

# **Floating Island International** **White Paper Response**

## 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 11, 2010

**BAA Technology Gap Area Addressed:**

Oil Wellhead Control and Submerged Oil Response:

Leviathan™ Floating Treatment Wetland (FTW), modified for use in marine settings.

**Offeror:**

**Floating Island International (FII)**

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

Intended solution: Collection and/or bioremediation treatment of submerged oil using the Leviathan Floating Treatment Wetland (FTW).

1. Introduction: Comprised of tested and commercially proven components, the Leviathan FTW is originally designed to destratify nutrient rich freshwater systems associated with hyper-eutrophied lakes. Strategically configured, the Leviathan FTW has the unique ability to treat and/or collect seawater contaminated by submerged oil.
2. Underlying Technology: The underlying technology of the Leviathan FTW is comprised of several elements: a) Floating Treatment Wetland platform; b) oil remediating microbial biofilm (Environmental Protection Agency National Contingency Plan (for Oil Spill Response) Product Schedule-listed bioremediation agent for oil, #B-54 – “Pristine Sea II”) integrated into the platform; c) Airlift low-head high-volume pump mechanism and collection tube.
3. a) *The Floating Treatment Wetland platform* is comprised of modular non-woven recycled polymer fiber matrix sections that can be constructed to any size, in any shape, and engineered to achieve any positive, neutral, or negative buoyancy. The non-woven matrix and the engineering design of the FTW is the result of extensive public and privately funded research and development over the past 12 years. The feasibility of the technology has been proven, with over 3,500 islands launched worldwide. The largest island launched thus far is 40,000 ft<sup>2</sup> and was installed by order of the U.S. Army Corps of Engineers in Sheepy Lake, CA.
4. b) *Oil remediating microbial biofilm.* Surface area/circulation is key to maximizing microbial processes that clean water. The Leviathan FTW brings this concentrated wetland effect to any water body, providing at least 375 ft<sup>2</sup> of surface area per cubic foot of FTW matrix. Millions of dollars of collaborative research have been conducted by Floating Island

International (FII) together with one of the world's leading biofilm research organizations, Montana State University's Center for Biofilm Engineering (CBE). The Leviathan FTW, designed using this advanced technical understanding of microbial biofilm engineering, is well positioned to incorporate an NCP-listed bioremediation microbial agent such as "Pristine Sea II". These bioremediating microbes were developed by researchers at Louisiana State University, approved in tests by EPA's RREL Laboratory and are licensed to TMD Technologies Group, LLC/Advanced BioSystems, LLC of Lafayette, LA.

5. *c) The Airlift Pump/Oil Recovery Tube System* is a subsurface fluid extraction apparatus comprised of a proven liquid transport technology and an appropriate conveyance conduit. Airlift pumping has been thoroughly tested in both laboratory and field applications and is currently a common alternative to traditional pumping methods, yielding greater efficiencies. Additionally, the airlift pump system could result in reduced fouling due to the lack of contact between moving mechanical parts and seawater. Alternatively, the Leviathan FTW platform could utilize traditional impeller pump systems to move oil-laden water from depth to the floating channel positioned within the FTW platform. Existing embodiments of the Leviathan FTW utilize both technologies.

6. How it will work: When addressing low contaminant concentration plumes, the likely objective would be on-site treatment. In this application the recovered oil/water mixture would be pumped to the surface and circulated through the vast amount of surface area provided by the FTW platform, pre-inoculated with bioremediation microbes. The floating stream channel design of the Leviathan FTW also allows for the integration of mechanical oil separators and/or absorbent materials when required. In this situation, the flow rate of the airlift pump/oil recovery

tube system could be monitored and adjusted accordingly to allow for adequate detention time for the contaminated water to reach desired treatment levels.

7. When addressing higher contaminant concentration plumes the likely objective would be recovery for off-site treatment and disposal. In this application the recovered oil/water mixture would be pumped from the channel on the FTW surface into containment vessels for transport to treatment. In this situation, the flow rate of the airlift pump/oil recovery tube system could be set to achieve maximum flow rate to optimize the pace of contaminated seawater extraction.

8. One of the premier features of the Leviathan system is that inflow volumes never rise appreciably above the water's surface. This results in remarkable efficiency -- efficiency that has been measured and established in existing embodiments of the system. The flexible modular design of the Leviathan enables supplementary airlift systems to be added to existing Leviathan FTWs, thus providing a multiplier effect. Other benefits of Leviathan FTWs include, but are not limited to, scalability, maneuverability, and availability. Leviathan FTWs can be transported, towed, anchored, expanded and repositioned indefinitely. And finally, the uniquely flexible Leviathan FTW design operates using already tested and proven technologies.

9. This system offers a unique blend of benefits that concurrently provide a means to mediate nutrients while also providing a platform from which to collect contaminated water/oil. FII and its licensed manufacturers have the proven experience to build Leviathan FTWs big enough and durable enough to function in a marine environment. In the past fifteen months, the FII group has launched five FTW 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 Leviathan FTWs to ship to the Gulf region with the first units available for deployment within 60 days of contract.

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

Estimated cost of one 2,500 ft<sup>2</sup> (approximately: 40' x 60' x 4')  
10,000 gpm<sup>1</sup> Leviathan FTW delivered to water's edge: \$880,000

Cost per square foot: \$352

The cost of the total effort depends upon: the method of deployment, location and number of installations, duration of operation, and whether the operation objective is to collect or treat oil-laden water. However, immediate initial investment in Leviathan FTWs 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, destratifying hyper-eutrophied deoxygenated water and rehabilitating “Dead Zones”.

This technology is remarkably straightforward. Operations and maintenance is truly minimal relative to the volume of uptake potential. The system is not motorized; it requires positioning and maintenance of that position. The system can be designed to be self-anchored, tethered to an existing vessel, or tethered to a platform. We anticipate that a two-person team would be able to monitor and maintain the Leviathan FTW during operation.

The Leviathan FTW is designed to be eminently flexible. The Leviathan FTW can be constructed to any size, 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 in-shore waters. The system design can be adjusted to pull water from depth or to operate in shallow-water conditions. 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.

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<sup>1</sup> Pumping rate conversions 10,000 gpm = 14,400,000 gpd, or 44.2 Acre-ft/day, or 457,142 Barrels (US liq.)/day, or 342,857 Barrels (US petro)/day, or 54,509,760 l/day, or 54,504 m<sup>3</sup>/day