Lake Pampulha, Belo Horizonte, Brazil.

Application dates: April 2016 to 2017

Summary

Aim: To bind the soluble phosphorus, reducing the frequency of algal blooms and significantly improving the aesthetics of the water body.

Description: man-made lake built in the early 1940's.

Size (m^2): 1 900 000 (190 ha)

Average depth (m): 5.1

Conductivity (µS/cm): ± 386

Dosage (tonnes): 950

The Lake

Figure 1: Aerial photo of Lake Pampulha (image from Google Earth Pro, 2017).

Lake Pampulha is a highly eutrophied lake in Belo Horizonte, Brazil. Lake Pampulha was constructed to reduce the effect of flood events and to contribute to the city's water supply. However after many years of receiving organic-laden loads from its river systems, Lake Pampulha has become eutrophied.

Background

The consortium "*Consorcio Pampulha Viva*" (English translation: "*The Consortium which brings Life to Pampulha"*) won the public tender to restore Lake Pampulha. PWS' Brazilian licensee Hidroscience (director - Dr Tiago Finkler) supplied the Phoslock and undertook extensive sampling (sediment and water) and modelling of the lake prior to winning the contract and applying Phoslock. Millennium Environmental Technology, a bioremediation company which manufactures the bacterial product, Enzilimp, was also a member of the Consortium. Enzilimp was used to catalyze the organic matter decomposition and indirectly reduce E.*coli*.

Figure 2: A section of Lake Pampulha prior to the application of Phoslock (Tiago Finkler, 2016).

The Treatment

The first Phoslock application was undertaken in May 2016. After this, applications were undertaken monthly over the contract period in order to achieve and maintain Class 3 conditions. A sediment curtain was installed in order to separate the shallow areas from deep areas of the lake and help reduce the nutrient load entering from the main rivers. The curtain is approximatly 250 m and made of polypropylene. It allows only the overflow of water to enter, retaining approximately 70 to 80% of solids.

Figure 3: Phoslock application to Lake Pampulha (photo taken by Tiago Finkler, 2016).

Figure 4: Photos of Lake Pampulha showing the location of the sediment curtain (red line in top photo) and the surface of the curtain in the lake water (Google Earth, modified by Tiago Finkler, 2016).

Lake Pampulha

Results

Prior to the application of Phoslock, Lake Pampulha was classified as highly eutrophic with the mean concentration of Total Phosphorus (TP) measured at 0.70 mg/L of TP.

Samples taken from the lake directly before the first application and over the following 5 months after the Phoslock treatments (Figure 5) show that total phosphorus (TP) concentrations decreased from a mean concentration of 0.62 to 0.05 mg/L TP.

After 10 months Lake Pampulha showed a significant reduction in all eutrophication indicator variables, being classified as Class 3 in accordance with the statutory law CONAMA 357/05 ("*National Council of Environment*").
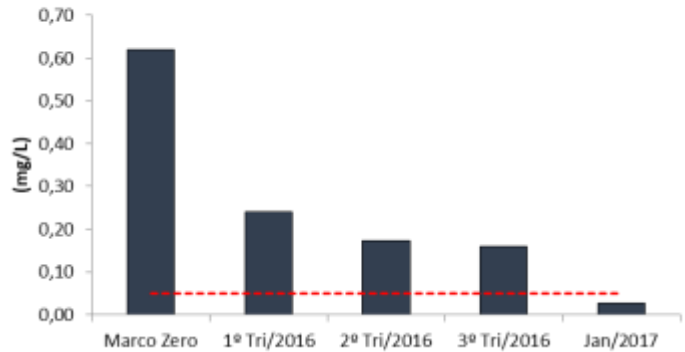

Total Phosphorus

Figure 5: Quarterly mean Total Phosphorus (TP) concentrations measured from 6 sampling points in Lake Pampulha. The data is from April (before application of Phoslock) to January 2017 (graph from Tiago Finkler presentation to NALMS, 2016).

Figure 6: Photos showing the before (April 2016) (LHS) and after (treatment with Phoslock) (July 2016)(RHS) water quality in Lake Pampulha (from Tiago Finkler presentation to NALMS, 2016).

Conclusion

The water in Pampulha will be continually monitored over time, however data collected since the application of Phoslock has shown that it was successful in significantly reducing the TP concentration (by 92%). There have also been significant reductions in the concentrations of chlorophyll *a*, cyanobacteria, ammonium and E.*coli*. Since the restoration of the lake and catchment, the lake has earned the UNESCO World Heritage title.

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