What does it take to grid-connect offshore?
Cable Laying and Monitoring at PacWave

Pacific Offshore Wind Consortium webinar

May 12, 2025

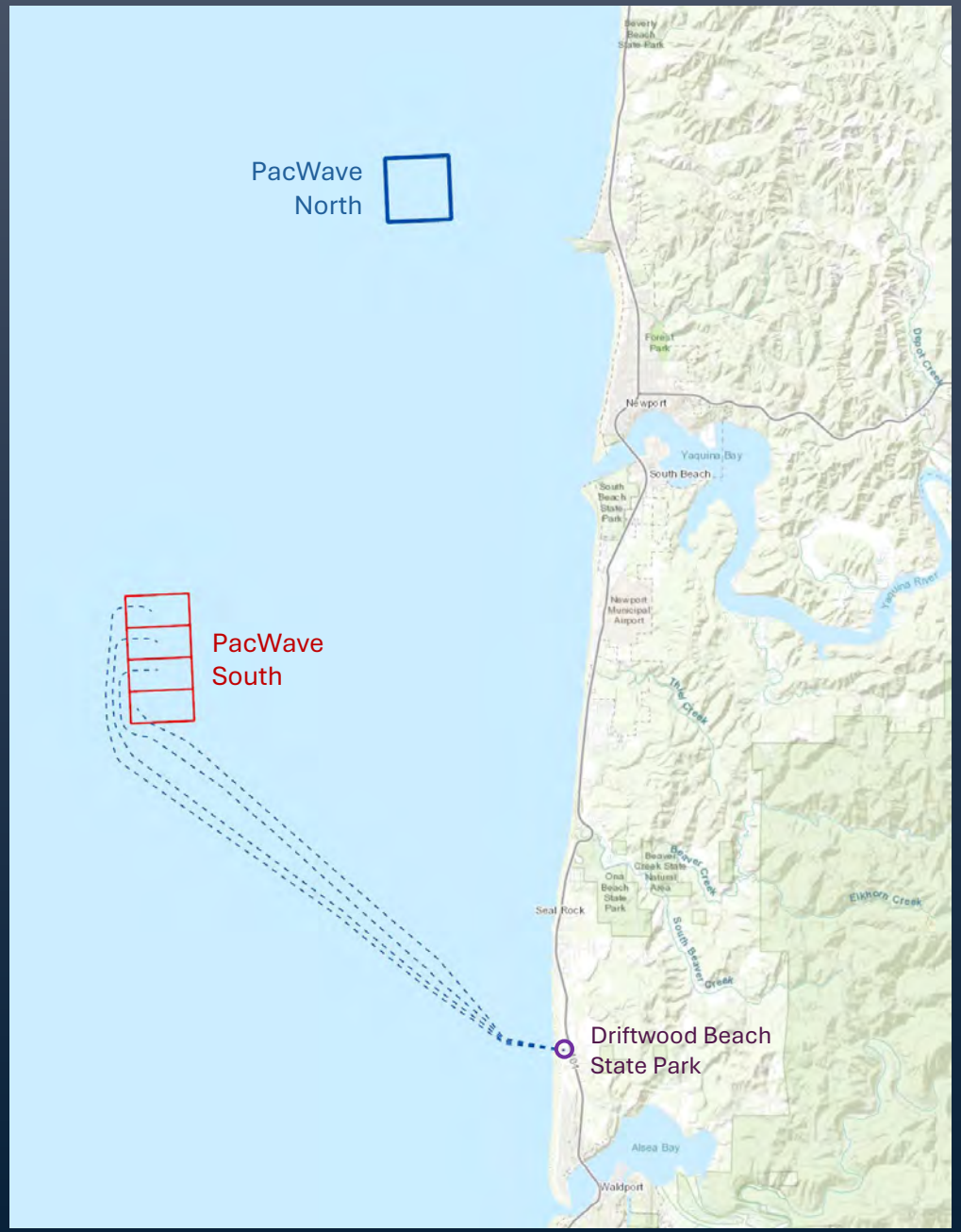
Dan Hellin
Director, PacWave

Oregon State University

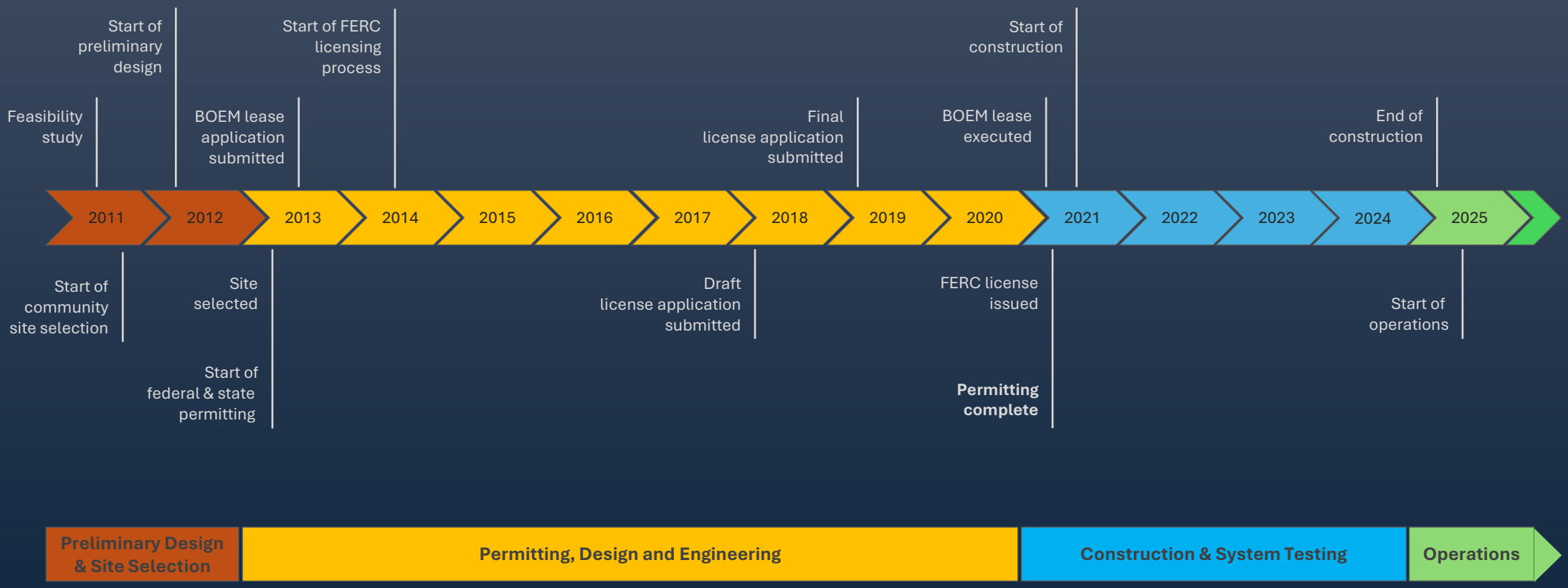
PMEC Pacific Marine Energy Center

PacWave

PacWave Test Sites

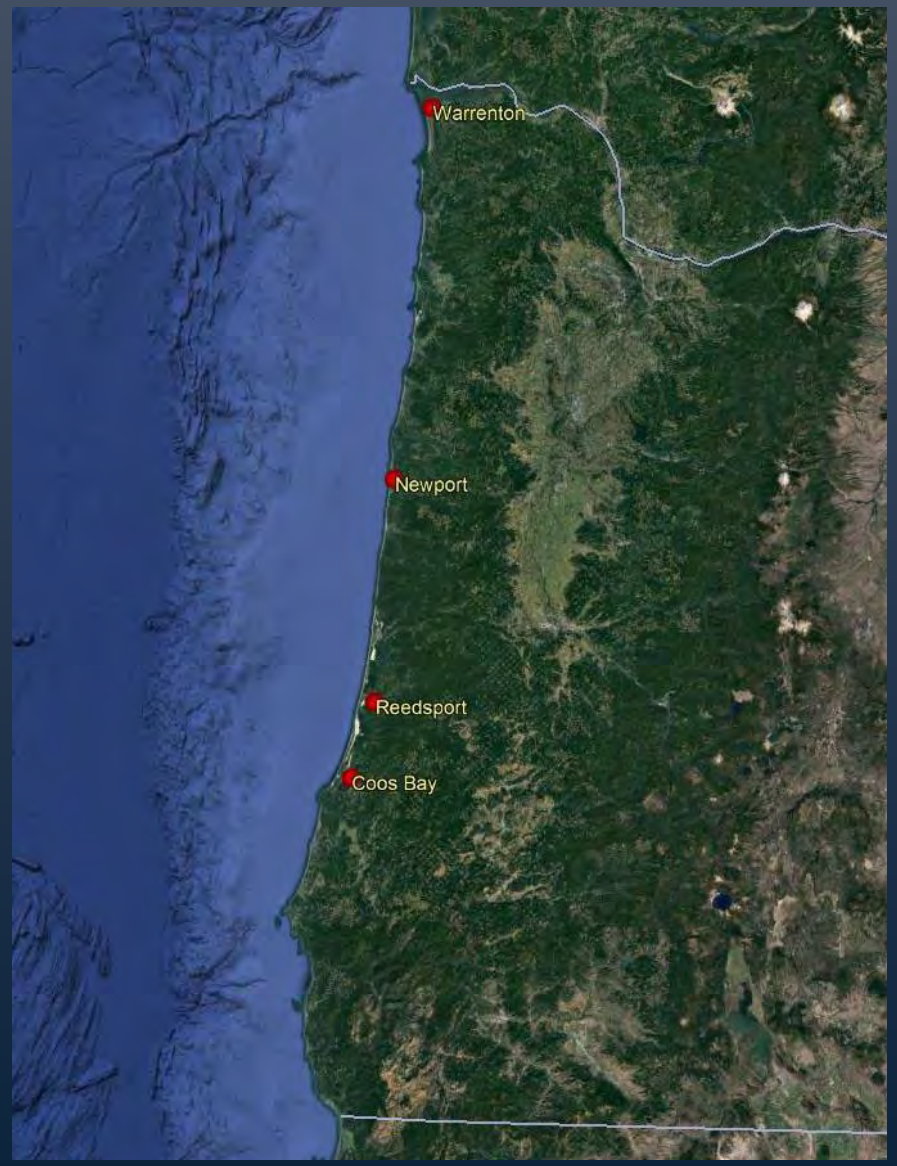


PacWave South Timeline



Site Selection

1. Four communities were initial identified
2. Community meetings held to assess interest
3. Down-selected to Newport and Reedsport (September 2012)
4. Community Site Selection Committees were formed. Included:
   - local fishermen
   - Tribes
   - local government officials
   - resource agencies
   - port operators
   - utility operators and
   - public at large
5. Proposals were submitted (December 2012)
6. Newport was selected (January 2013)



PacWave

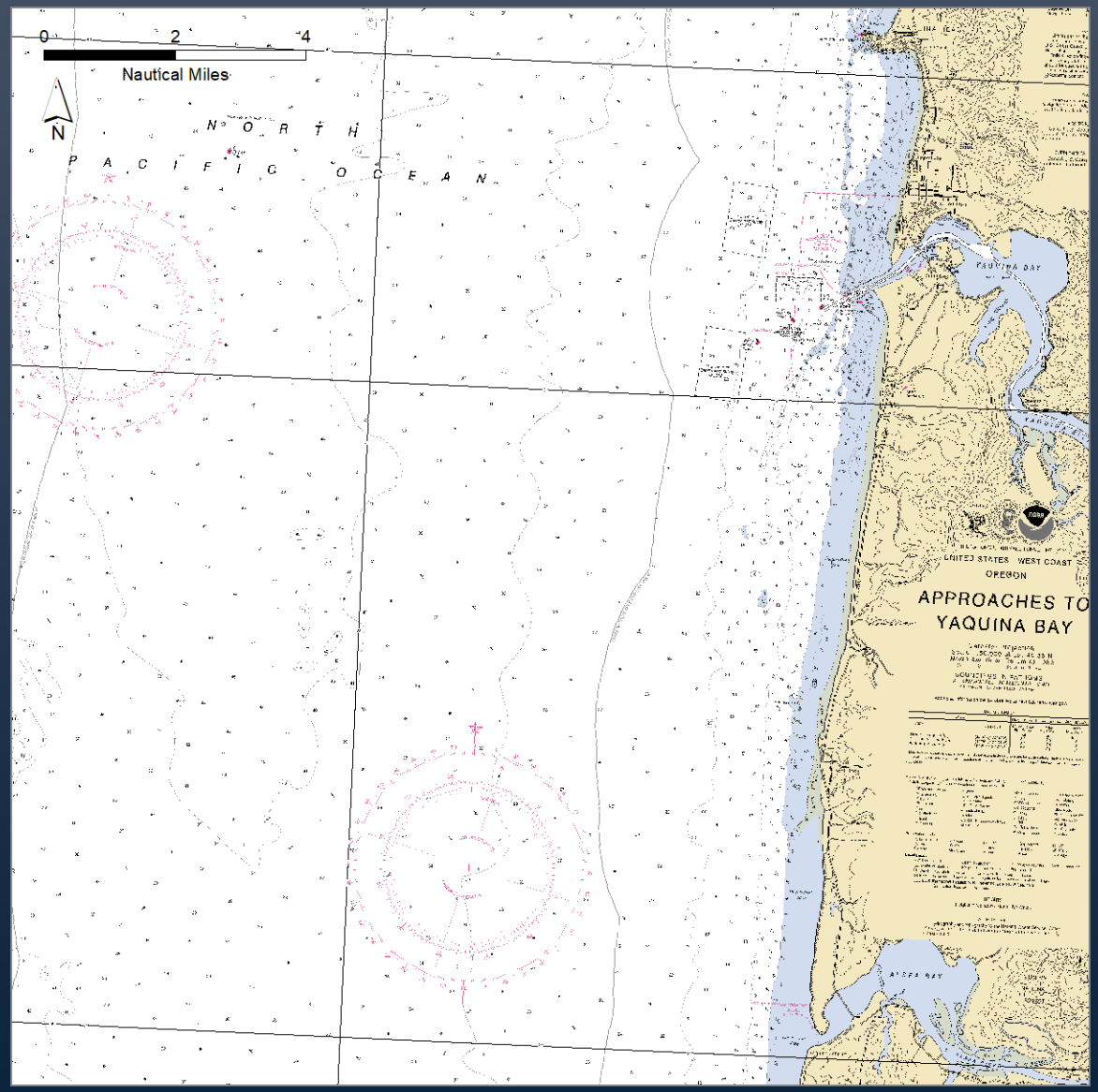
Site Selection

Key stakeholders were *Fishermen Involved in Natural Energy* (FINE):

- Established by Lincoln County
- Represented the spectrum of fisheries
- Tasked with reviewing all applications for the siting of wave energy facilities and submitting recommendations to the Board of Commissioners

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



PacWave

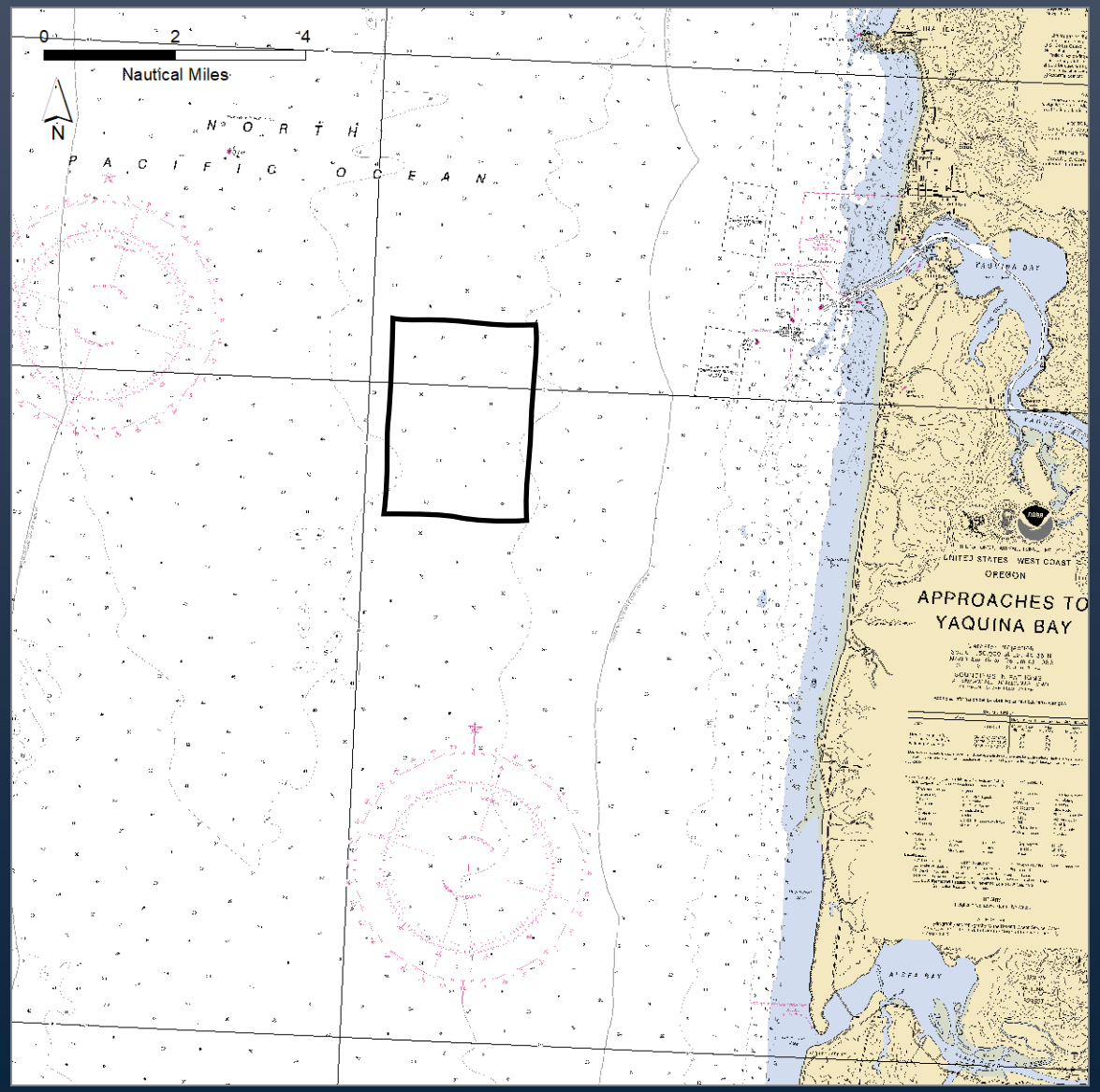
Site Selection

Key stakeholders were *Fishermen Involved in Natural Energy* (FINE):

- Established by Lincoln County
- Represented the spectrum of fisheries
- Tasked with reviewing all applications for the siting of wave energy facilities and submitting recommendations to the Board of Commissioners

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



PacWave

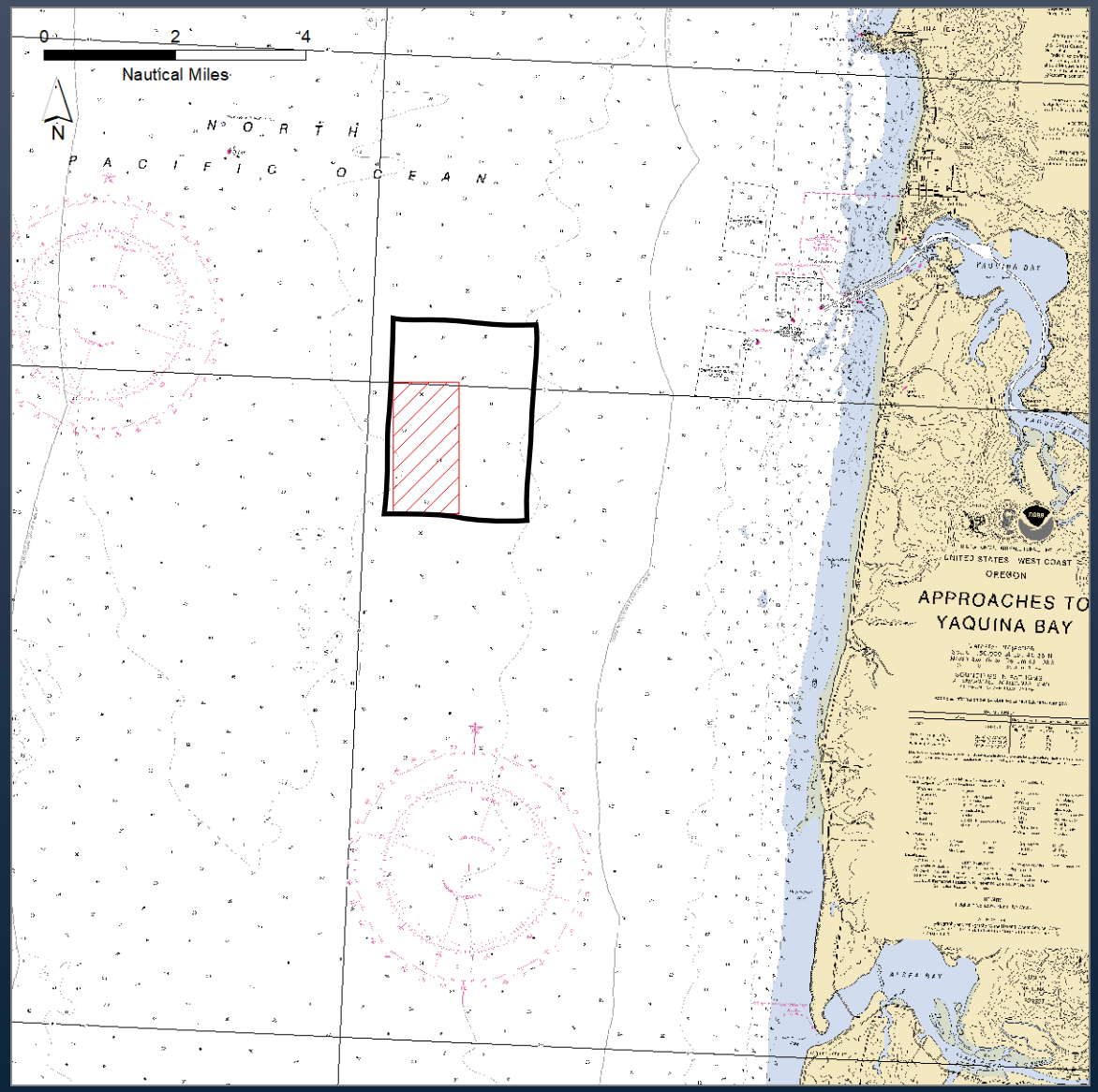
Site Selection

Key stakeholders were *Fishermen Involved in Natural Energy* (FINE):

- Established by Lincoln County
- Represented the spectrum of fisheries
- Tasked with reviewing all applications for the siting of wave energy facilities and submitting recommendations to the Board of Commissioners

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

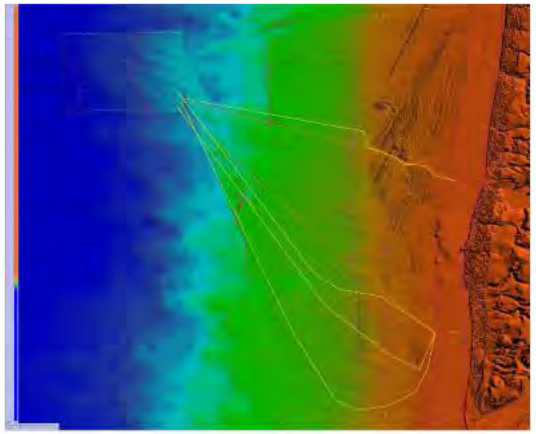


PacWave

Cable Routing

3U TECHNOLOGIES
Underground, Underwater, Under-Ice

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

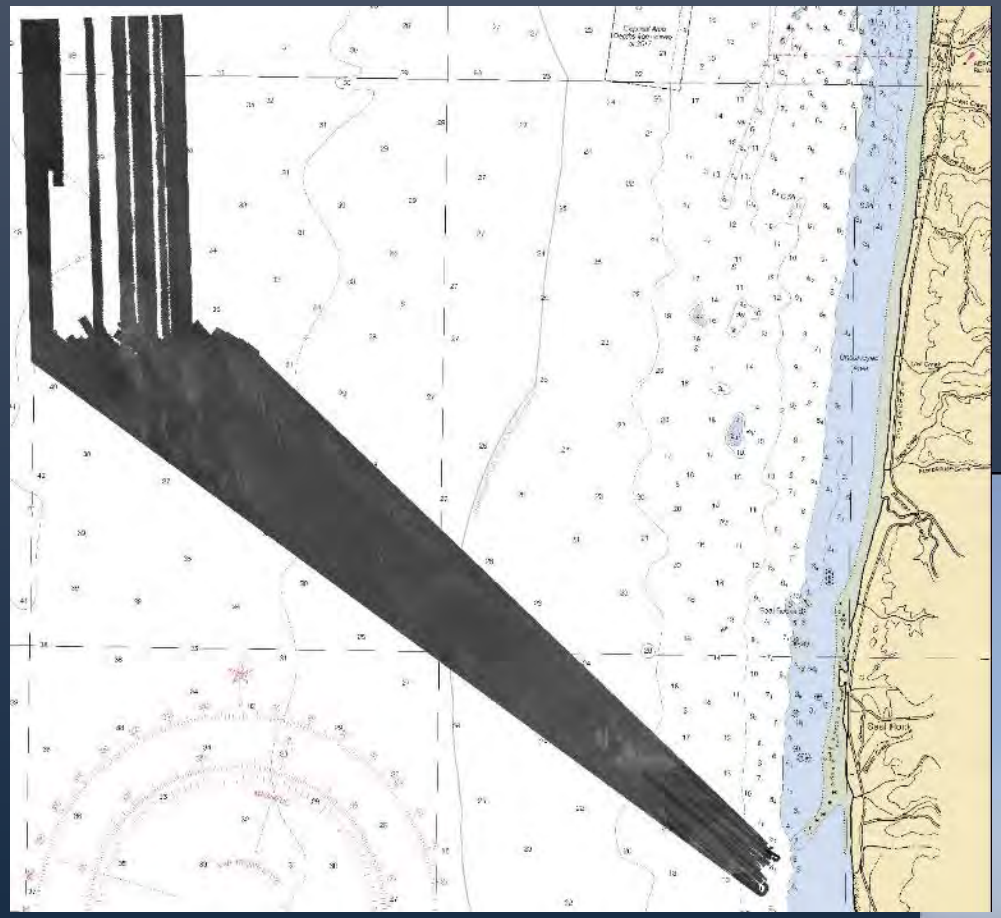
Pacwave

Cable Routing

BP	Year	Type	Location	Company (primary contactor)
1	2014	Geophysical	Nearshore & offshore	OSU - Chris Goldfinger
1	2017	Geophysical	Terrestrial (Driftwood)	Siemens & Associates
1	2018	Geophysical	Nearshore	Siemens & Associates
1	2019	Geophysical	Terrestrial (HDD Route)	Siemens & Associates
1	2019	Geophysical	Nearshore & offshore	TerraSond
1	2019	Geotechnical	Nearshore & offshore	OSU - Coring Group
1	2019	Geotechnical	Terrestrial (Driftwood)	Terracon
1	2019	Geotechnical	Terrestrial (UCMF)	Foundation Engineering
2	2020	Geophysical	Nearshore	Solmar Hydro (The HDD Company)
2	2020	Geotechnical	Terrestrial (HDD Route)	Jacobs (The HDD Company)
2	2021	Geophysical	Nearshore	Solmar Hydro (The HDD Company)
2	2022	Geophysical	Offshore	Tetra Tech (RT Casey)
2	2023	Geotechnical (CPT)	Nearshore & offshore	OSU - Matt Evans & Conetec (RT Casey)

PacWave

Cable Routing



Side scan sonar / multibeam echosounder

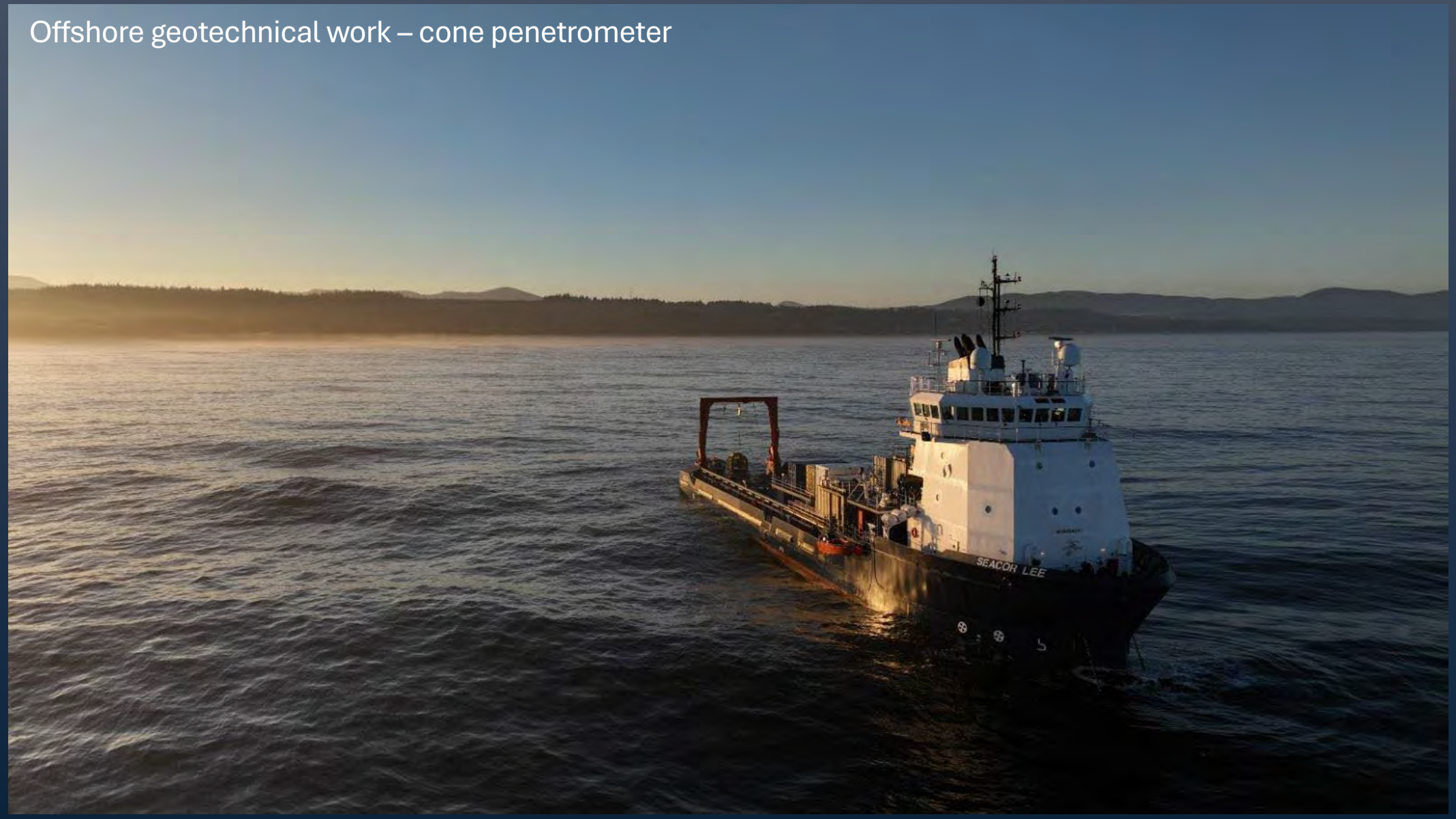
Sub-bottom profiler (CHIRP and boomer)

Gradiometer

Offshore geophysical work

Cable Routing

Offshore geotechnical work – cone penetrometer



Cable Routing

PacWave

Cable Routing

Geophysical work across Driftwood Beach

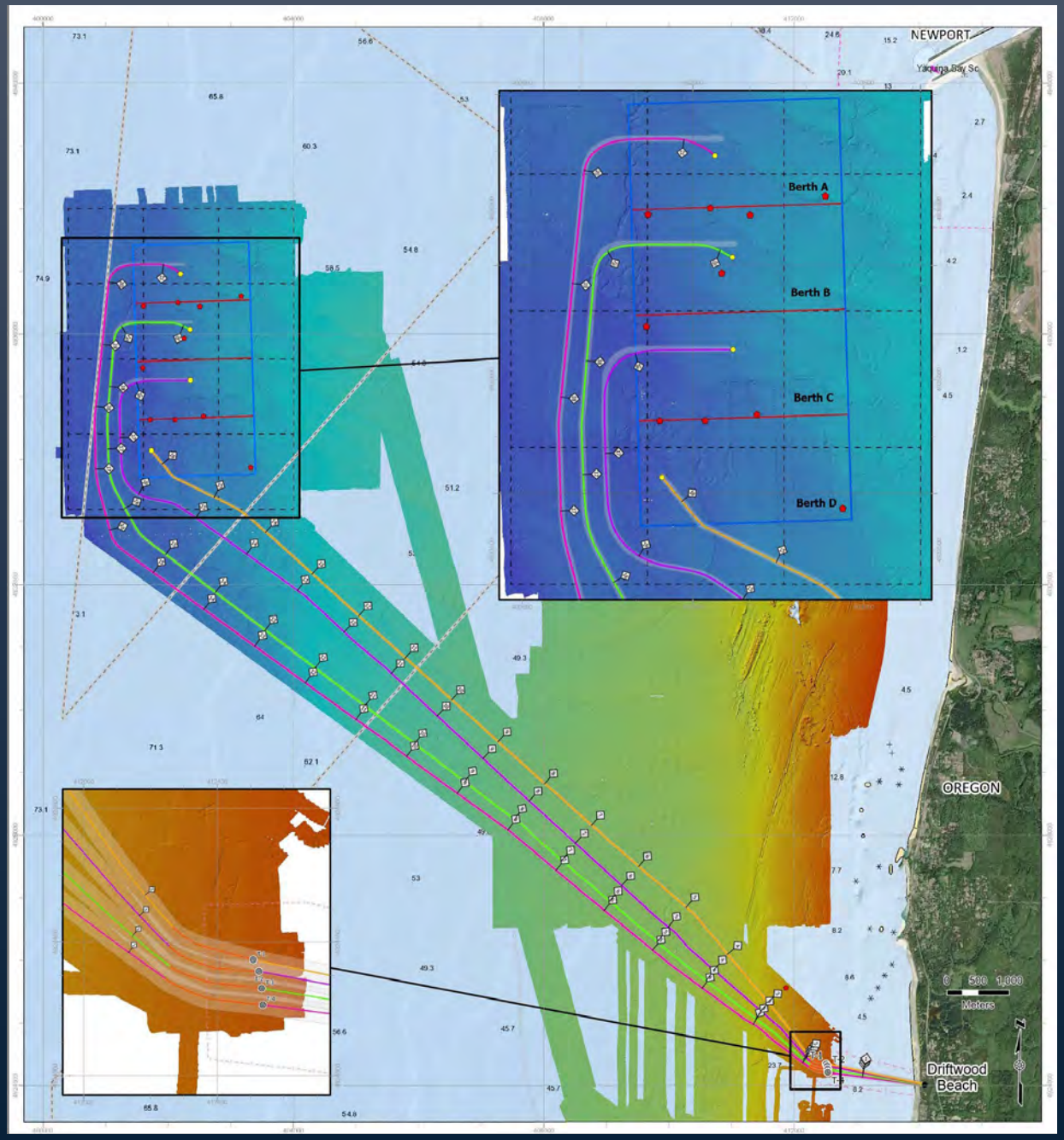
Cable Routing

Geotechnical work at Driftwood Beach state park

PacWave

Cable Routing

- Preliminary cable routes
- G&G surveys
- Final cable routes
- Burial assessment
- Logistics
- Cable installation plan of work



Pacwave

Construction Phases

Cable Manufacture & Installation 2023-2025

Underground Construction 2021-2022

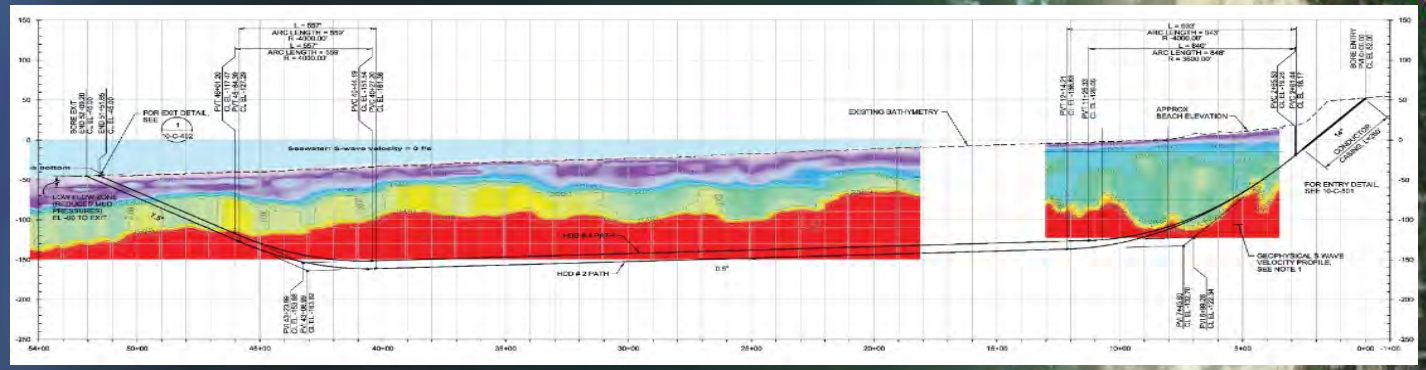
Terrestrial Construction 2021-2025

Pacwave

Underground Construction

Subsea Cables

HDD-installed Offshore Conduits



Driftwood Beach State Recreation Site

HDD-installed Terrestrial Conduits

Utility Connection & Monitoring Facility

NW Ray Ridge Dr

NW Terrace St

NW Powe Dr

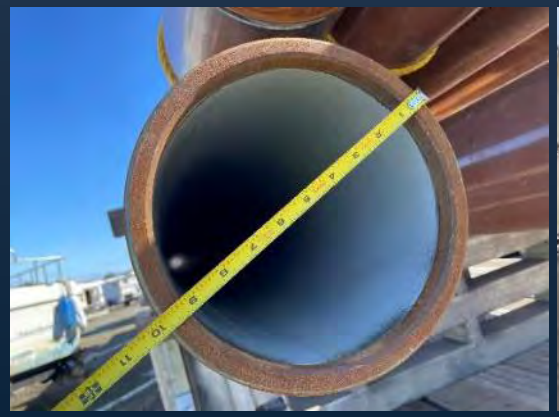
NW Wenger Ln

NW Camrose Dr

Pacwave


THE HDD COMPANY
Jacobs
Photograph:
Newport News Times

Underground Construction



Pacwave

Underground Construction

PacWave

Underground Construction

Underground construction work took almost a year.

A total of 6.2 miles of cable conduit were installed below ground.

Approximately 1,200,000 pounds of steel and 70,000 pounds of high-density polyethylene (HDPE) conduit were installed.

PacWave

Cable Manufacture & Installation

- Four subsea cables & four terrestrial cables
- Manufactured by Nexans in Norway & Switzerland
- Subsea cables terminated with half a subsea connector
- Connectors manufactured by MacArtney in Denmark
- Shipped from Norway to U.S.

Graphic: Nexans

Cable Manufacture & Installation

Pacwave

Cable Manufacture & Installation

Frieda

Length: 454 feet

- Cable & connector transportation from Norway to U.S.

HOS Innovator

Length: 240 feet
POB: 40

- Cable lay
- Articulated pipe
- Subsea connectors
- Concrete mattresses
- Light ROV operations

Liberty

Length: 89 feet
POB: 8

- Dive operations
- General support

Nautilus

Length: 242 feet
POB: 31

- Burial ROV support
- Post-lay inspection & burial (PLIB)
- Post-burial surveys

PacWave

Cable Manufacture & Installation

Cable Manufacture & Installation

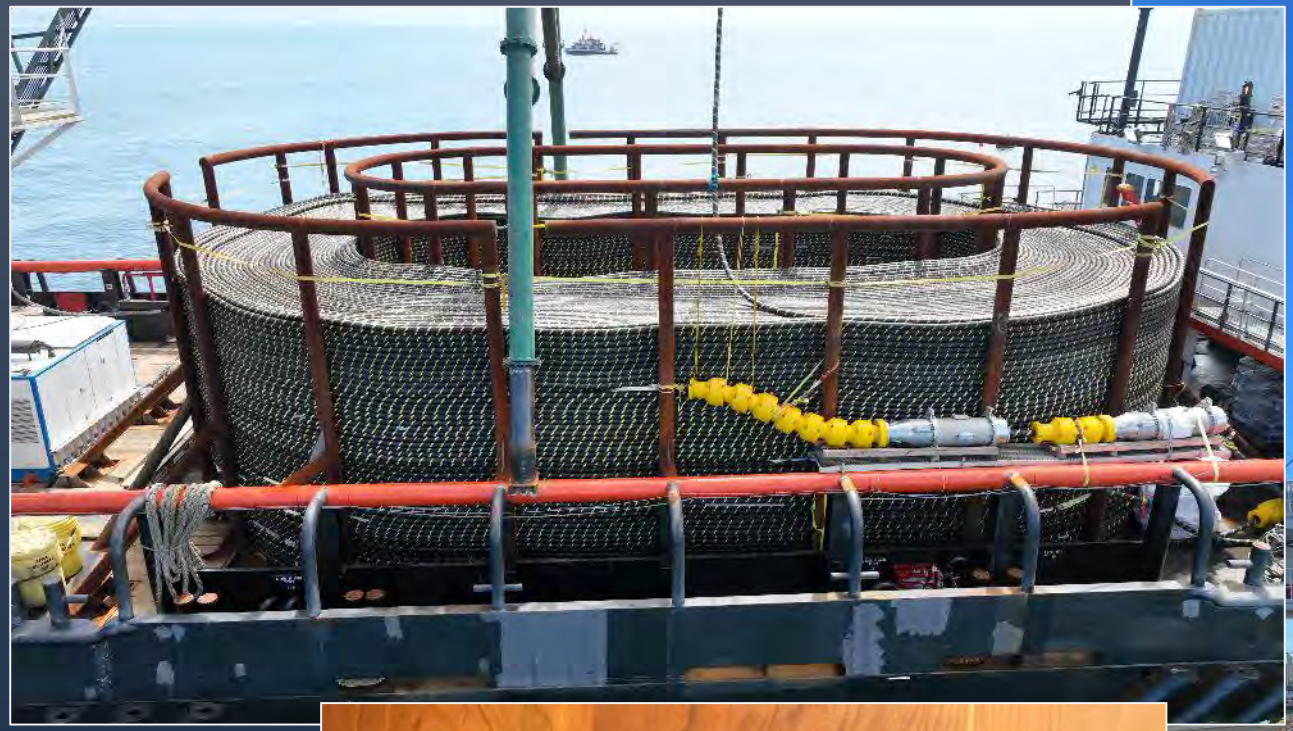
PacWave

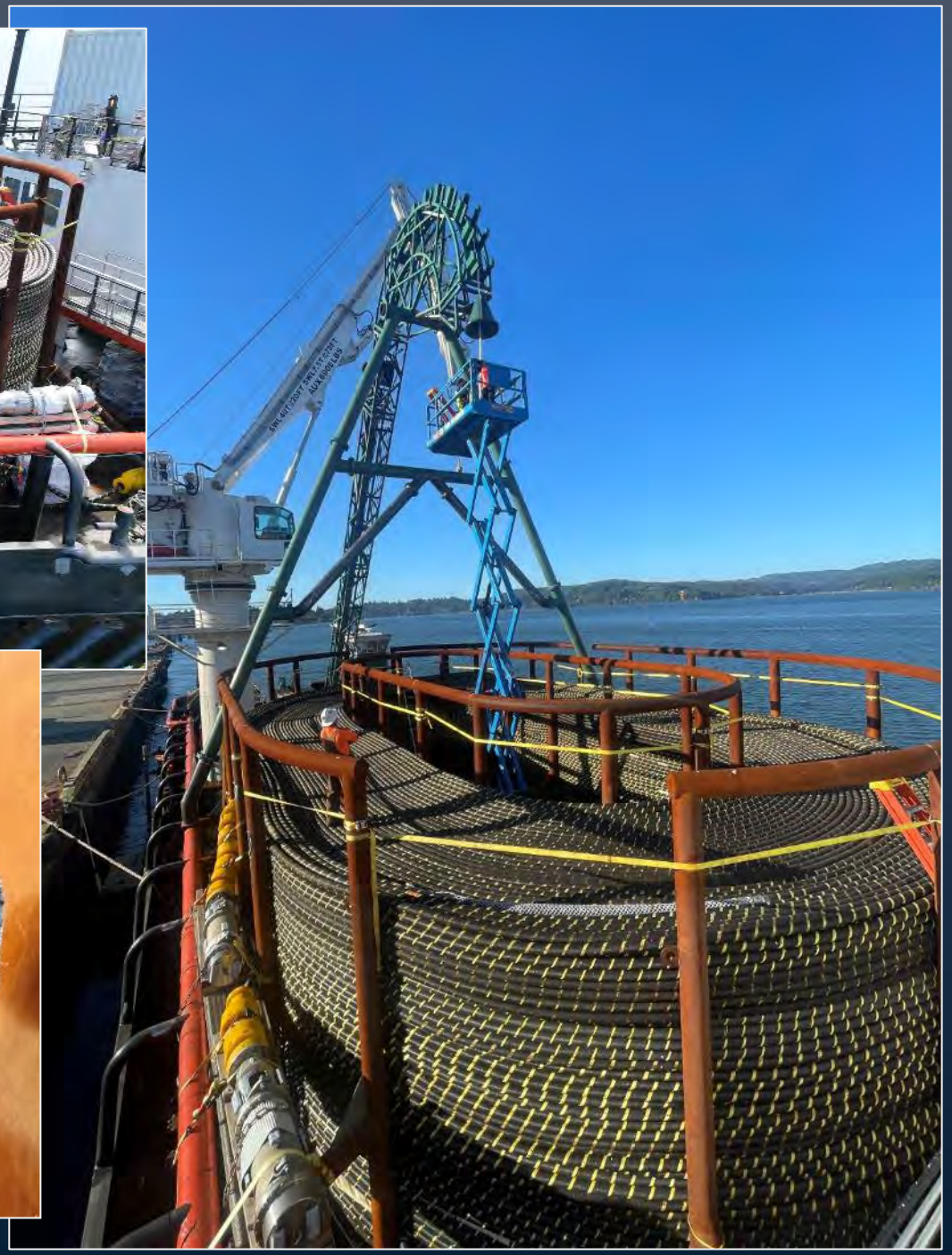
Cable Manufacture & Installation

Vessel/Activity	July				August				September				October		
	Week 0	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14
Liberty (grapnel)		Mob	Grapnel	De-mob											
Shoreside (cables, terminations)		Mob	Terrestrial Cable Install		Support for Cable Pull-in			Terrestrial Cable Install	Cable Terminations and Testing			De-mob			
Innovator (lay)		Transit from Louisiana		Mob for lay ops.	Cable Pull-in and Lay			De-mob							
Liberty (dive operations)				Mob	Support for Cable Pull-in and Lay			De-mob							
Innovator (protection)									Mob	Secondary Protection		De-mob			
Nautilus (burial, post-lay survey)					Mob	Cable Burial									De-mob

PacWave

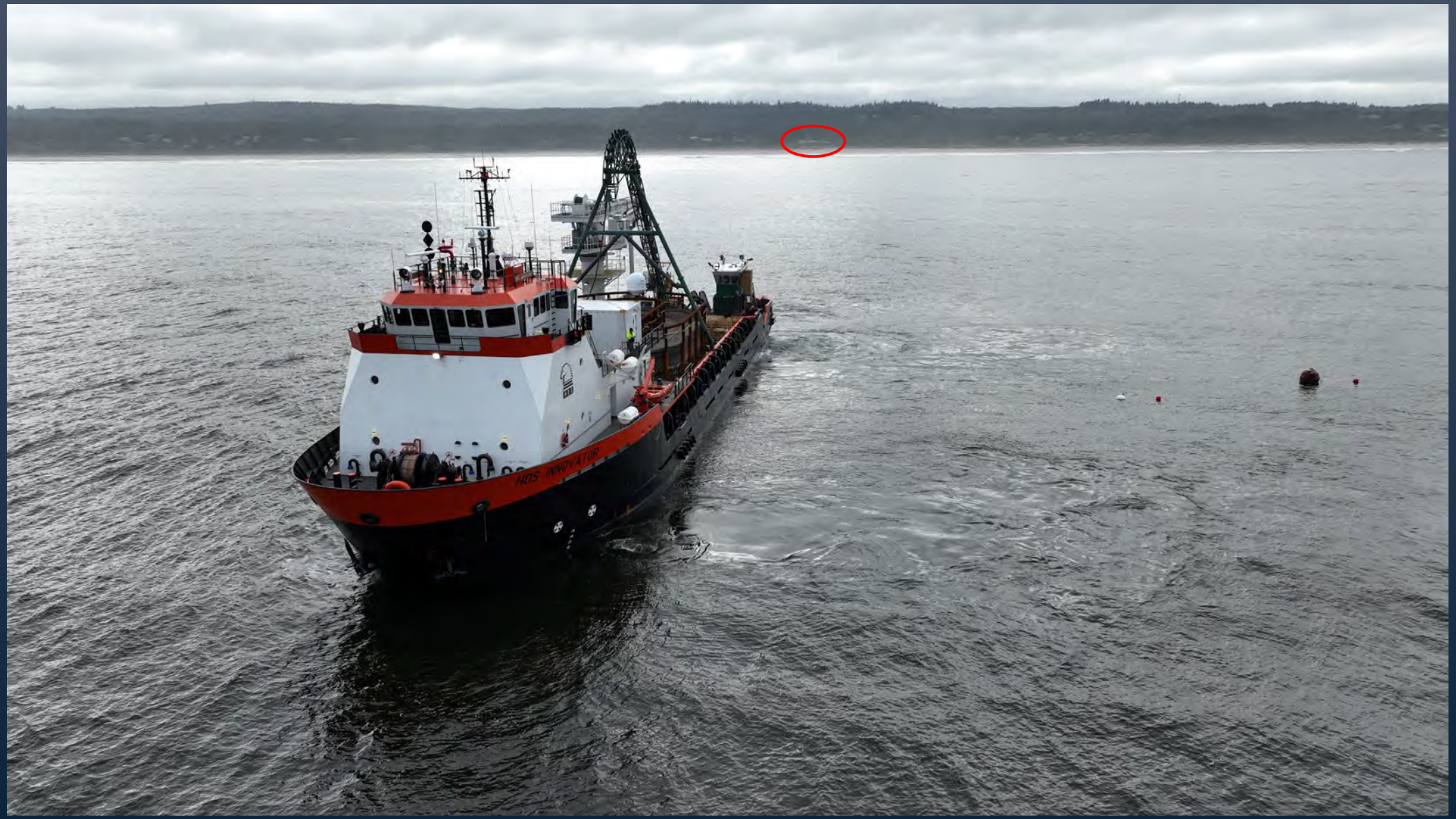
Cable Manufacture & Installation





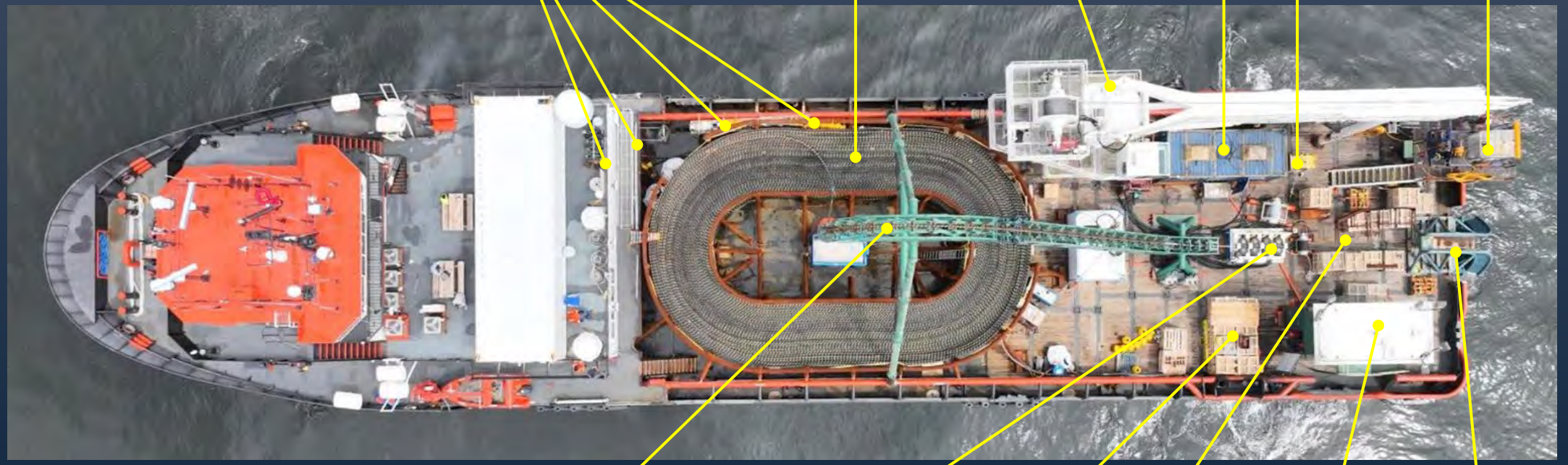
Pacwave

Cable Manufacture & Installation



PacWave

Cable Manufacture & Installation



Pacwave

Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation

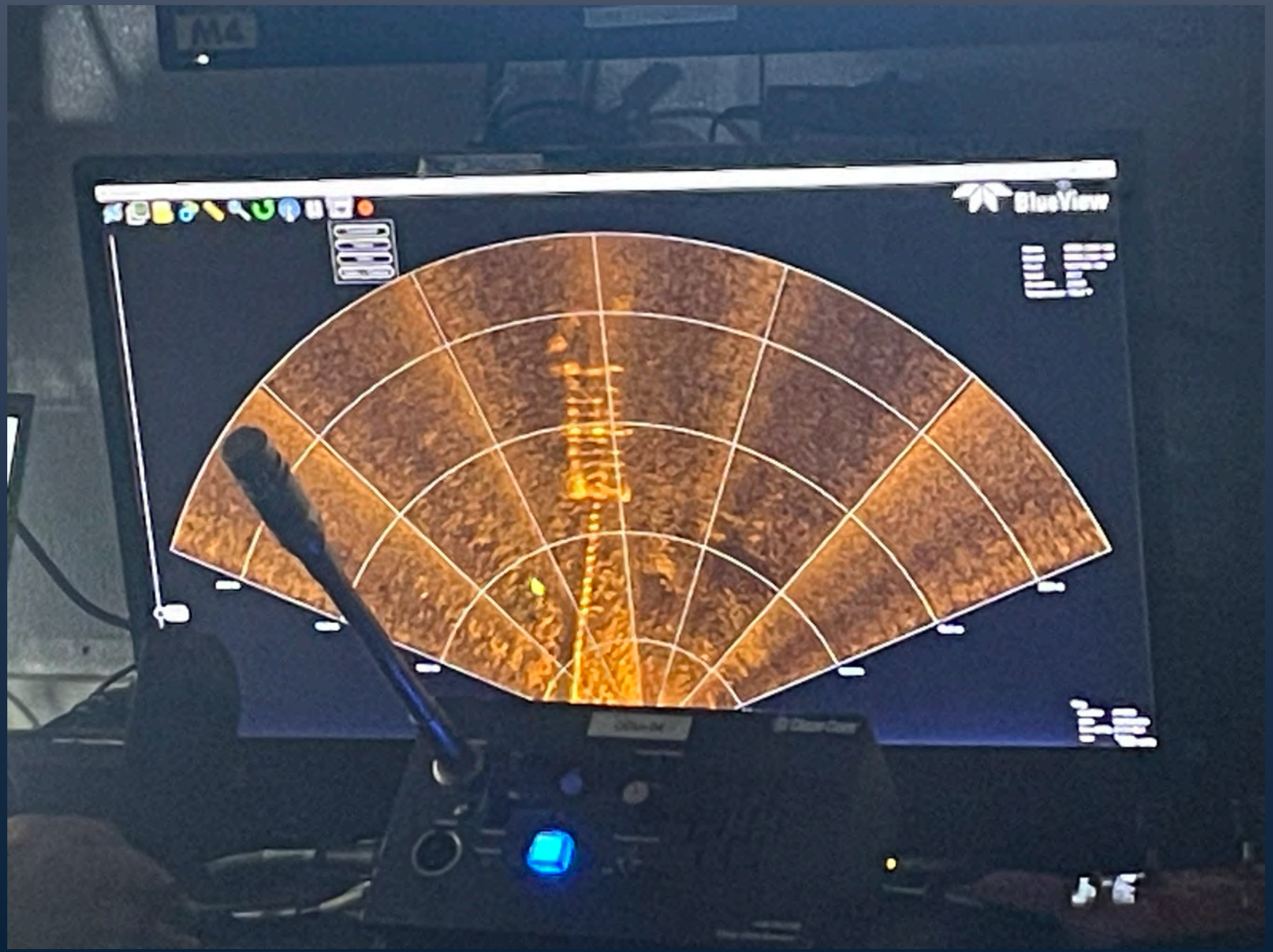
Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation

PacWave

Cable Manufacture & Installation



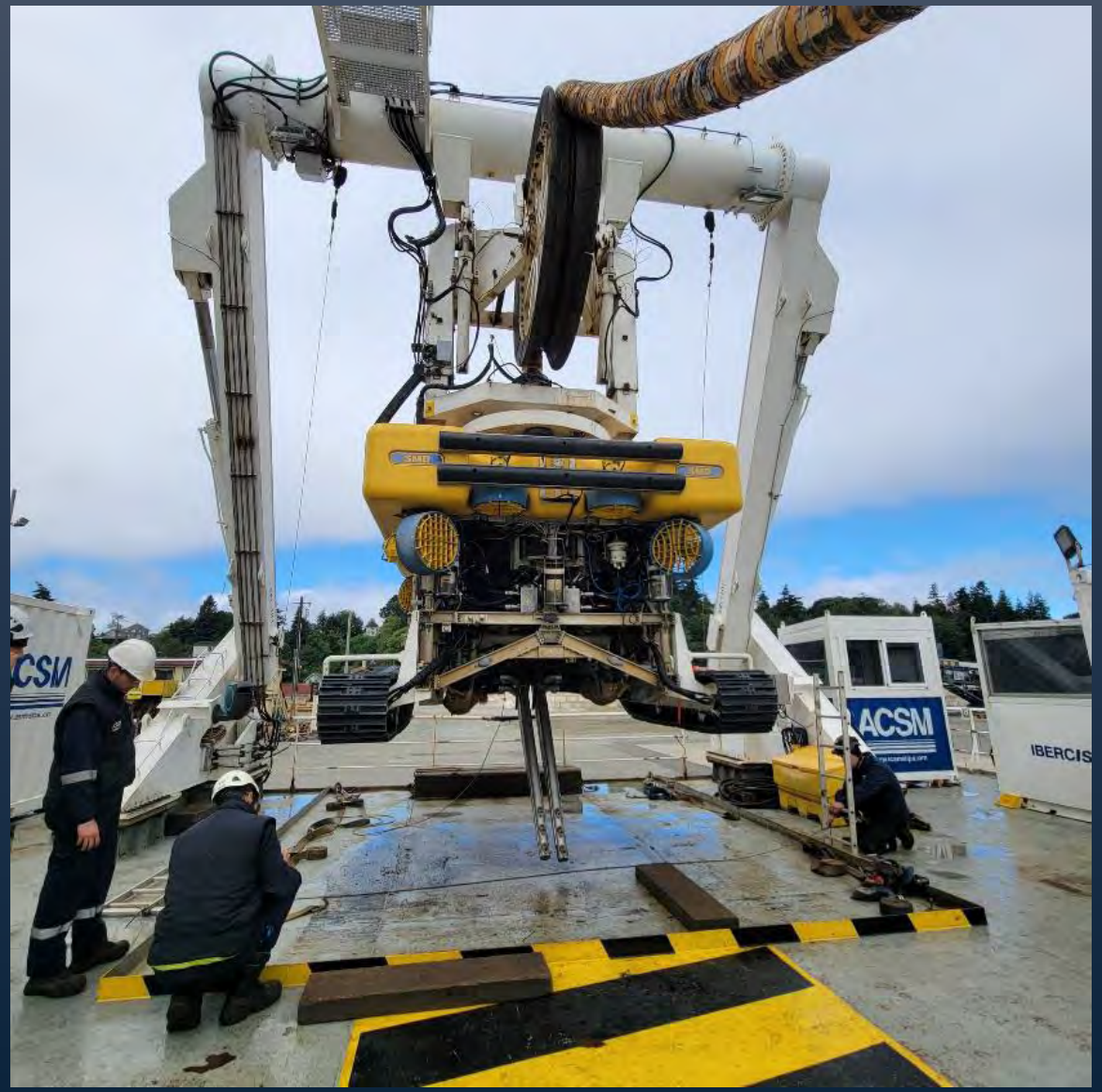
PacWave

Cable Manufacture & Installation

PacWave

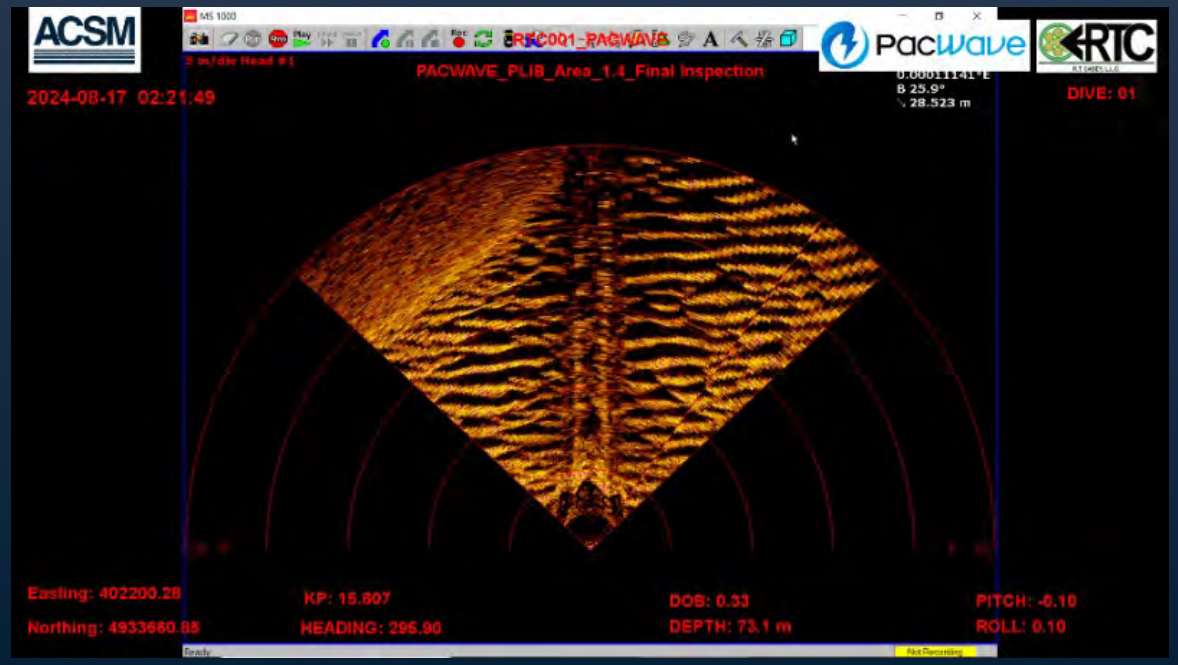
Cable Manufacture & Installation

Cable Manufacture & Installation



PacWave

Cable Manufacture & Installation



PacWave

Cable Manufacture & Installation

Cable Manufacture & Installation

- Cable installation work finished at 03:45 on October 13th, 2024
- Installation took about 27 months from initial contracting to completion of burial
- Cable manufacturing in Europe took 19 months
- Almost 300 vessel-days on charter
- Over 5,000 person-days for installation
- Almost 1,000 ROV-hours for cable burial
- Included the CMROV's longest work dive (138 hours, or 5.75 days)

PMEC.us
PacWaveEnergy.org

PacWave

Sarah Henkel
sarah.henkel@oregonstate.edu
541-867-0316

Dan Hellin
dan.hellin@oregonstate.edu
541-737-5452