

WATER & WASTEWATER SERVICES REPORT KAPAMA GAME RESERVE IN HOEDSPRUIT, LIMPOPO

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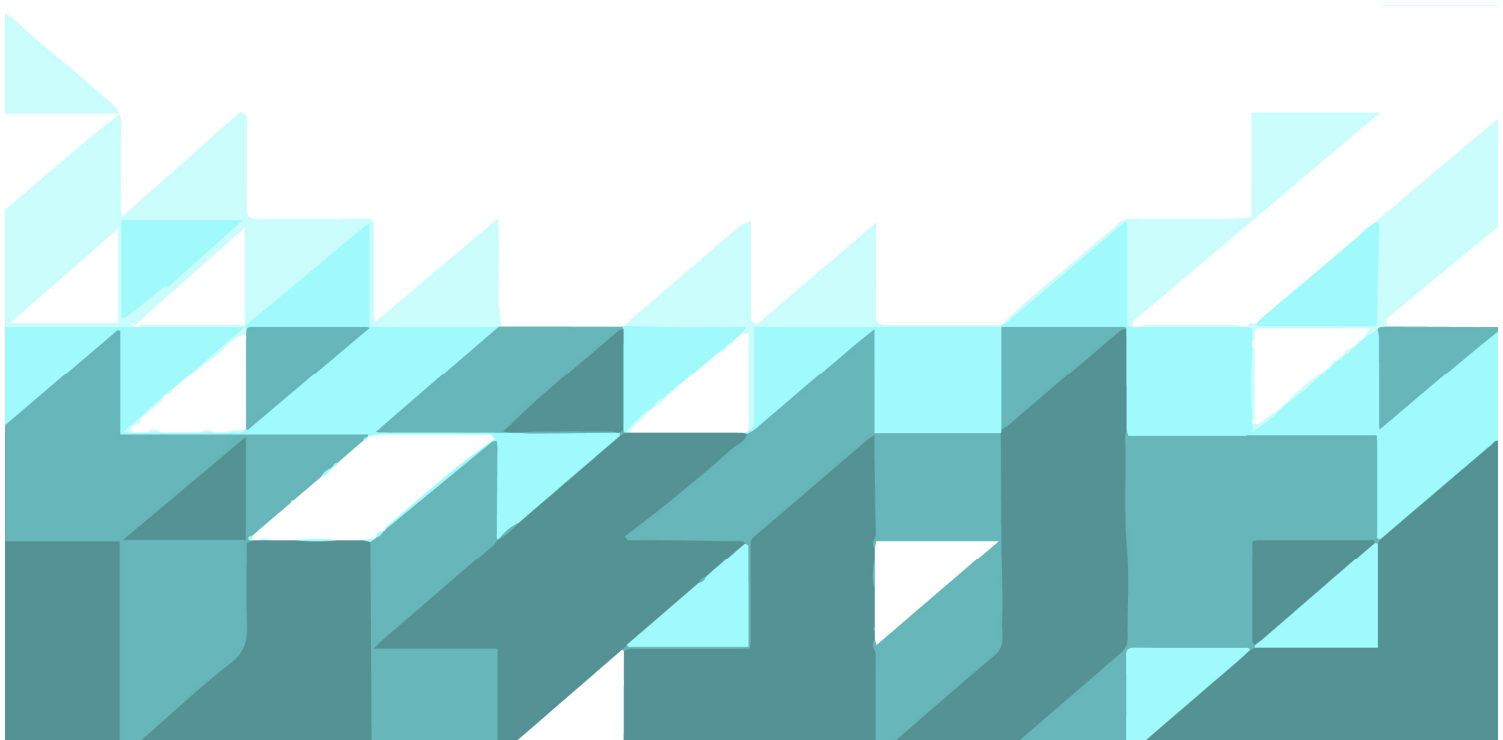


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Abbreviations

Ha	Hectares
m ³	Cubic metres
WWTW	Waste Water Treatment Works

1. Introduction

AquaEco has been appointed by NuLeaf Planning and Environmental to compile a Water and Wastewater Services Report for Kapama Game Reserve. This report contains details pertaining to the nature and extent of water use, the water use infrastructure, abstraction and purification details, pipeline networks, storage reservoirs, water usage patterns and volumes of the lodges and wastewater treatment systems.

1.1 Project Background and Locality

Kapama Game Reserve is situated in the Limpopo Province, approximately 6 km South of Hoedspruit. It falls within the Maruleng Local Municipality. Table 1 provides comprehensive locality details.

Table 1: Kapama Game Reserve Locality Description

Aspect	Description
Municipality	Maruleng Local Municipality
Nearest Town	Hoedspruit
Land Use Type	Open Space (Game Reserve / Conservation)
Coordinates (center)	24°26'11.06"S 31° 3'43.81"E
Property Size (ha)	14 000 ha
Quaternary catchment & Water Management Area	B73B & B73D Olifants (Lower Olifants)
Main River System	Klaserie River and associated tributaries

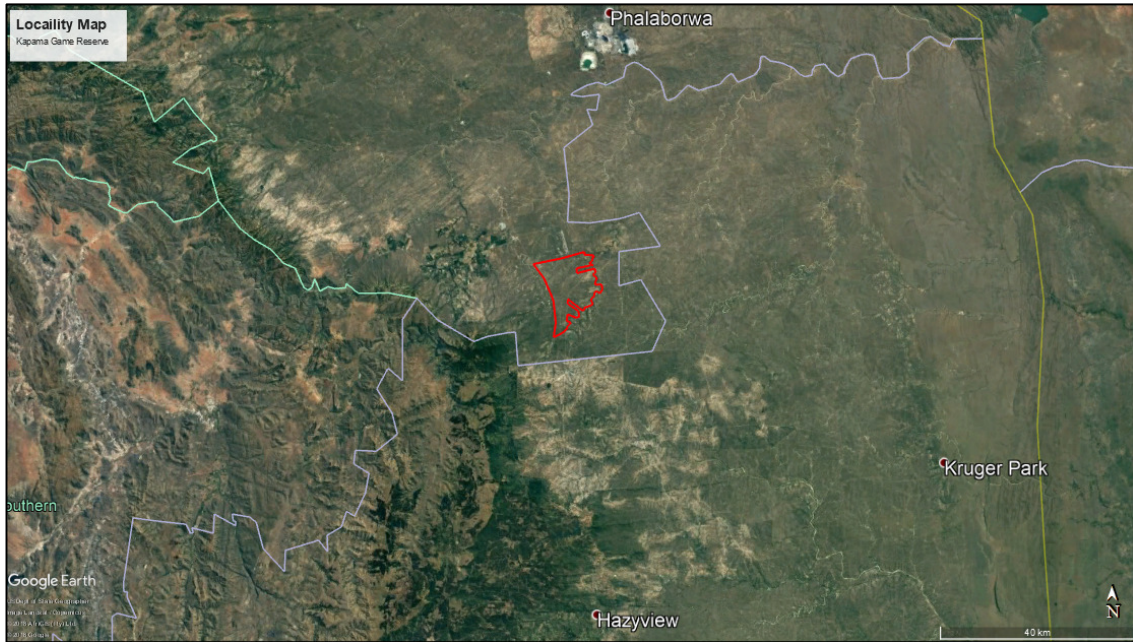


Figure 1: Locality map of Kapama Game Reserve

2. Description of Water Circulation System

Water for the respective lodges in the Kapama Game Reserve is abstracted from the Kubu Dam, which is a concrete wall in-stream dam on the Klaserie River. Water is abstracted by means of a submersible pump to a fluctuant based water treatment system, after which a sand filtration process is used for the removal of suspended matter. A flocculant is added to the water to promote efficiency of the filtration process, prior to the water flowing through a pressure driven sand system (Figure 2).



Figure 2: Images of water abstraction pump and purification system

Subsequently, the treated water from the purification system is pumped to two 8000 cubic meter reservoirs near the center of the Reserve where it is stored (Figure 2). The water stored in the reservoirs is distributed to each camp via a network of underground pipelines (Figure 3).



Figure 3: Main water reservoirs at Kapama Game Reserve (8000 m³ ea.)



Figure 4: Water Supply Network at Kapama Game Reserve

3. Water Supply & Use

3.1.1 Water Sources & Usage

The water abstracted from Kubu Dam in the Klaserie River is the only supply source that is used at the Kapama Game Reserve.

The estimated water use volume per person per day at each of the lodges is calculated by dividing the annual measured water use volume by the number of bed nights booked (Table 2).

Table 2: Water use volumes per lodge at Kapama Game Reserve

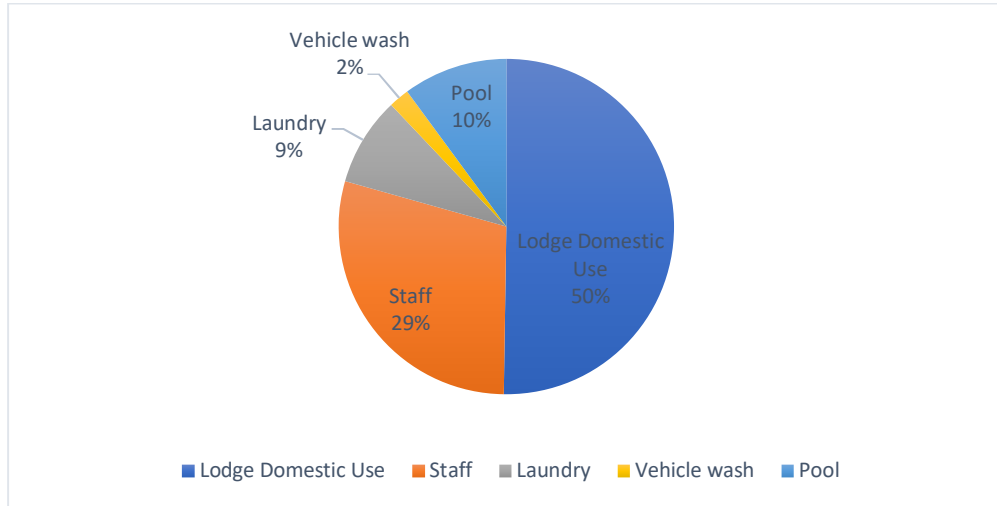
	River Lodge	Southern Camp	Kapama Karula	Buffalo Camp
Water use at lodge (m³/annum) *	48 768.60	19 390.3	13 336.2	8 573.4
Bed Capacity	136	56	28	20
Bed nights booked**	35 510	12 325	5 236	5 323
Water use per person (m³/ppn)	1.4	1.6	2.5	1.6

*Calculated from monthly water supply records to each lodge Mar 2018 to Mar 2019

**Calculated using guest records from 1 Mar 2018 to 28 Feb 2019 (1 guest staying one night)

The water use per person at each lodge can be further broken down into the following estimated percentages as depicted in the following pie chart:

Chart 1: Water use breakdown



Wastewater is mainly generated from water used for domestic use, staff use and laundry. Therefore, the volume of wastewater discharged from each of the lodges for onsite treatment and disposal is estimated as follows:

Table 3: Wastewater discharge per annum at Kapama Game Reserve

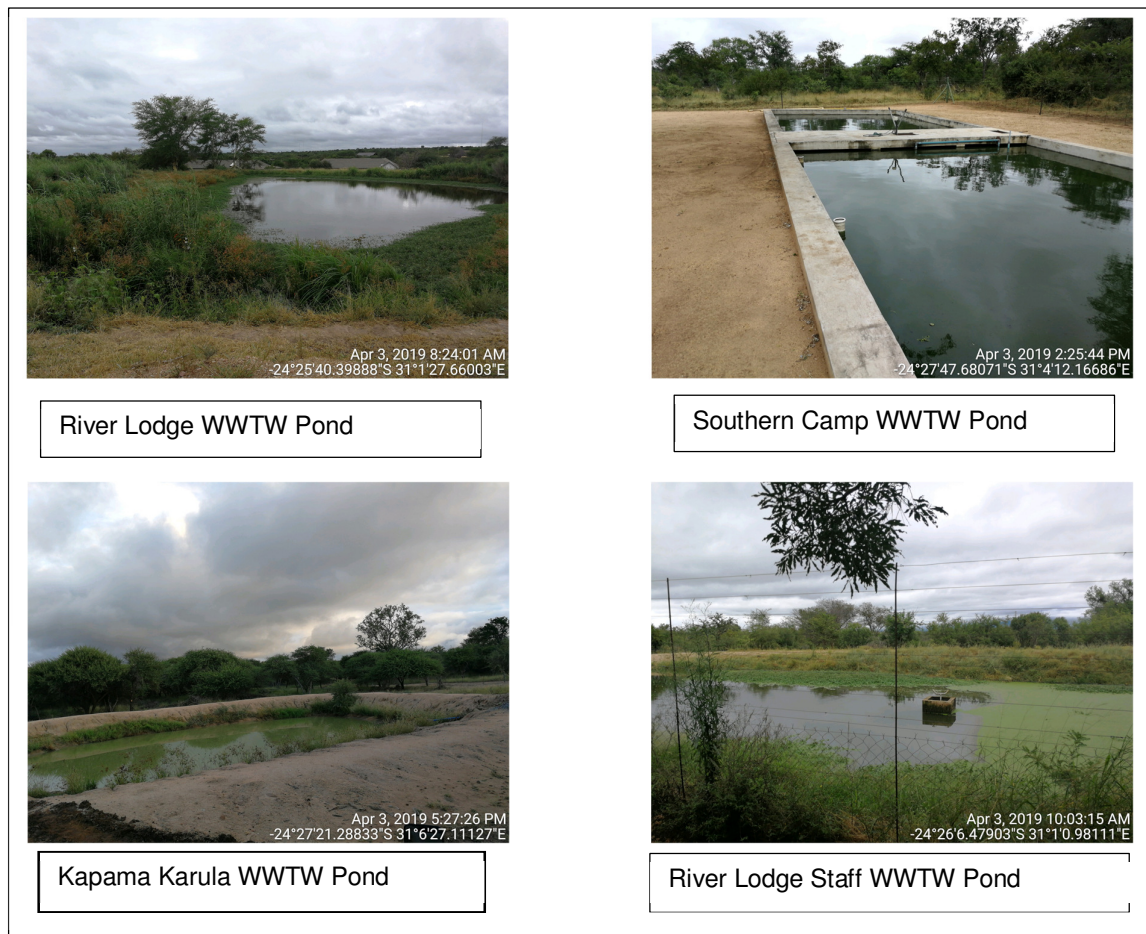
Lodge	Wastewater discharge (m ³ / annum)
River Lodge	39 990
Southern Camp	15 900
Kapama Karula	10 936
Buffalo Camp	7 030
Total	73 856

4. Description of Wastewater Treatment Works

Oxidation pond systems are used for treatment of wastewater at the various camps in Kapama Game Reserve (Figure 5). The wastewater enters the ponds from a septic tank located near each lodge / staff housing and is treated inside the pond using natural interactions between sunlight, bacteria, and algae, with varying degrees of oxygenation.

The overall current condition of the pond systems ranges from poor to moderate and an engineer's assessment has been commissioned to seek advice on improvements. The intention is to implement a system in which enough primary wastewater breakdown can be achieved for the water to be used in selected irrigation of certain areas surrounding the lodges.

Figure 5: Examples of WWTW at Kapama Game Reserve



Some of the oxidation pond systems are unlined. It is recommended that ponds which receive raw sewerage be lined with an HDPE or similar liner that prevents groundwater seepage, or that the wastewater be treated to a standard that can be accommodated in an earthen pond without risk to the environment.

A small volume of treated effluent from the oxidation ponds is currently being used for irrigation surrounding the lodges and staff accommodation.

5. Entitlement to the Use of Water

The dam in the Klaserie River (Kubu Dam) has an existing authorisation in terms of Section 62(2H)(a) of the Water Act, 1956. The extraction (supply) of water for the respective lodges is undertaken from water allocated to the respective portions of Kapama by the Klaserie River Irrigation Board.



Figure 6: Dam wall in the Klaserie River

Description of dam wall as authorised:

- Maximum dam wall height (overflow level): 2,8 m
- Overflow length (horizontal level): 70 m
- Total length of wall: 140 m
- Maximum capacity: 106 800 m³
- Diameter of outlet pipe: 850 mm

6. Recommendations

Based on the content of this water services report, the following recommendations are made towards the responsible management of water resources and services at Kapama:

- All water uses must be legal in terms of the National Water Act. This is currently being done through discussions with the Department of Water and Sanitation, which are informing an application for an integrated Water Use License, with due consideration to historical entitlements.
- An engineer should be appointed to undertake an assessment of the wastewater treatment systems and to recommend improvements in wastewater management to the level that the final effluent can be safely used in irrigation.
- Water saving measures should be implemented where possible. This may include the use of low-flow shower heads, the use of draught resistant species in landscaping around the lodges, limiting irrigation to the volumes that can be obtained from wastewater treatment and embarking on a staff and guest awareness programme around responsible use of water.

7. Conclusion

The primary objective of this report was to determine the current state of water and wastewater services at the Kapama Game Reserve. AquaEco believes that the information presented in this report addresses this objective.