May 08, 2024

WATER PRODUCTION FOR AWARE (Metals)

DOI
dx.doi.org/10.17504/protocols.io.36wgqn7yogk5/v1

Celia Manaia[1]

[1]Universidade Católica Portuguesa

AWARE Project
Horizon Europe 101084245

OPEN ACCESS

DOI: dx.doi.org/10.17504/protocols.io.36wgqn7yogk5/v1

Protocol Citation: Celia Manaia 2024. WATER PRODUCTION FOR AWARE (Metals). **protocols.io** https://dx.doi.org/10.17504/protocols.io.36wgqn7yogk5/v1

Protocol status: Working
We use this protocol and it's working

Created: May 08, 2024

Last Modified: May 08, 2024

Protocol Integer ID: 99418

Keywords: water sampling, water processing, water analysis, waste water treatment, advanced tertiary treatment SOP

Funders Acknowledgement:
Horizon Europe
Grant ID: 101084245

Abstract

The protocol summarises the procedures used for analytical control. The protocol describes the Standard Operating Procedure (SOP) for the optimization of advanced tertiary treatment of water, based on a comprehensive quality and risk assessment.

Guidelines

Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy.

Materials

	A	B	C	D	E	F	G	H
	Parameter	V (mL) x R	S	Processing	Analytical method	Result	LOD / LOQ	Goal value
	Metals	50 x 2	On ice	Acidification (0.15M HNO3)	ICPM-MS	Metals quantity (parts per billion (ppb) / parts per trillion (ppt)	Limit of Detection Al – 0.1 ppb V – 0.01 ppb Cr – 0.001 ppb Mn – 0.01 ppb Fe – 0.05 ppb Co – 0.001 ppb Ni – 0.01 ppb Cu – 0.01 ppb Zn – 0.05 ppb Th – 0.01 ppt Cd – 0.0005 ppb Csi – 0.005 ppb Ba – 0.01 ppb Pb – 0.005 ppb As – 0.01 ppb Sn – 1.0 ppt Sb – 1.0 ppt Pt – 0.1 ppt Tl – 0.01 ppt Bi – 0.01 ppt U – 0.01 ppt Ag – 0.01 ppt Hg – 0.01 ppt La – 0.01 ppt Ce – 0.01 ppt Pr – 0.001 ppt Nd – 0.01 ppt Sm – 0.005 ppt Eu – 0.005 ppt Gd – 0.01 ppt Tb – 0.005 ppt Dy – 0.005 ppt Ho – 0.005 ppt Er – 0.005 ppt Tm – 0.005 ppt Yb – 0.005 ppt Lu – 0.005 ppt	

Material: Metal-free centrifuge tubes

Safety warnings

Metals

1d 21h

1 The water production for AWARE main activities includes three stages – disinfection by ultraviolet C radiation (UVC), storage for 12:00:00 - 24:00:00 (according to water load and season) and ozonation. The water quality is monitored at these three stages, for the parameters indicated in Figure 1 below.

1d 12h

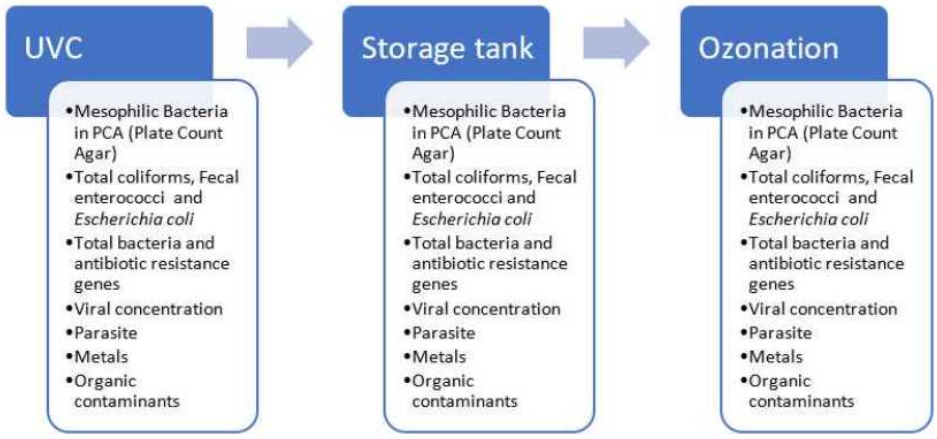

Figure 1. Treatment and storage of municipal treated wastewater used for integrated aquaponics and an indication of the comprehensive quality and risk assessment.

1.1 Sampling, Processing, and Analyses

9h

Water samples are collected (see Figure 2) and processed within a 06:00:00 interval, before being shipped for the partner responsible for the analyses (Table 1). In case no processing is needed, samples are frozen and stored at -80 °C within 03:00:00 .

For each sampling event, the date, day of the week and hour; the temperature and rain.
Sampling points, indicated in Figure 2 were designated from A to I:
- Influent of primary treatment (A)
- Influent of biological treatment (activated sludge) (B)
- Treated secondary effluent (C)
- Sand filter effluent (D)
- UVC effluent (E)
- Storage for reuse tank effluent (F)
- Ozonation effluent (1 dose, e.g., 5 mg O3) - MITO3X technology - (G)

- Effluent of the vacuum UV oxidation (VUV) (H)
- Effluent of reactive storage / Influent of the recirculation aquaculture system (RAS) (I)

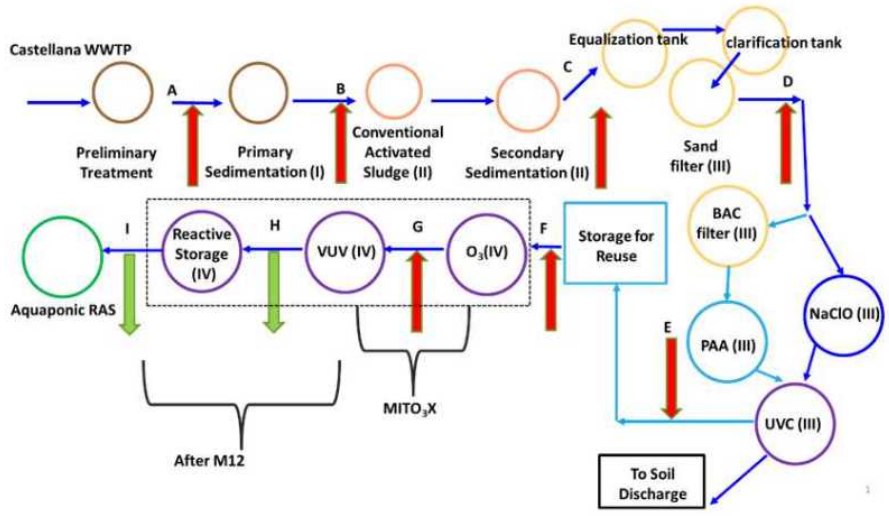

Figure 2. Diagram representing the wastewater treatment plant (WWTP), advanced treatment and sampling points.

Methods: The section below summarises the procedures used for analytical control – detailed protocols are annexed to this protocol. 12h

2 **Metals:** 12h

Analysis: Detection and quantification of metals

Method: Acidified water samples were analyzed for several metals (e.g. Al, Cu, Ni, Co, Pb, Zn, Cd, Pt, Sb, Sn, U, As, Ag, Hg, REEs) by means of ICP-MS (7900 Agilent) using matrix-matched external calibration.

Observations: Samples were filtered/centrifuged within 12:00:00 after collection, and then acidified to 0.15M HNO3.

Parameters framed by Legal and Regulatory Requirements:

3 Using the EU Drinking Water Directive:

Metals - DIRECTIVE 2008/105/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on environmental quality standards in the field of water policy

Protocol references

U.S. EPA. 1994. “Method 200.8: Determination of Trace Elements in Waters and Wastes by Inductively Coupled Plasma-Mass Spectrometry,” Revision 5.4. Cincinnati, OH.