

**APP-003708**

**CHOBE WATER VILLAS, KASIKA, ZAMBEZI REGION**

**ENVIRONMENTAL MANAGEMENT PLAN**



**Prepared by:**




**Prepared for:**




June 2022



<b>Project:</b>	<b>CHOBE WATER VILLAS, KASIKA, ZAMBEZI REGION: ENVIRONMENTAL MANAGEMENT PLAN</b>	
<b>Report: Version/Date:</b>	Final June 2022	
<b>Application Number:</b>	APP-003708	
<b>Prepared for: (Proponent)</b>	O & L Leisure (Pty) Ltd P.O. Box 2190 Windhoek Namibia	
<b>Lead Consultant</b>	Geo Pollution Technologies (Pty) Ltd PO Box 11073 Windhoek Namibia	TEL.: (+264-61) 257411 FAX.: (+264) 88626368
<b>Main Project Team:</b>	<b>Pierre Botha</b> (B.Sc. Geography/Geology); (B.Sc. (Hons) Geohydrology) <b>André Faul</b> (B.Sc. Zoology/Biochemistry); (B.Sc. (Hons) Zoology); (M.Sc. Conservation Ecology); (Ph.D. Medical Bioscience) <b>Wikus Coetzer</b> (B.Sc. Environmental and Biological Sciences); (B.Sc. (Hons) Environmental Sciences)	
<b>Cite this document as:</b>	Botha P, Faul A, Coetzer W. 2022 June; Chobe Water Villas, Kasika, Zambezi Region: Environmental Management Plan	
<b>Copyright</b>	Copyright on this document is reserved. No part of this document may be utilised without the written permission of Geo Pollution Technologies (Pty) Ltd.	
<b>Report Approval</b>	 <b>André Faul</b> Environmental Assessment Practitioner	

I STEWART MILNE acting as a representative of O&L Leisure (Pty) Ltd, hereby confirm that the project description contained in this report is a true reflection of the information which the Proponent provided to Geo Pollution Technologies. All material information in the possession of the proponent that reasonably has or may have the potential of influencing any decision or the objectivity of this assessment is fairly represented in this report and the report is hereby approved.

Signed at KASIKA on the 12 day of JUNE 2022.

  
O&L Leisure (Pty) Ltd

**CHOBE WATER VILLAS PTY LTD**  
**KASIKA CONSERVANCY**  
Business Registration ID Number  
PO BOX 2190, WINDHOEK  
+264 66253602



## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION &amp; BACKGROUND .....</b>	<b>1</b>
<b>2</b>	<b>SCOPE .....</b>	<b>1</b>
<b>3</b>	<b>ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS .....</b>	<b>2</b>
<b>4</b>	<b>ENVIRONMENTAL CHARACTERISTICS.....</b>	<b>5</b>
4.1	LOCALITY AND SURROUNDING LAND USE .....	5
4.2	CLIMATE .....	5
4.3	TOPOGRAPHY AND DRAINAGE .....	6
4.4	GEOLOGY AND HYDROGEOLOGY .....	7
4.5	WATER SUPPLY .....	7
4.6	FAUNA AND FLORA .....	7
4.7	DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS .....	8
<b>5</b>	<b>ENVIRONMENTAL MANAGEMENT PLAN.....</b>	<b>9</b>
5.1	OBJECTIVES OF THE EMP .....	9
5.2	IMPLEMENTATION OF THE EMP .....	9
5.3	MANAGEMENT OF IMPACTS: OPERATIONS AND CONSTRUCTION .....	10
5.3.1	<i>Planning.....</i>	<i>10</i>
5.3.2	<i>Skills, Technology and Development .....</i>	<i>11</i>
5.3.3	<i>Economic Resilience and Employment .....</i>	<i>12</i>
5.3.4	<i>Demographic Profile and Community Health .....</i>	<i>13</i>
5.3.5	<i>Increase in Carbon Footprint .....</i>	<i>14</i>
5.3.6	<i>Health, Safety and Security.....</i>	<i>15</i>
5.3.7	<i>Fire .....</i>	<i>17</i>
5.3.8	<i>Noise .....</i>	<i>18</i>
5.3.9	<i>Waste Production.....</i>	<i>19</i>
5.3.10	<i>Ecosystem and Biodiversity Impact .....</i>	<i>20</i>
5.3.11	<i>Groundwater, Surface Water and Soil Contamination .....</i>	<i>21</i>
5.3.12	<i>Water supply .....</i>	<i>22</i>
5.3.13	<i>Visual Impact.....</i>	<i>23</i>
5.3.14	<i>Cumulative Impact.....</i>	<i>24</i>
5.4	DECOMMISSIONING AND REHABILITATION .....	25
5.5	ENVIRONMENTAL MANAGEMENT SYSTEM.....	25
<b>6</b>	<b>CONCLUSION.....</b>	<b>25</b>
<b>7</b>	<b>REFERENCES.....</b>	<b>26</b>

## **LIST OF FIGURES**

FIGURE 2-1 PROJECT LOCATION .....	2
FIGURE 4-1 DAILY AND SEASONAL RAINFALL FROM CHIRPS-2 DATA (FUNK ET AL., 2015) .....	6

## **LIST OF TABLES**

TABLE 3-1 NAMIBIAN LAW APPLICABLE TO THE LODGE.....	2
TABLE 3-3 RELEVANT MULTILATERAL ENVIRONMENTAL AGREEMENTS FOR NAMIBIA AND THE DEVELOPMENT.....	4
TABLE 4-1. SUMMARY OF CLIMATE DATA FOR THE PROJECT AREA (ATLAS OF NAMIBIA PROJECT, 2002)	6
TABLE 4-2. RAINFALL STATISTICS BASED ON CHIRPS-2 DATA (FUNK ET AL., 2015).....	6
TABLE 4-3 GENERAL FLORA DATA (ATLAS OF NAMIBIA PROJECT, 2002).....	8
TABLE 4-4 GENERAL FAUNA DATA (ATLAS OF NAMIBIA PROJECT, 2002) .....	8
TABLE 4-4 DEMOGRAPHIC CHARACTERISTICS OF THE KABBE CONSTITUENCY, THE ZAMBEZI REGION AND NATIONALLY (NAMIBIA STATISTICS AGENCY, 2011).....	9

## **LIST OF ABBREVIATIONS**

<b>AIDS</b>	Acquired Immune Deficiency Syndrome
<b>DWA</b>	Department of Water Affairs
<b>DEA</b>	Directorate of Environmental Affairs
<b>EA</b>	Environmental Assessment
<b>EIA</b>	Environmental Impact Assessment
<b>EMA</b>	Environmental Management Act No 7 of 2007
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environmental Management System
<b>FGASA</b>	Field Guides Association of Southern Africa
<b>GPT</b>	Geo Pollution Technologies
<b>HIV</b>	Human Immunodeficiency Virus
<b>IUCN</b>	International Union for Conservation of Nature
<b>MEFT</b>	Ministry of Environment, Forestry and Tourism
<b>MSDS</b>	Material Safety Data Sheet
<b>NATH</b>	Namibian Academy for Tourism and Hospitality
<b>PPE</b>	Personal Protective Equipment
<b>RETOSA</b>	Charter of the Regional Tourism Organisation of Southern Africa
<b>SADC</b>	Southern African Development Community
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNFCCD</b>	United Nations Framework Convention to Combat Desertification
<b>WHO</b>	World Health Organization





## GLOSSARY OF TERMS

**Alternatives** - A possible course of action, in place of another, that would meet the same purpose and need but which would avoid or minimize negative impacts or enhance project benefits. These can include alternative locations/sites, routes, layouts, processes, designs, schedules and/or inputs. The “no-go” alternative constitutes the ‘without project’ option and provides a benchmark against which to evaluate changes; development should result in net benefit to society and should avoid undesirable negative impacts.

**Assessment** - The process of collecting, organising, analysing, interpreting and communicating information relevant to decision making.

**Competent Authority** - means a body or person empowered under the local authorities act or Environmental Management Act to enforce the rule of law.

**Construction** - means the building, erection or modification of a facility, structure or infrastructure that is necessary for the undertaking of an activity, including the modification, alteration, upgrading or decommissioning of such facility, structure or infrastructure.

**Cumulative Impacts** - in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area.

**Environment** - As defined in the Environmental Assessment Policy and Environmental Management Act - “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, palaeontological or social values”.

**Environmental Impact Assessment (EIA)** - process of assessment of the effects of a development on the environment.

**Environmental Management Plan (EMP)** - A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the project.

**Environmental Management System (EMS)** - An Environment Management System, or EMS, is a comprehensive approach to managing environmental issues, integrating environment-oriented thinking into every aspect of business management. An EMS ensures environmental considerations are a priority, along with other concerns such as costs, product quality, investments, PR productivity and strategic planning. An EMS generally makes a positive impact on a company’s bottom line. It increases efficiency and focuses on customer needs and marketplace conditions, improving both the company’s financial and environmental performance. By using an EMS to convert environmental problems into commercial opportunities, companies usually become more competitive.

**Evaluation** – means the process of ascertaining the relative importance or significance of information, the light of people’s values, preference and judgements in order to make a decision.

**Hazard** - Anything that has the potential to cause damage to life, property and/or the environment. The hazard of a particular material or installation is constant; that is, it would present the same hazard wherever it was present.

**Interested and Affected Party (IAP)** - any person, group of persons or organisation interested in, or affected by an activity; and any organ of state that may have jurisdiction over any aspect of the activity.

**Mitigate** - The implementation of practical measures to reduce adverse impacts.

**Proponent (Applicant)** - Any person who has submitted or intends to submit an application for an authorisation, as legislated by the Environmental Management Act no. 7 of 2007, to undertake an

activity or activities identified as a listed activity or listed activities; or in any other notice published by the Minister or Ministry of Environment & Tourism.

**Public** - Citizens who have diverse cultural, educational, political and socio-economic characteristics. The public is not a homogeneous and unified group of people with a set of agreed common interests and aims. There is no single public. There are a number of publics, some of whom may emerge at any time during the process depending on their particular concerns and the issues involved.

**Scoping Process** - process of identifying: issues that will be relevant for consideration of the application; the potential environmental impacts of the proposed activity; and alternatives to the proposed activity that are feasible and reasonable.

**Significant Effect/Impact** - means an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment.

**Stakeholder Engagement** - The process of engagement between stakeholders (the proponent, authorities and IAPs) during the planning, assessment, implementation and/or management of proposals or activities. The level of stakeholder engagement varies depending on the nature of the proposal or activity as well as the level of commitment by stakeholders to the process. Stakeholder engagement can therefore be described by a spectrum or continuum of increasing levels of engagement in the decision-making process. The term is considered to be more appropriate than the term “public participation”.

**Stakeholders** - A sub-group of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term therefore includes the proponent, authorities (both the lead authority and other authorities) and all interested and affected parties (IAPs). The principle that environmental consultants and stakeholder engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders.

**Sustainable Development** - “Development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs and aspirations” – the definition of the World Commission on Environment and Development (1987). “Improving the quality of human life while living within the carrying capacity of supporting ecosystems” – the definition given in a publication called “Caring for the Earth: A Strategy for Sustainable Living” by the International Union for Conservation of Nature (IUCN), the United Nations Environment Programme and the World Wide Fund for Nature (1991).

## 1 INTRODUCTION & BACKGROUND

---

O&L Leisure (Pty) Ltd (the Proponent) requested Geo Pollution Technologies (Pty) Ltd to update their existing environmental management plan (EMP) for the Chobe Water Villas, situated in the Kasika Conservancy, Zambezi Region. The lodge was previously known as, and operated under the name of, Kings Den Lodge and was refurbished and rebranded in 2014. The initial EMP for the redevelopment of the lodge from Kings Den to Chobe Water Villas was drafted in 2014 and an update drafted in 2018 (de Beer, 2018).

The upmarket lodge has ten luxury villas (rooms), two guide rooms, a restaurant, cocktail bar, lounge areas, shop, swimming pool and related support infrastructure. Electricity is supplied by a photovoltaic installation and backup generators. Water is abstracted from the Chobe River which is augmented by a shallow borehole close to the facility. Abstracted water is passed through a filtration system for use at the lodge. Domestic waste generated is sorted for recycling purposes and collected by an external contractor for disposal / recycling. Hazardous waste, if any, is disposed of at an appropriately classified waste disposal facility. Combustible, non-toxic waste, such as cardboard, paper, food and garden waste is burned on site to reduce volumes. Operational activities are typical of similar tourism facilities in Namibia and include day to day lodge operations and maintenance, guided local tours, including cultural visits to local villages within the conservancy, boat cruises on the Chobe River and a number of other tourist activities.

In order to comply with Namibian legislation, and to adhere to all codes and standards applied in their operations, the Proponent wishes to apply for renewal of their existing environmental clearance certificate (ECC) for the lodge operations. In support of the ECC renewal application, the updated EMP will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT). The EMP provides management options to ensure environmental impacts of the lodge are continually minimised. The environment being defined in the Environmental Assessment Policy and Environmental Management Act as “land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values”.

The EMP is a tool used to take pro-active action by addressing potential problems before they occur. This limits potential future corrective measures that may need to be implemented and allows for application of mitigation measures for unavoidable impacts. This document should continue to be used as an on-site reference document during all phases (planning, construction (care and maintenance), operations and decommissioning) of the lodge. All monitoring and records kept should be included in a report to ensure compliance with the EMP. Parties responsible for transgression of the EMP should be held responsible for any rehabilitation that may need to be undertaken. A Health, Safety, Environment and Quality policy as well as Environmental (HSEQ) Policy could be used in conjunction with the EMP. Operators and responsible personnel must be taught the contents of these documents. Relevant regulations and guidelines must be adhered to and monitored regularly as outlined in the EMP.

The updated EMP will be used to apply for renewal of the existing ECC in compliance with Namibia’s Environmental Management Act (Act No 7 of 2007).

## 2 SCOPE

---

The scope of the EMP is to:

- ◆ Provide a brief overview of all components and related operations of the lodge.
- ◆ Summarise the legal and regulatory framework within which the lodge operates.
- ◆ Provide a brief overview of the environment, i.e. the physical, biological, social and economic conditions, potentially impacted by the lodge.
- ◆ Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels.
- ◆ To provide sufficient information to the relevant competent authorities and the MEFT to make informed decisions regarding the development.

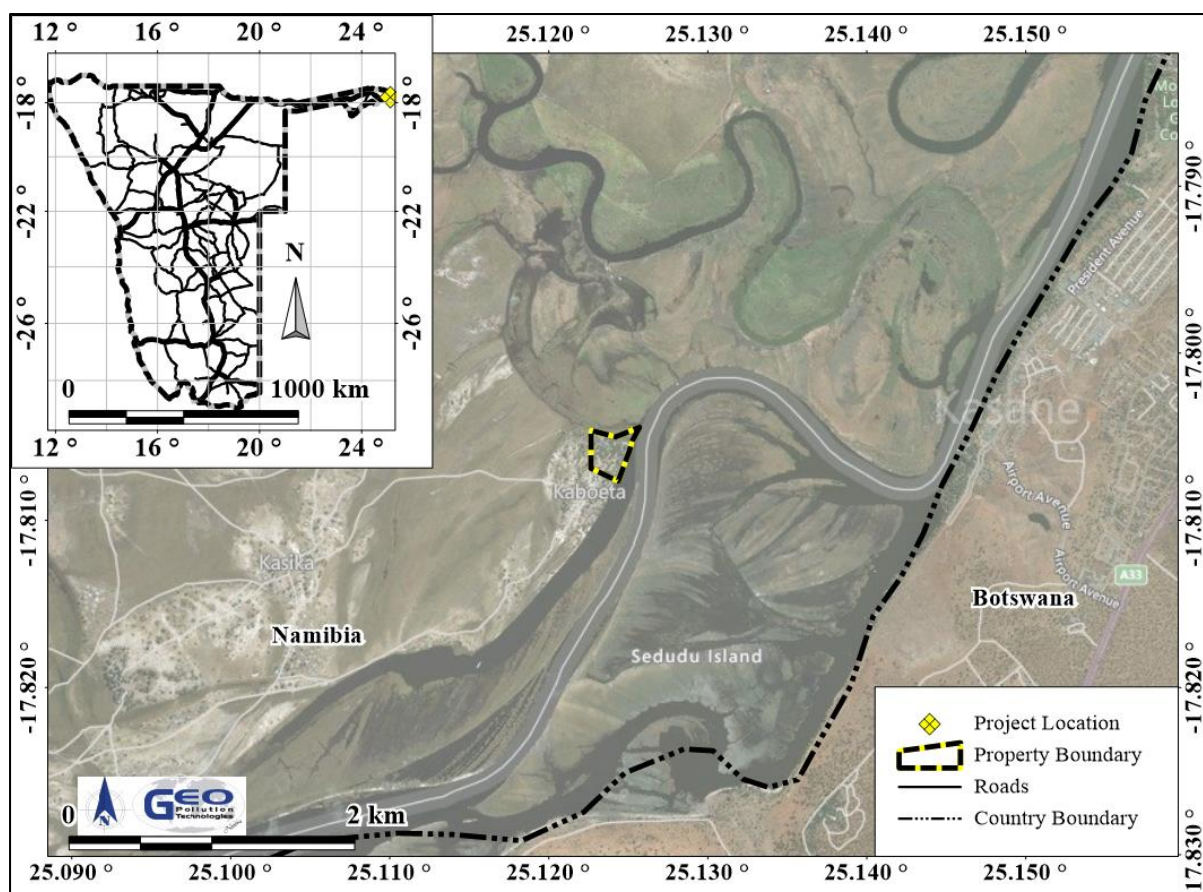


Figure 2-1 Project location

### 3 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies deemed to have adverse impacts on the environment require an ECC, as per the Namibian legislation. The legislation and standards provided in Table 3-1 to Table 3-2 govern the environmental assessment process in Namibia and/or are relevant to the lodge.

**Table 3-1 Namibian law applicable to the lodge**

Law	Key Aspects
<b>The Namibian Constitution</b>	<ul style="list-style-type: none"> <li>◆ Promote the welfare of people.</li> <li>◆ Incorporates a high level of environmental protection.</li> <li>◆ Incorporates international agreements as part of Namibian law.</li> </ul>
<b>Environmental Management Act</b> Act No. 7 of 2007, Government Notice No. 232 of 2007	<ul style="list-style-type: none"> <li>◆ Defines the environment.</li> <li>◆ Promote sustainable management of the environment and the use of natural resources.</li> <li>◆ Provide a process of assessment and control of activities with possible significant effects on the environment.</li> </ul>
<b>Environmental Management Regulations</b> Government Notice No. 28-30 of 2012	<ul style="list-style-type: none"> <li>◆ Commencement of the Environmental Management Act.</li> <li>◆ List activities that requires an environmental clearance certificate.</li> <li>◆ Provide Environmental Impact Assessment Regulations.</li> </ul>

Law	Key Aspects
<b>Namibia Tourism Board Act</b> Act no. 21 of 2000, Government Notice 261 of 200, 2000	<ul style="list-style-type: none"> <li>◆ Provide for the registration and grading of accommodation establishments.</li> <li>◆ Provide for the declaration of any sector of the tourism industry as a regulated sector and for the registration of businesses falling within a regulated sector.</li> <li>◆ Provides regulations and minimum requirements pertaining to:               <ul style="list-style-type: none"> <li>○ Levies payable.</li> <li>○ Registrations of regulated businesses.</li> <li>○ Registrations of accommodation establishments.</li> </ul> </li> </ul>
<b>Accommodation Establishments and Tourism Ordinance 20 of 1973</b>	<ul style="list-style-type: none"> <li>◆ Consolidate and amend the laws relating to accommodation establishments and tourism and to provide for the establishment of tourist recreation areas and incidental matters.</li> <li>◆ Provides for regulations of tourism establishments.</li> <li>◆ Numerous amendments and repeals.</li> </ul>
<b>Petroleum Products and Energy Act</b> Act No. 13 of 1990, Government Notice No. 45 of 1990	<ul style="list-style-type: none"> <li>◆ Regulates petroleum industry.</li> <li>◆ Makes provision for impact assessment.</li> <li>◆ Petroleum Products Regulations (Government Notice No. 155 of 2000).</li> </ul>
<b>The Water Act</b> Act No. 54 of 1956	<ul style="list-style-type: none"> <li>◆ Remains in force until the new Water Resources Management Act comes into force.</li> <li>◆ Defines the interests of the state in protecting water resources.</li> <li>◆ Controls the disposal of effluent.</li> <li>◆ Numerous amendments.</li> </ul>
<b>Water Resources Management Act</b> Act No. 11 of 2013	<ul style="list-style-type: none"> <li>◆ Provide for management, protection, development, use and conservation of water resources.</li> <li>◆ Prevention of water pollution and assignment of liability.</li> <li>◆ Not in force yet.</li> </ul>
<b>Forest Act</b> (Act 12 of 2001, Government Notice No. 248 of 2001)	<ul style="list-style-type: none"> <li>◆ Makes provision for the protection of the environment and the control and management of forest fires.</li> <li>◆ Provides the licencing and permit conditions for the removal of woody and other vegetation as well as the disturbance and removal of soil from forested areas.</li> </ul>
<b>Forest Regulations: Forest Act, 2001</b> Government Notice No. 170 of 2015	<ul style="list-style-type: none"> <li>◆ Declares protected trees or plants.</li> <li>◆ Issuing of permits to remove protected tree and plant species.</li> </ul>
<b>Local Authorities Act</b> Act No. 23 of 1992, Government Notice No. 116 of 1992	<ul style="list-style-type: none"> <li>◆ Define the powers, duties and functions of local authority councils.</li> <li>◆ Regulates discharges into sewers.</li> </ul>
<b>Public Health Act</b> Act No. 36 of 1919	<ul style="list-style-type: none"> <li>◆ Provides for the protection of health of all people.</li> </ul>
<b>Public and Environmental Health Act</b> Act No. 1 of 2015, Government Notice No. 86 of 2015	<ul style="list-style-type: none"> <li>◆ Provides a framework for a structured more uniform public and environmental health system, and for incidental matters.</li> <li>◆ Deals with Integrated Waste Management including waste collection disposal and recycling; waste generation and storage; and sanitation.</li> </ul>

<b>Law</b>	<b>Key Aspects</b>
<b>Labour Act</b> Act No 11 of 2007, Government Notice No. 236 of 2007	<ul style="list-style-type: none"> <li>◆ Provides for Labour Law and the protection and safety of employees.</li> <li>◆ Labour Act, 1992: Regulations relating to the health and safety of employees at work (Government Notice No. 156 of 1997).</li> </ul>
<b>Atmospheric Pollution Prevention Ordinance</b> Ordinance No. 11 of 1976	<ul style="list-style-type: none"> <li>◆ Governs the control of noxious or offensive gases</li> <li>◆ Prohibits scheduled process without a registration certificate in a controlled area.</li> <li>◆ Requires best practical means for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process.</li> </ul>
<b>Hazardous Substances Ordinance</b> Ordinance No. 14 of 1974	<ul style="list-style-type: none"> <li>◆ Applies to the manufacture, sale, use, disposal and dumping of hazardous substances as well as their import and export.</li> <li>◆ Aims to prevent hazardous substances from causing injury, ill-health or the death of human beings.</li> </ul>

**Table 3-2 Relevant multilateral environmental agreements for Namibia and the development**

<b>Agreement</b>	<b>Key Aspects</b>
<b>Charter of the Regional Tourism Organisation of Southern Africa (RETOSA), 1997</b>	<ul style="list-style-type: none"> <li>◆ Development of tourism through effective marketing of the Region in collaboration with the public and private sector.</li> <li>◆ To facilitate, encourage and assist in the development of legal and ethical tourism throughout the Southern African Region taking due consideration of the overall development of the people, the Region and the Region's natural and cultural resources.</li> </ul>
<b>Stockholm Declaration on the Human Environment, Stockholm 1972.</b>	<ul style="list-style-type: none"> <li>◆ Recognizes the need for a common outlook and common principles to inspire and guide the people of the world in the preservation and enhancement of the human environment.</li> </ul>
<b>Protocol on the Development of Tourism in SADC, 1998</b>	<ul style="list-style-type: none"> <li>◆ The Protocol sets out SADC's objective to build upon the region's potential as a tourist destination.</li> </ul>
<b>Statutes of the World Tourism Organization, 1970</b>	<ul style="list-style-type: none"> <li>◆ Promotion and development of tourism with a view to contributing to economic development, international understanding, peace, prosperity, and universal respect for, and observance of, human rights and fundamental freedoms for all without distinction as to race, sex, language or religion.</li> </ul>
<b>United Nations Framework Convention on Climate Change (UNFCCC)</b>	<ul style="list-style-type: none"> <li>◆ The Convention recognises that developing countries should be accorded appropriate assistance to enable them to fulfil the terms of the Convention.</li> </ul>
<b>Convention on Biological Diversity, Rio de Janeiro, 1992</b>	<ul style="list-style-type: none"> <li>◆ Under article 14 of The Convention, EIAs must be conducted for projects that may negatively affect biological diversity.</li> </ul>

Listed activities which require an ECC application (Government Regulation No 29 of 2012) related to this project include the following:

**Section 6 of Government Notice No. 29 of 2012: Tourism Development Activities**

- ◆ 6. The construction of resorts, lodges, hotels or other tourism and hospitality facilities: The lodge and related tourism facility was constructed and is currently in operation and maintained accordingly.

### ***Section 8 of Government Notice No. 29 of 2012: Water Resource Developments***

- ◆ **8.3. Any water abstraction from a river that forms an international boundary:** Water is abstracted from the Chobe River for current commercial (tourism) operations.
- ◆ **8.6 Construction of industrial and domestic wastewater treatment plants and related pipeline systems:** The Proponent has installed wastewater treatment facilities (septic tank and soakaway systems) within the operational area to manage mainly black and grey water.

## **4 ENVIRONMENTAL CHARACTERISTICS**

The following section provides a brief description of the environment of Chobe Water Villas.

### **4.1 LOCALITY AND SURROUNDING LAND USE**

Chobe Water Villas is situated in the Kasika Conservancy in the Zambesi Region (17.8061°S, 25.1245°E). The area falls under the jurisdiction of the Kabbe Constituency, Zambezi Regional Council. It is situated adjacent to the Chobe River, which forms the border between Namibia and Botswana. The surrounding area is underdeveloped and mainly hosts local villages and similar tourism establishments. There are no developed roads to the lodge, and access is gained via the Chobe River.

#### ***Implications and Impacts***

The lodge, located on communal land, facilitates tourism to the Kasika Conservancy by providing hospitality facilities in the remote area. Contribution to the local community is achieved through direct employment. The lodge has diversified the local and regional land-use, thereby strengthening the local economic resilience.

### **4.2 CLIMATE**

The lodge is situated in the semi-arid Caprivi Strip, an area classified by the Köppen Climate Classification as BSh (Beck et al., 2018), meaning a hot semi-arid, low-latitude steppe climate. A low-latitude steppe generally refers to a climate with an average temperature of more than 18°C with the coldest month having an average of more than 0 °C (Varma, 2018). The general lack of functioning weather stations in Namibia limits the availability of long term, true weather data. The lodge does not have a weather station. As a best possible workaround, long term rainfall data was obtained from the Atlas of Namibia Project (2002) and the CHIRPS-2 database (Funk et al., 2015), see Table 4-1, Table 4-2 and Figure 4-1. Atlas of Namibia Project data was compiled from almost 300 rainfall stations across Namibia, the data was contoured in 50 mm intervals prior to 1999 for variable length data sets. The CHIRPS-2 dataset (Climate Hazards Group Infra-Red Precipitation with Station data version 2) consist of long term rainfall data (1981 to near-present) obtained from satellite imagery and, where present, in-situ station data. The resultant dataset provides a reasonably well represented overview of the historic rainfall conditions of a general area. True values for single, site specific meteorological events may however differ to some degree. This is especially true where the dominant rainfall is depended on localized storm cells that causes a high rainfall variability over short distances.

In the project area, days are mostly warm with very hot days during the summer months, while nights cool down slightly. The rain season normally starts in October and last until April, peaking in December to February. Heavier rainfall (single day events) occur between October and February, with a single event of 50.8 mm in March (last 40 years data) being the highest (Table 4-2).

The average annual rainfall for the last 40 years was calculated as 546 mm/a, with a coefficient of variance of 24% (Table 4-2). This data shows a slight correlation with Atlas the of Namibia Project data, which calculated variation in rainfall at 30 % (Table 4-1). Daily and seasonal rainfall data (Funk et al., 2015) is presented in Figure 4-1. Seasonal (July to June) total rainfall, centred on the average line for the last 40 years, is presented, with the daily total rainfall and the seasonal cumulative rainfall.

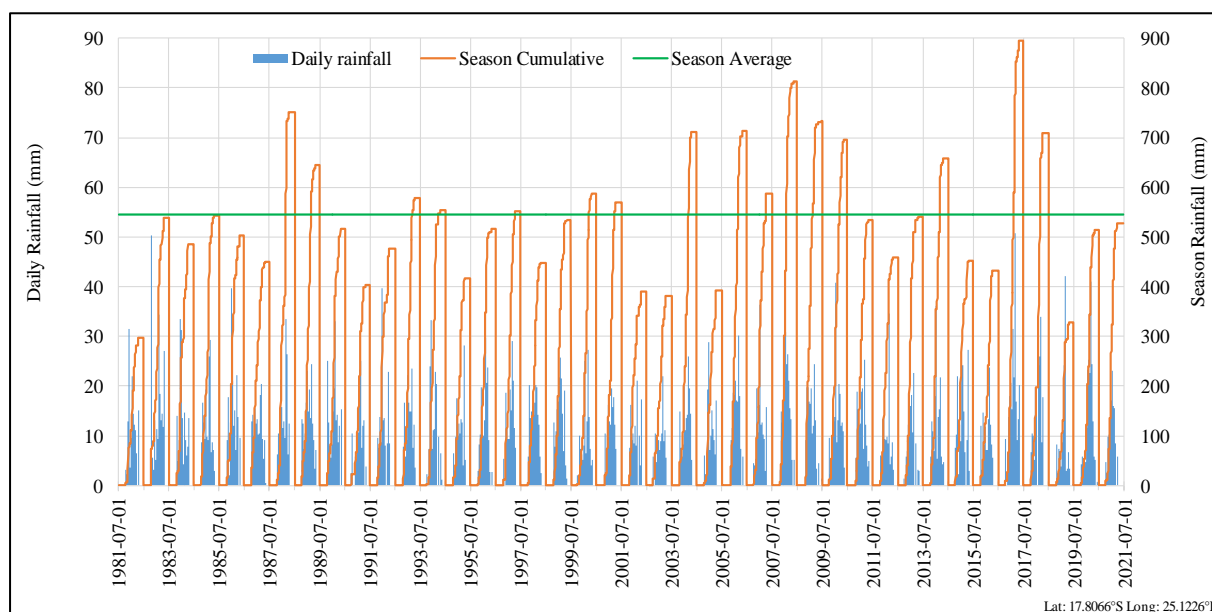
From the figure it is clear that the area has received mostly below average rainfall since the 2018-2019 season to the 2021 season. The driest year (last 40 years data) was the 1981-1982 season with about 300 mm recorded (Figure 4-1).

**Table 4-1. Summary of climate data for the project area (Atlas of Namibia Project, 2002)**

Variation in annual rainfall (%)	< 30
Average annual evaporation (mm/a)	2,400-2,600
Water deficit (mm/a)	< 1,300
Average annual temperatures (°C)	21-22

**Table 4-2 Rainfall statistics based on CHIRPS-2 data (Funk et al., 2015)**

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum (mm/m)	47.47	18.67	6.36	5.22	0.00	0.00	0.00	0.00	0.00	6.92	16.66	28.73
Maximum (mm/m)	320.27	353.24	194.41	70.84	5.33	2.89	0.11	0.00	2.82	72.65	193.33	232.75
Average (mm/m)	125.9	124.6	64.7	17.2	0.4	0.1	0.0	0.0	0.3	23.1	62.6	120.6
Variability (%)	46.0	58.0	59.0	86.0	302.0	390.0	436.0	0.0	266.0	68.0	53.0	44.0
Daily maximum (mm)	40.9	50.8	28.2	27.3	5.1	1.4	0.1	0.0	2.5	50.3	33.2	39.7
Average rain days	17	13	9	3	0	0	0	0	0	4	10	17
Season July - June average: 546 mm						Season coefficient of variation: 24 %						
Data range	1981-Jul-01 to 2021-Jun-30						Lat: 17.8066°S Long: 25.1226°E					



**Figure 4-1 Daily and seasonal rainfall from CHIRPS-2 data (Funk et al., 2015)**

### ***Implications and Impacts***

Water is a scarce and valuable resource in Namibia and the variability in seasonal rainfall makes water an extremely vulnerable resource. Rainfall events are typically thunderstorms with heavy rainfall that can occur in short periods of time (cloud bursts). Raw sewerage that enter the groundwater or river may pollute the valuable resource. Fuel stored on site, although in small volumes, may result in hydrocarbon spills which may enter the environment and potentially pollute the river and render the water unusable for nearby receptors. However, safe storage and handling practices such as storing fuels in bunded areas and use of drip trays / spill control surfaces where fuel is handled will successfully mitigate this risk.

### **4.3 TOPOGRAPHY AND DRAINAGE**

The landscape is classified as being in an ephemeral floodplain. The site is located on the banks of the Chobe River, a tributary of the Zambesi River, a perennial river draining in an eastern



direction. The local landscape, and the site and its immediate surroundings, is situated in a floodplain and the area is generally flat.

#### ***Implications and Impacts***

During the operational phase, any pollutants that are not contained, and are transported via surface water flow, will be transported out of the site via the storm water drainage lines and potentially pollute the surrounding environment and the river. As the area is prone to flooding, storage of hazardous substances should be done in a way that ensures substances remain contained and safe during flooding.

#### **4.4 GEOLOGY AND HYDROGEOLOGY**

The dominant surface soil cover in the area is eutric Fluvisols, alluvial soils with fair to good nutrient status. Surface geology in the area is dominated Kalahari deposits. The geology of the project area falls within the Kalahari group.

The project location is situated in the Caprivi Groundwater Basin. Localised groundwater flow may take place along preferred flow paths in different directions, but the general flow is expected to be in an eastern direction with the Chobe River serving as a local recharge zone. Groundwater flow would be mainly through primary porosity in the topsoil cover. As water is mainly abstracted directly from the river by users within the area, there are only 3 known boreholes within a 10 km radius of the project area. The project location falls outside a water control area and therefore a permit from the Ministry of Agriculture Water and Land Reform is not required for drilling or abstraction of water, except when drilling near the bank of the Chobe River. All groundwater remains the property of the Government of Namibia

#### ***Implications and Impacts***

A risk to groundwater pollution, and ultimately the Chobe River exists due to the geological sensitivity of the area. This is mainly due to the nature of the surficial deposits (river bed), which is sensitive to contamination, as well as the shallow groundwater. Groundwater remains an important resource and would be at risk if sewage / fuel spills are not contained, cleaned and disposed of properly.

#### **4.5 WATER SUPPLY**

Surface water, extracted directly from the Chobe River is the main bulk water supply to the area surrounding the river. Water is supplied to the lodge via a shallow borehole located near the lodge, as well as from water abstracted from the Chobe River.

#### ***Implications and Impacts***

Surface water in the area is an extremely valuable resource. Chemical or raw sewage spills may potentially contaminate surface and groundwater if not contained, cleaned and disposed of properly. Water usage of the lodge is not expected to impact on the availability of surface water.

#### **4.6 FAUNA AND FLORA**

The site lies in the Savanna biome with a Caprivi Floodplains vegetation type. Plant species such as *Cynodon dactylon*, *Phragmites australis*, *Acacia hebeclada*, *Combretum imberbe*, *Echinochloa pyramidalis*, *Hyphaene ventricosum* and a variety of other grass, shrub and tree species are characteristic of this vegetation type. Table 4-3 and Table 4-5 present a summary of the general fauna and flora of the broader area. Endemism for the area is low with one species of bird and one frog species being endemic.

The lodge is an existing facility and has been designed to incorporate the natural vegetation into the facility. The lodge is situated in the Kasika Conservancy, within the floodplains of the Chobe and Zambezi Region. Grasslands in the floodplains provide grazing for livestock of the local communities. Local communities further rely on fish in the river as a source of food as well as income.

**Table 4-3 General flora data (Atlas of Namibia Project, 2002)**

<b>Biome</b>	Savanna
<b>Vegetation type</b>	Caprivi Floodplains
<b>Vegetation structure type</b>	Grassland
<b>Diversity of higher plants</b>	High (Diversity rank = 2 [1 to 7 representing highest to lowest diversity])
<b>Number of plant species</b>	400 - 500
<b>Percentage tree cover</b>	0.1-1
<b>Tree height (m)</b>	5-10
<b>Percentage shrub cover</b>	0.1-1
<b>Shrub height (m)</b>	1-5
<b>Percentage dwarf shrub cover</b>	0.1-1
<b>Dwarf shrub height (m)</b>	< 0.5
<b>Percentage grass cover</b>	76-100
<b>Grass height (m)</b>	1-2

**Table 4-4 General fauna data (Atlas of Namibia Project, 2002)**

<b>Mammal Diversity</b>	61 - 75 Species
<b>Rodent Diversity</b>	16 - 19 Species
<b>Bird Diversity</b>	111-140 Species
<b>Reptile Diversity</b>	51 - 60 Species
<b>Snake Diversity</b>	15 - 19 Species
<b>Lizard Diversity</b>	> 35 Species
<b>Frog Diversity</b>	4 - 7 Species
<b>Termite Diversity</b>	7 - 9 Genera
<b>Scorpion Diversity</b>	14 - 15 Species

***Implications and Impacts***

The lodge is an existing facility, and itself does not present a threat to the regional biodiversity. Possible pollution and changes or creation of habitats, may create a suitable environment for species not traditionally know in the area or not frequenting the area– these include fauna and flora species. Temporary storage of food waste may present an opportunity for wildlife scavenging etc. while uncontrolled pollution (such a hydrocarbon spills) may and can cause damage to the local biodiversity.

While certain insects are considered pests (such as ants, mosquito, locusts, etc.), the use of pesticides may not be as effective and have detrimental effects on other insects as well as fauna relying on insects as a source of food. The presence of snakes and other venomous species as well larger animals such as crocodiles and hippos living in the river present safety risks to the staff and lodge patrons.

Poaching and illegal collection of plant and animal material may impact on the local environment. Patrons and staff alike should be made aware of the implications of poaching. Overharvesting of fish by staff for financial purposes should be prohibited as this may impact local fish populations.

**4.7 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS**

According to the results of the 2011 Population and Housing Census (National Planning Commission, 2012), the Kabbe Constituency has 14,518 people. Economic activities relate mostly to tourism, local businesses and small scale farming.

**Table 4-5 Demographic characteristics of the Kabbe Constituency, the Zambezi Region and nationally (Namibia Statistics Agency, 2011)**

	Kabbe Constituency	Zambezi Region	Namibia
<b>Population (Males)</b>	7,047	46,497	1,021,912
<b>Population (Females)</b>	7,471	44,099	1,091,165
<b>Population (Total)</b>	14,518	90,596	2,113,077
<b>Unemployment (15+ years)</b>	17%	38%	33.8%
<b>Literacy (15+ years)</b>	86%	84%	87.7%

***Implications and Impacts***

Current operations have increased employment locally and created positive economic spin-offs in the Kasika Conservancy. Employment opportunities and economic diversification, as brought on through the lodge, may influence the demographic profile of the local community through mainly in migration and education. Skills development and training benefit employees while the lodge may have an influence on further stimulating economic growth for the area. However, additional people would also put additional pressure on existing limited infrastructure, services and natural resources in the area.

**5 ENVIRONMENTAL MANAGEMENT PLAN**

The purpose of this section is to list the most pertinent environmental impacts that are expected from the operational, construction (upgrades, maintenance, etc.) and potential decommissioning activities of the lodge. The following general guidance for the EMP is based on the updated EMP of 2018 (de Beer, 2018), and primary and secondary information obtained regarding the lodge and its current operations.

**5.1 OBJECTIVES OF THE EMP**

The EMP provides management options to ensure impacts of the lodge is minimised. The objectives of the EMP are:

- ◆ to include all components of construction activities (upgrades, maintenance, etc.) and operations of the lodge;
- ◆ to prescribe the best practicable control methods to lessen the environmental impacts associated with the lodge;
- ◆ to monitor and audit the performance of operational personnel in applying such controls; and
- ◆ to ensure that appropriate environmental training is provided to responsible operational personnel.

**5.2 IMPLEMENTATION OF THE EMP**

Section 5.3 outline the management of the environmental elements that may be affected by the different activities. Impacts addressed and mitigation measures proposed are seen as minimum requirements which have to be elaborated on. Delegation of prevention and mitigation measures as well as reporting activities should be determined by the Proponent and included in the EMP. The EMP is a living document that must be prepared in detail, and regularly updated, by the Proponent as the project progress and evolve.

The EMP and ECC must be communicated to the lodge managers. A copy of the ECC and EMP should be kept on site. All monitoring results must be reported on as indicated. Reporting is important for any future renewals of the ECC and must be submitted to the MEFT. Renewal of ECC will require six monthly reports based on the monitoring prescribed in this EMP.

Various potential and definite impacts will emanate from the operations and decommissioning phases. The majority of these impacts can be mitigated or prevented. The prevention and mitigation measures are listed below.

### 5.3 MANAGEMENT OF IMPACTS: OPERATIONS AND CONSTRUCTION

The following section provide management measures for both the operational phase as well as construction (maintenance) activities related to the lodge.

#### 5.3.1 Planning

During the phases of planning for operations, construction and decommissioning of the lodge, it is the responsibility of the Proponent to ensure they are and remain compliant with all legal requirements. The Proponent must also ensure that all required management measures are in place prior to and during all phases, to ensure potential impacts and risks are minimised. The following actions are recommended for the planning phase and should continue during various other phases of the project:

- ◆ Ensure that all necessary permits from the various ministries, local authorities and any other bodies that govern the hospitality industry and construction related activities and operations of the establishment are in place and remains valid. This includes registration with the Namibia Tourism Board as well as water abstraction and effluent disposal permits from the Ministry of Agriculture, Water and Land Reform.
- ◆ Ensure all appointed contractors and employees enter into an agreement which includes the EMP. Ensure that the contents of the EMP are understood by the contractors, sub-contractors, employees and all personnel present or who will be present on site.
- ◆ Make provisions to have a Health, Safety and Environmental Coordinator to implement the EMP and oversee occupational health and safety as well as general environmental related compliance at the site.
- ◆ Have the following emergency plans, equipment and personnel on site where reasonable to deal with all potential emergencies:
  - Risk management / mitigation / EMP/ Emergency Response Plan and HSE Manuals;
  - Adequate protection and indemnity insurance cover for incidents;
  - Comply with the provisions of all relevant safety standards;
  - Procedures, equipment and materials required for emergencies.
- ◆ If one has not already been established, establish and maintain a fund for future ecological restoration of the project site should project activities cease and the site is decommissioned and environmental restoration or pollution remediation is required.
- ◆ Ensure all agreements entered into between the Proponent and the Kasika Conservancy / Ministry of Agriculture, Water and Land Reform are continually adhered to, and updated in writing if and where required.
- ◆ Establish and / or maintain a reporting system to report on aspects of construction activities, operations and decommissioning as outlined in the EMP.
- ◆ Submit bi-annual reports to the MEFT to allow for environmental clearance certificate renewal after three years. This is a requirement by MEFT.
- ◆ Appoint a specialist environmental consultant to update the EMP and apply for renewal of the environmental clearance certificate prior to expiry.

### **5.3.2 Skills, Technology and Development**

During various phases of the lodge, training is provided to a portion of the workforce to be able to conduct certain tasks according to the required standards. Skills are periodically transferred to an unskilled workforce for general tasks. Development of people and technology are key to economic development. During normal operations, employees will enhance their working expertise while some individuals may be identified for promotion and additional skills development and training.

**Desired Outcome:** To see an increase in skills of local Namibians, as well as development and technology advancements in the tourism industry and local community.

#### **Actions**

##### **Enhancement:**

- ◆ If the skills exist locally, contractors must first be sourced from the region and then nationally. Deviations from this practice must be justified.
- ◆ Skills development and improvement programs to be made available as identified during performance assessments.
- ◆ Employees to be informed about parameters and requirements for references upon employment.
- ◆ The Proponent must employ local Namibians from the area where possible. Deviations from this practise should be justified appropriately.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Record should be kept of training provided.
- ◆ Ensure that all training is certified or managerial reference provided (proof provided to the employees) inclusive of training attendance, completion and implementation.
- ◆ Bi-annual summary report based on employee training.

### **5.3.3 Economic Resilience and Employment**

The change in land use, from communal to tourism, lead to changes in the way revenue is generated and paid to the national treasury. Skilled and unskilled labour are required for the operations and maintenance / construction activities associated with the lodge. A report released by the World Travel and Tourism Council (2018), prior to the Covid19 pandemic, estimated that Namibia will see a growth of 3.6% in travel and tourism's contribution to employment over the next 10 years. The expected growth is higher than estimations for Sub-Saharan Africa (2.3%). As a result of the ongoing Covid19 pandemic, Namibia has seen a significant reduction in tourism, however the tourism sector is beginning to slowly recover. Increased travel within Namibia and specifically to this region is therefore expected to increase the demand for accommodation and related services.

**Desired Outcome:** Contribution to national treasury and continued remuneration of temporary and permanent employees as per the Labour Act. Continued contributions to social security.

#### **Actions**

##### **Enhancement:**

- ◆ The Proponent must employ local Namibians from the Conservancy where possible.
- ◆ If the skills exist locally, employees must first be sourced from the town, then the region and then nationally.
- ◆ Deviations from this practice must be justified.
- ◆ Develop and maintain a contractor management program, inclusive of compliance reviews of service level agreements etc.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Bi-annual summary report based on employee records and financial contributions to the various institutions such as social security, receiver of revenue etc.

#### **5.3.4 Demographic Profile and Community Health**

Greater economic prosperity as linked to the flourishing lodge operations may lead to a change in the demographic profile of the local community. Change will result with an influx of job seekers over time and further densification of the settlement. Community structures may change with an increase in population while the economic profile will be adjusted as the employment structure of the area is changed. Community health may be exposed to factors such as communicable disease like HIV/AIDS and alcoholism/drug abuse. An increase in people in the area may potentially increase the risk of criminal and socially deviant behaviour such as vandalism and poaching. More people in the area will exert additional pressure on governmental services, particularly essential services such as health care. Medical assistance, emergency services and the policing of the community may become strained.

**Desired Outcome:** To prevent the occurrence of social ills and prevent the spread of diseases such as HIV/AIDS.

#### **Actions:**

##### **Prevention:**

- ◆ Employ only local people from the conservancy where possible, deviations from this practice should be justified appropriately.
- ◆ Ensure sanitation facilities and all related sanitation requirements are available and maintained at the lodge for all employees.
- ◆ Develop and implement a maintenance and inspection program at staff accommodation facilities at the lodge.
- ◆ To prevent conflict between families within the conservancy, employment should be divided in such a manner that ensures adequate distribution between families as far as possible.
- ◆ Educational programmes for employees on various topics of social behaviour HIV/AIDS and general upliftment of employees' social status.
- ◆ To ensure disturbances to local villages and important cultural and sacred sites are limited, the lodges should only allow guided visits, based on terms set by the conservancy.
- ◆ Appointment of reputable contractors.
- ◆ A staff wellness program should be developed and implemented which focusses specifically on the needs of employees at isolated sites.
- ◆ A program should be developed and implemented to ensure staff safety during the events focussed on their entertainment or reward.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Facility inspection sheet for all areas which may present environmental health risks, kept on file.
- ◆ Bi-annual summary report based on educational programmes and training conducted.

### **5.3.5 Increase in Carbon Footprint**

Some activities associated with the operations of the lodge may contribute to the carbon footprint of the lodge. This includes activities such as diesel and petrol driven vehicles and machinery and the use of diesel driven backup generators etc. Excessive use of these items may negatively impact the carbon footprint of the organisation and the industry (resulting in a contribution, albeit negligible, to the global warming phenomenon).

**Desired Outcome:** Minimum contribution to the carbon footprint of the lodge.

#### **Actions**

##### **Prevention:**

- ◆ Investigate, increase and optimise the use of renewable energy on site.
- ◆ Implement energy saving initiatives and responsible electricity use to prevent the need for backup generators.

##### **Mitigation:**

- ◆ Monitor electricity consumption of the lodge and investigate unexplained increases in usage.
- ◆ Maintain a record of the use of items which may result in a significant contribution to the carbon footprint of the lodge.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ A bi-annual report should be compiled of all incidents reported, action taken, energy saving initiatives implemented and renewable energy sources utilised.



### 5.3.6 Health, Safety and Security

Activity associated with operations and maintenance / construction is reliant on human labour and therefore health and safety risks exist. Activities such as the operation of vehicles and machinery as well as handling of hazardous chemicals pose risks to employees. The site is located within a remote area and occurrences of wild animals, including crocodiles in the river, is common. Encounters with these wild animals, including venomous species like snakes and scorpions may pose risks to staff and uninformed guests. The occurrence of malaria is common in the area. Security risks will be related to unauthorized entry, theft and sabotage.

**Desired Outcome:** To prevent injury, health impacts and theft.

#### **Actions**

##### **Prevention:**

- ◆ Clearly label dangerous and restricted areas as well as dangerous equipment and products. This includes the chemical store and fuel storage area.
- ◆ Equipment and goods that will be locked away on site must be placed in a way that does not encourage criminal activities (e.g. theft).
- ◆ Develop and maintain a machinery and tools register for the lodge inclusive of a maintenance and inspection schedule, this should include driven machinery.
- ◆ Provide all employees with required and adequate personal protective equipment (PPE).
- ◆ Staff should be educated / trained on human wildlife conflict management, and guests should be informed upon arrival not to approach wild animals and to be vigilant for, and not to confront, snakes, crocodiles, etc. or other potentially venomous / dangerous animals.
- ◆ A standard operating procedure, including training, awareness and emergency response plan, should be developed and implemented for human wildlife conflict / interactions.
- ◆ A response and business continuity plan for flooding events should be developed and implemented as required to prevent health and safety related impacts and minimise operational impacts.
- ◆ As a result of the possibility of malaria infection, personnel and guests should be encouraged to, during times of mosquito activity, take measures to prevent mosquito bites including wearing long sleeved clothing, applying insect repellents and sleeping under mosquito nets.
- ◆ All Health and Safety standards specified in the Labour Act should be complied with.
- ◆ Implementation of maintenance register for all equipment and fuel/hazardous substance storage areas.
- ◆ Ensure legal appointments, of appropriately qualified and trained personnel, are in place for all necessary maintenance and specialised operational activities.
- ◆ All industry specific health and safety procedures and regulations applicable to the kitchen and the preparation of food for guests should be in place and adhered to, this should include a food handler's medical survey programme.
- ◆ Implement and maintain a food safety program at all facilities where food is prepared and provided to staff and guests (including staff and guest allergies).
- ◆ Develop and implement a fleet management programme for all vehicles utilised for the transport of staff between lodge / accommodation facilities / other locations

##### **Mitigation:**

- ◆ The remoteness of the lodge increases the risk in the event of an incident, therefore selected personnel should be trained in first aid and a first aid kit must be available on site. The contact details of all emergency services, including emergency evacuation services, must be readily available.
- ◆ Educate staff on the symptoms of malaria and encourage them to report such symptoms.
- ◆ Implement and maintain an integrated health and safety management system, to act as a monitoring and mitigating tool, which includes:
  - operational, safe work, first aid and medical procedures;

- permits to work programmes for dangerous work;
  - job hazard analysis and standard operating procedures where required;
  - emergency response plans and drills;
  - housekeeping programmes;
  - MSDS's and signage requirements (PPE, flammable etc.);
  - a medical surveillance program;
  - hygiene and ergonomic survey for the site;
  - a training needs analysis and training program for the lodge;
  - register of permits, permits requirements and adherence and permit renewals.
- ◆ Security procedures and proper security measures must be in place.

**Responsible Body:**

- ◆ Proponent
- ◆ Contractors

**Data Sources and Monitoring:**

- ◆ Any incidents must be recorded with action taken to prevent future occurrences.
- ◆ A bi-annual report should be compiled of all incidents reported. The report should contain dates when training were conducted and when safety equipment and structures were inspected and maintained.

### 5.3.7 Fire

Construction activities, failing electrical infrastructure and fires outside of designated areas may increase the risk of the occurrence of uncontrolled fires which may spread into the nearby field. Similarly machinery can ignite dry vegetation if sufficient heat (e.g. exhaust pipes) or sparks are produced. Chemicals and fuels stored and used for general activities may be flammable. Improper waste burning or discarding of cigarette buds further increases fire risks.

**Desired Outcome:** To prevent property damage, veld fires, possible injury and impacts caused by uncontrolled fires.

#### **Actions:**

##### **Prevention:**

- ◆ Prepare a holistic fire protection and prevention plan. This plan must include evacuation plans and signage, an emergency response plan and a firefighting plan.
- ◆ Have an electrical maintenance / service and inspection plan in place, this should include; regular inspections on high and low voltage reticulation systems; annual infrared scans on all main distribution boards and electrical equipment; annual Earth leakage tests, transformer management plan and legal appointments of responsible, qualified personnel.
- ◆ Develop and implement a maintenance program for all Liquid Petroleum Gas (LPG) installations on site.
- ◆ Ensure extraction canopies at cooking areas are regularly inspected, cleaned and effectively maintained.
- ◆ Personnel training (safe operational procedures, firefighting, fire prevention and responsible housekeeping practices).
- ◆ Ensure all chemicals are stored according to material safety data sheet (MSDS) and SANS instructions and all spills or leaks are cleaned up immediately.
- ◆ Maintain firefighting equipment and good housekeeping.
- ◆ Fire used for purposes such as cooking (by staff) must only be allowed within designated areas.
- ◆ The burning of garden waste should be done in a designated area and strictly controlled and monitored.

##### **Mitigation:**

- ◆ Implement the fire protection and prevention plan in the event of a fire.
- ◆ Quick response time by trained staff will limit the spread and impact of fire.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A register of all incidents must be maintained on a daily basis. This should include measures taken to ensure that such incidents do not repeat themselves.
- ◆ A bi-annual report should be compiled of all incidents reported. The report should contain dates when fire drills were conducted and when fire equipment was tested and training given.

### 5.3.8 Noise

Since the lodge is a tourist establishment, noise are typically kept to a minimum not to be a disturbance to guests. However, during construction and maintenance activities some noise generating activities can exist that may lead to hearing loss in workers.

**Desired Outcome:** To prevent any nuisance and hearing loss due to noise generated.

#### **Actions**

##### **Prevention:**

- ◆ Follow World Health Organization (WHO) guidelines on maximum noise levels (Guidelines for Community Noise, 1999) to prevent hearing impairment.
- ◆ All machinery and vehicles must be regularly serviced to ensure minimal noise production.

##### **Mitigation:**

- ◆ Hearing protectors as standard PPE for workers in situations with elevated noise levels.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ WHO Guidelines.
- ◆ Maintain a complaints register.
- ◆ Bi-annual reporting on complaints and actions taken to address complaints and prevent future occurrences.

### 5.3.9 Waste Production

Various waste streams are produced during the operational and construction / maintenance phases. Waste may include hazardous waste associated with hydrocarbon products and chemicals, and soil and water contaminated with such products. Construction waste may include building rubble (concrete) and discarded equipment. Domestic waste will be generated by the lodge and related operations. Waste presents a contamination risk and when not removed regularly may become a health and / or fire hazard as well as attract wild animals and scavengers. Sewage is a form of liquid biological waste that needs disposal.

**Desired Outcome:** To reduce the amount of waste produced, and prevent pollution and littering.

#### **Actions**

##### **Prevention:**

- ◆ Develop and implement a waste management program, this should include waste reduction and recycling initiatives and regular inspection and maintenance of waste storage areas.
- ◆ Ensure adequate disposal storage facilities are available that prevents waste being blown away by wind and prevent scavenging (human and non-human) of waste.
- ◆ Ensure all ablution facilities are connected to properly constructed and maintained effluent treatment system to prevent groundwater contamination.
- ◆ The septic tank should be designed and operated according to the general guidelines set forth in the *Department of Water Affairs and Forestry, Code of Practice: Volume 1, Septic tank Systems*.
- ◆ No foreign objects, hazardous chemicals, fuels or excessive amounts of cooking grease may enter the sewage system.
- ◆ Use only bio-degradable, septic tank friendly cleaning chemicals.
- ◆ All regulation and by-laws relating to environmental health should be adhered to.
- ◆ Adhere to effluent disposal permit conditions for sewerage management system.
- ◆ Should any buildings or structures be decommissioned, all waste and infrastructure should be disposed of at a pre-approved landfill site. For large projects, the EMP should be updated to identify appropriate disposal methods.
- ◆ Should the septic tanks be decommissioned, all waste should be removed from the tank and disposed of in an appropriate manner prior to decommissioning.
- ◆ The burning of waste should be in a fenced off, controlled area. Waste should be properly sorted and inspected prior to burning to ensure only non-toxic combustible waste such as paper, cardboard, garden waste and food is burnt.

##### **Mitigation:**

- ◆ Waste should be disposed of regularly and at appropriately classified disposal facilities, this includes hazardous material (empty chemical containers, contaminated rugs, paper water and soil).
- ◆ See the material safety data sheets available from suppliers for disposal of contaminated products and empty containers.
- ◆ Liaise with the local authority regarding waste and handling of hazardous waste.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A register of hazardous waste disposal should be kept. This should include type of waste, volume as well as disposal method/facility.
- ◆ Any complaints received regarding waste should be recorded with notes on action taken. All information and reporting to be included in a bi-annual report.

### 5.3.10 Ecosystem and Biodiversity Impact

Chobe Water Villas is an existing lodge and no further impact on vegetation is expected. The lodge is designed and operated in a way that incorporates the natural vegetation. Poaching and illegal collection of plant and animal materials may occur. Impacts may also be related to pollution of the environment. Human / wildlife interactions further presents a risk to both the wildlife and the people involved if not properly managed.

**Desired Outcome:** To avoid pollution of and impacts on the ecological environment.

#### **Actions.**

##### **Prevention:**

- ◆ Where possible, removal of trees, especially protected species and large trees, must be avoided during construction activities.
- ◆ The necessary permits from the Directorate of Forestry, MEFT must be obtained for removal of all protected species.
- ◆ Educate all contracted and permanent employees on the value of biodiversity.
- ◆ Strict conditions prohibiting harvesting and poaching of fauna and flora should be part of employment contracts. This includes prohibitions or regulations on the collection of firewood.
- ◆ Firewood should be sourced from official suppliers from regions with an abundance of wood, preferably from invasive species as far as possible.
- ◆ Regular inspection of surrounding areas and river courses for snares, traps or any other illegal activities.
- ◆ Disciplinary actions to be taken against all employees failing to comply with contractual conditions related to poaching and the environment.
- ◆ Only guided tours should be allowed from the lodge, and should be limited to existing established roads.
- ◆ Guides employed should be well trained and aimed to be either NATH or FGASA accredited.
- ◆ Policy documents should be drafted and implemented on how to deal with wildlife interactions and visits to villages, this should include:
  - Training requirements for land based and river guides,
  - Contractual requirements for third party guides,
  - Induction requirements for clients,
  - Routes that may be used (existing only).

##### **Mitigation:**

- ◆ For construction activities, if any, contain construction material to a designated laydown area and prevent unnecessary movement out of areas earmarked for clearing and construction.
- ◆ Report any extraordinary animal sightings, conflict or incidents to the MEFT.
- ◆ Mitigation measures related to waste handling and the prevention of groundwater, surface water and soil contamination should limit ecosystem and biodiversity impacts.
- ◆ Avoid scavenging of waste by fauna.

##### **Responsible Body:**

- ◆ Contractor
- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ All information and reporting to be included in a bi-annual report.

### 5.3.11 Groundwater, Surface Water and Soil Contamination

Various sources exist that may potentially pollute surface water, soil and subsequently groundwater. This include vehicles and machinery that leak oil or hydraulic fluids (guide motor vehicles and watercraft, generators, transformers etc.). Operations entail the storage and handling of chemicals in small quantities which present contamination risks if not sufficiently contained. Raw sewage not sufficiently treated that enters the environment can reach groundwater.

**Desired Outcome:** To prevent the contamination of water and soil.

#### **Actions**

##### **Prevention:**

- ◆ Proper training of operators of machinery and vehicles and employees must be conducted on a regular basis (fuel and chemical handling, spill detection, spill control).
- ◆ All machinery and vehicles should be properly maintained to be in a good working condition during operations.
- ◆ Employ drip trays and spill kits when servicing / repairs of equipment is needed.
- ◆ The sewage system must be regularly inspected and serviced as required.
- ◆ Ensure fat traps in the kitchen areas etc. are regularly inspected and maintained.
- ◆ If water from the swimming pool will enter the environment, biodegradable / environmentally friendly chemicals should be used for water treatment.
- ◆ An activity specific risk assessment should be conducted prior to the introduction of any new hazardous substance at the lodge, this includes the use of herbicides and pesticides.
- ◆ Standard operating procedures should be developed and implemented for the use of hazardous materials.
- ◆ All chemical should be stored in a sufficiently bunded area and a register maintained of all chemicals stored at the lodge.
- ◆ The storage and handling of fuel should be done in a way that prevents contamination of the environment in the event of spills or leaks, this includes storing fuel in a bunded area and the use of drip trays, spill proof surfaces where fuel is handled.

##### **Mitigation:**

- ◆ Any chemical spillage of more than 200 litre must be reported to the Ministry of Mines and Energy.
- ◆ Spill clean-up means must be readily available on site as per the relevant MSDS.
- ◆ The fuel storage bund area must be cleaned if any fuel products are present and this waste must be disposed of at a suitably classified hazardous waste disposal facility.
- ◆ A spill response plan should be developed and implemented where required to ensure spills are cleaned up immediately.

##### **Responsible Body:**

- ◆ Department of Water Affairs, Ministry of Agriculture, Water and Land Reform
- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ Effluent disposal permit.
- ◆ A report should be compiled bi-annually of all spills or leakages reported. The report should contain the following information: date and duration of spill, product spilled, volume of spill, remedial action taken.

### 5.3.12 Water supply

Surface and groundwater is abstracted for use at the facility. Surface water is abstracted from the Chobe River, while groundwater is abstracted from a nearby shallow borehole to augment the freshwater supply to the facility. Although water abstraction is minimal, and not expected to impact on any nearby users, improper management may result in interruptions to, or failure of, the freshwater supply to the lodge. This will negatively impact on the operations of the lodge.

**Desired Outcome:** To utilise water sustainably and ensure an adequate supply of freshwater remains available to the lodge.

#### **Actions**

##### **Prevention:**

- ◆ Develop and implement a water abstraction management plan.
- ◆ If not in place, obtain a permit from the Department of Water Affairs, Ministry of Agriculture, Water and Land Reform for the abstraction of water from the Chobe River.
- ◆ Adhere to water abstraction permit requirements and rates.

##### **Mitigation:**

- ◆ Develop and implement a water management programme, which includes water use reduction measures, monitoring of water abstraction and consumption volumes and regular inspections and maintenance of the water reticulation system.

##### **Responsible Body:**

- ◆ Department of Water Affairs, Ministry of Agriculture, Water and Land Reform
- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Water abstraction permit.
- ◆ A report should be compiled bi-annually of water abstraction / consumption and supply interruptions.



### **5.3.13 Visual Impact**

This impact is not only associated with the aesthetics of the site, but also the structural integrity. The lodge was refurbished and rebranded in 2015 aiding to the aesthetic appearance of the site. The lodge is uniquely located and serves as a point of interest to tourists and patrons to the area, it should be kept clean, tidy and maintained to ensure it remains aesthetically pleasing.

**Desired Outcome:** To minimise aesthetic impacts associated with the lodge.

#### **Actions**

##### **Prevention:**

- ◆ Regular waste disposal, good housekeeping and routine maintenance on infrastructure will ensure that the longevity of structures are maximised and a low visual impact is maintained.
- ◆ Low brightness lights should be used and directed downwards to ensure a minimal visual impact is maintained at night.

##### **Responsible Body:**

- ◆ Proponent
- ◆ Contractors

##### **Data Sources and Monitoring:**

- ◆ A maintenance record should be kept.
- ◆ A report should be compiled of all complaints received and actions taken.

#### **5.3.14 Cumulative Impact**

Possible cumulative impacts associated with the operational phase and any maintenance / construction activities are mainly linked to increased traffic as well as potential surface water pollution from surrounding lodges. Being isolated, cumulative impacts are however expected to be unlikely.

**Desired Outcome:** To minimise all cumulative impacts associated with the lodge.

#### **Actions**

##### **Mitigation:**

- ◆ Strategies should be put in place, in conjunction with the Conservancy, to reduce impacts on popular tourist spots “pressure points” within the vicinity.
- ◆ Addressing each of the individual impacts as discussed and recommended in the EMP would reduce the cumulative impact.
- ◆ Reviewing biannual and annual reports for any new or re-occurring impacts or problems would aid in identifying cumulative impacts and help in planning if the existing mitigations are insufficient.

##### **Responsible Body:**

- ◆ Proponent

##### **Data Sources and Monitoring:**

- ◆ Bi-annual summary report based on all other impacts must be created to give an overall assessment of the impact of the operational phase.

#### **5.4 DECOMMISSIONING AND REHABILITATION**

Decommissioning is not foreseen during the validity of the ECC. Construction activities may however include modification and decommissioning. Should decommissioning occur at any stage, rehabilitation of the area may be required. Prior to the complete decommissioning of the lodge, the post closure land use should be assessed. It is recommended that the lodge either be sold, or all infrastructure be offered to the local community in order to continue with the operations. This will mitigate the possible impacts associated with job losses etc. Should the lodge be donated to the local community / sold, all existing contamination at the site should be cleared / remediated prior to the transfer of infrastructure. The existing EIA and EMP should further be transferred to the new owner to ensure continual compliance with EMP requirements.

In the event where the lodge cannot be sold or transferred to the local community, decommissioning will entail the complete removal of all infrastructure including buildings and underground infrastructure, if any, not forming part of post decommissioning land use. Any pollution present on the site must be remediated. The impacts associated with this phase include noise and waste production as structures are dismantled. Noise must be kept within WHO standards and waste should be contained and disposed of at an appropriately classified and approved waste facility and not dumped in the surrounding areas. Should operations be decommissioned with no employment or remuneration plan for the conservancy and employees, a significant social and economic impact will be suffered by the local community. The EMP for the lodge will have to be reviewed and updated prior to decommissioning to cater for changes made to the site and implement guidelines and mitigation measures related to social and environmental aspects.

#### **5.5 ENVIRONMENTAL MANAGEMENT SYSTEM**

The Proponent could implement an Environmental Management System (EMS) for their operations. An EMS is an internationally recognized and certified management system that will ensure ongoing incorporation of environmental constraints. At the heart of an EMS is the concept of continual improvement of environmental performance with resulting increases in operational efficiency, financial savings and reduction in environmental, health and safety risks. An effective EMS would need to include the following elements:

- ◆ A stated environmental policy which sets the desired level of environmental performance;
- ◆ An environmental legal register;
- ◆ An institutional structure which sets out the responsibility, authority, lines of communication and resources needed to implement the EMS;
- ◆ Identification of environmental, safety and health training needs;
- ◆ An environmental program(s) stipulating environmental objectives and targets to be met, and work instructions and controls to be applied in order to achieve compliance with the environmental policy; and
- ◆ Periodic (internal and external) audits and reviews of environmental performance and the effectiveness of the EMS.
- ◆ The EMP.

## **6 CONCLUSION**

---

Operations of Chobe River Villas has a positive impact on the tourism sector operational in the area and Namibia. It provides luxury accommodation and tourism related services in a remote area, increasing ease of accessibility. It provides employment opportunities and skills development to a local workforce. Revenue is generated that contributes to the Kasika Conservancy as well as the Namibian economy.

Negative impacts associated with the operations and maintenance / construction activities can successfully be mitigated. Implementing a safety, health, environment and quality (SHEQ) policy will contribute to effective management procedures to prevent and mitigate impacts. All regulations relating to tourism and health and safety legislation should be implemented. Groundwater and soil pollution must be prevented at all times. Fire prevention should be key and fire response plans must be in place

and regular training provided. All staff must be made aware of the importance of biodiversity and the poaching or illegal harvesting of animal and plant products prohibited. Any waste produced must be removed from site and disposed of at an appropriate facility or re-used or recycled where possible. Hazardous waste must be disposed of at an approved hazardous waste disposal site.

The updated EMP should continue to be used as an on-site reference document for the operations of the lodge. Parties responsible for transgressing of the EMP should be held responsible for any rehabilitation that may need to be undertaken. The Proponent could use an in-house Environment Management System in conjunction with the environmental management plan. All operational personnel must be taught the contents of these documents.

## 7 REFERENCES

- Atlas of Namibia Project. 2002. Digital Atlas of Namibia Unpublished Report. Ministry of Environment & Tourism.
- De Beer, C. 2018. Environmental Management Plan, O&L Leisure – Chobe Water Villa’s
- Beck, H.E., Zimmermann, N. E., McVicar, T. R., Vergopolan, N., Berg, A., & Wood, E. F. 2018. Present and future Köppen-Geiger climate classification maps at 1-km resolution". *Nature Scientific Data*. DOI:10.1038/sdata.2018.214.
- Directorate of Environmental Affairs, 2008. Procedures and Guidelines for Environmental Impact Assessment (EIA) and Environmental Management Plans (EMP), Directorate of Environmental Affairs, Ministry of Environment and Tourism, Windhoek.
- Funk, C., Peterson, P., Landsfeld, M., Pedreros, D., Verdin, J., Shukla, S., Husak, G., Rowland, J., Harrison, L., Hoell, A. and Michaelsen, J., (2015) The climate hazards group infrared precipitation with stations - A new environmental record for monitoring extremes. *Scientific Data*, 2, 150066. <https://doi.org/10.1038/sdata.2015.66>.
- Namibia Statistics Agency. Namibia household Income and Expenditure Survey 2009/2010.
- Namibia Statistics Agency. Namibia 2011 Population and Housing Census Main Report.
- Varma, P. 2018. Köppen Climate Classification. <https://alchetron.com/K%C3%B6ppen-climate-classification#Group-B-Dry-arid-and-semiarid-climates>. Date Accessed: 17 February 2022.
- World Travel and Tourism Council 2018: Travel & Tourism Economic Impact 2018 Namibia.

## **Appendix A: Environmental Clearance Certificate**





REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

Tel: (00 26461) 284 2111  
Fax: (00 26461) 229 936

E-mail: [damian.nchindo@me1.gov.na](mailto:damian.nchindo@me1.gov.na)  
Enquiries: Mr. Damian Nchindo

Cnr Robert Mugabe &  
Dr Kenneth Kaunda Street  
Private Bag 13306  
Windhoek  
Namibia  
20 November 2018

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

Manager  
O&L Leisure Chobe Water Villas  
P.O. Box 2190  
Windhoek, Namibia

Dear Sir/ Madam

**SUBJECT: ENVIRONMENTAL CLEARANCE CERTIFICATE FOR OPERATION OF THE CHOBE WATER VILLAS LODGE, ZAMBEZI REGION, NAMIBIA**

Environmental Management Plan submitted is sufficient as it made provisions of the environmental management concerning the project's activities. From this perspective regular environmental monitoring and evaluations on environmental performance should be conducted. Targets for improvements should be established and monitored throughout this process.

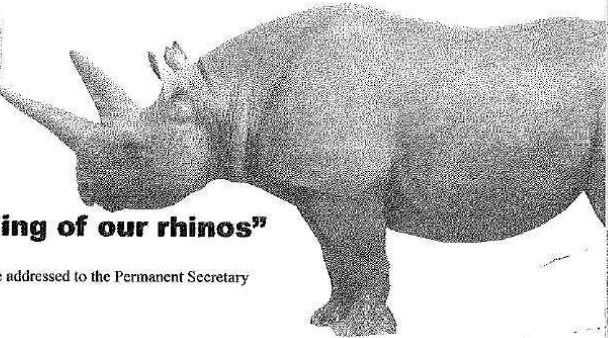
This Ministry reserves the right to attach further legislative and regulatory conditions during the operational phase of the project. From this perspective, I issue this clearance with the following conditions (1) no discharge of effluent waste in the water (2) key biodiversity habitats must be protected.

On the basis of the above, this letter serves as an environmental clearance for operations of the Chobe Water Villas. However, this clearance letter does not in any way hold the Ministry of Environment and Tourism accountable for misleading information, nor any adverse effects that may arise from these activities. Instead, full accountability rests with O&L Leisure Chobe Water Villas and their consultants.

This environmental clearance is valid for a period of 3 (three) years, effective from the date of issue unless withdrawn by this office.

Yours sincerely,

Teofilus Nghitila  
ENVIRONMENTAL COMMISSIONER



**"Stop the poaching of our rhinos"**

All official correspondence must be addressed to the Permanent Secretary





## **Appendix B: Consultants' Curriculum Vitae**



**ENVIRONMENTAL SCIENTIST****André Faul**

André entered the environmental assessment profession at the beginning of 2013 and since then has worked on more than 160 environmental impact assessments including assessments of the petroleum industry, harbour expansions, irrigation schemes, township establishment and power generation and transmission. André's post graduate studies focussed on zoological and ecological sciences and he holds a M.Sc. in Conservation Ecology and a Ph.D. in Medical Bioscience. His expertise is in ecotoxicological related studies focussing specifically on endocrine disrupting chemicals. His Ph.D. thesis title was The Assessment of Namibian Water Resources for Endocrine Disruptors. Before joining the environmental assessment profession he worked for 12 years in the Environmental Section of the Department of Biological Sciences at the University of Namibia, first as laboratory technician and then as lecturer in biological and ecological sciences.

**CURRICULUM VITAE ANDRÉ FAUL**

Name of Firm	:	Geo Pollution Technologies (Pty) Ltd.
Name of Staff	:	ANDRÉ FAUL
Profession	:	Environmental Scientist
Years' Experience	:	21
Nationality	:	Namibian
Position	:	Environmental Scientist
Specialisation	:	Environmental Toxicology
Languages	:	Afrikaans – speaking, reading, writing – excellent English – speaking, reading, writing – excellent

**EDUCATION AND PROFESSIONAL STATUS:**

B.Sc. Zoology	:	University of Stellenbosch, 1999
B.Sc. (Hons.) Zoology	:	University of Stellenbosch, 2000
M.Sc. (Conservation Ecology)	:	University of Stellenbosch, 2005
Ph.D. (Medical Bioscience)	:	University of the Western Cape, 2018

First Aid Class A	EMTSS, 2017
Basic Fire Fighting	EMTSS, 2017

**PROFESSIONAL SOCIETY AFFILIATION:**

Environmental Assessment Professionals of Namibia (Practitioner)

**AREAS OF EXPERTISE:**

Knowledge and expertise in:

- ◆ Water Sampling, Extractions and Analysis
- ◆ Biomonitoring and Bioassays
- ◆ Biodiversity Assessment
- ◆ Toxicology
- ◆ Restoration Ecology

**EMPLOYMENT:**

2013-Date	:	Geo Pollution Technologies – Environmental Scientist
2005-2012	:	Lecturer, University of Namibia
2001-2004	:	Laboratory Technician, University of Namibia

**PUBLICATIONS:**

Publications:	5
Contract Reports	+160
Research Reports & Manuals:	5
Conference Presentations:	1

**ENVIRONMENTAL GEOLOGIST****Wikus Coetzer**

Wikus has 6 years' experience in environmental science related fields with 4 years' experience in conducting environmental impact assessments and preparation of environmental management plans. He holds an honours degree in Environmental Sciences – Environmental Geology from the Northwest-University Potchefstroom (NWU) South Africa. He first completed a B.Sc. degree in Geology and Botany in the required time also from the Northwest University Potchefstroom, South Africa. His honours project focused on the rehabilitation and phytoremediation of various tailings types and soils.

He has working experience as an environmental monitor / assisting environmental officer at Petra Diamonds, Cullinan Diamond Mine (CDM) where he gained a proper understanding of environmental monitoring responsibilities as well as legislations, regulations and the implementation of EMS/ISO14001. He started working at Geo Pollution Technologies in 2017, and regularly conducts/assists and report on environmental impact assessments, environmental management plans and pollution surveys.

**CURRICULUM VITAE WIKUS COETZER**

Name of Firm : Geo Pollution Technologies (Pty) Ltd.  
 Name of Staff : WIKUS COETZER  
 Profession : Environmental Geologist  
 Nationality : South African  
 Position : Environmental Geologist  
 Specialisation : Environmental Geology/ Geochemistry  
 Languages : Afrikaans – speaking, reading, writing  
 English – speaking, reading, writing

**EDUCATION AND PROFESSIONAL STATUS:**

B.Sc. Environmental and Biological Sciences – Geology & Botany : NWU Potchefstroom 2013  
 B.Sc. (Hons.) Environmental Sciences – Environmental Geology : NWU Potchefstroom 2014

First Aid Class A EMTSS, 2017  
 Basic Fire Fighting EMTSS, 2017

**AREAS OF EXPERTISE:**

Knowledge and expertise in:

- ◆ Phytoremediation
- ◆ Environmental Geology / Geochemistry
- ◆ Environmental Monitoring
- ◆ Environmental Compliance
- ◆ Environmental Impact Assessments
- ◆ Environmental Management Plans

**EMPLOYMENT:**

2017 - Date: Geo Pollution Technologies  
 2015 - 2016: Petra Diamonds CDM – Environmental monitor / Assisting environmental officer  
 2015: Petra Diamonds CDM – Graduate program: Environmental Officer  
 2014: NWU Potchefstroom department of Geo and Spatial Sciences – Research assistant

**PUBLICATIONS:**

Contract Reports: +60