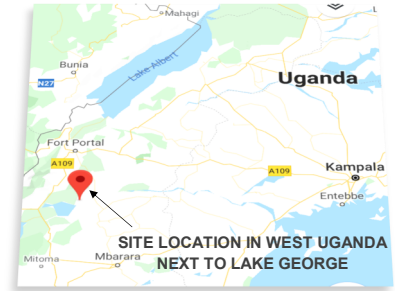


# SELF-WASHING FILTRATION PLANT

## MPANGA GORGE, KAMWENGE,



Mpanga Gorge formed by the Mpanga river with its cascading waterfalls contains a unique ecosystem providing home to the last remaining 8,000 Critically Endangered *Encephalartos Whitelokii* cycad plant species in the

world. The environment is located just before the river enters into Lake George in south-west Uganda.

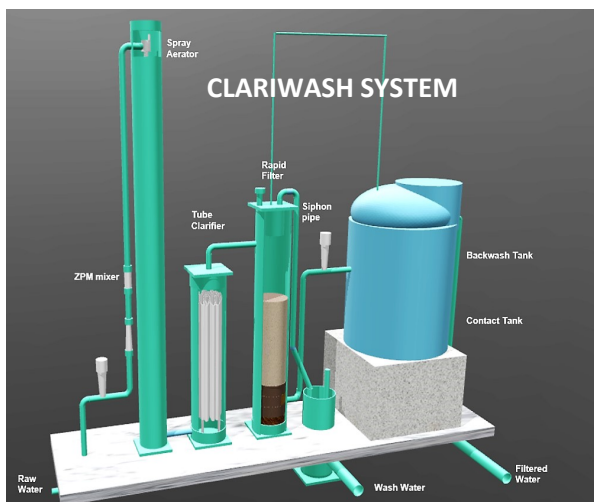
Unfortunately this environment is at risk from slash and burn agricultural techniques combined with the need to bring cattle down into the gorge to find water - in the process trampling on young cycads. This has brought the cycad population under significant pressure further endangering their existence.

To provide a solution to this problem, a hydraulic ram pump has been installed at the base of the gorge



CREDIT: PROTOS

to pump river water to the top of the gorge (some 135m elevation) where community beneficiaries homes are located adjacent to Mpanga Gorge. The pumped water flows into cattle watering troughs and to a tap-stand for community beneficiaries. This allows cattle to be watered without the need to enter the gorge (thus providing protection to the cycads of Mpanga Gorge) and the community beneficiaries no longer have the arduous journey to the bottom of the gorge to collect water.



The project

was developed and installed by Protos - Join For Water a Belgian NGO, supported by the International Union for Conservation of Nature (IUCN) Save our Species (SOS) initiative and DGD – Belgian Directorate-General for Development Cooperation.

In order to ensure the water quality delivered to the top of the gorge was suitable for community beneficiaries to use, PROTOS implemented a new self-washing filtration system which is designed to treat water for remote communities which have no access to power supply or spare parts. The system needs no operational

intervention to backwash and is constructed of locally available materials built to an exact geometrical arrangement to ensure correct functioning of the self-washing function.

The process comprises aeration, tube clarification, filtration and disinfection. Activated filter media (AFM) by Dryden Aqua is used in the filter - obtained from a supplier in Nairobi.

The self-washing cycle initiates hydraulically (without operator input) when the filter has clogged. The first phase of the wash cycle primes the siphon used to power the filter backwash, but in doing so, also flushes out the tube clarifier. After the siphon is primed, it reverses flow through the filter drawing on a clean backwash tank to wash the filter. Two process units are cleaned in the cycle.

The ClariWash system has been developed by WaterReach Ltd (a UK not for profit company) and installed at Mpanga by GAIND-Uganda.

Currently six other ClariWash filters are in operation else-



where in Uganda and have been operating satisfactorily for nearly 5 years to date without need for operator input to backwash. The system needs to be set-up to suit the pertaining raw water quality. The system at Mpanga does not utilise a coagulant to enhance clarification and filtration due to the difficulty in supply of chemicals and dose control in a remote location.

The filter at Mpanga Gorge has performed well, successfully supplying the community for nearly 2 years to date. Even under high turbidity loading, the system self-corrects allowing air entrainment and the siphon to re-prime. This has prevented any loss of supply to the community. To give greater security against surface blinding of the fine AFM media, a top layer of coarse granular carbon media approximately 200mm deep has been added as a dual media arrangement.

It is apparent that the river turbidity varies significantly being likely related to differences between the wet and dry seasons. In July 2018 (dry season) turbidity in the river water supplied via the ram pump was 7.54 NTU. By contrast, in October 2019 (wet season) a raw turbidity of 83 NTU was measured. Treated water turbidity on this occasion was < 5NTU.



From the appearance of the backwash water the majority of turbidity is removed by the tube clarifier with the filter performing a finishing function.

Limited test results showed good removal of E.coli and faecal coliforms with zero counts downstream of disinfection.



The calcium hypochlorite chlorine cartridge needs to be replaced when exhausted. Replacement cartridges are available from Davis and Shirliff in Kampala. It is possible to visually observe when a cartridge is exhausted on the Klorman unit. The interval between replacements will need



to be determined by experience on site. The chlorine residual at the tapstand needs to be checked regularly and controlled by adjustment of the Klorman unit to achieve just under 2mg/l free chlorine residual to maintain adequate disinfection whilst avoiding taste complaints .

Colour is present in the raw water possibly originating from organic material causing humic acids to be entrained in upstream forested areas. Addition of the carbon layer has improved this slightly and slowing the flow should also improve removal by the activated carbon layer.

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WaterReach Ltd is a UK registered "not for profit" company providing solutions for development and disaster response in the WASH sector.

**We are interested in linking up with groups, individuals, Charities, NGO's and the like who wish to be involved in further deployment and testing of the system.**

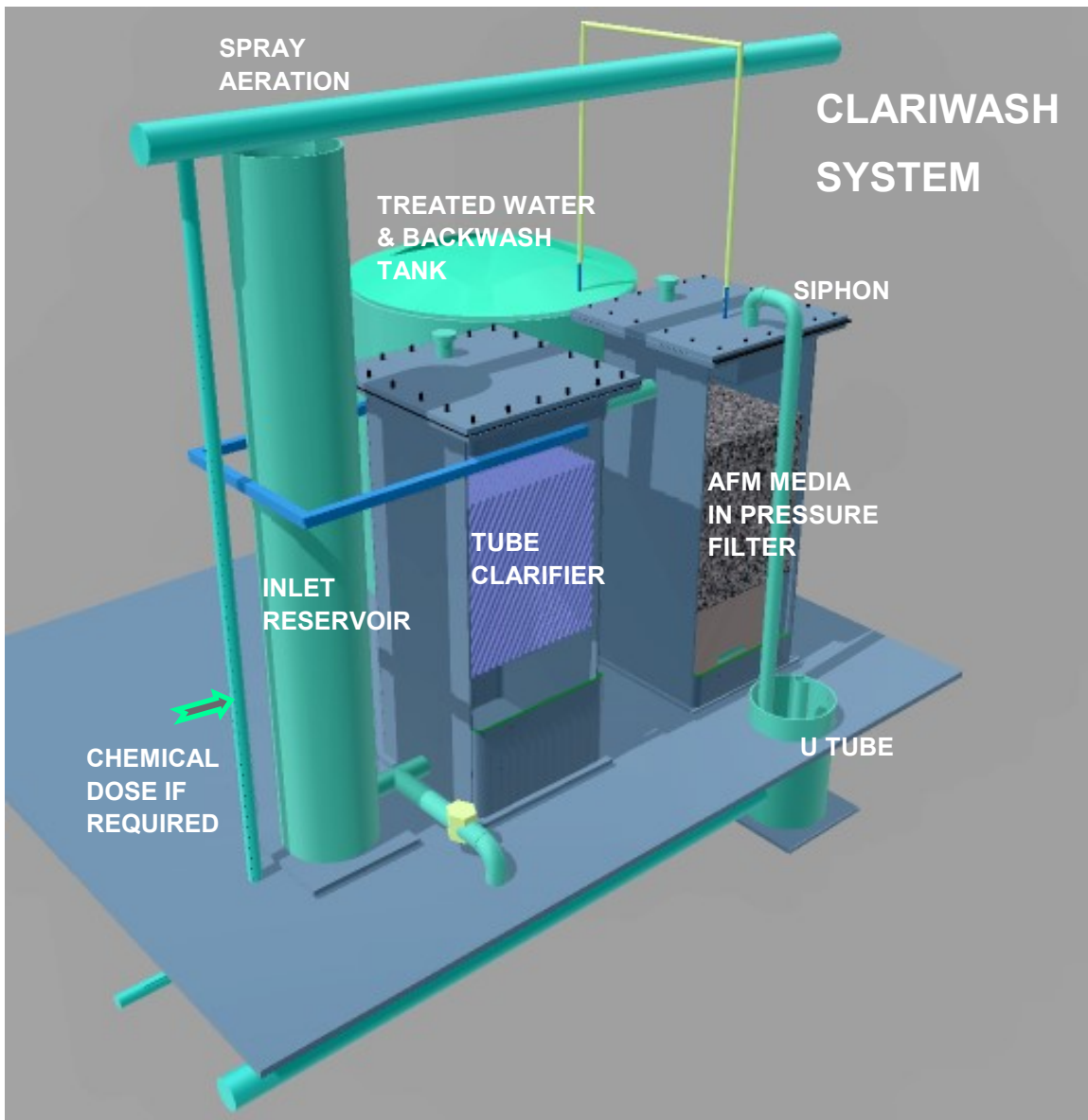
**SEE OVER FOR LARGER SIZE VERSION OF THE SYSTEM >>>>>>>>**

**WaterReach™**

Solutions for Development and Disaster Response

For larger communities a higher output self washing clarifier-filter combination is available as shown below. It is currently at prototype stage and soon to be tested—see site photographs overleaf. Daily output per filter is up to 85,000 litres/day (depending on raw water quality) — sufficient to supply up to 4,000 persons with 20 litres per head per day. A number of filter groups can be assembled together for larger outputs. Advantages are as follows:

- No need for power supply and no moving parts
- No control system or operator intervention to backwash
- Backwash cycle cleans both clarifier and filter
- Multiple treatment barrier comprising clarification, filtration and disinfection
- Pre-assembled modules suitable for manual transport off-road
- Rapid set-up in disaster response situations





**600MM INLET PIPE**

**850 SQ. CLARIFIER**

**850 SQ. FILTER**

**BACKWASH TANK**



**LAMELLA PLATES FOR CLARIFIER**

**PROTOTYPE OF LARGE CLARIWASH FILTRATION SYSTEM IN THE PHILIPPINES**

**U TUBE SIPHON PRIMER**

