Scoping Report and EMP for Zambezi Queen Houseboat

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Abbreviations

DEA	Department of Environmental Affairs
MET	Ministry of Environment and Tourism
EMA	Environmental Management Act (No. 7 of 2007)
I&APs	Interested and Affected Parties
MSDS	Materials Safety Data Sheet

1. Introduction

1.1 Project Location

Zambezi Queen houseboat is the largest among those operated by Zambezi Houseboats. Operating since 1992, the houseboat combines both accommodation and leisure activities for its guests on the Chobe River. The houseboat cruise covers a distance of approximately 25 kilometers within the Chobe river system, with temporal stops along the way for leisure activities of game and bird viewing. The furthest of its mooring point is Leguva where a night is spent, and the other two nights spent at its base mooring point of Ncheku (Kasika). The map below provides a better view of the routes of the Zambezi Queen with indicated mooring points.

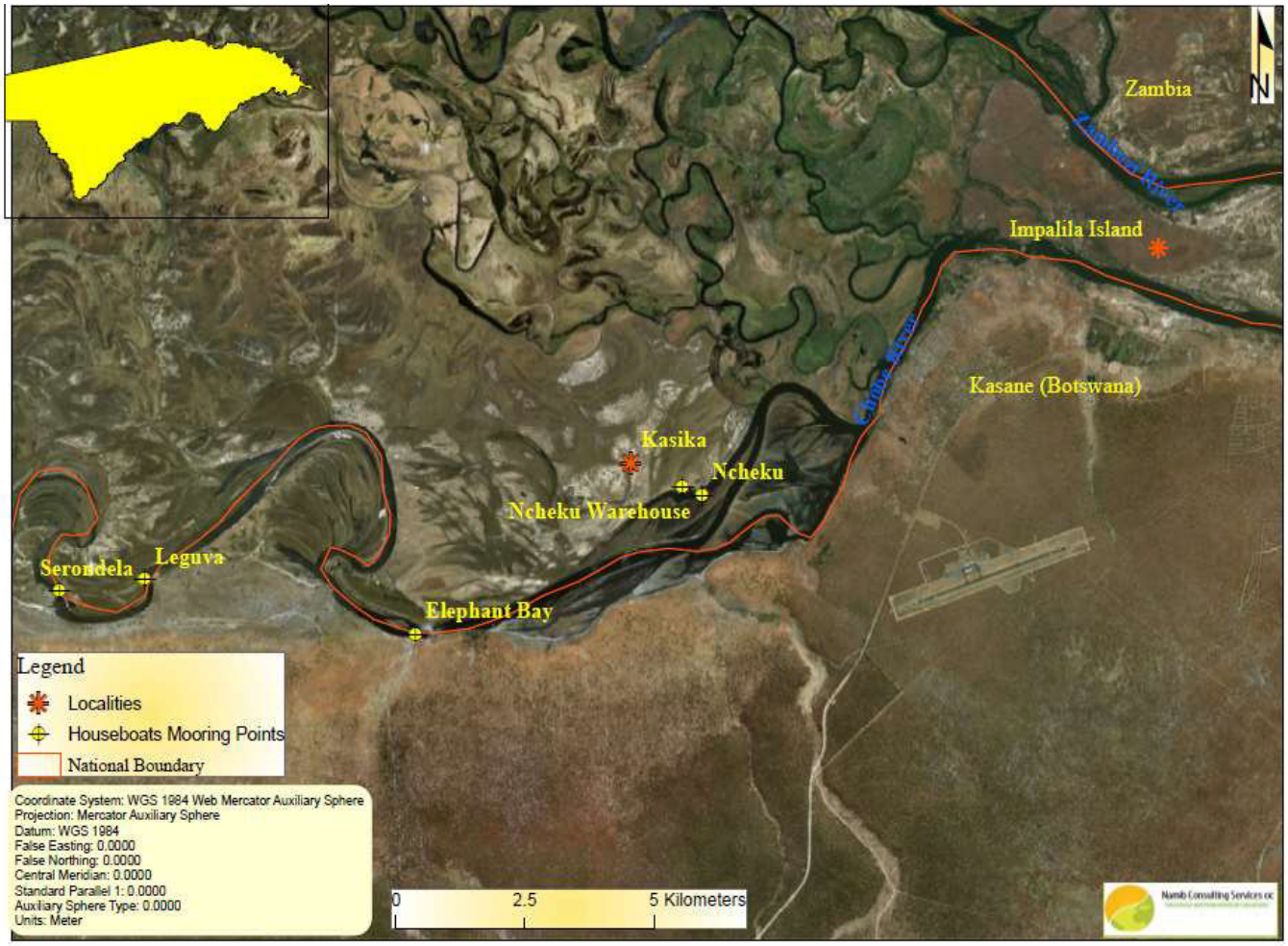

Figure 1 Mooring points of Zambezi queen in the Chobe River system

1.2 Project Motivation

The Environmental Management Act (No. 7 of 2007) and its regulations requires an environmental clearance be obtained prior to undertaking all listed activities. Subsequent to gazzetting the regulations of the Environmental Management Act (EIA Regulations (GN. No. 30 of 2012)), the Department of Environmental Affairs (DEA) of the MET has undertook efforts to ensure compliance to the requirements of the act and regulations for any new developments. Moreover, their efforts extends to ensure that already existing activities mitigate the impacts their operations to acceptable levels.

Therefore, this project responds to the efforts of DEA to ensure that operations of Zambezi Queen Houseboat comply with provision of the EMA and its regulations. Moreover, beyond compliance to legislation, this endeavor aims to ensure best practices in managing environmental and social impacts of the operations of Zambezi Queen as such builds a formidable reputation that attracts foreign tourists to the country thus continue to support the Namibian economy and local communities.

Description of Houseboat facilities and Operations

2. Zambezi Queen Houseboat Operations

The Operation of Zambezi Queen Houseboat can be categorized into two parts; *offshore* based operations and *onshore* activities.

Offshore Operations

The layout of the boat comprises the following; a dining area with bar, and a small swimming pool on an open deck space, comprise the top deck of the boat. The second deck comprises guestrooms only, while the ground deck comprises some guestrooms as well as the captain's cabin, a curio shop while towards the back of the ground deck is the hostess room, kitchen, housekeeping storeroom then engine and generators rooms.

2.1.1 Services and facilities onboard

2.1.1.1 Onboard Accommodation and leisure

The houseboat comprises 18 rooms (i.e. 14 double bedrooms for guests and 4 staff rooms). Accommodated capacity is a total of 28 guests, each room comprising a toilet, shower and a double bed, serviced with housekeeping on daily basis.

Guests are received aboard the Houseboat at its base station at Nchecku mooring point. The first night is spent at this mooring point with some travels in surrounding area for game and bird viewings. The second day is spent cruising towards Leguva mooring point where a night is spent at this point. The final day of the cruise, the boat travels back to its base station at Ncheku where the last night of the cruise is spent before departure of guests the next day.

2.1.1.2 Power supply

Power supply for the boat is from two diesel generators aboard, supplying all the power requirements on a 24 hours basis. The boat comprises a tank that stores diesel fuel that can serve for seven (7) days before another refueling is required. A fuel bowser designed tanker collects fuels from Kasane and refuels the boat.

Figure 2 Outlook of the engine and power supply for the houseboat

2.1.1.3 Water supply

Water used onboard the houseboat is abstracted directly from the Chobe River and treated through a process that involves filtration and disinfection by using UV light. This treated water is used in kitchens, sinks and lavatories aboard. Water for drinking is mostly procured bottled, while that used for ice cubes is separately treated onboard through a reverse osmosis process.

Figure 3 Treatment of water for facilities and ice making machine

2.1.1.4 Solid Waste Management

Solid waste from the houseboat is separated in accordance to final disposal measures in place. Such waste includes recyclables such as plastic bottles, glass bottles and cans, but also combustible such as packaging card boxes and papers as well as organic waste.

- Organic food waste is separated from other solid waste onboard and transferred to land for further handling.

- Combustible waste including packaging card boxes, some plastic and papers are also separated from other waste and transferred onshore for further handling.
- The recyclables and other plastics, packaging are separated and collected by the food supplier Sea-Pride Foods for recycling and others for disposal at Katima Mulilo landfill site.

Figure 4 Waste separation practices onboard

2.1.1.5 Kitchen Operations

A drain strainer fitted in the kitchen sinks ensures that all solid material in the water is retained and collected into waste bins. The draining greywater is directly discharged into the river.

2.1.1.6 Sewer systems

The most essential operation on the houseboat is handling of Blackwater mostly coming from sinks, lavatories and showers in rooms. The sewage treatment system aboard the houseboat involves a series of septic tanks where sewage water is received, treated, prior storage before pumping off the boat. The steps involved are as below;

- A first holding tank (1000 liters) receives all the wastewater from sinks, showers and toilets of guestrooms inclusive of public lavatories for the workers aboard. Biological breakdown of the sewerage is initiated by addition of eco-tabs (Fig 4). These eco-tabs are applied to the tank every Tuesday of the week.

Figure 5 First sewer tank onboard the houseboat where eco-tabs applied

- A rising level of wastewater in the first tank triggers outflows into the second tank (1000ltrs), where biological breakdown of the constituents of the sewage water continues. The tank

comprises of a macerator pump that reduces solids to small pieces in order to deal with rags and other solid waste. It has a rotating arm that stirs the effluent both clockwise and anticlockwise to avoid clogging thus mixing and aerating the effluent received from the first tank as it further undergoes degradation by microorganisms.

- This stirred effluent flows into a third (head tank) tank with 4 compartments. Three of the compartment are utilized for thorough biological breakdown of the constituents of the sewage by microorganisms. The final compartment of the tank is used to store the effluent prior its collection from the boat.
- Final step aboard the houseboat is the removal of the effluent from the boat. The effluent is pumped into a tanker designed small boat (honey sucker tanker). This tanker has capacity of 5000 liters and frequents the houseboats three times a day to collect this effluent. Figure 6 shows the honey sucker tanker and with connection of couplings to pump out the effluent to the tanker

Figure 6 Pumping out of effluent from the houseboat

2.1.1.7 Storage and use of Chemicals and Fuels

At the back of the boat is a secure storage compartment of fuels and other chemicals. All stored chemicals and fuels are well identifiable.

Figure 7 Storerooms for fuels

2.1.1.8 Maintenance Works

All maintenance works are carried out onboard the boat. All redundant items are sent to a warehouse storeroom onshore. Waste oil from generators/engines aboard are transferred to land operations. A two days shutdown every month allows for maintenance of the boat engines and generators.

Land Operations

2.1.1.9 Effluent transfer onshore and treatment

The tanker transfers the resultant pre-treated effluent to a land based treatment system at Ncheku Warehouse offshore of the Kasika area.

Figure 8 Effluent transfer to a land based treatment system

The second part of handling effluent is land-based in a further six stage treatment process. The steps are as follows;

- Pre-treated effluent delivered to the land-based treatment system is collected into a **first septic tank.** The septic tank consists mostly of liquid, and is level controlled and outflows into the second tank called the **conservancy tank**. The conservancy tank is utilized mainly for temporal storage of the sewerage. This tank is also level controlled and outflows outflow into the third tank called the **balancing tank.** The purpose of the balancing tank is ensure control of the outflow into the **bio-tower tank** also called the trickling filters.

Figure 9 Effluent treatment system at Ncheku-Kasika

- In the bio-tower tank, pre-treated wastewater is spread over the surface of a media, and as it trickles downward through the bed of filters, microbes feeds on the nutrients in the water forming a slime of microbes on the filters. As water continues to trickle down the filters, air

circulates upward through the media, as treated water is removed by an underdrain system. The biological slime of microbes formed on the media as water drains may need removal. However, bio-towers are advantageously known for generating very little sludge.

- The fifth tank of the system is the disinfection tank, where the treated effluent from the bio-towers is disinfected by ozonation as final step. The final tank is refereed as irrigation tank as it temporally stores treated effluent. Fitted with a level trigger, releases the final effluent through a sprinkler system as it fills up.

Figure 10 Final treated effluent sprinkled on nearby vegetation

2.1.1.10 Solid waste and waste oil handling and disposal onshore

On land although organic waste and combustible waste is separated from the Zambezi Queen houseboat, the two are together disposed into a landfill (Fig 11). The landfill is well fenced although the gate appears uncontrolled. Incineration appears not regularly scheduled and implemented. The landfill was constructed on land given by community of Kasika.

Figure 11 Solid waste disposal onshore

Waste oil from the maintenance works on the boat is transferred onshore for disposal in a shallow landfill beside the fenced solid waste landfill site.

Figure 12 Waste oil disposal onshore

2.1.1.11 Laundry Operations

Housekeeping of guestrooms onboard the houseboat relies on land based laundry operations. Greywater from the laundry is discharged through an open pipe some 20 meters away from the Chobe River. The discharged greywater flows overland into the Chobe River.

2.1.1.12 Staff accommodation

Much of the houseboat employees of Zambezi Queen are day workers, shuttled onto the board every morning and leaving for onshore accommodation by end of the day. The accommodation comprises three blocks of tents on decks each with septic tank to receive water from lavatories, sinks and showers. Another block is utilized as kitchen for the staff, while water supply to the accommodation and laundry room located 50m away is from two tanks (Fig 13). All solid waste from accommodation and laundry are disposed at the existing landfill.

Figure 13 Staff accommodation with own utility facilities

2.1.1.13 Power supply

The land based operations of laundry, staff accommodation, and effluent treatment system rely on power generated from two diesel generators located beside the Laundry. Also served from these generators is the Zambezi Queen houseboat during night time through a cable extending over the water to the boat.

Figure 14 Diesel generators for power supply for onshore operations and overnight to Zambezi Queen houseboat

2.1.2 Functional areas of the houseboat

Based on the above, it is evident that the active operational areas of the houseboat both onboard and offshore can be summarized as;

Offshore

- Guest and host rooms and public lavatories
- Kitchen, dining room and bar operations
- Transfer of pre-treated effluent to a tanker (honey sucker)
- Transfer of fuels onto the houseboat and their storage
- Maintenance works

Onshore

- Transfer effluent to land-based treatment system
- Solid waste transfer and handling
- Laundry operations
- Staff accommodation
- Effluent treatment system
- Power generation/supply

2.1.3 Employment Status

Operations of Zambezi Queen provides a significant employment opportunities to the communities of Kasika and Impalila. The Operations employs a total of 74 people, majority (95%) of which are Namibians with 28 of these females. The table below provides statistics of employment by Zambezi Queen operations. Beside the Regional managers located at Ichingo Lodge and some at Ncheku Warehouse, all other employees work on a shift basis offshore.

Table 1 Employment status of Zambezi Queen

Position	Location	Number of people
Regional Managers	Onshore (Ichingo Lodge)	2
General Manager	Offshore/Onshore	1
Host Manager	Offshore/Onshore	1
Maintenance manager	Offshore/Onshore	1
Assistant Manager	Offshore/Onshore	1
Administrator	Offshore	1
Bar Supervisor and tender	Offshore/Onshore	4
Skippers/Engineer	Offshore	4
Maintenance	Offshore/Onshore	6
Storekeepers	Onshore/Offshore	2
Guides	Offshore/Onshore	6

Housekeeping Supervisor and housekeepers	Offshore/Onshore	6
Head chef, chefs and trainees and scullery	Onshore/Offshore	12
Security	Offshore/Onshore	6
Laundry	Onshore	4
Maintenance/Groundkeepers and sewage boat	Offshore/onshore	11
Waitresses/servers supervisor and servers	Offshore/Onshore	7

3. Biophysical Setting Description

3.1 Introduction

Kasika is located on the extensive floodplain of the Zambezi-Chobe system. The area borders Kasikili Island and Chobe National Park in Botswana. This features make this area of significance both environmentally and socio-economically. Considered together as similar environment to the Impalila Island the biophysical setting of the area is described below.

3.2 Hydrology

The drainage of the far eastern parts of the Zambezi region is characterized by an extensive floodplain, with approximately 30% of the eastern parts of the region at risk of flooding in any given year (Mendelson and Roberts, 1997). The Chobe swamp and River joins the Zambezi River on the border with Botswana and Zimbabwe (IWRM Plan for Namibia Report, 2010). The Kasika area is located 10 km southwest of Impalila Island entirely in the extensive floodplain of the Chobe. The Chobe River like the Zambezi River it merges into are slow flowing with large floodplains and small, vegetated islands, with the only rapids being at Katima Mulilo and Impalila Island (WWF, 2007).

Rivers are critical to the survival of important wetlands providing clean water if unpolluted and support resources such as fish populations. Water quality of the Zambezi and Chobe River is less extensively studied, thus limited published literature exists. However, negligible available literature echoes declining water quality over many years of human settlement along the river. While the Zambezi River may appear less impacted due to its perennial nature, this is less so for the Chobe system which in drier month of the year is fragmented reducing its water quality to a muddy appearance and hugely maintained by a reverse flow reliant on the Zambezi River. However, experiencing different levels of flooding on a year to year basis, the water quality of the extensive Zambezi-Chobe River system can be said to be fairly of good quality and many rural communities along the river draw and consume without much treatment. This is echoed in the IWRM Plan for Namibia Report (2010) highlighting that the northern perennial river of Namibia and associated wetlands have yet been polluted extensively, with their exceptional diversity of fauna, these systems continues to retain their natural cleansing processes and cycles such that water is classed as excellent and flood cycles largely unregulated.

3.3 Geology and Soils

The geology of the eastern Zambezi region belong to the quaternary age Kalahari sand group which is present in the eastern and north eastern parts of Namibia. It is widely believed the Kalahari sand cover originally represent a series of sand dunes oriented mainly in a linear manner. This scenario imply that contrary to present day tropical to sub-tropical conditions, the region was generally dry during the deposition of the wind-blown sand dunes. The base of the Kalahari sand cover is marked by the presence of Karoo basalts, which are exposed at the rapids near Katima Mulilo, and near Ngoma to the east, however, more of these basaltic rocks are extensively exposed within the Island of Impalila (Miller, 2008). The thick Kalahari sand cover has varying thickness across the region, but was established through water borehole southwest of Katima Mulilo to average around 216m (Miller, 2008). Older borehole logs has shown a succession of sand or clayey to sand/loam in various parts of the region, with some of the sand layers unconsolidated. This sand layer is fine to medium grained, getting coarser with increasing depth.

Being part of the extensive Kalahari basin that formed over 130 to 180 million years, much of the soils of the region characterized by sand shaped into dunes. To a great extent the soil texture determines the classification of the soil, with much of the flood-prone areas characterized by high clayish to sand content, and those westward of the region more sand content (Mendelson and Roberts, 1997).

3.4 Hydrogeology

The local hydrogeology of the area is less extensively examined by existing literature. This is attributed to non-existent utilization of groundwater resources given proximity of the Zambezi – Chobe surface systems. However, regionally characterized in the Kalahari Group formations that extensively overlays the eastern Zambezi Region. The Upper Kalahari Group is composed mainly of Aeolian sands, colluvium, alluvial/deltaic sands, interbedded alluvium, sand, silt and clay, while the Lower Kalahari Group units include; conglomerates and gravel units which sporadically occur at the base of the Lower Kalahari Group and occasionally fine-grained, homogenous marls/clays; varicolored, sandstones; calcretes, silcretes and other duricrusts (Kawawa, 2015; Thomas & Shaw, 1991b). The Kalahari Sequence is characterized mainly of porous aquifers, however displays variability in properties over short distances (Struckmeier & Chritelis, 2001).

Groundwater table varies within 20 to 40 m below ground level in the far eastern parts of the region (Kawawa, 2015). The quality of groundwater is characterized as highly variable throughout the region,

however areas in proximity to rivers generally have good quality due to surface-groundwater interactions.

Despite significant potential of groundwater this resource is less utilized compared to its counterpart, surface water, however the former still valuable for maintaining ecosystem functioning and services.

3.5 Biodiversity

Locally the Kasika falls within the registered Kasika Conservancy, while regionally under the extensive Kavango Zambezi Transfrontier Conservation (KAZA) area, evidence of the biodiversity value of the area. Closer assessment of the biodiversity of the area is provided below.

3.6.1 Fauna

3.6.1.1 Mammals

The Kasika conservancy lists among large mammals found in their conservation area the following species Elephant, buffalo, crocodile, hippo, lechwe, sitatunga, waterbuck (NACSO, 2012). Much of these mammals are listed as specially protected or protected species under the Nature Conservation Ordinance (No 4 of 1975) however, of the list of these mammals, the Hippo is the only listed among threatened species on the IUCN Red list Reptiles

3.6.1.2 Reptiles

Among the common occurring reptiles in the Zambezi-Chobe system is the Nile crocodile. A wildlife survey of 2007 by Elephants Without Borders (EWB) funded by MET and cooperating partners indicated that crocodiles were widely distributed in the Chobe and Zambezi floodplains away from the main river channel. Moreover the no reptile species from the “four corners area” an area consisting of parts of Botswana, Namibia, Zambia and Zimbabwe sharing the Zambezi river appear on the 2002 IUCN Red List of Threatened Species, but all species in the lizard genus Cordylus and the Monitor lizard genus *Varanus*, in addition to *Python natalensis*, are listed on CITES Appendix 2 (AWF, 2004).

3.6.1.3 Amphibians

Without limitation to the Zambezi –Chobe, but an extensive connected system including the Kwando-Linyanti when flooded is pronounced as having three-quarter of all known frogs found in Namibia. According to AWF (2004), no amphibian species from the “four Corners area” appear on the 2002 IUCN Red List of Threatened Species.

3.6.1.4 Birds

The water channel along confluence of the Zambezi/Chobe River provide habitat for many federally threatened bird species. The area is renowned for its high diversity of wetland birds. More than 44 species belonging to 17 different families has been recorded within the limits of its borders making it a great birding destination for tourism. Avitourism is one of the faster growing subsectors of ecotourism, recognized for its economic value. Birdwatchers are a diverse group, some of whom competitively seek vagrant birds (i.e., birds outside their normal geographic range). Notable birds species around the Zambezi/Chobe area includes the little egret, squacco heron, black heron, cormorants, African darter, Blacksmith lap-winged plover, African skimmer and the Pied king fisher. Birdlife is especially rich where permanent water is present. There are many fish eagles on the river, and their call is one of the most iconic sounds of Africa. Potential species includes skimmers along the sand banks, making a sighting particularly exciting for southern Africa bird watchers. Most wetland birds dwells on small fish, making wetlands ecologically and biologically important. In addition to food source, wetlands of the Zambezi/Chobe Rivers are idyllic breeding sites and pass ways for migratory birds such as the heron, skimmers and the yellow billed storks. As a result, wetlands within the marginal border of the Zambezi/Chobe River must be viewed as important sites for future conservation of migratory birds.

3.6.1.5 Fishery

The middle Zambezi and Chobe Floodplains provide breeding and feeding grounds for a moderately rich fish fauna including a near-endemic radiation of large riverine cichlids. There are around 89 fish species in the Zambezi/Chobe ecoregions (Hay et al 2009). Cyprinids, Cichlids, Characins, Mochokidae, Claridae, Mormyridae and Schilbe dominate the fish fauna. The most common species consists mainly of cichlids: *Oreochromis andersonii, Oreochromis macrochir, Coptodon rendalli, Serranochromis spp*, but also *Hydrocynus vittatus* (Recreational species), *Clarias gariepinus* and *C. ngamensis*, smaller species such as Schilbe intermedius, *Marcusenius altisambesi, Synodontis spp, Brycinus lateralis*, small Barbus. *Hydrocynus vittatus*, *Oreochromis andersonii*, catfish, Nembwe and dusk breams are the target recreational species for tourists who practice catch and release.

3.6.2 Flora

The vegetation of the area of Kasika is categorsed by Mendelson and Roberts (1997) as Chobe wetland extending from Ngoma towards Impalila Island. The authors describe this group of vegetation as mainly dominated by various aquatic grasses and reeds, with the species *Cyperus*

papyrus forming large floating mates. Woody species are rare to find but only on well-developed river banks.

4. The Socio-Economics of Impalila Island

Kasika Village comprises an area of approx. 147 square kilometres and is part of the Kabbe South Constituency of the Zambezi region. It has a population estimated at 1100 people with majority of the people surviving through a diversity of subsistence activities including crop production, fishing, livestock keeping and selling of thatching grass and reeds (NACSO, 2012). Employment opportunities are less available but mostly in tourism and remote located public services such as Education and Health sector.

5. Stakeholder Consultation

The purpose of stakeholder consultation is deliberate to enable them to voice concerns related to the project and its activities. While consultation is a critical step in the planning stage of a new development, the value of the process can still be harnessed even for projects already in operating stage of the project to ensure that concerns raised by I&APs are addressed. Moreover, the process is valuable as it enables I&APs to support the project and attain approval of the acceptable risk level for the project to continue operating.

A stakeholder consultation was conducted on the 5th of October 2018 to give the community of Impalila and Kasika an opportunity to be involved in providing their concerns. Concerns raised and responses are attached as appendix to this document.

Figure 15 Stakeholder Consultation meeting at Impalila Sub-khuta

6. Impact Assessment

Impacts of the existing operations and infrastructure of Zambezi Queen were identified through a process involving;

- A public consultation meeting
- Site inspections visits
- Academic knowledge and professional experience in the field

Before impact assessment, it would be worthy providing the following definitions that form part of the impact assessment table provided below.

⇒ An *activity* is described as a distinct process or risk undertaken by an organization for which a responsibility can be assigned, inclusive of infrastructure or pieces of infrastructure that are possessed by an organization.

⇒ *Impacts* are consequences of the aspects on social or natural environment or receptors with particular value or sensitivity.

All Zambezi Queen operations have existed for years and therefore, this sections examines impacts of these activities and adequacy of the present measures to mitigate against them.

A simplified criteria of determining the level of impact was developed as described below. The likelihood was ignored as the report presents the present case scenarios of results of the lodge operations.

Impact severity scale/level;

- ***Low impacts*** activity has negligible change on the environment, lasting less than 12 month in duration and confined to point of occurrence.
- ***Medium Impact*** has moderate change on the environment, lasting over 1 to 3 years duration and of scale beyond the point of occurrence to 10km radius (i.e. beyond the local area but not nationally/Internationally).
- ***High impacts*** has prominent change lasting over 3 year's duration and going beyond national to international scale, beyond 10km radius.

6.1 Impacts of Existing lodge Operations, Present Mitigation and Environmental Risk Level

Activity/facilities	Waste type	Pathways	Receptor	Impact	Current practices	Risk Level with Present mitigation	Gaps/Risks
Guest and host rooms and public lavatories onboard the Houseboat	blackwater	water	Aquatic life, humans and wildlife	○ Degradation of the aquatic environment resulting in fatality of aquatic life, deterioration of water quality for any uses	○ Septic tank treatment system of wastewater aboard ○ Regular application of eco-tabs for degradation of the sewage ○ Thorough digestion of sewage by microorganisms in the third tank	Medium	○ Slack inspection of the system for leaks and overflows while ascertaining operability of the system at all times
Kitchen, dining operations and bar	Solid waste	Water	Aquatic environment and humans	○ Environmental health hazard ○ Impair the aesthetic value of the water	○ Waste is separated aboard the houseboat ○ Separated waste is transferred onshore for further handling ○	Medium	○ Inconsistent practices of separating waste ○ Irregular inspection of areas for implementation of the practice slacking
	Greywater	Water	Aquatic life, humans and wildlife	○ Access fats and oils may interfere with air-water interface processes reducing oxygen diffusion process	○ Greywater is discharged directly into the river ○ Sink rain strainer fitted to remove solids in the water	Medium	○ Possible discharge of water with high fatty and oil content into the river.

Transfer of pre-treated effluent to a tanker (honey sucker) and transfer to land-based treatment system	Pre-treated Blackwater	Water or land	Aquatic life, humans and wildlife	○ Degrade the quality of water in the area spreading outwards affecting aquatic life and reduce uses ○ Environmental health hazard to humans and wildlife	○ Pumping system involves coupling of that locks to prevent leaks during pumping into the honey sucker tanker	Medium	○ At completion of pumping and disconnection of couplings, some residual effluent left in the pipes drains into the water.
Transfer of fuels onto the boat and their storage	Hazardous waste	water	Aquatic life, humans and wildlife	○ Contamination of the aquatic system ○ Cause fatality to aquatic life ○ Health hazard to humans and wildlife of the area that may use contaminated water	○ Fueling point involves nozzle insertion into the tank to avoid any spills ○ All portable fuels stored in a secure storage	High	○ Although fueling nozzles involves insertion into the tank, overflow of the tank and possible spills could still occur and need to be managed ○ Refueling of small boats may result in spills. ○ Lack of regular inspection of tanks for leakages
Maintenance aboard the boat	Hazardous waste mainly waste oil	Water or land	Aquatic life, humans and wildlife	○ Contamination leading to degradation of land and water resources ○ Impair the quality of land or water	○ Spillages are handled with engine cleaner and resultant water pumped for disposal onshore	Medium	○ Improvement needed on handling of the oil spills or chemical contaminated water. ○ Disposal of contaminated waste or oil needs improvement

				for any productive uses			
Solid waste transferred onshore as well as onshore operations waste	Solid waste	Land	Humans and animals	○ Impair aesthetic value of the area ○ A health hazard to humans and animals ○ Release of smell due to degradation of the organic matter	○ A trench was dug and fenced-off as a landfill for incineration of combustible waste ○ Food waste disposed along with combustible waste in the land fill ○ Recyclable waste is collected by Sea-Pride for further handling in Katima Mulilo	Medium	○ Incineration not scheduled regularly and implemented ○ Food waste disposed along with combustible waste ○ None-recyclable waste collected by food supplier for disposal at Katima Mulilo may pressure landfill site there
Laundry operations onshore	Greywater	Land to water	Aquatic life, humans and wildlife	○ Stable foam formation in rivers may hinder water-air interactions ○ Hydrophilic detergents may endanger the survival of aquatic life ○ Lowering of surface tension of water thus increasing risk of fish to absorb other	○ Pipe discharges greywater approximately 20m from the river, forming an overland flow to the river	Medium	○ Direct flow of concentrated laundry water into the stream

				toxins into the body			
Staff accommodation onshore	Black water	Land and water resources	Humans, wildlife, water resources	○ Degrade the aquatic environment leading to fatality in aquatic life ○ Render river water unusable due to deteriorated quality ○ Pose a health hazard to wildlife and people in the local area and downstream	○ Each house has a concrete built septic tank system for containing wastewater ○ Mainly serves as temporal accommodation for on-shift staff only	Low	○ No regular inspection of operability including leaks and overflows from septic tanks ○ No response plan if any septic tanks may overflow
Power generation onshore	Hazardous waste	Land into water	Humans and wildlife	○ Contamination of the soils and water resources ○ Compromise health of the workers ○ Render aquatic system cease its ecosystem functioning	○ Generator stationed on concrete area to contain spills and leakages	Medium	○ Generator area not kept well tidy ○ Observable spillages beside and beyond the bounded area ○ Bund/concrete in some areas appears breaking/cracking not maintained ○ Empty cans left around the area ○ Generator exhaust pointed on the ground

Land based storeroom	Hazardous waste	Land into water	Aquatic life, humans and wildlife	○ Contamination of the soils and water resources ○ Compromise health of the workers ○ Render aquatic system cease its ecosystem functioning	○ All detergents and kept in a secure warehouse onshore.	Low	

7. Environmental Management Plans

An environmental management plan (EMP) is defined as a document outlining measures or management actions on how activities with significant impact on the environment will be mitigated, controlled and monitored during the various phases of the project or throughout the lifespan of an operation, but also ensuring capitalization of the positive benefits of the project or an operation. Further to that, an EMP will outline the roles and responsibilities and timescales both for implementation of mitigation measures but also the provide basis for measurement of compliance and ensuring general best environmental management practices.

Although the EMP covers the entire project cycle from construction, operation and decommissioning, an existing facility such as Zambezi Queen Houseboat has been operating for over 25 years and constructed prior to enacting of environmental legislation (EMA), requires an EMP for the operations and decommission components of the generic project cycle phases. Therefore, this EMP will cover the operational and decommissioning stages of Zambezi Queen Houseboat operations.

7.1 Mitigation Measures

Activity/facilities	Waste type	Current practices	Gaps/Risks	Revised or Additional Measures	Risk Status after Additional Mitigation	Responsible
Guest and host rooms and public lavatories onboard the Houseboat	blackwater	○ Septic tank treatment system of wastewater aboard ○ Regular application of eco-tabs for degradation of the sewage ○ Thorough digestion of sewage by microorganisms in the third tank	○ Slack inspection of the system for leaks and overflows while ascertaining operability of the system at all times	i. Develop a weekly schedule for inspection of the operability of the septic system complementing the application of the eco-tabs ii. Develop transfer protocol for shifts for consistence implementation of inspections.	Low	Maintenance Manager (i) Captain (ii)
Kitchen, dining operations and bar	Solid waste	○ Waste is separated aboard the houseboat ○ Separated waste is transferred onshore for further handling	○ Inconsistent practices of separating waste	○ Conduct routine inspection of waste separation across the facilities and operations on the boat.	Low	Captain
	Greywater	○ Greywater is discharged directly into the river ○ Sink drain strainers to remove solids in the water	○ Possible discharge of access fats and oils along with draining sink water directly into the river	○ Thorough scullery work removing fats and oils prior washing of dishes. ○ Install an underneath sink filter for fats and oils additional to the sink strainer ○ Desist from pouring oils and fats down the drain.	Low	Host Manager

Transfer of pre-treated effluent to a tanker (honey sucker) and transfer to land-based treatment system	Pre-treated Blackwater	○ Pumping system involves coupling of that locks to prevent leaks during pumping into the honey sucker tanker	○ At completion of pumping and disconnection, some residual effluent left in the pipes drains into the water.	○ Design and implement a bucket system to collect the residual effluent in the pumping pipes and add it to pumped effluent for onshore treatment ○ No leaks /Spills into river	Low	Captain
Transfer of fuels onto the boat and their storage	Hazardous waste	○ Fueling point involves nozzle insertion into the tank to avoid any spills ○ All portable fuels stored in a secure storage	○ Although fueling nozzles involves insertion into the tank, overflow of the tank and possible spills could still occur and need to be managed ○ Refueling of small boats may result in spills.	○ Use of a funnel to fill the fuel tanks of the boat with drip or spillage tray under ○ Filling up of the tanks should be conducted with full alertness and under supervision. ○ Develop standard operating procedure (SOP) for fuel handling. ○ All small boats fuel tanks to be fueled with placement of drip trays underneath or on areas if the boat where any spillages ma not leak or spill into the river e.g. the engine room	Low	Captain
Maintenance aboard the boat	Hazardous waste mainly waste oil	○ Spillages are handled with engine cleaner and resultant liquid waste pumped for disposal onshore	○ Improvement needed on handling of the oil or chemical contaminated water on land	○ Contaminated oil water potentially used as ignitor for combustible waste incineration	Low	Maintenance Manager

Solid waste transferred onshore as well as onshore operations waste	Solid waste	○ A trench was dug and fenced-off as a landfill for incineration of combustible waste ○ Food waste disposed along with combustible waste in the land fill ○ Recyclable waste is collected by Sea-Pride for further handling in Katima Mulilo	○ Incineration not scheduled regularly and implemented ○ Food waste disposed along with combustible waste ○ None-recyclable waste collected by food supplier for disposal at Katima Mulilo may pressure landfill site there	○ Schedule biweekly incineration of the waste by land based operations ○ Biweekly inspection of the implementation of incineration ○ Collaborate with local community of Impalila in designating and operate a local landfill on the island ○ Find alternative disposal of food waste such as composting or arrange with local communities to provide food for pets or farming	Low	Assistant Manager
Laundry operations onshore	Greywater	○ Pipe discharges greywater approximately 20m from the river, forming an overland flow to the river	○ Direct flow of contaminated laundry water into the stream	○ Establish a pond at discharge point of the pip to pond the water preventing direct overland flow into the river. This will allow for natural processes of filtration and evaporation to mitigate concentrated detergents in the water	Low	Assistant Manager
Staff accommodation onshore	Black water	○ Each house has a concrete built septic tank system for contain wastewater ○ Mainly serves as temporal	○ No regular inspection of operability including leaks and overflows from septic tanks	○ Schedule biweekly inspection of land based septic tanks to determine if there are leakages and overflows	Low	Assistant Manager

		accommodation for on-shift staff only	○ No response plan if any septic tanks may overflow ○ Lack of timely maintenance of pipes and other aging infrastructure	○ Develop a response plan for overflowing septic tank ○ reporting of incidents of infrastructure dilapidation, urgent repair and closeout of incidents		
Power generation onshore operations and during night time for Zambezi Queen	Hazardous waste	○ Generator stationed on concrete area to contain spills and leakages	○ Generator area not kept well tidy ○ Observable spillages beside the beyond the bounded area ○ Bund/concrete in some areas appears breaking not maintained ○ Empty cans left around the area ○ Generator exhaust pointed on the ground	○ A spill procedure involving the scooping of all the contaminated soils and disposed at incineration area to apply to this area with urgency ○ Repair the concrete bounding the generator area avoid spillage to the ground ○ No empty cans or other materials used in the generator area to be placed on the ground except where with a plastic lining under it ○ The exhaust pipe of the generator need be pointed away from the soils into the air to avoid accumulation of fumes on specific spot on the ground	Low	Maintenance Manager

7.2 Resource Utilization and Biodiversity Management

Activity	Requirements	Management Actions	Responsible
Water resources and wastewater	Water Act of 1956 Water abstraction from a river and treatment and disposal of wastewater must be in possession of a valid permit.	○ Application for water abstraction permit from the DWA ○ Regular monitoring and reporting of abstraction volumes. ○ Ensure that all leakages are reported and repaired with urgency ○ Encourage guests to reuse linen, through discouraging daily change of linen to reduce laundry use thus water used per day and discharged	Regional Manager
Electricity	Minimize emissions and carbon footprint	○ Keep unused lights off especially during the day ○ Maintain use of gas stoves in kitchen	Captain
Biodiversity	Nature conservation ordinance of No 4 of 1975 Protection of Namibia's fauna and flora	○ Movements of staff restricted to the operational sites and work areas only. ○ No hunting, trapping, setting of snares, or any other disturbance of any fauna species allowed without a required permit	Regional Manager
	Inland Fisheries Act (1 of 2003) as amended prescribes a need for recreational fishing license, fishing seasons and fishing areas, as well as type of fishing equipment's	○ Acquire a license for undertaking recreational fishing. ○ Familiarization with restricted fishing areas and closed fishing seasons ○ Obtain registration of all boats used in inland water	Regional Manager
	Forest Act of 2001 Section 21 of the Act prohibits cutting or removal of vegetation within 100m of a river or stream or watercourse except	○ No trees occurring in this environment may be damaged or removed for any purpose without the required permit ○ Any construction in new areas need a permit to be	Regional Manager

	under authorization of a license.	obtained prior removing any vegetation	

7.3 Healthy and Safety and Heritage Management

Activity	Requirements	Management Actions	Responsible
Healthy and safety of workers	Health and safety act Chapter 3 of the acts prescribes conditions for ensuring the welfare of workers at workplaces Chapter 5 of the acts prescribes management of hazardous substances. Chapter 6 of the acts prescribes requirements for managing of physical hazards to the workers as well as provision of protective equipment's	○ Establish formal protocols for handling of hazardous substances inclusive of proper protective wears where required. ○ Maintain policy of no intoxication while at work to eliminate safety and health risks ○ Provide training where needed on performing specific tasks with high safety or healthy risks	Maintenance Manager
	Hazardous Substances ordinance 14 of 1975 Prescribes restriction on storing and sale of Group I declared hazardous substances	○ Familiarization with regulation for import, storage and sale of group I declared hazardous substances	
Employment and Employee welfare	○ Labour Act of 2007 Stipulates requirements on employment of labour including specification on groups such as woman and children and disabled.	○ Any new employment opportunities should be filled with local employees ○ Adhere to the legal provisions in the Labour Act for the recruitment of labour (target percentages for gender balance, optimal use of local labour and SME's, etc.) in the Contract.	Regional Manager
Environmental training and Awareness	Sensitization of lodge employees of environmental impacts of their operations	○ Design a short induction training for new employees to sensitize them on environmental issues and expectations. ○ The lodge to keep a record of these trainings.	General Manager

		○ Regular weekly briefings of the current staff to include environmental issues relating to maintain and improve waste separation, handling and maintaining hygienic practices at all times in various areas of their operations, inclusive of minimization of water wastage, electricity saving as well as matter relating to health and safety of workers. ○ Explanation of the specific mitigation measures within this EMP especially unfamiliar provisions ○ Explanation of the importance of complying with the EMP	
Local Community	Local communities maintain their lifestyles without drastic alteration	○ The Lodge to develop an engagement strategy for the local community to sensitize them to understand of the lodge operations inclusive of how various environmental, health and safety issues are handled ○ Avoid drastic disturbance of social livelihood of local community ○ Engage communities on possible areas of support and maintain record of social responsibility projects (e.g. schools, clinic etc.).	Regional Manager

7.4 Rehabilitation

The Houseboat is planned to continue operations for an indefinite period in the future, therefore rather than plan for closure, the lodge to develop *a* strategy for decommission of redundant operations or facilities of the lodge. The strategy to look at aspects such as decommissioning of either facilities or equipment's that have become redundant as the lodge advance its activities. The strategy can include the

decommissioning of the current redundant boats at Ncheku warehouse to minimize potential risks and loss of economic value as the equipment ages.

7.5 Responsibilities and Monitoring Requirements

The following responsibilities are recommended to the following responsible:

Monitoring requirements	Frequency	Responsible
Inspection of septic tanks and French drain	Weekly	Maintenance Manager
Inspection of operation of kitchen staff on fats and use of drain strainer	Daily	Host Manager
Inspection of waste separation in all areas and proper storage/disposal as per requirements	Weekly	Captain/Host Manager
Inspection of laundry greywater discharge	Weekly	Assistant Manager
Inspection of chemicals Storeroom aboard	Weekly	Captain
Maintenance workshop area Inspection	Weekly	Maintenance Manager
Inspection of landfill site operations	Weekly	Assistant Manager
Inspection of the septic system as well as treatment onshore	Alternate months	Regional Manager

7.6 Reporting, EMP implementation and Review

7.6.1 Reporting

To ensure successfully implementation of the EMP, all employees are required to report incidents relating to environment, health and safety on the premises to their supervisors who shall report to the responsible manager. All environmental, health and safety incidents or observation to be recorded and actions taken to address these incidents and ensure close-outs.

7.6.2 Implementation

Implementation of this EMP rests in the Regional Manager of Zambezi Houseboats as the overall head of all operations. The Regional Manager may delegate responsibilities of specific areas of operations to his staff, however overall accountability is retained. The General Manager retains the accountability for;

- Reporting as required by competent authority
- Obtaining of all required permits as outlined in this EMP
- Review and update of this EMP document as required by competent authority.

8. Conclusion and Recommendations

The documents highlights that although the Houseboat/lodge has been in operation a period prior enacting of the EMA, operations have adopted significant measures to ensure that impacts to the environment and communities is minimized to acceptable levels. This document further indicates that with implementation of the prescribed additional or revised mitigation measures in the EMP section, the residual impacts of the operations of Zambezi Queen will be even more acceptably minimal.

The public consultation meeting revealed a lack of cordial transparent relationship between the Lodge and the community, as such there appears to be intense speculation of the methods of handling waste on the Houseboat. This can only be addressed through engagement and transparency that can be created through awareness. It is therefore recommended the Houseboat management make a commitment to establishing this transparent relation through inviting a committee that may include representatives from the following institutions; the traditional authority of the area (i.e. Induna of the Impalila and Kasika sub-khutas), the Impalila and Kasika conservancy, the Village Development Committees (VDC), ordinary members of the community and Ministry of Health to an awareness session on the practices of handling, treatment and disposal of waste especially sewerage from the houseboat. Intervals of such engagements to be determined by the lodge and such a committee.

Secondly, lack of a designated landfill site on the island and Kasika seems to be a major cause of inconsistent handling of waste both for lodge operations and local community. As per suggestions of the community at the consultation meeting to endeavor in seeking a portion of land from the people of the island to designate as landfill site, the lodge to support these efforts as it may potentially be beneficial and minimize environmental costs for own handling of waste.

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