



Application

for

Advanced Septic System Nitrogen Sensor Challenge

Performance Testing

Due: December 7, 2018 (11:59 pm, eastern)

To: Amy Dindal

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Application for Advanced Septic System Nitrogen Sensor Challenge Performance Testing

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Preface

The goal of the Advanced Septic System Nitrogen Sensor Challenge is to identify, test, and verify the performance of low-cost nitrogen sensor packages that can continuously monitor the performance of advanced nitrogen removal septic systems. The intent is to provide a practical measurement system that would lead to increased acceptance and utilization of advanced and innovative nitrogen reducing septic systems.

U.S. EPA contracted with Battelle Memorial Institute (Battelle) to plan, develop and implement the performance testing phase of the Challenge. Testing of the sensor technologies will include two no risk one-month tests; each will include the one-week screening test during the first 7 days. Sensors which pass the one-week screening test in at least one of the one-month no-risk tests will be selected for the six-month field verification test. These tests will be conducted at the Massachusetts Alternative Septic System Test Center (MASSTC) in Barnstable, Massachusetts. MASSTC will initiate the testing, and perform the day-to-day activities associated with testing, including sampling, data collection and storage.

EPA and Battelle encourage sensor developers who believe that their sensor prototype can meet or exceed the specific performance goals of the Challenge to complete an application for participation in the Challenge testing program. **This application is the initial screening tool that Battelle and an EPA-approved Technical Panel will use to determine if interested sensor developers have a sensor prototype design and associated specifications that can successfully participate in the preliminary screening phase of the Challenge.** In addition to completing this application, we request that sensor developers provide documentation of their sensor technology, and be prepared to assist with sensor installation and required O&M during testing.

Once Battelle and the Technical Panel review the applications and select candidates for screening, MASSTC will host the first one-month test, slated to begin on October 1, 2018. Applications for the second one-month test will be due on December 7, 2018, and the test will begin on January 7, 2019. Each one-month test will include the one-week screening test during the first 7 days. The Technical Panel in conjunction with Battelle will review each sensor's results for the one week screening test and report the results to EPA who, along with the Technical Panel, will determine which sensors are suitable for the 6-month field verification test, which is anticipated to begin mid-May 2019, lasting until mid-November 2019.

U.S. EPA established the performance goals for the Advanced Septic System Nitrogen Sensor Challenge in consultation with MASSTC, the University of Rhode Island (URI), eight state regulators, Suffolk County (NY) officials, sensor experts, the Nature Conservancy, and others.

The ideal sensor package would provide a precise reading of Total Nitrogen (TN) and effluent flow rate, include telemetry, be self-calibrating or require infrequent calibration, last 10 years, require no more than one maintenance visit per year, and cost the homeowner less than \$1,000 (USD).

At a minimum, a sensor package would provide an accurate reading of nitrate (NO_3^-) and ammonium (NH_4^+), be easily accessed and maintained (no more than four maintenance visits per year), require infrequent calibration, include telemetry, last 5 years, and cost no more than \$1,500 (USD).

The accuracy of sensors needs to be within 20% of true value (defined as the certified laboratory result for the parameter using approved test methods) and the range of detection between 2-60 milligrams of nitrogen per liter. The precision or repeated sensor measurements must be less than or equal to 30% relative percent difference.

Battelle has developed a Test and Quality Assurance Plan (T/QAP) to guide the sensor performance testing process. The T/QAP is available at: <http://www.verifiglobal.com/en/>

Disclaimer

Battelle, MASSTC, and U.S. EPA will use their best effort to provide fair and equitable performance testing as described in the T/QAP.

Sensor prototype technologies submitted for testing will be exposed to field conditions. Any damage to the sensor would be the responsibility of the sensor owner.

Battelle, MASSTC, and U.S. EPA will return the tested sensor to the sensor owner at the end of the test.

For more information, contact:

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Advanced Septic System Nitrogen Sensor Challenge Performance Testing

Part A – Applicant Information

A-1. Contact information

A-1.1 Person completing the application:

First name: Last name:

Organization:

Position title:

Address:

Phone:

Email:

A-1.2 Organizational affiliation if applicable (if different from the above information)

Organization name:

Address:

Address line 2:

City, State, Country:

Contact phone number:

Contact email address:

Website:

A-2. Technology ownership and patent information

A-2.1 Do you own the sensor technology you plan to submit for testing?

Yes

No

Clarity about the ownership of the sensor technology is important. If you are not the owner of the sensor design or any other intellectual property associated with the

sensor technology, or the patent holder (if patented) then please explain under what authority, license, or other agreement, you are presenting the sensor for testing.

A-2.2 Is your sensor technology proprietary? Both proprietary and non-proprietary technologies are eligible to participate.

Yes

No

Please explain, if necessary:

A-2.3 Is the technology patented, copyrighted, or otherwise protected? The Challenge will accept technologies with or without such protections.

Yes

If patented, what level of patent protection?

No

Please explain, if necessary:

A-3. Disclosure of potential conflicts of interest

A-3.1 Other than participation in Phase I of the Advanced Septic System Nitrogen Sensor Challenge and the March 2018 one-week test, has there been any involvement by Battelle, the Nature Conservancy, MASSTC or the U.S. EPA in the development of your sensor technology?

No

Yes

If “yes”, then please explain the involvement of one or more of these organizations.

A-3.2 Does any individual employed by any of the organizations above have a financial interest in the development and success of the sensor technology you plan to submit for testing?

No

Yes

If “yes” then please provide details so that the Challenge Team is aware of them.

Part B – Understanding the Advanced Septic System Nitrogen Sensor Challenge

B-1. Nitrogen Sensor Challenge performance goals

B-1.1 Have you reviewed and do you understand the Advanced Septic System Nitrogen Sensor Challenge Performance Goals listed in Table A-1 in the T/QAP?

Yes

No

Please note any questions or comments you have:

B-2. Performance testing and other requirements in draft T/QAP

B-2.1 Have you reviewed and do you understand all aspects of the Testing and Quality Assurance Plan (T/QAP) that has been prepared to guide the sensor performance testing process?

Yes

No

Please note any questions or concerns you have about the T/QAP:

B-3. Roles and responsibilities of primary organizations

B-3.1 Have you reviewed and are you willing to accept the roles and responsibilities of the primary organizations (US EPA, Battelle, MASSTC) involved in the Advanced Septic System Nitrogen Sensor Challenge

Yes

No

Please note any questions, comments, or concerns you might have:

B-3.1 Do you understand your role and responsibilities in applying to have your sensor tested and in the testing process?

Yes

No

If no, then please note any questions or concerns:

Part C – Sensor Technology Description and Functionality

C-1. Description of the sensor technology

C-1.1 What is the name of your sensor technology?

C-1.2 Please provide a brief description of your sensor technology and how it functions:

C-1.3 What parameters does your sensor measure? Check all that apply.

- Ammonium Ions (NH₄⁺)
- Nitrate Ions (NO₃⁻)
- Total Organic Carbon (TOC)
- Total Nitrogen (TN)
- Other. Please specify:

Please provide any explanation necessary:

C-1.4 How would your sensor meet the performance goals for each of the attributes listed in the table below:

This table is included in the T/QAP as Table A-3 and is the list of goals that must be met for a sensor to be eligible to move from the 1-week preliminary screening test to the 6-month performance test.

Attribute	Performance Goals to Determine Field Performance Test Invitation
Parameter	Measures <ul style="list-style-type: none"> • NH₄⁺ and NO₃⁻ <u>or</u> • NH₄⁺, NO₃⁻, and TOC <u>or</u> • TN
Data Management	Internal (local) sensor system data logger successfully collects time stamped data for the screen test
Applicability & Accessibility	Meets test size limits and performs under screen test environmental conditions
Maintenance	No more than one servicing during the preliminary screening test
Accuracy	Within 40% of true value ¹
Precision	≤40% RSD
Range	2-60 mg N/L 2-60 mg/L TOC
Deployment	High frequency (at least hourly) measurement for the duration of the test

¹ True value is defined as the certified laboratory result for the parameter using approved test methods.

C-1.5 In the third column in the table below, please indicate how your sensor will meet the logistical requirements for testing. This table is included in the T/QAP as Table A-2.

Sensor Attribute	Requirement	How Your Sensor Meets the Requirement
Size of Sensor	Overall dimensions no larger than 6" x 6" x 20", where the immersed portion of the device is no more than 6" x 6" x 6" ¹	
Attachment of Sensor to Test Cell	Clamped to the side (side thickness: ~1/4")	
Power Supply	UL-listed direct current (DC) requiring no more than 3 amps at 120 volts	
Data Output	Capable of collecting and retaining time-stamped nitrogen test data for download	
Interference	Sensors may not discharge into or in any other way contaminate the test cell contents ²	

¹ External electronics accompanying the sensor can be up to 12" x 12" x 12".

² Incidental microscale contamination such as leaching from an antifouling coating or corrosion of a sacrificial anode will be permitted.

C-1.6 Please describe how your sensor technology will need to be maintained during the 1-week preliminary screening test, if at all:

C-1.7 Please describe if your sensor requires wifi access:

C-2. Additional information

C-2.1 The following additional information would be helpful, but is not required:

- A description of any previous testing
- Current applications of the technology, if any
- Operating instructions
- How the sensor is manufactured. Or how do you plan to have it manufactured?
- Any additional supporting documents including testing results, technical reports, marketing and promotional literature and peer-reviewed articles
- Schematics, drawings or photographs

C-3. Statement of Confidential and Proprietary Information

C-3.1. Is there is any information about your sensor technology that is considered proprietary and should be treated as confidential?

- Yes
 No

If yes, please identify below the specific documents and specific information that should be treated as confidential. If necessary, a non-disclosure agreement will be signed.

**Date of Application for Advanced Septic System Nitrogen Sensor Challenge
Performance Testing**

Name, position and signature of authorized representative

Annex 1 – List of supporting documentation submitted with this application

Please list any additional supporting documents, including any technical reports, marketing and promotional literature, peer-reviewed articles and completed performance test reports for your sensor that you have included with this application.