

# DHS Science and Technology Directorate

## Internet of Things (IoT): Low-Cost Flood Inundation Sensors

### Early Warning Flood Sensors

Flooding is the nation's leading natural disaster, accounting for the greatest loss of life, property damage and economic impact. Over the past three decades alone, floods have accounted for \$8.2 billion in damages and more than 80 fatalities per year. Much of this devastation could be mitigated with deployable Internet of Things (IoT) technology that monitors flood-prone areas in real time, and rapidly detects and alerts officials, industry and citizens to potential threats.

The Department of Homeland Security's Science and Technology Directorate (S&T) is working with three small business partners to design, develop and test a network of inexpensive, deployable flood inundation sensors. The sensors will be part of a scalable wireless mesh network that rapidly measures rising water and reports flood conditions back to operations centers, first responders and citizens.

The sensors are designed to be modular, allowing maximum flexibility for communities to configure the sensors to meet specific needs. Once completed, the system can be deployed for years at a time with little-to-no maintenance. Sensor costs, depending upon configuration, are expected to be less than \$1,000 per unit—which is 20 times less expensive than many permanent flood sensors used today.

### Government, Industry Meeting Community Needs

In spring 2016, three industry performers—Evigia Systems, Inc., Physical Optics Corporation (POC), and Progeny Systems Corporation—were awarded Small Business Innovation Research (SBIR) Phase I funds to prototype low-cost flood sensors that are ruggedized, submersible and deployable across mesh networks in different environments.

### Next Phase: Sensor Refinement and Field Testing

SBIR Phase II, which began in spring 2017, is focusing on the technical refinement of the sensors to: harden the sensor housing, increase power through energy harvesting, expand communications network range, transmit imagery, provide GPS location, implement open data exchange standards and monitor performance diagnostics. By summer 2018, nearly 300 sensors will be field deployed with select state, county and city government stakeholders for testing and evaluation over a 6-month period. S&T is working with the three industry performers to identify commercial markets and foster community awareness and adoption.

### Industry Performer Sensor Profiles

**Evigia Systems, Inc.'s** ([www.evigia.com](http://www.evigia.com)) Flood Monitoring and Alert Sensor Network is a scalable IoT network of highly-reliable multi-sensing nodes with wide-area wireless coverage and cloud sensor data processing. This rugged network employs self and remote configurations to deliver optimal efficiency and situational-performance.



**Physical Optics Corporation's** ([www.poc.com](http://www.poc.com)) RAFFAR is a real-time flash flood early warning system that supports a self-healing mesh topology of sensor nodes, each consisting of a radio connected to a submersible flood sensor via a variable length cable to independently monitor waterway conditions. RAFFAR operates autonomously via continuous solar-and-battery power, communicating wirelessly between nodes and emergency data centers using satellite, radio, or cellular.



**Progeny Systems Corporation's** ([www.progeny.net](http://www.progeny.net)) IoT flood inundation sensor is a low cost, end-to-end solution that enables alerts, warnings and notifications to responders and citizens of ever-changing flood conditions.

The ruggedized, modular, self-sustaining and configurable sensor can monitor, detect and report situational data to operations centers through a scalable network architecture, enabling real-time decisions that improve disaster prediction and response.

