# Appendix A: Scoping Documents

# Notice of Scoping Letter

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

April 27, 2010

TO: Distribution List

SUBJECT: Notice of Scoping – Northwest National Marine Renewable Energy Center/Oregon State University Mobile Ocean Energy Test Berth Project Newport, Oregon

The U.S. Department of Energy (DOE) is proposing to provide funding to the Northwest National Marine Renewable Energy Center (NNMREC)/Oregon State University (OSU), in Corvallis, Oregon for their proposed project to construct and operate a wave energy test facility, known as the "Mobile Ocean Test Berth" (MOTB). Pursuant to the requirements of the National Environmental Policy Act (NEPA), the Council on Environmental Quality regulations for implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR Part 1021), DOE is preparing a draft Environmental Assessment (EA) to:

- Identify any adverse environmental effects that cannot be avoided should this proposed action be implemented.
- Evaluate viable alternatives to the proposed action, including a no action alternative.
- Describe the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.
- Characterize any irreversible and irretrievable commitments of resources that would be involved should this proposed action be implemented.

**Project Location and Proposed Action**

NNMREC/OSU has proposed to construct, deploy, and operate up to two MOTBs off the Oregon coast, approximately 2.0 miles off the coast of the city of Newport, Oregon. Each MOTB would be connected to a Wave Energy Conversion (WEC) device under test. An Underwater Sub-station Pod (USP) may also be included in the overall design and would serve to connect the

MOTB/WEC Devices. The MOTBs, WEC devices, and USP are referred to as the "proposed project."

The MOTBs would be operated within a one square-mile section of the Project Area shown in Figure 1. The Project Area would consist of a six square mile area, measuring 2 miles from east to west and 3 miles from north to south[1]. The MOTBs would serve as an integrated, standardized test facility for U.S. and international developers of wave energy, provide the critical infrastructure required to test and validate WEC devices, and allow developers to demonstrate the commercial viability of their technology. The MOTBs would provide WEC device developers with a resource to perform ocean testing of subscale and full-scale devices. The MOTBs would not be connected to the electrical grid on land, but instead would dissipate the energy generated by the testing of WEC devices through resistor load banks.

Each MOTB consists of a Power Analysis/Data Acquisition (PADA) device and an Adjustable Load Bank (ALB) contained on a standalone vessel on the order of 30- to 40–feet long. The MOTB hull design is based on the evaluation and analysis of ABS-approved materials and shapes. The design uses a composite hull with a boat shape, similar to the proven Navy Oceanographic Meteorological Automatic Device (NOMAD) style buoy used in the United States and Canada. The mooring system for each MOTB would consist of up to three anchors. The anchors would be either standard Danforth anchors or dead-weight anchors.

The PADA measures the WEC device's output voltage and current with respect to time at high sampling rates. The ALB dissipates the power generated from the WEC device. The NEPA analysis will also consider the use of an USP which would enable the power take-off cables from multiple test berth modules or WEC devices to be connected, and would enable the power to be delivered back to shore via a single subsea cable in future applications. The USP would either sit on the ocean bottom or float on the surface, depending on design specifics.

A variety of WEC devices could be tested with the MOTBs, but designs currently contemplated for testing fall into the general category of "point absorbers" or "oscillating water column" devices that can operate in the range of 150 feet of water." Each WEC device to be tested would include the device itself and a mooring system consisting of up to three anchors of variable configuration.

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[1] GPS coordinates for the corners of the Project area: NW = 44.697764, 124.148319; NE = 44.699034, 124.108056; SW = 44.65403, 124.145677; SE = 44.655299, 124.105439.

To support the MOTBs, associated monitoring equipment would also be deployed. This equipment may include Acoustic Wave and Current Profilers (AWAC), Acoustic Doppler Current Profilers (ADCP), Waveriders, acoustic hydrophones, plankton collection plates, water quality monitoring devices (dissolved oxygen, temperature, salinity, etc.), fish tag receivers, electromagnetic frequency monitoring equipment, etc.

The MOTBs and future Underwater Sub-station Pod would be designed for a maximum uninterrupted service life of 12 months.

**Development of a Reasonable Range of Alternatives**

DOE is required to consider a reasonable range of alternatives to the proposed action during the environmental review. The definition of alternatives is governed by the "rule of reason." An EA must consider a reasonable range of options that could accomplish the agency's purpose and need and reduce environmental effects.

The proposed action consists of DOE's decision to provide funding for the proposed project. NNMREC/OSU would reduce environmental effects through "applicant committed measures" incorporated into the proposed action. The no action alternative will also be addressed.

**Probable Environmental Effects/Issues Scoped for the Environmental Analysis (EA)**

The EA will address direct, indirect, and cumulative impacts of the proposed action, as well as the no action alternative. The EA will describe the potentially affected environment and the impacts that may result to:

- Air Quality/Meteorology
- Biological Resources
    - Benthic Habitat
    - Marine Vegetation and Algae
    - Plankton
    - Invertebrates
    - Fish and Reptiles
    - Marine Mammals
    - Birds
    - State Special-Status Aquatic Species
    - Threatened and Endangered Species

    - Essential Fish Habitat.
- Water Resources
    - Water Quality
    - Wave Characteristics
    - Wind and Current
- Aesthetics
- Cultural Resources
- Energy
- Marine Navigation
- Noise and Vibration
- Socioeconomics
- Recreational Resources

**Public Scoping**

This letter will be available to all interested state, local, and federal agencies to supply input on issues to be discussed in the EA. Agencies should identify the issues, within their statutory responsibilities, that should be considered in the EA. The general public and Native American Tribes are also invited to submit comments on the scope of the EA. As part of the process related to determining the scope of issues related to the Proposed Action, we request your comments or other information by May 28th, 2010. Please send your comments to:

**Department of Energy**
**Golden Field Office**
**c/o Laura Margason**
**1617 Cole Boulevard**
**Golden, CO 80401**

Or via email to: **laura.margason@go.doe.gov**

**Public Scoping Meeting**

DOE also invites all interested state, local, and federal agencies, Native American Tribes, and the general public to participate in a public scoping meeting to learn more about the project and provide comments. This meeting will be held in the **Hennings Auditorium at Hatfield Marine Science Center from 6:30pm - 8:30pm on Wednesday, May 5th at 2030 SE Marine Science Dr. Newport, OR 97365.**

This letter and the draft EA, when available, will be posted to the Golden Field Office electronic reading room for further reference:

http://www.eere.energy.gov/golden/reading_room.aspx.

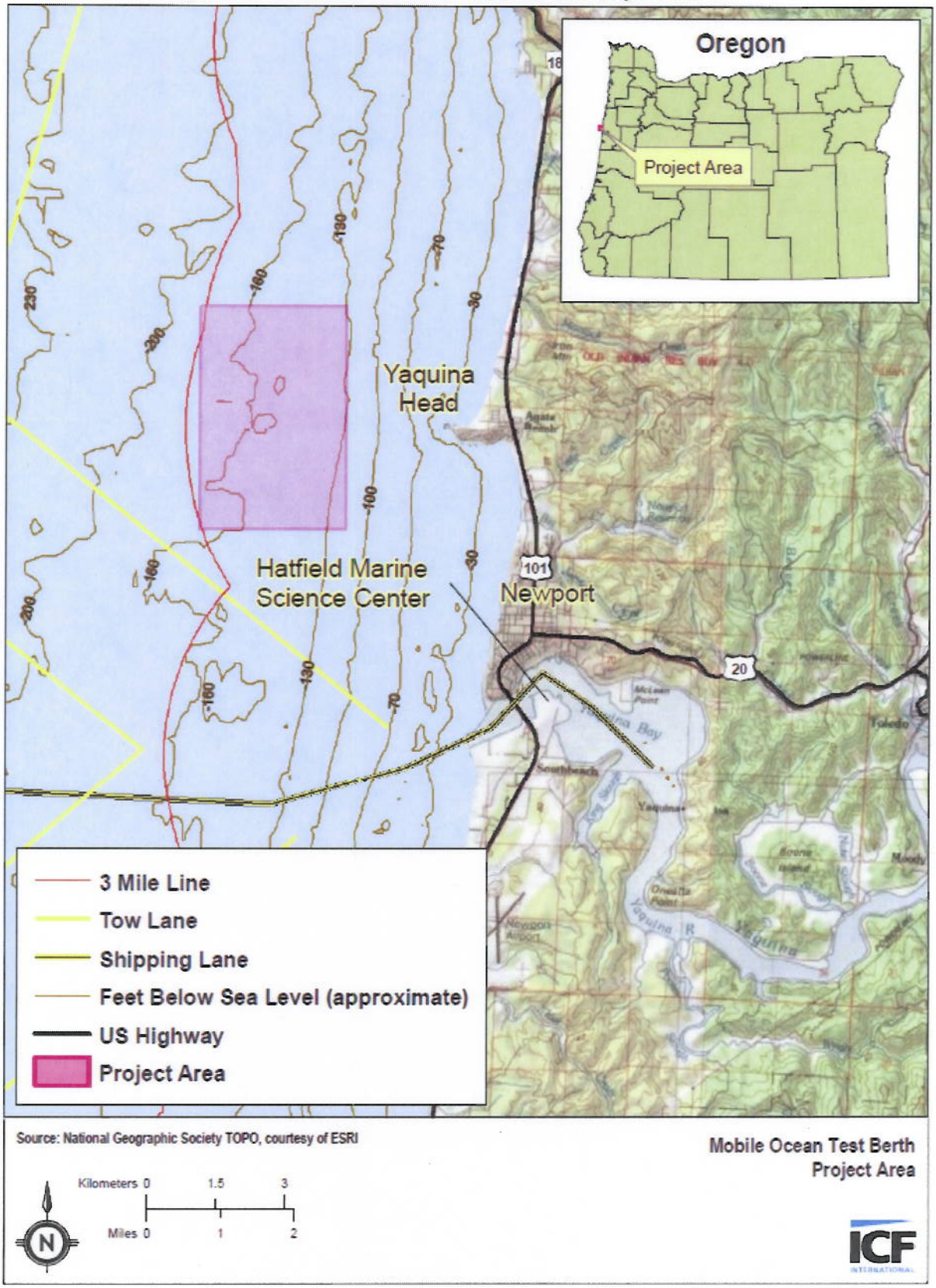
Thank you for your participation in the NEPA process.

Sincerely,

Steve Blazek
NEPA Compliance Officer

Attachments:
Figure 1: Mobile Ocean Test Berth Project Area

**Figure 1 – Mobile Ocean Test Berth Project Area**



# Public Notices

# NOTICE OF SCOPING

The U.S. Department of Energy (DOE) is requesting public input on the scope of environmental issues and alternatives to be addressed in the:

**Environmental Assessment**
**Mobile Ocean Energy Test Berth Project**
**Northwest National Marine Renewable Energy Center/OSU**
**Newport, Oregon**

Northwest National Marine Renewable Energy Center at Oregon State University is proposing to use funding from DOE to construct and operate a wave energy test facility, known as the "Mobile Ocean Test Berth". An Environmental Assessment (EA) will be prepared by DOE pursuant to the requirements of the National Environmental Policy Act (NEPA). The notice of scoping, description of the proposed project is available for review at the DOE Electronic Public Reading Room at

**http://www.eere.energy.gov/golden/Reading_Room.aspx**.

A public scoping meeting will be held on May 5, 2010 at Hennings Auditorium at Hatfield Marine Science Center from 6:30pm - 8:30pm located at 2030 SE Marine Science Dr Newport, OR 97365.

Public comments on the NEPA process, proposed action and alternatives, and environmental issues will be accepted until **May 28, 2010**.Please send comments to
Laura Margason, Department of Energy's Golden Field Office, 1617 Cole Blvd, Golden, CO 80401 or by email to laura.margason@go.doe.gov.

# PUBLIC NOTICES

CLASSIFICATION 8

**Public Notices 8**

METRO

**METRO COUNCIL WORK SESSION**
1:00 pm, Tues. May 4, 2010

**METRO COUNCIL MEETING**
5:00 pm, Thurs. May 6, 2010

Meetings are in the council chamber at Metro Regional Center, 600 NE Grand Ave., Portland, unless otherwise noted.
Please view agendas online at:
**www.oregonmetro.gov.**

You're invited at 6 p.m. the first Wed. of each month to the Metro Committee for Citizen Involvement. Information: 503-797-1539



**Public Notices 8**

REQUEST FOR COMMENTS
A 120-foot FCC licensed wireless communication tower is to be constructed at 2660 NW Division St., Gresham, Oregon. The FCC is seeking public comment on the proposed project as part of the review process by the Oregon State Historic Preservation Office. Please respond within 30 days of this publication to: Adapt Engineering Inc., 10725 SW Barbur Blvd., Suite 350, Portland, OR 97219 Attn: Bella Vista

**PUBLIC STORAGE AUCTION**
**PORTLAND SELF STORAGE**
**5803 SE 122nd St, 503-761-2843**
**May 7, 2010 at 11:30am**
#4072 Mary Couch



## NOTICE OF SCOPING

The U.S. Department of Energy (DOE) is requesting public input on the scope of environmental issues and alternatives to be addressed in the:

**Environmental Assessment Mobile Ocean Energy Test Berth Project, Northwest National Marine Renewable Energy Center/OSU Newport, Oregon.**

The Northwest National Marine Renewable Energy Center at Oregon State University is proposing to use funding from DOE to construct and operate a wave energy test facility, known as the "Mobile Ocean Test Berth". An Environmental Assessment (EA) will be prepared by DOE pursuant to the requirements of the National Environmental Policy Act (NEPA). The notice of scoping, description of the proposed project is available for review at the DOE Electronic Public Reading Room at:
**http://www.eere.energy.gov/golden/Reading_Room.aspx.**

A public scoping meeting will be held on May 5, 2010 at Hennings Auditorium at Hatfield Marine Science Center from 6:30pm - 8:30pm located at 2030 SE Marine Science Dr Newport, OR 97365.

The purpose of the meeting is to: 1) Inform the public about the project, 2) provide an overview of the DOE NEPA process, and 3) obtain feedback on what impacts should be considered by the NEPA process for the project.

Public comments on the NEPA process, proposed action and alternatives, and environmental issues will be accepted until May 28, 2010. Please send comments to:

Laura Margason, Department of Energy's Golden Field Office, 1617 Cole Blvd, Golden, CO 80401
or by email to laura.margason@go.doe.gov.

# PUBLIC NOTICES

**LEGAL DEADLINES:**

**WEDNESDAY EDITION: 5:00pm Thursday**
**FRIDAY EDITION: 12:00pm Tuesday**

**NOTICE**

Siletz Fire Protection District is selling the following surplus vehicles by sealed bid with no minimum bid required.' Bids must be received by Friday May 7, 2010 to the Siletz Fire Protection District, P. O. Box 380, Siletz, OR 97380, or delivered to the fire station in Siletz by 4:00 pm that day. The bid must include your name, address, phone number and what truck you are bidding on. Bids must be in a sealed envelope with which vehicle the bid is for on the outside of the envelope. Separate bids must be made for each vehicle. Payment must be made in full with possession of vehicle. If the highest bidder does not claim the vehicle within 10 days (May 20, 2010), then the second highest bidder will be contacted, and on down until the vehicle is sold. Bids will be opened at the Fire Department Board of Directors meeting on Monday, May 10, 2010 at 7:30 pm. All bidders are welcome to attend. 1994 Chevrolet Suburban 1500: It does not run, has good tires and new brakes, sold "AS IS." 1981 Ford 750 diesel truck with 1800 gallon steel water tank plumbed for pump. Pump is NOT included, new batteries, sold "AS IS." 1979 Ford C8000 diesel fire truck: Truck runs, pump does not work. 750 gallon steel water tank, tires have less than 500 miles on them, new batteries, sold "AS IS." The Siletz Fire Protection District reserves the right to reject any and all bids. A-28, 30, M-5, 7 (95-07)

**NOTICE OF SCOPING**

The U.S. Department of Energy (DOE) is requesting public input on the scope of environmental issues and alternatives to be addressed in the: Environmental Assessment Mobile Ocean Energy Test Berth Project, Northwest National Marine Renewable Energy Center/ OSU Newport, Oregon. The Northwest National Marine Renewable Energy Center at Oregon State University is proposing to use funding from DOE to construct and operate a wave energy test facility, known as the "Mobile Ocean Test Berth". An Environmental Assessment (EA) will be prepared by DOE pursuant to the requirements of the National Environmental Policy Act (NEPA). The notice of scoping, description of the proposed project is available for review at the DOE Electronic Public Reading Room at: www.eere.energy.gov/golden/Reading_Room.aspx. A public scoping meeting will be held on May 5, 2010 at Hennings Auditorium at Hatfield Marine Science Center from 6:30pm - 8:30pm located at 2030 SE Marine Science Dr Newport, OR 97365. The purpose of the meeting is to: 1) Inform the public about the project, 2) provide an overview of the DOE NEPA process, and 3) obtain feedback on what impacts should be considered by the NEPA process for the project. Public comments on the NEPA process, proposed action and alternatives, and environmental issues will be accepted until May 28, 2010. Please send comments to Laura Margason, Department of Energy's Golden Field Office, 1617 Cole Blvd, Golden, CO 80401 or by email to laura.margason@go.doe.gov. A-30, M-5 (17-05)

**NOTICE OF BUDGET COMMITTEE MEETING**

A public meeting of the Budget Committee of the Linn Benton Lincoln ESD, Linn County, State of Oregon, to discuss the fiscal year July 1, 2010 to June 30, 2011, will be held at 905 4th Avenue SE Albany, Oregon. The meeting will take place on the 12th day of May, 2010 at 6:00 P.M. The purpose of the meeting is to receive the budget message and to receive comment from the public on the budget. A copy of the budget document may be inspected or obtained on or after May 12, 2010 at 905 4th Avenue SE, Albany, Oregon 97321, between the hours of 8:00 A.M. and 5:00 P.M. This is a public meeting where deliberation of the budget committee will take place. Any person may appear at the meeting and discuss the proposed programs with the Budget Committee. A-16, M-5 (65-05)

**CITY OF TOLEDO NOTICE OF BUDGET COMMITTEE MEETING**

A public meeting of the Budget Committee of the City of Toledo, Lincoln County, State of Oregon, to discuss the budget for the fiscal year July 1, 2010, to June 30, 2011, including the expenditure of State revenue sharing funds, will be held at Toledo City Hall, Council Chambers, 206 N. Main Street. The meeting will take place on Monday, May 17h, 2010, at 5:30 p.m. The purpose of the meeting is to receive the budget message and to receive comment from the public on the budget. A copy of the budget document may be inspected or obtained on or after May 11th at City Hall, between the hours of 8 a.m. and 5 p.m. This is a public meeting where deliberation of the Budget Committee will take place. Any person may appear at the meeting and discuss the proposed programs with the Budget Committee. The Toledo City Hall Council Chambers is handicapped accessible. Please contact the City Recorder if you will need other assistance. /s/ Michelle Amberg, Budget Officer. PUBLISH: NEWS-TIMES, April 23rd & May 5th, 2010 (93-05)

**TRUSTEE'S NOTICE OF SALE**

Loan No.: 1117010556 T.S. No.: 7100378 Reference is made to that certain deed made by Jeffery D. McNelly and Diana K. Thomas, not as tenants in common, but with the Right of Survivorship as Grantor to Pacific Northwest Company of Oregon, Inc., as Trustee, in favor of Mortgage Electronic Registration Systems, Inc. as Beneficiary, dated 12/13/2006, recorded 12/19/2006, in the official records of Lincoln County, Oregon in book/reel/volume No. xx at page No. xx, fee/file/instrument/microfilm/reception No. 200619173 covering the following described real property situated in said County and State, to wit: Real property in the County of Lincoln, State of Oregon, described as follows: That portion of the Northeast 1/4 of the Northwest 1/4 of Section 33, Township 6 South, Range 10 West, Willamette Meridian, in Lincoln County, Oregon, described as follows: Beginning 480 feet West of the Southeast corner of the Northeast quarter of the Northwest quarter in Section 33 above described; thence North 660 feet; thence West 330 feet; thence South 660 feet; thence East 330 feet to the point of

# Scoping Responses

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Oregon Fish and Wildlife Office
2600 SE 98th Avenue, Suite 100
Portland, Oregon 97266
Phone: (503) 231-6179 FAX: (503) 231-6195

Reply To: 7971.0081
File Name: OSU Wave Energy Test Project
TAILS: 13420-2010-CPA-0112
TS Number: 10-940
DOC Type: Comment

MAY 27 2010

Laura Margason
Department of Energy
Golden Field Office
1607 Cole Boulevard
Golden, CO 80401

Subject: Oregon Fish and Wildlife Office comments on Notice of Scoping for the Northwest National Marine Renewable Energy/Oregon State University Mobile Ocean Energy Test Berth Project

The Fish and Wildlife Service's Oregon Fish and Wildlife Office (OFWO) has reviewed the Department of Energy's (DOE) April 27, 2010 "Notice of Scoping for the Northwest National Marine Renewable Energy/Oregon State University Mobile Ocean Energy Test Berth Project" regarding the proposal to provide funding to the Northwest National Marine Renewable Energy (NNMREC)/Oregon State University (OSU) in Corvallis, Oregon for their proposed project to operate a wave energy test facility, known as the "Mobile Ocean Energy Test Berth" (MOTB).

We submit the following comments and recommendations under the authority of the National Environmental Policy Act (42 U.S.C. § 4321 *et seq.*), the Migratory Bird Treaty Act, as amended (MBTA; 16 U.S.C. § 703), the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. § 1531 *et seq.*), the Fish and Wildlife Coordination Act (48 Stat. 401), as amended (16 U.S.C. § 661 *et seq.*), and the Federal Power Act (16 U.S.C. § 791a, *et seq.*).

## SPECIFIC COMMENTS

### Project Description

NNMREC/OSU has proposed to construct, deploy and operate up to two MOTBs, approximately 2.0 miles off of the coast near the city of Newport, OR. Each MOTB consists of a Power Analysis/Data Acquisition device and an Adjustable Load Bank contained on a stand alone vessel approximately 30 to 40 feet long, along with associated monitoring equipment. Each MOTB would be connected to a Wave Energy Conversion (WEC) device under test, and both the MOTB and the WEC would be independently moored to the ocean floor by up to three

anchors. An underwater substation pod (USP) may also be included in the project and would connect multiple MOTB/WEC sets with each other. This pod would either sit on the ocean bottom or float on the surface, depending on design specifics. A variety of WEC devices could be tested with the MOTBs. The MOTBs and USP would be designed for a maximum uninterrupted service life of 12 months.

**Fish and Wildlife Resources**

As part of the environmental analysis required for this process, we encourage the DOE to consider the effects of this project on several fish and wildlife resources of special interest to the OFWO. Species to consider include (but are not limited to) the ESA listed marbled murrelet (*Brachyramphys marmoratus*) and short-tailed albatross (*Phoebastria* (=Diomedea) *albatrus*), as well as the recently delisted brown pelican (*Pelicanus occidentalis*) and northern bald eagle (*Haliaeetus leucocephalus*). Potential adverse impacts and concerns from development and operation of wave energy test facilities include, but are not limited to, wildlife entrapment or direct mortality, and disruption or impairment of essential behavior patterns.

**Recommendations**

1. Marbled murrelet, a threatened species, nest in older forests near the ocean off the California, Oregon, and Washington coasts. Murrelets are currently in decline. Murrelets forage just offshore in the water column, and depend on these foraging sites year round. Much is still not known about their feeding behavior although it is thought they forage in exclusive areas in proximity to their nest sites during the nesting season (www.reo.gov/monitoring/10yr-report/marbled-murrelet/final-report.html). Wave energy MOTB construction and operation needs to insure that foraging areas for this species are not disrupted and direct mortality is avoided.

   Note: If the DOE, based on a Biological Assessment or evaluation, determines that the marbled murrelet or any other threatened and endangered species and/or critical habitat may be affected by activities authorized by the requested preliminary permit, we recommend that the DOE consult with the OFWO following the requirements of 50 CFR 402 which implements the ESA.

2. The Fish and Wildlife Service administers the rocks, reefs and islands along the Oregon coast, including those in Lincoln County, as part of Oregon Islands National Wildlife Refuges and Wilderness. Project design, construction and operation should incorporate measures that prevent direct impacts to the Refuge and indirect impacts (disturbance) to the seabird and pinniped populations using the Refuge. The most effective avoidance measure for any project of this type is to maintain maximal distance away from any rocks, reefs, and islands.

3. Oregon's near shore (Territorial Sea) waters serve as a foraging area for migratory seabirds that nest on the Refuge. In addition, these waters also serve as a major migration corridor for millions of seabirds, waterfowl, shorebirds and waterbirds annually. Much of this migration occurs at low altitude, just above the surface of the sea, therefore, wave energy MOTBs design, construction, and operation needs to insure that migration routes

are not disrupted and direct mortality (collision with above water surface project features) is minimized.

4. The gray whale (*Eschrichtius robustus*) is a coastal whale that may also frequent the coastline of Lincoln County. Gray whale pods and individuals may be seen off the Oregon coast at any time. The gray whale feeds in shallow water near shore during summer and fall, migrates in deeper water to the south for breeding and calving during the winter, and migrates north in the spring. Southbound pods pass the Oregon coast from December through early February. Northbound pods pass in late February through early June. Wave energy MOTB design, construction and operation needs to insure that gray whale migration routes and feeding areas are not disrupted.

## SUMMARY COMMENTS

While the OFWO is supportive of the testing and development of environmentally-sound, alternative energy technologies, the aforementioned environmental issues should be addressed during the NEPA process to prevent unnecessary delays in this test project. If you have any questions regarding these comments please contact Ann Gray or Doug Young of my staff at 503-231-6179.

Sincerely,

Paul Henson, PhD
FOR State Supervisor

cc:
Mead, USFWS
Sleeger, DOI
Enright, ODOE

May 28, 2010

Department of Energy
Golden Field Office
C/o Laura Margason
1617 Cole Boulevard
Golden, CO 80401

Re: Comments on Department of Energy's Scoping of the Northwest National Marine Renewable Energy Center/Oregon State University Proposed "Mobile Ocean Test Berth" Wave Energy Test Facility

Dear Ms. Margason,

Pursuant to 18 CFR 5.4(d)(2)(iv), the Oregon Chapters of the Surfrider Foundation (Surfrider) submit these comments on the proposed "Mobile Ocean Test Berth" Wave Energy Test Facility (Mobile Ocean Test Berth or MOTB). Surfrider appreciates the interest of the Department of Energy (DoE) and the Northwest National Marine Renewable Energy Center/Oregon State University (NNMREC/OSU) in substantively addressing potential environmental, recreational, and other impacts of the proposed MOTB. Listed below are Surfrider's comments regarding: 1) the proposed size and location of the MOTB, 2) the MOTB's environmental impacts, such as electromagnetic field generation, marine mammal entanglement, and habitat disturbance, 3) DoE and NNMREC/OSU's recognition of Oregon's coastal recreational community and interests as stakeholders, and 4) its support of incorporating and employing adaptive management and robust in-situ monitoring throughout the process.

<u>Comment One: The Proposed Size and Location of the MOTB and its potential affect on wave dynamics:</u>

The proposed MOTB will be located in the State's territorial waters, within the three nautical mile jurisdictional boundary, bordering the federal jurisdictional waters. The project elements sit directly in the Pacific Ocean, adjacent to an area with a number of high quality surf breaks that attract a large number of year-round recreational uses. The area's characteristics are attributable to the unique coastal topography, prevailing wind direction, currents, and resulting sand accretions. Every effort should be made to anticipate and consider the effects of the MOTB on these characteristics and the environmental factors that create and perpetuate them. Additionally, every effort should be made to preserve the area's value as a coastal recreation destination.

Even very minute alterations in substrate composition and character can have dramatic effects on wave characteristics. The proposed MOTB's impact, even if limited through careful site selection and mitigation, could result in permanent dramatic effects on the site's unique wave character and the recreational resource it

represents. Therefore, Surfrider requests that the particular location, configuration, and substrate characteristics and movement, which contribute to the proposed site's unique characteristics be given due consideration with non-consumptive coastal recreation in mind. Please do not give short shrift to the complex confluence of environmental conditions that make the proposed project site such a unique recreational resource for the region's surfing community.

Surfrider has determined that wave height reduction associated with hydrokinteic energy development and generation correlates with a project's reduced distance from the shoreline. Surfrider requests the project proponents give the myriad aspects making up the site's unique wave character great consideration, and study the proposed projects likely effects on wave quality. Moreover, Surfrider requests that all available measures be implemented to minimize sand substrate disturbance and wave energy attenuation to preserve the area's recreational resource in its current condition and quality.

Comment Two: The MOTB May Impact the Near-Shore Environment Through Electromagnetic Field Generation, Migration Corridor Overlap or Interference, and Substrate and Habitat Disturbance and Disruption:

The MOTB will likely affect the proposed project area's fish, crustacean, marine mammal, and other marine biotic resources through electromagnetic field generation, migration corridor overlap and interference, and habitat disturbance.

Hydrokinetic wave energy generation is known to emit electromagnetic fields (EMFs). Surfrider believes that shark behavioral response to these EMFs, and other wave energy operations, is an important public safety issue. Sharks detect and are adapted to respond to electric fields at low frequencies. They can detect a millivolt (1/1000 of a volt) at distances of up to 100 meters under water. Skate, ray, and shark species with heightened sensitivity to EMF may be located in or near the area affected by the proposed project. The Oregon coast provides habitat for as many as fifteen shark species, many of which commonly occupy near-shore areas. Past studies and anecdotal evidence indicate that aggressive shark species can be expected to be present in the vicinity of the project at various times of the year depending on the species' mating and migration patterns and environmental conditions. For example, Great White Sharks have been documented close to shore off the central Oregon coast. How these sharks may respond to EMF generated by a development like the MOTB is as-yet a largely unanswered question. There is a dearth of clear evidence indicating whether sharks will acclimate to, be attracted by, or be repulsed by EMF. While magnetic frequency ranges of wave and tidal energy technology may be outside the range of shark sensitivity, more research is required to assess behavioral impacts of EMFs on sharks and potential risks to surfers, swimmers, divers, windsurfers, and other in-the-water coastal recreationalists. Thus, DoE and NNMREC/OSU should consider generation of abnormal EMFs prior to implementation of the MOTB.

Also, as many as eleven cetacean species are known to navigate by echolocation in, through, or near the area affected by the proposed project. Of these species, gray whales and harbor porpoises are most likely to be found in the closest proximity to the project area. In addition to considering the effects of EMFs on these species, DoE and NNMREC/OSU should consider risks posed to whale migration from entanglement and/or collision into the MOTB mooring and transmission infrastructure.

Surfrider requests that DoE and NNMREC/OSU consider and incorporate all relevant studies of both EMF and entanglement risks to sharks, whales and other species, preferably from comparable study areas, into the MOTB development process. This should include assessments of the impacts posed by comparably moored projects beyond hydrokinetic developments.

Similarly, DoE and NNMREC/OSU should consider the effect of the MOTB's mooring equipment on other benthic species, and the environmental impacts of any proposed measures to keep the MOTB and its infrastructure free of accumulated biotic growth or debris.

Additionally, pre-development assessments should not preclude careful research and monitoring throughout the development and operation lifecycles of the MOTB. The weight of evidence regarding ecological safety is limited with respect to sharks, whales, and other local and migratory marine species. Wave energy is a nascent technology. Using existing limited data sets to speculate on the likelihood of potential impacts over time sets poor precedent for large-scale testing and development of renewable ocean energy. The Hawaii and Cape Wind assessments are helpful but certainly not exhaustive or comprehensive on this topic.

The recent Collaborative Offshore Wind Research into the Environment (COWRIE) reports include more extensive literature reviews and compilations regarding the effects of EMF. COWRIE asserts that a greater understanding of the environmental impact of EMF emissions is urgently required for offshore wind development, owing to the lack of current knowledge. COWRIE has identified a broad set of studies to investigate the potential effects of EMF. Surfrider recommends the project proponents consider and incorporate these studies.

Considering the variety of technologies likely to be used in association with the MOTB, Surfrider recommends that DoE and NNMREC/OSU consider monitoring and further quantification of frequencies and field levels of EMF as a necessary component of any permitting conditions for the proposed project. DoE and NNMREC/OSU should be required to focus research to monitor for attraction and other changes in faunal behavior. Fauna should not be limited to sharks. The NEPA process should give due consideration to impacts on other species similarly likely to be affected by EMF through identification of species of concern and development of a scientifically sound monitoring plan to assess impacts.

Surfrider recommends that the MOTB development and implementation process incorporate regular monitoring of the condition of the permanent infrastructure as well as any turbines, generators, and undersea cable, including ongoing monitoring of all elements for EMF. Such monitoring should include adaptive management mechanisms, such as triggers for corrective actions. Consideration should be given to any and all conditions under which the MOTB or its components could fail. Development conditions should establish contingencies for unexpected results or outcomes with respect to EMF and undersea cable. Careful consideration should be given to the COWRIE studies on EMF in developing monitoring and research programs for the MOTB. Draft monitoring and research plans should be available for public review throughout the process. Similarly, straightforward public access to monitoring results, such as through a project website, should be readily available.

Comment Three: Recognize and Involve Oregon's Coastal Recreation Community and Interests as Stakeholders and Thoroughly Consider Impacts On and To Them:

DoE's May 5th Community Scoping Meeting presentation mentioned DoE and NNMREC/OSU's intent to consider impacts to Oregon's coastal recreational community, as well as Oregon's coastal cultural and socioeconomic resources. Surfrider recommends that DoE and NNMREC/OSU take additional steps to actively involve Oregon's coastal recreational community as stakeholders and partners in the development of the MOTB. DoE and NNMREC/OSU should look to past efforts regarding licensing and permitting of wave energy development off of Coos Bay and Reedsport for resource materials and stakeholder analyses to supplement its own analysis. The Coos Bay Notice of Intent/Pre-Application Document (NOI/PAD) for the FERC Project No. 12749, the Coos Bay Ocean Power Technology (OPT) Wave Park, filed with FERC by the Oregon Wave Energy Partners I, LLC (OWEP) on March 7, 2008 provides an example of such analysis. Specifically, the Coos Bay NOI/PAD mentions the private developer's intent to implement an adaptive management plan for the Coos Bay OPT Wave Park. As with the similar Reedsport project, continued work with previously identified and engaged stakeholders will better facilitate identification of the DoE/NNMREC/OSU MOTB's potential impacts and alternatives.

Surfrider hopes that any forthcoming EA will give sufficiently thorough treatment to surfing and other near-shore water-based non-consumptive recreational pursuits, and adequately consider impacts thereon. Notably, while surfing does commonly occur near headlands, jetties, and the like, it is not uncommon for Oregon's surfers to recreate along open stretches of coastline in the shore break or at offshore breaks. The Yaquina Head area is home to a number of high quality and heavily utilized surf breaks. Surfrider requests that DoE and NNMREC/OSU give great consideration to the region's surfers and other members of the recreational community and their wave dependent and near-shore-based-recreation uses, including, but not limited to surfing, kayaking, boogie-boarding, skim-boarding, stand-up-paddling, surf-skiing, and body surfing. Such consideration should also be supplemented and enhanced by thorough consideration of commercial and

recreational fishing and crabbing, sightseeing, and other land-based recreational uses that may be impacted by a large near-shore development of this sort.

Comment Four: Employ Adaptive Management and Robust Monitoring Through All Phases of the MOTB's Permitting, Development, Installation, Use, and Future Decommissioning:

Finally, the need to employ adaptive management throughout this process cannot be over-emphasized. This is important to ensure that new information is applied to assess needs for modification, mitigation, and/or removal as conditions change and knowledge develops. Other projects being developed on the Oregon Coast may help aid in the understanding of the challenges that may be faced when deploying wave energy devices in Oregon's Territorial Sea. An example of this would be the sinking of the Finevera Buoy off of Yaquina Head in November of 2007. Unfortunately, this buoy wasn't removed from the seafloor until the summer of 2008 because an adequate emergency response plan was not in place at the time of sinking. There is no excuse for a similar event to occur with the MOTB. Similarly, DoE and NNMREC/OSU should consider and incorporate Oregon's ongoing efforts to revise and update its Territorial Sea Plan with regard to ocean-based hydrokinetic energy development and its impacts on other uses of Oregon's Territorial Sea.

Surfrider appreciates your timely consideration of these comments, requests and recommendations. Surfrider eagerly anticipates DoE's response to the foregoing, the forthcoming EA, and continued involvement in the permitting and development of the MOTB.

# FW Ocean Wave Energy Test Berth - Newport OR

-----Original Message-----
From: Yvonna Weiland [mailto:wldpt01@yahoo.com]
Sent: Wednesday, May 26, 2010 8:17 PM
To: Margason, Laura
Subject: Ocean Wave Energy Test Berth - Newport, OR

Dear Laura:

I attended the meeting held in Newport in early May. Thank you for the time and effort involved to bring this meeting to our community.

I would ask that careful consideration be made as to the location of the Test Berth. It is my understanding that currently you are looking at a site almost directly off shore from Yaquina Head. As you know, Yaquina Head and its lighthouse is one of the most popular tourist destinations on the central Oregon coast. I am concerned that a Test Berth would interfere with the view of the magnificant horizon from the lighthouse, and might negatively impact the revenue generated by Yaquina Head itself and the local hospitality businesses.

Perhaps a location to the south of the jetty would cause less of an impact to the tourist industry in and around Newport.

Thank you.

Yvonna Weiland

P.S. Please add me to your distribution list.

# Scoping Meeting Transcript

NEPA PUBLIC SCOPING MEETING

Northwest National Marine Renewable Energy Center/Oregon State University's Mobile Ocean Test Berth Deployment and Installation Environmental Assessment

At

Hatfield Marine Science Center

South Beach, Oregon

May 5, 2010

6:30 PM

Lee Blackwood
Blackwood Court Reporting
PO Box 536, Newport, Oregon 97365



APPEARANCES

| | |
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5

1 May 5, 2010 - 6:35 PM

LAURA MARGASON: I think we will get started here. Welcome, everyone.

So I'd like to welcome everyone. This is a Department of Energy Scoping Meeting for, umm, the Environmental Assessment that is going to be conducted for the Northwest National Marine Energy, umm, Renewable Energy Center, part of OSU. And their project is the Mobile Ocean Test Berth.

I want to introduce myself. My name is Laura Margason. I'm a NEPA specialist with the Department of Energy. I'm based at the Golden Field Office in Golden, Colorado, and I'm going to be conducting a little bit of a NEPA overview and some explanation about our process and what we do.

I have Kaety Hildenbrand here. She is here to help

facilitate, and she is with OSU Sea Grant.

My coworker is here today. His name is Tim Ramsey.

He's going to get up and speak a little more about the

program and -- the Water Power Program and its purpose and

its mission.

We are going to have a brief question section right

after Tim's discussion where if you have any questions on

the NEPA process or the Water Program's mission, then that



will be an opportunity for you to ask a specific question

on the process at that point.

And, umm, then afterwards we will have Meleah

Ashford. She is with the National Marine Renewable --

Northwest National Renewable Energy Center, just to

clarify. It's kind of a mouthful, so we're

going to call

it NNMREC from here on out. But Meleah will get up and

discuss a little bit more about NNMREC and give us an

overview of the project itself.

Did you have anything to add?

KAETY HILDENBRAND: And then we will open it up for

public comments. And a few of you did sign in that you

wanted to comment. If you change your mind during this

time, that's fine. We will start with people on the list,

and then we will ask for any more.

And there's also public comment forms inside your

envelope. You can either leave it here tonight, or the

address is on there if you want to mail it to us.

LAURA MARGASON: Okay. Thank you, Kaety.

I'm going to dive in now to the NEPA process

overview. This is pretty general, a very quick overview.

22 Some people may know more, some people may know very little

23 about this process, so I thought I would just give us a

24 brief overview to let you know how DOE is going to be

25 conducting this process, and the purpose and why we are



1 here today.

2 So what is NEPA? For those who don't know, it

3 stands for the National Environmental Policy Act. It was

4 signed by President Nixon in 1969 and enacted as federal

5 law effective in early 1970. It applies to federal

6 agencies only. So sometimes we will get a state or someone

7 in a private industry asking why, you know, do they have to

8 do NEPA? And, really, it is no unless this is a federal

9 action triggering the need for NEPA. It was one of the

first national charters for the protection of the environment.

And part of NEPA has a mandate that any environmental information that is collected during the NEPA process must be shared to any and all public officials and citizens prior to that NEPA decision being made.

So in order for NEPA to apply, there has to be some type of federal action. In this case the Department of Energy is proposing to fund the Northwest National Marine Renewable Energy Center, NNMREC, for their proposed project, which is to construct, deploy, and operate a wave energy test facility which they call the Mobile Ocean Test Berth. Funding underneath NEPA constitutes a federal NEPA action, so that is what triggers the need for NEPA compliance.

There are just some basic NEPA objectives. It is a

decision-making process. It helps the agency understand all the environmental consequences that could come about based on their proposed action. Umm, it helps implement and for the federal agencies to take actions in order to protect the shore and enhance the environment in which the proposed action will take place.

NEPA is supposed to focus truly on significant issues. This is important because a lot of people ask, you know, why aren't you looking at this topic? Why aren't you looking at this topic? It really is a concise and -- a concise document that wants to focus on significant issues and potentially significant impacts related to that proposed action, in this case the project.

And it's really there -- The NEPA process is there to promote an agency's decision making process and for better planning overall within that agency's programs.

UNIDENTIFIED PERSON: A quick question.

LAURA MARGASON: Yes.

UNIDENTIFIED PERSON: Who determines whether something is potentially significant or not? That's kind of subjective.

LAURA MARGASON: It is. It is very subjective, and, you know, case law has helped dictate specifically what is deemed significant. A lot of times with DOE's decision making process we're going to rely on various



agencies to help us figure out what is significant. We are going to work with local and state -- federal and state

level agencies in order to help us understand. You know, we are not biologists, so we are going to work with them in order to have them provide expertise in what is significant and what isn't.

We also have a third party consultant that has been hired to write our document. They are, you know, experts in their field of compiling documents, compiling information, and conducting analyses, but in the end the decision is still up to the DOE officials. But there is a lot that goes into making that final decision. Does that answer your question?

UNIDENTIFIED PERSON: Yes, it does.

LAURA MARGASON: Okay. So we will make the determination to do an environmental assessment for this project. An EA is basically an analysis of a potential impact that may occur from your actions on the

human and

19 the natural environment. Umm, and I'll often refer to it

20 as a proposed action, but in this specific instance we are

21 talking about the construction and deployment of the -- and

22 the operation of the Mobile Ocean Test Berth.

23 Umm, part of the EA describes the purpose and need

24 for this proposed action, and so that is a chapter in

25 itself; just on why we are doing it, and the purpose of the

10

1 project. And it's going to identify all the potential

2 impact and any mitigation that needs to go along with

3 those. So part of that is identifying any significant

4 impact that is applying mitigation to reduce those to what

5 is generally deemed less than significant.

6 We are going to look at -- Part of the analysis is

also on alternatives, so mitigation often looks at various alternatives that can be applied; location, size. It really depends on the project. But we are going to look at various alternatives, and kind of at the end of the analysis we go ahead and look at the short-term and long-term impacts, accumulative impacts to, you know, the surrounding area, and any commitments of resources that can result from implementing the proposed action.

Most importantly, it really describes how the public concerns were addressed in the document. NEPA is a public involved, umm -- It's a process that's very heavy in public involvement, and so we take all -- consider all comments and concerns, and they are incorporated into our analyses.

So I want to make it clear to everyone, this is a

scoping meeting. And so I -- In this slide I've tried to kind of describe what the scoping process really is about and why we are here today.

Umm, public notice in general for NEPA, you know,



is to inform and update the public where the agency and Department of Energy is in the EA process. It helps us finalize the scope. The scope is all the items of concern that we are going to look at in the EA. So we have a general idea right now of what we are going to look at in the EA, and we are inviting you folks today to help us finalize that scope. Perhaps we are missing something, and so we want to hear your concerns. This is an opportunity to, not so much to ask questions, but to tell us your

concerns and any comments that you would like us to address within the document and our analyses.

So it's big on, umm, -- This really is your opportunity to provide some input prior to us doing our review and our analyses and all the research that goes into the document itself.

So Public Scoping. This is the first phase of public involvement. We do have another phase. I'll discuss that a little bit later, but this truly is the first phase, and we're going to engage the public, and we are going to ask for your input.

Umm, things that we are looking for from you today is any input that you have or information on our proposed action, which is the project; any alternatives you think we should address and include in the document; umm, any possible like mitigation measures that maybe should be

thought of or implemented in order to help reduce any potential impacts from our project. And if you have any data, you know, all that kind of information is what we are looking for today.

So this is what we have come up with. We have worked with our environmental consultant, who has been brought in to do the analysis and write the document for us. They have been working in conjunction with DOE, and especially OSU, and NNMREC in order to come up with this.

This is kind of our generalized outline for the Environmental Assessment. These are all the specific things that we are looking at potentially, umm, and analyzing, some obviously in more detail than others.

So we are looking for you to enhance this list for us. Anything that we are missing, anything that you think, Okay, it's on here, but, you know, you really think we should take a closer look at, this is your time to tell us that.

I'll leave that up for a little bit longer. It really speaks to the bulk of what this project is really all about, what you are looking at. If you have any questions, umm, at the end of this, after Meleah's discussion, we can revisit this slide and maybe go into what some of these things mean.

So this is about you, really, Public comments.

13

What do you need to know about commenting? We are here for a reason, which is because we know that the

community,

especially in Newport, is very proud of their community,

very proud of the environment in which they live, and we

want you to have a say in what we are doing here. So your

comments and concerns are very important to us.

We do have a court reporter here today that will be

getting all the comments. And anything that is said today,

either in this meeting or, umm, via comments later on, will

be addressed in some form in the environmental assessment.

We have several ways for you to provide comments on

the scoping tonight: Obviously, at this meeting, or we

have comment cards which are in your packets right now.

There's comment cards. You are welcome to fill them out

and turn them in today, or you can mail them in to us, or

you can e-mail them to us.

Currently, we are about a week into our public

18 scoping period. It is 30 days long. We're about a week

19 into it, so we are going to take comments on public scoping

20 -- on the scoping, as we discussed, up until May 27th. At

21 that point, then we are working on the document. We are

22 actually conducting the analyses, writing it, doing all our

23 consultations and so forth.

24 The comment cards, as I mentioned, are in the

25 information folder. We're going to have some more at the

14

1 sign-in table if need be. And, umm, this right here, that

2 is my mailing address, so all your comments are directly

3 coming to me. I will make sure they get to the right

4 people for the analyses, and I do share them with OSU and

5 our consultant and numerous people throughout DOE, but they

are, you know, they are part of our record, and like I said, you can send them to me. There is my address and my e-mail address.

A lot of people like to know what's next. Okay.

You provided us some comments; great. Umm, like I said, we are going to incorporate them as appropriate into the draft EA. Umm, and a lot of people don't like that "as appropriate." What I mean by that is truly if they are applicable to the project. You know, if something miles from here is going on and it is not truly applicable to this project, we will definitely take your comment into consideration, but we are looking for things very specific to this region and this project.

Once all comments, the comment period, and the draft review -- we do a lot of internal review -- and once

the draft EA is ready for what we call public review again, we anticipate that to be out in early September, and we have a current list of stakeholders. Some of you might have received our postcards already. Those of you not on it, I believe our sign-up sheet should have an area where you put your address. If not, definitely send us a comment. Include it in your comment card.

So this next comment period that will happen will be really on the bulk of information. It will answer many of the questions that you probably have tonight that we're not going to be able to answer because we are still in the early phases. But the EA is going to provide the analysis and give you the information on the project and activity

and what the analysis will be on the various topics.

Once we receive all your comments on the draft EA, those also get incorporated into the final EA. We anticipate that coming out in early November. At that point, once the public has provided all their comments and we've consulted with various local and state agencies, as well as federal agencies, and complied with the various acts that NEPA is, umm, required to look at, we then take the information, and it goes to the powers that be, so to speak. And in this case it's my boss, the Golden Field Office's NEPA's compliance officer, and the Golden Field Office's manager, and they will make the determination either of a finding of no significant impact, or they will make the determination to proceed with the environmental impact statement.

I'll give you a little bit of background on that.

Uh, a finding of no significant impact, that's typically

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after there has been quite a bit of coordination and

mitigation already incorporated into the EA. So there is a

lot that comes up to that, umm, you know, finding at that

point. It's not just, Okay, looks good; We're going to

issue a FONSI, an acronym that we use. But there is some

thought and mitigation and applicant committed measures

that are incorporated into the document. And if we feel

that that has met everyone's needs, the public, the various

agencies, and ourselves, then we will issue a FONSI.

If for some reason we cannot mitigate our way

through any of the potential impacts, then that will

elevate the project into an environment impact statement, which is a much higher level, umm, thorough review of the project and potential impacts. I'm not going to get into EIS's tonight, but we do have more information on our website about those.

So that's it for kind of the NEPA overview.

My coworker, Tim Ramsey, is going to come up and speak very briefly about the Water Power Program. We are very proud of the program, and we want to share a little bit of this program with you. And after he speaks, then we will have a really brief process question section, so I'll let Tim here take it over. Thank you, Tim.

TIM RAMSEY: Okay. Thank you, Laura.

My name is Tim Ramsey. I work for the Department

of Energy, the DOE field office. I'm just going to do a very, very, very quick, 5-minute overview of the DOE Water Power Program, and then we will talk about the project specifics.

So the Golden Field Office is one of two field offices that support the Department of Energy headquarters in Washington D.C. The other field office is the National Energy Technology Laboratory, and that's in Pittsburgh, Pennsylvania.

The Golden Field Office is the only one dedicated solely to EERE activities. And you can see in the slide how it funnels down from the Department of Energy, down to Secretary Chu, down through EERE. The Wind and Water Power Program is one of the programs in the Golden Field Office.

So there are ten programs within EERE. EERE, you

can think of it as kind of two parts. There is EE, which is Energy Efficiency, and those are the sort of programs that try to take existing industries and make them more efficient. And then there is the RE side, the Renewable Energy side, and that's the typical energies from renewable resources that you think of, solar power, biomass, and geothermal. And then, of course, what we are covering tonight, the Wind and Water Power Program.

You can see here just the Organization and the Vision Statement of the Wind and Water Power Program. The

18

Resources up there, there's three links.

Uh, the Department of Energy has a great website. All the programs are outlined there, and you can do some

reading on each of the programs individually, and some of the technologies that the programs use, and just get some background information on the programs.

The Water Power Program specifically started because of an act of Congress in 2007 called the Energy Independent and Security Act. That was developed in 2007. And basically it's a mandate from Congress to the Department of Energy to look at Marine and Hydrokinetic technology. And in that act they define marine and hydrokinetic as energy from ocean, current, tides, and ocean thermal energy conversion without building new dams or diversionary structure. And EISA also mandated the department to establish national renewable energy centers where developers can come and test their technologies.

So in 2008 Congress actually gave us our first

budget to elicit this project, and we received 10 million dollars. We went out, and our first funding opportunity covered three topic areas, so we decided to look at our resource assessment and kind of try to begin figuring out what the potential is all there, what type of energy we could get from marine and hydrokinetic, from water power.

Another topic area was to fund technology.

19

Developers can use their technology just a little bit further across the path of commercialization.

And then the third one was to actually establish the marine centers where they could go and test their technologies. And Oregon State was one of those that was selected. We selected the two national marine centers.

The other was the University of Hawaii.

Since that time our budget has grown steadily over the next couple of years. In 2009 we received 40 million dollars, and now for the second round of funding opportunities for 22 projects. And then we also received 32 million in Recovery Act funds, known as the Stimulus Funds from the Recovery Act Bill. And all of those projects were selected. Seven projects were selected and all that went to conventional hydro type projects. We were going into checking facilities, dams, and upgrading facilities. That's what we did in 2009.

We are now in 2010, and our budget grew a little bit more. We have 50 million dollars for this current fiscal year, and we have our third round of funding, uh, our funding opportunities, and that's now currently underway now, and that concludes in June.

And as far as doing business with the Department of Energy, we are a funding agency, and almost all of our finds are competitively selected, and we go through a



bidding process through these funding opportunities. And these are some of the web sites where you can go if you do want to receive Department of Energy funding. Or, really, any agency funding.

The list here, the first FedConnect website, that is the main avenue where we tell people to go to look for Department of Energy funding. All agencies are there, or you could just kind of see the types of projects that DOE is soliciting, and kind of where the program is going by reading some of the information there.

Again, that was just a very, very quick, high-level overview of both the NEPA process and the Water Program.

In your folders, if you grabbed one, there is a business card in there with both Laura's and my e-mail address.

Feel free to e-mail us with any questions. This presentation will be on the public website, which is that first website there, and I believe it's also at the very, very bottom of that card in your folder, so you don't have to write that down. But if you have any questions about this presentation, feel free to shoot us an e-mail.

I believe we're going to take a quick 5-minute break if you have any questions for Laura or myself. If there are more specific project questions, perhaps about what we're actually funding here in Oregon, Meleah is going to talk next, and then we will have a long period of open

discussion for public comments.

JOHN LAVRAKAS: John Lavrakas. When I think of the environmental impact, the first thought is affecting the environment, which would be, you know, ocean life and things like that. And I noticed you had in there like marine navigation, so then I see that the effects there include maybe some other activities in the ocean. So the thought -- the question I have is, would it also include, you know, during normal operation there would be effects, but if things go wrong, then there would be additional effects that may affect agencies, or at least, umm, emergency service organizations. So would you consider those applicable in this case as environmental impacts?

LAURA MARGASON: It definitely could be considered a potential impact. NEPA is not just the natural environment. I like to truly think of it, and I had it up there, as the human and natural environment. So it is going to look at things. Umm, the fishing industry, that is a human environment, part of the human environment. We will look at that, and look at the socioeconomics, environmental justice sections. But how it affects the emergency response systems are a potential topic for analysis.

JOHN LAVRAKAS: Thank you.

LAURA MARGASON: Are there any other clarifying

22

questions?

UNIDENTIFIED MAN: If someone disagrees

with your

3 final environmental assessment, is there an appeal process?

4 LAURA MARGASON: There is. Umm, NEPA is not, umm,

5 -- I should know this. Just went over it today. It's

6 truly up to the public to comment and appeal. Umm, often

7 times, if there is an organization, umm, --

8 UNIDENTIFIED MAN: How do we appeal?

9 LINDA MARGASON: How? That's through the judicial

10 system. Umm, specifically, I'm sorry, I do not know. But

11 it is through the judicial system. I would imagine you

12 hire a lawyer, and they would, umm, go through that

13 process. But a lot of times, umm, through the public

14 comment period we are going to address your concerns, so we

15 are looking for specific concerns, things that you can

16 specifically point out that, you know, we would hope prior

17 to the decision that we would be able to mitigate.

18 And, you know, obviously not 100 percent of people

19 are going to be happy with the decision. However, we do

20 our best to incorporate everyone's concerns into the

21 document and address those concerns.

22 UNIDENTIFIED MAN: It sounds like it's an appeal to

23 the court.

24 LAURA MARGASON: It is. It's mainly through the

25 judicial system, yeah. And then it is regulated mainly by

23

1 the public. There is no oversight from NEPA. We have

2 regulations under, umm, the Council of Environmental

3 Quality, which is under the White House, but other than

4 that, it's truly up to the public, and that's why it is a

5 public review process. We engage the public so they can

tell us their concerns. And DOE is truly looking to not go into litigation, so we are going to address your concerns, definitely.

KAETY HILDENBRAND: We probably have time for one more clarifying question. (Pause, with no comment.)

Okay.

MELEAH ASHFORD: Okay. Thank you for coming tonight to help us with our scoping process. My name again is Meleah Ashford, and I'm the Program Manager for the Northwest National Marine Renewable Energy Center, which we just call NNMREC.

Well, I'm going to tell you about the proposed project. But first I'm going to start with a little bit of overview about wave energy in Oregon and about our center.

So, by the way, why Oregon?

As Tim mentioned, there are a lot of different ways

to get renewable energy from the ocean, but in Oregon we have great waves. We have some of the best waves in the world, as you can see by the map there . The red areas are kind of the sweet spot, and they are along a, umm, usually



a west-facing coast where there is a long ocean that allows the waves to build up. So, uh, we have got good waves. We have a high coastal population, and our population generally gets its power from the other side of the mountains, so it would be nice to have a local power source.

We have a power infrastructure along the coast. The mills that were installed over the century had power coming to the coast. Power doesn't care which direction it

is going. So we do have a good infrastructure and electrical grid. And we have good research capabilities and capacities with Oregon State University and the Hatfield Marine Science Center here. And, also, the resource of waves as you see in the, umm, -- Let's see.

This is very slow. As you can see from the graph there, this is over time; wave, power over time. We get the biggest waves in the summer -- I mean in the winter, which is when you need to use that power.

So getting energy from the waves, there's a lot of different ways. There's over a hundred different devices out there right now, and we are in the process of -- The industry is in the process of down selecting to what is really going to be the power generation process now for wave energy.

You have shore-based facilities like

this, umm,

25

1 WaveGen here that sits on the shore, and waves come in and

2 blow air through a turbine out through the top.

3 Pelamis is a very famous one that's like a snake.

4 It undulates and, umm, fluid moves between those sections

5 and runs the turbine.

6 This is the Finavera Buoy, which you may be

7 familiar with. It was deployed out there. It plunges up

8 and down and runs a turbine in a vertical direction.

9 The Oyster here on the bottom is a -- is a near

10 shore device. It flaps back and forth. In that flapping

11 action it pushes the water onto the -- through a piping

12 system on the shore and runs a turbine.

13 The other two here are what we call point

absorbers, and they collect energy from the waves in a deep water situation. Not really deep, but like 150 to 200 feet deep. The OBT device, you probably heard something about that, about proposing some in southern Oregon. And that's, again, like a plunger device.

And this is Columbia Power Technology device down here on the bottom, and it gets energy use through several different types of motions; the motion of flaps coming down, and the sideways motion.

They are all innovative, but they are all very much in developmental stages, which is why we had so much interest on the coast.

So the Northwest National Marine Renewable Energy Center, we are a partnership between Oregon State

University and the University of Washington. They focus on tidal issues. They have large tidal resources coming in and out of the Puget Sound.

We are funded partially by Department of Energy, but we have a lot of local funds. The State of Oregon provided us money for the actual infrastructure, and we have various other funding agencies that are shown there on the side. We also partner with the National Renewable Energies Lab, who is helping us with some of the technical testing issues.

The idea of NNMREC is to develop a range of capabilities to support wave and tide and energy development, and this center is structured to facilitate the development through the testing process and the modeling process to form regulatory and policy decision

makers to close information gaps.

So we are really a virtual center. We don't have a, you know, a location itself. Umm, and we are divided into three different areas. The technology area: In addition to technology, we have a testing and demonstration, which is what this project is about. We look at wave forecasting, survivability, reliability of devices, anti-fouling and corrosion issues, and



device/array optimization issues. Those are all modeling issues, and they are all part of the process.

In the environmental area we are studying sediment transport, electromagnetic fields, Benthic ecosystems issues, acoustics, umm, and then we have some others on there. Marine mammals is another area that we are

studying.

And then in the human dimension we are looking at the impact on the inside of things, fisheries and crabbing, outreach and engaging, and we're working on existing users and the local economy.

So the proposed action is the design, construction, and operation of a mobile, full-scale, open ocean wave energy testing facility. And the, uh, the project consists of two of these testing devices, and I'll show you what they look like. And those two devices will be connected to two wave energy devices. So our two test berths, and then two devices, so there's four things in the water.

And we are also looking at an underwater substation pod, which is a device that connects the cables from the energy devices. And then it's eventually designed to take that back to shore, so if there was an array of

these

device s, the array can come together to one substation

pod, and then one cable could go to shore.

Umm, in our case we are not grid connected. The



idea is it is a mobile test facility. And the grid

connection results in a lot of issues that, not only the

community, but funding issues, we are just not ready to

tackle yet. So we are looking at this in a mobile sense.

And, umm, the site that we are considering is about

two nautical miles off of Newport.

So this is a drawing, a conceptual drawing, of what

the test facility looks like, the test berth itself. And

we are working with a design team of SAIC, Hyak

Electroworks. Glosten and Associates are working on a

mooring system. Peregrine Power is working on the power issue. And then R.E.C.S. is a company that's putting in the hull.

And it's a composite hull in a boat shape. It is formed after the NOMAD style buoy that NOAA uses. Umm, it has internal spaces that are all subdivided so they are all watertight, and it's designed to be a plug and play, so a variety of different devices could use our testing facilities, and they will literally plug their device into the Mobile Ocean Test Berth. And we would be measuring the current, the voltage, and the, uh, -- of the device itself.

There's other parts of the device that are bilge pumps, the shore -- The data would be transmitted back to shore. So we collect data about how the device is creating energy, and that data would go back to shore for analysis.

1 And there are auxiliary sensors that are looking at the

2 motion of the test -- I'm sorry -- the motion of the device

3 under test, and checking the strains on that device and, as

4 I said, the power off of that device.

5 So this is -- This is a conceptual drawing of the

6 typical type wave energy conversion device that we are

7 focusing our efforts on being able to test at this point in

8 time. So I showed you a bunch of slides of lots of

9 different types of wave energy conversion devices, but,

10 umm, we think that it will be these point absorbers that,

11 umm, that will use our services the most.

12 And this is a picture of a three-point mooring

13 system, and this is how the point absorbers will typically

14 be moored. So you've got the device in the

middle, you've

got the power cable coming out the bottom, and you've got

the three, uh, three mooring systems, and the anchoring

system would vary depending on the device. We look at

probably a large dead weight anchor as the anchor that we

would use.

Now it gets a little more hairy. This is a picture

depicting what it would look like for our testing facility

connected to the wave energy device.

So, umm, we've got the wave energy device over here

with the three-point mooring. That's the photograph I just

showed you. And then it is connected to the test berth by

30

an underwater cable. The cable is probably going to be

about that big. A lot of data and a lot of information is

going to be pushed back and forth on that cable. And, uh,

it -- Conceptually right now it looks like that the test

berth itself will also be a three-point mooring. So you've

got quite a few more cables out in the ocean.

Okay. This is a description of the underwater

sub-sea pod. Some people call it a central junction box.

But it connects multiple wave energy devices and, uh, will

eventually be used for grid connection, although in our

case we would not use it in a grid connection because we

will not be grid connected. And it is an area that's

targeted research for Oregon State, and it's being covered

under NEPA because it's being funded by the Federal

Government.

So this is a picture of the site that we are

considering for the Mobile Ocean Test Berth, and, umm,

we've gone through a process where Oregon State has done two different tests of devices that were developed at Oregon State.

This test would be for commercial developers, but we do have some experience with testing of these devices that are -- that are not to the size that you are looking at with this one. We are looking at up to a megawatt, to have a capacity of up to a megawatt of energy from the



device. And the tests that we have done in the past were about 30 to 40 kilowatts. But, umm, -- So we know these devices need about 140 feet of water, out to possibly 200 feet of water. That's the area that we are targeting.

So we knew that there were some conditions that we

needed. We needed the 150 feet of -- 140 to 150 feet of depth, and we needed a soft, sandy bottom. And we wanted to make sure that it was close to a port so that we weren't spending a lot of boat time and lose a lot of operations in going back and forth, so we wanted to be close to a port.

We gave those considerations over to the FINE Committee, which is Fishermen Involved with Natural Energy, and we had discussions with them about where a site would be the least impact with them and from the fisheries standpoint, but meet the Oregon State criteria for that test berth.

So our final site will be one nautical mile by one nautical mile. But we have to date not honed in on exactly what one nautical mile, where it would be within this study area. So we have a big study area that's six square miles,

but the final site will be one square mile within that six square miles. And we have some additional community processes to go through to finalize the location of that one mile site.

Just some things to note. The red line on the map



is the Territorial Sea Line, and the territorial sea is what is under the jurisdiction of the State of Oregon, as opposed to what is beyond the Territorial Sea Line and is under the jurisdiction of the Mineral Management Service.

The regulations are different under the Mineral Management Service. That's not to say it is bad or good. It is different. We chose to be within the Oregon Territorial Sea. Primarily, that's the depth range that we are

targeting.

Okay. So other agencies and approvals that will be necessary for this project. So we are going through the NEPA process right now because the federal action is funding of this design, construction, and deployment of the Mobile Ocean Test Berth. But prior to the deployment there's a lot of other agencies involved. Primarily through the Corps of Engineers. So prior to deployment of this, we will need a permit from the Corps of Engineers, and we will do that process separately.

Uh, we will be going through consultations with NOAA; the National and Marine Fisheries Service; the Department of State Lands; Department of Land Conservation and Development to look at consistency with the territorial sea plans; the Department of Environmental Quality; the Coast Guard; Parks and Rec.

25 We will not be going through FERC because we are

33

1 not grid connected. That's the Federal Energy Regulatory

2 Commission. We are not grid connected, and so we don't go

3 through FERC. And we don't go through the Mineral

4 Management Service because we are within the territorial

5 sea.

6 So I just want to bring this up. Uh, as we've gone

7 through this process, it is important for us to have input

8 from the community. To date we have had really good input

9 from the FINE community, and they helped us understand some

10 of the issues that we will be facing when working with the

11 ocean, and have made us acutely aware of the impact that we

12 will have on the fishing industry.

But, uh, we also realize there are other people in the community that we would like to have engaged in the process. So as the test berth goes forward, not only to the design and the construction of the test berth, but on to the operation of the test berth, we felt it would be important to have a group of people from the community that would be involved in helping us make sure we are considering things, umm, that we -- that we may miss along the way, including discussions about the study, the study area and the siting area that we have.

So we have put together a Test Berth Committee, and in your packet there is an application form for that Test Berth Committee. It describes what we expect from people

who would like to be involved in this committee. And we anticipate the responsibility would be a commitment up to about two years, attend meetings, uh, around four times a year. Of course, that would be different depending on what was going on.

And the make-up of the committee, this is just a general description of it. The ones in the packet is just a little more accurate. This is a Mac, and I wasn't able to make the last minute changes to this. But basically the local communities, recreational fishermen, commercial fishing, ports, the wave energy device developers, the recreationalist, and conservationist, the marine researchers, the utility groups, economic development.

And, uh, the one missing off here is just the general public.

So I wanted to get in that little plug.

If you

17 want to be involved in the process, we would love to have

18 you involved through that Test Berth Committee.

19 I believe that's the last of my slides, and I will

20 turn it over to Kaety, who will talk about the public

21 comments.

22 KAETY HILDENBRAND: Great. So next we have quite a

23 bit of time, actually, to receive public comments. We do

24 have a microphone that's going to be going around.

25 Umm, we're going to limit it to three minutes per

35

1 speaker, and if time allows, you can speak again at the

2 end. We do have a court reporter present here, so make

3 sure to state your name in the beginning of comments. And

4 if you have a difficult spelling of your name, please spell

it out for us. And let us know if you are speaking as yourself or for a group. Again, the comment cards are in your packet as well.

To start it off, we're going to go down the list of when people said they want to comment when they signed in tonight. The first one is Chuck Pavlik. The microphone is coming.

JOHN HORST: I'm John Horst. Just go ahead and say your name again so it's on the record.

CHUCK PAVLIK: My name is Chuck Pavlik, P-A-V-L-I-K.

On your map here, your six-mile area, how long do you anticipate that that would be in effect, the six miles, before you go to your one square mile?

KAETY HILDENBRAND: So the purpose tonight is to look at and sort of scope out the entire six-mile site, and then through some of the things that are

addressed through

22 the process, as well as some other statements and comments

23 that are received through the various processes, umm, the

24 actual one-mile site will be chosen from all of those

25 comments. So in the near future, before the first buoy



1 goes into the water, we will have this one-mile site

2 selected. It's depending on various devices, and that

3 one-mile site could change, depending on the needs. I

4 guess that's one of the good things about staying mobile

5 with the test berth; we can move it around.

6 Does that answer your question?

7 CHUCK PAVLIK: Yeah. I live down the road in

8 Waldport. I'm a sports fisherman, and I keep a boat in

9 Newport six months out of the year, and I fish a lot right

in your blue area that you have highlighted. And, uh, it's a very popular halibut fishing area, salmon later in the year, as well as crabbing; not commercial, but sport. And, uh, basically, when I look at that, uh, I see a six-mile area where no trespassing signs are posted. Tell me that isn't so.

KAETY HILDENBRAND: The six miles will not be off limits. There will be a one-mile area that will be off limits, not six miles.

CHUCK PAVLIK: Okay. Did you -- When you were choosing your site, did you consider any areas further from Newport? Did you -- For instance, did you look, uh, at the area down by Waldport? When you get that far south, you've eliminated 98 percent of the sports fishing during the summer season out of Newport. There's literally

hundreds of boats that use this area, you know, like a



bunch of bees around the hive. They never get far from the jetties and the mouth in that area where you are at, a little bit south and a little further out. They stay pretty close to home. And, uh, just looking at your selection, uh, did you not look further south or further north to get further away from such a high use area?

KAETY HILDENBRAND: Umm, I'm kind of speaking for the people from OSU. In the criteria that was set down, for the people at OSU Waldport was too far for them. They wanted to be closer to, umm, the jetty entrance to be able to service that project.

CHUCK PAVLIK: Well, I can appreciate their desire

to have a convenient area, but Waldport is about 15 miles south, and, uh, they do have several million dollars worth of boats, OSU does, that are research vessels that could be used to get south or north to an area that didn't have any conflicts with sports fishermen out of Newport. Newport is the busiest area on the Oregon Coast as far as sports fishing goes. There are lots of boats, lots of fishing, a lot of people that use it for recreation all summer long. And, uh, for you to take away part of that area when there really isn't a need to, if you could just relocate a little ways, I think you have other options available.

JOHN HORST: Thank you very much.

KAETY HILDENBRAND: Uh, the next one that had a

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question mark next to the name is a John

Sherman. Is John

Sherman still here?

UNIDENTIFIED VOICE: He stepped out.

KAETY HILDENBRAND: Okay. Another name with a question mark was Mike Donnellan.

MIKE DONNELLAN: I'm Mike Donnellan, and --

JOHN HORST: Use this.

MIKE DONNELLAN: My name is Mike Donnellan. And I have a question just about the six-mile site. I understand it was developed with community input. So is that set in stone, or is that still, uh, potentially movable? In particular, I'll tell you why: Because Yaquina Head is an extremely important area for sea birds, in particular common murrers. About 80 or 90 thousand birds nest there and use that area, which is north, and, uh, British Columbia and Washington. And it's in a great whale migration corridor, so I was just wondering, is

that set in

18 stone?

19 LAURA MARGASON: Uh, Kaety did the last one, and

20 I'll get her out of the hot seat this time. So the answer

21 is that it is not cast in stone. We did go through a

22 process of what areas and what parameters Oregon State

23 developed were critical for the success of the Mobile Test

24 Berth, and then we did work with the FINE group to talk

25 about, you know, where from a fishing standpoint that area



1 would be best placed. And, uh, this six square miles that

2 we came up with, in the end there would be one square mile

3 that we would end up with. So, umm, it is at this point

4 the most desirable location for us, but it is not cast in

5 stone.

MIKE DONNELLAN: Thank you.

KAETY HILDENBRAND: Is there anybody else who wishes to comment that did not mark that?

JOHN HORST: Let me make my way to the back.

KAETY HILDENBRAND: Sure.

STEPHEN WEBSTER: Thank you very much.

JOHN HORST: What's your name?

STEPHEN WEBSTER: Umm, Stephen Webster. I've got two questions. Umm, if the site is finally permitted, is there any sunset to this permit? Is this in perpetuity? What's -- What's the time frame that the permit, uh, its life span?

LAURA MARGASON: You know, I have to say that I don't know how long the Corps of Engineers permit lasts. But our intent is that, umm, that we are looking at a ten-year horizon for the operation of the test berth. That is the best that we can foresee at this point

in time.

STEPHEN WEBSTER: My second question is, uh, what is your budget for ten years? What is your annual budget? If you could give some, uh, rough sketch of what that



budget entails.

LAURA MARGASON: Okay. Uh, the budget for the Mobile Ocean Test Berth is about 3 million dollars for the design and construction. And that's what we are looking for in the standpoint of funding.

Umm, the operation and maintenance and the management of the testing is to be determined. You know, we have some general ideas of, you know, how much management it would take and how much operation costs will be, but until that gets finally designed, we don't have

that information at this point.

STEPHEN WEBSTER: I don't have any other questions.

The only other comment I would like to make is I would be like Mr. Pavlik, noting that you are contending for prime real estate and that you couldn't choose an area that's probably more -- has any denser use in our region. Thank you.

JOHN HORST: Thank you. Appreciate your input.

Okay. Right here. I'd have you state your name.

JOHN LAVRAKAS: John Lavrakas, L-A-V-R-A-K-A-S.

I have a company, Advanced Research Corporation. We've recently figured an infrastructure investment for wave energy in Oregon. In it we learned that one of the issues that came out was the availability of emergency services for conditions when the, umm, things go wrong.

And in this case I would ask that attention be paid to those services as part of the environmental impact. It could be where someone works the vessel. When the ship gets in trouble, they get tangled up in the lines, or the vessel breaks free. In any of those things there is a tax on the emergency services. And they need to be aware of what kind of situations could occur so they are prepared; they have some kind of contingency planning that will work with you all working with them. That's my recommendation.

KAETY HILDENBRAND: Okay. I think I saw one more hand in the back.

JOHN HORST: Who had another comment? Okay.

DANIELLE ASSON: Hi, my name is Danielle Asson,

A-S-S-O-N, and I guess I had a question about -- You said it was going to be anchored by the three -- that little tripod anchor setup. And I was wondering if you were considering any other options for anchoring, because I know how much -- how much environment that those anchors actually impact, uh, like how big the concrete blocks have to be in order to keep that stable. And it doesn't seem very mobile to me as well.

I'm just wonder ing if you are taking that into consideration or if there are any other options on the table for anchoring. You know, I mean it is -- you have to figure out how best to do. But I do know that those

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anchors seem to have a pretty large impact on the

environment, and, also, I don't see how they would be easily moved. And so I was just wondering if you guys are considering anything else, if there are any other options on the table, if there is any way to do this with maybe a lesser environmental impact. That's all.

LAURA MARGASON: Okay.

JOHN HORST: Thank you very much.

LAURA MARGASON: We are, you know, in the early, early stages of the concept of the Mobile Ocean Test Berth. And depending on the final weight, that will be dictated by the components that are inside the mobile test berth, which are dictated by what the wave energy devices need us to provide them, uh, which will determine the types of mooring that we have to do.

So we are considering Danforth anchors, which are, you know, kind of a traditional type anchor, and the dead

weight anchors. And I think that the hope would be we could use Danforth anchors, but it will depend on the final weight and configuration of the test berth, whether those anchors will be adequate or not.

Also, with the mobile test berth itself, that anchoring system will stay for the duration of the test berth site, so they won't be moved. So there will be marker buoys that the test berth, when it does go into port



for maintenance, whatever, uh, they will stay there, and then it will come back out and hook up to those moorings.

Now, for the wave energy converter itself, those moorings will be brought in, and my understanding is that they bring in their full-size moorings. They are not able

to -- they want to test a full-scale ocean device. So they put in their full-scale mooring and anchoring system, and at the end of the test it is our plan to have them take those out. But the mooring system for the Mobile Ocean Test Berth will stay in.

DANIELLE HESTON: If you're planning on -- Danielle Heston, H-E-S-T-O-N.

If you're planning on testing multiple devices, is there any way that you could leave the mooring and just hook the mobile devices up to them?

LAURA MARGASON: Yeah, that's a -- That's a consideration, and it would be up to the wave energy device developers. The devices, by the time they get to the point where they are testing on a full scale, are very expensive. And there's a lot of liability associated with the moorings and anchoring systems that they would not want to pass from

one developer to another.

So based on experience in Europe, each device developer's anchoring and mooring system is a little bit different than the last one. So the chances that one



system would work for another are pretty slim. So our intent is that they would remove that at the end of their test -- remove their system at the end of the test.

DANIELLE HESTON: I got one more question.

LAURA MARGASON: Yeah.

DANIELLE HESTON: Uh, so when this finally comes, I guess, into being, uh, I don't know if you will be able to answer this. Umm, are you planning on testing multiple, like varying, all different types of wave energy things and

with the intention of putting them along the Oregon Coast,

or just to see, I guess, how they work?

And if you are going to -- if they are going to be

put on the coast, will we have a say in which device we

ultimately use? Because I know a little bit about the

devices, and I know which one I prefer. So will that --

will this process be continued when it comes to actually

starting to use that wave energy so we can base our

opinions on like which devices we think should be there

based on how much energy they give, and also with the

environmental impact?

LAURA MARGASON: Umm, that's a good -- A pretty

quick answer to that is, umm, only if it is federally

funded. Because the NEPA process is the public, umm,

involving the public. If it were an action that, uh,

either the Department of Energy or Army Corps

of Engineers,

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1 if it is a federally funded project, then yes, there will
2 be a public process to allow people to comment on.
3 The intent of this project is mainly to provide
4 testing. Umm, a little background: A lot of times you
5 need to verify a concept and test it in, umm, you know, in
6 an ocean environment in order to prove the capability of
7 the technology, and that is what this is going to be.
8 That's the intent of this test unit.
9 Where it goes from there, it's really up to the
10 developer at that point and what they foresee as an
11 applicable area for their deployment of their technology.
12 So the public will be able to come into play if it is
13 government funded at this point, you know.

But the permitting process does involve other federal agencies, so even if DOE doesn't, there is FERC and Army Corps and MMS, and they are all subject to the NEPA, and they have their own public review process. So it's always good to keep your ear open for these type of deployments.

DANIELLE HESTON: Thank you.

KAETY HILDENBRAND: Any other comments?

JOHN HORST: And, again, for this entire process, we are very grateful that you are here, and your concern to see some interest.

WIL BLACK: My name is Wil Black, and I also work



for Advanced Research Corporation. I have kind of a two-part question. They are related questions.

First of all, who -- who as far as wave developers have expressed an interest in putting their devices to be tested with the Mobile Ocean Test Buoy? And the second part of that is, umm, why would they want to do that when already they are putting devices by the end of the summer down in Reedsport doing this? And they are putting devices in the water around the world. Why do they need to use these?

MELEAH ASHFORD: Okay. I will answer those. We have a couple of developers, and I'm not going to name names, but we do have a couple of developers, and we plan on the first version of the test berth really to be focused on point absorbers, so those are ones that float vertically in the water, up and down, basically. And, umm, so we have talked with several people who are interested. We've got

some scheduling things to work out.

And, umm, the process that you are talking about in the south, in Reedsport, where OPT is planning to put their one buoy in there, they are just ahead of us. They have indicated that if the test berth was ready, they would use it, but they are ahead of us in the process.

So if they can go ahead without the need for the test berth, I think is what your second question is, why

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would you build a test berth? Umm, the OPT has tested their device, and is testing their device now at the test facility in Europe. The premiere test facility in the world is called the European Marine Energy Center. It's on the north shore of Scotland, the island of Orkney, and, umm, they have four test facilities there that

are grid

connected, and they are fairly well booked out. So there

is a lot of interest in testing these facilities. And OPT

has tested their device there. You can -- You can develop

your device without a test berth, but you don't get that

third party, reliable information that we believe and DOE

believes that the world needs.

You need a standardized process, you need

standardized testing, and it needs to be at some point a

third party so that it is well accepted.

WIL BLACK: So there has been pretty good industry

interest in that?

MELEAH ASHFORD: Yes, we are working with

developers at this point.

KAETY HILDENBRAND: Final comments?

JOHN HORST: Just restate your name.

MIKE DONNELLAN: My name is Mike Donnellan. I just

have one more question. It's my understanding that there's another federal funding wave energy project just offshore of this. Uh, it was a successful grant by OSU. I think it



was Minerals Management Service or something. So I'm just kind of wondering about the bigger context here.

KAETY HILDENBRAND: Yeah. I think the project you are referring to is actually not. It's related to sort of energy and the ocean, but it is not a wave energy project. It's actually a team of social scientists at Oregon State University looking at outer continental shelf uses and sort of how to mitigate or reduce conflict with energy producing devices that are put in the ocean. It is not specific to Oregon or this site. It's actually a project being done

both on the West Coast and on the East Coast. This is not a specific, you know, power project. It's looking at just how to reduce conflict more in different regions in the ocean. That's the only one that I know of that you might be thinking of.

MIKE DONNELLAN: Yeah, that sounds like it.

KAETY HILDENBRAND: Okay.

DICK BRIM: I'm Dick Brim. I apologize. I got here late. So if my question has been answered earlier, please let me know, and I'll get the (inaudible).

I'm curious. You have an onsite study area of six square miles with a final site of the one square mile. Can we assume that after you've made that final site selection that the other five square miles will be released and won't be used?

UNIDENTIFIED SPEAKER: That is correct. We made a commitment to the community, and the FINE group in Lincoln County was involved in that, that our site at this point would be one nautical mile by one nautical mile. And we were not able to come to a conclusion on exactly the one mile by one mile square yet, but there was general agreement about the six mile square area that allowed us to start the NEPA process. And before we get permits for deployment of the device, we will have one mile by one mile. And those are nautical miles.

DIFFERENT UNIDENTIFIED SPEAKER: I just want to clarify, those six miles are not closed now. It is not like they need to be released after we decide. We are just looking at it, so it's not closed. None of it

is closed at
this point.

DICK BRIM: Thank you.

KAETY HILDENBRAND: Anyone else?

JOHN HORST: I can handle this side of the room. I think we are okay.

LAURA MARGASON: Okay. I think it is official. I just want to thank everyone for the comments. We heard some really, very important things, umm, and received some great input. And rest assured, we're going to take all of your concerns and comments into consideration in developing the EA. Those of you who are on our mailing list, who have



received cards -- Those of you who have not, please make sure you send us some type of comment, or at least your name and address, to either -- preferably to

myself. I will make sure that you get on the distribution list for notification when the draft EA comes out. And other than that, that will be our next step. So thank you for attending tonight, and we appreciate all your comments.

SARAH HENKEL: I was just wondering, if people who spoke tonight, if they can still make any further comments?

LAURA MARGASON: Yes. I mentioned that before. You have until May 27th. Per our regulations, we have a 30-day window for scoping comments. It is the same with the draft environmental assessment comes out. It's going to be a 30-day window for anyone to provide their comments.

And so please have e-mail or mail your comments to me by the 27th. As long as they are postmarked, you know, we have a couple days. We are not very strict about dates,

but please try to have them in by that point. At that point we are already writing the EA draft, and we need those scoping comments by then.

Thank you, everyone.

(End of meeting)

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COURT REPORTER'S CERTIFICATE

I, Lee Blackwood, Certified Court Reporter for the State of Oregon, do hereby certify that the statements set forth in this matter are a true and correct transcript of said statements.

I further certify that the statements were made before me at the time and place set forth in the caption

hereof; that at said time and place I reported in Stenotype all proceedings had in the foregoing matter; that thereafter my notes were transcribed by me; and that the foregoing 50 pages constitute a true and accurate transcript of my original stenographic notes.

In witness whereof, I have hereunto affixed my signature this 21st day of June, 2010.

Lee Blackwood
Certified Court Reporter
Certificate No. 90-0130

# Scoping Meeting Sign-In List

*U. S. Department of Energy*
*NEPA Scoping Meeting for the Northwest National Marine Renewable Energy Center (NNMREC)*
*May 5th, 2010*

| NAME | ADDRESS/ZIP CODE | ORGANIZATION | TELEPHONE | EMAIL ADDRESS | Do you wish to **comment** tonight? |
|---|---|---|---|---|---|
| Chuck Pavlik | 785 Bayview Lp Waldport OR. | Sport Fisher | 563-5965 | Muleskinner@Peak-ORG | yes |
| John Lavrakas | 1542 N Nye st Newport 97365 | Advanced Research Corp | 265-9690 | jlavrakas@oregonarc.com | |
| Bob Hardy | | Self | 921-0294 | | No |
| Danielle Asson | | self | | | |
| Danielle Heston | 97333 | self | | | No |
| Theresa Wisner | PO Box 434 97380 | AMP | 541-444-2334 | twisner@hughes.net | no |
| MIKE MORROW | Po Box 942 Corvallis OR 97339 | M3 WAVE | 541 602 4160 | MIKE@M3WAVE.COM | No |
| Maryann Bozza | HMSC | | | maryann.bozza@oregonstate.edu | No |
| Richard Brun | 870 SW 29th St #D Newport, Or 97365 | | 541-867-7051 | rockymtn_5@hotmail.com | No |
| Jed Smith | 157 NW 15th St. Newport OR 97365 | ARC | 541 2659890 | jsmith@oregonarc.com | NO |
| Wil Black | 88 Pioneer Trail Toledo. OR | Advanced Research Corp | 541-270-9512 | wil.black@oregonarc.com | no |

*U. S. Department of Energy*
*NEPA Scoping Meeting for the Northwest National Marine Renewable Energy Center (NNMREC)*
*May 5th, 2010*

| NAME | ADDRESS/ZIP CODE | ORGANIZATION | TELEPHONE | EMAIL ADDRESS | Do you wish to **comment** tonight? |
|---|---|---|---|---|---|
| Terry Lettenmaier | PO Box 550, South Bch | | 541-867-4603 | lett@peak.org | No |
| Yvonna Lekiland | PO Box 757 Waldport OR 97394 | | 541-563-4046 | wldpt@yahoo.com | no |
| STEPHEN WEBSTER | 113 SE BAY Blvd Nt. | | 265-9213 | siletzbw@charter.net | no |
| Sharon Nieukirk | | OSU | 541 867 0268 | sharon.nieukirk@oregonstate.edu | No |
| John Sherman | P.O. Box 1676 Newport 97365 | | — | — | ? |
| MIKE DONNELLAN | | ODFW | | | ? |
| Bruce Lovelin | | CLPUD | | blovelin@cencoast.com | No |
| Caren Braby | | ODFW | | | |
| KHEM SO | 417 SW 6th | | | Abhayadana@yahoo.com | |
| Sreanna Steingass | Hatfield | OSU | 307-752-0244 | steingas@onid.orst.edu | no |
| | | | | | |

*U. S. Department of Energy*
*NEPA Scoping Meeting for the Northwest National Marine Renewable Energy Center (NNMREC)*
*May 5th, 2010*

| NAME | ADDRESS/ZIP CODE | ORGANIZATION | TELEPHONE | EMAIL ADDRESS | Do you wish to **comment** tonight? |
|---|---|---|---|---|---|
| Sarah Burnett | 1877 21st Ave SE # 28 Albany, OR | OSU | 972-965-1355 | burnetsa@onid.orst.edu | No |
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# Appendix B: Agency Correspondence

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 27, 2010

Thomas Taylor
Regulatory Project Manager
U.S. Army Corps of Engineers
CENWP-OD-GP
333 SW First Avenue
Portland, OR 97204

SUBJECT: INVITATION FOR COOPERATING AGENCY STATUS

Dear Mr. Taylor:

As you are aware, the U.S. Department of Energy (DOE) Golden Field Office in Colorado is the lead agency in preparing an Environmental Assessment (EA) for the development of a Mobile Ocean Test Berth (MOTB) located approximately two miles off the coast of Oregon near the city of Newport. The proposed project is expected to deliver a mobile capability for testing the output of wave energy conversion (WEC) devices for the generation of electricity. The Northwest National Marine Renewable Energy Center (NNMREC), led by Oregon State University, is the proponent of the project. NNMREC was established through the DOE Water Power Program and local funding to support wave and tidal energy development for the United States. DOE's Proposed Action is to provide funding to NNMREC to support the design, construction, testing, and deployment of a MOTB to perform off-electrical-grid testing of WEC devices.

During the first quarter of CY 2010, interactions regarding this project occurred between the EA contractor, NNMREC, and U.S. Army Corps of Engineers (USACE) to address project overviews and status of activities. In addition, on April 27, 2010, the USACE was provided with a Notice of Scoping for the proposed project and associated EA. Since the proposed project must meet the permitting requirements of Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, the DOE would like to extend an invitation to the USACE to become a cooperating agency in the development of the document. We anticipate the delivery of the Preliminary Draft EA by August 9th. If formal status as a cooperating agency is not desired, please provide us with the level of involvement the USACE deems appropriate for the process.

We look forward to your response and the opportunity to continue to work together on this important alternative energy test project.

Regards,

Laura Margason

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

July 29, 2010

Roger Roper
Deputy State Historic Preservation Officer
Oregon Parks and Recreation Department
State Historic Preservation Office
725 Summer Street NE, Suite C
Salem, OR 97301

**Subject: Request for Opinion; Proposed Oregon State University Wave Energy Project, Newport, Oregon**

Dear Mr. Roper:

This letter is to inform you that the U.S. Department of Energy (DOE) is preparing an Environmental Assessment (EA), in accordance with the National Environmental Policy Act (NEPA), for the proposed Northwest National Marine Renewable Energy Center (NNMREC) Mobile Ocean Test Berth (MOTB). The NNMREC is a DOE funded partnership between Oregon State University and University of Washington.

The proposed MOTB would be sited off the coast of Newport, Oregon (T. 10 N., R. 12 W., W.M). The analysis conducted pursuant to NEPA will cover a larger "Study Area" of approximately 2 X 3 miles in the Pacific Ocean. During final design a smaller 1 X 1 mile Test Site will be identified in which up to two MOTBs would be deployed. The final Test Site location is currently being determined through the NEPA and a site selection processes in conjunction with local governmental groups, the local community, and the Fisherman Interested in Natural Energy (FINE), a Newport fishing group. Each MOTB would be connected to one wave energy conversion (WEC) device. The MOTB would be capable of testing the output of a variety of wave energy conversion WEC devices without being connected to the electrical grid as a cost-effective means to evaluate the technical aspects, performance characteristics, and environmental impacts of developing marine renewable energy. One underwater sub-station pod (USP) may also be included in the facility and would be connected to both MOTBs and WEC devices.

The MOTB consists of a single-hull vessel, containing an adjustable load bank (ALB), submarine power cable, power analysis and data acquisition (PADA) unit, transformers,

and miscellaneous instruments and equipment. The hull would be approximately 14 feet wide by 32 feet long by 11 feet high and including equipment, would weigh approximately 45,000 pounds. The PADA measures the WEC device's output voltage and current waveforms with respect to time at high sampling rates. The ALB dissipates power generated from the WEC device by transforming it into heat that is dissipated into the ocean. Also included in the NEPA analysis is a USP, which enables the power take-off cables from multiple test berth modules and wave energy devices to be connected, and enables the power to be delivered back to shore via a single subsea cable.

The MOTB would likely be moored to an anchoring system on the sea floor consisting of a three-point mooring system with standard ship-type anchors (Stato anchors). The WEC devices would use a range of independent mooring and anchoring configurations depending on the device design; however, it is anticipated that they would also use a three-point mooring configuration. The MOTB and WEC device would be connected by a submarine power cable. The USP would also be moored to the sea floor during testing. The monitoring equipment would either be set on the sea floor (AWAC) or moored (Waverider, ADCPs, Plankton plates, etc.).

This project is the recipient of funding from the federal government, and requires a permit from the U.S. Army Corps of Engineers (Corps) for work in waters. The DOE is the lead Federal Agency responsible for compliance with Section 106 of the National Historic Preservation Act (NHPA). Pursuant to compliance with Section 106 of the NHPA, DOE is initiating consultation with your office regarding the proposed Area of Potential Effects (APE) for this wave energy project. Enclosed please find maps that illustrate the proposed APE for this project.

A record search was conducted at the State Historic Preservation Office (SHPO) in Salem, Oregon, in February of 2010. The records search was used to identify previously documented archaeological, historic, and architectural resources within, and directly adjacent to, the APE, and to help establish a context for developing expectations about potential resources within the study area. No cultural resource surveys have occurred in, or within one mile of, the APE. No archaeological sites or isolates were identified in, or within one mile of, the APE. In addition, an analysis of historic shipwreck locations along the Oregon Coast (Marshall 1984) indicated that no recorded wrecked ships are located within the APE.

Please provide any comments within 30 days of the stamped date on this letter to assist us in the development of the EA.

We look forward to hearing from you regarding this project. Please feel free to contact me by phone at 720.356.1322 or via email at laura.margason@go.doe.gov if you have any questions or comments.

Sincerely,

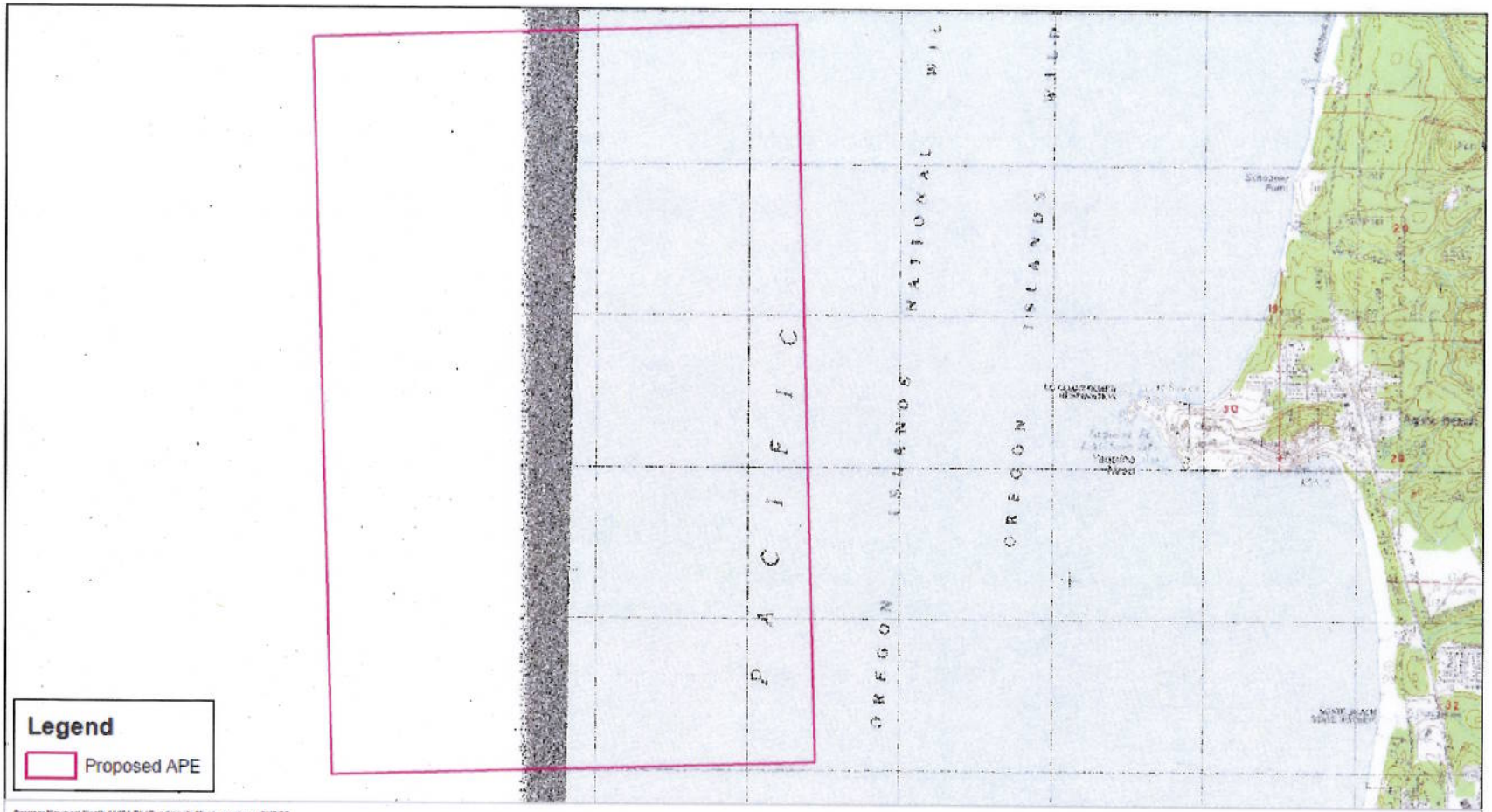
Laura Margason

Laura Margason
NEPA Document Manager

Enclosures:

USGS 1:24,000 scale map Newport North, with project APE overlay
National Geographic Society TOPO (courtesy of ESRI) of MOTB Study Area

cc: Dr. Dennis Griffin, State Archaeologist


PACIFIC
OREGON ISLANDS NATIONAL WILDLIFE REFUGE
Legend
Proposed APE
Source: Newport North 44124-F1 (Quadrangle Map), courtesy of USGS
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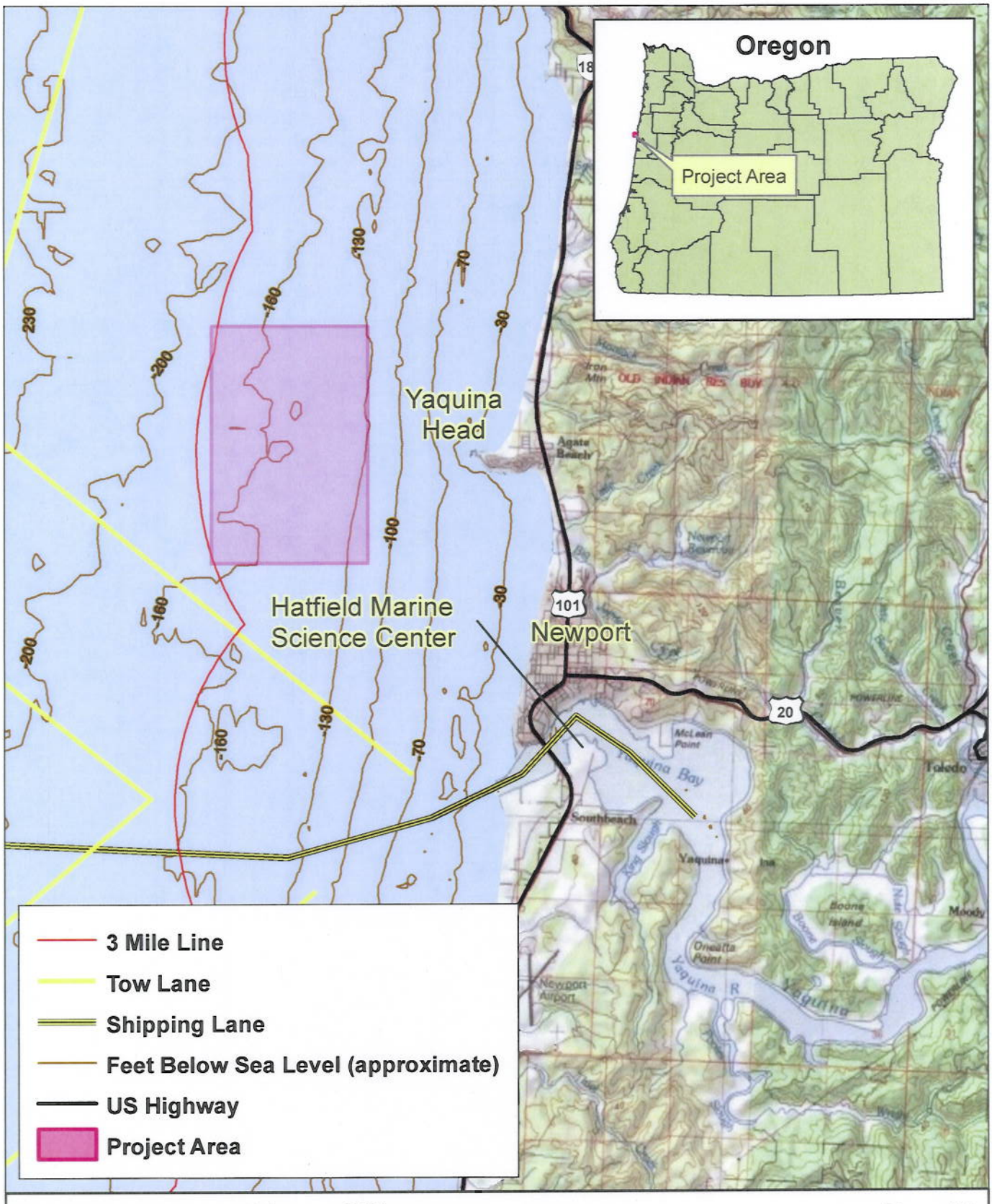
Meters 0 1,500 3,000
Feet 0 5,000 10,000
1:24,000
Oregon State University
Wave Energy
Proposed Area of Potential Effects
Map prepared by:
ICF
March 16, 2010




Source: National Geographic Society TOPO, courtesy of ESRI

**Figure 2-1**
**Mobile Ocean Test Berth**
**Project Area**

ICF INTERNATIONAL

Oregon
Theodore R. Kulongoski, Governor

Parks and Recreation Department
State Historic Preservation Office
725 Summer St NE, Ste C
Salem, OR 97301-1266
(503) 986-0671
Fax (503) 986-0793
www.oregonheritage.org

August 9, 2010

Ms. Laura Margason
DOE Golden Field Office
1617 Cole Blvd
Golden, CO 97401

RE: SHPO Case No. 10-1830
OSU Wave Energy Proj
10S 12W, Newport Lincoln County

Dear Laura:

Our office recently received your report about the project referenced above. I have reviewed your report and agree that the project will have no affect on any known cultural resources. No further archaeological research is needed with this project.

Please be aware, however, that if during development activities you or your staff encounters any cultural material (i.e., historic or prehistoric), all activities should cease immediately and an archaeologist should be contacted to evaluate the discovery. Under state law (ORS 358.905-955) it is a Class B misdemeanor to impact an archaeological site on public or private land in Oregon. Impacts to Native American graves and cultural items are considered a Class C felony (ORS 97.740-760). If you have any questions regarding any future discovery or my letter, feel free to contact our office at your convenience.

Dennis Griffin

Dennis Griffin, Ph.D., RPA
State Archaeologist
(503) 986-0674
dennis.griffin@state.or.us

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

June 19, 2012

Roger Roper
Deputy State Historic Preservation Officer
Oregon Parks and Recreation Department
State Historic Preservation Office
725 Summer Street NE, Suite C
Salem, OR 97301

**Subject: Update regarding Proposed Oregon State University Wave Energy Project, Newport, Oregon**

Dear Mr. Roper:

This letter is to provide you with an update on the U.S. Department of Energy (DOE) Environmental Assessment (EA), which is being prepared in accordance with the National Environmental Policy Act (NEPA), for the proposed Northwest National Marine Renewable Energy Center (NNMREC) Wave Energy Test Project. The NNMREC is a DOE funded partnership between Oregon State University and University of Washington.

In our letter dated July 29, 2010, DOE described the location where the proposed project would be sited, the components that would comprise the proposed project, and the specifications for those components. DOE's letter also described the record search that was conducted at the State Historic Preservation Office (SHPO) in Salem, Oregon, in February of 2010 and stated DOE's conclusion that no cultural, archeological, or historical sites are located within the area of potential effect (APE) for the proposed project. A figure illustrating the APE was enclosed in the 2010 letter and is also enclosed in this correspondence. In a letter dated August 9, 2010, the Oregon SHPO replied with their concurrence that the project would have no effects on known cultural resources.

At that time, it was anticipated that the Draft EA for the proposed project would be published in late 2010; however, the preparation of the Draft EA was postponed temporarily. During this time, NNMREC made minor changes to the proposed project. For example, these included changing the test apparatus (described as the Mobile

Ocean Test Berth or MOTB during scoping) from a 30- to 40-foot boat-shaped hull capable of testing loads up to 1 megawatt, to the Ocean Sentinel, a 6-meter NOMAD-shaped buoy capable of testing loads up to 100 kilowatts. The duration of deployments for the testing apparatus was shortened from 12 months to 3 to 6 months. The range of possible anchoring and mooring infrastructure was narrowed, and the standoff distance between the test buoy and the WEC device under test was decreased. The first WEC device (the WET-NZ device) to be tested at the project site was identified, though it fell within the parameters for likely WEC devices that would be tested as described in scoping. During scoping, the project site was defined as a 6-square-mile quadrant. Later, the project site was narrowed down to a 1-square-nautical-mile area within the original, larger site. DOE is presently revising the Draft EA to reflect all changes to the proposed Project and anticipates releasing the Draft EA in late June of 2012.

Because the specific location of site for the proposed project was refined to a smaller area within the original larger site and the activities that would take place as part of the proposed project are do not differ materially from those described during earlier consultation carried out pursuant to Section 106 of the National Historic Preservation Act, DOE believes that the SHPO's concurrence (letter dated August 9, 2010) also applies to the project in its current form.

If you have any questions or comments regarding this project, please feel free to contact me by phone at 720.356.1322 or via email at laura.margason@go.doe.gov.

Sincerely,

Laura Margason

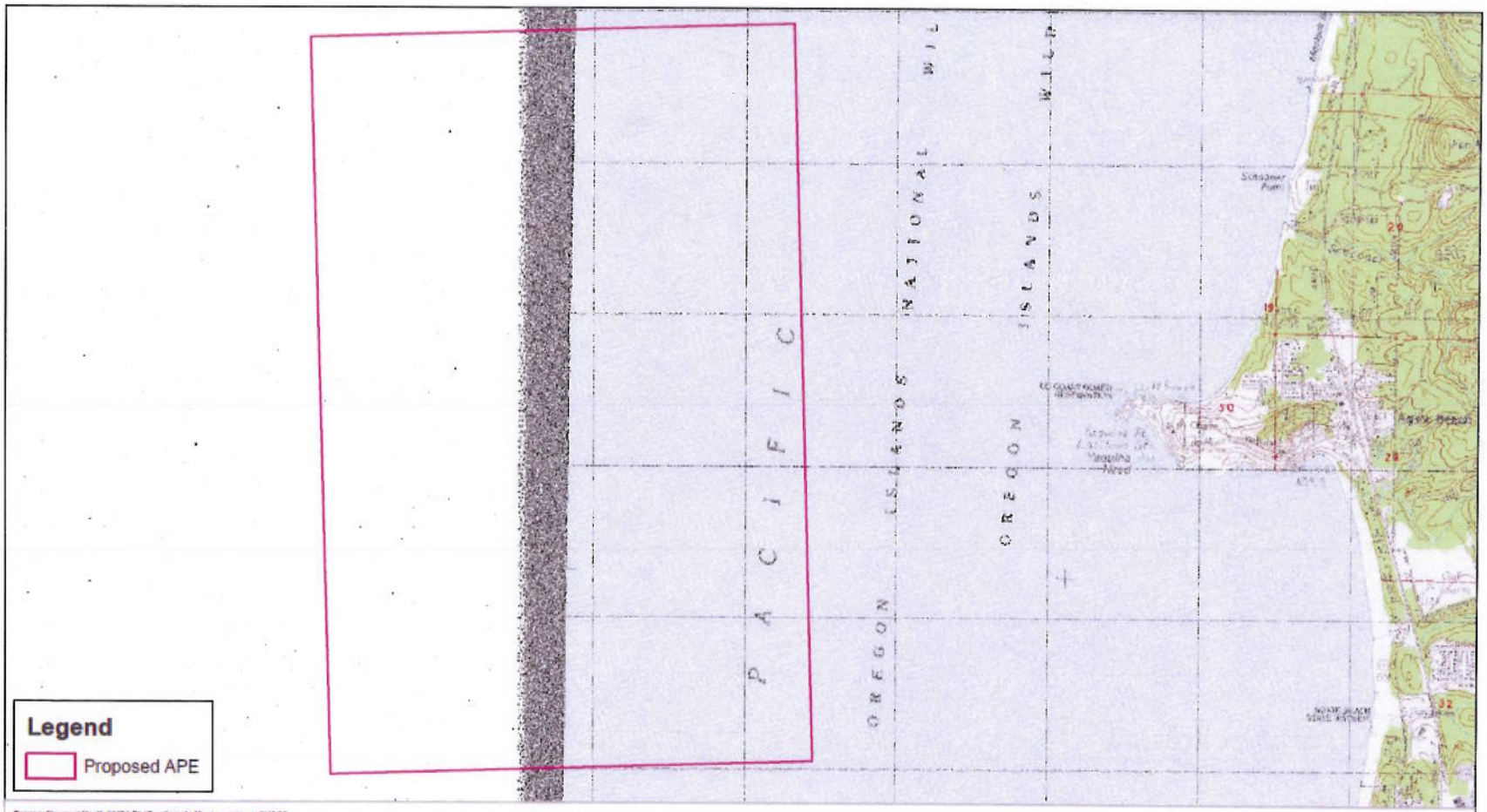
Laura Margason

NEPA Document Manager

Enclosures:

USGS 1:24,000 scale map Newport North, with project APE overlay
National Geographic Society TOPO (courtesy of ESRI)

cc: Dr. Dennis Griffin, State Archaeologist


PACIFIC
OREGON ISLANDS NATIONAL WILDLIFE REFUGE
OREGON ISLANDS WILDERNESS
Legend
Proposed APE
Source: Newport North 44124-F1 (Quadrangle Map), courtesy of USGS
Meters 0 1,500 3,000
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1:24,000
Oregon State University
Wave Energy
Proposed Area of Potential Effects
Map prepared by:
ICF
March 16, 2010

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

January 11, 2012

Keith Kirkendall
Habitat Conservation Division
National Marine Fisheries Service-Northwest Region
1201 NE Lloyd Blvd.
F/NWRS, Room 1100
Portland, OR 97232-1274

**Subject: Endangered Species Act, Magnuson-Stevens Fisheries Conservation and Management Act, and Marine Mammal Protection Act Consultation for the Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Facility Project, Newport, Oregon**

Dear Mr. Kirkendall:

The U.S. Department of Energy (DOE) proposes to authorize the expenditure of Federal funding to the Northwest National Marine Renewable Energy Center (NNMREC) and Oregon State University to support their Wave Energy Test Facility Project (Project). The funding of NNMREC's proposed Project would enable of final design, construction, and initial operation, including deployment, of a wave energy testing facility that would be able to perform off-grid testing of Wave Energy Conversion (WEC) devices. The proposed Project would allow for testing the output of WEC devices in an open-water setting, studying the environmental effects of a range of wave energy technologies, and supporting the market development of environmentally sustainable technologies that harness wave energy to generate electricity in a manner compatible with ocean and coastal environments and coastal users.

Implementation of the proposed Project, as funded by DOE, would entail deploying up to two WEC devices and their associated moorings in the project site, operating the devices, and recovering the devices. Additional WEC device testing by NNMREC is anticipated throughout the life of the wave energy testing facility. It is estimated that each WEC devise would be deployed for a period of up to 12 months. Each WEC device mooring system would consist of up to a four-point mooring configuration that may be left in place between WEC deployments. Project operations would also involve deploying either a manned vessel carrying a test device or up to two instrumentation buoys to be connected to the WEC devices for testing. The instrumentation buoys could receive power from the WEC devices and would analyze and record technical data on the power generation. The instrumentation buoys would have their own mooring systems that would consist of up to a four-point mooring and would be connected to the WEC devices by a floating or submerged cable at a distance of approximately 100 meters (328 feet). The instrumentation buoys would be unmanned during the test. Tests would run for 1 to 6 months during the months of May to October, although the WEC devices might remain on site

for longer, as noted above. Depending on the preferences, any of three possible testing scenarios could be implemented at the project site:

1. The WEC developers could deploy WEC devices and monitor their power generation using equipment contained within the device. Such deployments would typically last at least several months and could continue for as long as 12 months, thus, allowing WEC developers to see how their devices handle the severe winter storms that affect this region. NNMREC may help developers with the design and construction of the internal testing equipment.

2. The WEC devices could be monitored using test equipment deployed on a vessel. In this case the WEC devices would be connected to the vessel by a floating or submerged electrical cable at a distance of approximately 100 meters (328 feet). The vessel would be manned at all times and stationed using its own anchor. Due to the expense of keeping a manned vessel on site, such tests would not be expected to last more than 10 days. The WEC devices might remain on site for a longer period of time to demonstrate the survivability of the device. In this case, the power generation unit would either be taken off line, or directed toward an on-WEC load (e.g., a resistor bank).

3. The WEC devices could be monitored using test equipment deployed in self-contained instrumentation buoys. The instrumentation buoys would have their own mooring system that would consist of up to a four-point mooring configuration and would be connected to the WEC devices by a floating or submerged cable at a distance of approximately 100 meters (328 feet). The instrumentation buoys would be unmanned during the test. Tests would run for 1 to 6 months, although the WEC device itself might remain on site for longer, as noted above.

At the end of the proposed Project, WEC devices and the instrumentation buoys would be permanently removed from the site. All mooring components would be permanently removed at this time, with the possible exception of anchors, which may be decommissioned on site.

The proposed Project would be located within a 3.4-square-kilometer (1-square-nautical-mile) site (project site) in the Pacific Ocean off the Oregon coast near the city of Newport (see Figure 1-1 in the enclosed Biological Assessment). The final project site was refined through environmental studies and consultation with stakeholders and other interested parties, including the NNMREC research team, Hatfield Marine Science Center, Fisherman Involved in Natural Energy, and Oregon Sea Grant. Over a 24-month period, beginning prior to scoping and during more than 12 months of preliminary project development, NNMREC conducted a site selection process, which involved stakeholders and interested parties and resulted in a variety of site criteria.

DOE has prepared a Biological Assessment (BA), which includes a detailed description of the proposed Project and addresses the potential effects of the proposed Project on species listed as endangered or threatened, or proposed for such listing, under the Endangered Species Act (ESA) as well as the proposed Project's effects on critical habitat. The enclosed BA also

incorporates an evaluation of the potential effects of the proposed Project on Essential Fish Habitat (EFH), in compliance with the Magnuson-Stevens Fishery Conservation and Management Act, as amended in 2007, and establishes proposed Project compliance with the Marine Mammal Protection Act, as amended in 2007. The BA is enclosed with this letter. The conclusions of the BA are summarized below.

**Endangered Species Act: Listed Species and Designated Critical Habitat**

DOE has determined that the proposed Project ***may affect, but is not likely to adversely affect*** the following species under the jurisdiction of the National Marine Fisheries Service:

- Chinook salmon, lower Columbia River ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, upper Willamette River ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, upper Columbia River spring-run ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, Snake River spring/summer run ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, Snake River fall-run ESU (*Oncorhynchus tshawytscha)*
- Coho salmon, Southern Oregon/Northern California coast ESU (*Oncorhynchus kisutch)*
- Coho salmon, Oregon coast ESU (*Oncorhynchus kisutch)*
- Coho salmon, lower Columbia River ESU (*Oncorhynchus kisutch)*
- Green sturgeon, southern DPS (*Acipenser medirosris)*
- Eulachon, southern DPS (*Thaleichthys pacificus)*
- Leatherback turtle (*Dermochelys coriacea)*
- Green sea turtle (*Chelonia mydas*)
- Loggerhead tea turtle, Pacific DPS (*Caretta caretta*)
- Olive Ridley sea turtle (*Lepidochelys olivacea*)
- Steller sea lion, eastern DPS (*Eumetopias jubatus)*
- Killer whale, southern resident DPS (*Orcinus orca)*
- Humpback whale (*Megaptera novaeangliae)*
- Blue whale (*Balaenoptera musculus)*
- Fin whale (*Balaenoptera physalus* )

Designated Critical Habitat (DCE) has been identified for several of the species listed above. DOE has determined that the proposed Project would have ***no effect*** on DCE for the following species:

- Chinook salmon, lower Columbia River ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, upper Willamette River ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, upper Columbia River spring-run ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, Snake River spring/summer run ESU (*Oncorhynchus tshawytscha)*
- Chinook salmon, Snake River fall-run ESU (*Oncorhynchus tshawytscha)*
- Coho salmon, Southern Oregon / Northern California coast ESU (*Oncorhynchus kisutch)*
- Coho salmon, lower Columbia River ESU (*Oncorhynchus kisutch)*
- Eulachon, southern DPS (*Thaleichthys pacificus*)
- Green sea turtle (*Chelonia mydas*)
- Steller sea lion, eastern DPS (*Eumetopias jubatus)*
- Killer whale, southern resident DPS (*Orcinus orca)*

DOE has determined that the proposed Project ***may affect, but is not likely to adversely modify*** DCE for the following species:

- Coho salmon, Oregon coast ESU (*Oncorhynchus kisutch)*
- Green sturgeon, southern DPS (*Acipenser medirosris)*
- Leatherback turtle, eastern DPS (*Dermochelys coriacea)*

**Magnuson-Stevens Fisheries Conservation Act: Essential Fish Habitat**

The area in which the proposed Project would take place includes designated EFH for three fishery management plans: coastal pelagics, Pacific coast groundfish, and Pacific salmon. The species covered in these three fishery management plans are summarized in Tables 8-1, 8-2, and 8-3 in the BA prepared by DOE and enclosed with this letter. DOE has determined that the proposed Project ***would not adversely affect*** designated EFH for federally managed fisheries in Oregon waters.

**Marine Mammal Protection Act**

Marine mammals are protected under the Marine Mammal Protection Act of 1972, which restricts the taking, possession, transportation, selling, offering for sale, and importing of marine mammals. In addition to the five marine mammal species listed under the ESA, a number of other marine mammals are likely to occur in the project site or in the nearby surrounding waters. Marine mammal species likely to occur in and around the project site include cetaceans and pinnipeds and are described in Section 5.10 of the enclosed BA.

The most common year-round inhabitants are the pinnipeds, including the Pacific harbor seal and Steller sea lion. Male California sea lions and northern elephant seals are occasionally observed foraging in southern and central Oregon coastal areas but are not regular inhabitants. Section 6.1.18 of the enclosed BA includes an analysis of effects of the proposed Project on the Steller sea lion, eastern DPS and identifies potential impact mechanisms that can be considered applicable to other pinniped species in and around the project area.

Cetaceans potentially present in and around the project area include the transient killer whale, California gray whale, killer whale of the southern resident group, blue whale, finback whale, sei whale, Pacific right whale, humpback whale, and sperm whale. Section 6.1.19 though Section 6.1.22 of the enclosed BA includes an analysis of effects on cetacean species listed under the ESA. It describes potential impact mechanisms that can be considered applicable to other cetacean species in and around the project area.

In Section 7.18 of the BA, which includes the effects determination for the Steller sea lion, eastern DPS, DOE concludes that the proposed Project would result in an insignificant probability of incidental take for this species. In Section 7.19 through Section 7.22, which includes the effects determination for the four cetacean species analyzed in the BA, DOE concludes that the proposed Project would result in an insignificant probability of incidental take for these species.

Because the impact mechanisms and potential impacts for pinniped and cetacean species in and around the proposed Project area would be similar to those for the ESA-listed species analyzed in detail in the enclosed BA, DOE has determined that incidental take of marine mammals is unlikely to occur.

DOE requests your concurrence with the findings summarized above and detailed in the enclosed BA. We look forward to hearing from you regarding this project. Please feel free to contact me by phone at 720.356.1322 or via email at laura.margason@go.doe.gov if you have any questions or comments.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

*Enclosures*

*Biological Assessment for the Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Facility Project*

**Department of Energy**
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

January 11, 2012

Ann Grey
Program manager
U.S. Fish and Wildlife Service
2600 SE 98th Avenue, Suite 100
Portland, OR 97266

**Subject: Endangered Species Action Section 7 Informal Consultation for the Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Facility Project, Newport, Oregon**

Dear Ms. Grey:

The U.S. Department of Energy (DOE) proposes to authorize the expenditure of Federal funding to the Northwest National Marine Renewable Energy Center (NNMREC) and Oregon State University to support their Wave Energy Test Facility Project (Project). The funding of NNMREC's proposed Project would enable of final design, construction, and initial operation, including deployment, of a wave energy testing facility that would be able to perform off-grid testing of Wave Energy Conversion (WEC) devices. The proposed Project would allow for testing the output of WEC devices in an open-water setting, studying the environmental effects of a range of wave energy technologies, and supporting the market development of environmentally sustainable technologies that harness wave energy to generate electricity in a manner compatible with ocean and coastal environments and coastal users.

Implementation of the proposed Project, as funded by DOE, would entail deploying up to two WEC devices and their associated moorings in the project site, operating the devices, and recovering the devices. Additional WEC device testing by NNMREC is anticipated throughout the life of the wave energy testing facility. It is estimated that each WEC devise would be deployed for a period of up to 12 months. Each WEC device mooring system would consist of up to a four-point mooring configuration that may be left in place between WEC deployments. Project operations would also involve deploying either a manned vessel carrying a test device or up to two instrumentation buoys to be connected to the WEC devices for testing. The instrumentation buoys could receive power from the WEC devices and would analyze and record technical data on the power generation. The instrumentation buoys would have their own mooring systems that would consist of up to a four-point mooring and would be connected to the WEC devices by a floating or submerged cable at a distance of approximately 100 meters (328 feet). The instrumentation buoys would be unmanned during the test. Tests would run for 1 to 6 months during the months of May to October, although the WEC devices might remain on site for longer, as noted above. Depending on the preferences, any of three possible testing scenarios could be implemented at the project site:

1. The WEC developers could deploy WEC devices and monitor their power generation using equipment contained within the device. Such deployments would typically last at least several months and could continue for as long as 12 months, thus, allowing WEC developers to see how their devices handle the severe winter storms that affect this region. NNMREC may help developers with the design and construction of the internal testing equipment.

2. The WEC devices could be monitored using test equipment deployed on a vessel. In this case the WEC devices would be connected to the vessel by a floating or submerged electrical cable at a distance of approximately 100 meters (328 feet). The vessel would be manned at all times and stationed using its own anchor. Due to the expense of keeping a manned vessel on site, such tests would not be expected to last more than 10 days. The WEC devices might remain on site for a longer period of time to demonstrate the survivability of the device. In this case, the power generation unit would either be taken off line, or directed toward an on-WEC load (e.g., a resistor bank).

3. The WEC devices could be monitored using test equipment deployed in self-contained instrumentation buoys. The instrumentation buoys would have their own mooring system that would consist of up to a four-point mooring configuration and would be connected to the WEC devices by a floating or submerged cable at a distance of approximately 100 meters (328 feet). The instrumentation buoys would be unmanned during the test. Tests would run for 1 to 6 months, although the WEC device itself might remain on site for longer, as noted above.

At the end of the proposed Project, WEC devices and the instrumentation buoys would be permanently removed from the site. All mooring components would be permanently removed at this time, with the possible exception of anchors, which may be decommissioned on site.

The proposed Project would be located within a 3.4-square-kilometer (1-square-nautical-mile) site (project site) in the Pacific Ocean off the Oregon coast near the city of Newport (see Figure 1-1 in the enclosed Biological Assessment). The final project site was refined through environmental studies and consultation with stakeholders and other interested parties, including the NNMREC research team, Hatfield Marine Science Center, Fisherman Involved in Natural Energy, and Oregon Sea Grant. Over a 24-month period, beginning prior to scoping and during more than 12 months of preliminary project development, NNMREC conducted a site selection process, which involved stakeholders and interested parties and resulted in a variety of site criteria.

DOE has prepared a Biological Assessment (BA), which includes a detailed description of the proposed Project and addresses the potential effects of the proposed Project on species listed as endangered or threatened, or proposed for such listing, under the Endangered Species Act (ESA) as well as the proposed Project's effects on critical habitat. The BA is enclosed with this letter. The conclusions of the BA are summarized below.

DOE has determined that the proposed Action ***may affect but, is not likely to adversely affect*** the following species under the jurisdiction of the U.S. Fish and Wildlife Service:

- Marbled murrelet (*Brachyramphus marmoratus)*
- Western snowy plover (*Charadrius alexandrinus nivosus)*
- Short-tailed albatross (*Phoebastria albatrus)*

Designated Critical Habitat (DCE) has been identified for two of the species listed above. DOE has determined that the proposed Action would have ***no effect*** on DCE for the following species:

- Marbled murrelet (*Brachyramphus marmoratus)*
- Western snowy plover (*Charadrius alexandrinus nivosus)*

DOE requests your concurrence with the determinations summarized above and detailed in the enclosed BA. We look forward to hearing from you regarding this project. Please feel free to contact me by phone at 720.356.1322 or via email at laura.margason@go.doe.gov if you have any questions or comments.

Sincerely,

Laura Margason

Laura Margason
NEPA Document Manager

*Enclosures*

*Biological Assessment for the Northwest National Marine Renewable Energy Center and Oregon State University Mobile Ocean Test Berth Project*

## Moelter, Chris

**From:** Moelter, Christopher
**Sent:** Friday, May 18, 2012 7:15 AM
**To:** kim.hatfield@noaa.gov; keith.kirkendall@noaa.gov
**Cc:** Oestman, Richard; Meleah.Ashford@oregonstate.edu; laura.margason@go.doe.gov
**Subject:** NNMREC/OSU Wave Energy Test Project Biological Assessment

Dear Mr. Kirkendall and Ms. Hatfield:

On behalf of the U.S. Department of Energy (DOE), I present you with a Biological Assessment (BA) for the Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Project. The BA includes a detailed description of the Proposed Project and addresses the potential effects of the Proposed Project on species listed as endangered or threatened, or proposed for such listing, under the Endangered Species Act (ESA) as well as the Proposed Project's effects on critical habitat. The enclosed BA also incorporates an evaluation of the potential effects of the Proposed Project on Essential Fish Habitat (EFH), in compliance with the Magnuson-Stevens Fishery Conservation and Management Act, as amended in 2007, and establishes Proposed Project compliance with the Marine Mammal Protection Act, as amended in 2007.

The BA can be accessed through the ICF Secure File Transfer (SFT) site by following the link below. Please do not hesitate to contact me if you experience any difficulty in accessing or downloading the BA through the SFT and I will make immediate arrangements to provide it to you through alternative means.

The DOE requests your concurrence with the findings in the attached BA. We look forward to hearing from you regarding this project. Please feel free to contact me by phone at 503.525.6145 or email at CMoelter@icfi.com or Laura Margason, NEPA Document Manager, DOE at 720.356.1322 or via email at laura.margason@go.doe.gov if you have any questions or comments.

Sincerely,

Christopher Moelter| Manager | 503.525.6145 (office) | cmoelter@icfi.com | icfi.com
ICF INTERNATIONAL | 615 SW Alder Street, Suite 200, Portland, OR 97205 | 503.228.3820 (fax)



File(s) will be available for download until **02 June 2012**:

File: OSUWave-BA_05172012.pdf, 5,566.56 KB

## Moelter, Chris

**From:** Moelter, Christopher
**Sent:** Friday, May 18, 2012 7:18 AM
**To:** Jeff_Everett@fws.gov
**Cc:** laura.margason@go.doe.gov; Oestman, Richard
**Subject:** NNMREC/OSU Wave Energy Test Project Biological Assessment

Dear Mr. Everett:

On behalf of the U.S. Department of Energy (DOE), I present you with a Biological Assessment (BA) for the Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Project. The BA includes a detailed description of the Proposed Project and addresses the potential effects of the Proposed Project on species listed as endangered or threatened, or proposed for such listing, under the Endangered Species Act (ESA) as well as the Proposed Project's effects on critical habitat.

The BA can be accessed through the ICF Secure File Transfer (SFT) site by following the link below. Please do not hesitate to contact me if you experience any difficulty in accessing or downloading the BA through the SFT and I will make immediate arrangements to provide it to you through alternative means.

The DOE requests your concurrence with the findings in the attached BA. We look forward to hearing from you regarding this project. Please feel free to contact me by phone at 503.525.6145 or email at CMoelter@icfi.com or Laura Margason, NEPA Document Manager, DOE at 720.356.1322 or via email at laura.margason@go.doe.gov if you have any questions or comments.

Sincerely,

Christopher Moelter| Manager | 503.525.6145 (office) | cmoelter@icfi.com | icfi.com
ICF INTERNATIONAL | 615 SW Alder Street, Suite 200, Portland, OR 97205 | 503.228.3820 (fax)



File(s) will be available for download until **02 June 2012**:

File: OSUWave-BA_05172012.pdf, 5,566.56 KB

**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274
June 7, 2012

Laura Margason
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Debra Henry
US Army Corps of Engineers,
Portland District
PO Box 2946
Portland, Oregon 97208

RE: NMFS Request for Additional Information regarding the Department of Energy's Request to Initiate Endangered Species Act (ESA) section 7 consultation, and submittal of their Biological Assessment – Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Facility Project, May 2012 and US Army Corps Engineers Nationwide Permit #5 Application – Wave Energy Test Project at the Northwest National Marine Renewable Energy Center, March 27, 2012.

Dear Ms. Margason and Ms. Henry:

After reviewing the submitted Biological Assessment (BA), National Marine Fisheries Service (NMFS) needs specific additional information listed below before Endangered Species Act (ESA) consultation can begin. The requested additional information may be submitted on its own, revision and resubmission of the BA is not necessary.

1) Please provide a detailed description of anchor, tethering and tensioning plans or detailed drawings for all lines on all structures. This information is necessary for the evaluation of entanglement risk for marine mammals and ESA-listed species.

2) Please provide a detailed description including all tethering and tensioning plans, for any structures (e.g. anchors, lines, subsurface and surface floats, marker buoys) which may remain in place over the winter or any time when the WET-NZ buoy, Ocean Sentinel or other structures are removed for maintenance or overwintering. This information is necessary for the evaluation of entanglement risk for marine mammals and ESA-listed species.

3) Please clarify the statement "The Ocean Sentinel will be constructed with NMFS-approved passive deterrents, such as bull rails and netting, to prevent its use as a marine mammal haulout." If the Northwest National Marine Renewable Energy Center (NNMREC) has determined what

form of deterrent would be used, please provide a detailed description and plan drawings. If NNMREC is seeking guidance on development of an appropriate passive deterrent, please clearly state when such discussion is proposed to occur and that the Ocean Sentinel would not be deployed until NMFS has approved the deterrent method. This information is necessary to evaluate the risk of pinniped haulout.

4) Please clarify the potential operation of "oscillating water column" type wave energy converter (WEC). The limited information provided makes it difficult to determine if there is a risk of entrainment, entrapment or injury of marine species. This information is necessary to evaluate the effects of testing this type of device on ESA-listed species.

5) Please clarify the duration and nature of activities proposed to occur in Yaquina Bay which would not be considered normal marine/bay traffic and operations, such as deployment of the testing equipment or WECs in the bay for longer than 7 days. This information is necessary to evaluate the effects on Critical Habitat within Yaquina Bay.

6) Please clarify that derelict gear monitoring and, if deemed necessary, removal (Adaptive Management Framework (AMF) Section 3.2 p.6) will be conducted when **any** project related equipment remains in the water (e.g. anchors, lines, tethers, marker buoys and similar items related to the Ocean Sentinel and mooring gear, as well as each WEC that will be tested at the site). Not just when the Ocean Sentinel, TRIAXYS or other monitoring equipment is deployed. Please provide the frequency and method of such monitoring.

7) Please provide the analysis of effects to the Primary Constituent Elements (PCEs) of green sturgeon critical habitat referenced in the BA section 7.12 Green Sturgeon, southern DPS or clearly describe where in Chapter 6 the discussion and evaluation of effects on the PCEs for green sturgeon critical habitat is located. The final paragraph of this section concludes that the proposed action may affect but is not likely to adversely modify designated critical habitat of the green sturgeon and refers to an analysis in Chapter 6. However, NMFS was unable to locate the referenced analysis and needs this information for its effects analysis.

8) While not an additional piece of information needed, NMFS recommends that recording and reporting of opportunistic observations of marine mammals and other listed species during any visits to the site including installation, maintenance, monitoring and removal visits. This should be included in the both the NNMREC AMF and WET-NZ Adaptive Mitigation Plan, as well as any future WEC test Adaptive Mitigation Plan. The observations should not be a separate monitoring effort, but rather a practice added to any site visits and should not be limited to identification of injured or stranded marine mammals.

We appreciate the efforts the U.S. Department of Energy, US Army Corps of Engineers and NNMREC have made to work with NMFS on the development of the open ocean test program which will further research and development of alternative energy sources such as wave energy.

If you have any questions or concerns, please feel free to contact Kim Hatfield (503-231-2315 or Kim.Hatfield@noaa.gov).

Sincerely,

Keith Kirkendall, Chief
FERC and Water Diversions Branch
Hydropower Division

cc: (Sent electronically, unless noted as "hard copy")
Therese Hampton, PEV
Delia Kelley, ODFW
Debra Henry, Corps
Jeff Everett, USFWS

**Northwest National Marine Renewable Energy Center-OSU**
Oregon State University, 204 Rogers Hall, Corvallis, Oregon 97331-6001
**Phone** 541-737-9492 | **Fax** 541-737-2600 | http://nnmrec.oregonstate.edu

June 14, 2012

Ms. Laura Margason
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Ms. Debra Henry
Biologist/Regulatory Project Manager
United States Army Corps of Engineers
Portland District Regulatory Office
333 SW First Avenue
Portland, OR 97204-3495

**Subject:** NMFS Request for Additional Information

Dear Ms. Margason and Ms. Henry,
On June 7, 2012, the National Marine Fisheries Service (NMFS) submitted a request for additional information to support Endangered Species Act (ESA) consultation for the US Department of Energy's funding of the Northwest National Marine Renewable Energy Center (NNMREC) and the US Army Corps of Engineers' issuance of Nationwide Permit #5 for the 2012 – 2013 Wave Energy Test Project at the NNMREC ocean test site. We have reviewed the request and our responses are enclosed. If you have any questions or require further information, please feel free to contact me at (541) 737-9492 or via email at belinda.batten@oregonstate.edu.

Sincerely,

Belinda Batten
NNMREC Director

Cc (via electronic mail):

Keith Kirkendall, NMFS
Kim Hatfield, NMFS
Delia Kelley, ODFW
Jeff Everett, USFWS

**Northwest National Marine Renewable Energy Center at OSU Response to the National Marine Fisheries Service's Request for Additional Information**

**June 14, 2012**

Note: Each of NMFS's requests is shown in *italics*. NNMREC's response to each request follows.

*1) Please provide a detailed description of anchor, tethering and tensioning plans or detailed descriptions drawings for all lines on all structures. This information is necessary for the evaluation of entanglement risk for marine mammals and ESA-listed species.*

**Response:** The mooring systems for the Ocean Sentinel, WET-NZ device and TRIAXYS™ Wave Monitoring Buoy, as well as the overall deployment configuration, have been fully analyzed under a wide range of loading conditions to ensure the reliability of the systems and minimize the risk of marine mammal entanglement. Due to the dynamic nature of the ocean environment, the amount of tension in the lines will vary depending on the conditions.

The anchoring and mooring system is described in detail with graphics in section 2.8 of the Biological Assessment. In general, during a test, the anchoring and mooring will include:

1. Ocean Sentinel – one buoy anchored using a three-point system attached to moorings with surface floats. The tension in the Ocean Sentinel mooring lines will range between 500 – 1,500 lbs during calm sea states and could reach upwards of 6,000 lbs during significant wave events.
2. WET-NZ Device – one buoy anchored using a three-point system attached to moorings with surface floats. The tension in the WET-NZ mooring lines will range from 3,300 – 13,000 lbs in calm seas and could reach 35,000 lbs of tension under extreme weather conditions. The umbilical cable between the WET-NZ and the Ocean Sentinel is designed with subsurface floats to maintain tension at all times, with a peak tension of approximately 1,500 lbs.
3. TRIAXYS wave measurement device – one buoy anchored to the west of the test with a single-point mooring.
4. Marker buoys - four buoys anchored at the corners of the site on single-point moorings.

While the levels of tension in the mooring lines will vary with the sea state, the mooring systems feature subsurface floats to maintain tension in the lines taught and prevent any "slack" when the load decreases. Additionally, the mooring lines have an extremely high breaking strength, such that they will not "snap" under extreme load conditions, including that of a potential whale encounter.

*2) Please provide a detailed description, including all tethering and tensioning plans, for any structures (e.g. anchors, lines, subsurface and surface floats, marker buoys) which may remain in place over the winter or any time when the WET-NZ buoy, Ocean Sentinel or other structures are removed for maintenance or overwintering. This information is necessary for the evaluation of entanglement risk for marine mammals and ESA-listed species.*

**Response:** As described in section 2.8 of the Biological Assessment and the response above, the mooring systems and deployment configuration are designed to maintain tension at all times, in both static and dynamic states. To ensure that no slack is introduced into the system when the Ocean Sentinel is removed (either for maintenance or overwintering), its mooring lines will be connected to the corner marker buoys, and the marker buoys' anchors will maintain tension on the lines. When the WET-NZ is removed, its anchors and mooring lines will be removed as well.

*3) Please clarify the statement "The Ocean Sentinel will be constructed with NMFS-approved passive deterrents, such as bull rails and netting, to prevent its use as a marine mammal haulout." If the Northwest National Marine Renewable Energy Center (NNMREC) has determined what form of deterrent would be used, please provide a detailed description and plan drawings. If NNMREC is seeking guidance on development of an appropriate passive deterrent please clearly state when such discussion is proposed to occur and that the Ocean Sentinel would not be deployed until NMFS has approved the deterrent method. This information is necessary to evaluate the risk of pinniped haulout.*

**Response:** Due to the irregular shapes of the Ocean Sentinel, WET-NZ and TRIAXYS buoy, NNMREC does not anticipate that pinnipeds would be able to haul-out on any of these structures. As described in the Adaptive Mitigation Plan (AMP) and the Adaptive Management Framework (AMF), NNMREC would make opportunistic observations of marine mammals and other listed species during installation, maintenance, monitoring and any other activities at the project site. If pinnipeds are observed on one or more of the project structures, NNMREC would implement the haulout protocols listed in the AMP and notify NMFS to report the incident. In addition, NNMREC would seek guidance from NMFS on selecting and installing an appropriate haulout deterrent, as well as any other measures deemed necessary (e.g., device removal, modification of Project operations or monitoring plans).

*4) Please clarify the potential operation of "oscillating water column" type wave energy converter (WEC). The limited information provided makes it difficult to determine if there is a risk of entrainment, entrapment or injury of marine species. This information is necessary to evaluate the effects of testing this type of device on ESA-listed species.*

**Response:** Because testing of an OWC device has not been proposed, the operations of such a device cannot be described in further detail at this time. However, in general, and specifically for the example provided in the EA, the water column moves up and down with the wave action in a relatively stationary open chamber. As the peak of the wave passes air is compressed in the chamber and pushed through a turbine either at the top of the chamber or on the side of the chamber. As the water recedes as the wave trough passes a vacuum is created and air passes through the turbine back into the chamber. For this reason, these devices are sometimes referred to as oscillating "air" columns since oscillating "water" column is somewhat misleading.

If testing of an OWC device(s) is proposed, then NNMREC would consult with NMFS to evaluate the potential impacts and identify measures to minimize any risk of entrainment, entrapment or injury of marine species. Such consultation would take place during the permitting of the proposed test, in the Adaptive Management Committee proceedings, and/or other appropriate forum (e.g., direct consultation between NNMREC and NMFS). While there is limited information on OWC devices at this time, the NMFS screening criteria for traditional

hydropower projects may be useful in developing mitigation measures for OWC devices to minimize the risk of entrainment, entrapment or injury of marine species.

*5) Please clarify the duration and nature of activities proposed to occur in Yaquina Bay which would not be considered normal marine/bay traffic and operations, such as deployment of the testing equipment or WECs in the bay for longer than 7 days. This information is necessary to evaluate the effects on Critical Habitat within Yaquina Bay.*

**Response:** When the Ocean Sentinel and/or WET-NZ are removed from the project site for maintenance, there may be a need for dockside mooring at existing piers or docks in Newport. Dockside moorings would not occur for more than seven days at a time and would not involve excessive generation of noise or electrical currents, disturbance to bottom habitat, or changes in water quality. These activities would be within the scope of normal marine traffic and operations and would be performed in compliance with all applicable laws.

If activities that exceed the scope or duration of normal marine traffic and operations are proposed in the future, NNMREC would consult with NMFS and obtain the appropriate authorizations. Any such activities, once approved, would be performed within the in-water work window for Yaquina Bay and in adherence with any guidance or conditions prescribed by NMFS.

*6) Please clarify that derelict gear monitoring and, if deemed necessary, removal (Adaptive Management Framework Section 3.2 p.6) will be conducted when any project related equipment remains in the water (e.g. anchors, lines, tethers, marker buoys and similar items related to the Ocean Sentinel and mooring gear, as well as each WEC that will be tested at the site). Not just when the Ocean Sentinel, TRIAXYS or other monitoring equipment is deployed. Please provide the frequency and method of such monitoring.*

**Response:** Response to discovery of derelict gear would be performed in accordance with the thresholds and measures described in the AMP. In addition, NNMREC will add the following procedures to the AMP and the AMF:

i. **Detection:** NNMREC will perform underwater visual monitoring at least three times for each test: once prior to device deployment, once during active deployment, and once after device removal; as described in the Benthic Habitat Monitoring Plan (Appendix A of the BA). For the 2012 WET-NZ test this is anticipated to be June, August, and October 2012. The before and after monitoring would be when neither the Ocean Sentinel, TRIAXYS nor WEC device is deployed. Video lander sampling of anchors and reference locations will continue for the duration of the project (i.e., when any project related equipment remains in the water), weather permitting (as described in the Benthic Habitat Monitoring Plan). This sample method will provide for monitoring of derelict gear, as well as animal entanglement.

ii. **Notification**: If derelict gear is detected, NNMREC will contact NMFS and ODFW within two days of detection.

iii. **Removal**: Any gear entangled with project structures or moorings will be removed in spring/summer (prior to test device deployment) or in fall

(immediately following test device removal). If the gear poses an entanglement risk to marine organisms, NNMREC will consult with NMFS and ODFW to determine if an earlier or more immediate response is necessary (as described in the AMF and AMP).

iv. **Return**: NNMREC will make every effort to return gear to owner and will be responsible for storage of gear and contacting owner to retrieve property; ODFW can provide owner contact information.

v. **Recycle**: In the event that attempts to return gear are unsuccessful, gear may be recycled at the "Fishing for Energy" project located at Newport's International Port.

In addition to the above procedures, NNMREC will perform visual monitoring from the water surface during all visits to the project site to detect any entangled gear. NNMREC will also participate in monthly FINE meetings, contact members of the fishing community directly, and maintain ongoing communication with ODFW in regards to lost or entangled gear. Further, NNMREC would consult with NMFS, either through their participation in the Adaptive Management Committee or otherwise, to ensure the efficacy of the derelict gear monitoring and response methods for the duration of Project activities. For instance, if derelict gear is routinely found caught on the mooring lines or anchors, monitoring and removal episodes may need to be increased.

*7) Please provide the analysis of effects to the Primary Constituent Elements (PCEs) of green sturgeon critical habitat referenced in the BA section 7.12 Green Sturgeon, southern DPS or clearly describe where in Chapter 6 the discussion and evaluation of effects on the PCEs for green sturgeon critical habitat is located. The final paragraph of this section concludes that the proposed action may affect but is not likely to adversely modify designated critical habitat of the green sturgeon and refers to an analysis in Chapter 6. However, NMFS was unable to locate the referenced analysis and needs this information for its effects analysis.*

**Response:** Please see **Attachment 1**: Green Sturgeon Southern DPS: Primary Constituent Elements of Critical Habitat

*8) While not an additional piece of information needed, NMFS recommends that recording and reporting of opportunistic observations of marine mammals and other listed species during any visits to the site including installation, maintenance, monitoring and removal visits. This should be included in the both the NNMREC AMF and WET-NZ Adaptive Mitigation Plan, as well as any future WEC test Adaptive Mitigation Plan. The observations should not be a separate monitoring effort, but rather a practice added*

**Response:** As described in the AMP, opportunistic observations of marine mammals and other listed species would be conducted in a consistent manner, as frequently as possible. Additionally, NNMREC would coordinate with NMFS, either through their participation in the Adaptive Management Committee or individually, to develop a standard form to use in recording and reporting marine mammal observations. If marine mammals or sea turtles are observed entangled, injured or impinged at the Project, NNMREC would immediately follow the Reporting Protocol for Injured or

Stranded Marine Mammals (listed in Section B. iii of the AMP) and, as soon as practical within 24 hours, provide NMFS and ODFW with available information on the incident. In addition, NNMREC would consult with NMFS and ODFW regarding modifying the Project and/or monitoring plans.

# ATTACHMENT 1

## Green Sturgeon Southern DPS: Primary Constituent Elements of Critical Habitat

**Chris Earle, ICF. June 11, 2012.**

Critical habitat for the green sturgeon southern DPS was designated by NMFS on October 9, 2009 (74 FR 52300). Critical habitat includes the coastal marine waters 110 meters (361 feet) deep from Monterey Bay, California north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; and certain other areas, specifically including Yaquina Bay (74 FR 52300). The designated critical habitat includes the action area. In their proposal for critical habitat designation, NMFS identified PCEs for green sturgeon critical habitat in freshwater, estuarine, and nearshore marine habitats. The PCEs for freshwater habitat are irrelevant as no freshwater habitat occurs in the action area. The PCEs for estuarine habitat and nearshore marine habitat are identified below.

For estuarine habitat:

- Food resources that "primarily consist of benthic invertebrates and fishes, including crangonid shrimp, burrowing thalassinidean shrimp (particularly the burrowing ghost shrimp), amphipods, isopods, clams, annelid worms, crabs, sand lances, and anchovies" (73 FR 52089).
- Water flow (only applicable to the Sacramento River system).
- Water quality "including temperature, salinity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages." (73 FR 52089).
- Migratory corridor, "[a] migratory pathway necessary for the safe and timely passage of Southern DPS fish within estuarine habitats and between estuarine and riverine or marine habitats." (73 FR 52089).
- Water depth, "[a] diversity of depths necessary for shelter, foraging, and migration of juvenile, subadult, and adult life stages." (73 FR 52089).
- Sediment quality "necessary for normal behavior, growth, and viability of all life stages" (73 FR 52090).

For coastal marine habitat:

- Migratory corridor, "[a] migratory pathway necessary for the safe and timely passage of Southern DPS fish within marine and between estuarine and marine habitats" (73 FR 52090).
- Water quality "with adequate dissolved oxygen levels and acceptably low levels of contaminants" (73 FR 52090).

- Food resources, including "[a]bundant prey items for subadults and adults, which may include benthic invertebrates and fishes" (73 FR 52089).

The proposed action has little potential to affect PCEs for estuarine habitat; the action area only includes Yaquina Bay because project components would be deployed from and returned to that site, and physical locations used in Yaquina Bay would all be associated with pre-existing marine service facilities. As separately reported, no extended project-related activities (lasting more than 7 days) would occur in Yaquina Bay, which also supports a determination that those activities have minimal potential to affect PCEs for estuarine habitat.

Regarding PCEs for coastal marine habitat, the action area for the proposed project is located in nearshore marine waters traversed by green sturgeon migrating and foraging along the Oregon coast, and thus has the potential to affect these PCEs.

As noted in the BA species account, there is limited information on green sturgeon movements, behavior, habitat preferences, or requirements out in the open ocean. Data collected from seven out-migrating green sturgeon tagged with pop-off archival tags in the Rogue River indicates that green sturgeon generally inhabit depths of 40 to 70 meters, and occasionally make rapid ascents to the surface (Erickson and Hightower 2007). Lindley et al. (2008) found that peak migration rates of tagged green sturgeon exceeded 50 kilometers per day during the spring time southward migration. Available information from offshore commercial trawling efforts indicates green sturgeon remain within the 110-meter depth contour line (Erickson and Hightower 2007, National Marine Fisheries Service 2005a). If so, then green sturgeon in the vicinity of the action area are likely migrating between 3.5 km and 30 km offshore, where mean water depths are -40 to -110 m.

*"Migratory Corridor" PCE*

The WEC and Ocean Sentinel moorings obstruct only a few meters width in this corridor and thus have negligible potential to be perceived by migratory sturgeon; moreover they do not present any greater obstacle than existing features such as rock reefs and thus have minimal potential to present any impediment to sturgeon migration, or to alter the.

The WEC would also produce sound, which hypothetically could alter the marine acoustic environment in a manner that could affect green sturgeon migration. As noted in the BA analysis of hydroacoustic effects for lower Columbia River Chinook salmon, Section 6.1.1.1, there is very little reason to expect the acoustic signal from an operational WEC to be detected by a migrating green sturgeon, with acoustic effects damped to background levels within a short distance of the WEC. Thus acoustic stimuli, like the mooring structures, represent a very small fraction of the width of the migration corridor, with a proportionally small potential to alter green sturgeon behavior. There is, moreover, no evidence that acoustic stimuli per se have the potential to alter green sturgeon behavior. However, as noted in Section 6.1.1.1, there are nonetheless substantial uncertainties regarding potential acoustic impacts of WEC operation, and those impacts would be assessed periodically via an adaptive management process. It would also be appropriate at that time to reassess the potential for acoustic effects to affect green sturgeon migration.

The WEC would also produce EMF, which hypothetically could alter the marine EMF environment in a manner that could affect green sturgeon migration. As noted in the BA analysis of EMF effects for lower

Columbia River Chinook salmon, Section 6.1.1.4, there is very little reason to expect the EMF signal from an operational WEC to be detected by a salmonid, and even a green sturgeon is unlikely to detect EMF effects at a distance of more than about 10 meters (Section 6.1.12). Thus EMF stimuli, like the mooring structures, represent a very small fraction of the width of the migration corridor, with a proportionally small potential to alter green sturgeon behavior. However, as noted in Section 6.1.1.1, there are nonetheless substantial uncertainties regarding potential EMF effects of the proposed project on marine fishes, and those impacts would be assessed periodically via an adaptive management process. It would also be appropriate at that time to reassess the potential for EMF effects to affect green sturgeon migration.

*"Water Quality" PCE*

No mechanism has been identified whereby the proposed project could affect dissolved oxygen concentrations. Contaminant release from the proposed project is analyzed in detail in the BA, Section 6.1.1.2, and is there found to pose a negligible risk to Chinook salmon, a conclusion reiterated in Section 6.1.12 with regard to green sturgeon. By the same rationale there is negligible potential for the proposed project to affect the PCE for water quality.

*"Food Resources" PCE*

The proposed project has no identified potential to alter food resources availability except by placement of the physical structure of the WEC and its moorings. Those effects are analyzed in the BA, Section 6.1.1.3, which covers various effects related to project structures. That analysis finds that the proposed project is likely to cause some fish aggregation and may on occasion snag derelict fishing gear. Both of these constitute environmental changes that may locally alter foraging behavior of certain marine organisms, including green sturgeon. However, as explained in Section 6.1.1.3, these effects have minimal potential to appreciably alter fish behavior in the area, particularly in consideration of conservation measures addressing removal of derelict gear, monitoring of benthic habitat, and periodic adaptive management to reassess project effects on marine habitat. In view of these conservation, monitoring, and adaptive management measures, the proposed project has negligible potential to alter the PCE for food resources, and there is moreover high confidence that this conclusion will be periodically reassessed via the adaptive management process.

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**UNITED STATES DEPARTMENT OF COMMERCE**
**National Oceanic and Atmospheric Administration**
NATIONAL MARINE FISHERIES SERVICE
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

June 21, 2012

Laura Margason
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Debra Henry
US Army Corps of Engineers,
Portland District
PO Box 2946
Portland, Oregon 97208

RE: Initiation of formal ESA section 7 consultation for the Department of Energy's Northwest National Marine Renewable Energy Center and Oregon State University Wave Energy Test Facility Project and US Army Corps Engineers Nationwide Permit #5 for Wave Energy Test Project at the Northwest National Marine Renewable Energy Center.

Dear Ms. Margason and Ms. Henry:

This letter acknowledges National Marine Fisheries Service's (NMFS) receipt of the Department of Energy's (DOE) letter and biological assessment (BA) on May 21, 2012 and the US Army Corps of Engineers' letter and submission of the DOE's BA on June 8, 2012 requesting concurrence with an Not Likely to Adversely Affect (NLAA) determination for the following Endangered Species Act (ESA) listed species, critical habitat and essential fish habitats occurring within the project action area.

NMFS does not concur with the NLAA determination because the effects of the proposed action are unlikely to be insignificant or discountable, and are not wholly beneficial. NMFS based this preliminary assessment on the temporal scale (ten years), the risk of entanglement of marine mammals, and the significant uncertainty about sound and electromagnetic fields generated by the project and the resulting effects on marine life. These factors may adversely affect ESA-listed species. Therefore, this letter serves as notice of initiation of formal consultation under Section 7 of the ESA. Section 7 allows NMFS up to 135 calendar days from the receipt of a complete biological assessment to conclude formal consultation and complete our biological opinion (unless NMFS and the action agency mutually agree to an extension). NMFS received your response to our request for additional information dated June 15, 2012, on June 18, 2012. NMFS has determined that the BA and the additional information response provide all the information required from you to initiate consultation or that the information is available from other sources for our consideration and reference. NMFS considers consultation initiated as of

June 18, 2012, the date we received your response to our additional information request. Therefore, we expect to provide our biological opinion to you no later than October 31, 2012.

As a reminder, the ESA requires that after initiation of formal consultation, the Federal action agency may not make any irreversible or irretrievable commitment of resources that limits future options. This requirement ensures that agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species or destroying or modifying their critical habitats.

If you have any questions or concerns about this consultation or the consultation process in general, please feel free to contact Kim Hatfield of my staff at 503-231-2315 or Kim.Hatfield@noaa.gov.

We appreciate the efforts the U.S. Department of Energy, US Army Corps of Engineers and Northwest National Marine Renewable Energy Center have made to work with NMFS on the development of the open ocean test program, which will further research and development of alternative energy sources such as wave energy.

Sincerely,

Keith Kirkendall, Chief
FERC and Water Diversions Branch
Hydropower Division

cc: (Sent electronically, unless noted as "hard copy")
Therese Hampton, PEV
Chris Moelter, ICF
Delia Kelley, ODFW
Debra Henry, Corps
Jeff Everett, USFWS

# Appendix C: Example WEC Device Technologies

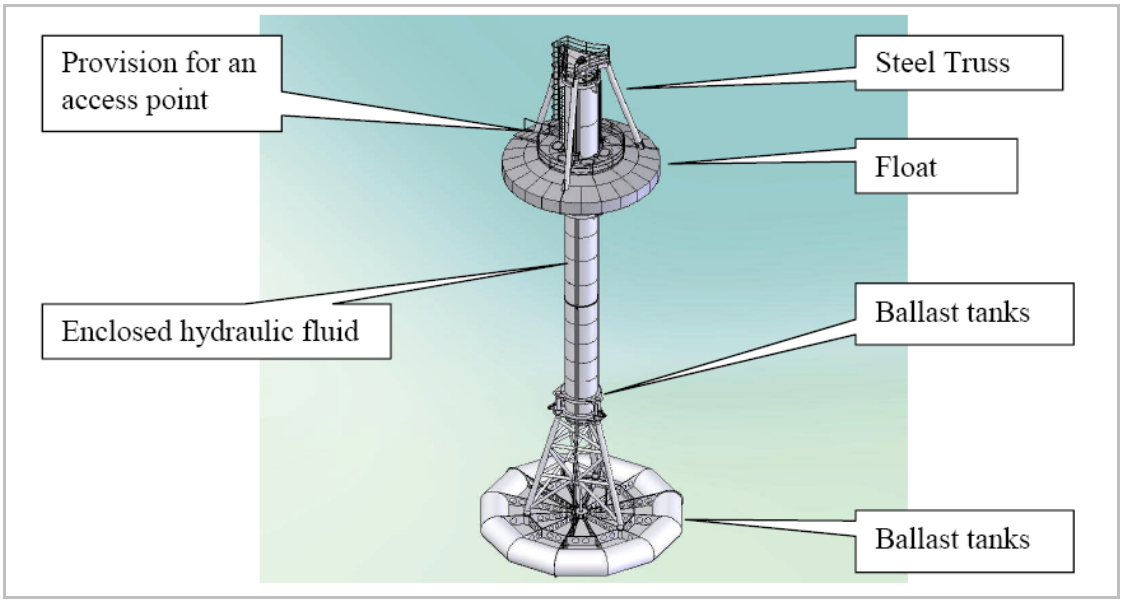
# Introduction

Over the lifetime of the Northwest National Marine Renewable Energy Center's Wave Energy Test Project, (Proposed Project) a number of wave energy conversion devices are expected be tested. The specific WEC device prototypes and models that would be tested as part of the Proposed Project are not presently known, with the exception of the WET-NZ device, which has a planned deployment at the project site in August of 2012 and will undergo testing in 2012 and 2013. As described in Section 2.7 of the Environmental Assessment (EA) for the Proposed Project, general WEC device designs that are reasonably expected as part of this Proposed Project include pitching/surging/heaving/sway devices, point absorber devices, and oscillating water column devices capable of operating in water depths of approximately 55 meters (180 feet). Examples of these designs are provide in this Appendix and include the most probable types of devices that could be tested with the Proposed Project. These examples provide a basis for the analysis of effects of the Proposed Project that is included in the EA. Other WEC devices proposed for future tests would require authorization by the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act prior to their deployment and would undergo environmental reviews under this process.

# Ocean Power Technologies PowerBuoy®

The PowerBuoy® design, developed by Ocean Power Technologies (OPT), is one of the most widely deployed WEC device designs in the world. Presently, a 10-buoy test array of the PB150 PowerBuoy® is proposed for deployment in Reedsport, Oregon (Figure 1). The PB150 is a utility-scale 150 kilowatt (kW) buoy that—in the initial design—contains hydraulic fluid, which is cycled as the buoy moves up and down with the waves. The moving fluid or mechanical parts are used to spin a generator, which produces electricity. The buoy is approximately 35 meters (115 feet) tall (of which approximately 9 meters [30 feet] project above the water's surface) and 11 meters (36 feet) in diameter. It is held in place by a three-point mooring system (Reedsport OPT Wave Park 2010).

**Figure 1. Ocean Power Technologies PB150 PowerBuoy®**




Source: Reedsport OPT Wave Park 2010.

# Embley Energy SPERBOY™

The SPERBOY™ (Figure 2), developed and patented by Embley Energy, is a floating oscillating water column device consisting of a buoyant structure with a submerged, enclosed column. Housed above the oscillating water column on top of the buoy is the plant: turbines, generators, and associated system facilities. Air displaced by the oscillating water column is passed through turbine generators above the water's surface. The device can be deployed in deep water to maximize energy production. The entire body floats and maintains optimum hydrodynamic interactions for the prevailing wave spectrum, maximizing energy capture. The total height of the device is approximately 50 meters (164 feet), with 35 meters (115 feet) of the device below water. The diameter of the SPERBOY™ is approximately 30 meters (98 feet[1]) (U.S. Department of Energy 2008).

[1] Dimensions represent maximum envisaged size of a full-scale commercial unit

**Figure 2. Embley Energy SPERBOY™**


Source: U.S. Department of Energy 2008.

## Ocean Energy Ltd. OEBuoy

The OEBuoy device is a floating system with the mouth of the oscillating water column facing away from the wave direction that uses wave energy to compress air in a chamber and pump it through an air turbine system (Figure 3). The design isolates the power conversion system above and away from the seawater and also provides high-speed air flow to the turbine. The OEBuoy has undergone several years of development and testing. In 2006 and 2007, Ocean Energy Ltd. conducted a winter sea trial on the 25,401-kilogram (28-ton), 1:4-scale OEBuoy prototype at the Irish Marine Institute test site in the waters off of Galway, Ireland (U.S. Department of Energy 2008). OEBuoy is the only device of its kind to have undergone 2 years of rigorous testing and is now ready for market.

**Figure 3. OEBuoy (1:4 Scale)**

Source: U.S. Department of Energy 2008.

## Floating Power Plant A/S FPP Poseidon

The Poseidon is based on a hydraulic power take-off system. It is designed for an offshore location in areas with considerable variation in wave activity levels and has a high efficiency and energy production. The Poseidon uses a float that absorbs the energy from incoming waves, and uses a piston pump to transform energy from the wave into water pressure. That water is then sent through a turbine to generate electricity. Poseidon was developed by the Danish company, Floating

Power Plant A/S (FPP). The Poseidon 37, a 327,000-kilogram (360-ton) and 37-meters (121-foot)-wide hybrid renewable energy demonstration plant (Figure 4), was launched in 2008 off the coast of Lolland in Denmark (Floating Power Plant 2011). Although the Poseidon 37 can be configured with wind turbines, any Poseidon device tested as part of the Proposed Project would include wave energy components only.

**Figure 4. Poseidon 37 (Shown with Wind Turbine Configuration)**

Source: Floating Power Plant 2011.

FPP has also developed and tested Poseidon models of the following sizes (Floating Power Plant A/S 2011):

- 2.4 meter (7.9-foot) wave front, system test
- 15 meter (49-foot) wave front, floater test
- 4 meter (13-foot) wave front, system test

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# Appendix D. Adaptive Management Framework

Newport Open Ocean Wave Energy Test Site
Northwest National Marine Renewable Energy Center

# ADAPTIVE MANAGEMENT FRAMEWORK

Revised 5/15/2012

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# 1 INTRODUCTION

The purpose of this Adaptive Management Framework (Framework) is two-fold. First, it provides a means for the broader regulatory and stakeholder communities to stay informed of and provide feedback on NNMREC test center monitoring and mitigation. The Adaptive Management Committee, described in Section 2, will receive an Annual Operations and Monitoring Report (Annual Report). The Annual Report will be a compilation of monitoring results, adaptive management thresholds, and mitigation actions taken during tests conducted at the NNMREC site. The Committee will meet on an annual basis to review results and provide guidance on future test center activities. Section 3 presents the Adaptive Management Thresholds that the Adaptive Management Committee will use in their review of monitoring results. This component of the Framework will be in place for the duration of NNMREC test center operations.

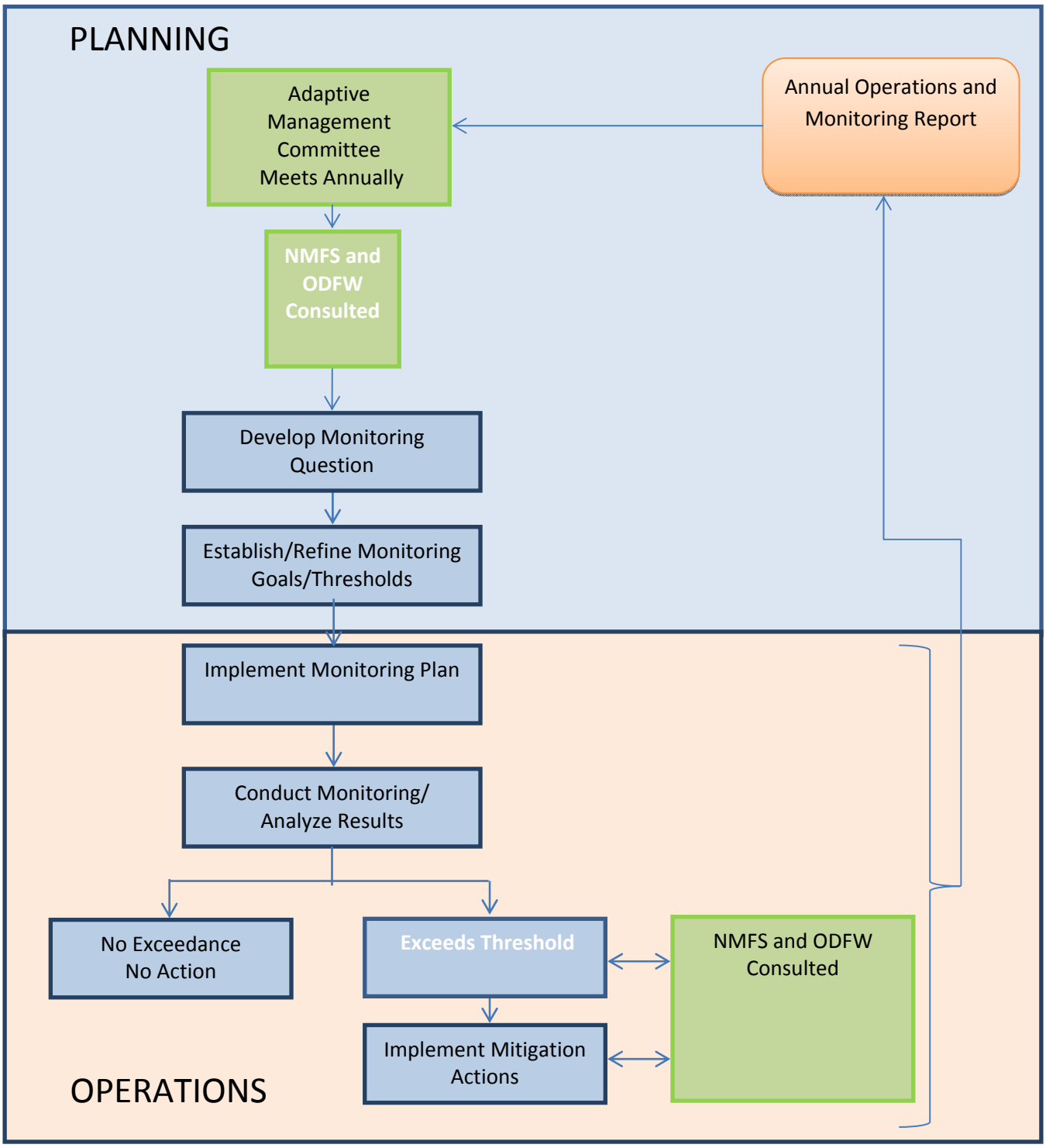
The NNMREC test center will be in operation from 2012 – 2022. Throughout this period, NNMREC will provide an opportunity for various WEC technologies to conduct short-term, non grid-connected tests within the project site, which is a 1 square-nautical-mile area in the Pacific Ocean, approximately 2 miles off the coast of Oregon near the city of Newport.

Second, this Adaptive Management Framework provides a foundation for the monitoring and adaptive management associated with individual tests at the NNMREC site. For each test performed at the NNMREC ocean site, an Adaptive Mitigation Plan will be developed that includes thresholds and mitigation actions for the particular test. The Adaptive Mitigation Plans will account for the unique attributes of that test, such as the characteristics of the technology being tested and duration of testing. In addition, results and analysis of previously completed monitoring studies will be used to inform the plans for future tests.

The Adaptive Mitigation Plan for the Ocean Sentinel/WET-NZ test (provided in Attachment 1) is included as an example of the Adaptive Mitigation Plan that will be developed for each test. Attachment 1 identifies thresholds that if exceeded may require a mitigation response. Monitoring results will be reviewed by NNMREC in real-time, whenever possible, to determine if thresholds have been exceeded. If the results show that thresholds are *not* exceeded then no action will be taken. If results show that thresholds are exceeded, NNMREC will consult with NMFS and ODFW to develop an appropriate response. Responses may include changes to monitoring methods, project operations and/or mitigation actions, as appropriate.

The general process for this Adaptive Management Framework is depicted in the figure below.

**Adaptive Management Framework Flow Chart**



# 2 ADAPTIVE MANAGEMENT COMMITTEE

The purpose of the Adaptive Management Committee ("AMC" or Committee) is to review marine resource issues (i.e. benthic habitat, derelict gear, marine mammals, acoustics, and electromagnetic fields) related to wave energy testing activities at the NNMREC Open Ocean Test Site and to make recommendations for changes in monitoring, project operations, and/or adaptive management/mitigation thresholds for the test center.

## 2.1 RECOMMENDATION AND REVIEW PROCESS

The timelines outlined in this section are designed to ensure that previous year's test information can be used to inform any permitting, adaptive management or other review processes for future year tests.

### 2.1.1 Annual Report

No later than December 1 of each year, an Annual Report will be provided to the Adaptive Management Committee for all tests conducted in the previous year. The Annual Report will include a compilation of monitoring conducted (including a summary of the purpose for monitoring, the methods used, and monitoring results) and mitigation actions taken. In addition, plans for future tests will be summarized.

### 2.1.2 Adaptive Management Committee Meeting

No later than January 31 of each year, NNMREC will convene and facilitate an annual meeting of the Committee. The Committee will evaluate the information relative to the adaptive management thresholds and mitigation actions discussed in the sections that follow.

The Committee will also evaluate technical issues and data interpretation associated with the monitoring, as appropriate. Such evaluation will include the sufficiency and adequacy of the information provided by the monitoring, consideration of monitoring results, as well as possible adjustments to subsequent monitoring methods and frequencies. Key functions of the Committee are to:

a) Review the results of studies and monitoring conducted during the previous testing period;

b) Use study and monitoring results, as well as other sources of relevant information, if applicable, to determine whether a change to project monitoring (e.g., study design, methods, or duration) is warranted or if existing monitoring approaches continue to be appropriate;

c) Review available information about wave energy devices proposed for testing in the following test season;

d) Evaluate any changes in plans made by NNMREC in response to the studies and/or monitoring, or upcoming devices; and

e) In the event effects are identified that require modification to project operations or monitoring, provide NNMREC with recommended measures to avoid, minimize, or mitigate the effects, which may include ceasing testing and/or removal of project structures.

### 2.1.3 Committee Recommendations

The Annual Reports will be used by the Adaptive Management Committee to inform discussions and make recommendations to NNMREC for the monitoring, operations, and adaptive management plans associated with the NNMREC test center. The recommendations of the Adaptive Management Committee are not intended to supplant or fulfill any required permitting processes needed for future tests, but will be completed no later than February 28 of each year.

### 2.1.4 NNMREC and Agency Review

Upon conclusion of the Committee's review, NNMREC, in consultation with NMFS and ODFW, will consider the Committee's recommendations and determine the appropriate approach to the monitoring, operations, and adaptive management/mitigation thresholds to ensure the Project's compliance with the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA) and other relevant federal and state statutes. NNMREC, in consultation with NMFS and ODFW, will also consider the Committee's recommendations in determining whether any additional mitigation measures are needed no later than March 31 of each year.

## 2.2 COMMITTEE MEMBERSHIP AND PARTICIPATION

Participation on the Committee by state or federal agencies does not affect their statutory responsibilities and authorities. Issues involving the exercise of agencies' specific authorities can be discussed, but agency decisions are not delegated to the Committee. Representatives of the following organizations will be invited to join the Committee:

- Northwest National Marine Renewable Energy Center
- US Army Corps of Engineers
- National Marine Fisheries Service
- U.S. Fish and Wildlife Service
- Oregon Department of Fish and Wildlife
- Oregon Department of Land Conservation and Development
- Department of State Lands
- Local Tribes
- Oregon Coastal Zone Management Agency
- Fishermen Involved in Natural Energy (or other appropriate fishing organization)
- Surfrider Foundation
- Oregon Shores

Representatives from other organizations may be asked to join, as deemed appropriate by NNMREC.

## 2.3 MEETING PROVISIONS

NNMREC shall arrange, administer, and chair all meetings, unless otherwise agreed. The Committee shall establish protocols for Committee meetings such as agenda development, subcommittee involvement, and timely distribution of materials, location and scheduling.

NNMREC will convene and facilitate an annual meeting of the group to be schedule no later than January 31 of each year. The Committee will convene annually for the life of the test center operations, unless deemed otherwise by Members.

NNMREC shall make the Committee meeting schedule and meeting agenda available on its web site.

NNMREC shall bear all costs associated with conducting meetings. Each Member shall bear its own cost of attendance. A Member's ongoing participation on the Committee is subject to that Member's budget and resource constraints.

# 3 ADAPTIVE MANAGEMENT THRESHOLDS[1]

The Adaptive Management Thresholds outlined in this section are used by the Adaptive Management Committee, NMFS, ODFW and NNMREC in the annual review of monitoring results and other operational information. As outlined in Section 2 above, these thresholds are used to evaluate single year data and multi-year data from the test center. These Adaptive Management Thresholds do not apply to individual testing operations. Specific adaptive mitigation thresholds developed for each test will be implemented during operations of individual tests.

In addition to the conducting the monitoring referenced below, NNMREC staff will make opportunistic observations of marine mammals and other listed species during installation, maintenance, monitoring and any activities at the project site. NNRMEC will record all opportunistic observations and include them in the Annual Report of monitoring results provided to the Adaptive Management Committee, NMFS and ODFW.

## 3.1 BENTHIC SPECIES AND HABITAT

**Adaptive Management Threshold 1:** If monitoring conducted as described in the Benthic Species and Habitat Monitoring Plan, which includes visual observation and gut analysis, shows *substantial differences* or *significant trends* as defined in consultation with ODFW and NMFS in benthic habitat or associated ecological communities between the Project-affected sites and reference sites, or at any one site over time, as defined by:

a. substrate composition; for example changes in grain size proportions;

[1] The use of the term consultation in this document does not relate to Section 7 ESA Consultation.

b. species composition; for example there could be new species attracted to anchors/devices or species no longer present;

c. species relative abundances; for example, existing species becoming more common or rare; and/or

d. changes to feeding habits; for example a new prey item or disappearance of a species both from visual observation and from gut analysis.

NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, implement one or more of the following actions to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Modify the monitoring plan and/or sampling frequency to determine if ecological interactions have negative effects on protected species, benthic habitat or associated ecological communities;
- Modify the Project to mitigate for Project effects;
- Conduct additional sampling or studies; and/or
- Make determination that no changes to monitoring plans or Project operations are needed.

## 3.2 DERELICT GEAR

**Adaptive Management Threshold 1:** If Annual Reports indicate that derelict gear is being ensnared on the *Ocean Sentinel* or project structures and posing harm to species, NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, implement one or more of the following actions to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Modify the Adaptive Mitigation Plan[2] to assure that derelict gear is addressed in a timely manner; or

Modify the Project to reduce the incidences of derelict gear being ensnared on the Ocean Sentinel and/or its mooring configuration.

**Adaptive Management Threshold 2:** If Annual Reports indicate that derelict gear is being ensnared on and posing harm to species during project tests on WEC devices similar to those proposed for upcoming test, NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, implement one or more of the following actions to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

[2] An individual Adaptive Mitigation Plan will be developed for each installation of any anchors, mooring lines, and devices associated with the Ocean Sentinel and WEC devices. Each Adaptive Mitigation Plan will be in effect as long as project structures are deployed.

- Recommend an Adaptive Mitigation Plan , which includes derelict gear removal, to the WEC developer to assure that derelict gear is addressed in a timely manner; or
- Require WEC developer to modify its device and/or mooring configuration to reduce the incidences of derelict gear being ensnared.

## 3.3 MARINE MAMMALS

**Adaptive Management Threshold 1:** If Annual Reports indicate observations of pinnipeds hauled out on the Ocean Sentinel, NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, implement one or more of the following actions to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Modify the Project to reduce the potential for pinniped haul-out on the Ocean Sentinel; and/or
- Apply for an Incidental Harassment Authorization if needed for deterrence or removal of hauled-out pinnipeds.

**Adaptive Management Threshold 2:** If Annual Reports indicate observations of pinnipeds hauled out on WEC devices similar to those being proposed for upcoming test, NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, require the WEC developer to implement one or more of the following actions:

- Require WEC developer to modify its device to reduce the potential for pinniped haul-out; and/or
- Require WEC developer to apply for an Incidental Harassment Authorization if needed for deterrence or removal of hauled-out pinnipeds.

## 3.4 ACOUSTICS

**Adaptive Management Threshold 1:** If acoustic monitoring indicates that sound pressure levels attributable to the Ocean Sentinel device at a distance[3] of 100m are above Level A injury threshold

[3] It may be ineffective to use an acoustic threshold 10 meters from the Ocean Sentinel as it not likely to result in measurements of the actual noise levels generated solely by the device. A 10-meter distance would be inside the larger project installation and the signals received may be inaccurate due to reflections (and other interactions) with other physical structures nearby. Therefore a greater threshold distance of 100 meters is proposed. Marine mammal detections in surveys covering the Oregon-Washington coast (*Green et al. 1992*) indicate a mean incidence of 0.5 animals per square kilometer. A 100-meter radius around the device corresponds to an area of 0.03 square kilometer so the risk of marine mammal exposure within that area is 0.03/0.5 = 0.06 animals, or about a 6% risk in association with a day or an incident of elevated underwater sound generation. Since the test device would be deployed for limited periods of time, there is lower potential for such incidents to occur frequently or for a sustained long period of time. As such the risk of exposure for any marine mammal is very low, even within the 100-meter radius.

criteria (either continuous or impulse of 180dB RMS for cetaceans and 190dB RMS for pinnipeds) or Level B harassment threshold criteria (120dB RMS continuous and 160dB RMS impulse), NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, implement one or more of the following actions to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Design and perform additional monitoring;
- Modify the operation of the Ocean Sentinel to decrease its acoustic emissions (e.g., locking down the device during high surf, increasing controls to slow the motion of the device, or repairing the device if noise is due to device malfunction);
- Apply for an Incidental Harassment Authorization for acoustic emissions of the Ocean Sentinel.

**Adaptive Management Threshold 2:** If acoustic monitoring indicates that sound pressure levels attributable to a WEC device similar to the device type (e.g. buoy or attenuator) proposed for testing are above Level A injury threshold criteria (either continuous or impulse of 180dB RMS for cetaceans and 190dB RMS for pinnipeds) or Level B harassment threshold criteria (120dB RMS continuous and 160dB RMS impulse) at a distance of 100m (see footnote 4 regarding rationale for 100m), NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, assure that one or more of the following is implemented during testing of the WEC device to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Additional monitoring;
- Modify the operation of the WEC device to decrease its acoustic emissions (e.g., locking down the WEC device during high surf, increasing controls to slow the motion of the WEC device, or repairing the WEC device if noise is due to device malfunction);
- Applying for an Incidental Harassment Authorization for acoustic emissions of the WEC device.

**Adaptive Management Threshold 3:** After review of individual test results, NNMREC, in consultation with the Adaptive Management Committee, will:

- Evaluate whether acoustic monitoring techniques are sufficient to adequately assess potential effects of different technologies;
- Assess new information about other sources of noise to confirm confidence in study ability to assess device noise; and
- Determine whether acoustic testing is required for all devices and whether previous study results can be used to support future tests.

Based on the evaluation and assessment described above, NNMREC, after consultation with the

Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, will implement one or more of the following to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Modified or additional monitoring techniques;
- Utilize data and information from existing studies to estimate acoustic emissions and perform potential effects analysis for future tests.

## 3.5 ELECTROMAGNETIC FIELDS

Monitoring electromagnetic fields (EMF) for marine renewable energy is a newly emerging application, and mission-specific instrumentation is needed. NNMREC has designed and will carry out the first deployment of an advanced 2$^{nd}$ generation EMF monitoring instrument to characterize the ambient EMF at the project site and measure the EMF during an energized WEC test. Post monitoring data analysis will take approximately 90 days. The results will be written up in a monitoring summary and provided the Adaptive Management Committee as part of the Annual Report by no later than February 1 following the initial test.

**Adaptive Management Threshold 1:** NNMREC, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS, will consider the following:

- Validate the effectiveness of the EMF Propagation Model and assess its efficacy in measuring EMF for future tests. If necessary, potential modifications to the model will be recommended.

Consider both the ability to detect and the level of EMF from the project devices and determine whether there is a meaningful source of EMF from the Project. Based on the evaluation and assessment described above, NNMREC will, after consultation with the Adaptive Management Committee, in consultation with NMFS and ODFW, and after approval by NMFS implement one or more of the following to ensure Project compliance with ESA, MMPA and other relevant federal and state statutes:

- Modified or additional monitoring techniques;
- Compare the EMF results with known values for impact on endangered species known or likely to be present in the area. If the results indicate that WEC-related EMF levels are within the documented magnetic or electric field sensitivity range of such species, NMFS, ODFW, OSU scientists and the Ocean Facilities Manager will work together on an approach to reduce EMF levels during a test. In the event that the monitoring shows EMF signatures at levels below concern, and after consulting with NMFS and ODFW, the EMF monitoring program will be modified accordingly.
- Utilize data and information from existing studies to estimate EMF emissions and perform potential effects analysis for future tests.

# 4 References

Green, G.A., J.J. Brueggeman, C.E. Bowlby, R.A. Grotefendt, M.L. Bonnell, and K.T. Balcomb, III. 1992. Cetacean Distribution and Abundance Off Oregon and Washington, 1989-1990. Chapter I. In Oregon and Washington marine mammal and seabird surveys, J.J. Brueggeman (ed.). Final Report prepared for the Minerals Management Service, Pacific OCS Region. OCS Study MMS 91-0093. 400 pp

# Attachment 1: WET-NZ/Ocean Sentinel Adaptive Mitigation Plan

## A) ADAPTIVE MITIGATION ACTIONS

This Adaptive Mitigation Plan outlines the thresholds and real-time mitigation actions that may be taken during the test of the NNMREC's Ocean Sentinel and the WET-NZ device. All mitigation action decisions associated with the WET-NZ and Ocean Sentinel will be made by NNMREC and Northwest Energy Innovations, Inc. (NWEI) in consultation with NMFS and ODFW. The Adaptive Management Committee (described in Section 2 of the Adaptive Management Plan) will not be convened or be used to inform real-time decisions for mitigation outlined below.

No later than December 1 following the test a Annual Report of monitoring results, adaptive management thresholds, and any mitigation actions associated with the deployment of the WET-NZ and Ocean Sentinel will be provided to the Adaptive Management Committee (as described in Section 2 of the NNMREC Test Facility Adaptive Management Framework). This report will be used to inform the Committee's discussion of monitoring and adaptive management plans associated with the NNMREC test center and future tests.

## B) ADAPTIVE MITIGATION THRESHOLDS AND MEASURES

In addition to the conducting the monitoring referenced below, NNMREC staff will make opportunistic observations of marine mammals and other listed species during installation, maintenance, monitoring and any activities at the project site. NNRMEC will record all opportunistic observations and include them in the Annual Report of monitoring results provided to the Adaptive Management Committee, NMFS and ODFW.

### i. BENTHIC SPECIES AND HABITAT

Consistent with the Benthic Monitoring Plan, benthic monitoring will be conducted prior to, during, and after the test. The monitoring results will be summarized and provided to the Adaptive Management Committee as outlined in Section 2 of the NNMREC Test Facility Adaptive Management Framework.

There are no adaptive mitigation thresholds for benthic habitat associated with this test.

### ii. DERELICT GEAR

Derelict gear will be monitored using the cameras described in the Benthic Monitoring Plan. If monitoring shows that derelict gear has become ensnared on any Project structure, the NNMREC Ocean Test Facility Manager will be notified within three days by the NNMREC scientist reviewing the monitoring results. The NNMREC scientist will review the footage and evaluate whether the gear has

the potential to endanger the safety of organisms and/or project devices. The NNMREC scientist may recommend taking additional photos or footage to better characterize the derelict gear.

**Adaptive Mitigation Threshold and Measure 1:** If monitoring shows that derelict gear has become ensnared or collected on any Project structure but no organisms are caught within it and the gear poses no threat to navigational safety or marine species, NNMREC will remove the derelict gear during removal of the test devices.

**Adaptive Mitigation Threshold and Measure 2:** If monitoring shows that derelict gear has become ensnared or collected on any Project structure and has entangled or poses the risk of entanglement to organisms, NNMREC will remove the derelict gear as soon as feasible, notify NMFS and ODFW within two days, and provide a report with all available information on the case. NNMREC will then, after consulting with NMFS and ODFW, modify the Project and/or monitoring plan if necessary.

**Adaptive Mitigation Threshold and Measure 3:** If monitoring shows marine mammals or sea turtles entangled in fishing gear or marine debris, NNMREC will report the incident as soon as practical and remove the gear consistent with the Reporting Protocol for Injured or Stranded Marine Mammals (outlined in Section iii below). NNMREC will then, after consulting with NMFS and ODFW, and approved by NOAA modify the Project and/or monitoring plan if necessary.

## iii. ENTANGLED OR INJURED SPECIES

**Adaptive Mitigation Threshold and Measure 1:** If marine mammals or sea turtles are observed entangled, injured or impinged at the Project Structure, NNMREC will immediately follow the Reporting Protocol for Injured or Stranded Marine Mammals (listed below) and give NMFS and ODFW all available information on the incident. In addition, NNMREC will contact NMFS and ODFW as soon as practical within 24 hours to consult with them regarding modifying the Project and/or monitoring plans.

**Reporting Protocol for Injured or Stranded Marine Mammals**: NNMREC proposes to implement the following NMFS protocols in the event an injured or stranded marine mammal is observed:

i. *Live marine mammals or sea turtles observed swimming but appearing debilitated or injured.*

Capability to respond to free swimming animals is very limited and relocation is a major issue. In addition, medical treatment facilities for marine mammals and sea turtles are for the most part non-existent in Oregon. Therefore, we recommend that monitors record the sighting as part of the monitoring report and provide the information to the Stranding Network. The data should include: 1) any photos or videos, if possible 2) species or common name of the animal involved; 3) date of observation; 4) location (lat/long in decimal degrees); 5) description of injuries or unusual behavior observed.

ii. *Live marine mammals or sea turtles observed entangled in fishing gear or marine debris.*

The marine mammal disentanglement network in Oregon is based at Hatfield Marine Science Center - contact Jim Rice at 541-867-0446 or Barb Lagerquist at 541-867-0128. The national network is available

at 877-SOS-WHALE (877-767-9425). Contact should be made immediately if an entanglement is observed and, if possible the reporting vessel should remain on scene while contact is made. Report should include the following information: 1) species or common name of animal involved; 2) location (lat/long in decimal degrees); 3) whether the animal is anchored by the gear or swimming with the gear in tow; 4) a description of the entangling gear (line size, line color, size number and color of floats if attached, presence or absence of pots or webbing; 5) if animal is towing gear, give direction of travel and current speed; 6) local weather conditions (sea state, wind speed and direction) 7) whether the vessel can stand by until someone is able to get there. The disentanglement network will determine whether or not a response can be mounted immediately and will advise the reporting vessel on next steps.

iii. *Dead marine mammals or sea turtles observed floating at sea.*

Dead floating marine mammals fall within the definition of "stranded" under the MMPA. To report strandings off central Oregon coast contact the Oregon Marine Mammal Stranding Network (Jim Rice) 541-867-0446.

iv. *Dead protected species found entangled or otherwise impinged at the project.*

These should be reported as part of the monitoring report to NMFS and ODFW, giving all available information on the case. The report should include the following information; 1) species or common name of animal involved; 2) location (lat/long in decimal degrees); 3) whether the animal was found on a project device or anchoring system; 4) a description of injuries or entanglement observed; if derelict fishing gear or other debris was involved, give a description of the gear (line size, line color, size number and color of floats if attached, presence or absence of pots or webbing; photographs if possible. In the event derelict gear is involved, the presence of protected species entangled in the gear should be included in the report initiating gear removal planning and coordination.

**Adaptive Mitigation Threshold 2:** If pinnipeds are identified on one or more of the project structures, NNMREC will implement the NMFS haulout protocols listed below. In addition, NNMREC will notify NMFS and ODFW within two weeks of the haul-out incident.

*Pinniped Haulout Protocols*

i. If pinnipeds are present on one of the project structures, monitoring or maintenance activities will occur at minimum of 100 yards from the structure (in accordance with the current NMFS guideline of 100 yards for vessel approach of hauled out pinnipeds).

ii. If the pinnipeds do not leave the structure upon approach up to 100 yards and the pinnipeds are non-ESA listed species (e.g., California sea lions), NNMREC may proceed to deter the pinniped from project structures so long as such measures do not result in the death or serious injury of the animal (pursuant to Section 101.(a)(4)(A) of the Marine Mammal Protection Act). NNMREC will follow NOAA guidance on deterring pinnipeds: http://www.nwr.noaa.gov/marine-mammals/seals-and-sea-lions/deterring-pinnipeds.cfm

iii. If pinnipeds present on project structures are an ESA-listed species (e.g., Steller sea lions), NNMREC will not pursue any directed take or intentional harassment, and will remain at least 100 yards from the structure so long as the ESA-listed species is present.

iv. If NNMREC needs to perform emergency maintenance that requires immediate attention (e.g. closing an opened hatch, repairing a failed mooring or electrical fault) and deterrence of a listed species is necessary, NNMREC staff will request assistance from a government official.[4] The NNMREC Response Coordinator will provide an account of the incident to the appropriate staff at NMFS and ODFW as soon as possible.

## iv. ACOUSTICS

The objective of the acoustic monitoring is to determine if the WET-NZ and/or Ocean Sentinel devices increase the ambient noise at the project site beyond mammal harassment thresholds, as described in the Acoustic Monitoring Plan in Section XX. This will be accomplished by measuring time-dependent acoustic background levels and frequency distributions of environmental, biological and anthropogenic sound sources that contribute to the noise budget during the test. NNMREC has collected continuous passive acoustic data to characterize the baseline acoustic conditions at the test site. During the WET-NZ/Ocean Sentinel test, amplitude and frequency distribution through time of the ambient noise field will be characterized and sound sources will be identified.

- Initial monitoring will occur within two weeks following deployment of the WET-NZ/Ocean Sentinel test. (This window may be modified if the health and safety of personnel is at risk due to unforeseen conditions such as weather or operational complications where approaching the device is not safe.)

- Results will be made available to NMFS and ODFW within seven days of the completion of monitoring. If results cannot be transmitted to NMFS and ODFW within seven days, NNMREC will contact NMFS and ODFW with an updated delivery schedule and the reason for delay.

- The following contacts will be notified regarding monitoring results and proposed mitigation, if applicable:

    - NMFS: Keith Kirkendall, Chief of FERC and Water Diversion Branch, 503-230-5431 or keith.kirkendall@noaa.gov

    - ODFW: Delia Kelly, Ocean Energy Coordinator, 541-867-0300 or delia.r.kelly@state.or.us

[4] Section 109(h) of the Marine Mammal Protection Act provides exceptions for take of listed and non-listed marine mammals by Federal, state or local government officials if such taking is for the protection or welfare of the mammal, the protection of the public health and welfare, or the nonlethal removal of nuisance animals [50 CFR 223.202].

**Adaptive Mitigation Threshold and Measure 1:** If acoustic monitoring indicates that sound pressure levels attributable to the WET-NZ and/or Ocean Sentinel device at a distance[5] of 100m are above Level A injury threshold criteria (either continuous or impulse of 180dB RMS for cetaceans and 190dB RMS for pinnipeds) or Level B harassment threshold criteria (120dB RMS continuous and 160dB RMS impulse),, NNMREC scientists and Ocean Test Facility Manager, in coordination with NMFS and ODFW, and after approval from NMFS, will develop and implement a response plan that outlines the appropriate mitigation action within 14 days of acquiring monitoring results. Actions may include, but are not limited to:

- Performing additional or alternative monitoring;
- Modifying the operation of the WET-NZ and/or Ocean Sentinel (e.g., locking down the device during high surf, increasing controls to slow the motion of the device, or conducting on-site repairs if noise is due to the device malfunction);
- Ceasing operations and performing necessary modifications to minimize noise levels. Subsequent monitoring would be conducted to verify that the noise associated with the test has been abated;
- Decommissioning of the test/installation; and/or
- Applying for an Incidental Harassment Authorization.

## v. ELECTROMAGNETIC FIELDS

As described in the EMF Monitoring Plan in Section XX, monitoring of Electromagnetic fields (EMFs) will be conducted during deployment of the Ocean Sentinel and the WET-NZ when the devices are energized, as well as when the devices have been removed. The monitoring results will be summarized and provided to the Adaptive Management Committee as outlined in Section 2 of the NNMREC Test Facility Adaptive Management Framework.

There are no adaptive mitigation thresholds for EMF associated with this test.

[5] It may be ineffective to use an acoustic threshold 10 meters from the Ocean Sentinel as it not likely to result in measurements of the actual noise levels generated solely by the device. A 10-meter distance would be inside the larger project installation and the signals received may be inaccurate due to reflections (and other interactions) with other physical structures nearby. Therefore a greater threshold distance of 100 meters is proposed. Marine mammal detections in surveys covering the Oregon-Washington coast (*citation pending*) indicate a mean incidence of 0.5 animals per square kilometer. A 100-meter radius around the device corresponds to an area of 0.03 square kilometer so the risk of marine mammal exposure within that area is 0.03/0.5 = 0.06 animals, or about a 6% risk in association with a day or an incident of elevated underwater sound generation. Since the test device would be deployed for limited periods of time, there is lower potential for such incidents to occur frequently or for a sustained long period of time. As such the risk of exposure for any marine mammal is very low, even within the 100-meter radius.

# Appendix E. Monitoring Plans

# List of Monitoring Plans

**NNMREC Ocean Test Facility (OTF) Short-term Acoustic Test**

**NNMREC Ocean Test Facility (OTF) Benthic Monitoring Studies**

**Proposed Study Electric and Magnetic Field (EMF) Monitoring of WET-NZ 1/2 scale Wave Energy Generator at NNMREC Ocean Test Facility**

**NNMREC Ocean Test Facility (OTF) Short-term Acoustic Test**

(03/14/2012)

**Title**: Short-term acoustic assessment of wave energy conversion at OSU's OTF

**Principle Investigators**: Joe Haxel, Robert Dziak, and Haru Matsumoto – Oregon State University/ Cooperative Institute for Marine Resources Studies (CIMRS)

**Background:** Continuous long-term passive measurements of ambient sound levels (1 Hz – 2 kHz) have been collected from March 2010 – April 2011 at two sites within the MOTB providing a characterization of background acoustic levels (*Haxel et al., in press & in prep.*) over a range of sea states and environmental conditions. Ambient sound in the ocean is composed of a complexamalgam of sources. Despite prior knowledge of probablesound sources within an oceanic region, a distinguishingcharacteristic of marine ambient sound is that no individualsignal dominates or can be readily identified within thereceived field. Analogous to the background "hum"emanating from a large city, ambient sound in the ocean is thebackground sound resulting from remote and near-fieldcontributions of a multitude of anthropogenic and naturalsources. At the MOTB site, theambient noise field consists primarily of sounds emanatingfrom breaking waves, winds, vessel traffic, marine mammals, and fish.

Root mean square (rms) maximum and minimum total sound pressure levels ($SPL_{rms}$) from the 1Hz-2kHz band calculated over 1 minute intervals during the experiment reached 136 dB re 1 µPa and 95dB re 1 µPa respectively. Meanwhile, the time averaged $SPL_{rms}$ value for the year-long deployment was 113 dB re1µPa.

$$SPL_{rms}\ (\text{dB re } 1\mu\text{Pa}) = 20 \log_{10}(p_{rms}/p_{ref})$$

Peak $SPL_{rms}$ values were encountered during heavy surf conditions recorded at a nearby offshore NOAA NDBC buoy (http://www.ndbc.noaa.gov/station_page.php?station=46050).

Underwater sounds generated by the operations of the mobile ocean test berth (MOTB)instrumentation buoy (Ocean Sentinel) and wave energy converter (WEC)this summer (2012) are expected to contribute to the local noise budget. The purpose of this study is to provide a rapid measurement of the maximum, root mean square (rms), and minimum absolute sound pressure levels (SPL) received at a range of 10 m – 200 m distance from the WEC device. These observations will provide the necessary information to evaluate the acoustic impact of the operational WEC on marine mammals based on NMFS criteria for harassment (120 dB) and injury (180 dB).

**Project Objectives:** Little information is knows about the sound impact of WECs. The objective of the acoustic monitoring is to determine if the device under test transmits acoustic energy above mammal harassment thresholds.

**Project Description:** The methods and instrumentation will be similar with techniques used by Bassett et al. (*in press*) to perform a similar evaluation of a WEC in Puget Sound operated by Columbia Power Technologies. Unlike the drifter used in the Bassett et al. (*in press*) study, we

propose to deploy a calibrated cabled hydrophonefrom a vessel. Each recording will begin and end ~200 m up and down drift of the WEC device. The hydrophone will be dropped to ~10 m below the sea surface and the vessel's engines will be shut down in order to eliminate noise contamination. The calibrated hydrophone system will record continuously at a sample rate of 50 kHz, providing reliable power spectral density estimates up to 20 kHz. A series of 4 drifts will be made past the WEC device during each recording cruise session.

Initial baseline near surface acoustic recordings using the protocol outlined above will be performed in May prior to any MOTB mooring installations in the area designated by Oregon State University for the WEC test. These baseline measurements will provide background for comparison of operational acoustic transmissions from the WEC, as well a test of our recording procedure prior to WEC installation and operation. Additionally, these initial recordings may indicate pre-existing ambient sound conditions above NMFS threshold criteria prior to MOTB activity. A subsequent recording cruise mission will be carried out after the WEC device has been deployed and is in operation.

**Reporting:** Data from each recording session will be processed and analyzed in a timely manner to provide NMFS and ODFW regulatory personnel with the necessary received SPL measurement information in order to assess acoustic levels produced by the WEC test.

**Adaptive Management:** Upon review of the initial results, and in coordination with NMFS and ODFW, NNMREC scientists may recommend further recording or no further recording upon satisfactory completion of the acoustic monitoring required by the WEC test permit.

If confirmed testing indicates that sound levels are above Level A (180dB SPL for cetaceans and 190dB for pinnipeds) or Level B (120dB SPL) harassment threshold criteria, and that the sound levels are attributable to the WEC test, NNMREC scientists and Ocean Test Facility Manager, in coordination with NMFS and ODFW, will determine the appropriate action. Action may include:

- Further recording to confirm acoustic pressure levels;
- Modifying the operation of the WEC or Ocean Sentinel;
- Ceasing operation and performing necessary modifications to minimize noise levels. Testing would be conducted to verify that the noise associated with the test has been abated; and/or
- Applying for an Incidental Harassment Authorization.

**Schedule:**

May 2012–baseline recording

July 2012 – initial recording of WEC (within 2 weeks of installation, weather permitting)
(initial results provided within 1 week)

August 2012 – continued recording of WEC (if necessary)

**NNMREC OTF Benthic Monitoring Studies**

**Title:** Monitoring of benthic habitat, invertebrates, and fishes at OSU's ocean test facility

**Principle Investigator:** Sarah Henkel – Oregon State University, Northwest National Marine Renewable Energy Center and Hatfield Marine Science Center

**Background:** Pre-installation baseline sampling of benthic habitats and species was conducted at and around the future ocean test facility location from May 2010 to December 2011. After exploratory video sled surveys in May 2010, sample stations were established on a regular grid. Twelve stations were established: two transects north of Yaquina Head, two transects south of the Head, and stations at approximately 30, 40, and 50 m on each of the transects. These transects are designated as (north to south): BB (Beverly Beach), MB (Moolack Beach), NH (Newport Hydrographic Line), and NS (Newport-South). All 12 stations were sampled ~bi-monthly for sediment and infaunal organisms using a box corer. For beam trawl surveys, only 9 stations were sampled on each visit. Those stations along the southern-most transect lie at the edge of a reef, and it is too risky for the net and the reef organisms to sample those stations. Video footage from the beam trawl was effectively captured in summer months; winter videography (attempted in February 2011) did not yield useful footage. Although not a primary objective of the videography, evidence of derelict gear did not show up on any of the transects. Wayward crab pots and research gear are anticipated to be the predominate type of derelict gear in the test area.

**Project Objectives:**

1. The presence of anchors and the potential for changes in benthic habitat may affect the distributions of benthic fishes and invertebrates. To investigate this hypothesis, benthic species and habitat monitoring will be conducted in to determine how benthic organisms will respond to WEC-induced changes to the habitat.

2. The introduction of hard surfaces may encourage colonization by marine invertebrates and fish attraction. To investigate this hypothesis, visual observations of the introduced surfaces to assess colonization will be conducted. Additionally, the ongoing benthic sampling conducted under objective (1) will investigate whether resident species are being affected by those attracted to the structures.

3. Marine mammals could become entangled or entrapped by derelict gear that has been ensnared on any Project structure. To investigate this hypothesis, derelict gear monitoring will be conducted to determine if gear is being ensnared by the anchors and mooring lines.

**Project Description:** The OTF is planned to be located approximately on the MB sampling transect in 45 m of water, so it will be in between the 40 and 50 m sampling stations on that line. Post installation monitoring of the NNMREC Ocean Test Facility (OTF) for assessing interactions with benthic habitats and species will be carried out in much the same manner as pre-installation baseline sampling. Table 1 indicates the pre-installation sampling already conducted (black text) and planned future monitoring, generally at the permitted site and for the 2012 test (blue text).

**Table 1: Sampling visits and gear types.**

| | Box Core | Trawl | Trawl Video | Lander Video |
|---|---|---|---|---|
| June 2010 | ✔ | ✔ | | |
| August 2010 | ✔ | ✔ | ✔ | |
| October 2010 | ✔ | ✔ | | |
| February 2011 | | ✔ | ✔ | |
| April/May 2011 | ✔ | ✔ | ✔ | |
| June 2011 | ✔ | ✔ | ✔ | |
| August 2011 | ✔ | ✔ | | |
| October 2011 | ✔ | ✔ | ✔ | |
| December 2011 | ✔ | ✔ | | |
| June 2012 | ✔ | ✔ | ✔ | ✔ |
| August 2012 | ✔ | ✔ | ✔ | ✔ |
| October 2012 | ✔ | ✔ | ✔ | ✔ |

We will visit the site in June 2012, once more prior to deployment since it will have been 6 months since our last visit. After the Sentinel Buoy and associated WEC device under test are deployed in July, we will visit the site again in August 2012 for an assessment while the devices are operational. Weather permitting, we will again visit the site after the Sentinel Buoy and WEC device are removed to assess if there are 'decommissioning' effects or if site characteristics are similar to pre-test conditions and/or baseline observations. Sample collection and data analysis methods are described in detail below.

***Sample Collection Methods***

i. Box core. One box core will be taken at each beam trawl station. The box core is a 0.1 $m^2$ modified Gray-O'Hare box corer. Upon landing the corer, a subsample of sediment from the

undisturbed surface will be collected and preserved for grain size and total organic carbon analysis. The sample will then be sieved onboard through a 1 mm mesh screen; samples will be stained and preserved for later identification and enumeration. Samples will be sorted into major taxonomic groups by lower level staff; these major taxonomic groups will be weighed for biomass determination. The laboratory manager will identify the echinoderms and molluscs to species and crustaceans and polychaetes to family (lower if possible).

ii. Beam trawl with mounted video camera. The beam trawl is 2 m wide by 0.5 m high with 20 mm wall netting and 3 mm cod end netting. The duration of beam trawls will be kept to 10 min from contact with bottom to retrieval. We will collect and preserve (freeze with dry ice and store at -20 $^{o}$C) fish and invertebrates from the net catches for later taxonomic identification. In the laboratory, all fish will be analyzed for size and morphometric body condition as well as their gut contents identified. This will enable us to investigate if the condition of the fish or their feeding habits has changed from what we observed in our 18 months of pre-installation baseline monitoring. Invertebrates will be sorted to species and each species' biomass determined. Videos will be viewed to determine the densities of sessile and mobile invertebrates (e.g. sea pens, crabs, sea stars) that are not well captured with the net.

iii. Video lander (drop-video camera). This is a sampling tool that was not used for baseline monitoring but will be valuable for assessing potential fish aggregating effects of anchors. The video lander is an aluminum frame with two sets of video cameras with lights mounted on the frame. The two cameras are oriented 180° from each other so that they are facing opposite directions. The lander will be deployed at the 40 and 50 m stations on the BB and MB lines as reference locations as well as dropped near each anchor of the Ocean Sentinel (n = 3; ~45 m depth) and at each anchor of the WEC under test (as appropriate for each device type). The lander will be left on the bottom for a total of 15 minutes at each drop station. The number of each species or taxa of fish observed over time by each camera will be counted and the primary (mostly sand) and secondary (potentially anchor) substrate observed will be recorded. Counts will be compared to determine if more fish are observed at anchor locations than at reference locations and if more fish are observed by the camera facing the anchor than facing away. Since the anchors for the Ocean Sentinel are planned to be left in the water, video lander sampling of Ocean Sentinel anchors and reference locations will continue for the duration of the project, regardless if whether there is a WEC device under test. This sample method will also provide for monitoring of derelict gear that may become tangled on the anchors and animal entanglement. For derelict gear, the location (lat/lon in decimal degrees), type of gear, and condition (approximate size, line color, number and color of floats, if attached, presence or absence of pots or webbing) will be recorded. For entanglement, the species, its condition of entanglement and location will be recorded.

iv. CTD-DO with chl a, and alkalinity. We will sample properties of the full water column with a SeaBird CTD profiler (SBE 25) with DO (SBE 43), pH, transmissivity and chlorophyll a sensors at every sampling station on each visit.

***Data Analysis***

For species assemblage analyses (conducted separately for box core invertebrates, trawl invertebrates, trawl fishes, and video lander fishes), taxa for which there is just one individual collected/observed

for the entire dataset will be removed so as not to skew the data based on rare species. Cluster analysis will be conducted on transformed density datasets for each assemblage in order to produce groups of similar stations based on species abundances. The SIMPROF routine will be run in Primer 6. This routine conducts a series of permutation tests to determine if clusters in a dendrogram have statistically significant structure. Samples within a cluster that cannot be significantly differentiated are considered to be a genuine group. The SIMPER procedure in Primer then will be used to identify species contributing most to similarities within clusters and differences between clusters. This analysis will be used to determine if there are unique communities within each assemblage found across the site. Analysis of the pre-installation collections indicated that there was strong spatial heterogeneity in the invertebrate collections that were stable over time. The spatial distributions of significantly different species groups from the post-installation surveys will be compared to the pre-installation surveys. Analysis of the fish data from pre-installations collections did not elucidate any spatial patterns of species presence or abundance; thus it will be interesting to see if we observe spatial differences in fish distributions post-installation. There was however, strong temporal variability in species present across seasons. We will determine if those patterns are consistent post-installation.

Multivariate analysis of the combined pre- and post-installation datasets will be conducted in Primer. Multidimensional Scaling (MDS) will be used to analyze the transformed density data to examine species composition and proportions across stations. MDS is an ordination technique where a small number of axes are selected prior to analysis and data are fitted to those dimensions, Data will be displayed in MDS plots such that samples that form a genuine cluster, as determined using the SIMPROF routine, have the same symbol on the plot. Thus, we will be able to visually determine if samples from the same season before and after installation cluster together or if post-installation samples are significantly different from pre-installation. Following MDS analysis of the organism data, the BEST function in Primer will be used. The BEST function is based on the BIO-ENV procedure, which uses all the available potential ‘explanatory’ (usually environmental) variables to find the combination that corresponds best to the patterns in the biological data. A correlation value is given for each comparison of the biological assemblage patterns and every combination of environmental variables. We will include a binary factor indicating pre- or post-installation in the environmental matrix in order to determine if that factor contributes to observed distinctions among collections.

In addition to multivariate analyses at the species level, we will compare our observations of infaunal invertebrates and fishes to longer time series by comparing summary statistics. The US Army Corps of Engineers samples the dredge spoils from Yaquina Bay for infaunal invertebrates and occasionally fishes. The location of the North Disposal Site and sampling area falls within the NNMREC sampling area (Figure 1); thus we are able to compare densities of major taxonomic groups (Polychaetes, Molluscs, Crustaceans, Echinoderms) to the USACE to expand our reference dataset, enabling us to put post-installation observations in the context of longer term, inter-annual trends and variability. Various Oregon State University researchers have been sampling flatfish along the MB and NH transects at various time since the mid-1970s. While direct density comparisons may not be possible due to differences in gear types, we will compare the relative abundances of different

flatfish species in our pre- and post-installation observations to those observed over the past few decades.

Drop camera footage will be viewed to determine if more fish are observed at anchor locations than at reference locations and if more fish are observed by the camera facing the anchor than facing away. Derelict gear and incidents of entanglement will also be recorded if found on the footage.

### *Reporting*

Following each WEC test, a summary report of the pre-, during-, and post-test surveys will be prepared and submitted to NMFS and ODFW for review of both sampling procedures and findings. The report will include findings related to derelict gear and animal entanglement. This reporting will be in compliance with NNMRECs Mobile Ocean Test Berth Operations and Maintenance Plan, Section 9: Marine Mammal Consideration, Reporting Protocol for Injured or Stranded Marine Mammals. The presence of derelict gear itself will be reported to the Oregon Department of Fish and Wildlife. If marine mammal entanglement is observed the Oregon Marine Mammal Stranding Network, which is based at the Hatfield Marine Science Center, will be contacted as well.

The approach described above is that which will be used for the NNMREC Ocean Test Facility site, generally, as well as what is proposed for the 2012 test, which will commence in July 2012. Changes to the timing of deployment for future tests may necessitate slight changes to the sampling schedule. Study plans for the following year and subsequent tests will be submitted to NMFS and ODFW, particularly in the event that any changes from the previous sampling are proposed. If adaptive measures are planned (see below), they will be reflected in the report.

### *Adaptive Management*

We believe it will be difficult to detect measureable changes in most of the sampled populations due to project effects of the Ocean Sentinel and a single WEC device under test. The 'baseline' sampling for the Ocean Power Technologies project off Reedsport, OR, is scheduled to commence when they have the first buoy in the water, as this is still considered 'pre-installation', and no measureable changes are expected with the deployment of the single buoy. Thus, for benthic monitoring at the NNMREC Ocean Test Facility site, there are few scenarios we can anticipate that would trigger a change in sampling strategy or test operations based on benthic changes.

If monitoring shows that derelict gear has become ensnared or collected on any Project structure, the NNMREC Ocean Test Facility Manager will be notified by the NNMREC scientist to review the footage and evaluate whether the gear has the potential to endanger the safety of species and/or the devices in the area. This may include taking additional photos or footage to characterize the gear more, if necessary. Action will depend on the severity of the derelict gear entanglement and the risk the gear poses to the safety of the test or entanglement of animals. If the gear poses no threat to safety or animals, it will be removed during removal of the project. Gear removal planning and coordination will be initiated by the Ocean Test Facility Manager if deemed appropriate.


**Figure 1: Map of project area. Repeat sampling locations are indicated with blue pins. The Ocean Test Facility project area is indicated by the light blue box. The planned location for the first test is indicated with the red star. US ACE dredge spoils sampling area is indicated by the white outline.**

**PROPOSED STUDY**

**Electric and Magnetic Field (EMF) Monitoring of WET-NZ 1/2 scale Wave Energy Generator at NNMREC Ocean Test Facility**

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Proposed Project Start Date: 1-April-2012
Proposed Project Duration: 24 months

## Background

The proposed project involves deploying the WET-NZ ½ scale wave energy converter (WEC) with the Ocean Sentinel instrumentation buoy at the Northwest National Marine Renewable Energy Center (NNMREC) Newport test site offshore Yaquina Head, Oregon. Deployment of the Ocean Sentinel and the WEC unit is planned for July, 2012. We propose to carry out measurements of electric and magnetic fields on the seafloor within and adjacent to the test site during periods when the Ocean Sentinel and WEC are installed and energized. To characterize background, baseline EMF levels, we propose to carry out measurements of EMF during periods when the devices have been removed.

EMF monitoring is not a yet a fully defined science for marine renewable energy applications, and mission-specific instrumentation is needed for the industry. OSU is in the process of developing this instrumentation and will be applying it for the first time to this project in an experimental mode. The National Science Foundation (NSF)-supported National Geoelectromagnetic Facility (NGF) at Oregon State University, led by the PI of this proposal, operates the US national academic instrument pool for terrestrial geoelectromagnetic instruments. The NGF pool currently consists of 46 transportable long-period magnetotelluric (magnetic and electric field) geophysical measuring instruments, as well as 7 such instruments that are permanently deployed at sites across the continental US. The NGF is also currently constructing the first 10 geoelectromagnetic instruments of a new type – termed "ultra-wideband". This collection of instruments is used extensively in geophysical investigations on land, both to image the electrical resistivity structure of the Earth's shallow near surface, crust and mantle, and to characterize both natural and anthropogenic electric and magnetic fields (EMFs).

Under Oregon Wave Energy Trust support, the PI of this proposal collaborated with M. Slater of SAIC in construction of a first generation marine EMF sensing platform that was a marine adapted direct offshoot and functional copy of the NGF ultra-wideband instruments that the PI developed under separate NSF support, in collaboration with Zonge, International, Inc. In July 2010, this instrument was successfully used by the PI, NGF technician A.T. Peery and M. Slater, to detect EMFs on the bottom of Yaquina Bay Oregon. The NGF team induced an artificial EMF in a buried, submerged pipeline under the bay by using a Zonge International, Inc., controlled source electromagnetic generator connected to the pipeline. In addition to detecting the location of the buried pipeline, this team also characterized the background natural and anthropomorphic EMFs at the waterline and on the seafloor in Yaquina Bay.

In 2011, under Oregon State University support, and with contributions from Zonge International, Inc. (and more recently through additional NNMREC/DOE support), the PI began the development

and construction of a more advanced, 2nd generation "multi-physics bottom lander" (MPBL) system that incorporates a significantly improved EMF sensor package, a wideband ocean bottom seismometer, auxiliary sensors including pressure, accelerometers, etc., capabilities for acoustic telemetry of sensor data from the seafloor to a surface vessel, a trawl resistant cowling to protect the instrument from damage due to fishing activity, and the capability for autonomous deployment of the sensor platform from the deck of a ship and buoyant return of the platform to the surface, by acoustic command.

The MPBL has been carefully designed to characterize EMFs associated with Ocean Sentinel and WEC installations (and, with the addition of its ground motion sensors/seismometers/accelerometers, it is also well suited to environmental monitoring of offshore wind energy installations, as well as to a variety of marine geophysical investigations). The sensors have been designed following guidance found in Slater, Schultz, Jones and Fischer, *Electromagnetic Field Study* (2010), Oregon Wave Energy Trust (346 pages).

The MPBL system consists of an EMF sensor package in a trawl-resistant conical capsule approximately 2m in diameter and 1.5m tall. The lander is hoisted overboard using a vessel-mounted winch at the locations indicated in the survey lines. After approximately 10-20 minutes of recording, it is winched back on to the vessel to be deployed at the next location. Operating in this deployment mode, a single MPBL can be used to characterize the EMF signature of a WEC/Ocean Sentinel installation. In future, the MPBL will also be configurable for an autonomous long-term monitoring mode, where it is deployed at a fixed position on the seabed to monitor EMFs and other environmental parameters over periods of days-to-weeks or longer.

The magnetic field sensors have been custom developed for the MPBL, with a noise floor of approximately 0.05 pT/√Hz at 1 Hz and 0.002 pT/√Hz at 50 Hz (where 1 pT = $10^{-12}$ Tesla). The Earth's magnetic field intensity as measured by a compass is about 50,000 nT (1 nT = $10^{-9}$ Tesla). In addition to their extraordinary sensitivity, the MPBL's magnetic field sensors have a flat frequency response from 0.1 Hz to 1 kHz, which makes them ideally suited to detecting even extremely small levels of 50/60 Hz power line noise at the fundamental frequency and its significant harmonics.

We have also developed a custom marine electric field detection system that is matched to the sensitivity of the magnetic field sensors, and both electric and magnetic field sensors detect both the amplitude and the direction of the EMFs, which is critically important during a survey in discriminating between several geographically disparate sources of EMFs (i.e. to determine which cable/installation is the origin of a given signal at a given location). These sensors have been coupled to the first portable, low power geophysical data acquisition system employing a digitizer with 32 bits of precision, providing the ability to digitize the MPBL's sensor signals with extraordinary fidelity (e.g. with a signal-to-noise ratio of 3.2 million:1 for signals at 250 Hz). This extended fidelity is important in efforts to detect the sometimes-subtle EMFs of interest that may be otherwise overwhelmed by signals (natural and anthropogenic) that may come from other sources such as the shore-side power grid.

Such a degree of sensitivity to, and ability to distinguish the sources of, EMFs is required if we are to match the known and postulated electro- and magneto-sensitivity of indicated species, some of which are endangered within this range, as detailed in Slater, et al (2010). That report also indicates that with appropriate conditions (bathymetry, seafloor rock type), it is possible for electrically resistive sub-seafloor geologic formations to act as a type of waveguide, extending the distance range over which potentially biologically significant EMFs may propagate, relative to the more rapid attenuation

of such fields in electrically conductive seawater. It is therefore necessary to carry out a program of EMF monitoring of WEC sites in order to characterize background and induced EMFs from such installations. Ideally such monitoring efforts will be coupled with numerical modeling of EMF propagation using a realistic 3D model of the electrical resistivity structure of the seafloor, water column and coastline.

Our current development plan calls for completion of the data acquisition, power supply, magnetic and electric field sections of the MBL, and fabrication of a survey frame to mount these components to so they are field deployable for pre-deployment acceptance testing in Yaquina Bay Oregon, by early August 2012.

**Monitoring Objectives:**

1. Marine EMF monitoring for marine renewable energy is a newly emerging application of this method, and mission-specific instrumentation is needed for the industry. To increase our understanding of EMF monitoring, OSU has designed and will carry out the first deployment of an advanced 2nd generation EMF monitoring instrument.
2. It is hypothesized that the proposed project is highly unlikely to generate EMF at levels that would adversely impact endangered species. To investigate this hypothesis EMF monitoring will be conducted to characterize EMF during an energized WEC test.

**Proposed EMF Monitoring**

We propose to carry out two EMF surveys within and immediately surrounding the NNMREC ocean test site. It will be necessary to map the seafloor EMFs surrounding the Ocean Sentinel/WEC installation when that system is operational and energized, and also to repeat the survey after the Ocean Sentinel/WEC system has been removed or powered down. Given the MPBL's acceptance testing schedule, we propose to begin monitoring operations in August 2012, while the Ocean Sentinel/WEC is in its energized configuration. Following its removal and before any new deployments of the Ocean Sentinel take place during the spring/summer of 2013, we will return to ocean test site and repeat the survey to obtain baseline EMF measurements.

During each survey, we plan to acquire data using a 4 kHz sampling rate, so we may resolve power line frequencies up to the $16^{th}$ harmonic (960 Hz) of the 60 Hz fundamental frequency and beyond. The survey will be capable of detecting both AC EMFs originating at the WEC generator (at ocean swell frequencies of ~0.07 Hz and harmonics, as well as at 60 Hz power line frequencies and harmonics) as well as DC power line transmission related electric fields that might arise in the event of faulty/damaged/cut cable insulation or connector failures..

**Survey Configuration**

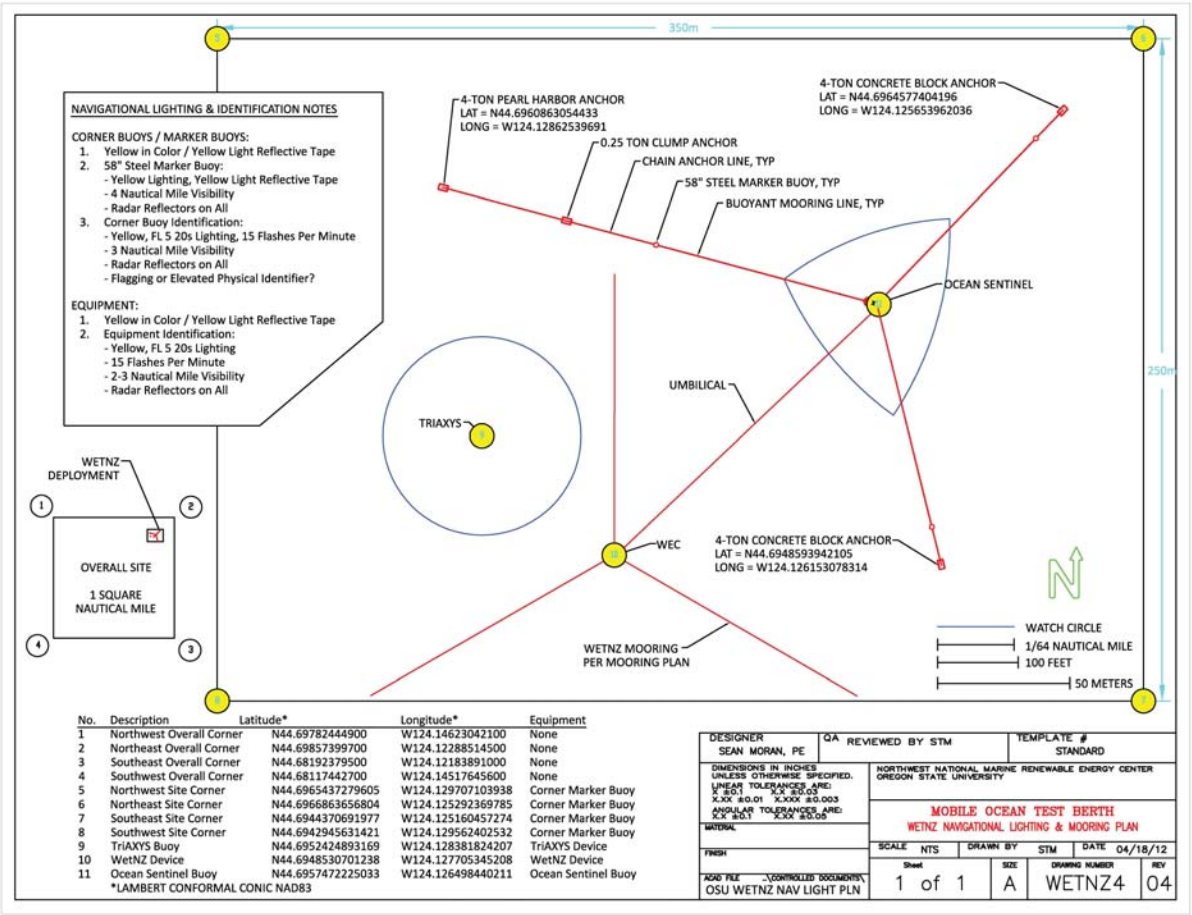
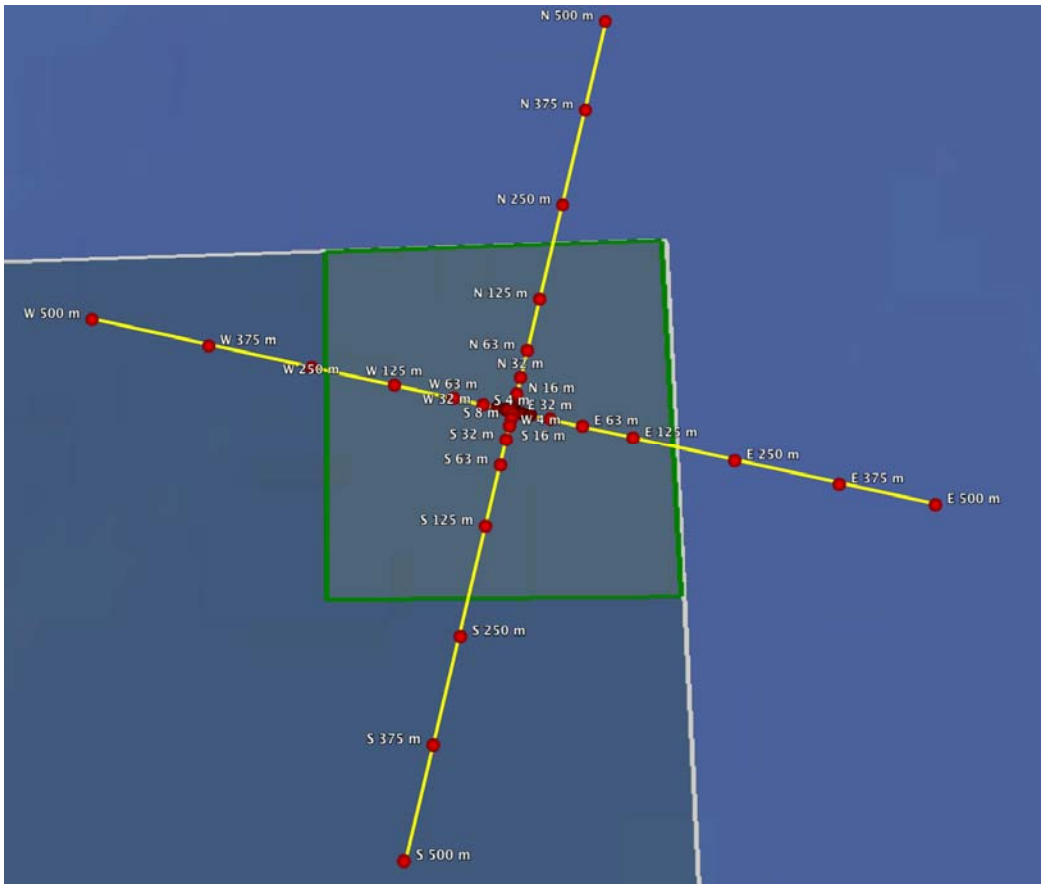



**Figure 1**. Map view of the Ocean Sentinel/WEC installation mooring lines and watch circle. The distance scale is marked in feet.

Our survey configuration is shown in Figure 2. This survey configuration will be repeated twice; first in August 2012 while the Ocean Sentinel/WEC system is positioned and energized, and again in the spring/summer of 2013 when it has been removed and prior to the reinstallation of the Ocean Sentinel. In the event of delays on the part of the WEC or Ocean Sentinel operators in deploying the system, we will adapt our schedule accordingly, reserving the ability to carry out all survey in 2013 if required. During each of these surveys the ship (the 53' Oregon State University coastal research vessel R/V Elakha) will deploy the EMF sensor platform on the seafloor at the positions indicated in Figure 2 (the red dots), using the vessel's winch. The positions will be navigated with reference to GPS.

36 separate survey stations are identified in Figure 2. Two 1-km long survey lines are shown. All directions are with reference to Magnetic North, a direction that in this location is close to parallel to the coastline and to lines of constant bathymetry. The first survey line is oriented to magnetic north-south and the second orthogonal line is oriented to magnetic east-west. The two lines cross near the center of the Ocean Sentinel/WEC installation midway along the umbilical between the Ocean Sentinel and WEC that is shown in Figure 1.

**Figure 2**. Each seafloor EMF measurement station is shown as a red dot lying along either a N-S or E-W (magnetic coordinates) survey line. Survey locations are found 4m, 8m, 16m, 32m, 63m, 125m, 250m, 375m and 500 m radially outward from the array center, in each of the four cardinal magnetic directions.




The EMF surface array is designed to tighten spacing between stations geometrically as the center of the array, i.e. the Ocean Sentinel/WEC installation is approached. Field intensity will increase geometrically with proximity to the signal source, so tighter station spacing is required closer in, while sparser EMF sampling is appropriate at greater distances. In addition to stations obtained along the cardinal directions (an approach that also increases ease of survey navigation and operational efficiency), as time allows additional EMF stations will be acquired within each of the quadrants bounded by the survey lines.

It is appropriate to monitor EMFs using such an array configuration to account for bathymetric effects on EMF propagation, and for the possibility that shallow sub-seafloor geology structure may vary in three dimensions, leading to non-uniform EMF propagation with distance from the Ocean Sentinel/WEC installation. The 500 m radius of the survey footprint allows for capture of EMFs that may have propagated along buried geologic waveguides. Experience from studies of induced EMF propagation along such waveguides, a phenomenon used in the oil industry to characterize marine oil/gas reservoirs, provides a rule of thumb: the propagation of induced EMFs due to an “electric dipole” source of a given length can be detected approximately ten dipole lengths distant, if a geologic waveguide is present. The length of the power transmission line between the Ocean Sentinel

and the WEC is approximately 50 m, thus the EMF rule of thumb suggests we should monitor EMFs to distances of up to 500 m radially from that cable. In the absence of such a waveguide, we would expect much more rapid attenuation of EMFs with distance from the center, thus the denser station spacing closer in, with stations as close as practical to the center point of the cable (minimum distance to be determined by the Ocean Sentinel manager and the Elakha's captain given prevailing winds and currents. The closest stand-off distances illustrated in Figure 5 are subject to change).

EMFs are best measured from a stable platform of the seafloor. The motion of the sensor platform dragged through the water column leads to a series of technical complications. Such a scenario would move the sensor package through the Earth's magnetic field lines, inducing an electric field that is an artifact of that motion. The platform would also pitch and yaw, changing the orientation of the sensors with respect to the EMFs being measured. Such motion would need to be carefully logged so the measured EMFs could be numerically rotated into constant orientation coordinates. Finally the motion of seawater across the electric field sensor electrodes would create "streaming potentials" that lead to spurious electric field measurements. Given these complications, it is preferable to execute the survey as described above, i.e. as a series of stable bottom station measurements.

**Reporting**

Post monitoring data analysis will take on the order of 90 days. The results will be written up in a short monitoring summary and transmitted to NMFS and ODFW for review.

**Adaptive Management**

The EMF results will be compared with known values for impact on endangered species known or likely to be present in the area. If the results indicate that WEC-related EMF levels are within the documented magnetic or electric field sensitivity range of such species, NMFS, ODFW, OSU scientists and the Ocean Facilities Manager will work together on an approach to reduce EMF levels during a test. In the event that the monitoring shows EMF signatures at levels below concern, and after consulting with NMFS and ODFW, the EMF monitoring program will be modified accordingly.