

ESTCP Project ER-201727
*Derivation and Demonstration of an Environmentally Relevant Approach for Stormwater Toxicity
Testing Compliance Monitoring*
<https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/ER-201727>

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Dear Esteemed Colleague,

Thank you in advance for taking the time to review this letter. This is a request for volunteer participation on a Pulsed Exposure Scientific Advisory Panel (PESAP) to help guide and shape the development of a new toxicity testing methodology to evaluate episodic discharges. Based on your knowledge on this topic, our team thinks you would be a highly relevant candidate to support this project.

PROBLEM STATEMENT:

Historically the greatest source of pollutants to our nation's water bodies were associated with direct point source discharges of wastewater effluents. Growing public awareness and concern for controlling water pollution led to the establishment of the Clean Water Act (CWA) in 1972. The CWA established the basic structure for regulating pollutant discharges into the waters of the United States and has since been a tremendous success story. A key component of the CWA is the requirement that there shall be "no discharges of toxics in toxic amounts." This led to the development of a variety of standardized whole effluent toxicity (WET) test procedures to assess and regulate point source discharges in the U.S. (e.g. EPA 2002a, EPA 2002b, and EPA 1995). These methodologies include a variety of short-term acute and longer term or sub-lethal chronic test endpoints using both freshwater and marine test species. **The methods were developed to assess impacts related to continuous point source exposures on ambient receiving water conditions.**

Following the successful control of water pollution from point source discharges, it was recognized that more diffuse and harder to control non-point source runoff is now considered to be the leading contributor of pollutants of concern to U.S. waters <https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/what-nonpoint-source>. In recognition of this concern, a variety of new regulations are now targeting control, treatment, and monitoring of non-point source runoff across the U.S., including stormwater. A variety of innovative methods to collect and assess contributions of pollutants from stormwater to receiving waters have been developed and implemented (e.g. automatic flow-weighted composite samplers), in support of regulatory compliance. **Methods to assess toxicological impacts to the receiving waters from such episodic events, however, have not evolved in the same manner.**

The Department of Defense (DoD), and other permittees across the nation, are required to comply with increasingly stringent water quality requirements to assess toxicity of stormwater. These requirements generally include end-of-pipe monitoring, enforced by National Pollutant Discharge Elimination System (NPDES) permits, prior to mixing in the receiving water. Regulatory concern with stormwater discharges is associated with the CWA's goal to prevent discharge of toxics in toxic amounts (USEPA 1972). As a result, the existing EPA WET test methods developed to assess toxicity of continuous point source discharges are now being applied to episodic discharges such as stormwater runoff. The concern is that

these WET methods do not provide a realistic assessment of the toxicity potential associated with episodic exposures and the dynamics and changes that occur within the associated receiving waters. DoD facilities and other industrial and municipal discharges, in fact, are frequently unable to comply with current stormwater NPDES requirements under the current test methodologies, even with the implementation of various Best Management Practices (BMPs). Passing or failing toxicity in any given end-of-pipe storm water discharge can be a function of the size of the storm, antecedent dry period, when the end-of-pipe sample was taken, or type of sample (grab or composite) as shown effectively in the pollutograph studies by Kayhanian et al. (2008). These variables increase the complexity with regard to interpreting the results for a given end-of-pipe storm water sample, necessitating a more realistic and standardized sample collection and toxicity exposure regime. **The key element of exposure duration and integration with receiving waters is missing from current methodologies.**

Toxicity tests are desirable for stormwater evaluations because they take into account contaminant bioavailability and they measure potential adverse effects associated with complex mixtures, including many contaminants that are not routinely monitored. However, stormwater toxicity is often measured with end-of-pipe samples collected during the first flush (first few hours of rainfall), and then evaluated with continuous exposures of up to 7 days, depending on the test species and endpoint. This methodology does not adequately replicate the dynamic nature of the stormwater exposure at either the point of compliance, or as it mixes with the receiving environment, which may have different physical and chemical properties than the runoff itself.

A more realistic assessment of the toxicological impacts of stormwater runoff on receiving system beneficial uses is critical to support decisions related to the need and prioritization of appropriate Best Management Practices (BMPs), and meaningful compliance with CWA goals. Results from pulsed toxicity exposures have been well documented in the peer-reviewed literature as a means of improving the characterization of exposure and potential for toxicity associated with episodic contaminant exposures (Rosen et al. 2016; AMEC 2015; Angel et al. 2010; Hoang et al. 2007a,b,c; Butcher et al. 2006; Diamond et al. 2006; WERF 2003; Stransky et al. in prep), however, the development and application of standardized protocols that are accepted by the regulatory community is currently lacking.

OBJECTIVE:

The objective of this project is to derive, demonstrate, and validate a standardized environmentally-relevant, scientifically-defensible, and conservative exposure design for laboratory toxicity testing to assess impacts to receiving waters related to stormwater runoff or other episodic discharges. This goal will be accomplished through implementation of the following tasks:

1. Engage and establish a panel of well-recognized toxicity experts, regulators, and organizations for critical review/debate, and to gain concurrence and support for proposed ‘pulsed’ exposure methodologies;
2. Review published pulsed exposure results for relevant contaminants, species and endpoints and conduct a critical review of historical rainfall duration, flow, and receiving water mixing dynamics at DoD facilities across the U.S. and Pacific rim to develop an improved understanding of exposure potential in distinct geographic locations;
3. Design, demonstrate, and implement a standardized pulsed exposure toxicity test procedure based on modifications of the EPA WET methodology to better represent site-specific exposure regimes at end-of-pipe monitoring locations and associated receiving waters during storm events;
4. Conduct concurrent validation exposures using the proposed new methodology along with traditional end-of-pipe collection and testing methods. Concurrent *in situ* testing will also be performed in the receiving environment to validate the representativeness and protectiveness of the new proposed laboratory-based methodology in both the receiving water and sediments;

5. Conduct a comprehensive interlaboratory comparison study to assess the ability of a variety of research and contract laboratories across the country to provide consistent and defensible data using the modified test methodology for pulsed exposure assessment. The organization, implementation, and performance goal objectives of the study would be comparable to that performed by EPA's inter-calibration study of standardized freshwater and marine WET methods conducted in 1999-2000 (EPA 2001).

Success of the inter-calibration effort will be measured using predetermined quantitative and qualitative performance criteria. These criteria will include comparisons between continuous and pulsed exposure regimes, comparisons between concurrent end-of-pipe and receiving water samples, and sufficient individual demonstration completion rates and adherence to quality assurance/quality control requirements for toxicity data. The recommended alternative laboratory approach is expected to be understandable and applicable to end-users and regulators, and meet expectations associated with regulatory acceptance.

THE REQUEST:

Collaboration and consensus of a modified testing methodology among toxicological experts, regulators, and dischargers is key for success. This is a request for you to join the Pulsed Exposure Scientific Advisory Panel (PESAP). The PESAP will be involved and assist in the following primary tasks:

- 1) Refine a conceptual approach to the problem;
- 2) Help guide any decisions on the experimental approach and validation methodologies;
- 3) Provide peer review on final results and recommendations for final guidance.

These tasks will be accomplished through volunteer-based participation on biannual conference calls and/or meetings. In advance to each meeting, the project team will send out a summary of progress and results obtained to-date for review. The PESAP will have an opportunity to review the summary documents and provide comments as appropriate.

Your participation on this panel will enhance relationships and ensure that the new methods proposed for episodic discharges will be scientifically defensible, more environmentally representative, and protective of beneficial uses in the associated receiving waters.

If interested, please contact Molly Colvin. If you believe that someone may be better suited to participate in the PESAP, please feel free to forward this letter. Thank you for taking the time to review this request and for your consideration to participate on this new Pulsed Exposure Scientific Advisory Panel.

Thank you,



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