

Developing a Wave Energy Test Site



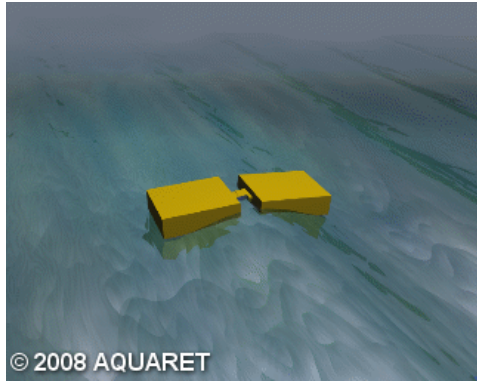
Dr. Sarah Henkel
Hatfield Marine Science Center
Oregon State University



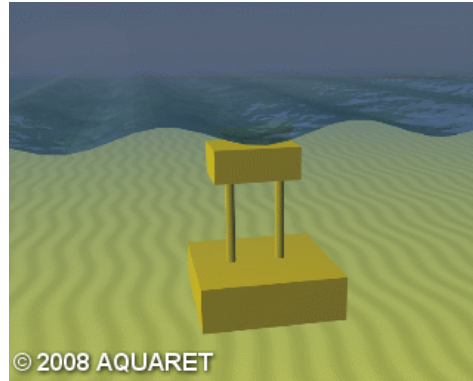
Harnessing Wave Resources



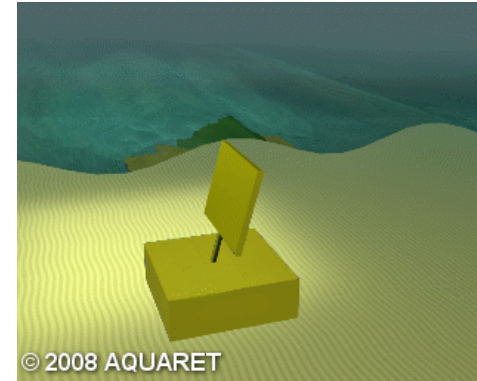
Point Absorber



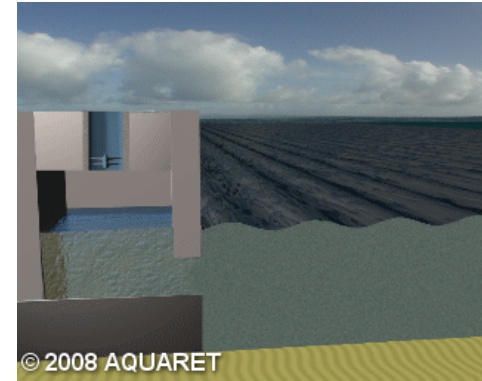
Attenuator



Submerged Pressure
Differential



Oscillating Surge
Converter



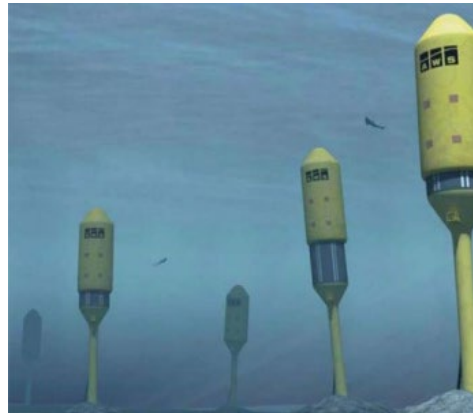
Oscillating Water
Column



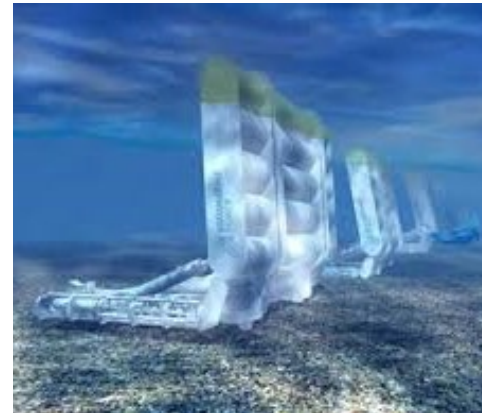
Ocean Power
Technology PB



Pelamis Wave Snake



Archimedes Swing



Oyster



Ocean Energy

U.S. Pacific Wave Energy Efforts

2004

Wave Energy Test Site (WETS) established off Marine Corps Base Hawaii. PB-40 deployed in 30 m berth



Sept – Oct
2007

Finevera deployed off Newport, OR



11-12 Oct
2007

Ecological Effects of Wave Energy Development Workshop held at HMSC in Newport, OR

2008 NNMREC Established



Oregon State University



UNIVERSITY of WASHINGTON

(HINMREC in 2009)

Sept
2008

Columbia Power Technologies tested off Newport, OR



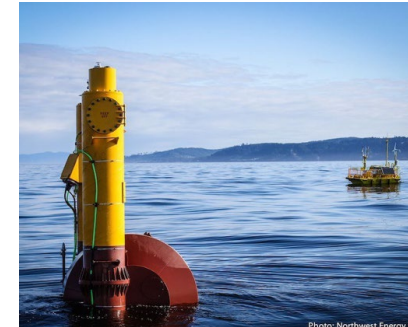
2011

Aquamarine Power leased offices in Newport, OR



Aug – Oct
2012

CPT 1:7 scale device deployed off Newport, OR at PacWave-N



2014 - Wave Energy Test Site (WETS) added berths 60 & 80 m depths.



2015 & 2018 - Azura device deployed

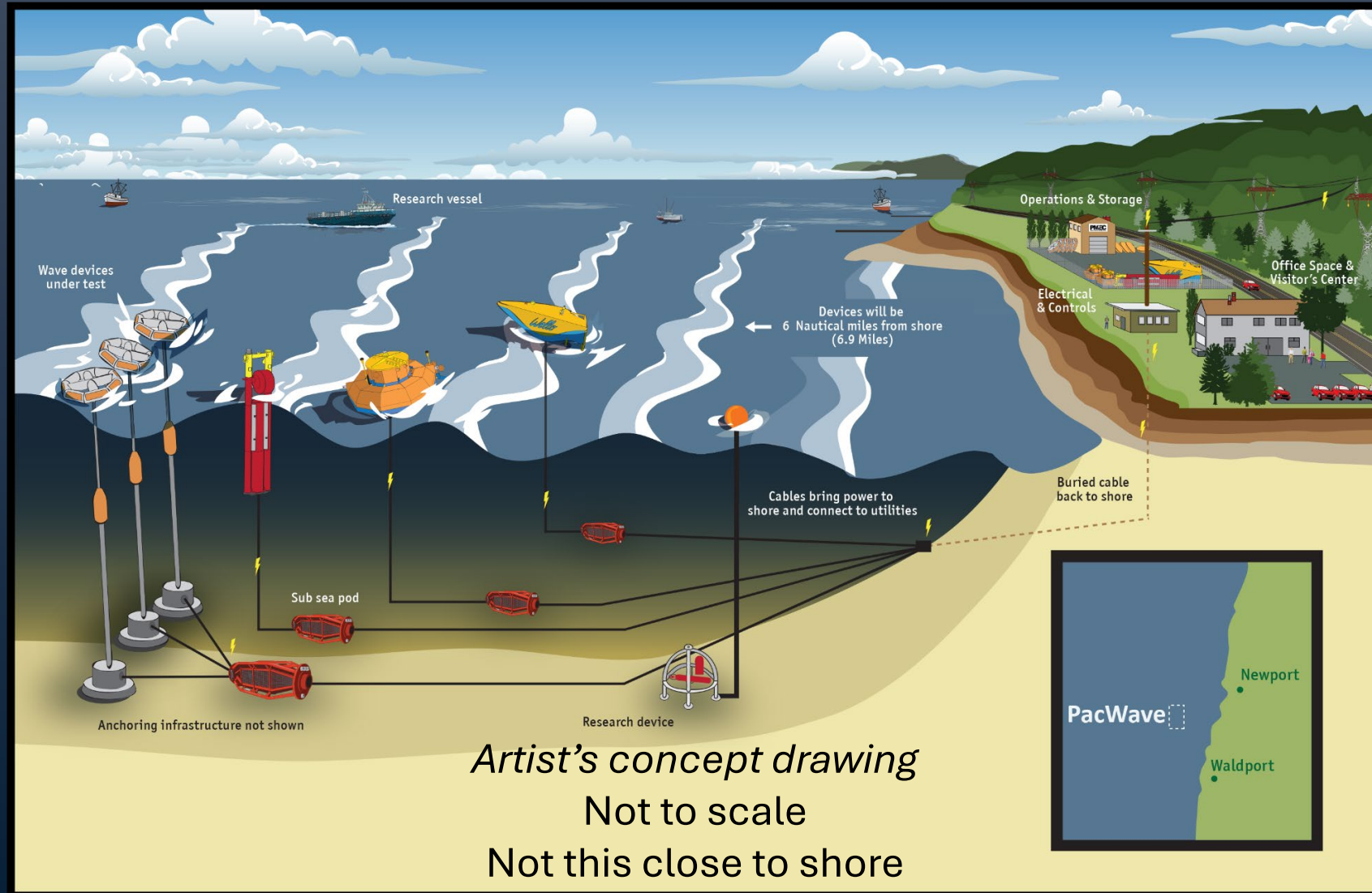
2016 & 2018 - Lifesaver device deployed

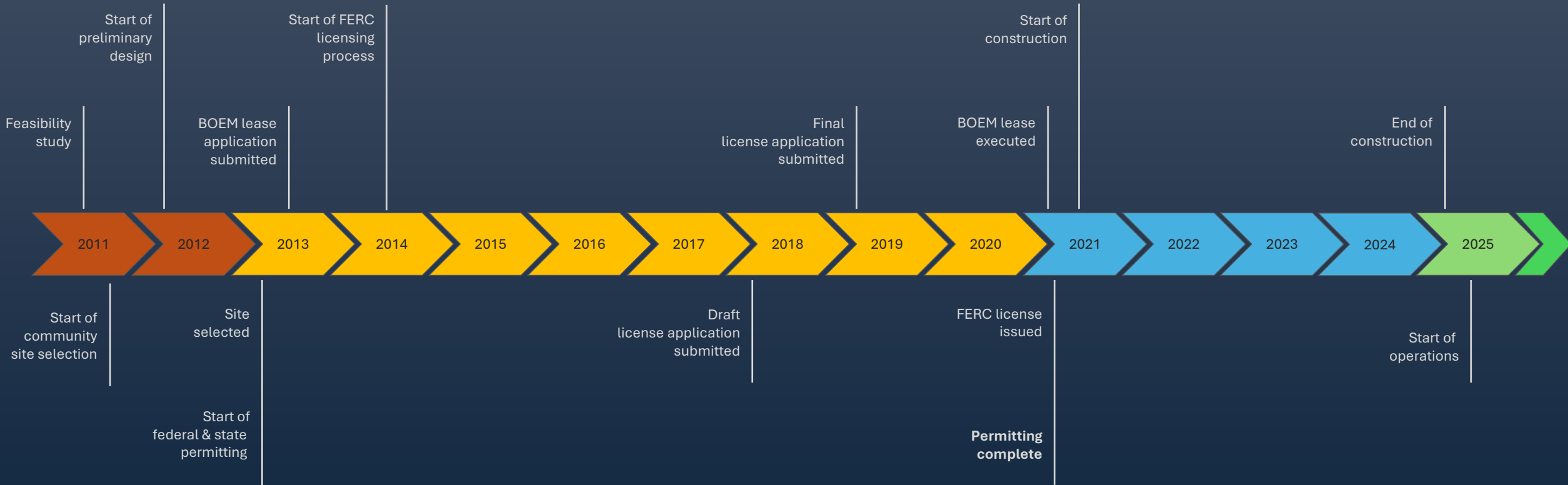
2023 & 2024 – C-Power SeaRay deployed





PacWave
TESTING WAVE ENERGY FOR THE FUTURE





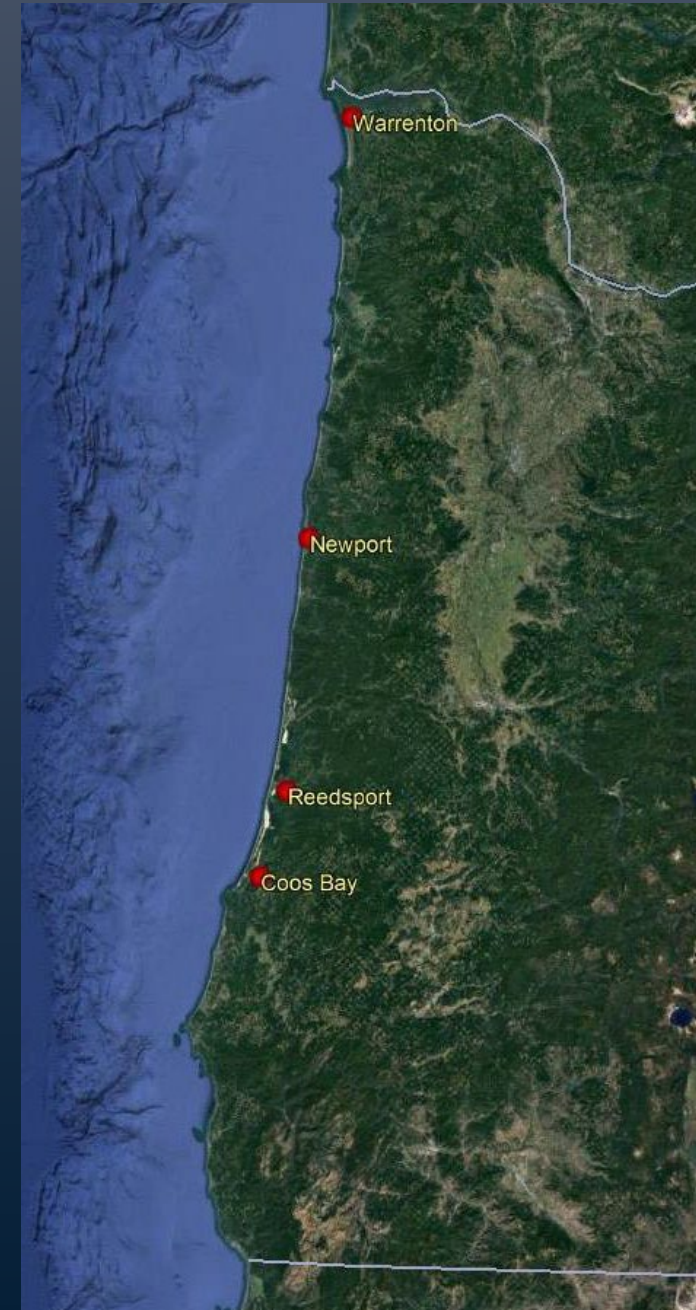
Preliminary Design & Site Selection (2011 – 2013)

Factors considered during site selection included:

- Water depth (less than 100 meters)
- Seafloor type (sand seafloor)
- Distance from shore
- Distance from port (<1 hour transit)
- Existing ocean users and potential space-use conflicts

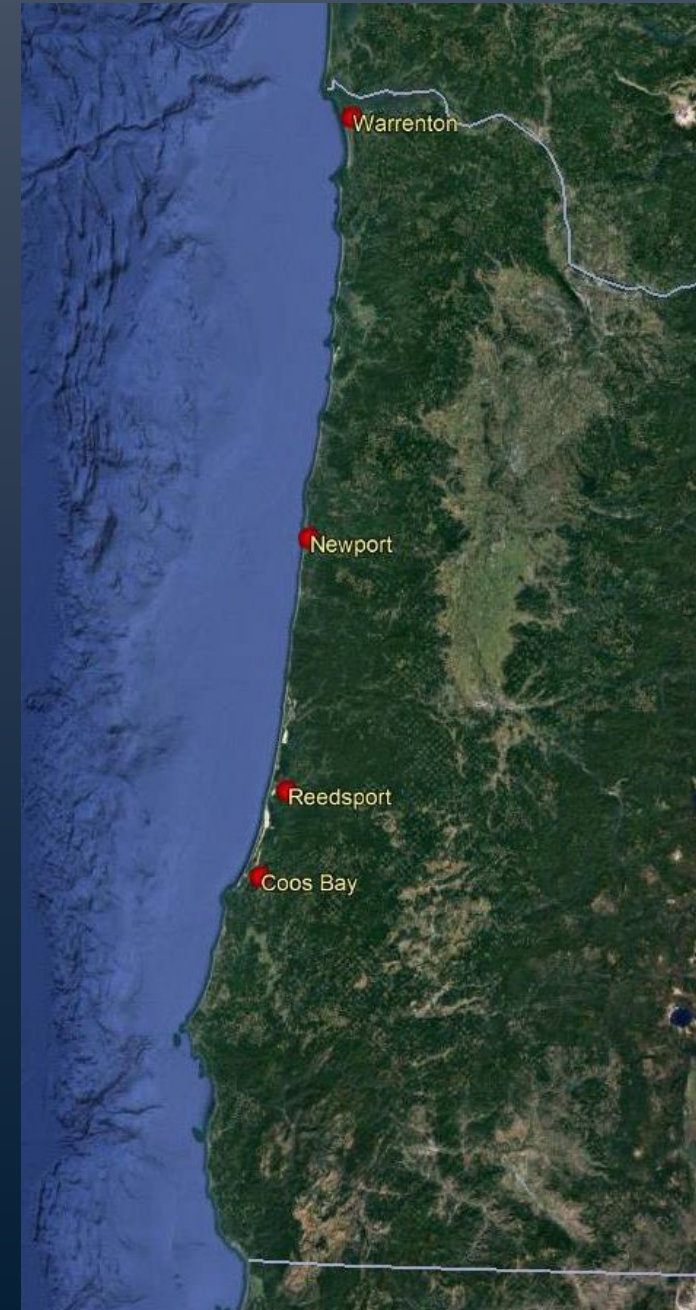
Four communities were initially identified in 2011:

- Warrenton
- Newport
- Reedsport
- Coos Bay

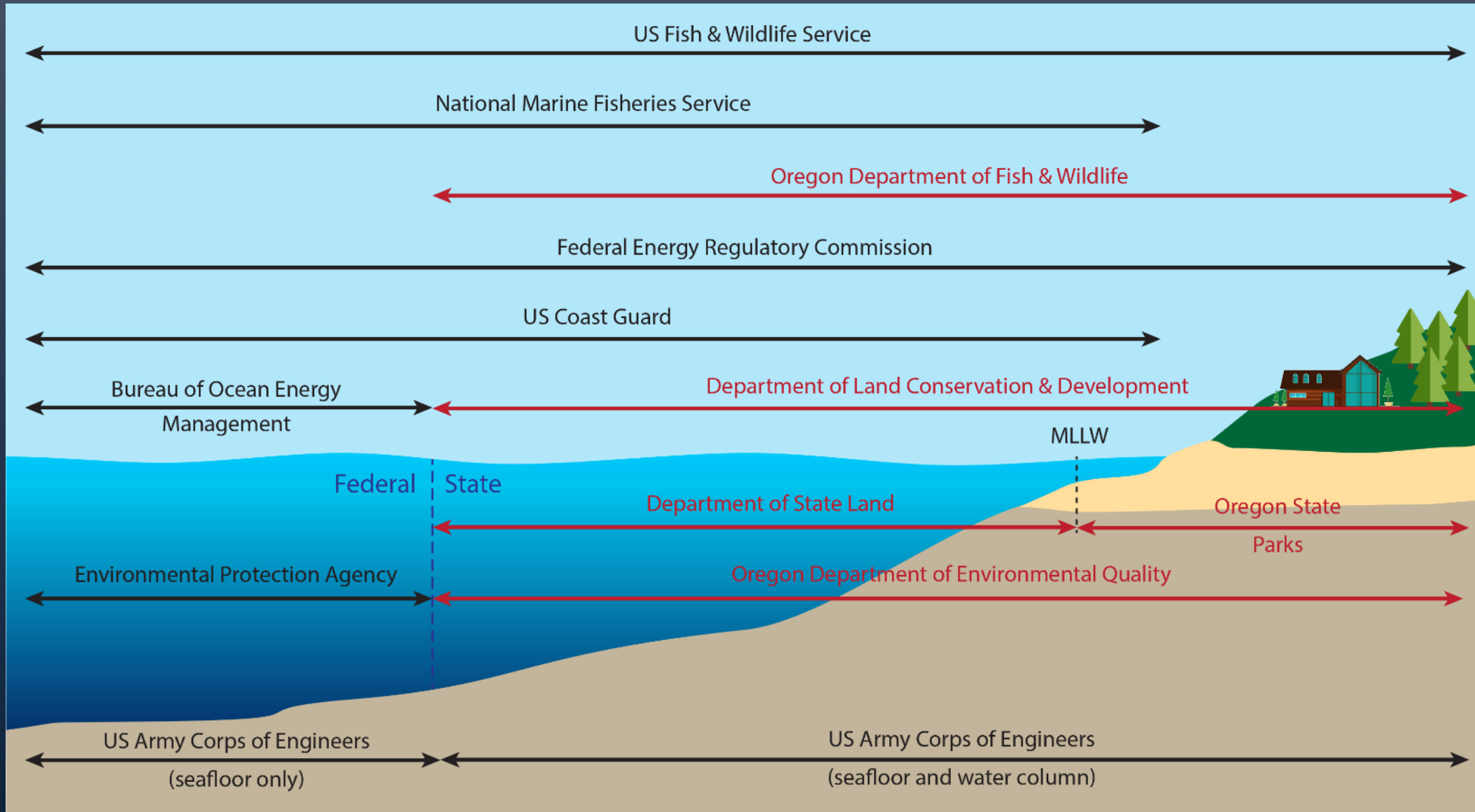


Preliminary Design & Site Selection (2011 – 2013)

- OSU held a series of community meetings in each of the 4 locations to assess community interest.
- In September 2012, the focus narrowed to Newport and Reedsport.
- Community Site Selection committees were formed in each community and included: local fishermen, tribes, local government officials, resource agencies, port operators, utility operators and the public at large.
- Proposals were submitted in December 2012.
- Newport was selected in January 2013.



Permitting, Design, and Engineering (2013 – 2020)



Permitting, Design and Engineering (2013 – 2020)

Federal

- **Federal Energy Regulatory Commission**
- National Marine Fisheries Service
- Bureau of Ocean Energy Management
- US Fish & Wildlife Service
- US Army Corps of Engineers
- National Park Service
- US Coast Guard
- US Department of Energy
- Environmental Protection Agency

Tribes

- Confederated Tribes of the Siletz
- Confederated Tribes of the Grand Ronde

County

- Lincoln County

Utilities

- Central Lincoln People's Utility District
- Bonneville Power Administration

State

- Oregon Department of Fish & Wildlife
- Oregon Parks and Recreation Department
- Oregon Department of State Lands
- Oregon Department of Land Conservation & Development
- Oregon Department of Environmental Quality
- Oregon Department of Transportation
- Oregon Department of Energy
- Office of the Governor
- Oregon Public Utility Commission

Municipal

- Port of Newport
- Port of Toledo
- City of Newport

Other

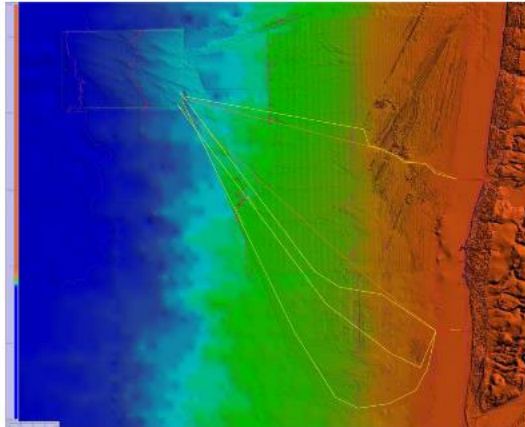
- Fishermen Involved in Natural Energy (FINE)
- Surfrider
- Oregon Wave Energy Trust
- Oregon Shores

Collaborative Workgroup (CWG) Members

Permitting, Design and Engineering (2013 – 2020)



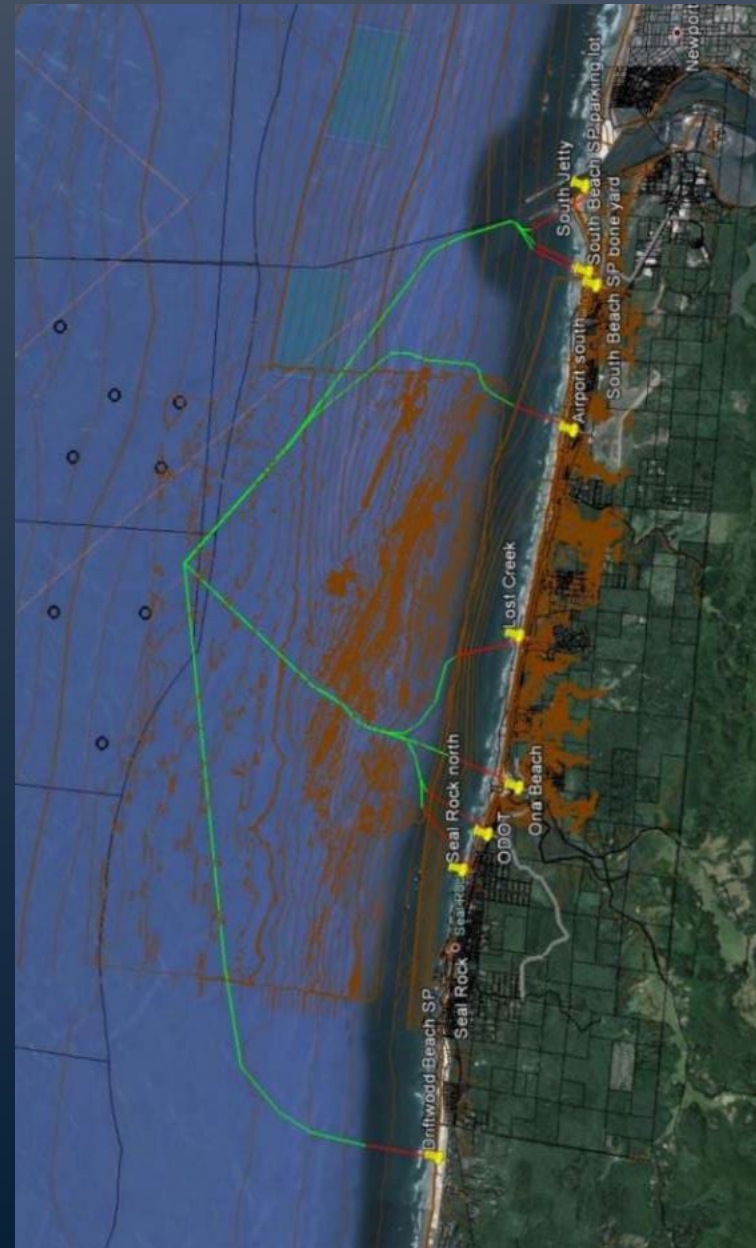
Cable Routing Desktop Study For Power Cables Near Newport, Oregon



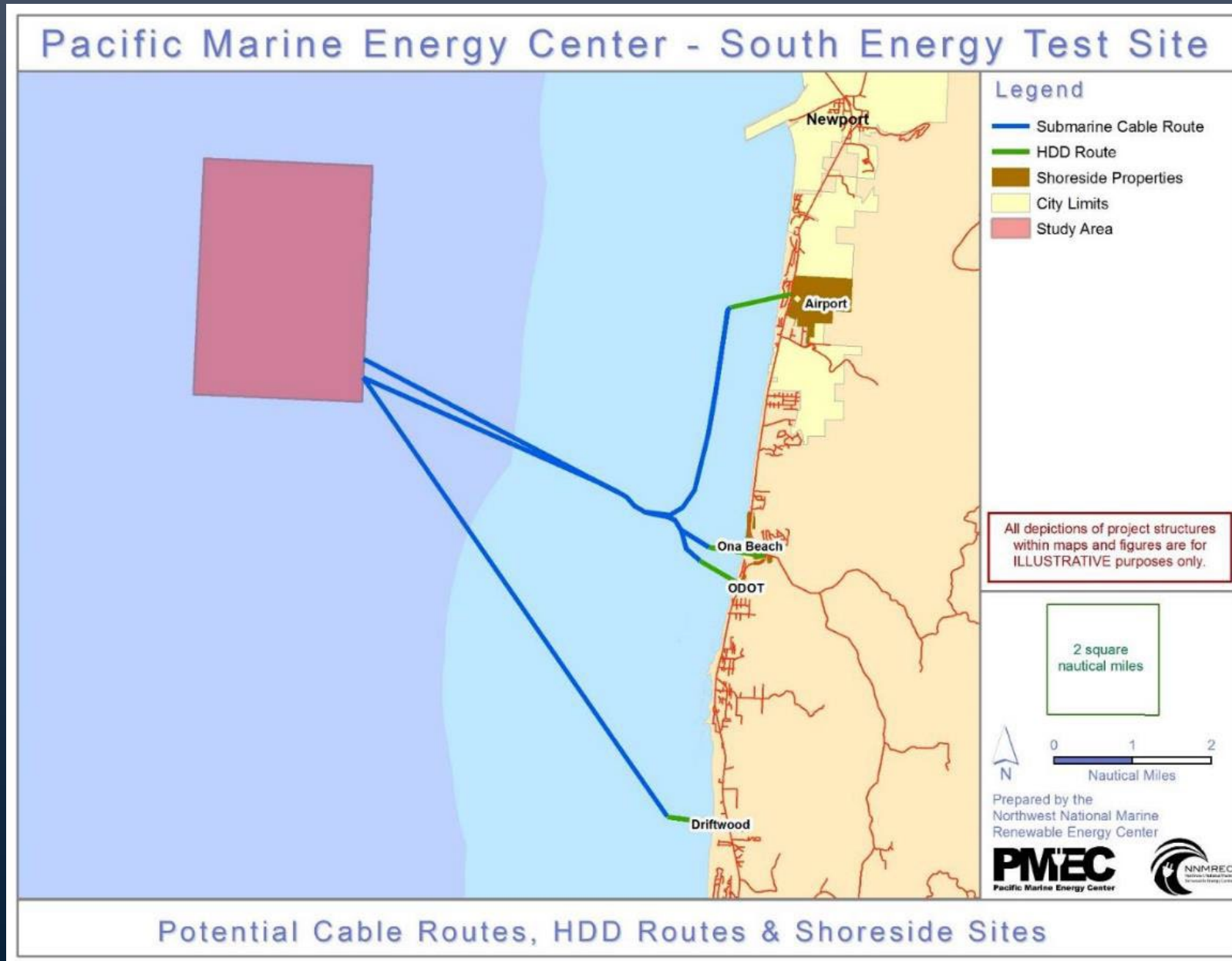
For
Northwest National Marine Renewable Energy
Center
Pacific Marine Energy Center
Oregon State University

Submitted By: 3U Technologies

November, 2014



Permitting, Design and Engineering (2013 – 2020)



Geophysical work across Driftwood Beach



Construction & System Testing (2021 – 2025)

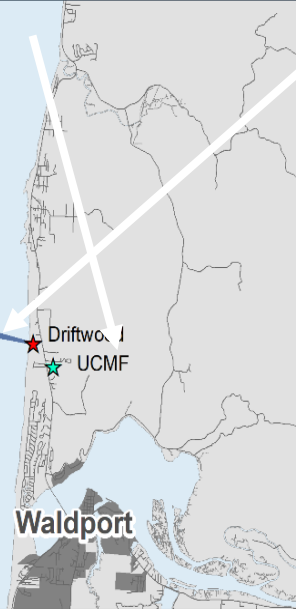
2021-24



2021-22



2024



Photograph:
Newport News Times

PacWave Environmental Surveys

1. Site Characterization

- Characterize spatial and temporal variability in habitat characteristics (physical/acoustic) and species distributions in the project areas
- Identify species potentially unknown to the area
- Inform the design and implementation of future pre-installation and post-installation surveys

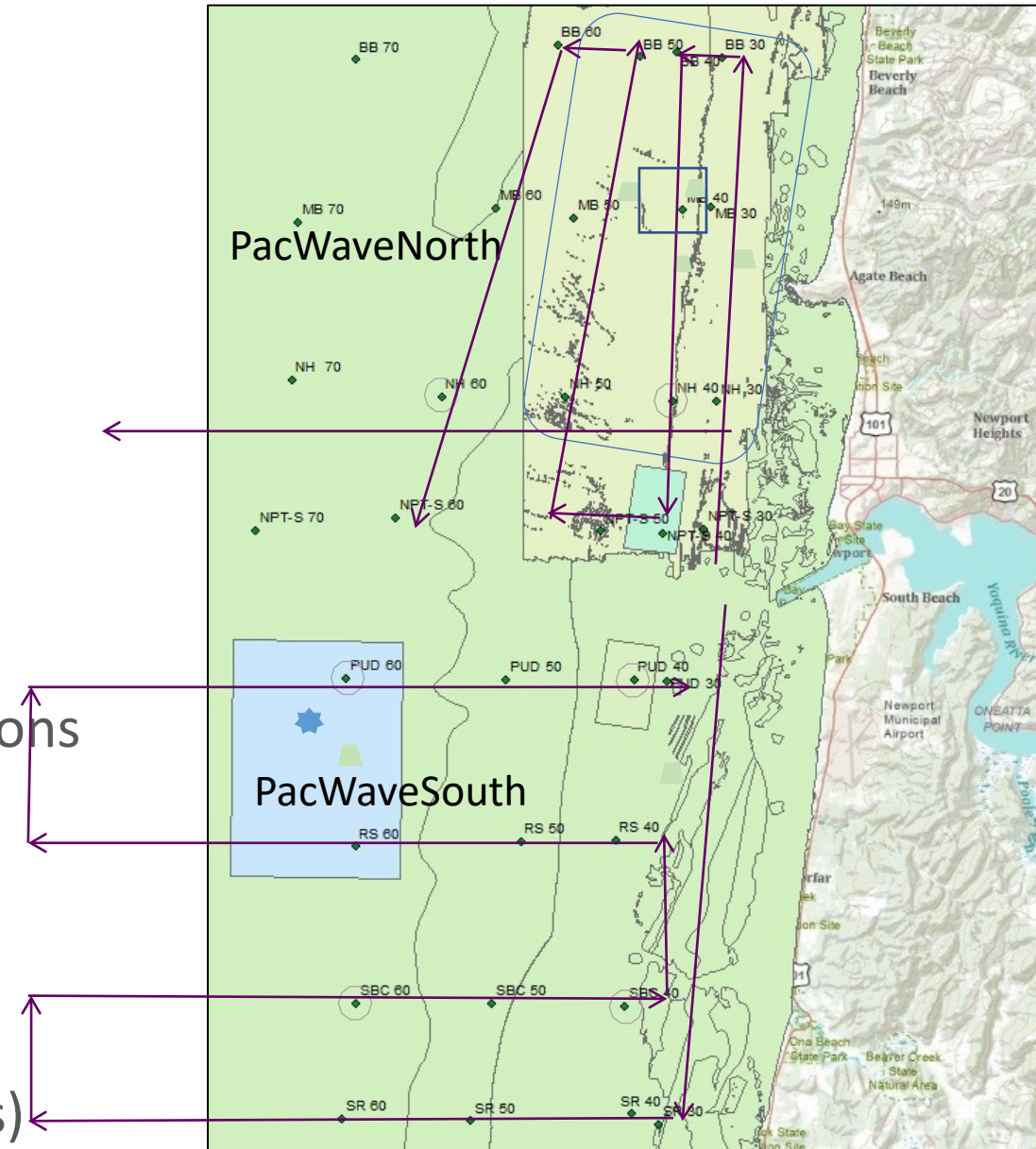
2. Pre- and Post-installation Monitoring

- Per license requirements

3. Opportunities for Research

PacWave Environmental Surveys

- ◆ Benthic Invertebrate and Sediment grabs
 - ◆ 2010-16, 2020-2021 @ PacWave North
 - ◆ 2013-15, 2019, 2021-2025 @ PacWave South
- Flatfish trawls
 - 2010-15 @ PWN
- ❖ Seafloor Videos
 - ❖ 2012 & 2024 @PWN, 2022 – 2025 @ PWS
- Dungeness Crab pots
 - 2013-15 @ PWS
- Marine Bird and Mammal ship-based observations
 - 2013-15 @ PWN & PWS
- ◇ Acoustics (hydrophones deployed)
 - 2011-13 @ PWN
 - 2015, 2022-2025 @ PWS
- ★ Electromagnetic Field mapping (also lab studies)



Get the full story at <https://www.youtube.com/watch?v=DQ-HJ3OSBgl>

Sarah Henkel

Acting Director, PMEC

Environmental Studies Lead, PacWave

sarah.henkel@oregonstate.edu

Dan Hellin

Director

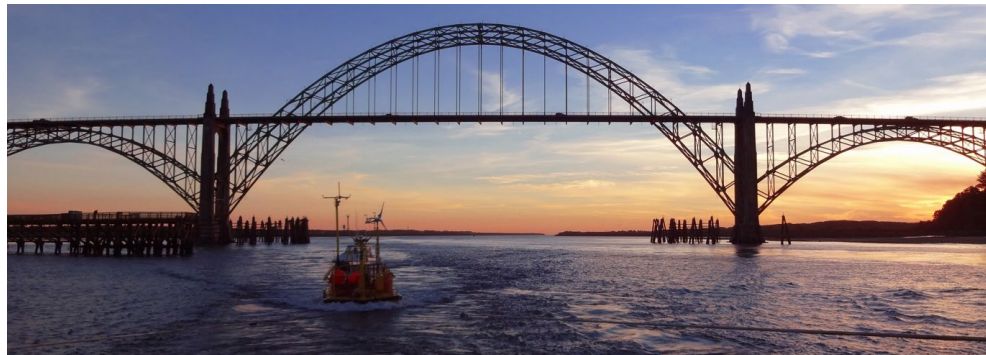
PacWave

dan.hellin@oregonstate.edu



PacWave

TESTING WAVE ENERGY FOR THE FUTURE



pmec.us

pacwavenergy.org