

PERFORMANCE VERIFICATION BY THE US EPA

About Aquamonitrix®

Aquamonitrix® is a new type of water analyser for the real-time, in-situ determination of nitrite and nitrate.

It has undergone independent one-week and one-month performance validation as part of an Advanced Septic System Nitrogen Sensor Challenge, led by the United States Environmental Protection Agency (US EPA).

Background

The US-EPA recognises the benefits of water resource managers having access to real-time nutrient sensors – to enable instantaneous decision making – and to acquire richer data sets to better understand nutrient pathways and optimise water treatment processes. However, a US Government review found that the use of water quality sensors is limited by issues such as instrument acquisition and maintenance cost, ease-of-use and data management challenges.

With this in mind, the US EPA threw down the gauntlet with a challenge to develop affordable, robust and sensitive nitrogen sensor technologies.

One-Week Performance Verification

The one-week performance verification testing for the Advanced Septic System Nitrogen Sensor Challenge was carried out in early 2019 at the Massachusetts Alternative Septic System Test Center (MASSTC), a National Sanitation Foundation certified test facility in Barnstable, Massachusetts. The table to the right shows how the actual performance of Aquamonitrix® either met or exceeded the key challenge targets.

Following testing at MASSTC, Aquamonitrix® was one of only a handful of sensors, globally, to progress to the final of the Advanced Septic System Nitrogen Sensor Challenge, for one-month testing as detailed on the next page.

Actual Performance vs Challenge Goals

Attribute	Performance Targets	Actual Performance
Maintenance	No more than one servicing	No maintenance required
Accuracy	Ideally 20% of true value	Total mean recovery for nitrite was 87% & for nitrate was 99%
Precision	Ideally <20% relative standard deviation (RSD)	Highest % RSD for nitrate was 5.64% & the highest for nitrite was 2.22%
Range	2-60 mg/L as N	Nitrite-N was 0.597-8.594 mg/L Nitrate-N was 8.497-54.034 mg/L
Deployment	Minimum hourly frequency	Criteria met



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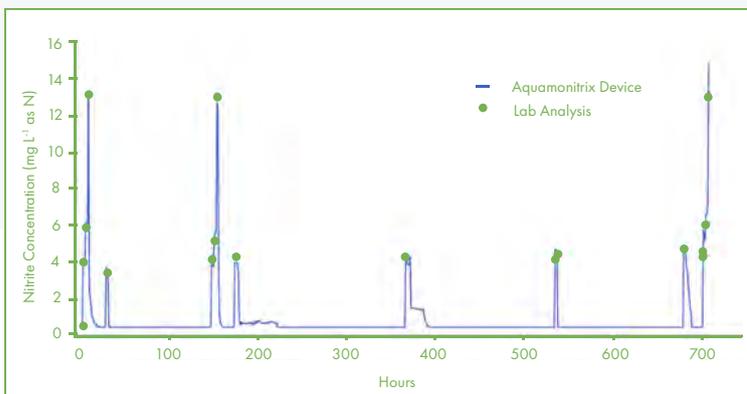
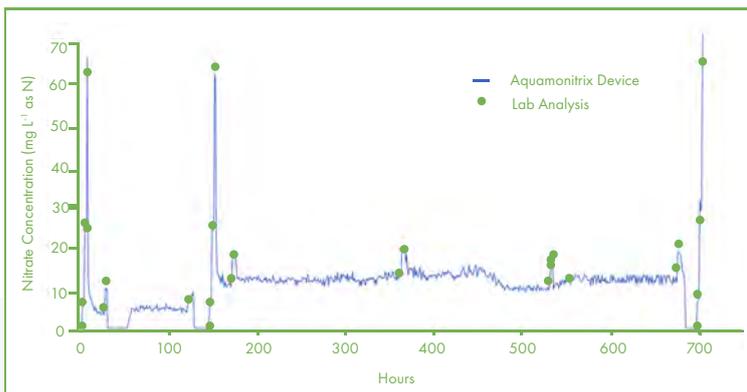
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One-Month Verification Testing

Battelle Memorial Institute was appointed by the EPA to develop the Test/Quality Assurance and Verification Plan, which was based on the International Organization for Standardization Environmental Technology Verification Standard - ISO 14034. Battelle Memorial Institute also oversaw the verification process.

The one-month trial included a one-week screening test. The graphs below illustrate how closely the performance by Aquamonitrix® tracked laboratory results.



Laboratory Performance in the Field

The one-month performance verification testing took place at MASSTC from December 11, 2019, through to January 9, 2020. During this time, Aquamonitrix® demonstrated lab-quality performance in terms of the accuracy and precision of nitrate and nitrite detection, as summarised in the tables below.

One-Month Accuracy		
Pollutant	Nitrate	Nitrite
Average % Recovery	92.03%	104.39%

One-Month Precision		
Pollutant	Nitrate	Nitrite
Average % RSD	5.16%	4.34%

We are happy to share the full report from Battelle Memorial Institute. This details the sensor's performance in terms of the accuracy, precision, range and frequency of nitrate and nitrite readings over the one-month trial period. It also confirms the absence of any maintenance/servicing requirements during the month.

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