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ECC-118-269-REP-15-D

ENVIRONMENTAL MANAGEMENT PLAN

PROPOSED MECHANIZED BUSH THINNING OPERATIONS ON
FARM GAI//KHAISA NO. 159
OTJOZONDJUPA REGION, NAMIBIA

PREPARED FOR
RETORT CHARCOAL PRODUCERS (PTY) LTD

FEBRUARY 2021

TITLE AND APPROVAL PAGE

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ABBREVIATIONS AND DEFINITIONS

LIST OF ABBREVIATIONS

BSCI	Business Social Compliance Initiative
ECC	Environmental Compliance Consultancy
EIA	Environmental Impact Assessment
EMA	Environmental Management Act, 2007
EMP	Environmental Management Plan
FSC	Forest Stewardship Council
ILO	International Labour Organisation
MAWL	Ministry of Agriculture, Water and Land Reform
MEFT	Ministry of Environment Forestry and Tourism
MSDS	Material Safety Data Sheet
NCA	Namibia Charcoal Association
PPE	Personal Protective Equipment
SHE	Safety Health and Environmental

DEFINITIONS

Bush thinning is defined as the removing of selected woody species under the guidance of Forestry permits and management plans. All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes (The FSC National Forest Stewardship Standard for the Republic of Namibia, 2019).

1 INTRODUCTION

1.1 BACKGROUND TO THE PROPOSED PROJECT

Environmental Compliance Consultancy (ECC) has been engaged by the proponent (Retort Charcoal Producers (Pty) Ltd) to apply for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 and its regulations. As part of the application an environmental scoping report and an Environmental Management Plan (EMP) are required to be submitted to the relevant competent authority, the Ministry of Environment, Forestry and Tourism (MEFT). Moreover, the proponent intends to be FSC (Forest Stewardship Council) certified in the future. If the proponent is accepted as a member of the FSC certification body, all applicable requirements of this body must be adhered to. See refer to section 3.5 in the environmental scoping report for more details.

Bush control activities are important to combat bush encroachment and restoring productivity to rangelands. Proposed activities for this project are likely to include mechanised methods done by a rubber wheeled timber logging machine (logger) in-field. Generally, these machines have a relatively low impact on soil structure due to the large high flotation tyres fitted on them as opposed to steel tracks. There have been bush control activities practiced on the farm in the past, therefore the area is not in a pristine condition as it is heavily impacted by past charcoal harvesting activities (Cunningham, 2020). The owner intends to implement bush control activities on an area covering approximately 5027 hectares within Gai//Khaisa no.159 farm. The proponent will produce charcoal and briquettes from the thinned-out biomass.

The productivity of the farm is compromised by the encroachment of invasive bush such as Blackthorn (*Acacia mellifera*), Sickle bush (*Dichrostachys cinerea*), Scented-pod acacia (*Vachellia nilotica*), Purple-pod Terminalia (*Terminalia prunioides*), to name but a few.

Bush encroachment is a common agricultural problem in Namibia. It reduces biodiversity, affects the groundwater table and subsequently the carrying capacity of rangelands. Retort Charcoal Producers intends to thin out invader bush species likely to occur on farm Gai//Khaisa no.159 for the reclamation of rangeland and selling of the processed biomass.

The implementation of bush thinning activities on the project site may be accompanied by impacts which may pose a risk with regards to the environment. Such anticipated risks are assigned mitigation measures and management actions in this EMP.

Through a robust baseline study, a range of potential impacts directed towards environmental receptors have been identified that may arise as a result of the project. Detailed project-related information can be found in the scoping report compiled.

This EMP provides guidelines and a framework to direct the proposed bush control activities on the farm. The identified management measures, if implemented, can mitigate potential negative impacts and enhance potential positive impacts.

The proposed project area is located approximately 30 km south east of the Kombat settlement and 42 km south-west of the Grootfontein town and can be accessed via the D2512 district road that branches from the B8 main road. See Figures 1 & 2.

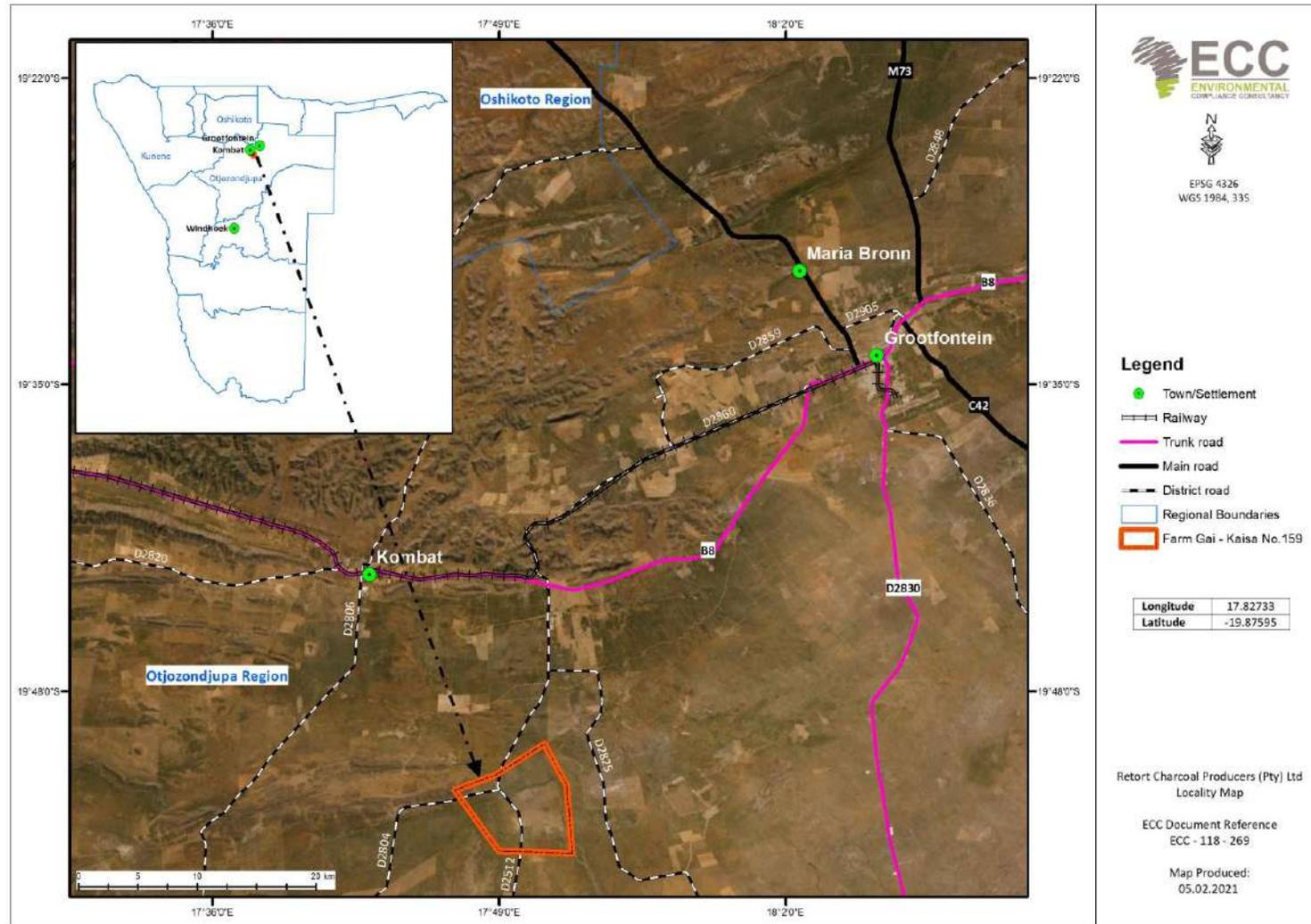


FIGURE 1 - LOCATION OF FARM GAI KAISA NO. 159

FARM NAME & NUMBER	CONTACT PERSON	EMAIL ADDRESS	CELL/TELL NUMBER
Rietfontein Farmers Association	Mrs. Sylvia Düvel	omambond@iway.na	0813646948
Ode - 156	Mr F. Hiho	N/A	N/A
Gunuchas - 162	Mr Tjeripo Hjarunguru	NA	NA
Otavi Farmers' Association	Christine Stoman (CS the Sec)	stoman@afol.com.na	081 244 6034

1.2 ENVIRONMENTAL REGULATORY REQUIREMENTS

The Environmental Management Act, No. 7 of 2007 stipulates that an environmental clearance certificate is required to undertake listed activities in terms of the Act and its regulations. The proposed bush control activities on Gai//Khaisa no.159 are classified as a listed activities as set out below:

TABLE 2 - LISTED ACTIVITIES

LISTED ACTIVITY	DESCRIPTION
FORESTRY ACTIVITIES	(4) The clearance of forest areas, deforestation, afforestation, timber harvesting or any other related activity that requires authorization in terms of the Forest Act, 2001 (Act No.12 of 2001) or any other law. – Bush thinning of encroached rangeland to support project activities.
HAZARDOUS SUBSTANCE TREATMENT, HANDLING AND STORAGE	(9.1) The manufacturing, storage, handling or processing of a hazardous substance defined in the Hazardous Substance Ordinance, 1974. – The storage of hazardous substances such as diesel (14 000 litres) on site per week.

1.3 MANAGING BUSH ENCROACHMENT

In 2017 the Ministry of Agriculture, Water and Forestry and the Ministry of Environment and Tourism jointly issued a publication to streamline and simplify the legal process authorising people to combat bush encroachment in Namibia (Ministry of Agriculture, Water and Forestry and Ministry of Environment and Tourism, 2017). This is based on the strategic environmental assessment of large-scale bush thinning and value-addition activities in Namibia (SAIEA, 2015) which distinguishes three categories of thresholds for the environmental impact assessment (EIA) process on bush control activities (Figure 3).

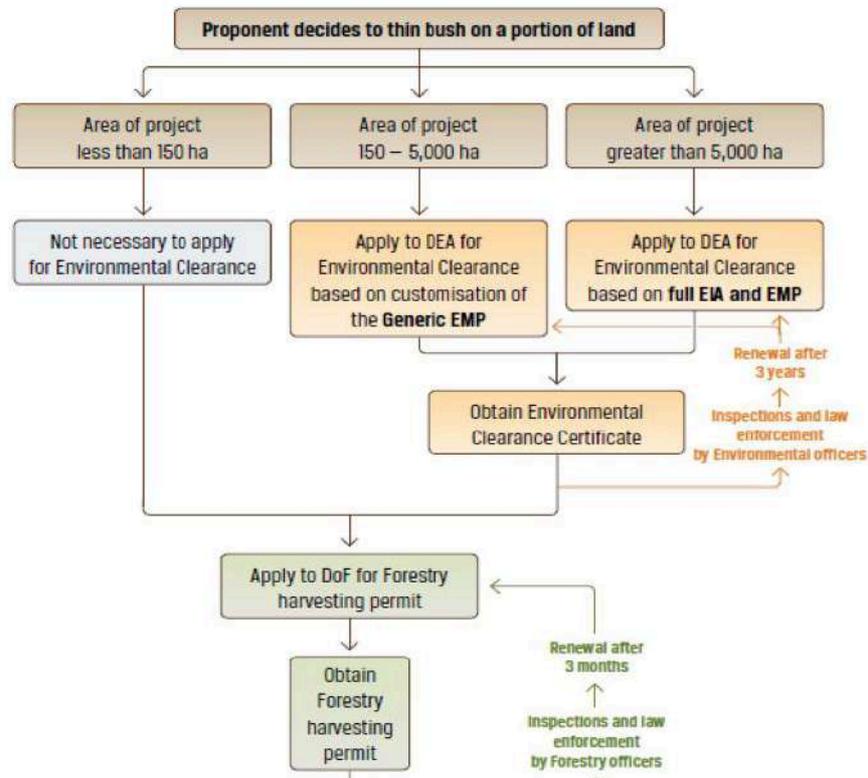


Figure 2: The combined authorisation process by MET & MAWF

FIGURE 3 - BUSH HARVESTING EIA PROCESS (SOURCE: MINISTRY OF AGRICULTURE, WATER AND FORESTRY AND THE MINISTRY OF ENVIRONMENT AND TOURISM, 2017)

Accordingly:

- No environmental clearance is required for areas smaller than 150 hectares where bush control activities are being conducted:
- A Generic Environmental Management Plan (GEMP) is required for an area larger than 150 hectares, but smaller than 5,000 hectares where bush control activities are being conducted;
 - The bush thinning activities under this project falls within this assessment category. Farm Gai//Khaisa no.159 covers an area of 5,027 hectares. However, when considering less dense areas, “no-go” areas and wildlife protection areas, the proposed thinning area is more than likely to happen on an area less than 5000 hectares. This is classified as a medium-sized bush harvesting operation (150 – 5,000 hectares), which thus requires an EMP only as an application for an environmental clearance certificate.
- A full ESIA and Environmental Management Plan (EMP) are required for an area larger than 5,000 hectares where bush control activities are being conducted and therefore not applicable to this project.

The Generic Environmental Management Plan (GEMP) aims to meet the requirements as legislated in section 8 (j) of the regulations of the Environmental Management Act, No. 7 of 2007 and includes information about the identified environmental impacts, the management, mitigation, protection or remedial measures to be undertaken to address the impacts associated with the proposed bush thinning operations. This EMP may be amended as new information is made available in future which may alter the scope of works.

1.4 PURPOSE AND SCOPE OF THIS REPORT

This EMP provides a logical framework, proposed mitigation measures and management strategies for the activities associated with the proposed project, in this way ensuring that the potential environmental and social impacts are mitigated and minimised as far as practically possible and that statutory and other legal obligations are adhered to and fulfilled. Outlined in the EMP are the protocols, procedures and roles and responsibilities to ensure the management arrangements are effectively and appropriately implemented.

This EMP forms an appendix to the environmental scoping report that was compiled for the retort biomass plant and has been based on the findings of that assessment; therefore, the retort biomass plant's environmental scoping report should be referred to for further information on the proposed project, assessment methodology, applicable legislation, and assessment findings.

This EMP is a live document and shall be reviewed at predetermined intervals, or updated when the scope of work alters, or when further data / information can be added. All personnel working on the project will be legally required to comply with the standards set out in this EMP.

1.5 MANAGEMENT OF THIS EMP

The proponent, Retort Charcoal Producers (Pty) Ltd, will hold the environmental clearance certificate for the proposed project and shall be responsible for the implementation and management of this EMP. Prior to the commencement of the project, this EMP shall be reviewed, amended as required and such amendments to be approved for implementation. The implementation and management of this EMP and thus the monitoring of compliance to it shall be undertaken through daily duties and activities as well as monthly inspections.

This EMP shall also be circulated to all contractors and made available on ECC's website.

1.6 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS OF THIS EMP

This EMP does not include measures for compliance with statutory occupational health and safety requirements. This will be provided for in the safety management plan to be developed by the proponent.

Where there is any conflict between the provisions of this EMP and any contractor's obligations under their respective contracts, including statutory requirements (such as licences, project approval conditions, permits, standards, guidelines and relevant laws), the contract and statutory requirements are to take precedence.

The information contained in this EMP has been based on the project description as provided in the retort biomass plant environmental scoping report. Where the project methods alter, this EMP may require updating and potential further assessment undertaken.

1.7 ENVIRONMENTAL CONSULTANCY

Environmental Compliance Consultancy (ECC), a Namibian consultancy with registration number CC/2013/11401, has prepared this document on behalf of the proponent. ECC operates exclusively in the environmental, social, health and safety fields for clients across Southern Africa in the public and private sector. ECC is independent from the proponent and has no vested or financial interest in the proposed project except for fair remuneration of professional services rendered.

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2 PROJECT MANAGEMENT PERSONNEL

The proponent shall provide a project team to oversee and undertake the preparation and operation activities, which shall be composed of the proponent’s personnel and contractors. A nominated role shall be identified to ensure the implementation and management of this EMP throughout the duration of the project, which shall be supported by the proponent.

2.1 ORGANISATIONAL STRUCTURE, ROLES AND RESPONSIBILITIES

The proponent shall be responsible for:

- Ensuring all members of the project team, including contractors, comply with the procedures as set out in this EMP;
- Ensuring that all personnel are provided with sufficient training, supervision, and instruction to fulfil this requirement; and
- Ensuring that any persons allocated specific environmental responsibilities are notified of their appointment and confirm, in writing, that their responsibilities are clearly understood.

Contractors shall be responsible for ensuring and demonstrating that all personnel employed by them are compliant with this EMP, and meet the responsibilities listed above. The key personnel and environmental responsibilities of each role through the project life are presented in Table 1.

TABLE 3 - ROLES AND RESPONSIBILITIES

ROLE	RESPONSIBILITIES & DUTIES
<p>General Manager</p>	<ul style="list-style-type: none"> – Responsible for ensuring compliance with this EMP; – Ensuring employees understand and comply with the requirements of this EMP; – Ensuring that all personnel are provided with enough training, supervision and instruction to fulfil this requirement; – Ensuring compliance with this EMP including overseeing the day-to-day activities during operations, and routine and non-routine maintenance works during operations; – Ensure the environmental policy is communicated to all personnel; – Responsible for providing the required resources (including financial and technical) to complete any required tasks; – Responsible for the management, maintenance and revisions of this EMP; – Maintain a community issues and concerns register and keep records of complaints; – Maintain an up-to-date register(s) of employees who have completed the site induction; – Ensuring that best environmental practice is undertaken throughout the operations in the plant; – Notifying relevant regulatory authorities if serious environmental incidents occur as soon as possible; – Being responsible for all management plans and environmental monitoring; and – Receiving and responding to environment-related complaints received from

ROLE	RESPONSIBILITIES & DUTIES
	the public or other stakeholders.
<p>Foreman (Appointed HSE responsible person)</p>	<p>The proponent should have a foreman who will be responsible for the implementation of the Health, Safety and Environmental requirements of the EMP for the plant. The foreman will be available, as required, throughout the bush thinning operations and is responsible for the following roles:</p> <ul style="list-style-type: none"> - Bearing authority and independence to demand reasonable steps as required to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant activities be ceased immediately should an adverse impact on the environment be likely to occur; - Weekly checklist must be completed by the foreman and findings submitted to the general manager; - Monthly EMP checklists must be completed by the foreman. Findings are to be submitted to the General Manager in a timely manner; - Internal compliance certificates must be completed monthly by the foreman incorporating the checklist' findings. This certificate must be submitted to the general manager; - Provisioning of environmental awareness/management training and inductions; - Ensuring that best environmental practice is undertaken throughout the operations of the plant; and - Timely distribution of any relevant environmental documentation, including revisions to this EMP to all staff. - Responsible for being compliant with and adhering to this EMP at all times; - Ensuring they have undertaken a site induction and are conversant with the requirements of this EMP; and - Reporting of any operations and conditions that deviate from the EMP or any non-compliant issues or accidents to the proponent.
<p>Employees / Contractors as well as visitors where applicable</p>	<p>Any contractors hired during the operation or maintenance activities on the farm shall be compliant with this EMP, and shall be responsible for the following:</p> <ul style="list-style-type: none"> - Undertaking activities in accordance to this EMP as well as relevant policies, procedures, management plans, statutory requirements, and contract requirements; - Implementing appropriate environmental and safety management measures - Reporting environmental issues, including actual or potential environmental incidents and hazards, to the proponent, and; - Ensuring appropriate corrective or remedial action is taken to address all environmental hazards and incidents reported by employees and subcontractors.

2.2 EMPLOYMENT

The proponent and all contractors shall comply with the requirements of the regulations for labour, health and safety and any amendments to these regulations. The following shall be complied with:

- In liaison with local government, community, stakeholders and relevant authorities the proponent shall ensure that local people have access to information about job opportunities and are considered first for contract employment positions;
- The number of job opportunities shall be made known together with the associated skills and qualifications;
- The maximum length of time the job is likely to last for shall be clearly indicated;
- Foreign workers with no proof of permanent legal residence shall not be hired;
- Every effort shall be made to recruit from the pool of unemployed workers living in the local area; and
- Every employee hired must be provided with a valid employment contract stating, the position hired for, the hourly remuneration offered.

3 COMMUNICATION AND TRAINING

It is important that regular communication is maintained with all the stakeholders and that stakeholders are made aware of potential impacts and how to minimise or avoid them. This section sets out the framework for communication and training in relation to the EMP.

3.1 COMMUNICATIONS

They shall communicate any environmental issues to the project team through the following means (as and when required):

- Site induction;
- Internal and external audits and site inspections;
- Toolbox talks, including instruction on incident response procedures; and
- Briefings on key project-specific environmental issues.

This EMP shall be distributed to the project team including any contractors and personnel working on the site to ensure that the environmental requirements are adequately communicated. Key activities and environmentally sensitive operations shall be briefed to workers and contractors prior to commencement.

During operational activities with regards to bush thinning, communications between the management team shall include discussing any complaints received and actions to resolve them, any inspections, audits or non-conformance with this EMP, and any objectives or target achievements.

3.2 ENVIRONMENTAL EMERGENCY AND RESPONSE

The general manager and the Foreman are the primary contact persons in the event of an environmental emergency. The general manager has the authority and independence to request reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse environmental impact be anticipated.

In the event of an incident that requires the emergency services, the following services should be contacted:

TABLE 4 - EMERGENCY CONTACT DETAILS

TOWN	AMBULANCE	POLICE	FIRE BRIGADE
Kombat	+264 (67) 23-1000	+264 (67) 1-0111	+264 (67) 23-1000

For large-scale spills (greater than 200 litres) and other significant environmental incidents, the local fire-fighting services should be contacted as required and the MEFT office informed of the incident (telephone +264 61 284 2111). All correspondence with MEFT should be undertaken by the general manager as guided by the foreman.

3.3 COMPLAINTS HANDLING AND RECORDING

The proponent shall maintain a complaint's register that will detail the name and contact details of the complainant, date and time of the complaint, nature of the complaint, the action is taken to resolve issues, and date of complaint handover. The proponent shall be responsible for nominating the correct personnel to coordinate and resolve the issue.

Any complaints received verbally shall be recorded as per above and the information shall be given to the proponent who is overall responsible for the management of complaints and will provide a written response to the complainant.

The workforce shall be informed about the complaints register, its location and the person responsible, to refer residents or the general public who wish to lodge a complaint. The complainant shall be informed in writing of the results of the investigation and action to be taken to rectify or address the matter(s). Where no action is taken, the reasons why are to be recorded in the register.

The complaints register shall be kept for the plant and will be available for government or public review upon request.

3.4 TRAINING AND AWARENESS

All personnel working on the project shall be competent to perform tasks that have the potential to cause an environmental impact. Competence is defined in terms of appropriate education, training, and experience.

3.4.1 SITE INDUCTION

All personnel involved in the project shall be inducted to the site with a specific environment and social awareness training component. The environment and social awareness training shall ensure that personnel are familiar with the principles of this EMP, the environment and social aspects and impacts associated with their activities, the procedures in place to control these impacts and the consequences of departure from these procedures. The proponent shall ensure a register of completed training is maintained. The site induction should include, but not limited to the following:

- A general site-specific induction that outlines:
 - o What is meant by "environment" and "social";
 - o What are the environmental risks and impacts of this plant;
 - o What can be done to mitigate against such impacts; and
 - o Why the environment needs to be protected and conserved;
- The inductee's role and responsibilities with respect to implementing the EMP;
- The sites environmental rules;
- Details of how to deal with, and who to contact if environmental problems should they occur;
- Basic vegetation clearing principals and species ID sheets;
- Focal themes such as compliance, reporting of accidents and incidents, good housekeeping and standard procedures for waste management;
- The potential consequences of non-compliance with this EMP and relevant statutory requirements; and
- The roles of responsible people for the project.

4 REPORTING, COMPLIANCE AND ENFORCEMENT

4.1 ENVIRONMENTAL INSPECTIONS AND COMPLIANCE MONITORING

4.1.1 DAILY COMPLIANCE MONITORING

A copy of this EMP shall be on site and shall be available upon request. It is the responsibility of the proponent and foreman to ensure this EMP is enforced and that all personnel complies with its provisions throughout their daily roles. Daily, weekly and monthly inspections will be undertaken. Any environmental problems or risks identified shall be notified to the manager and actioned as soon as is reasonably practicable.

4.1.2 MONTHLY COMPLIANCE MONITORING

Monthly inspections shall be undertaken by the general manager to check that the standards and procedures set out in this EMP are being complied with and pollution control measures are in place and working correctly. Any non-conformance shall be recorded, including the following details: a brief description of non-conformance, the reason for the non-conformance, the responsible party, the result (consequence), and the corrective action taken and any necessary follow up measures required.

4.1.3 REPORTING

There shall be a requirement to ensure that any incident or non-compliance, including any environmental issue, failure of equipment or accident, is reported to the manager.

4.2 RELEVANT PERMITS

Although the Water Resources Management Act, No. 11 of 2013 is not enforced, it is best practice to adhere to its stipulations while ensuring compliance with the Water Act, No. 54 of 1956, which is maintained still. Since water is sourced from a nearby existing borehole, a licence to abstract water is required in terms of the Water Act, No. 54 of 1956 and shall operate in accordance with any conditions of the licence.

A French drain system is envisioned for this project. When the layout designs are finalised, the proponent will ensure that all documentation, permits and measures are in place before discharge occurs, including obtaining the relevant effluent discharge permit in terms of the Water Act to be applied for at the Ministry of Agriculture, Water and Land Reform (MAWLR). In future, should the plant be connected to a water system, the responsible party is liable for the reticulation and treatment of sewerage water discharged into the sewerage system.

In order to obtain an effluent wastewater permit, the proponent should have the following information and complete the application:

- Specification of the treatment system (type of technology);
- Description of major activities resulting in effluent generation;
- List of contaminants (analysis of effluent samples);
- Effluent quality;

- Points of discharge;
- Show the present average quantities of incoming water, recycled water, final outflow; and
- Where final effluent discharged.

4.2.1 ADDITIONAL PERMIT REQUIREMENTS

Several forestry related permits must be in place for the project in order to be legally compliant and able to operate the proposed project. A list of such licences is contained in Table 4. The permits listed have conditions (e.g., no aerial application of herbicides, amongst others) attached and must be adhered to strictly.

TABLE 5 - RELEVANT PERMIT REQUIREMENTS

PERMIT AND LICENCES	RELEVANT AUTHORITY	PROJECT BEARING	VALIDITY/DURATION
WATER ABSTRACTION PERMITS	Ministry of Agriculture, Water and Land Reform	An abstraction permit is required for the abstraction of water from a borehole for commercial purposes.	Valid for a five-year period.
BUSH CONTROL LICENCE	Ministry of Environment, Forestry and Tourism	Legally required under Section 22 of the Forestry Act.	Permit dependent
FOREST LICENCE FOR HARVESTING	Ministry of Environment, Forestry and Tourism	A Harvesting Permit is required for any tree cutting and/or harvesting of wood in an area greater than 15 hectares per annum as stated under Section 22 (1), 23 (1), 24 (2&3) and 33 (1&2) of the Forest Act (Act 12 of 2001).	Renewed every 3 months after an inspection of the farm is done by a licencing officer.
CHARCOAL PRODUCTION LICENCE	Ministry of Environment, Forestry and Tourism	Legally required under Section 22 of the Forestry Act.	Permit dependent
FOREST PERMIT FOR TRANSPORTING	Ministry of Environment, Forestry and Tourism	A Transport Permit is required to convey any wood or wood products (e.g., charcoal, and firewood). It is obtainable from any	Valid for 7 days

PERMIT AND LICENCES	RELEVANT AUTHORITY	PROJECT BEARING	VALIDITY/DURATION
		Forestry Office.	
FOREST PERMIT FOR MARKETING	Ministry of Environment, Forestry and Tourism	A permit for marketing of forest produce is required as set out on Form 17 of section 21 of the forest regulations (12) of the Forest Act of 2001	Permit dependent

4.3 NON-COMPLIANCE

Where it has been identified that works are not compliant with this EMP, the proponent shall employ corrective actions so that the works return to being compliant as soon as possible. In instances where the requirements of the EMP are not upheld, a non-conformance and corrective action notice shall be produced. The notice shall be generated during the inspections and the manager shall be responsible for ensuring a corrective action plan is established and implemented to address the identified shortcoming.

A non-compliance event / situation, for example, is considered if:

- There is evidence of a contravention of this EMP and associated indicators or objectives;
- The Foreman or a contractor has failed to comply with corrective or other instructions issued by the manager or qualified authority; or
- The manager or contractor fails to respond to complaints from the public.

Activities shall be stopped in the event of a non-compliance until corrective action(s) has been completed.

4.4 INCIDENT REPORTING

The foreman must ensure that an accident and incident (including minor or near miss) reporting system is maintained so that all applicable statutory requirements are covered. For any serious incident involving a fatality, or permanent disability, the incident scene must be left untouched until witnessed by a representative of the police. This requirement does not preclude immediate first aid being administered and the location being made safe.

The foreman must investigate the cause of all work accidents and significant incidents and must provide the results of the investigation and recommendations on how to prevent a recurrence of such incidents. A formal root-cause investigation process should be followed.

4.4.1 DISCIPLINARY ACTION

This EMP is a legally binding document and non-compliance with it shall result in disciplinary action being taken against the perpetrator(s). Such action may take the form of (but is not limited to):

- Fines / penalties;
- Legal action;
- Monetary penalties imposed by the proponent on the contractor;
- Withdrawal of licence(s); and
- Suspension of work.

The disciplinary action shall be determined according to the nature and extent of the transgression / non-compliance, and penalties are to be weighed against the severity of the incident.

5 ENVIRONMENTAL AND SOCIAL MANAGEMENT

5.1 ENVIRONMENTAL PERFORMANCE MEASUREMENT

This chapter provides a register of environmental risks and issues, which identifies mitigation and monitoring measures, as well as roles responsible. This register will be subject to regular review by the manager and updated when necessary.

The proponent will use this register to undertake monthly inspections to ensure the project is compliant with this EMP.

5.2 OBJECTIVES AND TARGETS

Environmental protection is the responsibility of management and if management is environmentally aware, it motivates all employees and their associated business partners, customers and suppliers to think and act in a more environmentally responsible manner. Environmental objectives and targets have been developed so that activities on farm Gai//Khaisa no.159 can minimise potential impacts on the environment, as far as reasonably practicable.

Environmental objectives for the project are as follows:

- Zero pollution incidents;
- Sustainable resource use (water and energy);
- Application of the waste management hierarchy;
- A safe working environment for employees; and
- Use natural resources effectively and efficiently.

5.3 REGISTER OF ENVIRONMENTAL RISKS AND ISSUES

An environmental review of the proposed project has been completed to identify all the commitments and agreements made within the environmental scoping report. From this, a schedule of environmental commitments and risks has been produced (Table 3), which details deliverables including measures identified for the prevention of pollution or damage to the environment during the project lifetime.

Table 3 provides a register of environmental risks and issues, which identifies mitigation and monitoring measures, as well as the responsible person. This register will be subject to regular review by the proponent and updated whenever necessary. The general manager will use this register to undertake monthly inspections to ensure the project is compliant with this EMP.

TABLE 6 - ENVIRONMENTAL RISKS AND ISSUES, AND MITIGATION AND MONITORING MEASURES

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
Mechanised bush thinning activities	Loss of protected species	<ul style="list-style-type: none"> – Avoid cutting down protected trees (See Appendix A). – Ensure that the Bell Logger operators can identify protected species and inform all contractors/workers regarding the above-mentioned ecological issues prior to harvesting activities and monitor for compliance thereof throughout. – “Spotters” should be used to assist operators in identifying protected species, no go areas and sensitive areas. – Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species. – All staff must be informed in writing about the consequences of breaking EMP and permit conditions. 	Daily	All staff
	Loss of large, dead and evergreen trees	<ul style="list-style-type: none"> – Trees taller than 4 m, or greater than 18 cm diameter at the base, must be retained. (If the vegetation consists entirely of encroachers larger than 4 m, leave 300 – 500 per hectare). – Evergreen trees must be retained. – Some dead trees must be retained. 	Daily	All staff
	Loss of riverine vegetation	<ul style="list-style-type: none"> – No living tree, bush or shrub within 100 m of a drainage line shall be removed. 	Daily	All staff
	Imbalance of ecology due to over-thinning	<ul style="list-style-type: none"> – Do not clear cut the entire area, but follow a mosaic harvesting approach (include dense patches of bush); – Maintain connectivity of habitats, especially linking the sensitive areas (e.g. rocky areas, ephemeral pans and drainage lines); – Seek to create an environment with a matrix of grass, large trees and bush. (The TE-formula includes all sizes and species, including protected species. The outcome after bush control activities should be a park-like landscape, with some bushy ‘islands’. Areas larger than 1 hectare as representative samples of the original habitat should be left as well.) 	Daily	All staff
	Disturbance of sensitive plant habitats	<ul style="list-style-type: none"> – Avoid sensitive areas – avoid harvesting in the rocky areas and ephemeral pan system and drainage lines as indicated in Figure 1; 	Daily	All staff

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
		<ul style="list-style-type: none"> – Avoid harvesting on steep slopes where characteristic species dominate and soils prone to erosion occurs. – Remove all Aloe species (should these be encountered) prior to thinning and relocate elsewhere to a similar habitat on the farm that will not be impacted upon; – Avoid mechanical thinning in areas dominated by <i>Dihrostachys cinerea</i> (sicklebush) as these species are prone to aggressive re-establishment after disturbance. Such areas should the thinned by hand only. 		
	Presence of workforce on the farm can be blamed for stock theft and poaching in the surrounding area	<ul style="list-style-type: none"> – Killing of livestock or wildlife, and setting of snares, is strictly prohibited on the farm. Any person involved in such practices will be dismissed with immediate effect. – No person shall be in possession of a firearm or snare, such items should be confiscated if detected. A warning will be issued to the offender and a repeat offence will lead to dismissal. – All personnel must be informed in writing about the consequences of breaking these rules and ensure that the rules are clear and well understood. – Develop and implement an operation manual or procedures to work on private farms and implement monitoring programmes thereafter – Maintain continuous engagement with residents and neighbours to identify any concerns or issues, and appropriate mitigation and management measures agreed upon; – Ensure appropriate supervision of all activities on the grounds; – Raise awareness and sensitize employees about contentious issues such as stock theft and poaching; and – Accidents and incidents need to be reported to the project manager and recorded in incident register. 	Daily	All staff
	The influx of more people into the area may pose safety and security issues within	<ul style="list-style-type: none"> – Develop an effective safety risk management plan (which should include employee and emergency management procedures) and implement its provisions in conjunction with daily monitoring of grounds movements. – Raise awareness and sensitize employees about contentious issues such as 	Daily	HSE Representative and All staff.

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
	the local community.	trespassing onto private land and its consequences and the safety and security of the local community surrounding the project farm.		
	Loss of livestock or wildlife due to fire incidents	<ul style="list-style-type: none"> - Regular training of staff on fire prevention and management. - Fire management should be carefully planned – no burning during windy conditions, no fire in areas without firebreaks, early notification of neighbours, remove livestock from areas marked for burning, ensure escape routes, etc. - Keep fire-fighting equipment (e.g., beaters, backpack sprays, water carts with pumps, etc.) available. - Implement an early warning system to take care of fires urgently. - Open fires only permitted in designated areas; and - No fire or burning should be left unattended. 	Daily	All staff
	Escape of livestock or wildlife due to damaged fences or gates left open	<ul style="list-style-type: none"> - Ensure that the fences around the farm boundaries are well maintained and not damaged. - Ensure that the farm gates are always kept closed and access controlled; and - The importance of these should be made clear to all staff and ensure that they are informed in writing about the consequences of breaking the rules. 	Daily	All staff
	Air pollution due to dust emissions	<ul style="list-style-type: none"> - Areas that contain sensitive receptors (neighbours and their associated work areas) should be identified via field inspection prior to the bush thinning operations and buffer zones be determined thinning zones and sensitive receptors. - Thinning intensity to be reduced close to sensitive neighbouring land uses. - Vegetation buffers can be kept between thinning activities and sensitive receptors to reduce the potential of windblown dust from open areas, if possible. 	Daily	Foreman

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
	Disturbance of vertebrate fauna and birds	<ul style="list-style-type: none"> – Avoid sensitive areas – avoid harvesting in the rocky areas, ephemeral pan system and drainage lines as indicated in Figure 1; – Nests of large raptors such as eagles and vultures must be identified and avoided by at least 100 m. In an event where such nests are found, the clump of vegetation around them should not be harvested. – Do not harm or disturb slow moving and reside species (e.g., tortoises and snakes). – Survey areas on foot prior to harvesting to collect and remove slow moving reptiles, especially tortoise species, and relocate elsewhere to similar habitat on the farm. – Prevent the killing of perceived dangerous species (e.g., snakes); collection of veld foods (e.g., giant bullfrog, tortoise, monitor lizard); any form of poaching (e.g., setting of snares for birds and ungulates, etc.); – Most birds nests are associated with rainfall therefore avoid harvesting trees with birds’ nests during the breeding season; – Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g., baboon, black-backed jackal, crows, etc. – Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species. 	Daily	All staff
	Excessive sound generating machinery can result in nuisance for workers and neighbours while prolonged exposure to high levels of sound waves	<ul style="list-style-type: none"> – Ensure noise levels and the length of exposure to loud noise are maintained – within International Labour Organisation (ILO) occupational exposure limit levels of 85 dB (warning limit value). For example, workers may be able to hear sounds between 80-89 dB for 4-5 hours per day without trouble according to the WHO. However, sounds of 90dB (danger limit value) and more require exposure to it of not more than half an hour a day. Workers exposed to excessive loud sounds should ensure that they move to a quieter area intermittently to protect their hearing. – Ensure that machines are maintained and serviced on a regular basis; 	Daily	Foreman

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
		<ul style="list-style-type: none"> – Hearing protection (e.g., earplugs, noise-cancelling headphones) should be provided. – Avoid noise-generating activities at night. – Avoid hammering on metal that generates intermittent annoying noise especially at night, and ensure appropriate measures are put in place to rectify noise complaints should they occur. – Scheduling of works to avoid disturbance between the hours of 7:30 am and 5 pm; and – Saturday operational hours should be from 8 am – 12 noon, when near residential areas. – Procedures for receiving complaints from nearby land users or residents to be in place and mitigation measures to be implemented should activities generate excessive noise. 		
	Soil disturbance causing loss of topsoil	<ul style="list-style-type: none"> – Avoid harvesting during the rainy (wet) season as this may cause deep tracks and result in erosion and compaction of soils; – No bush on slopes steeper than 12.5% should be cut (e.g., 1-in-8). – Bush cutting is also not recommended on slopes of 5 – 12.5% (e.g., between 1-in-20 and 1-in-8). – Machinery should always move along the contours, not directly up and down on slopes of 5 – 12.5%. – Should the slopes be significantly encroached, set it aside as part of the 50% of bush-encroached areas per farm that will not be cut in the medium to long term. 	Daily	All staff
	Erosion	<ul style="list-style-type: none"> – Cutting of any living trees, bushes or shrubs within 100 m of a watercourse, pan or spring is prohibited except: – Where bush has encroached into seasonal pans, one may clear the floor of the pan but not around the outside margins. – Remove all invasive alien species on site – e.g., Prosopis spp., etc. This would not only indicate environmental commitment, but actively contribute to a better overall landscape; 	Daily	Employees

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
		<ul style="list-style-type: none"> – Avoid harvesting during the rainy (wet) season as this may cause deep tracks and result in erosion and compaction of soils; – Implement erosion control measures where applicable – e.g., cross drains on slopes, do not make tracks along drainage lines and cross these at a right angle, etc. 		
	Loss of soil fertility	<ul style="list-style-type: none"> – Encroacher species found growing in soil that is potentially susceptible to wind and water erosion should be thinned less vigorously (e.g., sandy soils without structure and thin, shallow soils like leptosols) – All sites should be harvested according to the TE – rainfall formula to reduce the potential of exposing soil to erosion (Appendix D). 	Daily	Employees
	Activities involving mechanical equipment may cause injury or even death to personnel	<ul style="list-style-type: none"> – Safety induction training sessions should be given to all technicians and field staff prior to commencement of their shifts. – Risk identification and suitable prevention measures should be employed within the plant area to eliminate potential impacts. – Routine medical checks to be conducted on personnel to ascertain fitness for work levels. – Frequent maintenance of all equipment and daily inspections done; and – No unauthorized use of equipment is allowed. 	Daily/Monthly	SHE Representative
Indirect impacts as a result of bush control activities	Pollution of water (surface and underground)	<ul style="list-style-type: none"> – Spillages and leaks of hydrocarbons need to be contained where possible and clean-up measures should be applied immediately after such incidents. – Good maintenance and servicing should be in place to avoid breakdowns. – Waste disposal should be away from water bodies and contained if possible. 	Daily	Employees
	Environmental pollution (littering and poor storage of waste)	<ul style="list-style-type: none"> – Implement a waste management plan covering all aspects of waste generated on site. – Training and toolbox-talks about the importance of waste management. – Ensure high standard of housekeeping across the site. – Solid waste shall be stored in an appointed area in covered, tip-proof metal drums/skids for collection and disposal to an approved waste management site. 	Daily	All Staff

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
		<ul style="list-style-type: none"> – The waste storage areas shall always be kept clean and tidy. – Storage of domestic waste on site may result in the attraction of unwanted scavengers and should be removed as soon as it is feasible. – Implement the waste management hierarchy across the site: Avoid, reuse, recycle, then the disposal. – Return packaging of hazardous and non-hazardous materials (wherever possible), such as empty bags for reuse. – Solid wastes should be deposited/emptied on a regulate basis. – See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers. – Liaise with the governing body (municipality/council) regarding the waste and handling of hazardous waste; and – Hydrocarbon and chemical contaminated solids have the potential to cause contamination of the soil, ground or surface water, thus correct storage and disposal methods are required. 		
Aftercare activities	Increased encroachment after bush thinning	<ul style="list-style-type: none"> – Investigate ecologically sound “after care” methods as mechanical disturbances could result in a denser bush scenario than prior to harvesting operations. This would depend on the objective of harvesting – e.g., sustainable bush utilisation versus veld reclamation for grazing, etc. – Ensure inspection / monitoring routine of bush density in previously harvested areas is conducted. 	Weekly / Monthly	All staff

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
Heritage	Disruption of heritage sites during bush thinning.	<p>Areas of proposed development activity are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found in the course of development work.</p> <ul style="list-style-type: none"> – The archaeological survey and assessment conducted by Dr. John Kinahan Appendix F of the retort biomass environmental scoping study, reported that the area is not archaeologically sensitive based on the indicative value of surface finds and existing survey data to which the assessment was limited. However, Dr. Kinahan cautions that hidden or buried archaeological or paleontological remains might be exposed as the project proceeds (2020). – The survey conducted by Dr Kinahan identified two recently dated graves and a possible graveyard in close vicinity of the farmhouse on the farm (Appendix C). Although the graves may not be classified as archaeologically sensitive, they are protected under the Burial Place Ordinance (27 of 1996) to prohibit the desecration or disturbance of graves and to regulate matters relating to the removal or disposal of dead bodies (Kinahan, 2020). <p>The “chance-find “procedure recommended by Dr john Kinahan covers the reporting and management of such finds.</p> <p>Scope: The “chance finds” procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person.</p> <p>Compliance: The “chance finds” procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): “a person who discovers any archaeological object ...must as soon as practicable report the discovery to the Council”. The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field. Please refer to Appendix C for details on its implementation.</p>	Daily	All Staff

ACTIVITY	POTENTIAL IMPACT	MANAGEMENT / MITIGATION MEASURES	MONITORING REQUIREMENTS	RESPONSIBILITY
Job creation, skills development and business opportunities	Beneficial socio-economic impacts on a local and regional scale	<ul style="list-style-type: none"> – Maximise local employment and local business opportunities – Enhance the use of local labour and local skills as far as reasonably possible – Goods and services are sourced from the local and regional economy as far as reasonably possible 	Monthly	Farmer / Farm manager or appointed supervisor

5.4 ADHERENCE TO THE MAIN PRINCIPLES OF BUSH CONTROL ACTIVITIES

The *Strategic environmental assessment of large-scale bush thinning and value-addition activities in Namibia* (SAIEA, 2015) recommends strongly that “bush farming” (re-growth of encroaching species for the purpose of re-harvesting) should not be encouraged because this approach inhibits the repair of the water cycle, will not improve soil fertility, optimal biodiversity will not be achieved, and overall rangeland productivity is less likely. Bush farming will not allow the process of ecological succession to proceed to a climax state and is also contrary to the objectives of the Forestry Act and the Rangeland Management Policy and Strategy. Instead, an approach of bush-thinning is preferred so that the landscape ecology can recover, a broad range of ecosystem services can be delivered on a sustainable basis (groundwater recharge, soil health, habitats for biodiversity) and the overall land productivity improve.

The Bush Control Manual (2017) sets the main principles for bush control in Namibia:

- Concentrate bush control on species and individuals that are obviously part of encroacher growth and leave the others alone.
- Leave a mix of trees and bushes on the land: The veld should have a variety of tree species (including some of the encroacher species) of different sizes. They should be spaced in a way that there are some open patches and some dense patches. This provides a variety of habitats for animals and imitates the heterogeneity (patchiness) of natural landscapes.
- Thin bush in a phased approach: Avoid to “shock” the land by an abrupt change from dense bush to open veld.
- Protected plants should not be harvested. Exceptions can be made under supervision of Forestry officials in cases of high densities.
- If arboricides are being used, foliar (leaf spray) and stem-applied arboricides are recommended. Pellets should not be used, as they tend to get washed along the surface by rain and end up in non-target areas.
- Dry riverbeds tend to carry more and larger trees. Forestry regulations state that trees should not be thinned within 100 metres of a river course. Thinning is required in densely encroached river margins, but one should leave a higher density of trees than on the adjacent habitat. It is especially important to leave large trees along a river course. The exception to this is *Prosopis*, an exotic species that invades riverbeds, and should be eradicated completely.
- Training of the work force is necessary before harvesting starts. Workers need to know which trees to target and which to avoid. Work teams need to be managed so that any excessive harvesting or killing of the wrong species is noticed and corrected.

5.5 ADHERENCE TO THE MAIN PRINCIPLES OF AFTERCARE ACTIVITIES

Aftercare is as important as bush thinning itself and an essential step to eventually restore the productivity of rangelands. Several studies and extensive research and review conform aftercare as the essential final component of a comprehensive bush control program (SAIEA, 2015). In short, aftercare is necessary to facilitate the process of ecological succession of savanna grasslands towards a climax state – e.g., dominated by perennial grasses and sufficient woody plants. It is therefore necessary to investigate ecologically sound “after-care “methods as mechanical disturbances could result in a denser bush scenario

than prior to harvesting operations. This would depend on the objective of harvesting – e.g., sustainable bush utilisation versus veld reclamation for grazing, etc. (Cunningham, 2020).

The natural response after bush clearing is the regrowth of more woody replacements. If bush control activities are more selective and the encroachers thinned less radically, larger individuals suppress smaller ones and less follow-up removals of unwanted species are required. The timing of aftercare intervention, the duration of an aftercare program and the type of aftercare activities differ from area to area. Monitoring is thus essential – to keep control over coppicing and the emergence of seedlings. Coppicing occurs quickly on stumps that were not killed during harvesting. The emergence of seedlings depend on water supply and is closely coupled to the rainy season.

Part of all aftercare programs is the removal of small, immature woody plants – mainly low coppice growth and saplings – to return the rangeland to the bush density achieved after the initial bush control activities (Bush Control Manual, 2017). Non-chemical methods are preferred because most of the small bush and saplings can be manually removed (e.g., chopping them off below ground level). Introducing browsers like goats on bush-controlled areas can keep sprouting and the emergence of seedlings under control, in addition. Controlled burning to kill off immature plants and saplings is another way to keep bush-controlled areas in check. Chemical aftercare is normally the last option of aftercare.

5.6 ADHERENCE TO SUSTAINABLE RANGELAND MANAGEMENT

Namibia's National Rangeland Management Policy and Strategy of 2012 emphasises eight widely applicable principles of sound rangeland management:

- Know the resource base: For any land manager it is essential to know which perennial grass species and which woody species dominate, to know the soil characteristics, differences and conditions, to know nutrient hotspots and to understand the general rangeland ecology to be able to evaluate the condition of the rangeland – whether it degrades, stabilizes or improves.
- Manage grasses for effective recovery and rest: Perennial and preferred grasses are usually grazed first and most intensely, by the most animals. Adaptive grazing management should be practiced – to allow recovery and seeding.
- Manage for effective utilization of grasses and shrubs: On savanna rangelands browsing is often neglected, while the herbaceous (grassy) component is often over-utilized. For this reason, browser-based livestock enterprises are encouraged.
- Enhance soil conditions: Healthier soil conditions allow healthier grass cover. In short it means that the topsoil must be in a good condition – allowing water to infiltrate easily, containing nutrients and preventing that the soil leach out. A good vegetation cover, in turn, provides the soil with dead matter and prevents water and wind erosion.
- Control bush encroachment: When the woody component outcompetes the herbaceous (grassy) component, the grazing potential of rangelands diminishes resulting in knock-on effects such as less biodiversity and disturbance of the water cycle.
- Plan for droughts: Timorous reduction of livestock numbers prevent fodder deficits. The availability of fodder fluctuates per season and it is simply wise to compile a fodder bank in times of surplus.

- Monitor the resource base: Good decisions about rangeland management are based on good information, and record keeping is an essential requirement in this regard.
- Plan land use infrastructure: Providing enough camps to facilitate effective rotational grazing management is one way of making sustainable rangeland management easier.

After bush control activities the treated landscape should not appear homogenous but have a mosaic character with a mix of tree and bushes. Clumps are important to provide shelter and large trees suppress woody saplings. Bush control on steep slopes is risky and not recommended because of potential erosion. Woody fines should be left on the land to improve soil organic matter, to enhance soil moisture and seed germination, to increase nutrient levels and to reduce erodibility. Annual grasses normally capitalize after bush control activities but form an unstable vegetation cover with insufficient nutrients to sustain fodder to grazing animals throughout the year. To enhance the re-establishment of perennial grass it is often necessary to leave more bush initially.

6 IMPLEMENTATION OF THE EMP

The bush thinning operation will be carried out in compliance with the relevant regulations. No significant impacts are anticipated for the activities that have been identified and management and mitigation measures are in place for potential risks.

This EMP:

- A. Has been prepared pursuant to a contract with the proponent;
- B. Has been prepared on the basis of information provided to ECC up to November 2020;
- C. Is for the sole use of the proponent, for the sole purpose of an EMP;
- D. Must not be used (1) by any person other than the proponent or (2) for a purpose other than an EMP; and
- E. Must not be copied without the prior written permission of ECC.
- F. Once the proponent has certified its land under FSC, this EMP should be updated accordingly.

ECC has prepared the EMP on the basis of information provided by the proponent, flora and fauna specialist report, heritage report and the environmental scoping report conducted for the biomass plant on Farm Gai//Khaisa No. 159.

7 LIST OF REFERENCES

- Cunningham, P. (2020). Vertebrate fauna and flora associated with farm Gai//Khaisa no.159, Kombat area [Desktop Study – Baseline/Scoping]. Windhoek: Unpublished.
- De-bushing Advisory Services (2017). Bush control manual. Windhoek: Prepared by AgriConsult Namibia, Ministry of Agriculture, Water and Forestry / Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- Kinahan, D. J. (2020). Archaeological assessment for the proposed bush thinning and charcoal burning project near Kombat, Otjozondjupa region. Windhoek: Unpublished.
- Southern African Institute for Environmental Assessment (SAIEA) (2015). Strategic environmental assessment (SEA) of large-scale bush thinning and value-addition activities in Namibia. Windhoek: Ministry of Agriculture, Water and Forestry / Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- World Health Organization (WHO) 2016. WHO country cooperation strategy 2010 – 2015 Namibia. Windhoek: WHO

APPENDIX A - LIST OF PROTECTED SPECIES

<i>Species name</i>	Common names (English)	Reasons to be protected (ES = Ecosystem Services; EU = Extent of use)
<i>Acacia erioloba</i> E. Mey.	Camel-thorn	EU (Heavily utilized by humans and animals - medicinal, cash crop, unsustainable harvesting of fuel wood for export, slow growth rate, cultural value, economic value, ES (keystone species))
<i>Acacia nigrescens</i> Oliv	Knob-thorn	EU (Used by humans and animals -wood used for construction, utensils, fuel, tanning, browsed by game), ES (retains river banks)
<i>Acanthosicyos horridus</i> Welw. Ex Hook.f.	Nara	Cultural and economic value, ES (Dune stabiliser)
<i>Adansonia digitata</i> L.	Baobab	ES2 (Keystone species) EU (heavily utilised by humans and animals)
<i>Adenia pechuelii</i> (Engl.)	Harms Elephants-foot	EU (unsustainable harvesting for horticultural trade), slow growth rate, Slow or episodic recruitment
<i>Adenium boehmanium</i> Schinz	Bushman poison	EU (unsustainable harvesting for horticultural trade)
<i>Afzelia quanzensis</i> Welw.	Pod mahogany	EU (Extensively used by humans and animals- curios, medicinal, timber, potential as ornamental trees, browsed by animals), slow growth rate, Restricted range.
<i>Albizia anthelmintica</i> (A.Rich.) Brongn.	Worm-cure albizia	EU (Utilized by humans and animals - medicinal, utensils, browsed by livestock and game)
<i>Aloe dichotoma</i> Masson	Quiver tree	EU (unsustainable harvesting for horticultural trade), Slow growth rate, Cultural value, Slow or episodic recruitment
<i>Aloe pillansii</i> L. Guthrie	Giant quiver tree	Slow growth rate, Restricted range, Slow or episodic recruitment
<i>Aloe ramosissima</i> Pillans	Maiden's quiver tree	Slow growth rate, Restricted range, Slow or episodic recruitment
<i>Baikiaea plurijuga</i> Harms	Zambezi teak or Rhodesian teak	EU (heavily utilised for timber, implements, utensils, wood carvings)
<i>Berchemia discolor</i> (Klotzsch) Hemsl.	Bird-plum	EU (heavily utilised by humans and animals)
<i>Boscia albitrunca</i> (Burch.) Gilg & Gilg-Ben.	Shepherd's tree	EU (heavily utilised by humans and animals)
<i>Burkea africana</i> Hook.	Burkea	EU (heavily utilised by humans - timber, firewood, implements)
<i>Caesalpinia merxmullerana</i> A.Schreib.	Orange-river caesalpinia	Restricted range
<i>Citropsis daweania</i> Swingle & M.Kellerm.		EU (Wild crop relative - genetic resource), Restricted range
<i>Colophospermum mopane</i> (J. Kirk ex Benth.) J. Kirk ex J. Léonard	Mopane	EU (heavily utilised by humans and animals (browse and forage) - charcoal, timber, fuel wood, construction, medicine, host to important edible caterpillar), slow growth rate, cultural value.

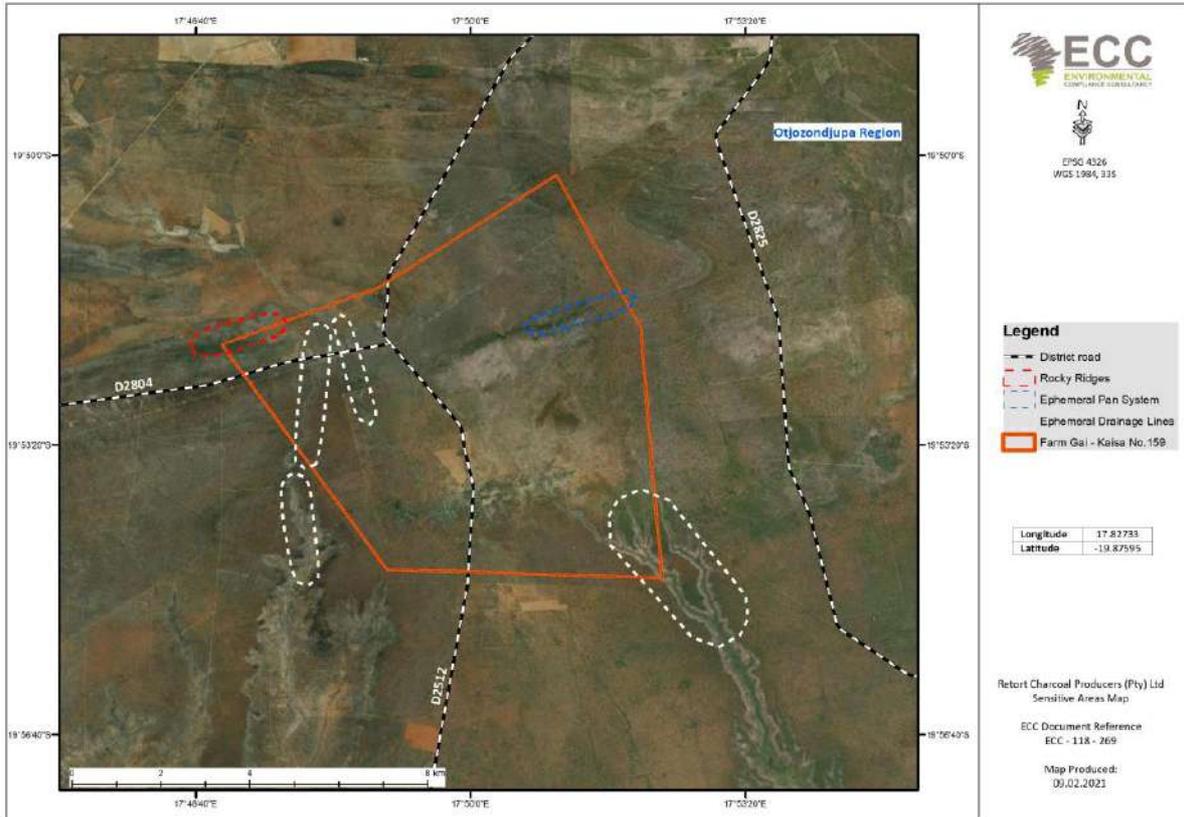
<i>Combretum imberbe</i> Wawra	Leadwood	EU (heavily utilised by humans and animals - fuel wood, construction material, implements, illegally harvested for charcoal, other purposes, browse, shade), Cultural value, Extremely slow growth rate.
<i>Commiphora capensis</i> (Sond.) Engl.	Namaqua corkwood	EU (illegally harvested for horticultural trade), Restricted range
<i>Commiphora cervifolia</i> J.J.A.van der Walt	Antler-leaved corkwood	EU (illegally harvested for horticultural trade), Restricted range
<i>Commiphora dinteri</i> Engl.	Namib corkwood	EU (illegally harvested for horticultural trade)
<i>Commiphora gariensis</i> Swanepoel	Orange River corkwood	Restricted range
<i>Commiphora giessii</i> J. J. A. van der Walt	Brown-stemmed corkwood	Restricted range
<i>Commiphora gracilifrons</i> Dinter ex J. J. A. van der Walt	Karee corkwood	Restricted range, EU (illegally harvested for horticultural trade), Restricted range
<i>Commiphora krauseliana</i> Heine	Feather-leafed corkwood	EU (illegally harvested for horticultural trade), Restricted range
<i>Commiphora namaensis</i> Schinz	Nama corkwood	EU (illegally harvested for horticultural trade)
<i>Commiphora oblanceolata</i> Schinz	Swakopmund corkwood	Very small, widely scattered populations, Restricted range
<i>Commiphora saxicola</i> Engl.	Rock corkwood	EU (illegally harvested for horticultural trade)
<i>Commiphora virgata</i> Engl.	Slender corkwood	Value (cultural - host to edible caterpillar)
<i>Commiphora wildii</i> Merxm.	Oak-leaved corkwood	EU (resin for perfume), Value (cultural - perfume)
<i>Cyphostemma bainesii</i> (Hook. F.) Desc.	Gouty vine	EU (illegally harvested for horticultural trade), Restricted range
<i>Cyphostemma currorii</i> (Hook. F.) Desc.	Kobas	EU (illegally harvested for horticultural trade)
<i>Cyphostemma juttæ</i> (Dinter & Gilg) Desc.	Blue kobas	EU (illegally harvested for horticultural trade), Restricted range
<i>Cyphostemma uter</i> (Exell & Mendonça) Desc.	Kaoko kobas	Restricted range
<i>Dialium englerianum</i> Henriq.	Kalahari podberry	EU (Extensively used by humans – fruit an important part of diet of San and Kavango peoples, medicinal, timber, implements)

<i>Diospyros mespiliformis</i> Hochst. Ex A.DC.	Jackal-berry	EU (Heavily utilised by humans and animals - important fruit tree, timber, cash crop, utensils, watos, fuel wood, medicinal, fruit eaten by animals and frugivorous birds), slow growth rate.
<i>Elephantorrhiza rangei</i> Harms	Karas elephant-root	Restricted range and habitat
<i>Entandrophragma spicatum</i> (C.DC) Sprague	Owambo wooden-banana	Cultural value, slow growth rate, Restricted range
<i>Erythrina decora</i> Harms	Namib coral-tree	Small populations scattered over wide area, Cultural value, potential horticultural value
<i>Euclea asperrima</i> Friedr.- Holz.	Mountain guarri	Restricted range
<i>Euclea pseudebenus</i> E. Mey. Ex A. Dc.	Wild ebony	ES (Keystone species, prevent erosion of water courses), Slow growth rate
<i>Faidherbia albida</i> (Delile) A.Chev.	Ana tree	ES (Important component of riparian fringe, prevents erosion of river beds, Keystone species), EU (heavily utilised by stock and game, important shade tree in arid west).
<i>Ficus burkei</i> (Miq.) Miq.	Strangler fig	EU (fruit for humans and animals), Restricted range
<i>Ficus cordata</i> Thunb.	Namaqua rock-fig	EU (fruit for humans and animals)
<i>Ficus sycomorus</i> L.	Sycamore fig	EU (fruit for humans and animals)
<i>Guibourtia coleosperma</i> (Benth.) J. Léonard	False mopane	EU (Heavily utilised by humans and animals - food, cash crops, very important shade tree, timber, watos, utensils)
<i>Hyphaene petersiana</i> Klotzsch ex Mart.	Makalani palm	EU (heavily utilised by humans and animals - utensils, basketry, thatching, fuel, ropes, palm wine, food)
<i>Kirkia dewinteri</i> Merxm. & Heine	Kaoko kirkia	Restricted range
<i>Lannea discolor</i> (Sond.) Engl.	Live-long	EU (used by humans and animals), Restricted range
<i>Maerua schinzii</i> Pax	Ringwood tree	EU (heavily used by humans and animals), slow growth rate
<i>Moringa ovalifolia</i> Dinter & A.Berger	Phantom tree	EU (heavily used by humans and animals - horticultural value, browse and tourism)
<i>Neoluederitzia sericeocarpa</i> Schinz	Silk-seed bush	Restricted range
<i>Ozoroa concolor</i> (C. Presl. Ex Sond.) De Winter	Green resin-bush	Restricted range, scattered distribution
<i>Ozoroa namaquensis</i> (Sprague) Von Teichman & A. E. van Wyk	Gariep resin-tree	Restricted range
<i>Pachypodium lealii</i> Welw.	Bottle tree	Slow growth rate, EU (unsustainable harvesting for horticulture trade)

<i>Pachypodium namaquanum</i> (Wyley ex Harv.) Welw.	Elephant-trunk	Slow growth rate, EU (unsustainable harvesting for horticulture trade), Restricted range
<i>Pappea capensis</i> Eckl. & Zeyh.	Jacket-plum	ES (Keystone species, prevents erosion in rivers), EU (utilised by humans and animals - important shade tree, edible fruit, browsed)
<i>Philenoptera violacea</i> (Klotzsch) Schrire.	Apple-leaf, rain tree	ES (important component of riparian and floodplain canopy) EU (utilised by humans and animals - fences, watos, medicines, browse, fodder)
<i>Protea gaguedi</i> J. F. Gmel.	African white protea	Restricted range, EU (heavily utilised by humans – medicinal overharvesting of roots)
<i>Pterocarpus angolensis</i> DC.	African teak, kiaat	Value (economic), EU (heavily utilised for timber, implements, utensils, wood carvings)
<i>Salix mucronata</i> subsp. <i>Capensis</i> (Thunb.) Immelman	Small-leaved willow, river willow	ES (stabilisation of river banks, shade), EU (Heavily utilised by humans – overharvesting for fuel wood, potentially threatened), Restricted range
<i>Schinziophyton rautanenii</i> (Schinz) Radcl.-Sm.	Manketti	EU (heavily utilised by humans and animals - utensils, curios, musical instruments, timber, shade, fruit a very important food and cash crop)
<i>Schotia afra</i> (L.) Thunb. var. <i>angustifolia</i> (E. Mey.) Harv.	Karoo schotia	EU (Utilised by humans for wood), Restricted range
<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	Marula	EU (Heavily utilised by humans and animals for fruit, shade, browse, medicines, wood).
<i>Searsia lancea</i> (L. F.) F. A. Barkley	Karee	ES (Prevent erosion of river banks)
<i>Sesamothamnus benguellensis</i> Welw.	Kaoko sesame-bush	EU (Illegally harvested for the horticultural trade), slow growth rate, Restricted range
<i>Sesamothamnus guerichii</i> (Engl.) E. A. Bruce	Herero sesame-bush	EU (Illegally harvested for the horticultural trade), slow growth rate
<i>Sesamothamnus leistneri</i> Giess ex Ihlenf., ined.	Large-leaved sesame- bush	EU (Illegally harvested for the horticultural trade), slow growth rate, Restricted range
<i>Spirostachys africana</i> Sond.	Tamboti	EU (Heavily utilised by humans - timber)
<i>Sterculia africana</i> (Lour.)Fiori	African star-chestnut	Economic value (tourism and horticulture) EU (utilised by humans – medicinal and food)
<i>Sterculia quinqueloba</i> (Garcke) K. Schum.	Large-leaved sterculia	Economic value (tourism and horticulture), restricted habitat
<i>Strychnos cocculoides</i> Baker	Corky monkey-orange	Economic value (cash crop), EU (heavily utilised by humans and animals - fruit)
<i>Strychnos potatorum</i> L. F.	Black bitterberry	ES (Important component of river and flood plain vegetation) EU (utilised by humans (fish poison, shade) and animals (food and shade), Restricted range.
<i>Strychnos pungens</i>	Spine-leaved	Economic value (cash crop), EU (heavily utilised by humans and

Soler.	monkey-orange	animals - fruit, medicinal)
<i>Strychnos spinosa</i> Lam.	Spiny monkey-orange	Economic value (cash crop), EU (heavily utilised by humans and animals – fruit and furniture), Restricted range
<i>Tamarix usneoides</i> E. Mey. Ex Bunge	Wild tamarisk	ES (prevents erosion of river beds and river banks, important component of riparian vegetation), EU (browsed by game)
<i>Tylecodon paniculatus</i> (L. F.) Toelken	Southern botterboom	EU (unsustainable harvesting – horticultural trade), Restricted range
<i>Welwitschia mirabilis</i> Hook f.	Welwitschia	Cultural value, scientific value, economic value (tourism)
<i>Ziziphus mucronata</i> Willd.	Buffalo-thorn	ES (prevents erosion of river beds and river banks, important component of riparian vegetation) EU (Utilized by humans and animals - medicinal, construction, implements, fuel wood, browsed by livestock and game.

APPENDIX B – AREAS TO BE AVOIDED



Sensitive areas that should be avoided and excluded from mechanical harvesting operations on Farm Gai //Khaisa No.159 include the rocky ridges (red dotted oblong); ephemeral pan system (blue dotted oblong) and ephemeral drainage lines (white dotted oblongs). Note the open areas currently/previ-ously impacted by charcoal harvesting operations throughout most of the farm (Cunningham, 2020). All areas outside these demarcated areas can be utilised for bush thinning purposes.

APPENDIX B.1- VERTEBRATE FAUNA AND FLORA SPECIALIST STUDY

**VERTEBRATE FAUNA AND FLORA ASSOCIATED
WITH FARM GAI KAISA No. 159, KOMBAT AREA
[Desktop Study – Baseline/Scoping]**

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Vertebrate fauna and flora known/expected in the general Kombat area

1 Introduction

A desktop study (i.e. literature review) was conducted between 3 and 6 November 2020 on the vertebrate fauna (e.g. reptiles, amphibians, mammals and birds) and flora (trees, shrubs and grasses) expected to occur in the general Kombat area. This study was conducted to determine the effect that the proposed mechanized bush thinning operations and charcoal burning (central retort system) for Farm Gai Kaisa No. 159, approximately 30 km south of Kombat, may have on the bio-physical environment (vertebrate fauna and flora) and immediate surroundings.

This literature review was to determine the actual as well as potential vertebrate fauna and flora associated with the general area commonly referred to as the Karstveld (Giess 1971; Mendelsohn *et al.* 2002). The Savannah Biome has 7.5% protected and makes up 37% of the land area while the Karstveld is wholly unprotected (Barnard 1998). Karst caves/sinkholes/springs and Otavi Mountains are sites of special ecological importance in the general Karstveld vegetation type (Curtis and Barnard 1998). The Otavi Highlands are ranked as an area with high biodiversity importance, but due to its relatively low relief and accessibility, endemism is low (Irish 2002).

This part of north-central Namibia in general is regarded as “average to high” in overall (all terrestrial species) diversity and “high” in endemism (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “high” with 5-6 species expected of which kudu, oryx and red hartebeest having average densities while the overall diversity and density of large carnivorous mammals (large predators) is “high” with 5 species expected of which leopard and cheetah have average densities (Mendelsohn *et al.* 2002).

According to Maggs (1998) there are approximately 4344 higher plant species with the most species being within the grasses (422), composites (Asteraceae) (385), legumes (Fabaceae) (377) and figs (Moraceae) (177), recorded from Namibia. Total species richness depends on further collecting and taxonomic revisions. High species richness is found in the Okavango, Otavi/Karstveld, Kaokoveld, southern Namib and Central Highland (Windhoek Mountains) areas. Endemic species – approximately 687 species in total – are mainly associated with the Kaokoveld (northwestern) and the succulent Karoo (southwestern) Namibia. The major threats to the floral diversity in Namibia are:

- 1). Conversion of the land to agriculture (with associated problems) and,
- 2). poorly considered development (Maggs 1998, Mendelsohn *et al.* 2002).

Mountain Savannah and Karstveld

The mountainous areas are characterised by *Kirkia acuminata*, *Berchemia discolor*, *Croton* spp. and many others, while the depressions are characterised by *Acacia ataxacantha*, several *Ficus* sp., *Peltophorum africanum*, *Sclerocarya birrea* and *Spirostachys africana*. The higher regions are characterised by grasses such as *Brachiaria serrata*, *Digitaria seriata* and *Panicum maximum* while the lower slopes are dominated by *Eragrostis* sp. Lower lying areas are dominated by *Digitaria seriata* and *Urochloa bolbodes* climax grasses and annuals such as *Brachiaria schoenfelderi*. The true Karstveld areas with limestone deposits on shallow soils support stands of *Combretum imberbe*, *Dichrostachys cinerea* and *Terminalia prunioides* with last mentioned two species often responsible for bush thickening (encroachment) in Namibia (Giess 1971).

The generally Kombat area has a “high” plant diversity with the Karst Mountains >500 species while endemism is viewed as “average” with 6-15 species and the area known for its

local endemics (Mendelsohn *et al.* 2002). These estimates are limited to “higher” plants as information regarding “lower” plants is sparse. The greatest variants affecting the diversity of plants are habitat and climate with the highest plant diversity generally associated with high rainfall areas. Pockets of high diversity are found throughout Namibia in “unique” habitat – often transition zones – e.g. mountains, inselbergs, etc. Furthermore, Mendelsohn *et al.* (2002) views the overall plant production as “extremely high” and the overall variation in plant production as “low” (5-10%) in the general area.

The availability of hardwoods and grazing is “average” while the browsing is “good” in the general area (Mendelsohn *et al.* 2002). Bush thickening (encroachment) problems are experienced in the general area with densities of between 4,000-12,000 plants/ha for *Dichrostachys cinerea* being the most contentious species (Bester 1996, Cunningham 1998). Land cleared for cultivation is “low” (<10%) and the risk of farming is viewed as “low” while the tourism potential is viewed as “high” in the general area (Mendelsohn *et al.* 2002).

No communal conservancies occur within the area with the closest being the Otjituuo Conservancy located to the east in the Grootfontein area with the major wildlife resource listed as wild dog, kudu, gemsbok, leopard, eland, warthog, steenbok, klipspringer and spotted hyena (NACSO 2009, 2011). The closest Government protected areas are the Etosha National Park and the Waterberg Plateau Park to the northwest and south, respectively. A number of farms are part of the Ongarangombe Freehold (commercial) Conservancy in the general Kombat area (Mendelsohn *et al.* 2002, See: www.canam.iway.na).

It is estimated that at least 73 species of reptile, 15 amphibian, 107 mammal, 261 bird species (breeding residents), 145 larger trees and shrubs (>1m in height) and 111 grasses are known to or expected to occur in the general area of which a low proportion are endemics (e.g. 16.4% for reptiles being the highest).

2 Methods

2.1 Literature review

A comprehensive and intensive literature review (i.e. desktop study) regarding the vertebrate fauna – e.g. reptiles, amphibians, mammals and birds – and flora (e.g. trees/shrubs >1m in height, grasses and herbs, etc.) that could potentially occur in the general Kombat (Farm Gai Kaisa) area was conducted using as many references as manageable. A list of the references consulted can be viewed in the Reference section (Page 41).

3 Results

3.1 Reptile Diversity

The reptile diversity known, and/or expected to occur in the general Kombat area, is presented in Table 1 below.

Approximately 261 species of reptiles are known or expected to occur in Namibia thus supporting approximately 30% of the continents species diversity (Griffin 1998a). At least 22% or 55 species of Namibian lizards are classified as endemic. The occurrence of reptiles of “conservation concern” includes about 67% of Namibian reptiles (Griffin 1998a). Emergency grazing and large scale mineral extraction in critical habitats are some of the biggest problems facing reptiles in Namibia (Griffin 1998a).

Table 1. Reptile diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
TURTLES AND TERRAPINS					
<i>Stigmochelys pardalis</i>	Leopard Tortoise	Vulnerable; Peripheral; Protected Game	LC		C2
<i>Psammobates oculiferus</i>	Kalahari Tent Tortoise	Vulnerable; Protected Game			C2
<i>Pelomedusa subrufa</i>	Marsh/Helmeted Terrapin	Secure			
SNAKES					
Blind Snakes					
<i>Rhinotyphlops schinzi</i>	Schinzi's Beaked Blind Snake	Endemic; Secure		P	
<i>Rhinotyphlops schlegelii</i>	Schlegel's Beaked Blind Snake	Secure			
Thread Snakes					
<i>Leptotyphlops merkeri (scutifrons)</i>	Peters' Thread Snake	Secure	LC		
<i>Leptotyphlops labialis</i>	Damara Thread Snake	Endemic; Secure			
Pythons					
<i>Python anchietae</i>	Anchietae's Dwarf Python	Endemic; Incufficiently known; Protected Game	LC		C2
<i>Python natalensis</i>	Southern African Python	Vulnerable; Peripheral; Protected Game		V	C2
Burrowing Asps					
<i>Atractaspis bibronii</i>	Bibron's Burrowing Asp	Secure			
<i>Atractaspis duerdeni</i>	Duerden's or Beaked Burrowing Asp	Insufficiently known			
Purple-Glossed Snakes					
<i>Amblyodipsas ventrimaculata</i>	Kalahari Purple-glossed Snake	Secure	LC		
Quill Snouted Snakes					
<i>Xenocalamus bicolor bicolor</i>	Bicoloured Quill-snouted Snake	Secure			
<i>Xenocalamus mechowii</i>	Elongate Quill-snouted Snake	Secure			
Typical Snakes					
<i>Lamprophis fuliginosus</i>	Brown House Snake	Secure			
<i>Lycophidion ornatum (capense)</i>	Cape Wolf Snake	Secure	LC		
<i>Mehelya capensis</i>	Cape File Snake	Secure			
<i>Mehelya vernayi</i>	Angola File Snake	Insufficiently known; Rare?			
<i>Pseudaspis cana</i>	Mole Snake	Secure			
<i>Prosymna bivittata</i>	Two-striped Shovel-snout	Secure			
<i>Psammophylax tritaeniatu</i>	Striped Skaapsteker	Secure			
<i>Psammophis trigrammus</i>	Western Sand Snake	Endemic; Secure			
<i>Psammophis leightoni</i>	Namib Sand Snake	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
<i>Psammophis subtaeniatus</i>	Stripe-bellied Sand Snake	Secure			
<i>Psammophis brevirostris leopardinus</i>	Leopard Grass Snake	Secure			
<i>Psammophis massambicus</i>	Olive Grass Snake	Secure			
<i>Philothamnus semivariegatus</i>	Spotted Bush Snake	Secure			
<i>Dasypeltis scabra</i>	Common/Rhombic Egg Eater	Secure			
<i>Telescopus semiannulatus polystriatus</i>	Eastern Tiger Snake	Secure			
<i>Dispholidus typus</i>	Boomslang	Secure			
<i>Thelotornis capensis oatesii</i>	Twig or Vine Snake	Secure			
<i>Aspidelaps lubricus</i>	Coral Snake	Secure			
<i>Aspidelaps scutatus scutatus</i>	Shield-nose Snake	Secure			
<i>Elapsoidea semiannulata</i>	Angolan Garter Snake	Secure			
<i>Elapsoidea sunderwallii fitzsimonsi</i>	Sundevall's Garter Snake	Endemic; Secure			
<i>Naja anchietae</i>	Snouted Cobra	Secure			
<i>Naja mossambica</i>	Mozambique Spitting Cobra	Secure			
<i>Naja nigricincta</i>	Black-necked Spitting Cobra	Endemic?; Secure			
<i>Dendroaspis polylepis</i>	Black Mamba	Secure	LC		
<i>Bitis arietans</i>	Puff Adder	Secure			
<i>Bitis caudalis</i>	Horned Adder	Secure			
Worm Lizard					
<i>Zygaspis quadrifrons</i>	Kalahari Round-headed Worm Lizard	Secure			
<i>Monopeltis anchietae</i>	Anchieta's Spade-snouted Worm Lizard	Secure	LC		
<i>Monopeltis mauricei</i>	Slender Spade-snouted Worm Lizard	Secure			
LIZARDS					
Skinks					
<i>Acontias occidentalis</i>	Percival's Legless Skink	Secure			
<i>Mochlus (Lygosoma) sundevallii</i>	Sundevall's Writhing Skink	Secure	LC		
<i>Trachylepis occidentalis</i>	Western Three-striped Skink	Secure			
<i>Trachylepis spilogaster</i>	Kalahari Tree Skink	Secure			
<i>Trachylepis striata wahlbergi</i>	Striped Skink	Secure			
<i>Trachylepis varia</i>	Variable Skink	Secure			
<i>Trachylepis variegata punctulata</i>	Variiegated Skink	Secure			
<i>Panaspis wahlbergii</i>	Wahlberg's Snake-eyed Skink	Secure			
Old World Lizards					
<i>Heliobolus lugubris</i>	Bushveld Lizard	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International status		
			IUCN	SARDB	CITES
<i>Ichnotropis capensis</i>	Cape Rough-scaled Lizard	Secure			
<i>Ichnotropis squamulosa</i>	Common Rough-scaled Lizard	Secure			
<i>Nucras intertexta</i>	Spotted Sandveld Lizard	Secure			
<i>Nucras holubi</i>	Holub's Sandveld Lizard	Secure			
<i>Pedioplanis lineocellata</i>	Spotted Sand Lizard	Secure			
<i>Pedioplanis namaquensis</i>	Namaqua Sand Lizard	Secure			
<i>Pedioplanis undata</i>	Western Sand Lizard	Endemic; Secure			
Plated Lizards					
<i>Cordylus subdorsalis</i>	Dwarf Plated Lizard	Endemic; Secure	LC		
<i>Zonosaurus (Gerrhosaurus) multilineatus</i>	Kalahari Plated Lizard	Secure			
<i>Zonosaurus (Gerrhosaurus) nigrolineatus</i>	Black-lined Plated Lizard	Secure			
<i>Zonosaurus (Gerrhosaurus) validus maltzahni</i>	Giant Plated Lizard	Secure			
Girdled Lizards					
<i>Karusasaurus (Cordylus) jordani</i>	Jordan's Girdled Lizard	Endemic; Secure			C2
Monitors					
<i>Varanus albigularis</i>	Rock or White-throated Monitor	Vulnerable; Peripheral; Protected Game		V	C2
Agamas					
<i>Agama aculeata</i>	Ground Agama	Secure			
Chameleons					
<i>Chamaeleo dilepis</i>	Flap-neck Chameleon	Secure	LC		C2
Geckos					
<i>Lygodactylus bradfieldi</i>	Bradfield's Dwarf Gecko	Endemic; Secure			
<i>Pachydactylus capensis</i>	Cape Thick-toed Gecko	Secure			
<i>Pachydactylus turneri laevigatus</i>	Turner's Thick-toed Gecko	Endemic; Secure			
<i>Pachydactylus punctatus</i>	Speckled Thick-toed Gecko	Secure			
<i>Pachydactylus rugosus rugosus</i>	Rough Thick-toed Gecko	Endemic; Secure			
<i>Pachydactylus weberi</i>	Weber's Thick-toed Gecko	Secure	LC		
<i>Ptenopus garrulous maculatus</i>	Common Barking Gecko	Secure			

IUCN (2020): LC – Least Concern

SARDB (2004): V – Vulnerable, P – Peripheral

CITES: CITES Appendix 2 or 3 species

Source for literature review: Alexander and Marais (2007), Bzauer (2010), Bauer *et al.* (2006), Branch (1998), Branch (2008), Bonin *et al.* (2006), Boycott and Bourquin 2000, Broadley (1983), Buys and Buys (1983), Clauss and Clauss (2002), Cunningham (2006), Griffin (1998a), Griffin (2003), IUCN (2020), Marais (1992), SARDB (2004), Tolley and Burger (2007)

The overall reptile diversity and endemism in the general area is estimated at between 71-80 species and 5-8 species, respectively (Mendelsohn *et al.* 2002). Griffin (1998a) presents figures of between 21-30 and 31-40 for lizard and snake diversity, respectively, from the general area in north-central Namibia. According to Griffin (1998a) 1-10 endemic lizards and 3-4 endemic snakes are expected from this area. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 109 and 83 species of reptiles, respectively (Griffin 1998a).

At least 73 species of reptiles are expected to occur in the general area with 12 species being endemic (16.4%). These consist of at least 2 tortoise, 1 terrapin, 38 snakes (2 blind snake, 2 thread snake, 2 python, 2 burrowing asps, 1 purple-glossed, 2 quill snouted and 27 typical snakes) and 34 lizards (3 worm lizard, 8 skinks, 8 Old World lizards, 4 plated lizards, 1 girdled lizard, 1 monitor lizard, 1 chameleon, 1 agama and 7 geckos). Typical snakes (27 species – 3 species being endemic (11.1%) and 1 species insufficiently known and rare (3.7%), Old World lizards (8 species – 1 species being endemic (12.5%) and geckos (7 species – 3 species being endemic (42.9%) are the most numerous reptiles expected from the general area. The burrowing worm lizards are more numerous in the sandier north eastern parts of Namibia. Namibia with approximately 129 species of lizards (Lacertilia) has one of the continents richest lizard fauna (Griffin 1998a). Due to the fact that reptiles are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented above.

Eighteen species (24.7%) have some form of Namibian conservation status (endemics included and some species have more than 1 status) with 12 species endemic, 1 species rare, 4 species vulnerable, 5 species protected game, 3 species insufficiently known and 3 species peripheral.

Sixteen species (21.9%) have some form of international conservation status (some species have more than 1 status) with 11 species classified as Least Concern by the IUCN (2020) while all the other species have not yet been assessed by the IUCN Red List. The SARDB (2004) classifies 3 species as vulnerable (2 species) and peripheral (1 species) while 7 species are listed under CITES as Appendix 2 species.

Not all the species indicated as potentially occurring in the general area are expected to occur in the proposed development area as reptiles often have very specific habitat requirements – e.g. rupicolous species associated with Karst formations, etc.

The most important species are viewed as those with some form of conservation status (Namibian and International – See Table 1) with the tortoises, leopard tortoise (*Stigmochelys pardalis*) and Kalahari tent tortoise (*Psammobates oculiferus*) the pythons, Anchietae's dwarf python (*Python anchieta*) and Southern African python (*P. natalensis*), monitor lizard (*Varanus albigularis*) and the 1 species listed as "rare" – Angola file snake (*Mehelya vernayi*) – probably the most important in the general area. Two relatively recent discoveries of 2 new species of *Pachydactylus* spp. from the Karst Mountains include *Pachydactylus boehmei* (Bauer 2010) and *P. otaviensis* (Bauer *et al.* 2006). These 2 species fall within the *Pachydactylus serval/weberi* group and not included in Table 1 as individual species although viewed as important as they are restricted range species from the general Kombat area.

However, none of the reptiles are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving reptile species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the two

tortoise species known/expected to occur in the area. Tortoises are the reptile family of greatest national concern and most under threat in Namibia (Griffin 1998a).

Furthermore, unsustainable exploitation (i.e. poaching) and alteration of habitat are two main categories of threat to most reptiles in Namibia (Griffin 1998a).

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as agama, gecko, monitor lizard, etc.).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.2 Amphibian Diversity

The amphibian diversity known, and/or expected to occur in the general Kombat area, is presented in Table 2 below.

Table 2. Amphibian diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status: IUCN
Rain Frogs			
<i>Breviceps adspersus</i>	Bushveld Rain Frog		LC
Toads			
<i>Amietophrynus gutturalis</i>	Guttural Toad		LC
<i>Amietophrynus maculatus</i>	Flat-backed Toad		LC
<i>Amietophrynus poweri</i>	Western Olive Toad		LC
Kassinias			
<i>Kassina senegalensis</i>	Bubbling Kassina		LC
Rubber Frog			
<i>Phrynomantis affinis</i>	Spotted Rubber Frog		LC
<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog		LC
Puddle Frog			
<i>Phrynobatrachus mababiensis</i>	Dwarf Puddle Frog		LC
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog		
Ornate Frogs			
<i>Hildebrandtia ornata</i>	Ornate Frog		LC
Cacos			
<i>Cacosternum boettgeri</i>	Boettger's Caco		LC
Bullfrogs			
<i>Pyxicephalus adspersus</i>	Giant Bullfrog*		LC
Sand Frogs			
<i>Tomopterna krugerensis</i>	Knocking Sand Frog		LC
<i>Tomopterna tandyi</i>	Tandy's Sand Frog		LC
Platannas			
<i>Xenopus laevis</i>	Common Platanna		LC

Namibian conservation and legal status according to the Nature Conservation Ordinance No 4 of 1975 (Griffin 2003)

IUCN (2020): LC = Least Concern

*The giant bullfrog is classified as "near threatened" by Du Preez and Carruthers (2009)

Source for literature review: Carruthers (2001), Channing (2001), Channing and Griffin (1993), Du Preez and Carruthers (2009), Passmore and Carruthers (1995)

Amphibians are declining throughout the world due to various factors of which much has been ascribed to habitat destruction. Basic species lists for various habitats are not always

available with Namibia being no exception in this regard while the basic ecology of most species is also unknown. Approximately 4,000 species of amphibians are known worldwide with just over 200 species known from southern Africa and at least 57 species expected to occur in Namibia. Griffin (1998b) puts this figure at 50 recorded species and a final species richness of approximately 65 species, 6 of which are endemic to Namibia. This “low” number of amphibians from Namibia is not only as a result of the generally marginal desert habitat, but also due to Namibia being under studied and under collected. Most amphibians require water to breed and are therefore associated with the permanent water bodies, mainly in northeast Namibia.

According to Mendelsohn *et al.* (2002), the overall frog diversity in the general area is estimated at between 12-15 species. Griffin (1998b) puts the species richness in the general area at between 15-16 species. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 18 and 13 species of amphibians, respectively (Griffin 1998b).

At least 15 species of amphibians can occur in suitable habitat in the general area. The area is under represented, with 1 rain frog, 3 toads, 1 kassina, 2 rubber frogs, 2 puddle frogs, 1 ornate frog, 1 caco, 1 bullfrog, 2 sand frogs and 1 platanna known and/or expected (i.e. potentially could be found in the area) to occur in the area. None of the amphibians are endemic (Griffin 1998b) while 1 species is classified as “near threatened” due to habitat loss and development (*Pyxicephalus adspersus*) (Du Preez and Carruthers 2009) – i.e. 6.7% of amphibians of conservation value from the general area. *Pyxicephalus adspersus* is more common in northern Namibia where their numbers are also declining due to overutilization as food by humans (Griffin pers. com.). The IUCN (2020) lists all the species as Least Concern.

The most important species is *Pyxicephalus adspersus* although they are widespread in Namibia and not exclusively associated with the Kombat area in particular. Permanent water bodies viewed as amphibian habitat in the area include the various fountains known to occur in the Karst formations in the surrounding hills. Other potential habitats in the area include ephemeral pans, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

Due to the fact that amphibians are an understudied group of animals, especially in Namibia, it is expected that more species may be located in the general area than presented in Table 2 above. Furthermore, as Namibia is an arid country with increasing human population and intensified agriculture, all the amphibians which depend on perennial water sources are viewed as vulnerable in the long term (Griffin 1998b).

However, none of the amphibians are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on amphibian habitat if ephemeral water features, especially pans and ground dams are disturbed and/or radically altered. On the other hand, bush thinning may increase groundwater levels and consequently result in more water for fountains and pans and thus improve amphibian habitat or result in more runoff and erosion and thus less water penetration into the groundwater system. This would depend on the scale and intensity of the harvesting operation.

3.3 Mammal Diversity

The mammal diversity known, and/or expected to occur in the general Kombat area, is presented in Table 3 below.

Table 3. Mammal diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
Elephant Shrews					
<i>Elephantulus intufi</i>	Bushveld Elephant-shrew	Secure		DD	
Aardvark					
<i>Orycteropus afer</i>	Aardvark	Secure; Protected Game			
Shrews					
<i>Crocidura fuscomurina</i>	Tiny Musk Shrew	Secure		DD	
<i>Crocidura hirta</i>	Lesser Red Musk Shrew	Secure		DD	
Hyrax					
<i>Procavia capensis</i>	Rock Hyrax	Secure; Problem animal			
Bats					
<i>Eidolon helvum</i>	African Straw-coloured Bat	Secure; Migrant	NT		
<i>Epomophorus crypturus</i>	Peter's Epauletted Fruit Bat	Not listed			
<i>Rousettus aegyptiacus</i>	Egyptian Rousette	Not listed			
<i>Cloeotis percivali</i>	Percival's Short-eared Trident Bat	Not listed			
<i>Macronycteris (Hipposideros) caffer</i>	Sundevall's Leaf-nosed Bat	Secure		DD	
<i>Macronycteris (Hipposideros) gigas</i>	Giant Leaf-nosed Bat	Not listed	¹ NT		
<i>Macronycteris (Hipposideros) vittatus</i>	Striped Leaf-nosed Bat	Not listed	NT		
<i>Rhinolophus blasii</i>	Blasius's Horseshoe Bat	Not listed			
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	Secure		NT	
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	Secure; Peripheral		NT	
<i>Rhinolophus denti</i>	Dent's Horseshoe Bat	Secure		NT	
<i>Rhinolophus fumigatus</i>	Rüppell's Horseshoe Bat	Secure		NT	
<i>Rhinolophus hildebrandtii</i>	Hildebrandt's Horseshoe Bat	Not listed			
<i>Rhinolophus swinnyi</i>	Swinny's Horseshoe Bat	Not listed			
<i>Taphozous mauritanus</i>	Mauritian Tomb Bat	Secure			
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	Secure			
<i>Chaerephon ansorgei</i>	Ansorge's Free-tailed Bat	Not listed			
<i>Chaerephon nigeriae</i>	Nigerian Free-tailed Bat	Secure			
<i>Mops midas</i>	Midas Free-tailed Bat	Secure			
<i>Sauromys petrophilus</i>	Roberts's Flat-headed Bat	Secure			
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	Secure			
<i>Miniopterus inflatus</i>	Greater Long-fingered Bat	Insufficiently known; Rare?			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
<i>Miniopterus natalensis</i>	Natal Long-fingered Bat	Secure		NT	
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	Secure			
<i>Glauconycteris variegata</i>	Variiegated Butterfly Bat	Secure		NT	
<i>Hypsugo anchietae</i>	Anchieta's Pipistrelle	Not listed			
<i>Kerivoula lanosa</i>	Lesser Woolly Bat	Indeterminate; Rare?; Peripheral		NT	
<i>Laephotis botswanae</i>	Botswana Long-eared Bat	Secure		V	
<i>Mimetillus thomasi</i>	Thomas's Flat-headed Bat	Not listed			
<i>Neoromicia capensis</i>	Cape Serotine Bat	Secure			
<i>Neoromicia nana</i>	Banana Bat	Secure			
<i>Neoromicia zuluensis</i>	Zulu Serotine Bat	Secure			
<i>Nycticeinops schlieffeni</i>	Schlieffen's Twilight Bat	Secure			
<i>Pipistrellus hesperidus</i>	Dusky Pipistrelle	Not listed			
<i>Pipistrellus rueppellii</i>	Rüppell's Pipistrelle	Insufficiently known; Peripheral			
<i>Pipistrellus rusticus</i>	Rusty Pipistrelle	Secure		NT	
<i>Scotophilus dinganii</i>	Yellow-bellied House Bat	Secure			
<i>Scotophilus leucogaster</i>	White-bellied House Bat	Not listed			
Hares and Rabbits					
<i>Lepus saxatilis</i>	Scrub Hare	Secure			
<i>Pronolagus randensis</i>	Jameson's Red Rock Rabbit	Secure			
Rodents					
Molerat					
<i>Cryptomys damarensis</i>	Damaraland Mole-Rat	Secure			
Porcupine					
<i>Hystrix africaeaustralis</i>	Cape Porcupine	Secure			
Rats and Mice					
<i>Petromys typicus</i>	Dassie Rat	Endemic; Secure		NT	
<i>Pedetes capensis</i>	Springhare	Secure			
<i>Xerus inaurus</i>	South African Ground Squirrel	Secure			
<i>Funisciurus congicus</i>	Striped Tree Squirrel	Secure			
<i>Paraxerus cepapi</i>	Tree Squirrel	Secure			
<i>Graphiurus murinus</i>	Woodland Dormouse	Secure			
<i>Lemniscomys rosalia</i>	Single-striped Grass Mouse	Secure		DD	
<i>Rhodomys pumilio</i>	Four-striped Grass Mouse	Secure			
<i>Mus indutus</i>	Desert Pygmy Mouse	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
<i>Mastomys natalensis</i>	Natal Multimammate Mouse	Secure			
<i>Mastomys coucha</i>	Southern Multimammate Mouse	Secure			
<i>Thallomys paeuducus</i>	Acacia Rat	Secure			
<i>Thallomys nigricauda</i>	Black-tailed Tree Rat	Secure			
<i>Aethomys chrysophilus</i>	Red Veld Rat	Secure			
<i>Aethomys namaquensis</i>	Namaqua Rock Mouse	Secure			
<i>Desmodillus auricularis</i>	Cape Short-tailed Gerbil	Secure			
<i>Gerbillurus paeaba</i>	Hairy-footed Gerbil	Secure			
<i>Tatera leucogaster</i>	Bushveld Gerbil	Secure		DD	
<i>Tatera brantsii</i>	Highveld Gerbil	Secure			
<i>Saccostomus campestris</i>	Pouched Mouse	Secure			
<i>Malacothrix typica</i>	Gerbil Mouse	Secure			
<i>Steatomys pratensis</i>	Fat Mouse	Secure			
<i>Petromyscus collinus</i>	Pygmy Rock Mouse	Endemic; Secure			
<i>Petromyscus shortridgei</i>	Shortridge's Rock Mouse	Secure			
<i>Mus musculus</i>	House Mouse	Invasive alien			
Primates					
<i>Galago moholi</i>	South African Galago	Vulnerable; Protected Game			C2
<i>Papio ursinus</i>	Chacma Baboon	Secure; Problem animal			C2
<i>Cercopithecus pygerythrus</i>	Vervet Monkey	Secure			C2
Hedgehog					
<i>Atelerix frontalis angolae</i>	Southern African Hedgehog	Insufficiently known; Rare; Protected Game		R; NT	
Pangolin					
<i>Smutsia (Manis) temminckii</i>	Ground Pangolin	Vulnerable; Peripheral; Protected Game	V	V	C2
Carnivores					
<i>Proteles cristatus</i>	Aardwolf	Insufficiently known; (Vulnerable?); Peripheral			
<i>Parahyaena (Hyaena) brunnea</i>	Brown Hyena	Insufficiently known; (Vulnerable?); Peripheral	NT	NT	
<i>Crocuta crocuta</i>	Spotted Hyena	Secure?; Peripheral		NT	
<i>Acinonyx jubatus</i>	Cheetah	Vulnerable; Protected Game	V	V	C1
<i>Panthera pardus</i>	Leopard	Secure?; Peripheral; Protected Game	V		C1
<i>Caracal caracal</i>	Caracal	Secure; Problem Animal			C2
<i>Felis silvestris</i>	African Wild Cat	Vulnerable			C2
<i>Felis nigripes</i>	Black-footed Cat	Indeterminate; Rare	V		C1
<i>Genetta genetta</i>	Small Spotted Genet	Secure			

Species: Scientific name	Species: Common name	Namibian conservation and legal status	International Status		
			IUCN	SARDB	CITES
<i>Suricata suricatta</i>	Suricate	Secure			
<i>Cynictis penicillata</i>	Yellow Mongoose	Secure			
<i>Galerella sanguinea</i>	Slender Mongoose	Secure			
<i>Mungos mungo</i>	Banded Mongoose	Secure			
<i>Helogale parvula</i>	Dwarf Mongoose	Secure			
<i>Otocyon megalotis</i>	Bat-eared Fox	Vulnerable?; Peripheral			
<i>Vulpes chama</i>	Cape Fox	Vulnerable?			
<i>Canis mesomelas</i>	Black-backed Jackal	Secure; Problem animal			
<i>Mellivora capensis</i>	Honey Badger/Ratel	Secure; Protected Game		NT	
<i>Ictonyx striatus</i>	Striped Polecat	Secure			
Pigs					
<i>Phacochoerus africanus</i>	Common Warthog	Secure; Huntable Game			
Antelopes					
<i>Giraffa camelopardalis</i>	Giraffe	Vulnerable?; Peripheral; Specially Protected Game	V		
<i>Tragelaphus strepsiceros</i>	Greater Kudu	Secure; Huntable Game			
<i>Tragelaphus oryx</i>	Eland	Insufficiently known; Vulnerable?; Protected Game			
<i>Alcelaphus buselaphus</i>	Red Hartebeest	Secure; Protected Game			
<i>Oryx gazella</i>	Gemsbok	Secure; Huntable game			
<i>Sylvicapra grimmia</i>	Common Duiker	Secure			
<i>Antidorcas marsupialis</i>	Springbok	Secure; Huntable game			
<i>Madoqua damarensis</i>	Damara Dik-Dik	Insufficiently known; Protected Game			
<i>Raphicerus campestris</i>	Steenbok	Secure; Protected Game			
<i>Oreotragus oreotragus</i>	Klipspringer	Secure; Specially Protected Game			

SARDB (2004): R = Rare; E = Endangered; NT = Near Threatened; DD = Data Deficient

IUCN (2020): V = Vulnerable; NT = Near Threatened

¹Monadjem *et al.* (2010)

CITES: Appendix 1 or 2 species

Other species not listed are viewed as "Least Concern" by IUCN (2020) or not yet been assessed by the IUCN Red List.

Source for literature review: De Graaff (1981), Griffin and Coetzee (2005), Estes (1995), Frost (2014), IUCN (2020), Joubert and Mostert (1975), Monadjem *et al.* (2010), Skinner and Smithers (1990), SARDB (2004), Skinner and Chimimba (2005), Stander and Hanssen (2003) and Taylor (2000)

Namibia is well endowed with mammal diversity with at least 250 species occurring in the country. These include the well known big and hairy as well as a legion of smaller and lesser-known species. Currently 14 mammal species are considered endemic to Namibia of which 11 species are rodents and small carnivores of which very little is known. Most endemic mammals are associated with the Namib and escarpment with 60% of these rock-dwelling (Griffin 1998c). According to Griffin (1998c) the endemic mammal fauna is best characterized by the endemic rodent family *Petromuridae* (dassie rat) and the rodent genera *Gerbillurus* and *Petromyscus*.

Overall terrestrial diversity and endemism – all species – is classified “average to high” in overall (all terrestrial species) diversity and “high” in endemism in the north-central part of Namibia (Mendelsohn *et al.* 2002). The overall diversity and abundance of large herbivorous mammals (big game) is viewed as “high” with 5-6 species expected of which kudu, oryx and red hartebeest having average densities while the overall diversity and density of large carnivorous mammals (large predators) is “high” with 5 species expected of which leopard and cheetah have average densities (Mendelsohn *et al.* 2002). The overall mammal diversity in the general area is estimated at between 61-75 species with 1-2 species being endemic to the area (Mendelsohn *et al.* 2002). Griffin (1998c) puts the species richness distribution of endemics also between 9-11 species. The closest protected areas – Etosha National Park and the Waterberg Plateau Park – have an estimated 102 and 82 species of mammals, respectively (Griffin 1998c).

At least 107 species of mammals are known and/or expected to occur in the general area of which 2 species (1.9%) are classified as endemic. The Namibian legislation classifies 4 species as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), 10 species as vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland), 2 species as specially protected game, 10 species as protected game, 7 species as insufficiently known, 2 species as indeterminate, 9 species as peripheral, 1 species as migrant, 4 species as huntable game, 3 species as problem animals and 13 species not listed. At least 35.5% (38 species) of the mammalian fauna that occur or are expected to occur in general Kombat area are represented by bats of which 2 species are classified as rare (5.3%). This is followed by rodents with 27.1% (29 species) of which 2 species are classified as endemic (6.9%) and carnivores with 17.8% (19 species) of which 1 species is classified as rare (5.3%) and 6 species as vulnerable (31.6%). Species probably underrepresented in the above mentioned table for the general area are bats and rodents, as these groups have not been well documented from Namibia.

Thirty three species (30.8%) have some form of international conservation status (some species have more than one status) of which the IUCN (2020) classifies 5 species as vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and 3 species as near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena); SARDB (2004) classifies 1 species as rare, 3 as vulnerable, 13 as near threatened and 6 as data deficient while CITES lists 3 species as Appendix 1 species and 6 species as Appendix 2 species. Furthermore Monadjem *et al.* (2010) classifies 1 species as near threatened although this is probably using old IUCN status revised in IUCN (2020). The House Mouse (*Mus musculus*) is viewed as an invasive alien species to the area. *Mus musculus* are generally known as casual pests and not viewed as problematic although they are known carriers of “plague” and can cause economic losses.

The most important species from the general area are probably all those classified as vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena) by the IUCN (2020) and those species classified as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), and vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland),

under the Namibian legislation. However, not all the species occur permanently in the proposed development area, but may move through the area sporadically – e.g. cheetah, eland, etc.

However, none of the mammals are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving mammal species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the ground pangolin and South African hedgehog known/expected to occur in the area. However, they are nocturnal and usually utilise aardvark and other burrows during daylight hours. Most other larger mammals – e.g. carnivores and ungulates – would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as bats, galago, etc.).

Furthermore, habitat alteration and overutilization are the two primary processes threatening most mammals in Namibia (Griffin 1998c). On the other hand, habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. cheetah, oryx, springbok, etc.

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.4 Avian Diversity

The avian diversity known, and/or expected to occur in the general Kombat area, is presented in Table 4 below.

Although Namibia's avifauna is comparatively sparse compared to the high rainfall equatorial areas elsewhere in Africa, approximately 658 species have already been recorded with a diverse and unique group of arid endemics (Brown *et al.* 1998, Maclean 1985). Fourteen species of birds are endemic or near endemic to Namibia with the majority of Namibian endemics occurring in the savannas (30%) of which ten species occur in a north-south belt of dry savannah in central Namibia (Brown *et al.* 1998).

Bird diversity is viewed as "high" in the general area with an estimated 171-230 species and 1-3 species being endemic (Mendelsohn *et al.* 2000). Simmons (1998a) suggests 4-6 endemic species and "average" rankings for southern African endemics and red data birds expected from the general area. Although the Kombat area is not classified as an Important Birding Area (IBA) in Namibia (Simmons 1998a) the closest such sites are located at the Etosha National Park to the northwest and the Waterberg to the south.

At least 261 species of terrestrial ["breeding residents"] birds occur and/or could occur in the general Kombat area at any time (Hockey *et al.* 2006, Maclean 1985, Tarboton 2001). All the migrant and aquatic species and those breeding extralimital, have been excluded. Eight of the 14 Namibian endemics are expected to occur in the general area (57.1% of all Namibian endemic species or 3.1% of all the species expected to occur in the area). Seven species are viewed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), 3 species as vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and 5 species as near threatened (Rüppell's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) (Simmons

Table 4. Avian diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Struthio camelus</i>	Common Ostrich			
<i>Peliperdix coqui</i>	Coqui Francolin			
<i>Dendroperdix sephaena</i>	Crested Francolin			
<i>Scleroptila levaillantoides</i>	Orange River Francolin		N-end	
<i>Pternistis hartlaubi</i>	Hartlaub's Spurfowl	End	N-end	
<i>Pternistis adspersus</i>	Red-billed Spurfowl		N-end	
<i>Pternistis swainsonii</i>	Swainson's Spurfowl			
<i>Coturnix coturnix</i>	Common Quail			
<i>Coturnix delegorguei</i>	Harlequin Quail			
<i>Numida meleagris</i>	Helmeted Guineafowl			
<i>Turnix sylvaticus</i>	Kurrichane Buttonquail			
<i>Indicator indicator</i>	Greater Honeyguide			
<i>Indicator minor</i>	Lesser Honeyguide			
<i>Campethera bennettii</i>	Bennett's Woodpecker			
<i>Campethera abingoni</i>	Golden-tailed Woodpecker			
<i>Dendropicos fuscescens</i>	Cardinal Woodpecker			
<i>Dendropicos namaquus</i>	Bearded Woodpecker			
<i>Pogoniulus chrysoconus</i>	Yellow-fronted Tinkerbird			
<i>Tricholaema leucomelas</i>	Acacia Pied Barbet		N-end	
<i>Tockus monteiri</i>	Monteiro's Hornbill	End		
<i>Tockus erythrorhynchus</i>	Red-billed Hornbill			
<i>Tockus damarensis</i>	Damara Hornbill	End	N-end	
<i>Tockus leucomelas</i>	Southern Yellow-billed Hornbill		N-end	
<i>Tockus bradfieldi</i>	Bradfield's Hornbill		N-end	
<i>Tockus nasutus</i>	African Grey Hornbill			
<i>Upupa africana</i>	African Hoopoe			
<i>Phoeniculus purpureus</i>	Green Wood-Hoopoe			
<i>Phoeniculus damarensis</i>	Violet Wood-Hoopoe	E, N-end		
<i>Rhinopomastus cyanomelas</i>	Common Scimitarbill			
<i>Coracias caudatus</i>	Lilac-breasted Roller			
<i>Coracias naevius</i>	Purple Roller			
<i>Halcyon leucocephala</i>	Grey-headed Kingfisher			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Halcyon senegalensis</i>	Woodland Kingfisher			
<i>Halcyon albiventris</i>	Brown-hooded Kingfisher			
<i>Halcyon chelicuti</i>	Striped Kingfisher			
<i>Ceryle rudis</i>	Pied Kingfisher			
<i>Merops hirundineus</i>	Swallow-tailed Bee-eater			
<i>Merops apiaster</i>	European Bee-eater			
<i>Colius colius</i>	White-backed Mousebird		End	
<i>Urocolius indicus</i>	Red-faced Mousebird			
<i>Clamator jacobinus</i>	Jacobin Cuckoo			
<i>Clamator levaillantii</i>	Levaillant's Cuckoo			
<i>Clamator glandarius</i>	Great Spotted Cuckoo			
<i>Cuculus solitarius</i>	Red-chested Cuckoo			
<i>Cuculus clamosus</i>	Black Cuckoo			
<i>Cuculus gularis</i>	African Cuckoo			
<i>Chrysococcyx klaas</i>	Klaas's Cuckoo			
<i>Chrysococcyx caprius</i>	Diederick Cuckoo			
<i>Centropus senegalensis</i>	Senegal Coucal			
<i>Poicephalus meyeri</i>	Meyer's Parrot			
<i>Poicephalus rueppellii</i>	Rüppell's Parrot	NT, N-end	N-end	
<i>Agapornis roseicollis</i>	Rosy-faced Lovebird	End	N-end	
<i>Cypsiurus parvus</i>	African Palm Swift			
<i>Tachymarptis melba</i>	Alpine Swift			
<i>Apus bradfieldi</i>	Bradfield's Swift		N-end	
<i>Apus affinis</i>	Little Swift			
<i>Apus horus</i>	Horus Swift			
<i>Apus caffer</i>	White-rumped Swift			
<i>Corythaixoides concolor</i>	Grey Go-away Bird			
<i>Tyto alba</i>	Barn Owl			
<i>Otus senegalensis</i>	African Scops-Owl			
<i>Ptilopsis granti</i>	Southern White-faced Scops-Owl			
<i>Bubo africanus</i>	Spotted Eagle Owl			
<i>Bubo lacteus</i>	Verreaux's Eagle-Owl			
<i>Glaucidium perlatum</i>	Pearl-spotted Owlet			
<i>Glaucidium capense</i>	African Barred Owlet			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Asio capensis</i>	Marsh Owl			
<i>Caprimulgus pectoralis</i>	Fiery-necked Nightjar			
<i>Caprimulgus tristigma</i>	Freckled Nightjar			
<i>Caprimulgus fossii</i>	Square-tailed Nightjar			
<i>Caprimulgus rufigena</i>	Rufous-cheeked Nightjar			
<i>Columba livia</i>	Rock Dove			
<i>Columba guinea</i>	Speckled Pigeon			
<i>Streptopelia capicola</i>	Cape Turtle Dove			
<i>Streptopelia senegalensis</i>	Laughing Dove			
<i>Turtur chalcospilos</i>	Emerald-spotted Wood-dove			
<i>Oena capensis</i>	Namaqua Dove			
<i>Treron calvus</i>	African Green-Pigeon			
<i>Neotis ludwigii</i>	Ludwig's Bustard	E	N-end	E
<i>Ardeotis kori</i>	Kori Bustard	NT		NT
<i>Lophotis ruficrista</i>	Red-crested Korhaan		N-end	
<i>Afrotis afraoides</i>	Northern Black Korhaan		End	
<i>Lissotis melanogaster</i>	Black-bellied Bustard			
<i>Pterocles namaqua</i>	Namaqua Sandgrouse		N-end	
<i>Pterocles bicinctus</i>	Double-banded Sandgrouse		N-end	
<i>Pterocles burchelli</i>	Burchell's Sandgrouse		N-end	
<i>Burhinus vermiculatus</i>	Water Thick-knee			
<i>Burhinus capensis</i>	Spotted Thick-knee			
<i>Vanellus armatus</i>	Blacksmith Lapwing			
<i>Vanellus senegallus</i>	African Wattled Lapwing			
<i>Vanellus coronatus</i>	Crowned Lapwing			
<i>Rhinoptilus africanus</i>	Double-banded Courser			
<i>Rhinoptilus chalcopterus</i>	Bronze-winged Courser			
<i>Cursorius rufus</i>	Burchell's Courser		N-end	
<i>Cursorius temminckii</i>	Temminck's Courser			
<i>Macheiramphus alcinus</i>	Bat Hawk			
<i>Elanus caeruleus</i>	Black-shouldered Kite			
<i>Gyps africanus</i>	White-backed Vulture	E		CE
<i>Torgos tracheliotos</i>	Lappet-faced Vulture	V		E
<i>Trigonoceps occipitalis</i>	White-headed Vulture	V		CE

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Circaetus pectoralis</i>	Black-chested Snake-Eagle			
<i>Circaetus cinereus</i>	Brown Snake-Eagle			
<i>Terathopius ecaudatus</i>	Bateleur	E		NT
<i>Polyboroides typus</i>	African Harrier-Hawk			
<i>Kaupifalco monogrammicus</i>	Lizard Buzzard			
<i>Melierax metabates</i>	Dark Chanting Goshawk			
<i>Melierax canorus</i>	Southern Pale Chanting Goshawk		N-end	
<i>Melierax gabar</i>	Gabar Goshawk			
<i>Accipiter badius</i>	Shikra			
<i>Accipiter minullus</i>	Little Sparrowhawk			
<i>Accipiter ovampensis</i>	Ovambo Sparrowhawk			
<i>Buteo augur</i>	Augur Buzzard			
<i>Aquila rapax</i>	Tawny Eagle	E		
<i>Aquila verreauxii</i>	Verreaux's Eagle	NT		V
<i>Aquila spilogaster</i>	African Hawk-Eagle			
<i>Hieraaetus pennatus</i>	Booted Eagle	E		
<i>Aquila wahlbergi</i>	Wahlberg's Eagle			
<i>Polemaetus bellicosus</i>	Martial Eagle	E		V
<i>Sagittarius serpentarius</i>	Secretarybird	V		V
<i>Polihierax semitorquatus</i>	Pygmy Falcon			
<i>Falco rupicolus</i>	Rock Kestrel			
<i>Falco rupicoloides</i>	Greater Kestrel			
<i>Falco chicquera</i>	Red-necked Falcon			
<i>Falco cuvierii</i>	African Hobby			
<i>Falco biarmicus</i>	Lanner Falcon			
<i>Falco peregrinus</i>	Peregrine Falcon	NT		
<i>Egretta garzetta</i>	Little Egret			
<i>Ardea cinerea</i>	Grey Heron			
<i>Ardea melanocephala</i>	Black-headed Heron			
<i>Bubulcus ibis</i>	Cattle Egret			
<i>Scopus umbretta</i>	Hamerkop			
<i>Leptoptilos crumeniferus</i>	Marabou Stork	NT		
<i>Oriolus auratus</i>	African Golden Oriole			
<i>Dicrurus adsimilis</i>	Fork-tailed Drongo			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Terpsiphone viridis</i>	African Paradise-Flycatcher			
<i>Nilaus afer</i>	Brubru			
<i>Dryoscopus cubla</i>	Black-backed Puffback			
<i>Tchagra senegalensis</i>	Black-crowned Tchagra			
<i>Tchagra australis</i>	Brown-crowned Tchagra			
<i>Laniarius atrococcineus</i>	Crimson-breasted Shrike		N-end	
<i>Prionops plumatus</i>	White-crested Helmet-Shrike			
<i>Lanioturdus torquatus</i>	White-tailed Shrike	End	N-end	
<i>Batis molitor</i>	Chinspot Batis			
<i>Batis pririt</i>	Pirit Batis		N-end	
<i>Corvus capensis</i>	Cape Crow			
<i>Corvus albus</i>	Pied Crow			
<i>Lanius collaris</i>	Common Fiscal			
<i>Corvinella melanoleuca</i>	Magpie Shrike			
<i>Eurocephalus anguitimens</i>	Southern White-crowned Shrike		N-end	
<i>Campephaga flava</i>	Black Cuckooshrike			
<i>Anthoscopus minutes</i>	Cape Penduline Tit		N-end	
<i>Anthoscopus caroli</i>	Grey Penduline Tit			
<i>Parus niger</i>	Southern Black Tit			
<i>Parus carpi</i>	Carp's Tit	End	N-end	
<i>Parus cinerascens</i>	Ashy Tit		End	
<i>Riparia paludicola</i>	Brown-throated Martin			
<i>Riparia cincta</i>	Banded Martin			
<i>Hirundo albigularis</i>	White-throated Swallow			
<i>Hirundo dimidiata</i>	Pearl-breasted Swallow			
<i>Hirundo cucullata</i>	Greater Striped Swallow			
<i>Hirundo abyssinica</i>	Lesser Striped Swallow			
<i>Hirundo semirufa</i>	Red-breasted Swallow			
<i>Hirundo spilodera</i>	South African Cliff Swallow			
<i>Hirundo fuligula</i>	Rock Martin			
<i>Delichon urbicum</i>	Common House Martin			
<i>Pycnonotus nigricans</i>	African Red-eyed Bulbul		N-end	
<i>Achaetps pycnopygius</i>	Rockrunner	End	N-end	
<i>Sylvietta rufescens</i>	Long-billed Crombec			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Eremomela icteropygialis</i>	Yellow-bellied Eremomela			
<i>Eremomela usticollis</i>	Burnt-necked Eremomela			
<i>Acrocephalus baeticatus</i>	African Reed-Warbler			
<i>Turdoides bicolor</i>	Southern Pied Babbler		End	
<i>Turdoides gymnogenys</i>	Bare-cheeked Babbler	End		
<i>Parisoma subcaeruleum</i>	Chestnut-vented Tit-Babbler		N-end	
<i>Zosterops senegalensis</i>	African Yellow White-eye			
<i>Zosterops pallidus</i>	Orange River White-eye		End	
<i>Cisticola chiniana</i>	Rattling Cisticola			
<i>Cisticola rufilatus</i>	Tinkling Cisticola			
<i>Cisticola subruficapilla</i>	Grey-backed Cisticola		N-end	
<i>Cisticola fulvicapilla</i>	Neddicky			
<i>Cisticola juncidis</i>	Zitting Cisticola			
<i>Cisticola jaridulus</i>	Desert Cisticola			
<i>Prinia flavicans</i>	Black-chested Prinia			
<i>Malcorus pectoralis</i>	Rufous-eared Warbler		End	
<i>Apalis flavida</i>	Yellow-breasted Apalis			
<i>Camaroptera brevicaudata</i>	Grey-backed Camaroptera			
<i>Calamonastes fasciolatus</i>	Barren Wren-Warbler		N-end	
<i>Mirafra passerina</i>	Monotonous Lark			
<i>Mirafra africana</i>	Rufous-naped Lark			
<i>Mirafra fasciolata</i>	Eastern Clapper Lark		N-end	
<i>Mirafra sabota</i>	Sabota Lark			
<i>Calendulauda africanoides</i>	Fawn-coloured Lark		N-end	
<i>Pinarocorys nigricans</i>	Dusky Lark			
<i>Chersomanes albofasciata</i>	Spike-heeled Lark		N-end	
<i>Eremopterix leucotis</i>	Chestnut-backed Sparrowlark			
<i>Eremopterix verticalis</i>	Grey-backed Sparrowlark		N-end	
<i>Calandrella cinerea</i>	Red-capped Lark			
<i>Alauda starki</i>	Stark's Lark		N-end	
<i>Spizocorys conirostris</i>	Pink-billed Lark		N-end	
<i>Monticola brevipes</i>	Short-toed Rock Thrush			
<i>Psophocichla litsitsirupa</i>	Groundscraper Thrush			
<i>Turdus libonyana</i>	Kurrichane Thrush			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Bradornis infuscatus</i>	Chat Flycatcher		N-end	
<i>Melaenornis mariquensis</i>	Marico Flycatcher		N-end	
<i>Muscicapa striata</i>	Spotted Flycatcher			
<i>Cercotrichas leucophrys</i>	White-browed Scrub-Robin			
<i>Cercotrichas paena</i>	Kalahari Scrub-Robin			
<i>Oenanthe monticola</i>	Mountain Wheatear		N-end	
<i>Oenanthe pileata</i>	Capped Wheatear			
<i>Cercomela familiaris</i>	Familiar Chat			
<i>Myrmecocichla formicivora</i>	Ant-eating Chat		End	
<i>Onychognathus naboroupp</i>	Pale-winged Starling		N-end	
<i>Lamprotornis nitens</i>	Cape Glossy Starling			
<i>Lamprotornis chalybaeus</i>	Greater Blue-eared Starling			
<i>Lamprotornis australis</i>	Burchell's Starling			
<i>Cinnyricinclus leucogaster</i>	Violet-backed Starling			
<i>Creatophora cinerea</i>	Wattled Starling			
<i>Chalcomitra amethystina</i>	Amethyst Sunbird			
<i>Chalcomitra senegalensis</i>	Scarlet-chested Sunbird			
<i>Cinnyris talatala</i>	White-bellied Sunbird			
<i>Nectarinia fusca</i>	Dusky Sunbird		N-end	
<i>Cinnyris mariquensis</i>	Marico Sunbird			
<i>Bualornis niger</i>	Red-billed Buffalo-Weaver			
<i>Sporopipes squamifrons</i>	Scaly-feathered Finch		N-end	
<i>Plocepasser mahali</i>	White-browed Sparrow-Weaver			
<i>Philetairus socius</i>	Sociable Weaver		End	
<i>Ploceus intermedius</i>	Lesser Masked-Weaver			
<i>Ploceus velatus</i>	Southern Masked-Weaver			
<i>Ploceus rubiginosus</i>	Chestnut Weaver			
<i>Anaplectes melanotis</i>	Red-headed Weaver			
<i>Quelea quelea</i>	Red-billed Quelea			
<i>Euplectes afer</i>	Yellow-crowned Bishop			
<i>Euplectes orix</i>	Southern Red Bishop			
<i>Ortygospiza atricollis</i>	African Quailfinch			
<i>Amadina erythrocephala</i>	Red-headed Finch		N-end	
<i>Amadina fasciata</i>	Cut-throat Finch			

Species: Scientific name	Species: Common name	Status: Namibia	International Status	
			Southern Africa	IUCN
<i>Estrilda erythronotos</i>	Black-faced Waxbill			
<i>Estrilda astrild</i>	Common Waxbill			
<i>Granatina granatina</i>	Violet-eared Waxbill			
<i>Uraeginthus angolensis</i>	Blue Waxbill			
<i>Pytilia melba</i>	Green-winged Pytilia			
<i>Vidua macroura</i>	Pin-tailed Whydah			
<i>Vidua paradisaea</i>	Long-tailed Paradise-Whydah			
<i>Vidua regia</i>	Shaft-tailed Whydah			
<i>Passer domesticus</i>	House Sparrow			
<i>Passer motitensis</i>	Great Sparrow		N-end	
<i>Passer melanurus</i>	Cape Sparrow		N-end	
<i>Passer griseus</i>	Southern Grey-headed Sparrow			
<i>Petronia superciliaris</i>	Yellow-throated Petronia			
<i>Motacilla aguimp</i>	African Pied Wagtail			
<i>Motacilla capensis</i>	Cape Wagtail			
<i>Anthus cinnamomeus</i>	African Pipit			
<i>Anthus leucophrys</i>	Plain-backed Pipit			
<i>Anthus vaalensis</i>	Buffy Pipit			
<i>Crithagra atrogulariis</i>	Black-throated Canary			
<i>Serinus flaviventris</i>	Yellow Canary		N-end	
<i>Serinus albogularis</i>	White-throated Canary		N-end	
<i>Emberiza impetuani</i>	Lark-like Bunting		N-end	
<i>Emberiza tahapisi</i>	Cinnamon-breasted Bunting			
<i>Emberiza capensis</i>	Cape Bunting		N-end	
<i>Emberiza flaviventris</i>	Golden-breasted Bunting			

Simmons *et al.* (2015): E = Endangered; V = Vulnerable; NT = Near threatened

End = Endemic (Brown *et al.* 1998)

N-end = Near-endemic (Simmons *et al.* 2015)

Endemic and near endemic – southern African status (Hockey *et al.* 2006)

IUCN (2020): CE = Critically Endangered; E = Endangered; V = Vulnerable; NT = Near Threatened

[This table excludes migratory birds (e.g. Petrel, Albatross, Skua, etc.); species breeding extralimital (e.g. stints, sandpipers, etc.) and aquatic birds (e.g. ducks, herons, etc.) and rather focuses on birds that are breeding residents or can be found in the area during any time of the year. This

would imply that many more birds (e.g. Palaearctic migrants and aquatic species) could occur in the area depending on “favourable” environmental conditions]

Source for literature review: Brown *et al.* (1998), Hockey *et al.* (2006), IUCN (2020), Komen (n.d.), Maclean (1985), Simmons *et al.* (2015) and Tarboton (2001)

et al. 2015). Furthermore, Simmons *et al.* (2015) classifies 2 species as near endemic which were previously seen as endemic (i.e. violet wood-hoopoe and Rüppel's parrot). The IUCN (2020) classifies 2 species as critically endangered (white-backed vulture, white-headed vulture), 2 species as endangered (Ludwig's bustard and lappet-faced vulture), 3 species as vulnerable (Verreaux's eagle, martial eagle and secretarybird) and 2 species as near threatened (kori bustard, bateleur).

Fifty five (21.1% of all the birds expected) species have a southern African conservation rating with 8 species classified as endemic (14.5% of southern African endemics or 3.1% of all the birds expected) and 47 species classified as near endemic (85.5% of southern African endemics or 18% of all the birds expected) (Hockey *et al.* 2006).

The most important endemic species known/expected to occur in the general area are viewed as Hartlaub's spurfowl (*Pternistis hartlaubi*), Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), Carp's tit (*Parus carpi*), rockrunner (*Achaetops pycnopygius*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppel's parrot (*Poicephalus rueppellii* – near-endemic). The most important species are those listed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and near threatened (Rüppel's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) from Namibia as well as the species classified as critically endangered (white-backed vulture, white-headed vulture), endangered (Ludwig's bustard and lappet-faced vulture), vulnerable (Verreaux's eagle, martial eagle and secretarybird) and near threatened (kori bustard, bateleur) by the IUCN (2020).

However, none of the birds are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on the ground nesting bird species as these are usually cryptic (i.e. difficult to see) and will only flee oncoming heavy vehicles at the last moment. The most important ground nesting birds would include the Hartlaub's spurfowl (endemic), Ludwig's bustard (endangered), kori bustard (near threatened) and rockrunner (endemic). Although the adult birds will disperse when disturbed, eggs and chicks will be destroyed. Most other birds would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity nesting and crown nesting species). The most important cavity nesting birds would include the Monteiro's and Damara hornbills (both endemics), violet wood-hoopoe (endangered and near endemic), Rüppel's parrot (near threatened and near endemic), rosy-faced lovebird, Carp's tit and rockrunner (all endemic). The most important crown nesting birds would include the white-backed, white-headed and lappet-faced vultures (the first 2 species are listed as critically endangered by the IUCN (2020), bateleur, booted eagle, martial eagle (all endangered), secretarybird (vulnerable) and Verreaux's eagle, marabou stork (both near threatened). Raptor, especially vulture, numbers are decreasing alarmingly throughout their range and they often abandon their nests (which are often reused) when disturbed.

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. Ludwig's and kori bustards, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. small birds with ball/cup shaped nests favouring inaccessible

thorny shrubs such as eromomela, finches, sunbirds, white-eyes, etc. (See: Cunningham and Joubert 2011).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.5 Tree and Shrub Diversity

The tree and shrub diversity known, and/or expected to occur in the general Kombat area, is presented in Table 5 below.

The trees and shrubs known, and/or expected to occur in the general Kombat area (derived from Mannheimer and Curtis 2018) is presented in Table 5 below. Species indicated are known from the quarter-degree square distribution principle used and don't necessarily occur throughout the entire area.

Table 5. Tree and shrub diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Status: Namibia	International Status:	
		IUCN	CITES
<i>Acacia ataxacantha</i>			
<i>Acacia erioloba</i>	Protected (F#)		
<i>Acacia erubescens</i>			
<i>Acacia fleckii</i>			
<i>Acacia hebeclada</i>			
<i>Acacia hereroensis</i>			
<i>Acacia karroo</i>			
<i>Acacia kirkii</i>			
<i>Acacia luederitzii</i>			
<i>Acacia mellifera</i>			
<i>Acacia nebrownii</i>			
<i>Acacia nilotica</i>			
<i>Acacia reficiens</i>			
<i>Acacia senegal</i>			
<i>Acacia tortilis</i>			
<i>Adansonia digitata</i>	Protected (F#)		
<i>Adenium boehmianum</i>	Protected (F#)		
<i>Albizia anthelmintica</i>	Protected (F#)		
<i>Aloe littoralis</i>	NC		C2
<i>Bauhinia petersiana</i>			
<i>Berchemia discolor</i>	Protected (F#)		
<i>Boscia albitrunca</i>	Protected (F#)		
<i>Boscia foetida</i>			
<i>Burkea africana</i>	Protected (F#)	LC	
<i>Caesalpinia rubra</i>			
<i>Carissa bispinosa</i>			
<i>Carissa edulis</i>			
<i>Cassia abbreviata</i>			
<i>Catophractes alexandri</i>			
<i>Cissus nymphaeifolia</i>			
<i>Combretum apiculatum</i>			
<i>Combretum collinum</i>			
<i>Combretum engleri</i>			
<i>Combretum hereroense</i>			
<i>Combretum mossambicense</i>			
<i>Combretum imberbe</i>	Protected (F#)	LC	

Desktop study: Vertebrate Fauna & Flora - Cunningham

Species: Scientific name	Status: Namibia	InternationalStatus:	
		IUCN	CITES
<i>Combretum psidioides</i>			
<i>Combretum zeyheri</i>			
<i>Commiphora africana</i>		LC	
<i>Commiphora angolensis</i>			
<i>Commiphora glandulosa</i>		LC	
<i>Commiphora glaucescens</i>	N-end	LC	
<i>Commiphora mollis</i>		LC	
<i>Commiphora pyracanthoides</i>		LC	
<i>Commiphora tenuipetiolata</i>		LC	
<i>Cordia sinensis</i>			
<i>Croton gratissimus</i>			
<i>Croton menyharthii</i>			
<i>Cyphostemma juttae</i>	Protected (F#); End; NC		
<i>Dichrostachys cinerea</i>			
<i>Diospyros lycioides</i>			
<i>Dombeya rotundifolia</i>			
<i>Ehretia alba</i>			
<i>Ehretia namibiensis</i>			
<i>Elaeodendron transvaalense</i>			
<i>Elephantorrhiza suffruticosa</i>			
<i>Entada arenaria</i>			
<i>Erythrina decora</i>	Protected (F#); End		
<i>Erythrococca menyharthii</i>			
<i>Euclea divinatorum</i>			
<i>Euclea undulata</i>			
<i>Euphorbia avasmontana</i>			C2
<i>Euphorbia guerichiana</i>			C2
<i>Euphorbia transvaalensis</i>			
<i>Faidherbia albida</i>	Protected (F#)	LC	
<i>Ficus burkei/petersii</i>	Protected (F#)		
<i>Ficus cordata</i>	Protected (F#)	LC	
<i>Ficus ilicina</i>			
<i>Ficus sycomorus</i>	Protected (F#)	LC	
<i>Flueggea virosa</i>			
<i>Fockea multiflora</i>			
<i>Grewia avellana</i>			
<i>Grewia bicolor</i>			
<i>Grewia falcistipula</i>			
<i>Grewia flava</i>			
<i>Grewia flavescens</i>			
<i>Grewia olukondae</i>			
<i>Grewia retinervis</i>			
<i>Grewia schinzii</i>			
<i>Grewia subspathulata</i>			
<i>Grewia tenax</i>			
<i>Grewia villosa</i>			
<i>Gossypium triphyllum</i>			
<i>Gymnosporia buxifolia</i>			
<i>Gymnosporia senegalensis</i>			
<i>Gyrocarpus americanus</i>			
<i>Heteromorpha stenophylla</i>			
<i>Hyphaene petersiana</i>	Protected (F#)	LC	
<i>Ipomoea adenioides</i>			
<i>Kirkia acuminata</i>			
<i>Laggera decurrens</i>			
<i>Lannea discolor</i>	Protected (F#)	LC	

Desktop study: Vertebrate Fauna & Flora - Cunningham

Species: Scientific name	Status: Namibia	InternationalStatus:	
		IUCN	CITES
<i>Lycium cinereum</i>			
<i>Maerua juncea</i>			
<i>Maerua parvifolia</i>			
<i>Maerua schinzii</i>	Protected (F#)	LC	
<i>Melianthus comosus</i>			
<i>Montinia caryophyllacea</i>			
<i>Moringa ovalifolia</i>	Protected (F#); NC; N-end		
<i>Mundulea sericea</i>			
<i>Obetia carruthersiana</i>	N-end		
<i>Ochna pulchra</i>			
<i>Olea europaea</i>			
<i>Opilia campestris</i>			
<i>Osyris lanceolata</i>			
<i>Ozoroa crassinervia</i>			
<i>Ozoroa insignis</i>			
<i>Ozoroa paniculosa</i>			
<i>Ozoroa schinzii</i>	N-end		
<i>Pachypodium lealii</i>	Protected (F#); NC; N-end		
<i>Pavetta zeyheri</i>			
<i>Peltophorum africanum</i>			
<i>Philenoptera nelsii</i>			
<i>Pouzolzia mixta</i>			
<i>Pseudolachnostylis maprouneifolia</i>			
<i>Psydrax livida</i>			
<i>Rhigozum brevispinosum</i>			
<i>Rhigozum trichotomum</i>			
<i>Rothea myricoides</i>			
<i>Salsola</i> spp.			
<i>Schinziohyton rautanenii</i>	Protected (F#)	LC	
<i>Sclerocarya birrea</i>	Protected (F#)		
<i>Searsia ciliata</i>			
<i>Searsia lancea</i>	Protected (F#)	LC	
<i>Searsia marlothii</i>			
<i>Searsia pyroides</i>			
<i>Searsia tenuinervis</i>			
<i>Securidaca longependunculata</i>			
<i>Spirostachys africana</i>	Protected (F#)	LC	
<i>Steganothaenia araliacea</i>			
<i>Sterculia africana</i>	Protected (F#)	LC	
<i>Tarchonanthus camphoratus</i>			
<i>Terminalia brachystemma</i>			
<i>Terminalia prunioides</i>			
<i>Terminalia sericea</i>			
<i>Tetradenia riparia</i>			
<i>Tinnea eriocalyx</i>			
<i>Tinnea rhodesiana</i>			
<i>Vangueria cyanescens</i>			
<i>Vangueria infausta</i>			
<i>Vangueria lanciflora</i>			
<i>Vernonia cinerascens</i>			
<i>Ximenia americana</i>			
<i>Ximenia caffra</i> var. <i>caffra</i>			
<i>Ziziphus mucronata</i>	Protected (F#)	LC	

Endemic = End and Near-endemic = N-end (Mannheimer and Curtis 2018)

F# = Forest Act No. 12 of 2001

NC = Nature Conservation Ordinance No. 4 of 1975

C2 = CITES Appendix 2 species

LC = Least Concern (IUCN 2020)

Source for literature review: Mannheimer and Curtis (2018), Steyn (2003)

Plant diversity is viewed as “high” in the general area with an estimated 400-499 species and 2-5 species being endemic (Mendelsohn *et al.* 2000). Furthermore, the Karst area (limestone areas of the Otavi-Groofofontein-Tsumeb hills) is known as a hotspot for local endemics (Mendelsohn *et al.* 2000). According to Barnard (1998) the Otavi Mountains are known for their high biodiversity richness and endemism and views the general area as a top priority for conservation protection. Maggs (1998) refers to the Karsveld area as a species-rich “island” which supports relic populations of southern vascular plants and a refuge to mosses and ferns due to the higher altitudes, cooler temperatures and sheltered sites.

At least 145 species of larger trees and shrubs (>1m in height) are known and/or expected to occur in the general area of which 2 species are classified as endemic (1.4%) and 5 species as near endemic (3.5%).

Thirty six (24.8%) species of larger trees and shrubs have some kind of protected status in the general area (this includes endemic and near endemic species) of which 25 species are protected by the Forest Act No. 12 of 2001(17.2%), 4 species are protected by the Nature Conservation Ordinance No. 4 of 1975 (2.8%) and 3 species are listed as CITES Appendix 2 species (2.1%). The IUCN (2020) classifies 19 species as least concern (13.1%) although not all the species have been assessed by the IUCN Red List.

The most important larger tree and shrub species are viewed as *Cyphostemma juttae* (endemic, protected by Forest Act and Nature Conservation Ordinance) and *Erythrina decora* (endemic, protected by Forest Act) from the general area.

The Farm Gai Kaisa No. 159 is located to the south of the most important parts of the Mountain and Karstveld although there are limestone outcrops (See Figure 1) which potentially have some of the important species mentioned in Table 5.

However, none of the larger trees and shrubs is expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

*The plants expected to be impacted would be those important species typically associated with the Karst formations (i.e. dolomite outcrops/ridges/hills) such as the endemic *Cyphostemma juttae* and *Erythrina decora* and various *Aloe* species. However, although the rocky terrain is usually unsuitable for mechanical operations, these important areas should nevertheless be avoided and excluded from harvesting activities.*

Various protected tree species occur in the areas potentially suitable for mechanical harvesting operations. These trees (See Table 5), especially the larger specimens, should be avoided as they potentially serve as habitat to a variety of vertebrate fauna (Further, see the Forest Act for tree harvesting limitations – i.e. 18cm diameter, etc.).

*Larger tree specimens (including protected species – e.g. *Searsia lancea*, *Ziziphus mucronata*, etc.) are usually associated with ephemeral drainage lines and pans in the general area. These areas should be avoided as the trees potentially serve as habitat to a*

variety of vertebrate fauna and stabilise soils around these drainage lines (Further, see the Forest Act for harvesting limitations – i.e. 100m from streams, etc.).

A mosaic harvesting approach (i.e. patch harvesting which results in a variety of openness, but still includes dense patches) is recommended as this would increase the ecotone area around these patches and consequently associated biodiversity. Bad planning and execution could result in mechanised harvesting “over harvesting” areas with dire consequences to the ecology of the area.

Connectivity of areas is recommended as these corridors serve as thoroughfare for various vertebrate species. The most important habitats should be connected – i.e. rocky areas, pans and drainage lines. Bad planning and execution could result in mechanised harvesting eliminating connectivity with dire consequences to the ecology of the area.

Dichrostachys cinerea (sicklebush) is known to react aggressively when disturbed by mechanical means – i.e. become exceedingly dense. Areas dominated by this species should not be harvested mechanically to avoid the area becoming even more dense and inaccessible than prior to harvesting operations (e.g. De Wet 2015, Smit et al. 2015, Tainton 1999).

Soil disturbances are a common feature of mechanical harvesting depending on the type of vehicles used; soil type; aspect; slope, etc. (De Klerk 2004, SAIEA 2016). Wheel mounted Bell Loggers, as envisaged for this operation, would result in less disturbances than track mounted vehicles. Nevertheless, rocky areas (erosion) and clay soils (compaction and tracks in wet season) should be avoided and harvesting should rather be limited to areas with sandy soils where fewer problems are expected.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to trees/shrubs at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of browse) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.6 Grass Diversity

The grass diversity known, and/or expected to occur in the general Kombat area, is presented in Table 6 below.

The grasses known and/or expected to occur in the general Kombat area (¹Müller 1984, ²Van Oudtshoorn 1999, and ³Müller 2007) is presented in Table 6 below.

Table 6. Grass diversity known and/or expected to occur in the general Kombat area – i.e. north-central Namibia.

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
^{2,3} <i>Andropogon chinensis</i>		Decreaser	High
¹ <i>Andropogon schinzii</i>		Decreaser	High
^{1,2,3} <i>Anthephora pubescens</i>		Decreaser	High
^{1,3} <i>Anthephora schinzii</i>		?	Low
^{1,2,3} <i>Aristida adscensionis</i>		Increaser 2	Low
^{1,2,3} <i>Aristida congesta</i>		Increaser 2	Low
^{2,3} <i>Aristida stipitata</i>		Increaser 2	Low

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
^{1,3} <i>Aristida effusa</i>		?	Low
^{1,2,3} <i>Aristida meridionalis</i>		Increaser 3	Low
^{1,2,3} <i>Aristida rhiniochloa</i>		Increaser 2	Low
^{1,3} <i>Aristida stipitata</i>		Increaser 2	Low
³ <i>Aristida stipoides</i>		?	Low
^{1,2,3} <i>Brachiaria deflexa</i>		Increaser 2	Average
² <i>Brachiaria eruciformis</i>		Increaser 2	Average
^{1,2} <i>Bothriochloa radicans</i>		Increaser 2	Low
³ <i>Brachiaria malacodes</i>		Increaser 2	Low
^{1,2} <i>Brachiaria marlothii</i>		Increaser 2	Low
^{1,2,3} <i>Brachiaria nigropedata</i>		Decreaser	High
¹ <i>Brachiaria poaeoides</i>		?	Average
^{1,2,3} <i>Cenchrus ciliaris</i>		Decreaser	High
² <i>Centropodia glauca</i>		Decreaser	High
^{1,2,3} <i>Chloris virgata</i>		Increaser 2	Average
^{1,2,3} <i>Cymbopogon caesius</i>		Increaser 1	Low
² <i>Cymbopogon plurinodis</i>		Increaser 1	Low
^{1,3} <i>Cymbopogon pospischilii</i>		Increaser 1	Low
^{1,2,3} <i>Cynodon dactylon</i>		Increaser 2	High
^{1,2,3} <i>Dactyloctenium aegyptium</i>		Increaser 2	Average
^{1,3} <i>Danthoniopsis ramosa</i>		?	Average
^{2,3} <i>Dichanthium annulatum</i>		Decreaser	High
¹ <i>Dichanthium papillosum</i>		Decreaser	High
^{1,2,3} <i>Digitaria eriantha</i>		Decreaser	High
^{2,3} <i>Digitaria velutina</i>		Increaser 2	Low
² <i>Diplachne fusca</i>		Decreaser	High
^{1,2,3} <i>Echinochloa holubii</i>		Increaser 2	Average
² <i>Eleusine coracana</i>		Increaser 2	Low
^{1,2,3} <i>Elionurus muticus</i>		Increaser 3	Low
^{1,2,3} <i>Enneapogon cenchroides</i>		Increaser 2	Average
^{1,2,3} <i>Enneapogon desvauxii</i>		Intermediate	Average
³ <i>Enneapogon scaber</i>		?	Low
^{1,2,3} <i>Enneapogon scoparius</i>		Increaser 3	Low
^{1,3} <i>Entoplocamia aristulata</i>		?	Average
^{1,3} <i>Eragrostis annulata</i>		?	Low
^{2,3} <i>Eragrostis bicolor</i>		?	Low
^{1,2,3} <i>Eragrostis biflora</i>		Increaser 2	Low
² <i>Eragrostis cilianensis</i>		Increaser 2	Low
² <i>Eragrostis curvula</i>		Increaser 2	High
^{1,3} <i>Eragrostis cylindriflora</i>		Increaser 2	Low
³ <i>Eragrostis dinteri</i>		Increaser 2	Average
^{1,2,3} <i>Eragrostis echinochloidea</i>		Increaser 2	Average
² <i>Eragrostis gummiflua</i>		Increaser 2	Low
^{1,2,3} <i>Eragrostis lehmanniana</i>		Increaser 2	Average
^{1,2,3} <i>Eragrostis nindensis</i>		Increaser 2	Average
^{1,3} <i>Eragrostis omahekensis</i>	End	Increaser 2	Low
^{1,3} <i>Eragrostis porosa</i>		Increaser 2	Low
^{1,2,3} <i>Eragrostis rigidior</i>		Increaser 2	Average
^{1,2,3} <i>Eragrostis rotifer</i>		?	Average
^{1,3} <i>Eragrostis scopelophila</i>	End	Decreaser	Average
^{1,2,3} <i>Eragrostis superba</i>		Increaser 2	Average
^{1,2,3} <i>Eragrostis trichophora</i>		Increaser 2	Average
¹ <i>Eragrostis truncata</i>		?	Average
^{2,3} <i>Eragrostis viscosa</i>		Increaser 2	Low
^{1,2,3} <i>Fingerhuthia africana</i>		Decreaser	Average
^{1,2,3} <i>Heteropogon contortus</i>		Increaser 2	Average
^{1,2,3} <i>Hyparrhenia hirta</i>		Increaser 1	Average

Species: Scientific name	Status: Namibia	Ecological Status	Grazing Value
² <i>Imperata cylindrica</i>		Increaser 1	Low
³ <i>Leptochloa fusca</i>		?	Average
^{1,2,3} <i>Melinis repens</i>		Increaser 2	Low
^{1,2,3} <i>Microchloa caffra</i>		Increaser 2	Low
^{1,3} <i>Monelytrum leuderitzianum</i>		?	Low
³ <i>Odyssea paucinervis</i>		?	Low
^{2,3} <i>Oropetium capense</i>		Increaser 2	Low
^{1,2,3} <i>Panicum coloratum</i>		Decreaser	High
^{1,3} <i>Panicum lanipes</i>		?	High
^{1,2,3} <i>Panicum maximum</i>		Decreaser	High
³ <i>Panicum novemnerve</i>		?	Low
³ <i>Panicum repens</i>		Decreaser	High
^{1,3} <i>Panicum stapfianum</i>		Decreaser	High
^{1,3} <i>Pennisetum foermeranum</i>	End	?	Low
^{1,3} <i>Pogonarthria fleckii</i>		Increaser 2	Low
^{1,2,3} <i>Pogonarthria squarrosa</i>		Increaser 2	Low
^{2,3} <i>Schizachyrium sanguineum</i>		Increaser 1	Low
^{1,2,3} <i>Schmidtia kalahariensis</i>		Increaser 2	Low
^{1,2,3} <i>Schmidtia pappophoroides</i>		Decreaser	High
^{1,3} <i>Setaria finita</i>	End	?	Low
² <i>Setaria incrassata</i>		Decreaser	High
² <i>Setaria pallide-fusca</i>		Increaser 2	Average
^{1,2,3} <i>Setaria verticillata</i>		Increaser 2	Average
³ <i>Sorghum bicolor</i>		?	High
^{2,3} <i>Sporobolus festivus</i>		Increaser 2	Low
^{1,2,3} <i>Sporobolus fimbriatus</i>		Decreaser	High
^{1,2,3} <i>Sporobolus ioclados</i>		Increaser 2	Average
² <i>Sporobolus pyramidalis</i>		Increaser 2	Low
^{1,2} <i>Stipagrostis ciliata</i>		Decreaser	High
^{1,2,3} <i>Stipagrostis hirtigluma</i>		Increaser 2	Low
^{1,3} <i>Stipagrostis hochstetteriana</i>		Decreaser	High
^{1,2,3} <i>Stipagrostis namaquensis</i>		?	Average
^{1,2,3} <i>Stipagrostis obtusa</i>		Decreaser	High
^{1,2,3} <i>Stipagrostis uniplumis</i>		Increaser 2	Average
^{1,2} <i>Themeda triandra</i>		Decreaser	High
^{2,3} <i>Tragus berteronianus</i>		Increaser 2	Low
³ <i>Tragus racemosus</i>		Increaser 2	Low
^{1,2,3} <i>Tricholaena monachne</i>		Increaser 2	Average
² <i>Trichoneura grandiglumis</i>		Increaser 2	Low
¹ <i>Triraphis purpurea</i>		Increaser 1	Low
^{1,3} <i>Triraphis ramosissima</i>		?	High
¹ <i>Urochloa bolbodes</i>		Decreaser	High
³ <i>Urochloa brachyura</i>		?	Average
^{2,3} <i>Urochloa oligotricha</i>		Decreaser	High
^{2,3} <i>Urochloa panicoides</i>		Increaser 2	High
³ <i>Urochloa trichopus</i>		?	Low
³ <i>Willkommia sarmentosa</i>		?	High

End = Endemic (Müller 2007)

? – not classified in literature, but often similar to other species within the genus

Source for literature review: Müller (1984), Müller (2007), Van Oudtshoorn (1999)

Up to 111 grasses are expected in the general Kombat area of which 4 species are viewed as endemic (*Eragrostis omahekensis*, *Eragrostis scopelophila*, *Pennisetum foermeranum* and *Setaria finita*). *Pennisetum foermeranum* is associated with rocky mountainous terrain and consequently only expected in such suitable habitat. *Eragrostis omahekensis* is virtually

only found on disturbed soils – e.g. close to watering points – while *Eragrostis scopelophila* is associated with mountainous areas under trees and shrubs.

The most important grass is viewed as the endemic *Setaria finite* which is associated with drainage lines in the general area and never very common wherever it occurs.

However, none of the important grasses are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

Grass biomass is expected and known to increase dramatically after bush thinning although these consist almost entirely of annual grasses which are not as palatable and/or resilient to drought and fire as perennial grass species. Only by controlling the livestock stocking rate; employ rotational grazing and rest, will the overall grass species compositions improve over time – i.e. with active visionary adaptive management and sound farming practices. Understanding the grass-tree interactions (positive and negative) is paramount in the recovery of the grazing sward (e.g. Tainton 1999).

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) and increased grass growth – e.g. grazing ungulates, cheetah, domestic stock, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. various browsers (kudu), small elusive ungulates (dik dik), etc. All wildlife require shade and shelter as part of their basic habitat requirements and a drastic change from a bush thickened area to an open grassland area would negatively affect most species. It is therefore imperative to find the correct balance of trees/shrubs/grasses.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to grass at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of grazing) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

3.7 Other Species

Aloes

Aloe species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – include 3 other species not included in Table 5, but which potentially occur in the general Kombat area, and also viewed as important are *Aloe dinteri*, *A. hereroensis* and *A. zebrina* (Rothmann 2004).

Commiphoras

Many endemic *Commiphora* species are found throughout Namibia with Steyn (2003) indicating that *Commiphora crenato-serrata* (not included in the Table 5) potentially also occurring in the general area. Furthermore, some species are also known to have an economic potential – i.e. resin properties of *C. wildii* used in the perfume industry (Knott and Curtis 2006) – which makes them an important group of plants.

Ferns

At least 64 species of ferns, of which 13 species being endemic, occur throughout Namibia. Ferns in the general area include at least 31 indigenous species (*Actiniopteris radiata*, *Adiantum capillus-veneris*, *A. incisum*, *A. poiretii*, *Asplenium cordatum*, *Blechnum australe*, *Cheilanthes dinteri*, *C. dura*, *C. eckloniana*, *C. involuta*, *C. marlothii*, *C. multifida*, *C. pentagona*, *C. viridis*, *Christella chaseana*, *Doryopteris concolor*, *Marsilea aegyptiaca*, *M. ephippiocarpa*, *M. farinosa*, *M. marcocarpa*, *M. nubica*, *M. unicornis*, *M. vera*, *Microlepia speluncae*, *Ophioglossum polyphyllum*, *O. reticulatum*, *O. sandieae*, *Pellaea calomelanos*, *P. pectiniformis*, *Pteris vittata*, *Thelypteris confluens*) with no endemics known/expected (Crouch *et al.* 2011).

Although ferns require specific habitat – often rocky substrate – the general area is undercollected with more species probably occurring than presented above.

Lichens

The overall diversity of lichens is poorly known from Namibia, especially the coastal areas and statistics on endemism is even sparser (Craven 1998). More than 100 species are expected to occur in the Namib Desert with the majority being uniquely related to the coastal fog belt. Lichen diversity is related to air humidity and generally decreases inland from the Namibian coast (Schultz and Rambold 2007). Off road driving is the biggest threat to these lichens which are often rare and unique to Namibia. To indicate how poorly known lichens are from Namibia, the recent publication by Schultz *et al.* (2009) indicating that 37 of the 39 lichen species collected during BIOTA surveys in the early/mid 2000's were new to science (i.e. new species), is a case in point.

Although lichens require specific habitat – often rocky substrate – there are species that live on the bark of trees, usually the cooler southern side of the trees (often *Acacia* spp.) in the general area.

Lithops

Lithops species – all protected (See Nature Conservation Ordinance No. 4 of 1975) – are not known to occur in the Kombat area with the closest species associated with the Otjiwarongo (*Lithops pseudotruncatella* var. *elisabethiae*) area (Cole and Cole 2005).

Other

Other species with commercial potential that could occur in the general area include *Harpagophytum procumbens* (Devil's claw) – harvested for medicinal purposes and often over-exploited – and *Citrullus lanatus* (Tsamma melon) which potentially has a huge economic benefit (Mendelsohn *et al.* 2002).

Although the focus of this survey was on the larger trees, shrubs, grasses and more important other species potentially occurring in the general area, many more species – e.g. especially herbs – occur throughout the area and are viewed as important.

4. Conclusion

The proposed development area – Farm Gai Kaisa – does not fall within the biodiversity important Karst formations located further to the north around Kombat, although there are a few Karst ridges located on the northwest portion of the farm (See Figure 1). Furthermore, the area is not pristine and much harvesting for charcoal production has already altered most of the landscape – i.e. disturbed areas with secondary growth, etc. (See Figure 1).

Reptiles

The most important species are viewed as leopard tortoise (*Stigmochelys pardalis*), Kalahari tent tortoise (*Psammobates oculiferus*), Anchieta's dwarf python (*Python anchieta*), Southern African python (*P. natalensis*), monitor lizard (*Varanus albigularis*), Angola file

snake (*Mehelya vernayi*) and 2 relatively recent discoveries of 2 new species of *Pachydactylus* spp. from the Karst Mountains – i.e. *Pachydactylus boehmei* (Bauer 2010) and *P. otaviensis* (Bauer *et al.* 2006).

However, none of the reptiles are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving reptile species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the two tortoise species known/expected to occur in the area. Tortoises are the reptile family of greatest national concern and most under threat in Namibia (Griffin 1998a).

Furthermore, unsustainable exploitation (i.e. poaching) and alteration of habitat are two main categories of threat to most reptiles in Namibia (Griffin 1998a).

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as agama, gecko, monitor lizard, etc.).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Amphibians

The most important species is viewed as the giant bullfrog (*Pyxicephalus adspersus*) although they are widespread in Namibia and not exclusively associated with the Kombat area in particular. Permanent water bodies viewed as amphibian habitat in the area include the various fountains known to occur in the Karst formations in the surrounding hills. Other potential habitats in the area include ephemeral pans, farm reservoirs and earth dams although the latter are also dependant on localised showers and temporary of nature.

However, none of the amphibians are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on amphibian habitat if ephemeral water features, especially pans and ground dams are disturbed and/or radically altered. On the other hand, bush thinning may increase groundwater levels and consequently result in more water for fountains and pans and thus improve amphibian habitat or result in more runoff and erosion and thus less water penetration into the groundwater system. This would depend on the scale and intensity of the harvesting operation.

Mammals

The most important species are viewed as those classified as vulnerable (ground pangolin, cheetah, leopard, black-footed cat, giraffe) and near threatened (African straw-coloured bat, striped leaf-nosed bat, brown hyena) by the IUCN (2020) and those species classified as rare (greater long-fingered bat, lesser woolly bat, Southern African hedgehog, black-footed cat), and vulnerable (South African galago, ground pangolin, aardwolf, brown hyena, cheetah, African wildcat, bat-eared fox, Cape fox, giraffe, eland), under the Namibian legislation.

However, none of the mammals are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on slow moving mammal species as these are usually cryptic (i.e. difficult to see) and sedentary (i.e. small home ranges) and will not be able and/or willing to flee oncoming heavy vehicles. This is especially true for the ground pangolin and South African hedgehog known/expected to occur in the area. However, they are nocturnal and usually utilise aardvark and other burrows during daylight hours. Most other larger mammals – e.g. carnivores and ungulates – would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity and bark dwelling species such as bats, galago, etc.).

Furthermore, habitat alteration and overutilization are the two primary processes threatening most mammals in Namibia (Griffin 1998c). On the other hand, habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. cheetah, oryx, springbok, etc.

These negative impacts would depend on the scale and intensity of the harvesting operation.

Birds

The most important species are viewed as the endemic species such as Hartlaub's spurfowl (*Pternistis hartlaubi*), Monteiro's hornbill (*Tockus monteiri*), Damara hornbill (*Tockus damarensis*), Carp's tit (*Parus carpi*), rockrunner (*Achaetops pycnopygius*), bare-cheeked babbler (*Turdoides gymnogenys*) and Rüppell's parrot (*Poicephalus rueppellii* – near-endemic). The most important species are those listed as endangered (violet wood-hoopoe, Ludwig's bustard, white-backed vulture, bateleur, tawny eagle, booted eagle, martial eagle), vulnerable (lappet-faced vulture, white-headed vulture, secretarybird) and near threatened (Rüppell's parrot, kori bustard, Verreaux's eagle, peregrine falcon, marabou stork) by Simmons *et al.* (2015) from Namibia as well as the species classified as critically endangered (white-backed vulture, white-headed vulture), endangered (Ludwig's bustard and lappet-faced vulture), vulnerable (Verreaux's eagle, martial eagle and secretarybird) and near threatened (kori bustard, bateleur) by the IUCN (2020).

However, none of the birds are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

Mechanical harvesting is expected to impact on the ground nesting bird species as these are usually cryptic (i.e. difficult to see) and will only flee oncoming heavy vehicles at the last moment. The most important ground nesting birds would include the Hartlaub's spurfowl (endemic), Ludwig's bustard (endangered), kori bustard (near threatened) and rockrunner (endemic). Although the adult birds will disperse when disturbed, eggs and chicks will be destroyed. Most other birds would typically move out of an area experiencing human disturbances and mechanical activities.

Many arboreal species are also expected to be negatively affected, especially if larger tree specimens and dead trees are targeted which serve as refuge to a variety of unique species (e.g. cavity nesting and crown nesting species). The most important cavity nesting birds would include the Monteiro's and Damara hornbills (both endemics), violet wood-hoopoe (endangered and near endemic), Rüppell's parrot (near threatened and near endemic), rosy-faced lovebird, Carp's tit and rockrunner (all endemic). The most important crown nesting birds would include the white-backed, white-headed and lappet-faced vultures (the first 2 species are listed as critically endangered by the IUCN (2020), bateleur, booted eagle, martial eagle (all endangered), secretarybird (vulnerable) and Verreaux's eagle, marabou stork (both near threatened). Raptors, especially vulture, numbers are decreasing rapidly

throughout their range and often abandon their nests (which are often reused) when disturbed.

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) – e.g. Ludwig’s and kori bustards, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. small birds with ball/cup shaped nests favouring inaccessible thorny shrubs such as eromomela, finches, sunbirds, white-eyes, etc. (See: Cunningham and Joubert 2011).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Trees/shrubs

The most important larger tree and shrub species are viewed as *Cyphostemma juttae* (endemic, protected by Forest Act and Nature Conservation Ordinance) and *Erythrina decora* (endemic, protected by Forest Act) from the general area.

The Farm Gai Kaisa No. 159 is located to the south of the most important parts of the Mountain and Karstveld although there are limestone outcrops which potentially have some of the important species mentioned in Table 5.

However, none of the larger trees and shrubs is expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

*The plants expected to be impacted would be those important species typically associated with the Karst formations (i.e. dolomite outcrops/ridges/hills) such as the endemic *Cyphostemma juttae* and *Erythrina decora* and various *Aloe* species. However, although the rocky terrain is usually unsuitable for mechanical operations, these important areas should nevertheless be avoided and excluded from harvesting activities.*

Various protected tree species occur in the areas potentially suitable for mechanical harvesting operations. These trees (See Table 5), especially the larger specimens, should be avoided as they potentially serve as habitat to a variety of vertebrate fauna (Further, see the Forest Act for tree size limitations – i.e. 18cm diameter, etc.).

*Larger tree specimens (including protected species – e.g. *Searsia lancea*, *Ziziphus mucronata*, etc.) are usually associated with ephemeral drainage lines and pans in the general area. These areas should be avoided as the trees potentially serve as habitat to a variety of vertebrate fauna and stabilise soils around these drainage lines (Further, see the Forest Act for harvesting limitations – i.e. 100m from streams, etc.).*

A mosaic harvesting approach (i.e. patch harvesting which results in a variety of openness, but still includes dense patches) is recommended as this would increase the ecotone area around these patches and consequently associated biodiversity. Bad planning and execution could result in mechanised harvesting “over harvesting” areas with dire consequences to the ecology of the area.

Connectivity of areas is recommended as these corridors serve as thoroughfare for various vertebrate species. The most important habitats should be connected – i.e. rocky areas and

drainage lines. Bad planning and execution could result in mechanised harvesting eliminating connectivity with dire consequences to the ecology of the area.

Dichrostachys cinerea (sicklebush) is known to react aggressively when disturbed by mechanical means – i.e. become exceedingly dense. Areas dominated by this species should not be harvested mechanically to avoid the area becoming even more dense and inaccessible than prior to harvesting operations (e.g. Dewet 2015, Smit et al. 2015, Tainton 1999).

Soil disturbances are a common feature of mechanical harvesting depending on the type of vehicles used; soil type; slope, etc. Wheel mounted Bell Loggers, as envisaged for this operation, would result in less disturbances than track mounted vehicles. Nevertheless, rocky areas (erosion) and clay soils (compaction and tracks in wet season) should be avoided and harvesting should rather be limited to areas with sandy soils where fewer problems are expected.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to trees/shrubs at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of browse) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Grass

The most important species is viewed as the endemic *Setaria finite* which is associated with drainage lines in the general area and never very common.

However, none of the grasses are expected to be exclusively associated with the Farm Gai Kaisa No. 159 development site.

Mechanical harvesting – Impact

The impact of mechanical harvesting would depend on the scale and intensity of the harvesting operation and overall vision, planning, execution of the operation and especially the control over the harvesters.

Grass biomass is expected and known to increase dramatically after bush thinning although these consist almost entirely of annual grasses which are not as palatable and/or resilient to drought and fire as perennial grass species. Only by controlling the livestock stocking rate; use rotational grazing and rest will the overall grass species compositions improve over time – i.e. with active visionary adaptive management and sound farming practices. Understanding the grass tree interactions (positive and negative) is paramount in the recovery of the grazing sward (e.g. Tainton 1999).

Habitat alteration during responsible bush thinning operations (i.e. scientifically managed), could create habitat for certain species which favour more open landscape or a mosaic of landscapes (i.e. varying patches of bush densities) and increased grass growth – e.g. grazing ungulates, cheetah, domestic stock, etc. On the other hand many species favour bush thickets and a change in habitat could detrimentally affect them – e.g. various browsers (kudu), small elusive ungulates (dik dik), etc. All wildlife require shade and shelter as part of their basic habitat requirements and a drastic change from a bush thickened area to an open grassland area would negatively affect most species. It is therefore imperative to find the correct balance of trees/shrubs/grasses.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to grass at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of grazing) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

These negative impacts would depend on the scale and intensity of the harvesting operation.

Other spp.

Except for various Aloe species known to occur in the general area, most other species are not expected to be adversely affected by the proposed mechanical harvesting operations. Should Aloe spp. be encountered then they should be removed and relocated to similar habitat on the farm.

Hydrocarbon spills are a risk (e.g. groundwater contamination and detrimental to all flora at site of spill) when dealing with mechanised harvesters and would have to be planned for.

Fire is a risk (e.g. destruction of flora) when dealing with mechanised harvesters and would have to be planned for (e.g. De Wet 2015).

Sensitive areas

The Farm Gai Kaisa No.159 does not have any major unique habitats; is not in a pristine condition and is heavily impacted by current/past charcoal harvesting activities. However, the following areas are viewed as the most unique (sensitive) on the farm:

a) Rocky areas

Any Karst formations – i.e. dolomite hills, ridges, etc. – as located on the northwest portion of the farm, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).

b) Ephemeral pan system

All well vegetated ephemeral pans (northeast portion of farm) with larger and especially protected tree species, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).

c) Ephemeral drainage lines

All well vegetated ephemeral drainage lines (north, west and southeast portions of farm) with larger and especially protected tree species, are potentially important for biodiversity and should be avoided and excluded from harvesting activities (Figure 1).



Figure 1. Sensitive areas that should be avoided and excluded from mechanical harvesting operations on Farm Gai Kaisa No.159 include rocky ridges (red dotted oblong); ephemeral pan system (blue dotted oblong) and ephemeral drainage lines (white dotted oblongs). Note the open areas currently/previously impacted by charcoal harvesting operations throughout most of the farm.

5. Recommendations

To show environmental sensitivity and ensure environmental commitment to the proposed mechanical harvesting operations the following general recommendations are made:

Vertebrate fauna

- i) Avoid sensitive areas – avoid harvesting in the rocky areas, ephemeral pan system and drainage lines as indicated in Figure 1;
- ii) Survey areas on foot prior to harvesting to collect and remove slow moving reptiles, especially tortoise species, and relocate elsewhere to similar habitat on the farm;
- iii) Identify vulture and other raptor nesting trees and avoid harvesting in these areas;
- iv) Most birds nest in association with rainfall therefore avoid harvesting trees with birds' nests during the breeding season;
- v) Prevent the killing of perceived dangerous species (e.g. snakes); collection of veld foods (e.g. giant bullfrog, tortoise, monitor lizard); any form of poaching (e.g. setting of snares for birds and ungulates, etc.);

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- vi) Initiate a suitable and appropriate refuse removal policy as littering could result in certain animals becoming accustomed to humans and associated activity and result in typical problem animal scenarios – e.g. baboon, black-backed jackal, crows, etc.;
 - vii) Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species.

Flora

- i) Avoid sensitive areas – avoid harvesting in the rocky areas and ephemeral pan system and drainage lines as indicated in Figure 1;
- ii) Avoid removing the large protected tree species;
- iii) Remove all *Aloe* species (should these be encountered) prior to harvesting and relocate elsewhere to similar habitat on the farm;
- iv) Avoid mechanical harvesting in areas dominated by *Dihrostachys cinerea* (sicklebush);
- v) Obtain the necessary permits from the Ministry of Environment, Forestry and Tourism prior to the collection, removal and relocation of protected species.

Ecology

- i) Avoid sensitive areas – avoid harvesting in the rocky areas and ephemeral pan system and drainage lines as indicated in Figure 1;
- ii) Investigate ecologically sound “after care” methods as mechanical disturbances could result in a denser bush scenario than prior to harvesting operations. This would depend on the objective of harvesting – i.e. sustainable bush utilisation versus veld reclamation for grazing, etc.;
- iii) Do not clear cut the entire area, but follow a mosaic harvesting approach (include dense patches of bush);
- iv) Maintain connectivity of habitats, especially linking the sensitive areas (i.e. rocky areas, ephemeral pans and drainage lines);
- v) Avoid harvesting on slopes and soils prone to erosion;
- vi) Avoid harvesting during the rainy (wet) season as this may cause deep tracks and result in erosion and compaction of soils;
- vii) Implement erosion control measures where applicable – e.g. cross drains on slopes, do not make tracks along drainage lines and cross these at a right angle, etc.;
- viii) Remove all invasive alien species on site – e.g. *Prosopis* spp., etc. This would not only indicate environmental commitment, but actively contribute to a better overall landscape;
- ix) Ensure that adequate fire fighting equipment (e.g. fire beaters; extinguishers, etc.) is available on Bell Loggers; at camp sites and kitchen areas (at plant) to avoid accidental fires;
- x) Ensure that all hydrocarbon spills are avoided and/or dealt with adequately and quickly;

- xi) Ensure that the Bell Logger operators can identify protected species and inform all contractors/workers regarding the above mentioned ecological issues prior to harvesting activities and monitor for compliance thereof throughout; and
- xii) Investigate FSC certification to ensure compliance and external auditing with international standards.

All human induced activities (including mechanical harvesting activities) change or are destructive to the local fauna, flora and ecology to some or other degree. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope and intensity of the activity – i.e. once initiated, may have a different effect on the fauna and flora as originally predicted. Thus continued monitoring of such impacts during the operational phase(s) is imperative.

The Farm Gai Kaisa No.159 does not have any major unique habitats (including vertebrate fauna and flora); is not in a pristine condition and is heavily impacted by current/past charcoal harvesting activities. Mechanical harvesting activities using Bell Loggers without tracks is not expected to further affect and/or impact negatively on the vertebrate fauna, flora and ecology of the farm, especially if the sensitive areas are avoided and the recommendations (suggested mitigations) are followed and implemented.

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APPENDIX C – HERITAGE SITES AND HERITAGE SPECIALIST STUDY



Left: The grave of Theodor, Farmworker (1966) located 200m Southeast of the farmhouse

Right: The grave of Rosemarie (1948) and Ernst Adalbert (1963) von Goldfus, located approximately 240m Northeast of the farmhouse. The localities of the graves are also indicated in the map below.



2 December 2020

ECC Environmental
Windhoek
Namibia

For attention: Mr Lester Harker, Environmental Assessment Practitioner

**ARCHAEOLOGICAL ASSESSMENT FOR PROPOSED BUSH THINNING AND CHARCOAL BURNING
PROJECT NEAR KOMBAT, OTJZONDJUPA REGION**

DECLARATION

I hereby declare that I do:

- (a) have knowledge of and experience in conducting assessments, including knowledge of Namibian legislation, specifically the National Heritage Act (27 of 2004), as well as regulations and guidelines that have relevance to the proposed activity;
- (b) 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;
- (c) comply with the aforementioned Act, relevant regulations, guidelines and other applicable laws.

I also declare that I have no interests or involvement in:

- (i) the financial or other affairs of either the applicant or his consultant
- (ii) the decision-making structures of the National Heritage Council of Namibia.



John Kinahan, Archaeologist

EXECUTIVE SUMMARY

An archaeological/heritage reconnaissance survey was carried out on the farm Gai-Kaisa in the Otjozondjupa Region. The field survey did not locate any archaeological sites, but did record two recent grave sites. It is recommended that the project adopt the attached Chance Finds Procedure in the event of encountering buried archaeological remains in the course of development work. It is pointed out that the grave sites are protected in terms of the Burial Places Ordinance (27 of 1966).

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2. Legal requirements
3. The receiving environment
4. Conclusions & recommendations

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Appendix 2: Burial Place Ordinance 27 of 1966

1. INTRODUCTION

1.1 Background

Environmental Compliance Consultancy (ECC) is carrying out an environmental assessment of the farm Gai-Kaisa (159) of the Otjozondjupa Region for the purposes of a bush-thinning and charcoal production project. Land-use changes are listed in the Environmental Management Act (2007) as activities requiring environmental assessment and the issuance of an Environmental Clearance Certificate.

Archaeological remains in Namibia are protected under the National Heritage Act (2004) and National Heritage Regulations (Government Notice 106 of 2005), and ECC has accordingly appointed the undersigned, J. Kinahan, archaeologist, to carry out an assessment of the project. A field visit to the site was carried out on 19th and 20th November 2020.

1.2 Terms of Reference

The primary task of the archaeological assessment reported here was to identify sensitive archaeological/heritage sites that could be affected by the proposed exploration and mining activities. The archaeological/heritage assessment forms the basis of recommended management actions to avoid or reduce negative impacts, as part of the environmental assessment. The study is intended to satisfy the requirements of the relevant legislation and regulations, in which the process of review and clearance may require further, or different mitigation measures to be adopted.

Specifically, the archaeological/heritage assessment addresses the following primary elements:

1. The identification and assessment of potential impacts on archaeological/heritage resources, including historical sites arising from the proposed exploration and mining activities.
2. The identification and demarcation of highly sensitive archaeological/heritage sites requiring special mitigation measures to eliminate, avoid or compensate for possible destructive impacts.
3. Formulation and motivation of specific mitigation measures for the project to be considered by the authorities for the issuance of clearance certificates.
4. Identify permit requirements as related to the removal and/or destruction of heritage resources.

1.3 Assumptions & Limitations

Archaeological assessment relies on the indicative value of surface finds recorded in the course of field survey. Field survey results are augmented wherever possible by inference from the results of surveys and excavations carried out in the course of previous work in the same general area as the proposed project, as well as other sources such as historical documentation. Based on these data, it is possible to predict the likely occurrence of further archaeological sites with some accuracy, and to present a general statement (see Receiving Environment, below) of the local archaeological site distribution and its sensitivity. However, since the assessment is limited

to surface observations and existing survey data, it is necessary to caution the proponent that hidden, or buried archaeological or palaeontological remains might be exposed as the project proceeds.

2. LEGAL REQUIREMENTS

The principal instrument of legal protection for archaeological/heritage resources in Namibia is the National Heritage Act (27 of 2004). Part V Section 46 of the Act prohibits removal, damage, alteration or excavation of heritage sites or remains. Section 48 *ff* sets out the procedure for application and granting of permits such as might be required in the event of damage to a protected site occurring as an inevitable result of development. Section 51 (3) sets out the requirements for impact assessment. Part VI Section 55 Paragraphs 3 and 4 require that any person who discovers an archaeological site should notify the National Heritage Council. Heritage sites or remains are defined in Part 1, Definitions 1, as “any remains of human habitation or occupation that are 50 or more years old found on or beneath the surface”.

It is important to be aware that no specific regulations or operating guidelines have been formulated for the implementation of the National Heritage Act in respect of archaeological assessment. However, archaeological impact assessment of large projects has become accepted practice in Namibia during the last 25 years, especially where project proponents need also to consider international guidelines. In such cases the appropriate international guidelines are those of the World Bank OP/ BP 4.11 in respect of “Physical Cultural Resources” (R2006-0049, revised April 2013). Of these guidelines, those relating to project screening, baseline survey and mitigation are the most relevant.

Archaeological/heritage impact assessment in Namibia may also take place under the rubric of the Environmental Management Act (7 of 2007) which specifically includes anthropogenic elements in its definition of environment. The List of activities that may not be undertaken without Environmental Clearance Certificate: Environmental Management Act, 2007 (Govt Notice 29 of 2012), and the Environmental Impact Assessment Regulations: Environmental Management Act, 2007 (Govt Notice 30 of 2012) both apply to the management of impacts on archaeological sites and remains whether these are considered in detail by the environmental assessment or not.

Graves are protected under the Burial Places Ordinance (27 of 1966) and permission is required in the event of development work encroaching on such sites.

3. THE RECEIVING ENVIRONMENT

Farm Gai-Kaisa (159) lies 20km SE of Kombat in the northern Otjozondjupa Region. The farm is characterized by typical tree and shrub savanna with a large component of *Combretum imberbe* woodland on the headwaters of two well developed drainage lines, both northern tributaries of the Omatako omuramba. Between the drainage

lines the terrain is relatively subdued, with outcropping calcretes and dolomites of the Otavi Group overlain by shallow sandy loam soils.

Figure 1 shows the location of Gai-Kaisa in relation to known archaeological sites and proclaimed National Monuments. There has been little recent archaeological field research carried out in this area, other than a corridor survey for a NamPower transmission line (now in place) running close to the northern boundary of the property. The survey did not record any archaeological sites in this vicinity. Figure 1 shows a relatively dense distribution of archaeological sites to the SW of Gai-Kaisa and few if any records from the area to the east of the property. Although this pattern confirms the archaeological significance of the high density distribution, the existence of these records also reflects the fact that more archaeological work has been carried out on commercial farmland rather than communal farmland. In other words, the eastern parts of the Otjozondjupa Region are disproportionately under researched and the available data do not therefore provide a reliable reflection of the local archaeology.

The known archaeological/heritage record of this region spans the entire upper Pliocene to recent historical period. Early hominoid fossil remains were recovered from a limestone breccia at Berg Aukas¹ and there have been numerous investigations of sites yielding important palaeoclimatic evidence in this area². Little is known of the upper Pleistocene and Holocene human occupation of the area, although the accumulated site records shown in Figure 1 demonstrate its likely importance. A systematic survey of rock art on commercial farms in the Otjozondjupa Region³ yielded a number of sites indicating the presence of hunter-gatherer communities in this area during the last 5000 years. Historical and ethnographic research on hunter-gatherer populations in this region points to the existence of widespread social networks which probably formed part of trade routes that were used by recent indigenous and colonial peoples⁴. The 19th century hunter and trader Axel Eriksson (1846

¹ Conroy, G.C., Pickford, M., Senut, B., Van Couvering, J. & Mein, P. 1992. *Otavipithecus namibiensis*, first Miocene hominoid from southern Africa. *Nature* 356: 144–8.

² e.g. Sletten, H.R., Railsback, L.B., Liang, F., Brook, G., Marais, E., Hardt, B.F., Cheng, H. & Edwards, L.R. 2013. A petrographic and geochemical record of climate change over the last 4600 years from a northern Namibia stalagmite, with evidence of abruptly wetter climate at the beginning of southern Africa's Iron Age. *Palaeogeography, Palaeoclimatology, Palaeoecology* 376: 149–62. See also Deacon, J. and Lancaster, N. 1988. *Late Quaternary Palaeoenvironments of Southern Africa*. Clarendon, Oxford.

³ Breunig, P. 1986 (ed.) *Ernst-Rudolf Scherz, Felsbilder in Südwest-Afrika Vol. 3. Die Malereien. Zusammenfassungen*. Köln Wien: Böhlau Verlag.

⁴ Kose, E, 2009. New light on iron-working groups along the middle Kavango in northern Namibia. *South African Archaeological Bulletin* 64: 130 – 147; Kose, E. and Richter, J. 2007. The prehistory of the Kavango people. *Sprache und Geschichte in Afrika* 18: 103-129; see also Wiessner, P. 1994. The pathways of the past: !Kung San hXaro exchange and history. In: Bollig, M. & Klees, F. eds *Überlebensstrategien in Afrika. Colloquium Africanum* 1: 101 – 124. Cologne, Heinrich Barth Institute, and Wilmsen, E. 1989. *Land filled with flies: a political economy of the Kalahari*. University of Chicago Press. 402pp.

– 1901) is buried at Rietfontein north of Gai-Kaisa⁵, and the *omiramba* drainage lines which also bisect the Gai-Kaisa property were central to Ovaherero settlement and landuse in the 18th and 19th centuries⁶.

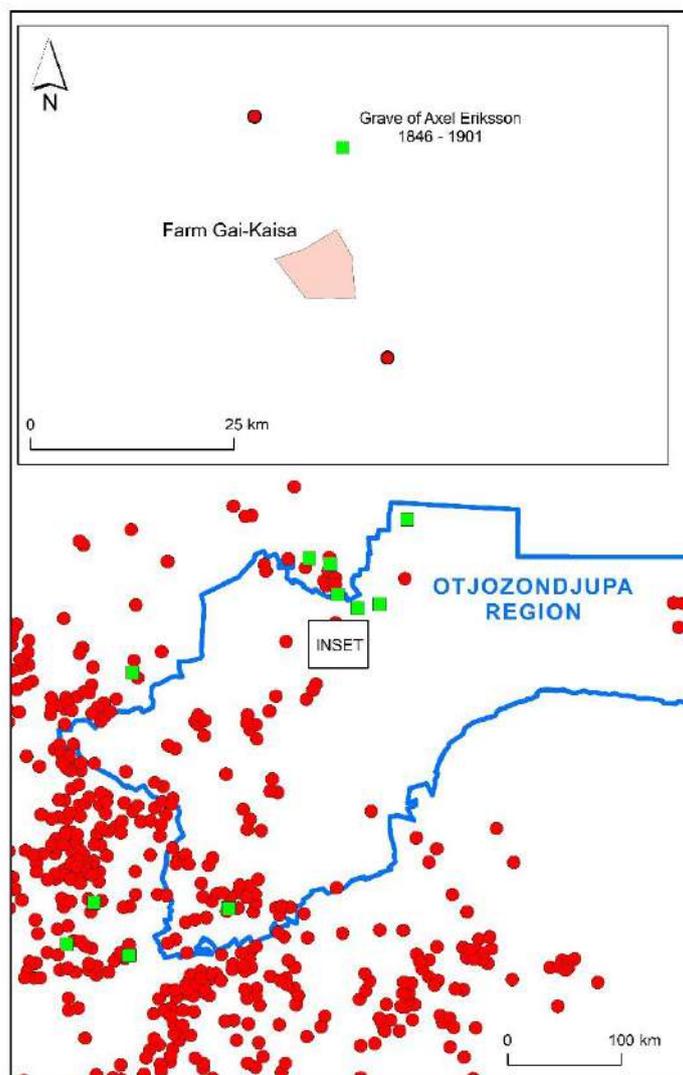


Figure 1: The location of Farm Gai-Kaisa in the Otjozondjupa Region shown in relation to known archaeological sites (red circles) and proclaimed National Monuments (green squares).

⁵ Vogt, A. 2004. *National Monuments in Namibia: An inventory of proclaimed national monuments in the Republic of Namibia*. Windhoek: Macmillan.

⁶ Lindholm, K.-J. 2006. *Wells of Experience: A pastoral land-use history of Omaheke, Namibia*. Studies in Global Archaeology 9, University of Uppsala.

Earlier surveys provide an indication of the archaeological importance of this general area, although the intensity of survey varies considerably and large parts of the area are archaeologically unknown, including that of Gai-Kaisa itself. The general sequence and archaeological characteristics of the area under consideration, based on current knowledge, are as follows:

- a. **Pliocene and early Pleistocene (ca. 10my to 0.128my; including OIS 6, 7, 19 &c):** represented by limestone breccia material as well as surface scatters of stone tools and artefact debris, usually transported from original context by fluvial action, and seldom occurring in sealed stratigraphic context.
- b. **Mid- to upper Pleistocene (ca. 0.128my to 0.040my; OIS 3, 4 & 5a-e):** represented by dense surface scatters and rare occupation evidence in sealed stratigraphic context, with occasional associated evidence of food remains.
- c. **Late Pleistocene to late Holocene (ca. 0.040my to recent; OIS 1 & 2):** represented by increasingly dense and highly diverse evidence of settlement, subsistence practices and ritual art, as well as grave sites and other remains.
- d. **Historical (the last ca. 250 years):** represented by remains of crude buildings, livestock enclosures, wagon routes and watering points, as well as graves, comprising small cemeteries near farm settlements or isolated burial sites.

In summary, Pliocene and early Pleistocene sites are associated with sinkholes, exhumed breccias, pans, outwash gravels, drainage lines and river gravels. These sites are difficult to detect and because they are easily overlooked in the course of development work and are often damaged or destroyed in the process. Mid- to upper Pleistocene sites occur in similar contexts to the earlier material, but hill foot-slopes and outcrops of rock suitable for artefact production (e.g. chert, fine-grained quartzites) are also focal points. Late Pleistocene to late Holocene sites occur in almost every terrain setting, with the exception of very steep slopes and mountain tops. These sites often exhibit locally integrated distribution patterns which allow some reconstruction of land-use and subsistence. Major Holocene sites include stratified occupation deposits, containing an array of organic and inorganic residues. Heritage sites relating to the historical period relate mainly to early mining and farming settlement in the vicinity of Otavi, Grootfontein, Tsumeb and outlying villages.

3.2 Observations

A reconnaissance survey of Gai-Kaisa traversed the drainage lines of the eastern and southern margins of the property and, following existing farm tracks, traversed the entire property from east to west at several points. No archaeological sites such as described above were found in the course of the survey, although two grave sites of recent date were recorded in the near vicinity of the farmhouse. These are shown in Figures 2 and 3.



Figure 2: Grave of Rosmarie (1948) and Ernst Adalbert (1963) von Goldfus.



Figure 3: Grave of Theodor, farmworker (1966), with headstone circled.

The grave of Rosmarie (1948) and Ernst Adalbert (1963) von Goldfus (Figure 2), has a dolerite headstone and is surrounded by a fenced enclosure about 200m SW of the farmhouse (-19.89653S 17.83071E). The grave and its surroundings are clearly demarcated and adequately protected. The site is not considered to be vulnerable to disturbance. However, the grave of Theodor (Figure 3), a farmworker (1966) located approximately 240m NE of farmhouse (-19.89643S 17.83109E) is a different matter. The grave is marked by a crude concrete crucifix (now fallen) and the entire site (which may contain more than one grave) has been undermined by animal burrows. The site lies approximately 250m N of what appears to be an abandoned workers' compound. This site is considered to be vulnerable and merits enclosure as in the case of the previous site.

4. CONCLUSIONS & RECOMMENDATIONS

On the basis of the field survey reported here Gai-Kaisa is not considered to be archaeologically sensitive. No archaeological sites requiring further investigation or mitigation were located in the course of the survey. It is however recommended that the proponent should adopt the Chance Finds Procedure in Appendix 1 as part of the project Environmental Management Plan.

The two grave sites located on the farm are protected in terms of the Burial Place Ordinance (27 of 1966) which was enacted to "prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies". Permission will be required if the proposed development of the farm will encroach on the grave sites.

Appendix 1: Chance Finds procedure

Areas of proposed development activity are subject to heritage survey and assessment at the planning stage. These surveys are based on surface indications alone, and it is therefore possible that sites or items of heritage significance will be found in the course of development work. The procedure set out here covers the reporting and management of such finds.

Scope: The “chance finds” procedure covers the actions to be taken from the discovery of a heritage site or item, to its investigation and assessment by a trained archaeologist or other appropriately qualified person.

Compliance: The “chance finds” procedure is intended to ensure compliance with relevant provisions of the National Heritage Act (27 of 2004), especially Section 55 (4): “ a person who discovers any archaeological ... objectmust as soon as practicable report the discovery to the Council”. The procedure of reporting set out below must be observed so that heritage remains reported to the NHC are correctly identified in the field.

Responsibility:

Operator	To exercise due caution if archaeological remains are found
Foreman	To secure site and advise management timeously
Superintendent	To determine safe working boundary and request inspection
Archaeologist	To inspect, identify, advise management, and recover remains

Procedure:

Action by person identifying archaeological or heritage material

- a) If operating machinery or equipment stop work
- b) Identify the site with flag tape
- c) Determine GPS position if possible
- d) Report findings to foreman

Action by foreman

- a) Report findings, site location and actions taken to superintendent
- b) Cease any works in immediate vicinity

Action by superintendent

- a) Visit site and determine whether work can proceed without damage to findings
- b) Determine and mark exclusion boundary
- c) Site location and details to be added to project GIS for field confirmation by archaeologist

Action by archaeologist

- a) Inspect site and confirm addition to project GIS
- b) Advise NHC and request written permission to remove findings from work area

c) Recovery, packaging and labelling of findings for transfer to National Museum

In the event of discovering human remains

- a) Actions as above
- b) Field inspection by archaeologist to confirm that remains are human
- c) Advise and liaise with NHC and Police
- d) Recovery of remains and removal to National Museum or National Forensic Laboratory, as directed.

Appendix 2: Burial Place Ordinance 27 of 1966

Republic of Namibia
Annotated Statutes

Burial Place Ordinance 27 of 1966

(OG 2728)

came into force on date of publication: 10 June 1966

ORDINANCE

To prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies.

(Assented to 3rd June, 1966)

(English text signed by the Administrator)

ARRANGEMENT OF SECTIONS

1. Definitions
2. Desecration of graves and removal of bodies
3. Short title

BE IT ORDAINED by the Legislative Assembly for the Territory of South West Africa as follows:-

Definitions

1. In this ordinance, unless the context indicates otherwise -

“Administrator” means the Administrator of the Territory of South West Africa;

“body” means any human dead body including the body of any still-born child;

“burial place” means any burial ground, whether public or private, or any place wherein one or more bodies are buried, cremated or otherwise disposed of or intended to be buried, cremated or otherwise disposed of.

Desecration of graves and removal of bodies

2. (1) No person shall desecrate or destroy a grave in a burial place or, without the written permission of the Administrator, disturb or cause such grave to be disturbed.

(2) Except where the exhumation of a dead body is ordered in terms of any other law for the purposes of forensic medicine or public health and subject to the provisions of section 222 of the Municipal Ordinance, 1963 (Ordinance 13 of 1963) no person shall exhume or cause to be exhumed or disturb or cause to be disturbed or remove or cause to be removed a body or the mortal remains of a body buried in a burial place without the written permission of the Administrator or unless such precautions are observed as may be prescribed by the Administrator or any medical practitioner appointed by him: Provided that no person shall be guilty of a contravention of this sub-section who temporarily of necessity disturbs or causes to be disturbed a body or the mortal remains of a body which is buried for the purpose of burying another body in the same grave.

**[The Municipal Ordinance 13 of 1963 has been replaced
by the Local Authorities Act 23 of 1992.]**

(3) No person shall, except with the permission of the Administrator, in any way disturb, damage, remove or destroy a grave, monument, gravestone, cross, inscription, rail, enclosure, chain or erection of any kind whatever, or part thereof in any burial place.

(4) Any person acting in contravention of the provisions of this ordinance shall be guilty of an offence and shall on conviction be liable to a fine not exceeding *one hundred* rand or, in default of payment, to imprisonment for a period not exceeding *six* months or to both such fine and such imprisonment.

Short title

3. This ordinance shall be called the Burial Place Ordinance, 1966.

APPENDIX D - RECOMMENDED DENSITY OF TREES AFTER BUSH THINNING

This appendix defines what level of bush thinning is most appropriate, categorized according to the main encroacher species. The information is based on De Klerk (2004), the draft policy on bush encroachment (2004), and the opinion of six bush experts (Dave Joubert, Nico de Klerk, Axel Rothauge, Ben Strohbach, Cornelis van der Waal, Roelie Venter).

The recommendations use a formula based on tree equivalents (TEs) and average annual rainfall. A TE is defined as a woody tree / bush of 1.5 metres height. Thus a 3 m tree represents 2TE. A 0.75 m tree/bush represents half a TE.

Main principles:

- All bush thinning should aim to leave a heterogeneous mix of trees and bush. The veld that remains should have a variety of tree species (including some of the encroacher species), of different size classes, and spaced so that there are some open patches and some dense patches, to provide a variety of habitats for animals.
- Bush thinning should be carried out in a phased approach so that the system is not shocked by an abrupt change from dense bush to open veld.
- If arboricides are going to be used, only foliar (leaf spray) and stem-applied arboricides are recommended. Pellets should not be used, as they tend to get washed along the surface by rain and end up in non-target areas.
- Dry riverbeds tend to carry more trees, and larger trees. Forestry regulations state that trees should not be killed within 100 m of a river course. Thinning is required in densely encroached river margins, but one should leave a higher density of trees than on the adjacent habitat. It is especially important to leave the large trees and protected species along a river course. The exception to this is *Prosopis spp.*, which invades riverbeds, but should be eradicated.
- Judicious thinning should leave behind a sufficient number of trees (applying the formulas provided) to create a more stable savanna that does not need major intervention at short intervals after the initial thinning.
- Training of the work force is necessary before harvesting starts, so that workers know which trees to target and which to avoid. Work teams need to be managed so that any excessive harvesting or killing of the wrong species is noticed and corrected.

DOMINANT SPECIES	TREE EQUIVALENT (TE)
<i>Acacia spp.</i>	<ul style="list-style-type: none"> – Leave large trees with a stem greater than 18 cm diameter – Leave protected species – Leave enough <i>Acacias</i> so that the total density of TEs per hectare = 1.5 times the average rainfall. e.g., in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha. – In sandy substrates, leave enough <i>Acacias</i> so that the total density of TEs per hectare = 2 times the average rainfall. e.g., in an area with ~400 mm rain and sandy soil, the total density of all trees should be ~800 TEs / ha.
<i>Dichrostachys cinerea</i>	<ul style="list-style-type: none"> – Leave large trees with a stem greater than 18 cm diameter, as well as individuals with a stem greater than 10 cm diameter (these are taller).

DOMINANT SPECIES	TREE EQUIVALENT (TE)
	<ul style="list-style-type: none"> - Leave enough <i>Dichrostachys</i> so that the total density of TEs per hectare = 1.5 times the average rainfall e.g., in an area with ~400 mm rain, the total density of all trees should be ~600 TEs / ha. - Protect the soil surface by packing brush - Aftercare is essential to prevent re-infestation
<i>Terminalia sericea</i>	<ul style="list-style-type: none"> - Leave large trees with a stem greater than 18 cm diameter - Leave enough <i>Terminalias</i> so that the total density of TEs per hectare = 3 times the average rainfall e.g., in an area with ~400 mm rain, the total density of all trees should be ~1,200 TEs / ha. This recognizes the extra importance of the trees is supplying nutrients to the sandy soil. <p>(A large <i>Terminalia sericea</i>, approx. 6 m high, is 4 TEs!)</p>
*Mopane	<ul style="list-style-type: none"> - Leave large trees with a stem greater than 18 cm diameter - Leave protected species - Leave enough mopanes so that the total density of TEs per hectare = 2 times the average rainfall. e.g., in an area with ~400 mm rain, the total density of all trees (all species) should be ~800 TEs / ha. This recognizes the importance of mopanes as fodder. - All cases where thinning is planned in mopane-dominated veld, especially where the veld is degraded (e.g., lack of grass, soil erosion) should first be inspected by DoF officials or a bush expert, to assess the level of harvesting that should be done. It might be advisable in such conditions to leave more trees than the 2x rainfall amount specified above.
* <i>Rhigozum trichotomum</i>	<ul style="list-style-type: none"> - Leave enough <i>Rhigozum</i> so that the total density of TEs per hectare = 2 times the average rainfall e.g., in an area with ~200 mm rain, the total density of all trees and bushes should be ~400 TEs / ha. <p>(A <i>Rhigozum</i> bush is usually ~0.75 m tall, e.g., 0.5 TEs. If there are no other trees or bushes, the density of <i>Rhigozum</i> should be ~800 bushes / ha)</p>
* <i>Prosopis spp.</i>	<ul style="list-style-type: none"> - Take out all <i>Prosopis</i> trees. - Use only approved methods, such as manual chopping or responsible use of arboricides. Do not use polluting methods such as applying engine oil to cut stems.

*Species that are not expected to occur on the farm

APPENDIX E: ADVERTS PUBLISHED

Daphne Carolina Stoffels
* 1971/09/09 - 2017/03/09

Here, it is my love, it says in my
Wat ek ontrief, kom alles van 'n
in Pragtige deel to my my afkomst,
Ja, wat ek ontrief het, is vir my
swaai. Ek sal die Here loof wat my
voor die magte loof gebring het; want
in die oog van die Here is geen
my lewe. Ek het die Here alreeds by
my; omdat My by my is, sal ek nie
strukkel nie.
Psalm 16:5-8

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NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS FOR THE PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING, STORAGE, AND PACKAGING PLANT ON FARM GAI – KAISA NO. 159 NEAR KOMBAT, OTJOZONDJUPA REGION, NAMIBIA

Environmental Compliance Consultancy CC (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant: Retort Charcoal Producers (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy
Location: Otjozondjupa Region, Namibia

Project: The proposed mechanized bush thinning operations and construction of a biomass processing, storage and packaging plant on farm Gai – Kaisa No. 159 in the Otjozondjupa Region, Namibia.

Proposed activity: Key infrastructure additions and activities on the site will include: The mechanized bush thinning of erodible species and establishment of a biomass processing, storage, and packaging plant, which includes carbonization of biomass as well as manufacturing of briquettes.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Retort Charcoal Producers (Pty) Ltd Namibia is required to apply for an environmental clearance certificate from the Ministry of Environment, Forestry and Tourism for the above-mentioned project.

Purpose of the review and registration period: The purpose of the registration and review period is to introduce the proposed project by way of a Non-Technical Summary (NTS) to all who register as Interested and Affected Parties (I&APs). The same will be afforded an opportunity to comment on the NTS and to ensure that potential issues and concerns are brought forward, captured by ECC and considered further in the assessment process.

Registration period: Effective from 17th November to 1st December 2020.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and public participation process in terms of the Environmental Management Act. I&APs and stakeholders are required to register for the project at: <https://eccenvironmental.com/projects/>

Environmental Compliance Consultancy Close Corporation
Registration Number: CC/2013/11404
Members: Mr JS Bezuidenhout and Mrs J Mooney
PO Box 91193, Klein Windhoek
Tel: +264 816 697 608
E-mail: info@eccenvironmental.com
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Project ID: ECC-118-269-ADV-12-A

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NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS EXPLORATION ACTIVITIES ON EPL 7729 AND EPL 7935 IN THE OTJOZONDJUPA REGION, NAMIBIA

Environmental Compliance Consultancy CC (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant: Cheetha Minerals Exploration (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy
Location: Otjozondjupa Region, Namibia

Project: Exploration activities on EPL 7729 and EPL 7935 for base and rare metals, and precious metals in the Otjozondjupa Region.

Proposed activity: The proponent intends to carry out exploration activities for base and rare metals, and precious metals on EPL 7729 and EPL 7935. Both EPLs are located within the Otjozondjupa Region, west of the BT and east of Erindi Private Game Reserve. Exploration methods may include ground geophysical surveys (non-invasive), soil and stream sediment sampling and geological mapping. Exploration drilling is also planned.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Cheetha Minerals Exploration (Pty) Ltd is required to apply for an environmental clearance certificate from the competent authority, the Ministry of Environment, Forestry and Tourism, for the mentioned project.

Purpose of the review and registration period: The purpose of the review and registration period is to introduce the proposed project and to afford Interested and Affected Parties (I&APs) an opportunity to register and comment on the Non-Technical Summary (NTS) and to ensure that potential issues and concerns are brought forward, captured and considered further in the assessment process.

Registration period: Effective from 17th November to 1st December 2020.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and public participation process in terms of the Environmental Management Act. I&APs and stakeholders are required to register for the project at: <https://eccenvironmental.com/projects/>

Environmental Compliance Consultancy Close Corporation
Registration Number: CC/2013/11404
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E-mail: info@eccenvironmental.com
Website: <https://eccenvironmental.com/projects/>
Project ID: ECC-117-323-ADT-04-B

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A chronic disease of the brain and central nervous system

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NOTICE OF AN ENVIRONMENTAL ASSESSMENT AND PUBLIC PARTICIPATION PROCESS FOR THE PROPOSED MECHANIZED BUSH THINNING OPERATIONS AND CONSTRUCTION OF A BIOMASS PROCESSING, STORAGE, AND PACKAGING PLANT ON FARM GAI – KAISA NO. 159 NEAR KOMBAT, OTJOZONDJUPA REGION, NAMIBIA

Environmental Compliance Consultancy (ECC) hereby gives notice to the public that an application for an environmental clearance certificate in terms of the Environmental Management Act, No. 7 of 2007 will be made as per the following:

Applicant: Retort Charcoal Producers (Pty) Ltd
Environmental Assessment Practitioner (EAP): Environmental Compliance Consultancy Otjozondjupa Region, Namibia

Location: Project: The proposed mechanized bush thinning operations and construction of a biomass processing, storage and packaging plant on farm Gai – Kaisa No. 159 in the Otjozondjupa Region, Namibia.

Proposed activity: Key infrastructure additions and activities on the site will include: The mechanized bush thinning of encroacher species and establishment of a biomass processing, storage, and packaging plant, which includes carbonization of biomass as well as manufacturing of briquettes.

Application for environmental clearance certificate: In terms of the Environmental Management Act, No. 7 of 2007, ECC on behalf of Retort Charcoal Producers (Pty) Ltd Namibia is required to apply for an environmental clearance certificate from the Ministry of Environment, Forestry and Tourism for the above-mentioned project.

Purpose of the review and registration period: The purpose of the registration and review period is to introduce the proposed project by way of a Non-Technical Summary (NTS) to all who register as Interested and Affected Parties (I&APs). The same will be afforded an opportunity to comment on the NTS and to ensure that potential issues and concerns are brought forward, captured by ECC and considered further in the assessment process.

Registration period: Effective from 17th November to 1st December 2020.

The team at ECC will be in contact with all registered I&APs to review any other documents after the registration period referred to above.

How you can participate: ECC is undertaking the required environmental assessment and public participation process in terms of the Environmental Management Act. I&APs and stakeholders are required to register for the project at: <https://eccenvironmental.com/projects/>

Environmental Compliance Consultancy Close Corporation
Registration Number: EC/2013/11404
Members: Mr JS Bezuidenhout and Mrs J Mooney
PO Box 91193, Klein Windhoek
Tel: +264 816 697 608
E-mail: info@eccenvironmental.com
Website: <https://eccenvironmental.com/projects/>
Project ID: ECC-118-269-ADV-12.A



Erongomed, an equal opportunity employer and leading Namibian Medical and Pharmaceutical Company, seeks to expand its workforce with a strong, self-motivated, charismatic applicant to fill the position of **Director** (based in Windhoek).

Requirements:

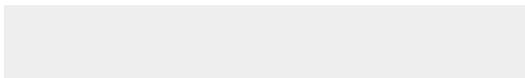
- Pharm degree essential
- Registration with the Pharmacy Council of Namibia (HPCNA)
- Minimum 10 years' cross functional and operational experience in similar setting
- Experience working with medical devices and equipment
- Excellent organizational skills
- Excellent managerial and leadership skills
- Ability to work under pressure
- Strong financial acumen
- Planning and forecasting
- In depth knowledge of markets and changing business environments
- Must be willing to travel
- Strong communication skills- written and verbal

Key Performance Areas:

- Prepare a corporate plan and annual business plan and monitor progress against these plans to ensure that the Company attains its objectives as cost-effectively and efficiently as possible
- Provide strategic advice and guidance to the Chairman and the members of the Board, to keep them aware of developments within the industry and to ensure that the appropriate policies are developed to meet the Company's mission and objectives and to comply with all relevant statutory and other regulations
- Prepare, gain acceptance, and monitor the implementation of the annual budget to ensure that budget targets are met, that revenue flows are maximised and that fixed costs are minimised.
- Establish and maintain effective formal and informal links with major customers, relevant government departments and agencies, local authorities, key decision-makers and other stakeholders, to exchange information and views and to ensure that the Company is providing the appropriate range and quality of services.
- Develop and maintain Total Quality Management systems throughout the company to ensure that the products and services are provided to customers timely and effectively.
- Ensure and identify the needs and implementation of policies and procedures to ensure that the Company complies with all statutory regulations, employee management, health and safety and other regulations.
- Support Operational Purchase Requirements of pharmaceutical products, disposable products and devices for the business.

We offer a market-related remuneration package, which includes Pension Fund and Medical Aid. Preference will be given to Namibian citizens and Permanent Residents. Candidates, who comply with the above-mentioned requirements, are invited to forward their CVs with copies of qualifications, relevant documentation and cover letter to the following address: hr@erongomed.com

Tel: 061-296 5900
CLOSING DATE: 20/11/2020
Only shortlisted candidates will be contacted.




REPUBLIC OF NAMIBIA
MINISTRY OF WORKS AND TRANSPORT
MINISTRY OF WORKS AND TRANSPORT WILL HOLD A PUBLIC AUCTION

GOVERNMENT AUCTION – DAY 4

OSHAKATI – VEHICLES AUCTION
VIEWING DATE: WEDNESDAY 18 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: THURSDAY 19 NOVEMBER 2020 AT 10H00
VENUE: MINISTRY OF HOME AFFAIRS, IMMIGRATION, SAFETY AND SECURITY – OSHAKATI POLICE STATION AND HOSPITAL

Items to be sold
3X TOYOTA 2.0, 8X TOYOTA HILUX 2.5 4X4, FORD IKON 1.6, 6X TOYOTA HILUX 2.7, 5X ISUZU 240 LDV, NISSAN NP 300 4X4, TOYOTA COROLLA 1.8, 2X HINI TRUCK 4X4, 2X M BENZ TRUCKS 4X4 AND MUCH MORE.....

Registration: N\$ 500.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: MR J NAMPWEYA 081 289 6545 / E STEENKAMP 081 249 2338 / 061 208 6144

GOVERNMENT AUCTION – DAY 5

OSHAKATI – LOOSE ITEMS AUCTION
VIEWING DATE: MONDAY 23 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: TUESDAY 24 NOVEMBER 2020 AT 10H00
VENUE: MINISTRY OF FINANCE – OSHAKATI CUSTOMS, AGRICULTURE, WORKS

Items to be sold
BALE CLOTHING, SPACTULAS, CUPS, SANDALS, PLASTIC BOWLS, PLATES, WOODEN CUP, CAR BEER AND MUCH MORE.....

Registration: N\$ 5000.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: MR J NAMPWEYA 081 289 6545, E STEENKAMP 081 249 2338 / 061 208 6144

GOVERNMENT AUCTION – DAY 6

OSHAKATI – VEHICLES AUCTION
VIEWING DATE: THURSDAY 26 NOVEMBER 2020 from 09H00 to 16H00
AUCTION DATE: FRIDAY 27 NOVEMBER 2020 AT 10H00
VENUE: MINISTRY OF ENVIRONMENT, FORESTRY AND TOURISM – ONGWEDIVA DVC

Items to be sold
2X MAZDA BT-50, 4X NISSAN, 4X FORD RANGER, TOYOTA 2.7, 2X FORD COURIER, 3X MBENZ 1113, 2X HINO TRUCK, GARDEN TOOLS AND MUCH MORE.....

Registration: N\$ 5000.00 (CASH ONLY)
Terms and Conditions apply, No VAT Details are subject to change without prior notice
ALL PAYMENTS MUST BE MADE BY 15H00 HOURS ON A UCTION DATE

Contact: MR J NAMPWEYA 081 289 6545, E STEENKAMP 081 249 2338 / 061 208 6144



SAFE ROADS TO PROSPERITY

EXPRESSION OF INTEREST

EMERGING CONTRACTOR COURSE IN LABOUR-BASED ROAD CONSTRUCTION

In line with the Roads Authority's SME development policy in promoting SMEs in the sector, the RA through the Roads Technical Training Unit (RTTU) intends to offer the EMERGING CONTRACTOR COURSE to experienced Namibian SME Contractors with the aim of advancing SME Contractors to the level of self-supporting Emerging Contractors.

The Emerging Contractor Course will take place over two weeks focusing on contractual issues and the detailed pricing of the all-inclusive costs in the field of concrete works, labour-based construction work and plant-based construction work.

Course Fee: N\$ 2,500.00 for the two-week course, including instructional material

Number of participants per session is limited.

For details on the Emerging Contractor Course please contact: R Ochs +264 61 2847031 or +264 81 122 8144
Interested entities/individuals kindly forward your company profile, clearly listing successfully completed construction projects, to: rittmanz@ra.org.na

SME TRAINING – LABOUR-BASED ACTIVITIES

In line with the Roads Authority's SME development policy in promoting SMEs in the sector, the RA through the Roads Technical Training Unit (RTTU) intends to offer SME TRAINING COURSES to Namibian SME Contractors.

The SME Course will take place over one week focusing on contractual issues and the detailed pricing of the all-inclusive costs in the field of concrete and labour-based construction work.

Course Fee: N\$ 1,000.00

Number of participants per session is limited.

For details on the possible training courses please contact: R Ochs +264 61 2847031 or +264 81 122 8144
Interested entities/individuals kindly forward your company profile, clearly listing successfully completed construction projects (if any), to: rittmanz@ra.org.na

Roads Authority, Private Bag 12030, Aussenplanplatz, Windhoek, Namibia, www.ra.org.na



APPENDIX F: ECC CVS

STEPHAN BEZUIDENHOUT

Name of Consultant: Stephan Bezuidenhout
 Position / Profession: Managing Member & Senior Environmental Practitioner
 Date of Birth: 11 April 1989
 Nationality: Namibian
 Professional Memberships: EAPAN, FSC Environmental Chamber, NCE, NCA, N-BiG
 Email: stephan@eccenvironmental.com
 Website: www.eccenvironmental.com
 Contact: +264 81 262 7872



QUALIFICATIONS:

University of Pretoria: 2011 – 2012 Postgraduate Degree in Environmental Management and Analysis
University of Stellenbosch: 2007 – 2010 Bachelor of Applied Science

PROFILE:

ECC's proudly Namibian Principal leads the ECC team as the lead Environmental Practitioner with a strong and dedicated environmental background. Mr Bezuidenhout has leading practical experience in Identifying and applying legislative requirements to proposed projects. Identifying impacts and mitigations for projects within different sectors, including mining, energy, agriculture and construction.

KEY AREAS OF EXPERTISE:

Agriculture and Ecology	-	Aftercare, rehabilitation & restoration methodology & implementation Forest Stewardship Council (FSC) implementation and compliance
Environmental (and social) Impact Assessments (EIAs) (ESIAs) & Environmental Management	-	Compiling EIA Reports and EMPs Coordinate and review specialist studies Review EIA reports Environmental Management Systems (EMS) Public Participation & Stakeholder Management
Project Management	-	Management of teams through Southern Africa for various projects

LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent



SUMMARY OF EXPERIENCE AND CAPABILITY:

Since 2010, Stephan has been working as an environmental assessment practitioner. Stephan has a strong ecological background and has gained more than ten years' experience in the environmental industry. As a lead practitioner, Stephan has successfully driven environmental impact assessments and compliance assessments within Southern Africa. His hands on and practical experience and knowledge of international standards, such as FSC, IFC and World Bank standards allows Stephan to advise his clients and teams constructively and effectively.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Best Practice Guide: Environmental Principles for Mining in Namibia	2017 - 2019	Team member
The FSC National Forest Stewardship Standard of Namibia	(2018-2020)	Part of the working group who compiled the National Standard for Forest Stewardship Council (FSC) in Namibia allowing for a higher rate of certification and improved compliance.
Jumbo Charcoal FSC Group Scheme Management	2015 - 2020	Jumbo Charcoal FSC Group Scheme Management
Biophysical Rehabilitation Plan for ML 42, 43, 44 and 45 as well as an overarching 5-year Biophysical Rehabilitation Plan for Namdeb	2018 - 2019	Part of the ECC team who completed the reporting and aided in the implementation of the Biophysical Rehabilitation Plans for Namdeb.
ESIA amendment for B2Gold Namibia Mining Licence (ML 169) to developed underground working for the Otjikoto (gold mine)	2018 - 2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
Kunene Regional Counsel sustainable water supply Pipeline and Ancillary works	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for B2Gold Namibia 10.8 megawatt PV solar upgrade to the B2Gold Power Plant	2017 - 2018	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA application for Otjiwarongo Wastewater Treatment and Bulk Water Supply	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
ESIA for the Wastewater Treatment facilities for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
MAWF permit application for Water Abstraction and Discharge for Gondwanan Collection	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).
EIA application for various exploration activities for Votorantim Metals Namibia Pty Ltd	2018 - Present	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report review).



Abengoa Solar SA, Kaxu Solar One 100MW Concentrating Solar Plants (CSP) Trough	2015 - 2017	Environmental Control Officer during commissioning and rehabilitation phases
Konkoonsies II PV Solar Energy Facility, On-site substation and a 132kV power line Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA process
Abengoa Solar SA Paulputs CSP (Pty) Ltd. 150 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Assessment Practitioner during EIA Process
Abengoa Solar SA, Xina Solar One 200 MW CSP Trough Northern Cape, South Africa	2015 - 2017	Environmental Control Officer during construction phase
Soil Remediation and Commissioning report of NGALA Camp for Isondlo Project Support (IPS) (Pty) Ltd Gauteng, South Africa	2015	Lead consultant and project manager.
375 km 26-inch natural gas installation for SASOL & ROMPCO Mozambique representing Worley Parsons (Pty) LTD. South Africa	2013 - 2015	Environmental Coordinator and Manager
Department of Water Engineering (working on a catchment management project for the Municipality of Stellenbosch)	2011 - 2012	Intern at Aurecon South Africa
Other projects	2011-2020	Stephan has successfully completed various other projects in the sectors of Agriculture, Mining, Energy and Tourism where he acted as the Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP, and report review).

PUBLICATIONS

N.S., et al., Some ecological side-effects of chemical and physical bush clearing in a southern African rangeland ecosystem, Southern African Journal of Botany (2015), <http://dx.doi.org/10.1016/j.sajb.2015.07.012>

The FSC National Forest Stewardship Standard of Namibia (Draft V 4). Co-authored by S Bezuidenhout, P Cunningham, A Ashby, F Detering, W Enslin & D Honsbein

CERTIFICATION:

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

DATE: 21 / 10 / 2020

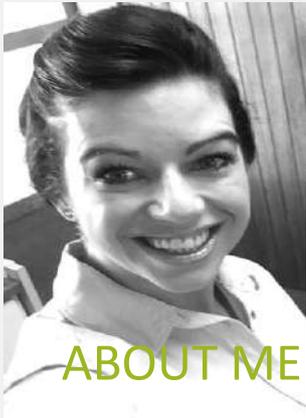


FULL NAME OF CONSULTANT

Jacobus Stephanus Bezuidenhout



Hello! :)



Name

Jessica Mooney

Born

24 October 1984

Phone

+264 81 653 1214

Email

Jessica@eccenvironmental.com

Website

www.eccenvironmental.com

Contact me!

How to reach me!

+264 81 653 1214



Jessica.mooney7



+264 81 653 1214



Jessica Mooney



Education & Qualifications

Federation University
Australia
2003-2006

Bachelor of Applied Science -Environmental Management

**Additional
Qualifications**

Management Systems Leadership
ICAM - Incident Cause Analysis Method
Certificate II in Metalliferous Mining core safety and risk management
Certificate III in Mine Emergency Response & Rescue
Level 3 – HLTF402B Apply Advanced first Aid
Emergency Rope Rescue
Level 2 - 21593VIC First Aid level 2
Bonded Asbestos Removal >10m2
Leading and Managing People –
Brisbane North Institute of TAFE



Experience & Work History

Current

Environment Specialist



Environmental Compliance Consultancy
With 13 years international experience, Jessica provides professional consulting services to clients in Namibia with particular focus on approvals, ECCs, reporting and compliance.

- ECC Approvals
- Mine Closure Plans
- Rehabilitation
- Strategic Environmental Impact Assessments
- Social Impact Assessments
- ARD/AMD Assessments and Reporting
- IMS (ISO14001 and 18001)

Nov 2013-
Feb 2016

Group HSE Manager



Weatherly Mining Namibia
An exciting role covering the breadth of two operational underground mines (Otjihase and Matchless) and the construction of a new open pit mine (Tschudi) working for Weatherly Mining in Namibia, Africa.

- Managed company's SHEQ portfolio
- Full scale construction of new greenfield mine into operational copper mine
- Reduced LTIFR by 90% from 23.1 to 2.4 in 22 months!
- Implemented integrated management system
- Approvals, ECC renewals and EMPs
- Established the first mining environmental forums in Namibia
- Implemented SAFE COPPER cultural change programme

References

Feel free to ask the boss

MR CRAIG THOMAS
Managing Director
Weatherly Mining

MR COLIN BULLEN
Managing Director
Imerys (client)

Group Manager Lihir Gold

MR NICK CURREY
Director at Sustainable Mining
Strategies

*Or ask those who have worked
for me?*

Ms Asteria Salmon
Worked as Control Room Operator
WMN

Mr. Hermanus Lamprecht
Paramedic Safety Officer

Professional Associations

- Chamber of Mines Namibia
- Women on Boards
- The Chamber of Minerals and Energy of Western Australia Industry Member – Mining, Minerals and Resources

Fun Facts:

- I can deadlift 135kg
- To keep fit I Olympic weight lift
- I run ultra Marathons & the longest run yet the fish river Canyon 65km
- I am one of 6 children - do you think that means 4 of us suffer middle child syndrome?

Words I live by:

‘The journey will bring you
happiest, not the
destination’



Experience & Work History

Feb 2013-
Feb 2014

Environmental Consultant

Ensolve Pty Ltd - Australia

In February 2013 an opportunity came about to launch my own business, Blue Wren Environmental Services.

During this time I have worked alongside Ensolve Pty Ltd to deliver several environmental projects including:

- A mine closure project taking an operating mine site into the rehabilitation and closure phase. This project involved the full development of a mine closure plan, facilitation of the government approvals, stakeholder engagement and technical environmental studies to inform the mine closure plan
- Sustainability reporting in accordance with the Global Reporting Initiative
- Rehabilitation of historic exploration sites and obtaining associated government approvals for relinquishment of bonds.

Jan 2010-
Feb 2013

Site Environmental Manager

Panoramic Resources – Australia

- Brought the site into full compliance with the Environmental Licence within 1 year.
- Managed projects relating to the expansions of the current mine tailings dams including obtaining approvals under the Mining Act 1978 and Environmental Protection Act 1986.
- Managed the environmental and community aspects of three operations; Savannah Nickel Mine, Copernicus Nickel Mine (currently in care and maintenance) and the operations at Wyndham Port
- Responsible for the environment, sustainability and social reporting portfolio
- Developed productive working relationships with local government environmental agencies and non-government agencies, which assisted with the approvals process.
- Developed strategies for the recruitment and retention of local Indigenous personnel

Jan 2007-
Jan 2010

Environmental Systems Coordinator

Lihir Gold Limited – Australia

Working on site to provide technical environmental and community advice to ensure all regulatory and licence obligations were met or exceeded

- Regulatory Approvals (State and Federal Government)
- Environment and social aspects of the international cyanide management code
- Operational budgeting and bond management for mine closure
- Compliance with the legislative framework
- Community engagement

Name of Consultant: Lester Harker
 Position / Profession: Environmental Assessment Practitioner
 Date of Birth: 26 February 1988
 Nationality: Namibian
 Email: lester@eccenvironmental.com
 Website: www.eccenvironmental.com
 Contact: +264 81 602 2082

 **QUALIFICATIONS:**

University of Stellenbosch: **2006 – 2010** Bachelor of Arts (Environment and Development)

PROFILE:

Lester works as an Environmental Assessment Practitioner with a diverse environmental background. Mr Harker has leading practice experience in fields of construction, exploration, monitoring and audit compliance and consultancy obtained from leading professionals.

KEY AREAS OF EXPERTISE:

Environmental Management	-	Project Management
Environmental (and social) Impact Assessments (EIAs)	-	Conducting and managing various small to large scale EIAs Compiling EIA Reports and EMPs Coordinate and review specialist studies
Environmental & Social Compliance reporting	-	Environmental and Social compliance audits in the construction industry

 **LANGUAGES:**

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent



SUMMARY OF EXPERIENCE AND CAPABILITY:

Has over 8 years of work experience. His first three years were as a junior environmental assessment practitioner, but already became involved with the holistic management of EIA projects. The following 5 years he has worked in the environmental management field with experience in Environmental Impact Assessments (EIAs), compliance monitoring and auditing in Namibia, the DRC and Equatorial Guinea. Has above average experience in successful client relations.

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
Collaborated with the British CRIDF donor organisation to conduct a high level environmental investigation to determine the feasibility of treating and reusing the Rehoboth Wastewater facility for agricultural purposes	2015	Environmental Assessment Practitioner
Environmental scoping and impact assessment for exploration activities for Westrine Mining & Exploration Company (Pty) Ltd	2016	Environmental Assessment Practitioner.
Conducted an Environmental Scoping and Impact Assessment for the construction of a cement mining and processing facility in Equatorial Guinea, North Africa, for N.B.L.E Sa.	2016	Environmental Assessment Practitioner.
Conducted an environmental impact assessment for the Dauremas Mineral Development Company for exploration and proposed mining activities, Kunene Region.	2015-2017	Environmental Assessment Practitioner.
Conducted an Environmental Impact Assessment for a terrestrial diamond exploration project south of Aus, Karas Region for Hallie Investment Number 14.	2017	Environmental Assessment Practitioner.
Conducted an environmental performance audit in collaboration with a British firm for a copper and cobalt processing facility for the Somika Sarl Group of Companies operating in the DRC to fund the expansion of their processing facility.	2018	Environmental Assessment Practitioner
Projects Completed while at ECC		
Environmental impact assessment for a pilot sustainable water supply project by means of desalination, powered by solar to supplement water supply for Walvis Bay Erongo Region, Namibia	2020	Environmental Assessment Practitioner
Amendment application for the Palmwag Lodge, Gondwana Namibia.	2020	Environmental Assessment Practitioner
Environmental Assessment for the proposed development of residential, retail including tourism activities on Erf 4747, Swakopmund Namibia.	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental scoping and impact assessment for the proposed exploration activities on 19 EPLs	2020	Lead Environmental Assessment Practitioner managing the EIA process

in the Omaheke and Khomas regions for Kuiseb Copper Company (Pty)Ld		(including stakeholder engagement and PPP.
Environmental assessment for proposed exploration activities on EPL 7769 for Jin Peng Investments (Pty) Ltd	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental assessment for the proposed exploration activities on EPL 7688	2020	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement and PPP.
Environmental and social compliance audit for 21 sites across Namibia under the Education, Training and Quality Improvement Project funded by the African Development Bank	2020	Site audits and development of an audit report and corrective action plan

Name of Consultant: Lovisa Amwele
 Position / Profession: Junior Environmental Practitioner
 Date of Birth: 10 September 1993
 Nationality: Namibian
 Professional Memberships: None
 Email: lovisa@eccenvironmental.com
 Website: www.eccenvironmental.com
 Contact: +264 81 435 1689



 **QUALIFICATIONS:**

Cape Peninsula University of Technology: **2020 – 2021** Masters of Environmental Management
2019 – 2019 B-Tech: Environmental Management
2016 – 2018 ND: Environmental Management

PROFILE:

I am vibrant and energetic. Academically trained in the field of Environmental management and science sphere. I have been hard at work establishing my personal reputation as a mature critical problem solver and effective communicator driven by a strong set of ethical principles founded in social and environmental awareness. My objectives are to secure a challenging position, where I can utilize my abilities when granted the opportunity for additional career growth.

KEY AREAS OF EXPERTISE:

Environmental (and social) Impact Assessments (EIAs)	-	Compiling EIA Reports and EMPs
	-	Reviewing EIA reports
	-	Compiling of bi-annual environmental reports
	-	Environmental monitoring (Air and borehole water level)
	-	Data interpretation and verification
	-	Maps compilation for various projects using Google Earth and ArcMap
Environmental feasibility studies	-	Various activities pertaining to environmental baseline and monitoring



LANGUAGES:

	Read	Write	Speak
English	Excellent	Excellent	Excellent
Oshiwambo	Excellent	Excellent	Excellent



SUMMARY OF EXPERIENCE AND CAPABILITY:

Feb 2020 – Present: Environmental Compliance Consultancy

Position: Junior Environmental Practitioner

- Providing professional consulting services to clients
- Assisting in the development of scoping reports
- Assisting in the development Environmental management plans for exploration
- Maps compilation for various projects using Google Earth and ArcMap

References: Jessica Money Bezuidenhout

☎ : +264 81 653 1214

July 18 – Jan 2019: Gecko, Namibia

Environmental Management Specialist

Position: Intern

- Compiling and submitting of bi-annual environmental reports for exploration activities
- Various activities pertaining to environmental baseline and monitoring
- Maps compilation for various projects using Google Earth and ArcMap
- Involvement in the writing and compilation of Environmental Impact Assessment (EIA) reports for exploration activities
- Data entry, data organization with quality control
- Data interpretation and verification
- Site visits and various aspects of fieldwork at mineral exploration project areas (Water levels and air quality monitoring)
- Engaged in clients and stakeholders' meetings.

References: Oliver Krappmann

☎ : +264 61 30 5444

June 2017 and Dec 2017: Oniipa Town Council

Environmental Health Inspector

Position: Intern

- Waste management and health education
- Environmental pollution and monitoring control
- Risk assessment at work and public places
- Business inspection to ensure compliance
- Training on food safety manual

References: Daniel Nicodemus

☎ : +264 65 245 700/11

PROJECT EXPERIENCE

PROJECT	DATE	ROLE
<p>Kunene Resources (Pty) Ltd holds EPL 5885 which is located on communal land South of Swartboisdriфт, Opuwa town, Kunene region. The license is granted for the exploration of base and rare metals, precious metals as well as industrial minerals. As part of the application process, a detail ESIA and EMP process needs to be conducted.</p>	2019	Lead Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).
<p>The Swakopmund Salt Company (Pty) Ltd (hereafter referred to as Salt Co) would like to start up solar salt operations at Cape Cross area which is approximately 120km north of Swakopmund. The Mining License 66D (ML66D) covers the industrial minerals commodity, salt. As part of the application process, a detail ESIA and EMP process needs to be conducted.</p>	2018	Assistant Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).
<p>Kunene Resources (Pty) Ltd holds EPLs 6561 & 5992 which are located on communal land south and east of Grootfontein town. The licenses are granted for the exploration of precious metals, base and rare metals, dimensions stones as well as industrial minerals. This Environmental Impact Assessment Report should be submitted for an application for Environmental Clearance to conduct mineral exploration work.</p>	2018	Assistant Environmental Assessment Practitioner managing the EIA process (including stakeholder engagement, PPP and report compilation and review).