WATER SAFETY PLANNING

OPERATIONAL POLICY
AND GUIDING DOCUMENT

PREPARATION & IMPLEMENTATION OF WATER SAFETY PLANS


SAFE WATER
SAVES LIVES

GHANA WATER COMPANY LIMITED
GWCL ... At Your Service

Drinking Water Quality Policy Statement

Ghana Water Company Limited is responsible for providing safe, good quality drinking water to the citizens of Ghana

To achieve this, we will work collaboratively with our staff, relevant government agencies, and national and international stakeholders to:

01 Comply with all regulatory requirements, including the current version of the National Drinking Water Quality Management Framework for Ghana and the Ghana Standards for Drinking Water Quality.

02 Prepare and implement Water Safety Plans for each of our drinking water supply systems.

03 Undertake both regular monitoring of the quality of drinking water at barriers and reporting to verify compliance with the regulatory requirements and promote confidence in our drinking water supplies and their management.

04 Maintain appropriate contingency plans and have adequate incident response protocols to ensure safe and adequate water supplies at all time.

05 Consult and integrate the needs and expectations of our customers into our planning process.

06 Ensure staff and contractors involved in the supply of drinking water are adequately trained and understand their obligations.

07 Investigate and implement new water treatment and distribution system techniques and technologies to improve water quality.

08 Strive to continually improve our Water Safety Plans.

We will engage all staff and/or stakeholders involved in the supply of drinking water to implement this policy

MANAGING DIRECTOR
ING. DR. CLIFORD A. BRAIMAH

APPROVALS

This **Operational Policy Handbook**, documents the Preparation and Implementation of Water Safety Plans in Ghana Water Company Limited.

The signatures of the Appropriate Authorities below indicate that the handbook is being accepted individually and collectively, and that the contents shall be implemented in the daily operational activities of the Water Quality Assurance Department nationwide.

MANAGING DIRECTOR
ING. DR. CLIFORD A. BRAIMAH

14 / 01 / 2022
DATE

DEPUTY MANAGING DIRECTOR
OPERATIONS
ING. JACOB Z. YENDOR

19 / 01 / 2022
DATE

CHIEF MANAGER
[WATER QUALITY ASSURANCE]
DR. MRS. MARGARET N.M. MACAULEY

19 / 01 / 2022
DATE

REGIONAL CHIEF MANAGER
NAME
REGION

DATE

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Introduction

This Operational Policy supports Ghana Water Company Limited's ongoing compliance with its Drinking Water Quality Policy, specifically the policy objective:

- **Prepare and implement Water Safety Plans for each of our drinking water supply systems.**

This Operational Policy provides the minimum requirements for the preparation and implementation of Water Safety Plans (WSPs) across Ghana Water Company Limited's water supply systems.

This Operational Policy is divided into three distinct sections: Catchment, Treatment and Distribution, and provides information on the minimum requirements for each part of the catchment-to-consumer WSP framework.

Catchment

The following are the **minimum requirements** that need to be undertaken for the **catchment** elements of a WSP. It is important that these requirements are integrated into the WSP.

Minimum Catchment Requirements	Undertaken (Y/N)
As part of the preparation of the WSP, a survey is undertaken of the catchment area for the water supply system (Module 2*), with the aim to identify potential sources of hazards for the production of safe drinking water (Module 3)	
Undertake a risk assessment to determine the priority catchment-level risks to the water supply (Modules 3 and 4)	
Identify short, medium and long-term catchment improvement activities that are needed to remove or minimize the identified risks, in consultation with relevant stakeholders (Module 5), develop and implement a management plan endorsed by the senior management (National and Regional) (Modules 6 to 8)	
At the offtake point(s) to the water treatment facility, routine monitoring is undertaken in order to understand changes in raw water quality and potential impacts on the downstream water treatment process (Module 6). Preferably this monitoring is undertaken continuously, using online meters, but if that is not possible, then regular grab samples should be collected to capture baseline data for both normal flow regimes and events, such as heavy rainfall and drought	
Raw water quality data is reviewed regularly, and triggers or targets have been developed that would alert operational staff when the raw water quality deteriorates to a point where it should either not be drawn into the water treatment facility, or, if it has to be used, it would either compromise the ability of the facility to adequately treat the water, or it would necessitate a major change to the treatment process (e.g. increased coagulant dosing; more frequent backwashing of filters) (Module 6). In all cases, approvals to use such water will have to be sought.	
If the raw water intake has different abstraction levels, then a protocol should be developed to guide operational staff on the choice of the appropriate abstraction level.	
A scouring programme should be developed to minimise the build-up of sediment at the raw water intake	
A programme that assesses sediment accumulation in raw water storages should be undertaken regularly to guide decision-making in respect to the need for dredging.	

Module reference refers to module in WHO WSP Framework

Treatment

The following are the **minimum requirements** that need to be undertaken for the **treatment** elements of a WSP. It is important that these requirements are integrated into the WSP.

Minimum Treatment Requirements	Undertaken (Y/N)
At each water supply system, a process has been undertaken to compare the hazards that were identified during the catchment survey with the available treatment processes to determine whether there is sufficient treatment to guarantee consistent production of safe drinking water (i.e. the effectiveness of any existing barriers (control measures) that are in place to manage the associated risks (Module 4))	
If the above process finds that there is insufficient available treatment, then an improvement plan needs to be prepared for consideration by senior management	
For each water treatment process at a water treatment facility, a standard operating procedure (SOP) has been development, which helps ensure that all operational staff have a common understanding and methodology for operating each treatment process	
Develop water treatment targets for each water treatment process	
Appropriate Critical Control Points (CCPs) have been identified within each water treatment facility, using advice from Coliban Water's review of the Kwanyako Water Treatment Plant as guidance for identifying likely CCPs	
For each identified CCP, Alert and Critical Limits have been developed and implemented	
For each identified CCP, the Alert and Critical Limits is regularly monitored, ideally with online meters, but if that is not possible, then with regular grab samples	
For each identified CCP, a response plan has been developed for any breach of either an alert or critical limit, and this response plan details the actions to be taken in the event that either an alert or critical limit is breached	
All meters that are used to monitor the performance of CCPs, whether online or in an onsite laboratory, are maintained, regularly calibrated and regularly serviced, in order to ensure that all monitoring results are as accurate as possible	
There is a process in place to notify staff in the event that the chlorination of the final treated water stops. The importance of continuous primary disinfection with chlorine needs to be recognised	
All staff are adequately trained and competency-assessed in the aspects of water treatment that they are responsible for, as well as drinking water quality risk management	

Minimum Treatment Requirements	Undertaken (Y/N)
Whilst each water treatment plant will be different, and local circumstances will vary greatly, below are some targets that should be met, as much as possible, to ensure adequate treatment has occurred: Turbidity of water after clarification: Ideally <1 NTU, acceptable ≤2 NTU, no greater than 5 NTU Turbidity of water after media filtration: Ideally <0.3 NTU, acceptable 0.5 to 1 NTU, but no greater than 1 NTU Chlorination: the minimum Ct value^ disinfection should be 15mg/L.min, which equates to maintaining a free chlorine concentration of 0.5 mg/L for 30 minutes. Chlorination: The turbidity of the water at time of chlorination must be <1NTU ^The Ct value defines the effectiveness of disinfection. The Ct value is calculated by multiplying the free residual Chlorine concentration in mg/L by the time in minutes that the Chorine is in the water. For example, if the expected residual Chlorine is 2.0mg/L for a contact time of 30minutes then the Ct value will be 2x30 = 60mg.min/L Based on recommendations in Water Research Australia (2020) Good Practice Guide to the Operation of Drinking Water Supply Systems for the Management of Microbial Risk Second Edition https://www.waterra.com.au/project-details/247 which are based on other recognised international good practice (e.g. USEPA)	
There is a management system in place to ensure that all chemical additives (e.g. chlorine, coagulants) are of suitable quality for use in drinking water, and consumables for water quality testing are stored appropriately (with basic good stock management practices in place), handled safely, ordered in a timely fashion, with appropriate supply chain contingency in place.	

NOTE 1: The turbidity requirement in the Ghana Standards for Drinking Water Quality is 5.0NTU, which is based on aesthetic consideration at the customer interface to make allowances for turbidity increases of treated water in the pipe network. GWCL is currently in consultation with a review committee to reduce this standard (relevant to the water supplied to the customer) in order to minimise the potential health risks associated with the higher target of 5.0NTU

NOTE 2: In setting the ideal, acceptable and upper turbidity values for turbidity limits on post-clarification and post-filtration, it is recognised that these values may not be able to be met in the short-term. The listed values reflect current good practice and if they cannot be met, then they should be factored into improvement plans for each water treatment plant

NOTE 3: The internationally accepted ideal turbidity value for post filler turbidity is less than 1.0NTU: Values greater than 1NTU compromise effective primary dissinfection and indicate insufficient pathogen removal during the fitration process.

Distribution

The following are the **minimum requirements** that need to be undertaken for the **distribution** elements of a WSP. It is important that these requirements are integrated into the WSP.

Minimum Distribution Requirements	Undertaken (Y/N)
A minimum free chlorine residual 0.2 mg/L is maintained across the entire distribution system to the point of delivery.	
A process to identify and eliminate, or manage, points of cross-connection between treated drinking water and untreated water has been developed and implemented	
A process to identify and eliminate points of backflow between untreated water and treated drinking water has been developed and implemented	
A process to identify and eliminate points of backflow between customers' premises and treated drinking water has been developed and implemented	
A procedure to safely manage mains breaks and mains repairs has been developed and implemented, so that breaks and repairs are managed in such a way as to minimise the risk of contamination, specifically in relation to the ingress of contaminants, unplanned interruptions and low-pressure events	
A process to manage tools, equipment and materials, including chemicals used by construction, operation and maintenance staff has been developed and implemented, in order to manage risks associated with cross contamination and maintain good hygienic practices	
A process to manage contamination risks during design, construction and commissioning of new water supply assets, or system upgrades, in accordance with the relevant standards/guidelines, has been developed and implemented	
All distribution staff are adequately trained and competency-assessed in water distribution system management and drinking water quality risk management	
As appropriate, asset maintenance programs, such as storage tank inspection and cleaning and water mains cleaning programs, are developed and implemented, in order to minimise biofilm growth and the accumulation of sediments/particles within distribution systems	
A mains flushing programme is developed and implemented, with flushing occurring at a regular frequency	
A protocol is developed and implemented for the effective management of the distribution network	
A distribution water quality monitoring plan is developed and implemented, with monitoring occurring a regular frequency	
A protocol is developed and implemented that facilitates regular and timely communication between customers, the GWCL call centre, distribution system staff and Quality Assurance personnel.	

General Requirements

The following table contains a number of general requirements that should be implemented to ensure that the WSP stays current, is reviewed regularly, and that the views and concerns of customers are valued and used as part of a continuous improvement culture.

General WSP Requirements
Catchment surveys are conducted at a routine interval (e.g. every 1-2 years) in order to identify any changes in the catchment environment, or land use, which may impact on the quality or available quantity of source water (Module 2)
A process to support customers with water quality related issues in the customer's premises and a process to measure customer satisfaction are developed and implemented
A process to manage customers complaints and queries is developed and implemented
Educational material on the way that GWCL manages drinking water quality from the catchment to the consumer is prepared and made available to customers
The WSP undergoes regular (e.g. yearly) internal review to ensure that it reflects the currently available water treatment infrastructure and current risk management practice. The internal reviews are documented and kept for future reference
The WSP undergoes both regular internal and external audit, as required by the top management of GWCL, as well as the regulatory agencies

Reference Documents

The following documents can be used as references when preparing and implementing WSPs.

Ghanaian resources

National Drinking Water Quality Management Framework for Ghana

Ghana Standards for Drinking Water Quality

World Health Organization (WHO) resources

Guidelines for drinking-water quality (fourth edition incorporating the first addendum)
WHO (2017) https://apps.who.int/iris/handle/10665/254636

Water safety plan manual: Step-by-step risk management for drinking-water suppliers
WHO & IWA (2009) https://apps.who.int/iris/handle/10665/75141

Water safety planning for small community water supplies:
Step-by-step risk management guidance for drinking-water supplies in small communities
WHO (2012) https://apps.who.int/iris/handle/10665/75145

Protecting surface water for health:
Identifying, assessing and managing drinking-water quality risks in surface water catchments
WHO (2016) https://apps.who.int/iris/handle/10665/246196

Water quality and health - review of turbidity:
Information for regulators and water suppliers
WHO (2017) https://apps.who.int/iris/handle/10665/254631

Water safety in distribution systems
WHO (2014) https://apps.who.int/iris/handle/10665/204422

Climate-resilient water safety plans:
Managing risks associated with climate variability and change
WHO (2017) https://apps.who.int/iris/handle/10665/258722

WHO resource documents are available from WHO WSH website.
Further supporting resources, and practical tools can be found in the WSP Portal.

Other resources

Coliban Water 2019 Drinking Water Quality Risk Management Plan

Coliban Water 2019 Assessment Report on the Kwanyako Water Treatment Plant

Water Research Australia (2020) ***Good Practice Guide to the Operation of Drinking Water Supply Systems for the Management of Microbial Risk Second Edition***
https://www.waterra.com.au/project-details/247

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- Margaret N.M. Macauley (Dr. Mrs)

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We would like to specially acknowledge the contribution of GWCL's Top management under the sterling leadership of our Managing Director, Ing. Dr. Clifford A. Braimah who has demonstrated exceptional commitment to this project.

Last but not the least, Management also acknowledges the roles played by Dr. Mrs. Margaret N. M. Macauley – Chief Manager (Water Quality Assurance) and Mr. Mark T. Ayertey – Senior Officer (Water Quality Assurance) specifically for the technical inputs, document review and also for coordination of the entire project.

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