

**Floating Island International**  
**White Paper Response:**  
**Bioremediation Habitat Islands**  
**(BioHaven® Floating Islands with BioBarrier™)**

Research Opportunity Number

Broad Agency Announcement (BAA) HSCG32-10-R-R00019  
Amendment 0001

Agency

United States Coast Guard (USCG)  
Research and Development Center (RDC)  
1 Chelsea Street  
New London, CT 06320

Research Opportunity Title

Deepwater Horizon Response

Program Name

Interagency Alternative Technology Assessment Program (IATAP)

Submitted: June 29, 2010

**BAA Technology Gap Area Addressed:**

Oil Spill Damage Assessment and Restoration:

Installation of bioremediation habitat islands.

**Offeror:**

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## **SECTION A: Technical Approach:**

1. **Intended solution:** Oil spill damage protection and recovery of waterbird populations and habitat through the use of BioHaven® Floating Islands (BFI) strategically configured to fit the particular needs of each locale (oiled/not oiled) and each locale's species mix.
2. **Introduction:** BFI are already in use by the US Army Corps of Engineers (USACE) as nesting sites for piscivorous colonial waterbird populations in Oregon and California under the Bird Northwest Research Project. The USACE teamed with the U.S. Geological Survey, Oregon State University, Oregon Department of Fish and Wildlife, Real Time Research, Floating Islands International (FII) and Floating Islands West in an innovative program to create "floating tern islands" to draw the terns away from Columbia River nesting sites in order to reduce tern predation on wild salmon fry in the Columbia Basin. The most recent bird counts (June 2010) at Sheepy Lake BFI included 440 Caspian terns, 1277 Ring-billed gulls and 551 California gulls. Thirty-three of the tern nests contained eggs.
3. The Gulf oil disaster has already affected Important Bird Areas, National Seashore sites, National Wildlife Refuges and Wildlife Management Areas in Louisiana, Mississippi, Alabama and Florida. More will likely be affected. We envision two configurations of BFI being used to offset oil spill damage to bird populations in the Gulf: 1) BFI like those already in use by the USACE; and 2) BFI with BioBarrier™ to provide oil-free habitat for the protection and long-term recovery of already impacted or soon-to-be impacted bird populations.
4. **Underlying Technology:** The underlying technology of the BFI system is comprised of two main elements: a) the primary floating island matrices (which can be customized to meet the target species' needs) and b) BioBarrier inoculated with oil remediating microbes (EPA NCP-listed bioremediation agent for oil, #B-54).

5. a) *Floating island matrices*: Comprised of modular non-woven recycled polymer fiber matrix sections, BFI can be built to any size, any shape and any buoyancy with a customized vegetation, sand or soil cover to fit the target species' needs. The non-woven matrix and engineering design of the BFI is the result of 12 years of extensive publicly and privately funded research and development. The technical feasibility and physical durability of the technology is proven, with over 3,500 islands launched worldwide. The two largest launches thus far are 29,000-ft<sup>2</sup> and 39,700-ft<sup>2</sup> launched off North Island, New Zealand and in Sheepy Lake, CA. The islands are designed to mimic a specific embodiment of natural floating island that occurs around the world. The fibers of the matrix allow plant life to thrive on the surface of the BFI and extend their roots into the water below. Like the root mass of a natural floating island, the matrix fibers and the plant roots bring a vast amount of surface area to the water body (375 ft<sup>2</sup> surface area per ft<sup>3</sup> of matrix), catalyzing microbial growth that cleans water and creates biofilm, a critical element of the aquatic food chain. We call this the “concentrated wetland effect.”

6. b) *The BioBarrier inoculated with oil remediating microbes*: The BFI with BioBarrier brings this concentrated wetland effect to any water body. The BioBarrier design, already in use in the Gulf as an improved oil containment boom device, incorporates the NCP-listed bioremediation microbial agent developed by researchers at Louisiana State University, approved in tests by EPA's RREL Laboratory and licensed to TMD Technologies Group & Advanced BioSystems of Lafayette, LA. Combined and strategically configured, the BFI with Bio-Barrier system has the unique ability to not only contain oil and begin to treat it through bioremediation, but also provide safe-haven habitat for birds and other wildlife.

7. How it will work: Deployment for two primary strategic purposes: 1) to lure bird populations away from oiled areas to safe areas not impacted by the oil spill; and 2) to provide

front-line “safe haven” habitat for birds in areas already impacted by oil or likely to be. With the first purpose, the BFI installations will be designed and launched to lure target species of birds. Island launch sites would be selected based upon availability of preferred food sources and other habitat values identified by expert ornithologists.

8. With respect to the second purpose, BFI will be outfitted with BioBarrier perimeters to shield the island and begin mediating the oil. BioBarrier rings are attached to the BFI by expandable and adjustable rigging, and can be easily removed and replaced with new BioBarrier booms. The open water space between the BioBarrier and the BFI provides safe surface water access for birdlife and other wildlife.

9. The BFI and BFI with BioBarrier technology generates a multiplicity of benefits that provide a means to mediate oil contamination while also serving as a contaminant-free, safe-haven habitat for birdlife. Other benefits include scalability and maneuverability. The flexible modular design of the BFI system enables additional island or barrier surface area to be added to existing BFI, providing a multiplier effect. BFI can be transported, towed, anchored and repositioned indefinitely. And finally, birds are extensively utilizing new BFI as this paper is written.

10. FII and its licensed manufacturers have the proven experience to build BFI large and durable enough to function in estuarine, coastal and marine environments. In the past 15 months, the FII group has launched five BFI systems in excess of 20,000 ft<sup>2</sup>. With sufficient contracting arrangements and strategic deployment partners in place, our nationwide network of licensees and suppliers would begin production of the required quantity of BFI and BFI with BioBarrier to ship to the Gulf region with the first units available for deployment within 90 days of contract.

**SECTION B: Rough Order of Magnitude (ROM) Cost:**

Estimated cost of one 25,000 ft <sup>2</sup> (approximately: 250' x 100' x 2')	
BioHaven Floating Treatment Wetland Habitat without BioBarrier system (Build Level: 1)	\$750,000
Cost per square foot:	\$30 plus Shipping
Estimated cost of one 25,000 ft <sup>2</sup> (approximately: 250' x 100' x 2.25')	
BioHaven Floating Treatment Wetland with BioBarrier system (Build Level: 2)	\$875,000
Cost per square foot:	\$35 plus Shipping
Estimated cost of one 25,000 ft <sup>2</sup> (approximately: 250' x 100' x 2.5')	
BioHaven Floating Treatment Wetland with BioBarrier system (Build Level: 3) includes anchoring, gravels, plants, install, anchoring	\$1,050,000
Cost per square foot:	\$42 plus Shipping

Square feet requirement per bird will vary upon species. Island substrate will vary.

The cost of the total effort depends upon: the method of deployment, location and number of installations, and whether the operation objective is to treat oil-laden water. However, immediate initial investment in BioHaven FTWs with BioBarrier would provide returns long after the British Petroleum Deepwater Horizon Oil Spill disaster is mitigated. Post-catastrophe, FTWs could be left in place or strategically repositioned to operate as originally designed, providing supporting sustainable wildlife habitat and remediating hyper-eutrophied waters.

This technology is remarkably straightforward. A “set it and forget it” system, operations and maintenance is truly minimal, only requiring cycling of BioBarrier platforms if they become completely oil saturated. The system is not motorized; it requires positioning and maintenance of that position by means of either an anchor or tether.

The BFI with BioBarrier is designed to be eminently flexible. The BFI with BioBarrier can be constructed to any size or shape, dependent upon the deployment strategy deemed most strategic (i.e., large versions or multiple smaller versions). It can operate in the open ocean or it can operate in near-shore waters. The modularity of the design also reduces costs and shortens response time because it allows for rapid expansion of existing units already placed in strategic locations. BFI are easily moved by small vessels. A single 150 horsepower engine powered craft can move and position a 20,000-ft<sup>2</sup> BFI.