



Triton Initiative

Marine and Hydrokinetics Program

9 October 2019

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Pacific Northwest National Laboratory
Marine Sciences Laboratory

Project Overview

Project Summary	Project Information
<p>Triton supports DOE-funded projects that advance environmental monitoring for the marine renewable energy sector.</p> <p>Task 1: Continuation of FY16 FOA Awardee support provides expertise, research vessels, and permitted testing sites.</p> <p>Task 2: Fish Mesocosm Study collects data for risk analysis of turbine and fish interaction.</p> <p>Task 3: Triton Field Trials (TFiT) produces criteria for consistent environmental measurement guidelines for marine energy developments.</p>	Project Principal Investigator(s)
	Genevra Harker-Klimeš Meg Pinza
	WPTO Lead
	Sam Eaves Steven DeWitt
Project Objectives & Impact	Project Partners/Subs
<p>MHK research, development and monitoring require extensive, targeted communication with stakeholders. Triton's success streamlines the path toward siting of installations:</p> <ol style="list-style-type: none">1. Support advancement of environmental monitoring sensors.2. Conduct fundamental research in relation to fish behavior and collision risk with MHK devices.3. Develop guidelines and protocols for consistent data collection to inform regulators.	BioSonics, Inc.; Florida Atlantic University; Integral Consulting, Inc.; University of Washington; Woods Hole Oceanographic Inst.
	Project Duration
	<ul style="list-style-type: none">• Project Start Date: Oct 2016• Project End Date: Sep 2021

Marine and Hydrokinetics (MHK) Program Strategic Approaches

Data Sharing and Analysis

Foundational
and
Crosscutting
R&D

Technology-
Specific
Design and
Validation

Reducing
Barriers to
Testing

Reducing Barriers to Testing

- Enable access to world-class testing facilities that accelerate the pace of technology development
- Work with agencies and other groups to ensure that existing data is well-utilized and identify potential improvements to regulatory processes and requirements
- Support additional scientific research as needed, focused on retiring or mitigating environmental risks and reducing costs and complexity of environmental monitoring

Triton provides access and infrastructure for testing environmental monitoring technologies in the water.

- Vessels, divers, and permits are in place to provide a location to test instruments and software analysis.
- The acceleration of environmental monitoring techniques and interpretation will enable MHK devices to be deployed faster and at lower cost.

Creating a common set of guidelines to environmental monitoring methods may decrease time and effort spent by developers on permitting requirements.

The fish studies focused on particular environmental monitoring challenges such as fish collision uncertainty around turbines.

Project Budget

FY17	FY18	FY19 (Q1 & Q2 Only)	Total Project Budget FY17–FY19 Q1 & Q2 (October 2016 – March 2019)	
Costed	Costed	Costed	Total Costed	Total Authorized
\$1,333,163	\$1,166,348	\$878,678	\$4,745,607	\$8,365,000

Carryover of funding FY20 is related to the delay in field work associated with the Wave Energy Test Site (WETS). The field work must coincide with installation of the wave energy converters (WEC).

Phase 2 of the Fish Mesocosm Task will not occur until the tidal turbine is installed in Sequim Bay. The current estimate for installation is January of 2021.

Management Approach

- Regular communication with internal team.
- Communication with collaborators via email, phone and onsite visits to MSL.
- Smart Tools used to track milestones and project activities.
- Weekly financial updates.
- Monthly calls with DOE Team.
- Quarterly milestones delivered on time and within budget for the FOA and TFiT tasks. Delay in moving to Phase 2 of the FMS task based on shifting schedule for installation of tidal turbine.

Triton Tracking Tool

	At Risk	Task Name	Status	Start Date	End Date
1	🚩	Milestones		09/01/17	09/30/19
2	🚩	FOA			
3	🚩	Communication Plan to DOE	Complete	12/31/18	12/31/18
4	🚩	Document detailing the timetable and vessel/equipment requirements for the deployments at WETS and PacWave to DOE.	Complete	03/31/19	03/31/19
5	🚩	Status update discussing the progress and planned activities of all seven projects to DOE.	Complete	06/30/19	06/30/19
6	🚩	Update triton.pnnl.gov re: FOA award projects	Pending	09/30/19	09/30/19
7	🚩	T-FIT			
8	🚩	Methodologies briefing document to DOE	Complete	12/31/18	12/31/18
9	🚩	List and map suitable sites identified to DOE	Complete	03/31/19	03/31/19
10	🚩	Report defining the initial standard methods to be tested, presented as draft methodologies to DOE.	Complete	06/30/19	07/30/19
11	🚩	Report on completed review of permitting requirements and feasibility for testing at identified sites to DOE.	Pending	09/30/19	09/30/19
12	🚩	Fish Mesocosm Study			
13	🚩	Completion of Phase 1 fieldwork	Complete	12/31/18	12/31/18
14	🚩	Comparison of tags and AMP data briefing to DOE	Complete	03/31/19	03/31/19
15	🚩	Go/No-Go DOE review	Conditional	04/30/19	01/31/20
16	🚩	Conferences		10/01/18	09/30/19
17	🚩	Oceanology International Americas 2019	Complete	02/25/19	02/27/19
18	🚩	Poster submitted			
19	🚩	Waterpower Week	Complete	04/01/19	04/03/19
20	🚩	METS 2019 call for abstracts deadline		01/18/19	01/18/19
21	🚩	Ocean Technology Conference (OTC)	Complete	05/06/29	05/09/19
22	🚩	Abstract due			
23	🚩	OREC 2019		09/11/19	09/12/19

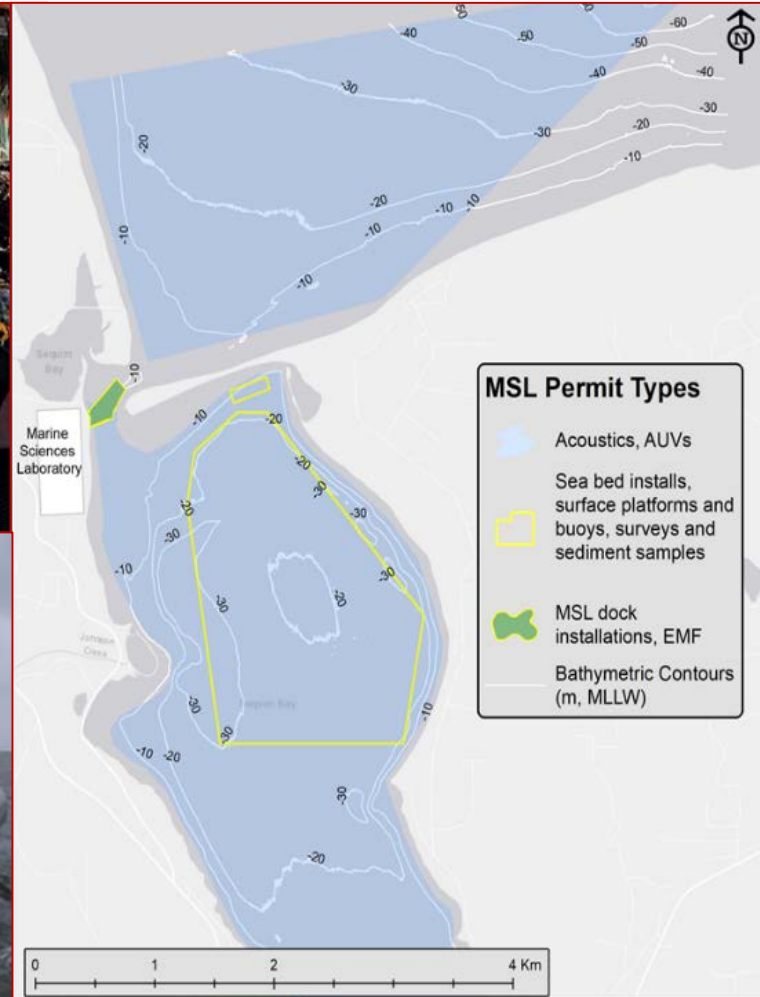
- Continue iterative process for advancing the readiness of environmental monitoring technologies.
 - *Field work occurred at permitted test bed in Sequim. Six of the seven awardees have progressed to Budget Period 3 – open water testing at Wave Energy Test Site (WETS or PacWave)*
- Apply novel fish tracking approach to provide data regarding fish interaction around a simulated/real turbine at the mesocosm scale.
 - *Incorporating JSATS acoustic tagging technology, developed by PNNL for juvenile salmon passage at large-river dams, demonstrates the suitability of this technology for research applications related to fish/turbine interactions in marine environments.*
- Develop best practices for a consistent set of data collection procedures for environmental monitoring.
 - *Gathering expert feedback from researchers and consultants will allow TFiT to field test the most accepted and recommended options. This research will provide a list of sensors and methodologies for developers to more efficiently consult with regulators and other stakeholders.*

- Developed a Communications Plan for Triton (draft Dec. 2018) that includes information provided by DOE *Lab Best Practices for Communication Material Packet*.
- Engagement examples include discussion with Subject Matter Experts to obtain feedback on the proposed best practices for conducting environmental monitoring in and around MRE devices. FOA awardees will be contacted and input will be received relative to their expertise to assist in the direction for TFiT.
- Dissemination activities focus on Triton website updates (<https://triton.pnnl.gov/>), creation and marketing brochures, and presentation of relevant content and discussions through public communication pieces such as Reddit Ask Me Anything, conferences and meetings
- Created a virtual tour of the PNNL Marine Sciences Laboratory (MSL) where Triton efforts are featured.
- PNNL is publishing research associated with the Fish Mesocosm Task and has an accepted abstract to the Seattle Oceans 2019 conference.

Technical Accomplishments – Task 1 FOA Support

PNNL provides technical expertise and a platform for research:

- Permitted test site in a quiescent environment and an easily accessible energetic site in Sequim Bay Channel.
- Controlled laboratory setting for prototype development.
- Technical expertise to assist with technology development.
- Research vessel and scientific dive team support.

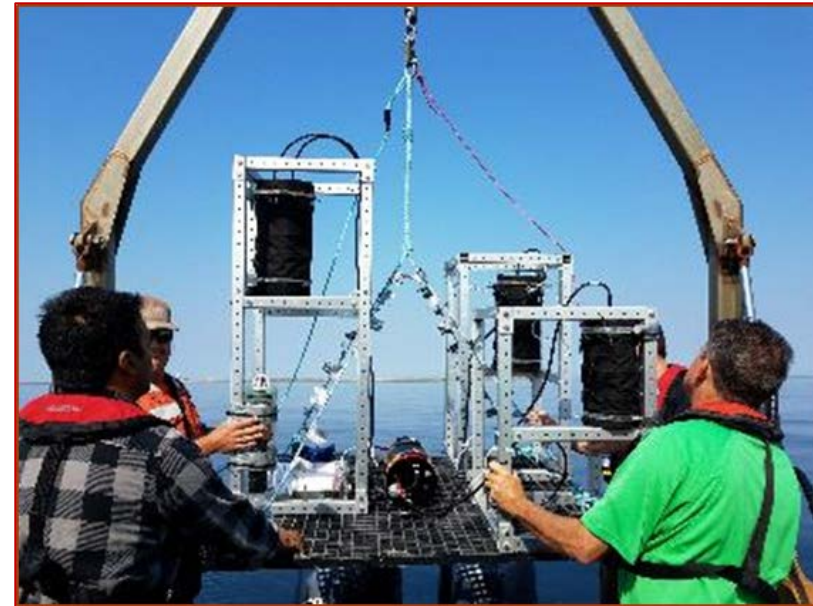
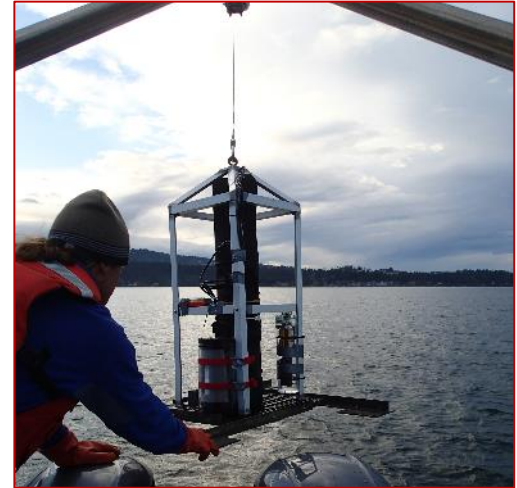
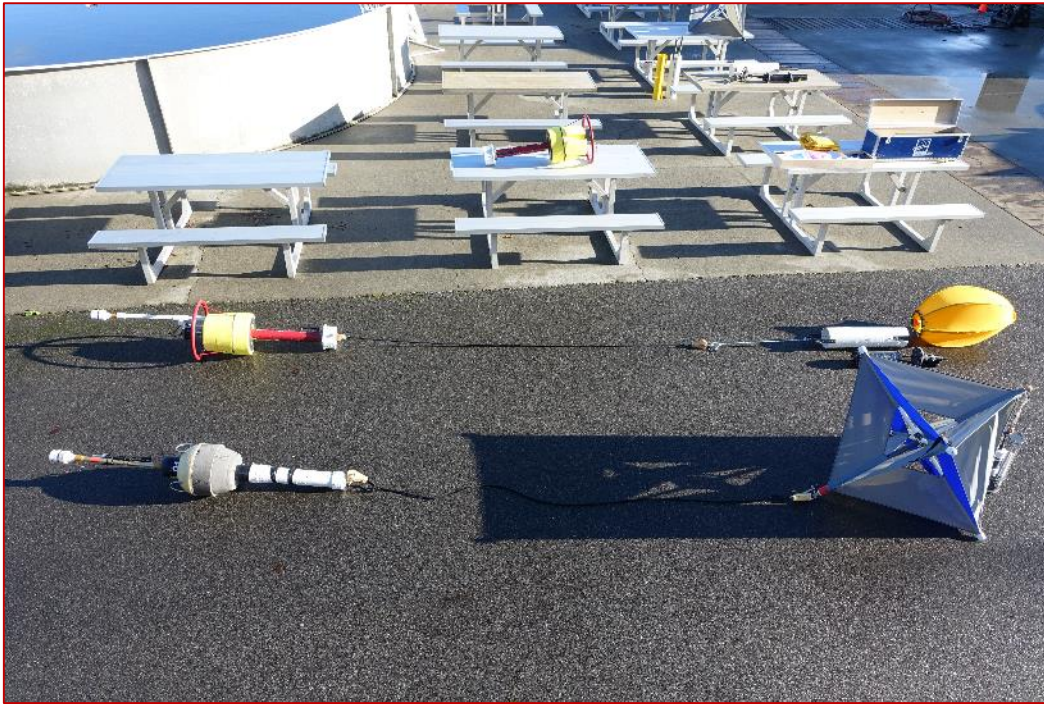


Technical Accomplishments – Task 1 FOA Support

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

Acoustics



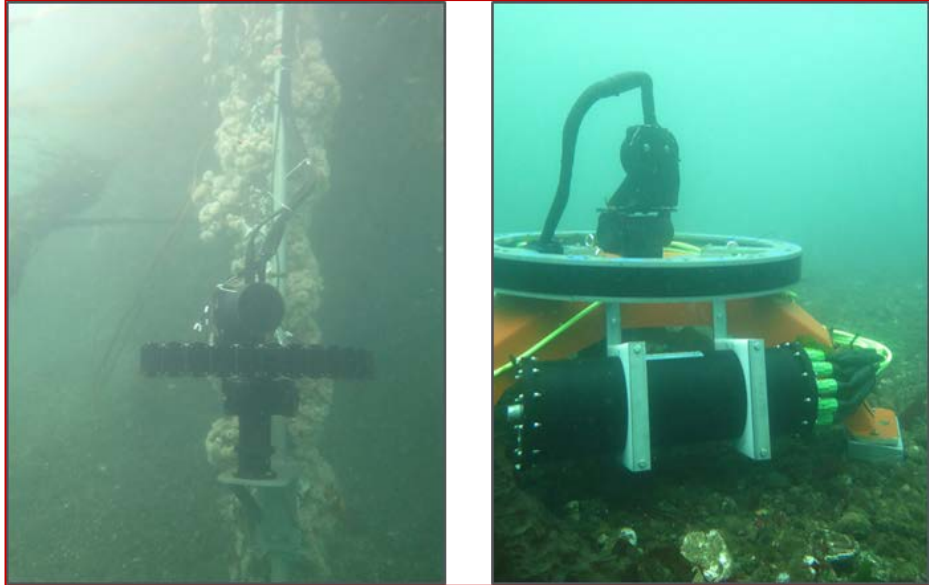
UW DAISY & Integral NoiseSpotter

Technical Accomplishments – Task 1 FOA Support

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

Animal Interaction



BioSonics

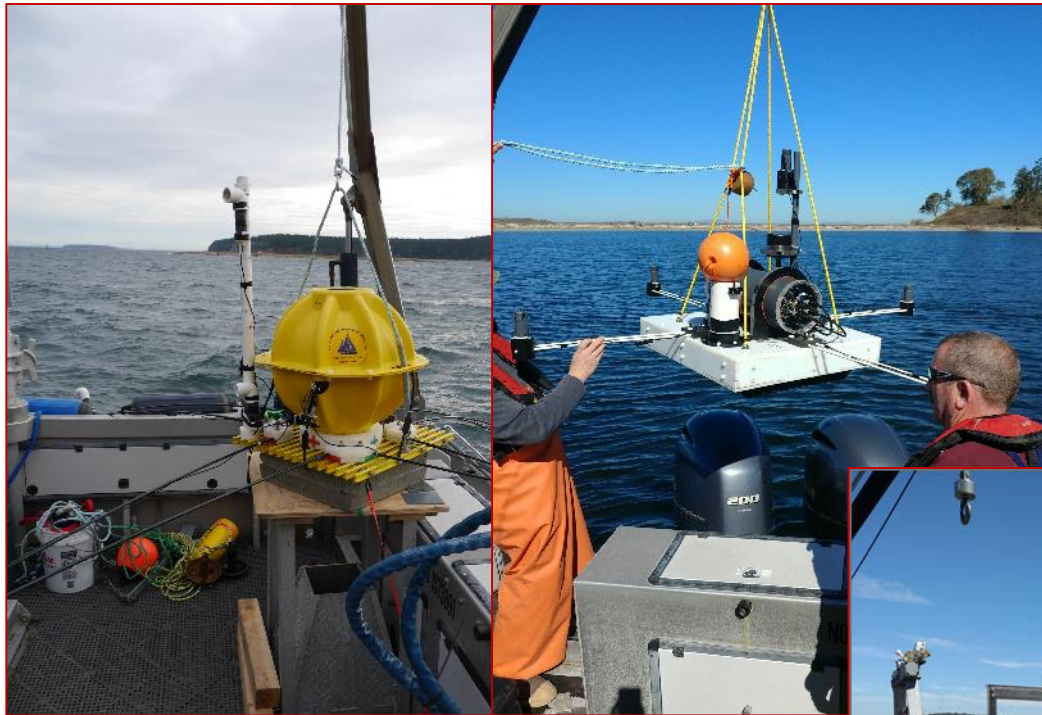


Florida Atlantic University

Technical Accomplishments – Task 1 FOA Support

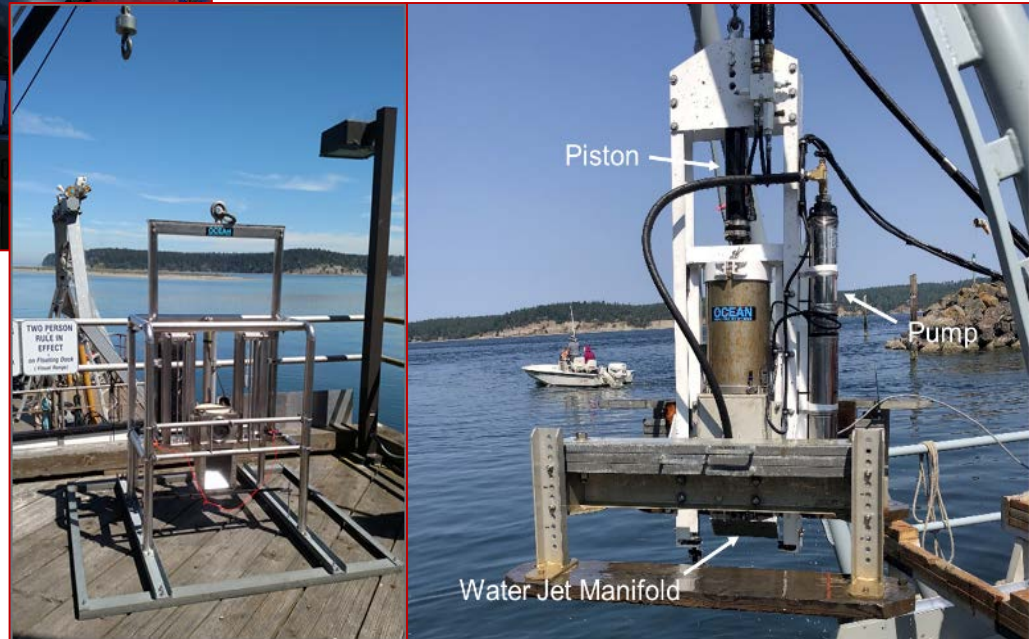
U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



**EMF – Woods Hole
Oceanographic Institute**

**Benthic Habitat
Mapping - Integral**



Technical Accomplishments – Task 1 FOA Support

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



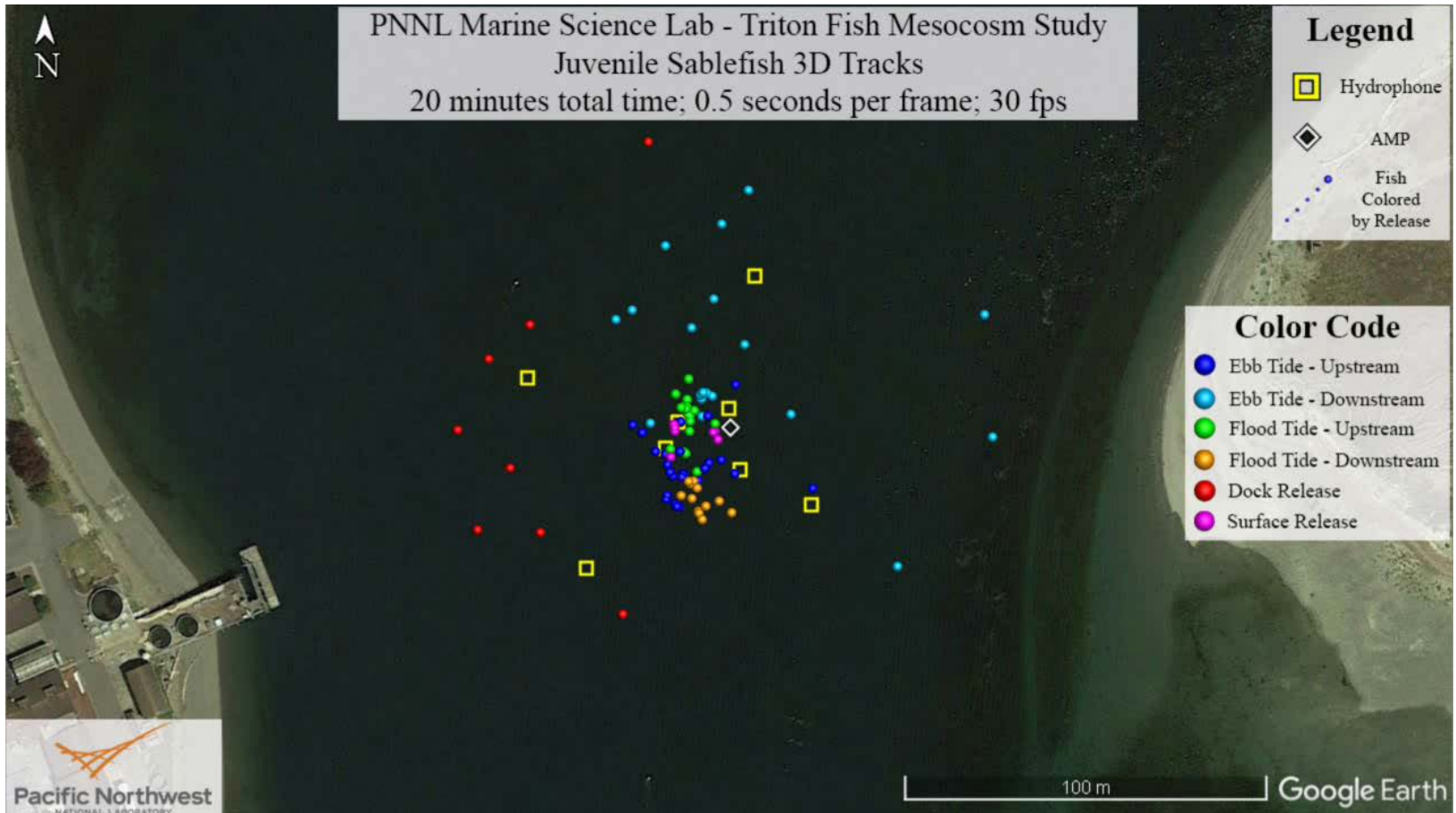
UW 3G Adaptable Monitoring Package

Technical Accomplishments- Fish Interaction

- Inform risk models regarding how fish behave near a turbine.
- Use acoustically tagged fish released in a semi-controlled manner in Sequim Bay channel. Movement is tracked by using passive hydrophones designed to “listen” for the tagged fish.
- Phase 1 (complete) included an 8-hydrophone array and 100 JSATS tagged sablefish.



Technical Accomplishments Fish Interaction



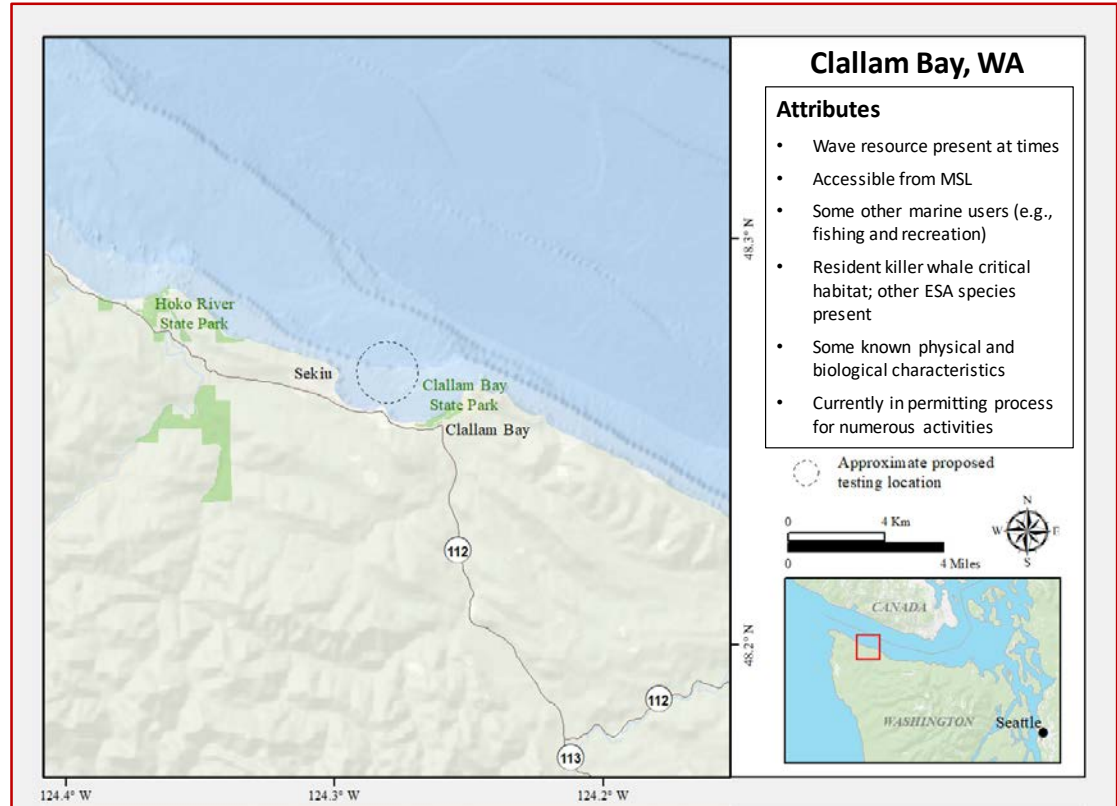
Triton Field Trials Tasks:

1. Detail environmental concerns associated with marine energy.
2. Review existing assessment methods.
3. Compare different assessment methods in the field.
4. Review available models and required data relevant to the environmental concerns identified in Task 1.
5. Produce recommendations for a consistent set of methods for measurements and analysis.

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1. Physical oceanography
 2. Geologic resources
 3. Water quality
 4. Benthic resources
 5. Fish
 6. Essential fish habitat
 7. Marine mammals and sea turtles
 8. Birds
 9. Cultural resources
 10. Marine uses

1. Collision risk
2. Underwater noise
3. EMF
4. Changes in habitat
5. Displacement of animals
6. Changes in physical systems

- List and map suitable sites in the northwest identified for testing methods in the field.
- Possible test locations selected from 12 identified include:
 - Sequim Bay, WA
 - Clallam Bay, WA
 - PacWave, OR
 - Tanana River, AK
- Develop testing methodologies using sensors and analysis to confirm approach.



- Task 1 FOA –Additional field work at MSL may be completed by the time peer review occurs.
- Task 2 FMS – no changes to this task. Current forecast is for installation to occur in January of 2021.
- Task 3 TFiT - Produced a briefing document describing the initial standard methods to be presented as draft methodologies to DOE.

- *BP3 FOA Support for testing at WETS in Hawaii.*
 - Provides a dynamic wave environment
 - *Challenge is WEC install schedule at WETS*
- *Phase 2 FMS.*
 - Fish interaction with a deployed prototype tidal turbine
 - 1,000 fish (tagged)
 - Determine sensor array
 - Conduct trials under a variety of conditions
 - Work in collaboration with UW APL
 - Data will inform fish interaction modeling
 - *Challenge is testing depends on installation of turbine in Sequim which is not part of our scope.*
- *TFiT field tests.*
 - Obtain permits at selected sites
 - Coordinate equipment purchase or subcontractors to support monitoring
 - *Challenge is gaining access to field sites to validate selected best practices.*