PART 2: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

1. Introduction to the EMP

Based on the risk assessment and the likely impacts identified associated with respect to the proposed 800m long by 2.5 m high and 6 m wide earthbridge development across the floodplain linking the Mahangu Safari Lodge in Kavango Region, this Part 2 of this report covers the Environmental Management Plan (EMP). The EMP outlines the management actions that shall be undertaken / implemented in managing and mitigating the identified impacts associated with the proposed development. Overall, most the impacts are likely to be temporary and localised. The impact would also depend on the location, frequency and duration of the proposed activities during the construction and operational phases.

2. Objectives of the EMP

The Environmental Management Plan (EMP) provides a detailed plan of action required in the implementation of the mitigation measures for minimising and maximising the identified negative and positive impacts respectively. The EMP also provides the management actions covering roles and responsibilities requirements for implementation by the Developer (during construction)/ Operator (during operation). The EMP gives commitments including financial and human resources provisions for effective management of the likely temporal and permanent environmental liabilities with respect to the proposed project life-cycle.

Regular assessments and evaluation of the temporal and permanent environmental liabilities as a result of the proposed project activities will need to be undertaken. The monitoring process will ensure adequate provision of the necessary resources towards good environmental management at various stages of the project life cycle. Overall, the EMP forms the basis for the Environmental Contract to be signed between the developer and the Government of the Republic of Namibia (Ministry of Environment and Tourism).

The Environmental Management Plan, described below, is based on the findings as outlined in Part 1 of this Report. Within the framework of the existing Environmental Policy, the EMP is to be incorporated in the Environmental Management System (EMS) of the operator in accordance with operational practices, procedures and guidelines.

3. The EMP

3.1 General Guidance

(i) The implementation of the proposed activities shall only be undertaken once an Environmental Clearance has been issues by the Ministry of Environment and Tourism;

(ii) The development, operation and management shall be undertaken in accordance with other provisions set out by other Ministries such the Ministry of Water Affairs and Forestry operational practices, procedures and guidelines;

(iii) The developer / operator / management team responsible for managing the operations must try to reduce any likely cumulative impacts through coordinating their activities with other operators and must adhere to the recommendations contained in this EMP concerning conservation and preservation of natural features and all infrastructure;

(iv) The developer / operator must appoint an Environmental Coordinator to manage all the environmental related issues during the construction and operational phases if required;

(v) All staff including contractors and sub consultants must be informed and reminded of good environmental management. The Environmental Coordinator must make sure that necessary remediation where required are undertaken in accordance with the recommended approach. In the absence of the recommended approach, the remediation to any impacts done to the environment must be undertaken in accordance with best available practices;

(vi) All communications (public relations) with the stakeholders must be channelled through one communication channel. The Environmental Coordinator should play a significant role in this regard and contractor's personnel must be courteous and considerate when dealing with other resource users and members of the general public;

3.2 Specific Guidance

3.2.1 Waste Management

Various types of waste including sewage will be generated during the construction stage of the proposed development. All such wastes are to be stored safely and separately (if there is risk of injury to those who may subsequently be handling the wastes or if there is risk of spontaneous combustion), and in such a manner as to prevent liquids from contaminating the environment.

3.2.2 Air Emissions

Discharges to the atmosphere are primarily related to combustion of fuels and incineration activities, where compounds such as Carbon Monoxide, Carbon Dioxide, Nitrous Oxide and Sulphur Oxide are emitted. In order to minimize these toxic discharges all equipment are required to be serviced in accordance with the guidelines of the manufacturers. Records of services are required to be retained in the log books.

3.2.3 Local Hire

To the extent that is available with sufficient skills, the developer (during the construction phase) and the operator (during the operational phase) are encouraged to employ local residents and subcontractors in order to strengthen, support and improve the living standard of the local communities.

3.2.4 Environmental Awareness Training

The developer / operator must include in any plan to undertake any activities an Environmental Awareness Training programme for all personnel, including subcontractors, involved in any activity to be coordinated by the Environmental Coordinator. The programme must be designed to inform each person working on the project of environmental, social, and cultural concerns which relates to the individual jobs and responsibilities.

The programme must employ effective methods to ensure that personnel understand and use techniques necessary to preserve the floodplain environment including fauna, flora, geological, archaeological, and biological resources. In addition, the programme must be designed to help personnel increase their sensitivity and understanding of community values, customs, and lifestyles in areas where they will be operating.

3.2.5 Prehistoric, Historic, and Archaeological Sites

If prehistoric, historic and archaeological sites or artefacts have been discovered in the process of implementing the proposed activities the developer / operator must inform the Environmental Coordinator who must evaluate and prepare an inventory of the discovery. The inventory must include consideration of information provided by other users and documentation of oral history regarding prehistoric and historic uses of such sites or artefact. The Environmental Coordinator must submit the inventory to the relevant authorities. The Environmental Coordinator must make every reasonable effort to preserve and protect such site, structure, or object from damage until after consultation with the relevant authorities / specialists have given directions as to the actions that need to be taken.

4. Implementation of the EMP

Tables 4.1- 4.2 outline the management of the environmental elements that may be affected by the proposed activities and are grouped to be managed in the following phases:

1. Construction; and
2. Operational phases;

Contents of Tables 4.1 and 4.2, could be built into the regular Management Control Systems during the various planning phases of the planned activities. The following are responsible for the implementation of the EMP including the various mitigation measures recommended:

1. Developer / Operator Project Manager;
2. Contractor / Sub Consultants;
3. Environmental Coordinator.

Table 4.1: Summary of positive impacts, description and mitigation measures.

Summary Type of Impacts			Summary Description	Mitigation Measures
Positive Impacts	Climatic, Environmental and Ground	Improved Local Infrastructure Development	The area is located to remote part of the Kavango Region and development of earthbridge will contribute greatly to the rural and local infrastructure development and heavily enhance the social economic development of the area throughout the year. The proposed development is inline with the Government Policy on Rural development as well as Vision 2030 Strategies.	Local communities should be made aware and sensitised on the need to protect and avoid vandalism of the bridge. In order to enhance the benefits and sustainable operation of the earth bridge awareness and maintenance of the bridge should the responsibility of everyone using the bridge in the area
		Protection and Conservation	Because of their attractiveness, natural areas around Mahangu Safari Lodge including the floodplain channel of the proposed earth ridge maybe venerable as the result of extracting construction material and increased tourist in the area.	The implementation of the proposed zonation as well as management strategies of each zone during construction and operational phase will significantly improve the protection and conservation efforts around Mahangu Safari Lodge, the Kavango Region and Namibia as a whole.
		Awareness Raising and Environmental Education	The proposed earth bridge to support the tourism in this area has the potential to increase public appreciation of the environment and to spread awareness of environmental problems by bringing people into closer contact with nature and the environment.	✓ The Operator must providing environmental information and raising awareness among local communities and tourists of the environmental consequences of their actions; ✓ The developer to utilize environmentally friendly bridge design and suitable construction materials.
		Improved Environmental Management and Planning	Planning helps to make choices between conflicting uses, or to find ways to make them compatible. By planning early for the proposed earth bridge development, damaging and expensive mistakes can be prevented, avoiding the gradual deterioration of environmental assets significant to tourism.	Cleaner Production such as the use of environmentally friendly construction methods, designs and material choices will immensely improve the pressure on resources needs. Shallow slope designs and wider water flow channels are important in the maintenance of the local ecosystem balance and social livelihood patterns.
		Alternative Temporal and Permanent Employment	The operation of lodge throughout the year through the construction of the bridge will provide employment opportunities during the construction and operational phases of the proposed development.	The Operator must involvement local communities in the development and operation of bridge as part of the indirect contribution to social economic development through employment creation and skills development.
		Poverty Alleviation and Improved Standard of Living	The construction of the bridge will supports the creation of community facilities and services that otherwise might not have been developed, and this will bring higher living standards to local communities.	Community involvement and full maintenance support is important in maximising the benefits

Table 4.2: Summary of negative impacts, description and mitigation measures.

Summary Type of Impacts			Summary Description	Mitigation Measures
Negative Impacts	Climatic, Environmental and Ground	Loss of Biological Diversity	The proposed development is closely linked to biodiversity and the attractions created by a rich and varied environment. It can also cause loss of biodiversity when land and resources are strained by excessive use, and when impacts on vegetation, wildlife, and flood channel environments and water resources exceed the carrying capacity. This loss of biodiversity in fact means loss of tourism potential for the area.	Based on the land zonation provided in Figs 2 and 3, (Constraint and Opportunity DSTs Layers) the Operator must development effective management plan including minimising the tampering effect on the surrounding environment during construction.
		Depletion of the Ozone Layer	Ozone depleting substances (ODSs) such as CFCs (chlorofluorocarbon) and halons have contributed to the destruction of this layer. The tourism industry may be part of the problem; direct impacts start with the construction of new developments and continue during daily management and operations. Refrigerators, air conditioners and propellants in aerosol spray cans, amongst others, contain ODSs and are widely used in the hotel and tourism industry.	A number alternative refrigerators, air conditioners and propellants in aerosol spray cans, amongst others, without ODSs currently available and the operator is encourage to seek and use non ozone layer depleting substances.
		Climate Change	One of the most significant greenhouse gas is carbon dioxide (CO_2), which is generated when fossil fuels, such as coal, oil and natural gas are burned (e.g. in industry, electricity generation, and automobiles). In the long run, the accumulation of CO_2 and other greenhouse gases in the atmosphere can cause global climate change - a process that may already be occurring in the area through lose of developable land due to flooding.	The proposed development will involve the movement of material and will accounts a certain percentage of vehicle movements locally. In contributing to the fight on Climate Change, the developers and operator are encouraged to seek and adapt energy efficiency and use alternative energy sources to reduce the environmental impacts of energy use and of transportation on climate change through reduction in CO_2 footprint in the local area, regional, and national level footprint.
		Water Resources	Water, and especially fresh water, is one of the most critical natural resources. The proposed development may result in unnecessary water use for construction and possible water pollution. This can result in water shortages and degradation of water supplies due to the damage caused by dumping of waste in flood plain channel during the construction phase.	Reduce unnecessary water use for construction through training and awareness raising must be implemented as part of the operational procedures as well as information dissemination to employees in waste management and protection of water uses. Area disturbed must be rehabilitated properly and waste dumped during construction must be collected and disposed on approved site in order to avoid water contamination.
		Local Resources	The development of the earthbridge will have a significant effect and pressure on local resources like construction materials, energy, food, and other raw materials. Greater extraction and transport of these resources exacerbates the physical impacts associated with their utilisation.	Responsible resources utilisation coupled with proper planning and scheduling during construction and operational phases must be an integral part of the proposed development.

Table 4.2: Summary of negative impacts, description and mitigation measures (*Cont.*).

Summary Type of Impacts			Summary Description	Mitigation Measures
Negative Impacts	Climatic, Environmental and Ground	Land Degradation	The proposed development will have an increased pressure on land and scenic landscapes. Direct impact on natural resources, both renewable and non-renewable, in the extraction of construction materials can be caused by the use of building materials for the proposed earthbridge.	The implementation and the Environmental Management Plan (EMP) as well as the properly rehabilitation of areas where construction materials will extracted is important.
		Air and Noise Pollution	Air and noise pollution is likely to be associated with the transportation process particularly during the construction phase.	The adoption of cleaner production, pollution prevention, and cleaner technology with continual improvements will significantly reduce the likely impacts to low. Other measures that will improve the air quality includes: ✓ The use of cleaner fuels with low-NOx with the optimum level of excess air within the resort; ✓ Strict house rules may reduce noise pollution.
		Solid Waste and Littering	The proposed development is likely to have high concentrations of people during construction. Waste management is to be a serious problem and improper disposal can be a major despoiler of the natural environment such as scenic areas, floodplain channel, and roadsides.	The Operator will provide facilities for waste management including bins, collection, transportation and safe disposal services. All hazardous waste must be disposed off in a secure site. Waste Minimisation including reuse and recycling is encouraged. Information dissemination, awareness raising and training on the impacts of poor waste management must be provided as apart the proposed project development.
		Human Waste	If not managed well, wastewater can pollute the floodplain channel area. If no toilets provided during construction, human waste causes serious damage to the flood plain channel during construction because it stimulates the growth of algae, which cover the filter-feeding water species, hindering their ability to survive. Changes in salinity and siltation can have wide-ranging impacts on floodplain channel and threaten the health of humans and animals.	Temporal toilet facilities must be provided during construction.
		Aesthetic Pollution	The proposed earthbridge development will be built across an area that is low lying making it so visible across the floodplain channel.	The developers are highly encouraged to integrate the proposed structures with the natural features through the use of natural materials and indigenous architectural style designs of the earthbridge features. Large, dominating features of disparate design can look out of place in any natural environment and may clash with the indigenous structural design.

Table 4.2: Summary of negative impacts, description and mitigation measures (*Cont.*).

Summary Type of Impacts			Summary Description	Mitigation Measures
Negative Impacts	Climatic, Environmental and Ground	Physical Impacts of Infrastructure Development	Construction activities and infrastructure development of the proposed facilities will likely to involve local material mining resulting in possible soil erosion. In addition, road and access construction can lead to land degradation and loss of wildlife habitats and deterioration of scenery.	The developer / operator is highly encouraged to utilise existing disturbed grounds for roads, access and sources of construction materials. During the construction stage, barriers must be erected to protect sensitive zones and prevent an authorised recreational driving around the floodplain.
		Alteration of Ecosystems	The proposed development can contribute to the habitat degradation through unnecessary off-road driving	
		Trampling Impacts on Vegetation	The proposed development is likely to increase presence of people in the area. This may result in increased trampling on sensitive. The trampling can result in breakage and bruising of stems, reduced plant vigor, reduced regeneration, loss of ground cover and change in species composition.	
		Trampling Impacts on Soil, and Landscape	The proposed development is likely to increase people presence in the area. This may result in increased trampling on around floodplain area along the bridge access. The trampling effect may result in loss of organic matter, reduction in soil macro porosity, decrease in air and water permeability, increase in run off and accelerated erosion during the flood and rainy seasons.	
		Conflicts with Traditional Land-Uses	Conflicts arise when the choice has to be made between development of the land for tourist facilities or infrastructure and local traditional land-use. Luckily, the proposed development focuses on providing infrastructure accessible by local people. However, future land use conflict may arise either actual construction or operational phases.	Effective transparent communication and consultation with the local communalities during the construction and operational phases will be effective tool to resolve any land use conflict that may arise. The construction must take into consideration the local use of the floodplain. The earthbridge slopes must be as shallow as possible in order to make sure that people and animals can cross it during the dry season.
		Resource Use Conflicts	The proposed development is located in an area that forms part of the floodplain area and local communities heavily depend on the floodplain for grazing their animals during the dry season. Although highly unlikely unless the access across the earth bridge becomes difficulty for people and animals, there could be some conflicts between the proposed development and the local population for the use of prime resources like water and grazing land.	

5. Monitoring of the EMP

5.1 Overview

The monitoring programme developed for the proposed project activities outlines further data collection and analyses to ensure safe development and operation for the protection of the environment. By sampling before, during and after operations it may be possible to identify unpredicted effects and take the necessary precautions to eliminate the likely impacts before the effects become significant.

The main objectives of the monitoring programme are to:

- Check the overall effectiveness of design and operational procedures in protecting the environment;
- Comply with regulations, standards and any agreement/s conditions;
- Detect sudden or long term environmental changes;
- Measure physical disturbance and subsequent recovery (e.g. the effects of barrier to the surrounding environment and other land use zones);
- Study impact and recovery following an accident (e.g. spillages or damage to the vegetated dune zone or beach with respect to the ongoing emotional rate); and
- Compare actual impacts with those predicted in the EIA and thereby aim to improve the EMP process and performances.

5.2 Monitoring Implimentaion

The implementation of the monitoring programme by the developer / operator will require resources to collect, analyse the required data sets and propose recommendations on what need to be done. The implementation could be done as an in-house activity or partly in-house (data collection including sampling) and outsource (employ a consultant) to undertake the assessment and recommend measures to be implemented. There will be a need for a full range of laboratory and technical facilities to support the monitoring programme.

5.3 Monitouring Staretgy

The monitoring programme has been developed to allow maximum flexibility in both the timing and locations for sampling to allow adaptation to the conditions encountered and to allow decisions to be made onsite based on all available data. As a basis for this, a two level scheme is proposed so that sampling effort can be increased if dictated by the results. As many of the analyses as possible will be carried out onsite to allow immediate feedback to the monitoring programme, the waste management plan and general operation. The monitoring programme acts as a quality assurance check on all environmental procedures and environmental performances with respect to the implementation of the mitigation measures and the overall Environmental Management

Plan (EMP). External reference sites will be determined in accordance with the provisions of the ongoing monitoring programme and in the absences of external monitoring programme internal monitoring will be sufficient based on the EMP.

5.4 Moniotuirng Parameters

The parameters that need to be record as part of the monitoring programme include:

1. Flood events and water heights and flow characteristics;
2. Health of the floodplain fauna and flora (habitat) both upstream and downstream;
3. Recovery rate of the floodplain grass of the disturbed ground;
4. Birds and other related fauna usage of the habitat including the new habitat that has been created in the areas where construction material have been removed;
5. Performance of the bridge slopes with respect to humans, cattle and goats crossing the bridge during the dry season;
6. Stability of the slopes and beams in order to detect and likely failure that may cause and an accident;
7. Local community, workers and visitors access, usages, interaction and vandalism.