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DESIGNING OF A WATER QUALITY MANAGEMENT PLAN. A CASE STUDY OF CRITERION WATER TREATMENT WORKS IN BULAWAYO, ZIMBABWE.

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INTRODUCTION & AIM

The quality of drinking water is one of the main aspects that influences people's health. Unfortunately, many nations, particularly developing nations, have unsatisfactory drinking water quality, which has led to the spread of numerous waterborne diseases (Li and Wu, 2019). According to reports, water quality is a factor in 3.3% of global deaths and 4.6% of disability-adjusted life years, also worldwide, waterborne illnesses claim millions of lives each year as stated by Wen et al., (2020). A proper water quality management plan (WQMP) guarantees that pollutants and pathogens are managed well in water treatment plants, lowering the risk of waterborne illnesses, safeguarding public health and protecting the environment (Alver, 2019). The main aim is to design a water quality management plan for the Criterion water treatment works in Bulawayo, Zimbabwe.

METHOD

The data collected details principal elements of a water quality management plan. This data is collected from literature (water reports, journals and online articles). The most common method of assessing the water quality of a treatment plant was to collect water samples, from raw water in glass bottles, after coagulation, sedimentation, filtration, and disinfection within a specific timeframe (Omar, 2019). Every sample was obtained within the water treatment plant (WTP), with the raw water samples being gathered at the WTP's trunk main input. To ensure that the qualities of the water sampled were not changed, the containers were pre-washed with distilled water. To accurately evaluate the WTP's hydraulic capacity, essential archive design drawings and data about the original construction of the plant and years of operation were gathered. This was carried out to assist in locating possible problems or restrictions with the hydraulic capacity, such as improperly sized pipelines, treatment units or pumps.

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RESULTS & DISCUSSION

The principal elements of a water quality management plan (WQMP) were obtained from literature. The identified principal key elements for the Criterion water works that make up a WQMP are; tittle, background and scope of a problem, objectives, management needs, management approach, management levels of constituents, analysis, and economic issues.

Figure 1: *Variation of mean turbidity, mean conductivity along a treatment train and WQI for 2022-2023 data compared to the excellent quality rating.*

Table 1: *HRT and SLR tables for Criterion water treatment plant units respectively.*

Treatment Unit	Volume (V); (m^3)	Flowrate (Q) (m^3/day)	HRT=V/Q	Permissible range	Remarks
Flocculator	-	-	-	-	No Data
Clarifier	4500	86400	1.25hrs	2-6hours	Failed
Filter	130	13200	15min	15-30min	Passed

Treatment Unit	Volume m^3/day	Area A(m^2)	SLR=V/A ($m^3/h/m^2$)	Design value ($m^3/h/m^2$)	Remarks
Flocculator	-	-	-	-	No Data
Clarifier	86400	905	4.0	10	Failed
Filter	13200	55	10.0	5	Pass

CONCLUSION

- The study reveals significant shortcomings in the current potable water quality management plan for BCC Criterion water treatment works due to hydraulic overload and inadequate upgrades. This leads to insufficient contaminant removal, potential recontamination events, and occasional exceeding of regulatory standards.
- However, implementing a revised WQMP can improve water quality, which is safe for human consumption and sustainable. In addition there is need to compare and upgrade the WQMP based on developed countries and advancing technology.