employed should erosion be identified. Where erosion begins to take place, this must be dealt with immediately to prevent significant erosion damage to the surface water resources. Should large scale erosion occur, a rehabilitation plan will be required. Input, reporting and recommendations from a suitably qualified wetland/surface water specialist must be obtained in this respect should this be required.	

7.3.2 Stormwater Run-off Impacts to Surface Water Resources

The impact of stormwater run-off is primarily related to the types of structures and surfaces that will need to be established for the proposed development. Hard impermeable surfaces and foundations are to be laid for wind turbines, buildings and associated infrastructure. Additionally, where regular movement from vehicles flatten the ground surface making it a preferential flow path for storm water, sediment transportation from hardened gravel surfaces via run-off for access and service roads can result in increased sedimentation. In general, flat and hard surfaces aid with the acceleration and generation of run-off which can impact on nearby surface water resources through the onset of erosion due to increased run-off, as well as through the generation of increased sedimentation.

Assessment of the above potential negative impacts and mitigation measures thereto are provided in **Table 8** below.

Table 8. Storm-water Run-off Impacts to Surface Water Resources

IMPACT TABLE		
Environmental Parameter	Surface water resources	
Issue/Impact/Environmental Effect/Nature	Impermeable and hardened surfaces creating accelerated run-off, consequent erosion and sedimentation	
Extent	Site	
Probability	Probable	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	*Pre-mitigation significance rating is low and negative. With appropriate mitigation measures, the impact can be reduced.*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	2	2
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	-28 (low negative)	-11 (low negative)

Mitigation measures	Any hardstand area or building within 50m proximity to a surface water resource must have energy dissipating structures in an appropriate location to prevent increased run-off entering adjacent areas or surface water resources. This can be in the form of hard concrete structures or soft engineering structures (such as grass blocks for example). Alternatively, a suitable operational storm water management design or plan can be compiled and implemented that accounts for the use of appropriate alternative structures or devices that will prevent increased run-off and sediment entering adjacent areas or surface water resources.

7.4 Decommissioning Phase Potential Impacts

7.4.1 Decommissioning Impacts

Should the proposed development need to be decommissioned, the same impacts as identified for the construction phase of the proposed development can be anticipated. Similar impacts are therefore expected to occur and the stipulated mitigation measures where relevant must be employed as appropriate to minimise impacts.

8 SPECIALIST RECOMMENDATIONS

A detailed field assessment is required to verify, groundtruth and accurately delineate desktop identified surface water resources. Surface water resources will need to be remapped and reclassified where applicable. Alternatively, where surface water resources are not verified in the field, these will need to be removed from the maps.

The impact assessment will need to be revisited to determine whether potential impacts and related mitigation measures as stipulated in this report are relevant and applicable, once wind turbine and building layout options become available.

Lastly, mitigation measures for potential wind turbine collision of avi-fauna especially around surface water resources as advised by the avi-fauna specialist must be adhered to, as these are not provided in this assessment.

9 CONCLUSION

SiVEST has been appointed by BioTherm Energy (Pty) Ltd. to undertake an Environmental Impact Assessment (EIA) and Environmental management Programme (EMPr) for the proposed construction of the Aletta Wind Farm, near Copperton in the Northern Cape Province. As part of the EIA study, the need to undertake a surface water impact assessment was identified. A scoping–level surface water assessment was conducted to identify all potential surface water resources at a database and desktop level.

The scoping level surface water study incorporated GIS database information and a desktop (Google™ satellite imagery overlaid upon 1:50 000 topographical images) assessment of the proposed development site. Database and desktop findings were scrutinised to determine the number of surface water resources for the proposed development. Findings were consolidated in the desktop level assessment using information initially obtained via the database assessment. It was determined that the following surface water resources were identified on the proposed development site:

- Ten watercourses (drainage lines)
- Twenty seven wetlands: Twenty six depression wetlands and one man-made impoundment.

It was identified that several potential impacts may affect the surface water resources within the proposed development site where construction activities encroach or are in close proximity to identified surface water resources. Potential negative impacts to surface water resources that may be associated with the proposed development were scoped and discussed. The impacts for each phase of the proposed development are summarised as follows:

PRE-CONSTRUCTION PHASE		
	Pre-mitigation Rating	**Post-mitigation Rating**
Construction Lay-down Area	-22 (low negative)	-6 (low negative)
CONSTRUCTION PHASE		
	Pre-mitigation Rating	**Post-mitigation Rating**
Vehicle and Machinery Degradation Impacts	-26 (low negative)	-6 (low negative)
Human Degradation of Flora and Fauna associated with Surface Water Resources	-10 (low negative)	-6 (low negative)
Degradation and Removal of Soils and Vegetation in Surface Water Resources	-42 (medium negative)	-6 (low negative)
Increased Run-off, Erosion and Sedimentation Impacts	-26 (low negative)	-6 (low negative)

OPERATION PHASE		
	Pre-mitigation Rating	**Post-mitigation Rating**
Vehicle Damage to Surface Water Resources	-42 (medium negative)	-8 (low negative)
Stormwater Run-off Impacts to Surface Water Resources	**-**28 (low negative)	-11 (low negative)

It is not anticipated that the proposed development will need to be decommissioned. Should this need to take place, the same impacts as identified for the construction phase of the proposed development can be anticipated. Hence, the same impacts are expected to occur and the stipulated mitigation measures where relevant must be employed to minimise impacts.

Finally, specialist recommendations include undertaking a detailed field assessment to groundtruth and accurately delineate desktop identified surface water resources and mapped accordingly. Additionally, the impact assessment will need to be revisited to determine whether potential impacts and related mitigation measures as stipulated in this report are relevant and applicable once wind turbine and building layout options become available. Lastly, mitigation measures for potential wind turbine collision of avi-fauna especially around surface water resources as advised by the avi-fauna specialist must be adhered to, as these are not provided in this assessment.

10 REFERENCES

1. Department of Water Affairs and Forestry (DWAF), 2005: *A practical field procedure for identification and delineation of wetlands and riparian areas* (edition 1). DWAF, Pretoria.
2. Mucina, L & Rutherford, M. C., 2006: The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.
3. Ollis, D.J., Snaddon, C.D., Job, N.M & Mbona, M., 2013: Classification System for Wetlands and other Aquatic Ecosystems in South Africa, User Manual: Inland Systems.

Appendix A:

Impact Rating Methodology

The determination of the effect of an environmental impact on an environmental parameter (in this instance, wetlands) is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global) whereas intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in **Table 9**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is usually assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

In this case, a unique situation is present whereby various scenarios have been posed and evaluated accordingly. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 9. Example of the significance impact rating table

NATURE		
Includes a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).

4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).

4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.** The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

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