

ETV STATEMENT OF VERIFICATION

Technology: Aquamonitrix® - Nitrate and Nitrite Analyser

Registration Number: JHL_ETV_01

Date of Issuance: 14th March 2022



Verification Body

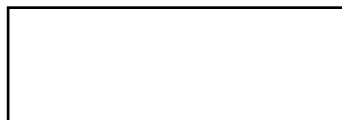
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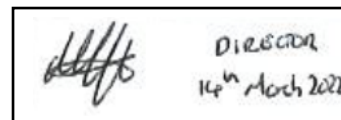
Signatures

Verification Body



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Verification Report No:
ETV Report No: JHLETV001

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WF002: Version 2 01-02-22

1 DESCRIPTION OF THE TECHNOLOGY

1.1 SUMMARY DESCRIPTION OF THE TECHNOLOGY

Aquamonitrix® is a portable analytical device based on ion chromatography which measures simultaneously and selectively Nitrate and Nitrite in raw and effluent water. It is designed to give real-time measurement – with laboratory accuracy in the field. It has a broad analytical range covering fresh and wastewater applications. Data transmission is instantaneous to a SCADA or telemetry system and /or, as in the data compiled in this report, to a dedicated Datamonitrix data management platform.^[1]

For the purpose of this verification, the instrument used was:

- Name: - EW53-001-001A
- Serial number: 200610043

Dimensions and Features

- External size: 23cm X 36cm X 57cm
- (Enclosure size, without supporting cradle)
- Weight: 12 kg
- Portable
- Integrated provision for mounting/securing to a fixed surface (e.g., floor, wall, etc.)
- Integrated carry handle and lockable hinged door
- Rugged construction: Impact, UV and corrosion-resistant
- Reagent: Potassium hydroxide (KOH)
- Alarms and indicators: Tri-colour Status LED

Specification

- Sensory Type: Ion chromatography and optical detection
- Minimum sampling interval: 15 mins

The unit is powered by a 15-25 Vdc power, 50W max. rated power and has an integrated battery for backup.

1.2 INTENDED APPLICATION (MATRIX, PURPOSE, TECHNOLOGIES, TECHNICAL CONDITIONS)

Improved process control and shortcut biological nitrogen removal, enabled through the real time nitrate and nitrite monitoring, can significantly reduce electricity demand for aeration

The unit will be set up at the outlet of a sewage treatment plant and will be monitoring the nitrate of treated sewage. The plant used is Bo'ness treatment plant and is subject to tidal intrusion and thus has variable chloride levels. Due to the low levels of nitrite in the effluent, this statement of verification will only apply to the nitrate.

1.3 Information on operation and performance of the technology

Aquamonitrix® from TellLab is a novel cost-effective, portable remote water quality monitoring device. It employs Ion Chromatography (IC) with UV detection for accurate and precise in-situ determination of nitrate levels in surface water and industrial applications. It employs embedded software to control set time intervals between tests, sample pump initiation, valve actuation, eluent syringe pump pressures and critical fluidic flow rates, and incorporates a software algorithm to process raw data and extract the concentration of nitrate levels in the water sample.^[2]

- Analytical Range*
 - Nitrate up to 500 ppm as NO₃ (113 ppm as N)
- Limits of Detection*
 - Nitrate 1.5 ppm as NO₃ (0.34 ppm as N)

*Lower/higher limits of detection and custom ranges can be provided

1.4 Development status and readiness for market

The technology is complete and has been successfully deployed and trialled within a broad range of early adopter sites. The analyser has shown a high level of analytical performance. Reliability of the systems has steadily improved through design improvements which have been implemented following the early adopter deployments.

The technology is at TRL 9 as it is fully commercially available and has already sold a number of units.

1.5 Information on significant environmental impacts

The apparatus poses no significant environmental impact but should be disposed of in accordance with appropriate regulations at end of life covered by Waste Electrical and Electronic Equipment (WEEE). There is detailed instruction on this in section 10 of the Aquamonitrix® manual^[2].

1.6 PERFORMANCE CLAIM TO BE VERIFIED

- Accuracy: > 90% to 110% - the performance for Aquamonitrix® will be within 90% to 110% of the “gold standard” Independent ISO 17025 accredited laboratory analyses. The performance is to be carried out over 1 month with 120 samples analysed by Aquamonitrix® and the laboratory.
- Precision 95% - the repeatability of known standards at 10% and 80% of the calibration range will be < 5% RSD.

2 EVALUATION

2.1.1 OPERATIONAL PARAMETERS

Treated sewage is pumped through a container (*figure 1*) at a rate sufficient create a turbulence. The grab sampler for taking samples for laboratory analyses can be seen with the green band at the back of the tank. The input tube for the grab sampler and the input tube for Aquamonitrix® are taped together to ensure that the samples are taken from the same proximity in the tank, minimising any sample variation issues.



Figure 1 - Collection tank

VERIFICATION RESULTS (VERIFIED PERFORMANCE CLAIM)

2.1.2 PERFORMANCE PARAMETERS

Table 1 – Accuracy

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	Claim	Achieved 95% CI	n
Nitrate	90% to 110% agreement with ISO 17025 lab data	98% to 101%	117

Nitrate meets the claim based on 117 data pairs in this trail. Three nitrate readings were discounted due to air in the system.

Table 2 – Precision

	Claim	QC solution (mg/l)	Mean reading (mg/l)	%RSD	n
Nitrate	95% (<5% RSD) reproducibility with known QC solutions	80	76.01	1.91	9
		10	10.54	4.96	11

Nitrate meets the claims based on 9 results for the 80% calibration range and 11 results for the low calibration range.

Disclaimer

The verifications for accuracy and precision are based on the effluent water from Bo'ness wastewater treatment plant for the time of this exercise. It is applicable to the instrument serial number indicated in section 1.1 of this statement. Post publication, it is the responsibility of the applicant to inform the verifier in writing of any changes that have been made to the technology in accordance with section 5.6.2 of ISO 14034.

2.1.3 ENVIRONMENTAL PARAMETERS

The testing for unit three took place between 21/10/2021 and 18/11/2021. The unit was housed in an unheated building protected from weather conditions and the temperature varied between 8°C to 25°C.

2.2 STATEMENT OF VERIFICATION

Based on the verified performance described in section 2.1.2 above a statement of verification including the following parameters:

- Nitrate in treated sewage of varying salinity and ranging from 49 mg/L as NO₃ to 17 mg/L as NO₃ has a 95% confidence interval of between 98 % and 102% recovery of ISO 17025 laboratory tests

- *Aquamonitrix® provides an environmental benefit by providing real time reliable monitoring of nitrate and thus enabling more immediate action in the event of elevated nitrate readings in nitrate vulnerable zones, and reduced the need of sampling and the associated pollution of running vehicles to collect samples.*

3 REFERENCES

References.

1. *Aquamonitrix(2021) Available at: [Home - Aquamonitrix® - Nitrate and Nitrite Analyser](#)*
2. *Aquamonitrix(2021). AQM-v1.0 User Manual for Nitrate and nitrite analyser, Tullow, Co. Carlow, Ireland*