VINEYARD WIND

Virtual Information Session For Fishermen

August 25, 2020

OVERVIEW

1. Who we are
2. How did we get here?
3. Overview of Vineyard Wind 1
4. Overview of Park City Wind
5. Cable Installation & Monitoring
6. Fisheries Science
7. Fisheries Outreach
8. Questions?

ABOUT VINEYARD WIND

- Vineyard Wind, established in 2010 with the name Offshore MW, is an American offshore wind development company backed by a 50-50 partnership of Avangrid Renewables and Copenhagen Infrastructure Partners (CIP)
- Based in New Bedford, MA with teams in Boston, MA and Bridgeport, CT
- Holds 2 federal lease areas
- In development:
  - Vineyard Wind 1 (MA)
  - Park City Wind (CT)

PARTNERS

- Avangrid Renewables
  - Headquartered in Oregon with offices in Connecticut
  - Expertise in wind farm development nationwide
- Copenhagen Infrastructure Partners (CIP)
  - Public pension fund investment firm with a history of investing in renewable energy projects

PARTNERSHIP WITH VINEYARD POWER COOPERATIVE

- Vineyard Power, a non-profit on Martha's Vineyard, with more than 1,400 members
- Entered into Community Benefit Agreement in 2015
- Partnership to bring offshore wind power to the region
- Cooperating on community engagement and stakeholder outreach

HOW DID WE GET HERE?
STATE POLICY & FEDERAL SITING

2008 Mass. Passes Global Warming Solutions Act

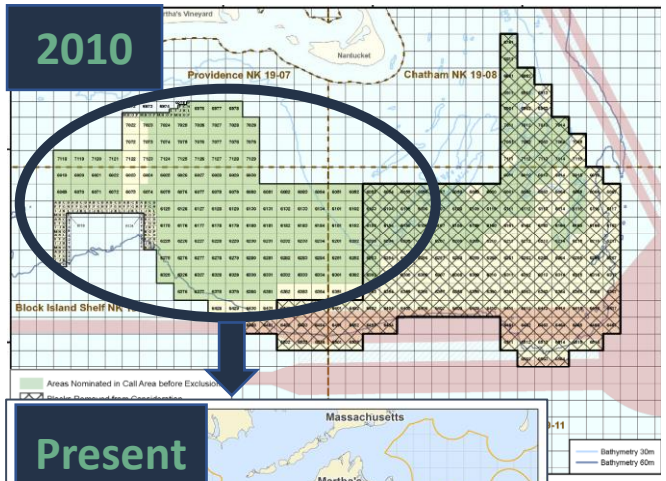
2010 Federal Siting Process Begins

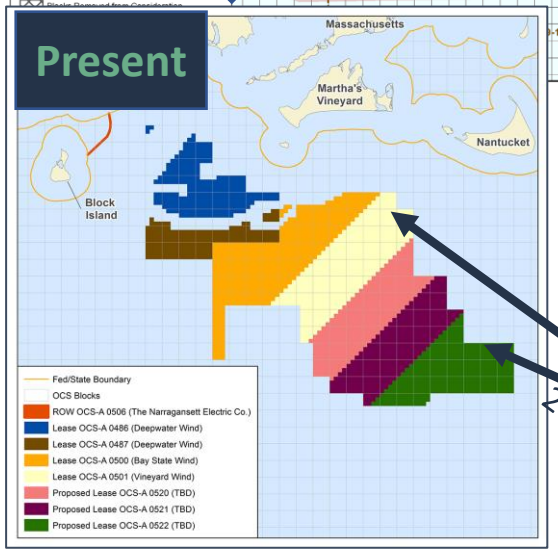
2015 First Federal Lease Area Auction

2016 Mass. Passes Energy Diversity Act

2018 First Mass. Procurement (800 MW)

2019 MA, NY, CT Procurements (3,300 MW)

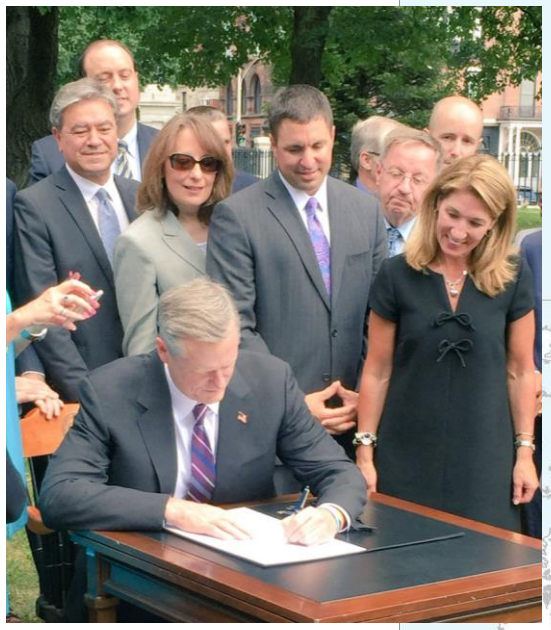


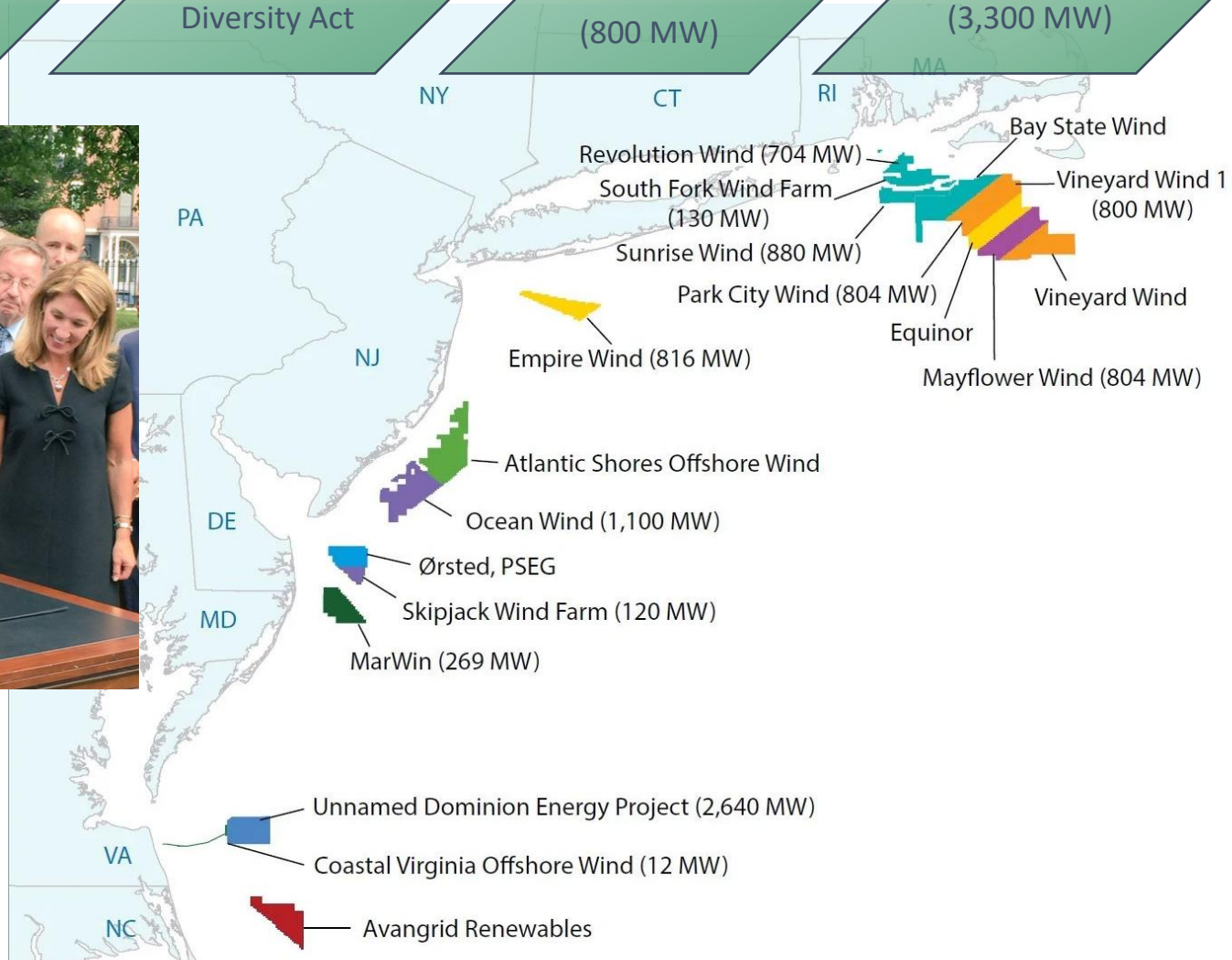


2015

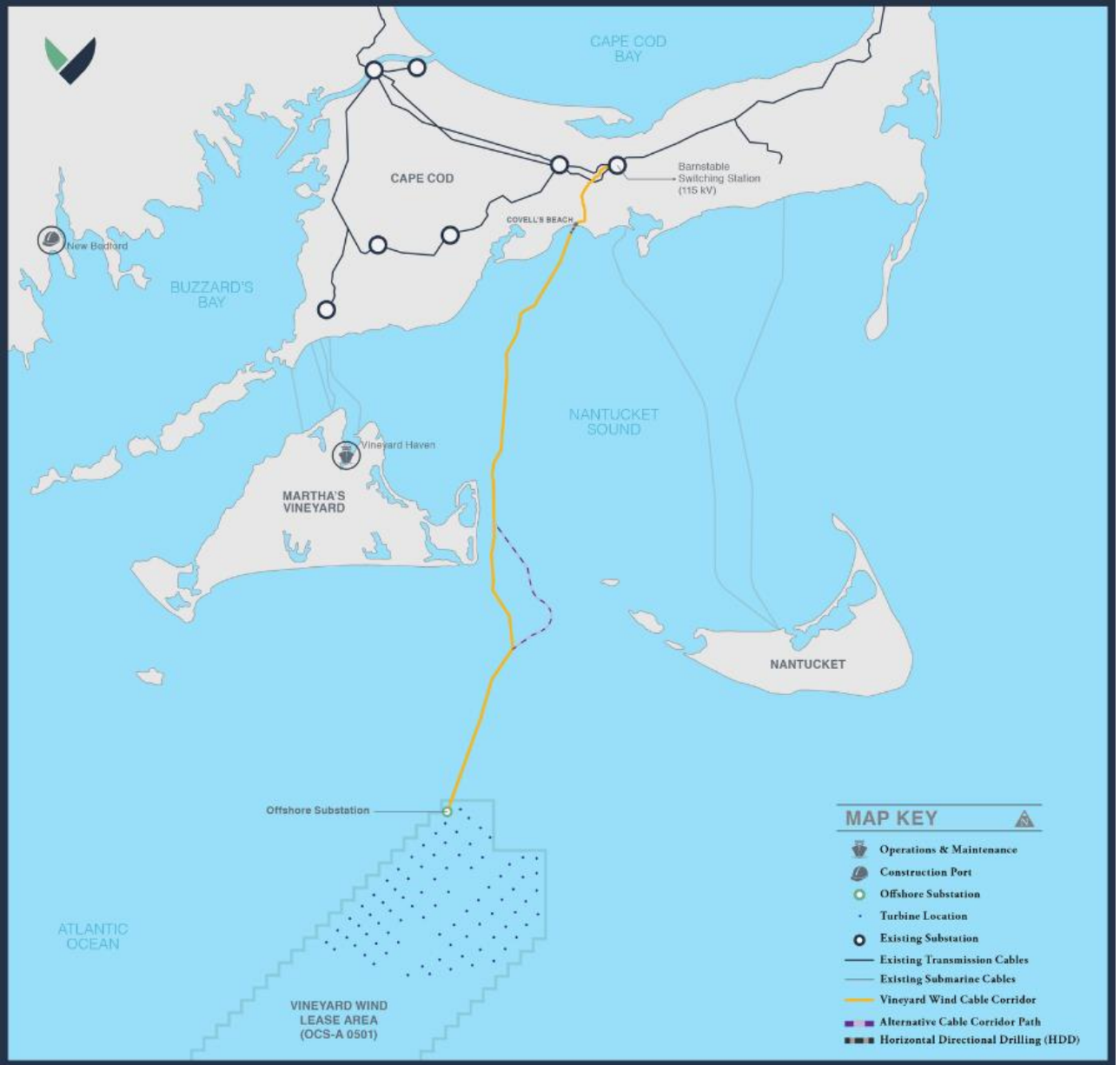
2018

VINEYARD WIND





OVERVIEW OF VINEYARD WIND 1



Generation Capacity

- 800 Megawatts (MW)
- Enough energy for over 400,000 homes and businesses

Turbine area (OCS-A-501)

- 14+ miles South of the Islands
- 35 miles from Cape Cod

Construction, Operations & Maintenance

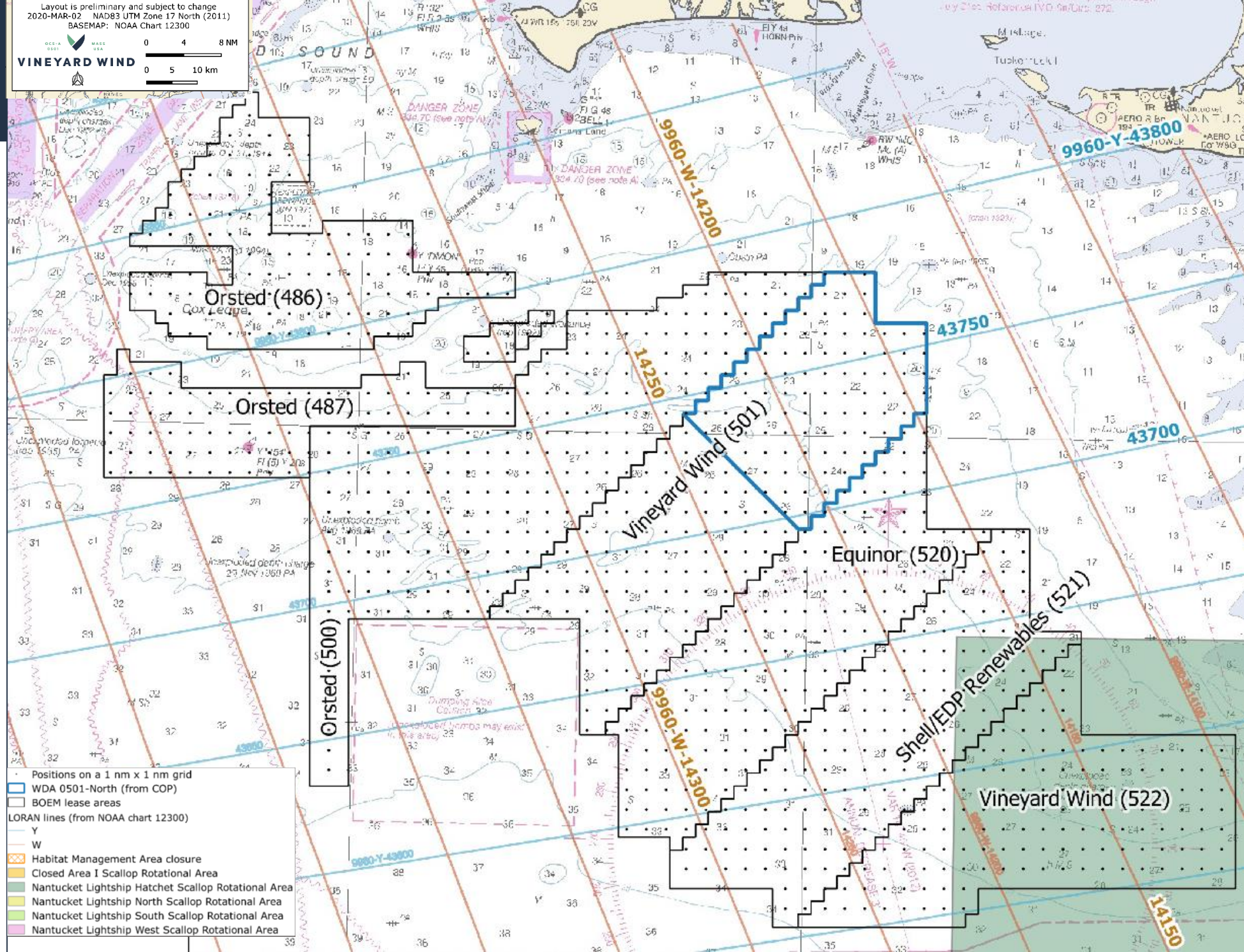
- Construction staging at the Port of New Bedford or other nearby ports
- Long term operations based in Vineyard Haven

Electric Grid Interconnection

- Substation in Independence Park
- Cable landfall in Barnstable

TURBINE LAYOUT

- Vineyard Wind originally proposed a Northwest-Southeast orientation averaging 0.8 nautical mile spacing
- After feedback, the uniform layout across lease areas was proposed with East-West, North-South 1 nautical mile layout and spacing



OVERVIEW OF PARK CITY WIND

Similarities with Vineyard Wind 1

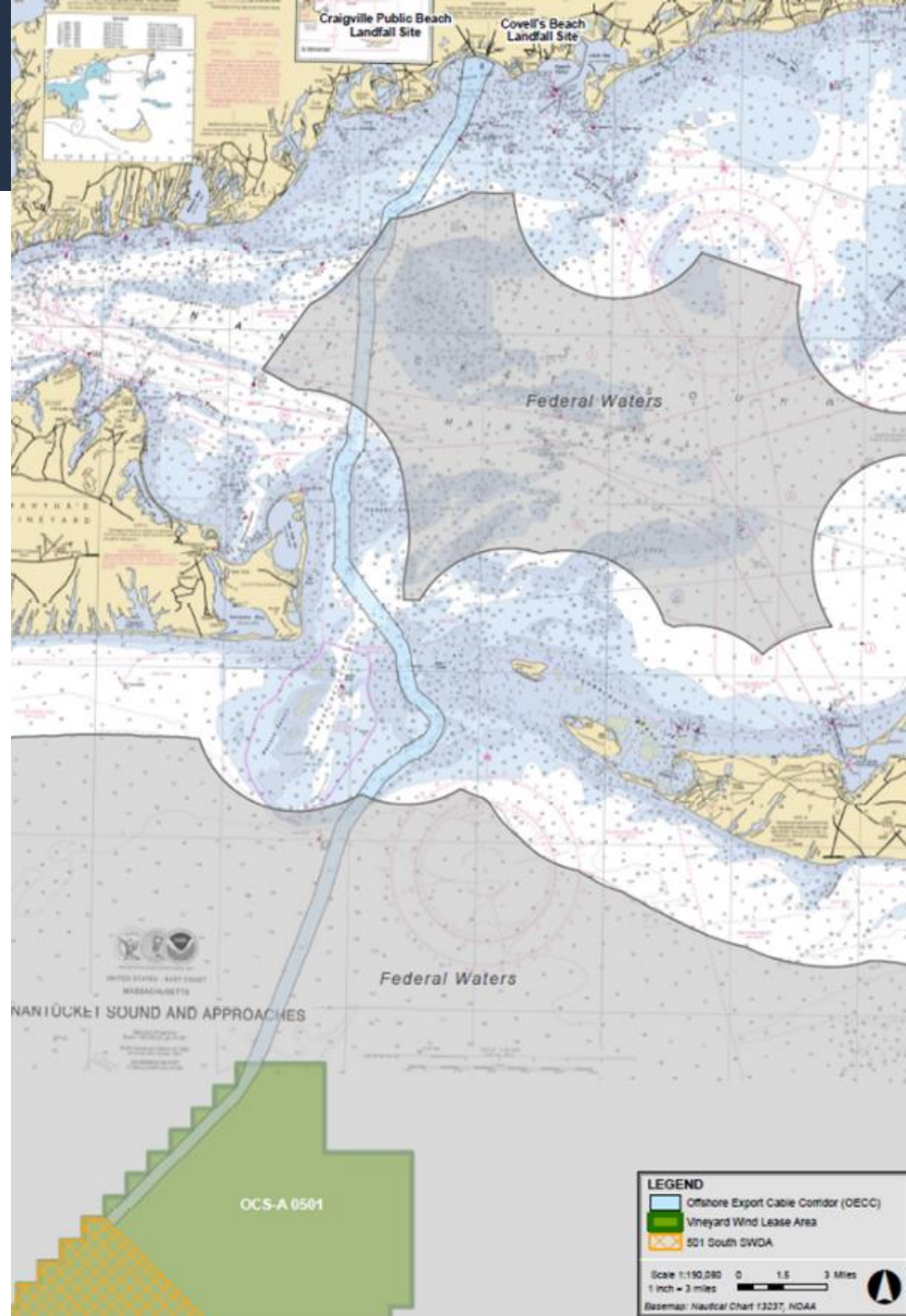
- 804 Megawatts (MW) = electricity for over 400,000 homes
- Emissions reductions, reliability, ratepayer benefits
- Located adjacent to Vineyard Wind 1
- Similar offshore cable transmission route
- Similar revenue commitment and sewer infrastructure benefits for Barnstable
- Similar commitments to offshore construction schedule and road repaving in Barnstable

Electric Grid Interconnection

- Substation to be located on Shootflying Hill Road & connecting to existing West Barnstable Substation
- Cable landfall at Craigville Public Beach or Covell's Beach as an alternative

Timeline

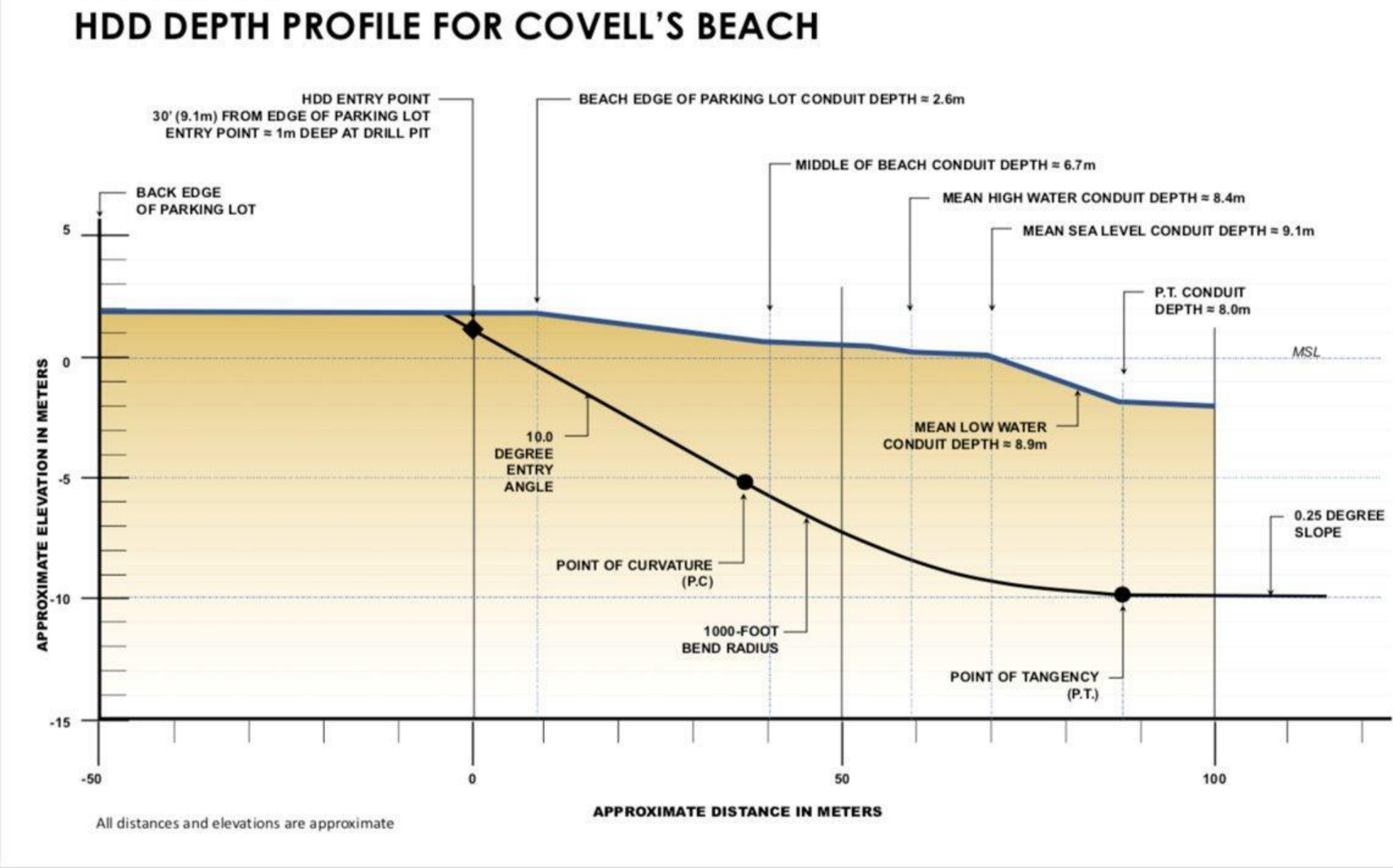
- Onshore construction anticipated: 2023



CABLE LANDFALL

Horizontal Directional Drilling (HDD)

- Tunnels from the beach parking lot to 1,000 feet offshore
- Cable conduit installed approximately 30 feet beneath the beach at the tide line



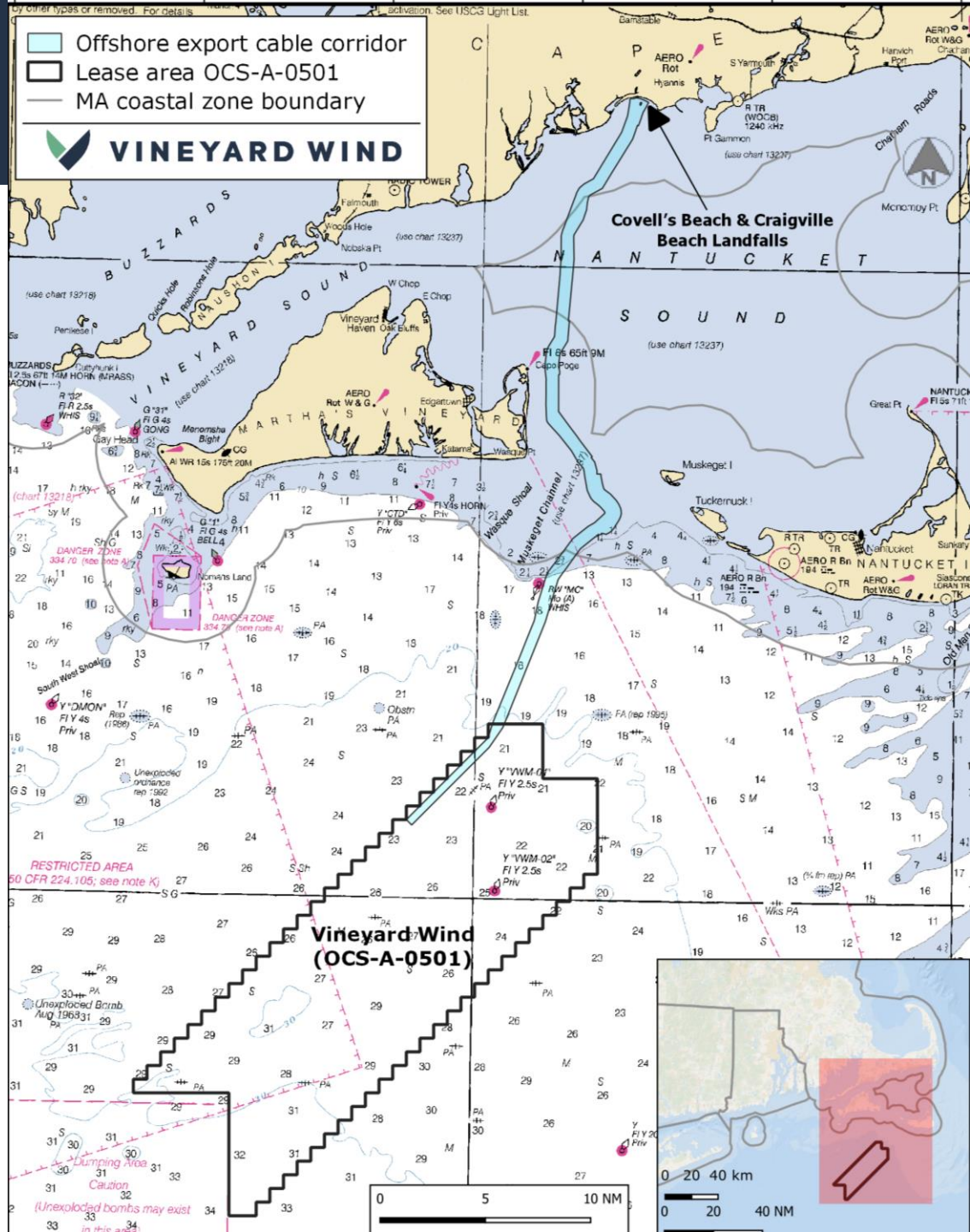
CONNECTING OFFSHORE WIND TO THE ELECTRIC GRID

Offshore Export Cable Corridor (OECC)

- Width: 3,100 – 5,100 feet
- Length: ~48 miles

  (Park City Wind includes ~14 miles within lease area OCS A-0501)
- Number of cables: 4

  (2 for Vineyard Wind 1, 2 for Park City Wind)
- Target burial depth: 5 – 8 feet
- Temporary trench width per cable: 3.5 feet



CABLE PROFILE

EXPORT CABLES:

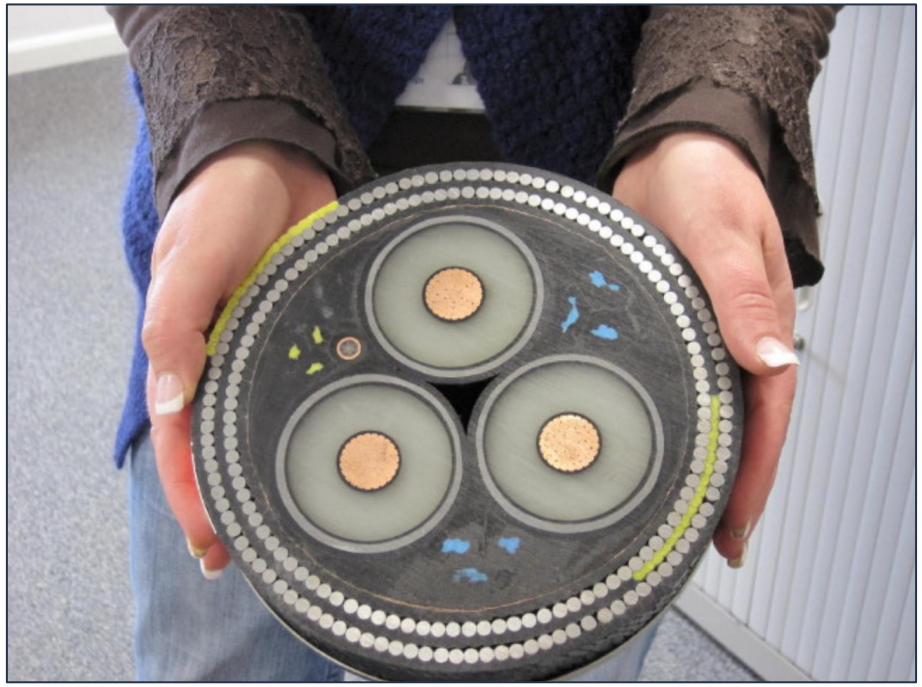
Size: 10-11 inches diameter

Type: 220-275 kv AC

INTER-ARRAY CABLES:

Size:
5-6 inches diameter

Type: 66 kv AC



Typical Submarine Cable Cutaway

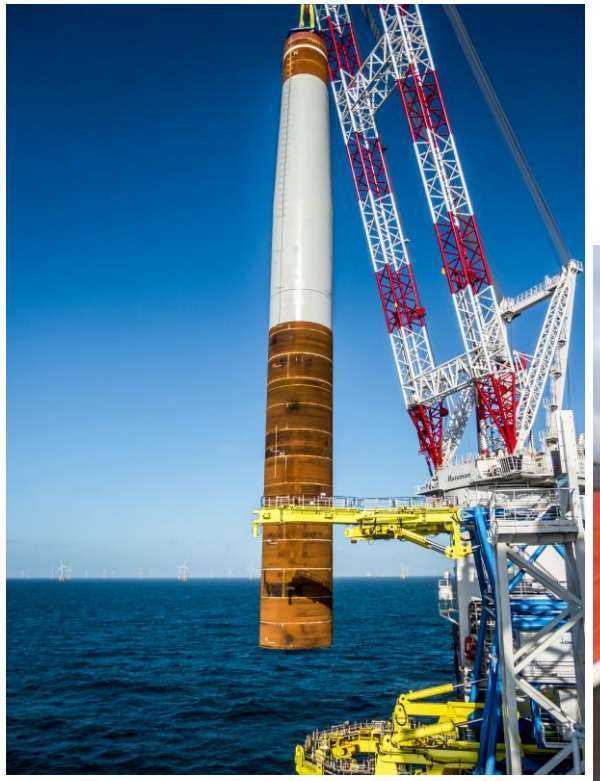
(Figure 3.1-7, page 75, Volume I of the Construction & Operations Plan for Vineyard Wind 1 filed with the Bureau of Ocean Energy Management)

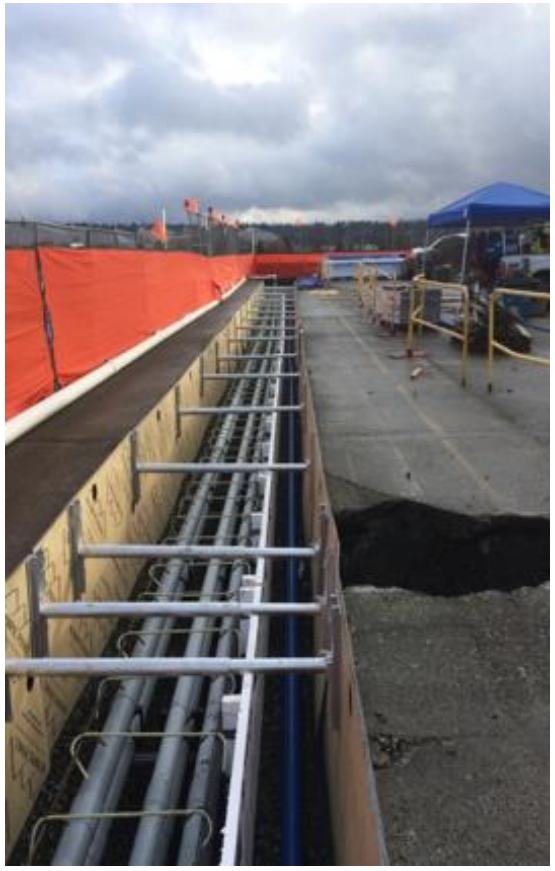
Design:

1. Conductor (Al or Cu)
2. Inner semi-conducting layer
3. XLPE insulation
4. Outer semi-conducting layer
5. Swellable tape
6. Lead sheath
7. PE oversheath
8. Fibre optic cable
9. Filler profiles
10. Bedding (PP)
11. Armouring
12. Outer sheath (PP)

CABLE INSTALLATION TIMELINE

- 2020: Record of Decision expected in December
- 2021: Onshore infrastructure work expected to begin
- 2022: Offshore installation expected to begin
- Select Time of Year (TOY) restrictions for installation:
  - Offshore export cables: No installation in Northern Nantucket Sound April – June
  - Cable landfall and horizontal directional drilling (HDD): No installation May – September (per Host Community Agreement)





OPTIONS FOR CABLE INSTALLATION TOOLS

Vertical Injector Tool (right): This type of jet plow uses high-volume low-pressure water jets to loosen a trench in the seabed into which the cable is lowered.

HD3 Plough (below): A type of jet plow that uses an additional jetting arm forward of the plough to loosen the seabed into which a cable is lowered

(Images: Page 3-4, Appendix A, COP Addendum for Vineyard Wind 1)

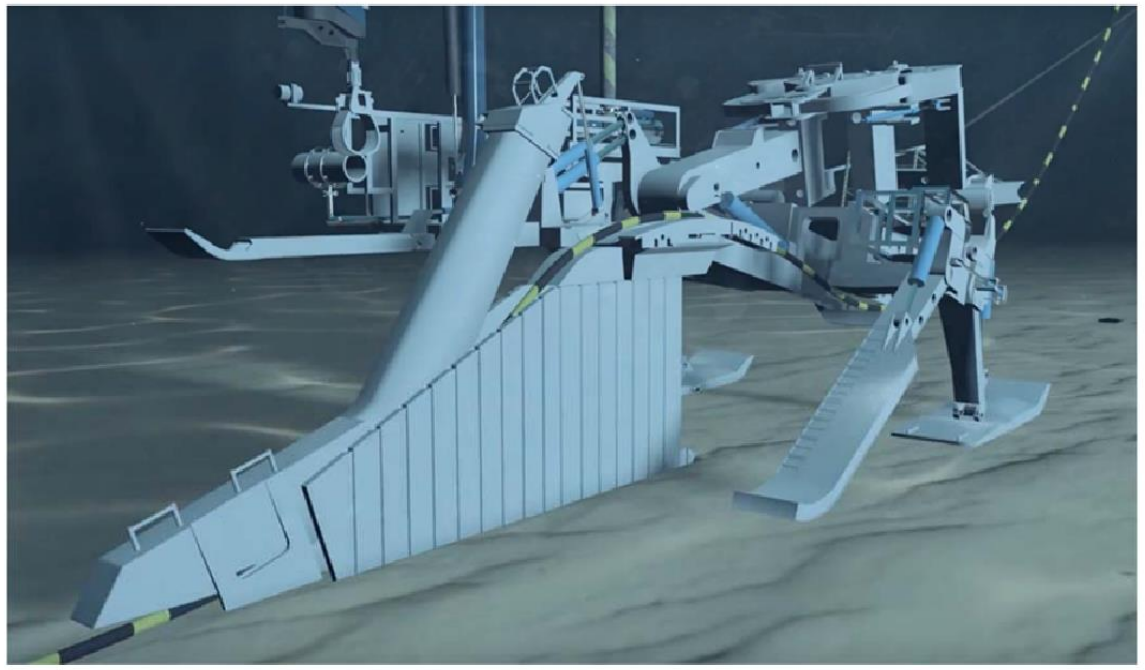


Figure 2 - HD3 Plough

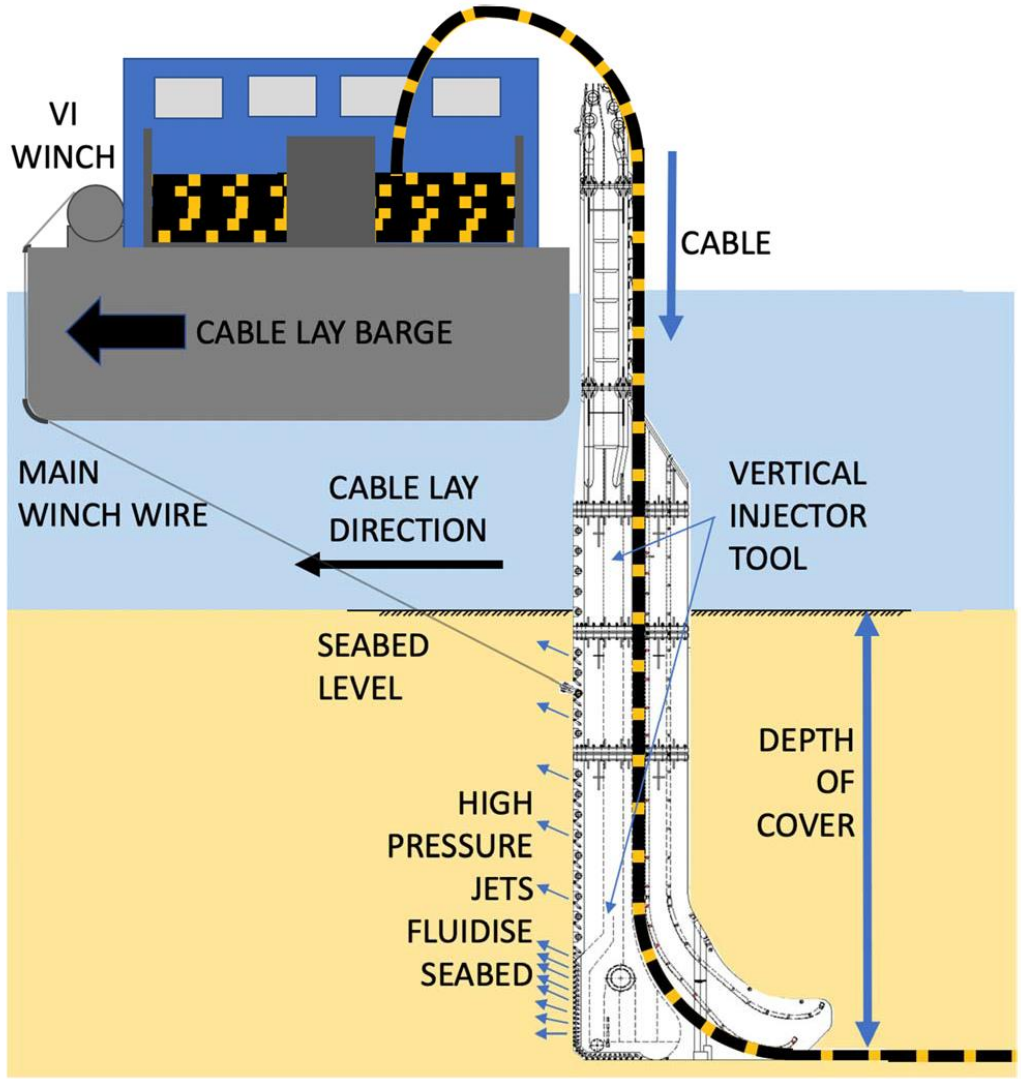
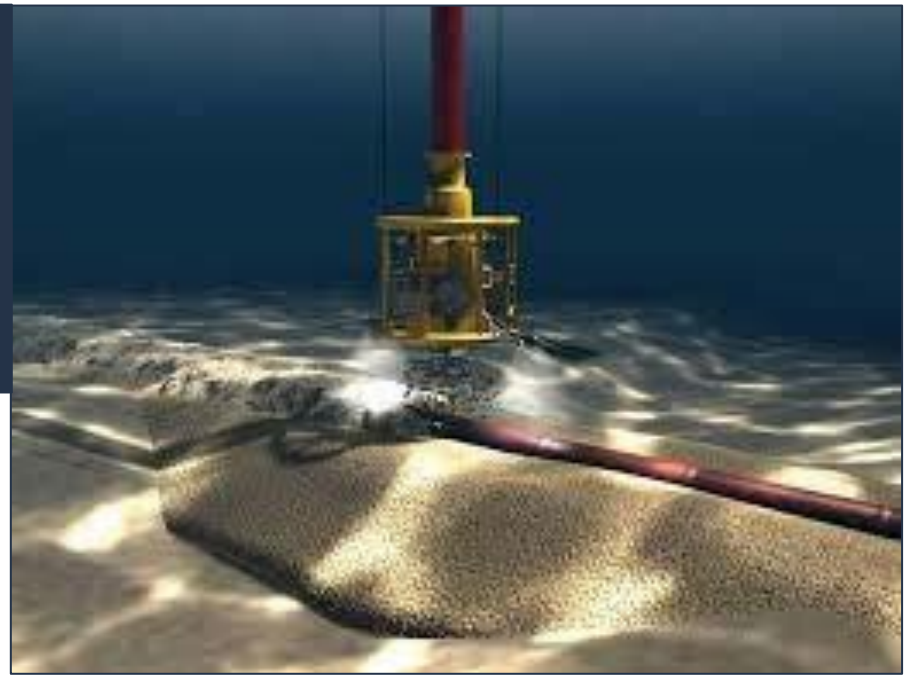


Figure 1 - Vertical Injector Configuration Installing Cable

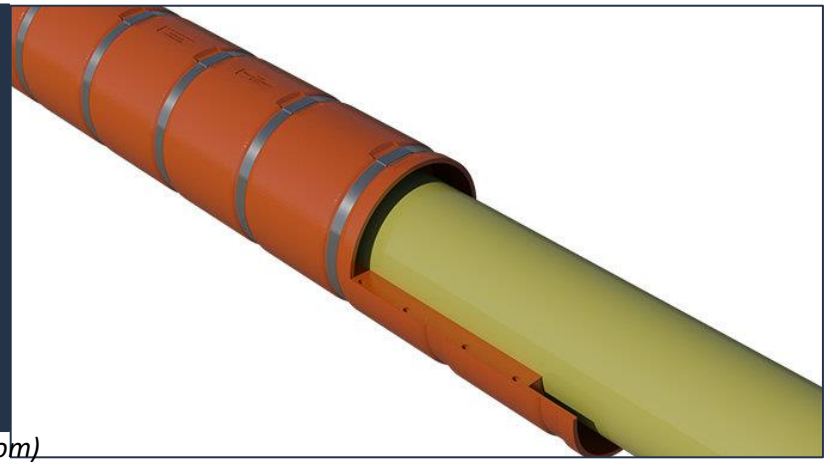
CABLE PROTECTION ALTERNATIVE OPTIONS

Rock Placement (right): Gravel/rock placed on top of a laid cable

(Image Source: NYS Fisheries Technical Working Group Presentation 7.17.2020)



Half-Shell Pipe (right): Two half shell pipes fixed around the cable to provide protection



(Image source: trelleborg.com)

Concrete Mattress (below): Prefabricated flexible concrete coverings laid on top of the cable

(Image source: subseaprotectionsystems.com)

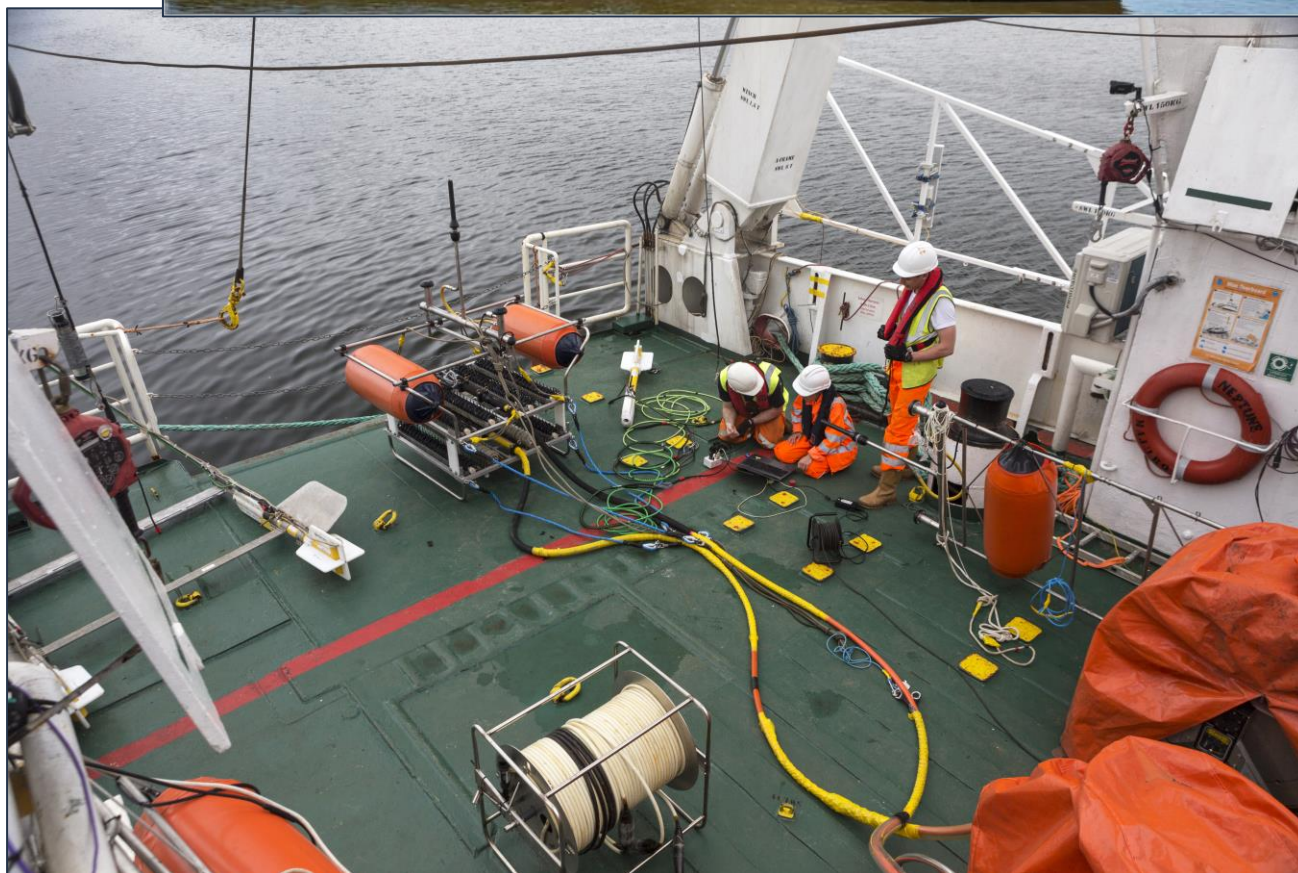
CABLE CORRIDOR: DATA COLLECTION METHODS

- Vineyard Wind has collected geological data about the cable corridor from 2016 to 2020

- Geophysical surveys - remote sensing
  - Side scan sonar
  - Multibeam sonar
  - Magnetometer

- Geotechnical surveys - physical sampling
  - Cone penetration testing (CPT)
  - Benthic grabs
  - Vibracore

- Visual Imagery
  - Underwater cameras



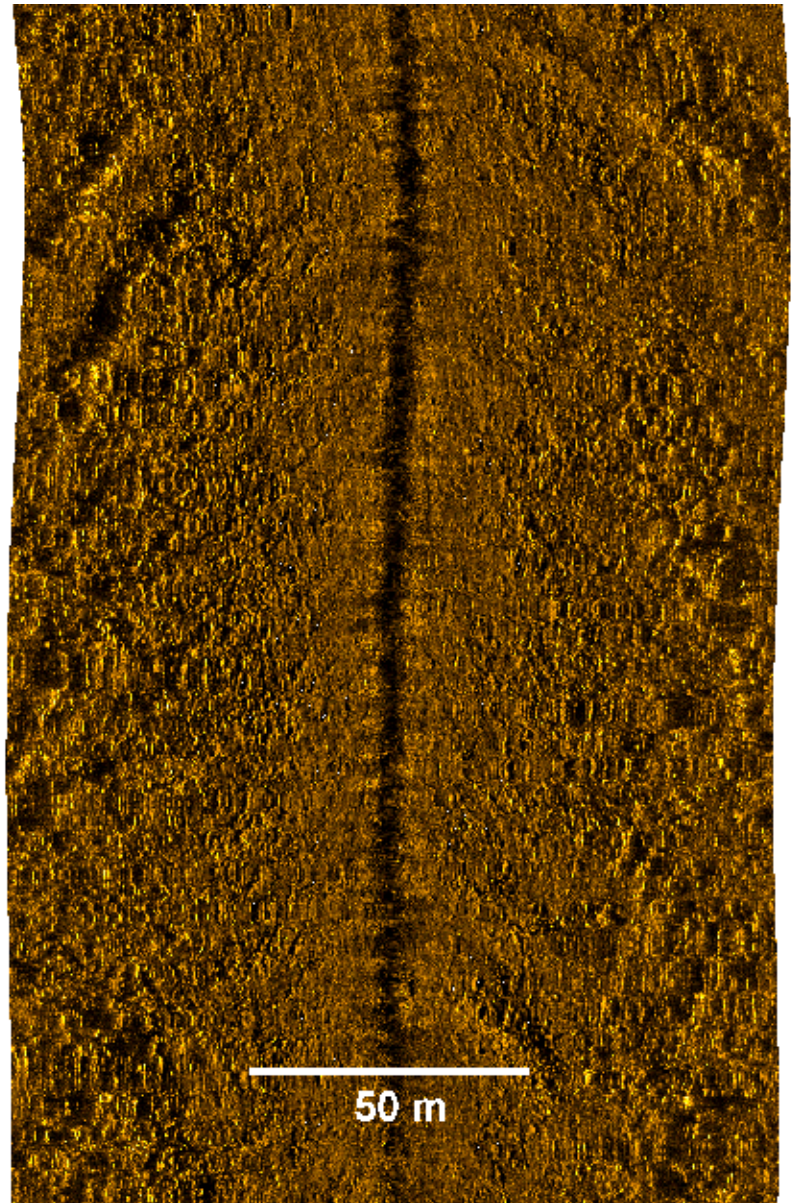
CABLE CORRIDOR SURVEYS

Side scan sonar image

Muskeget Channel - showing a concentration of coarse material and boulders in relatively shallow water west of Muskeget Rock

(The black line in the middle is an outgoing sonar pulse, not a trench)

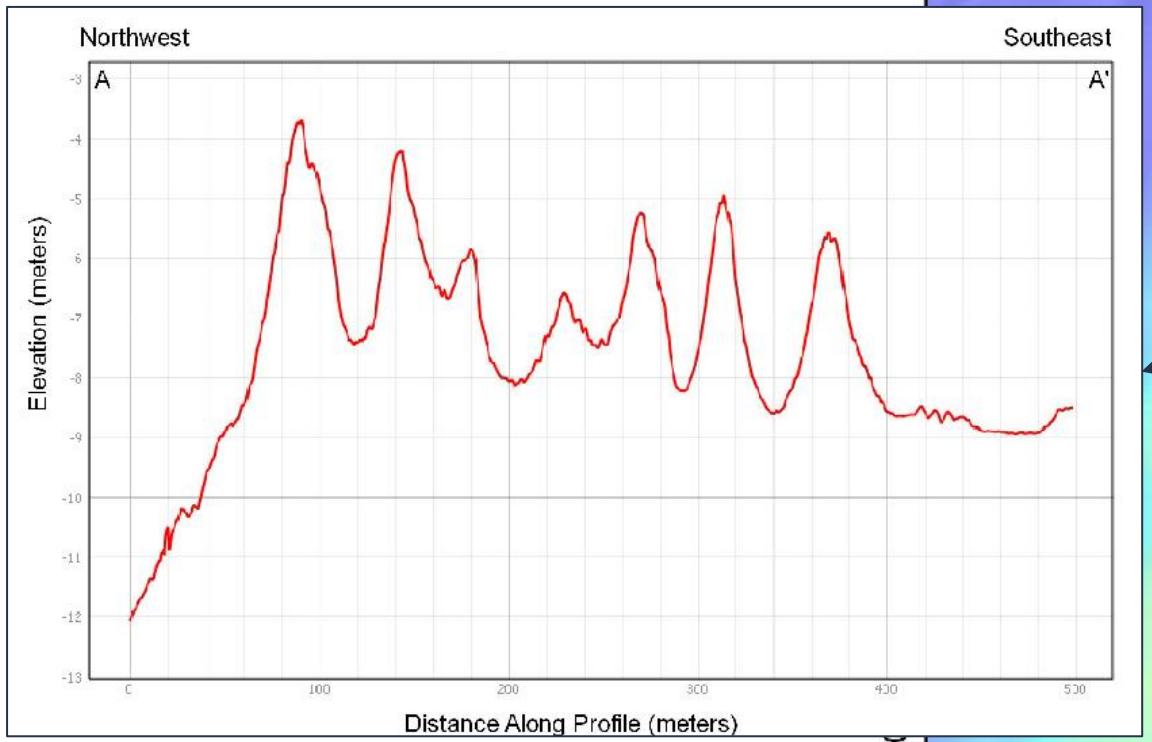
(See Volume II, Appendix G, Figure 3.2-7 of Vineyard Wind Connector 2 filing with the Massachusetts Energy Facilities Siting Board (EFSB))

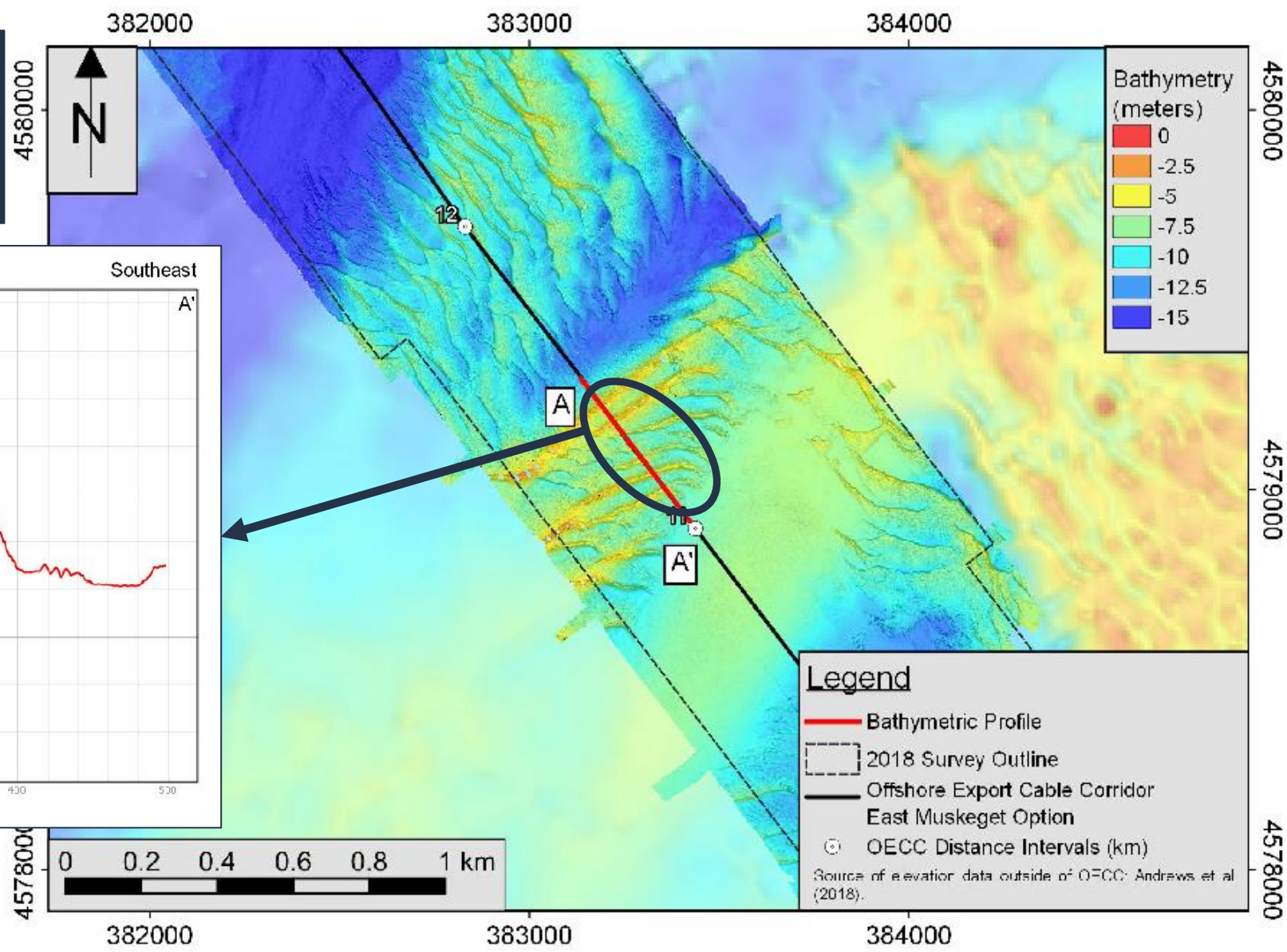


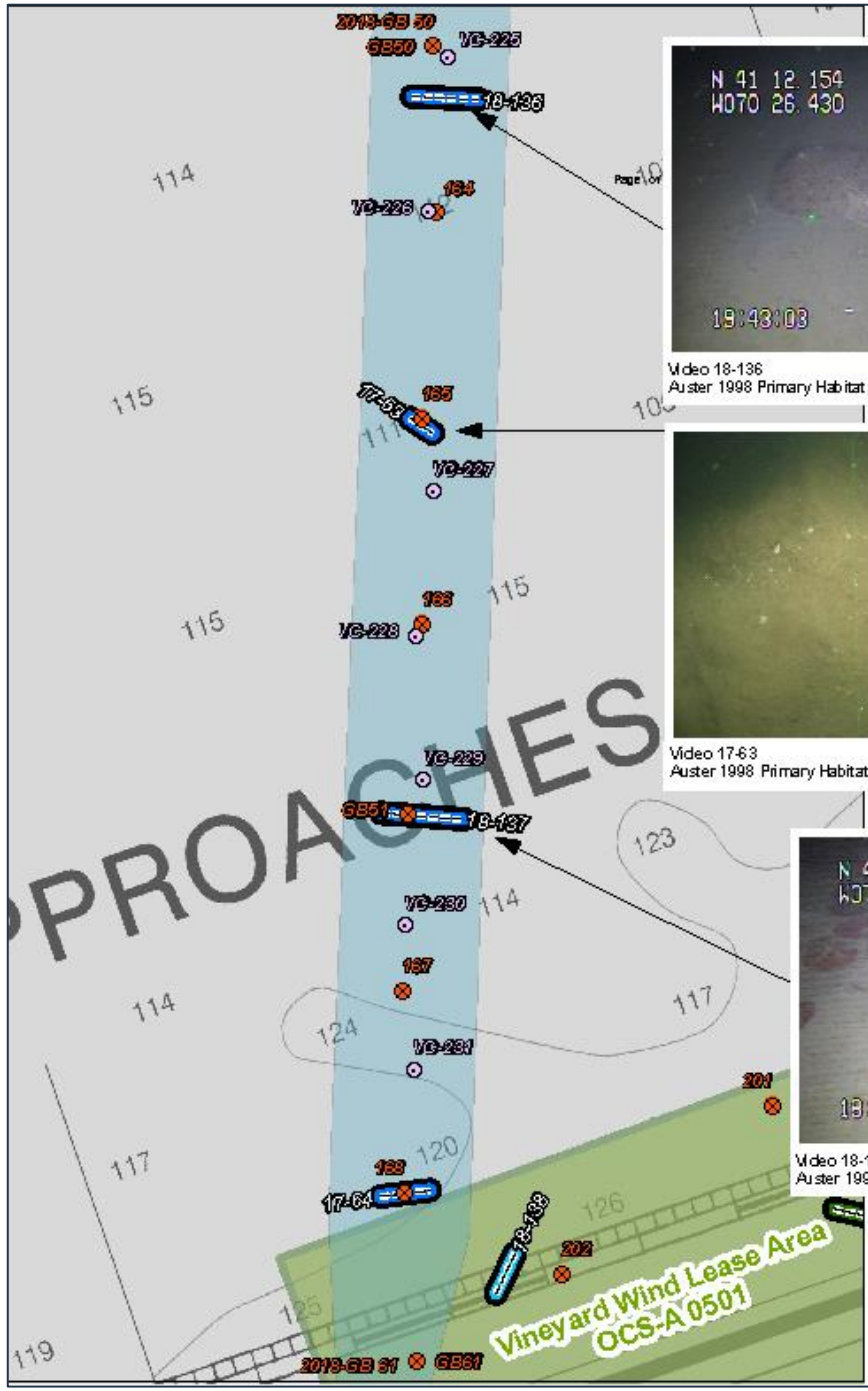
CABLE CORRIDOR SURVEYS

Bathymetric profile of Muskeget Channel sand wave field

(See Volume II, Appendix G, Figure 3.2-3 of Vineyard Wind Connector 2 filing with the Massachusetts Energy Facilities Siting Board (EFSB))



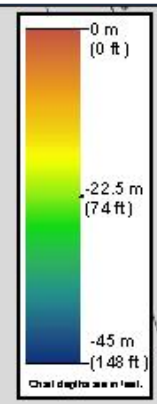


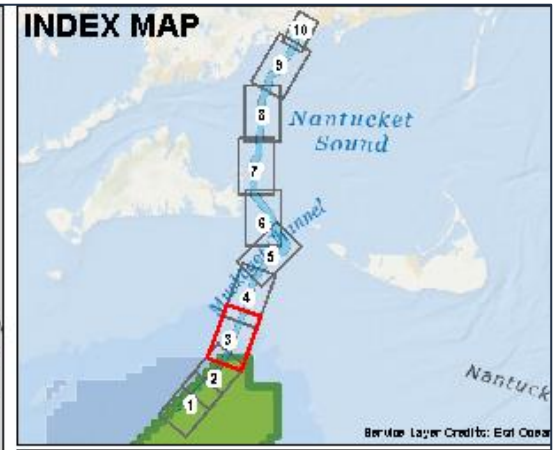


Video 18-136
Auster 1998 Primary Habitat: Flat sand, Mud

Video 17-63
Auster 1998 Primary Habitat: Flat sand, Mud

Video 18-137
Auster 1998 Primary Habitat: Flat sand, Mud





LEGEND

- Vibracore (2018)
- Benthic Grabs
- Benthic Grabs (2020)
- Video Transect
- State/Federal Boundary
- Eelgrass - 2015 DEP Survey
- Hard Bottom/Coarse Deposits (2018 Survey)
- Biogenic/Surface Organics & Mats (2018 Survey)
- Complex Seafloor/Bedforms (2018 Survey)
- Offshore Export Cable Corridor (OECC) – Vineyard Wind Connector 2/Park City Wind
- Vineyard Wind Lease Area
- Massachusetts Ocean Management Planning Area Boundar
- Federal Waters

2015 Massachusetts Ocean Management Plan

- North Atlantic Right Whale Core Habitat
- Eelgrass
- State Mapped Hard-Complex Bottom

Auster 1998 Primary Habitat

- Biogenic Structures
- Flat sand, Mud
- Flat sand, Mud/biogenic structures
- Flat sand, Mud/Pebble cobble
- Flat sand, Mud/Sand waves
- Flat sand, Mud/Shell Aggregates
- Pebble cobble
- Pebble/Cobble with sponge
- Sand waves
- Sand waves/Pebble cobble
- Shell aggregates
- Shell aggregate/Pebble cobbl

Cable alignments represent preliminary engineering estimates. The alignments within the installation corridor will continue to be refined throughout the route engineering process.

NOTE: Depths shown on nautical charts are in feet.

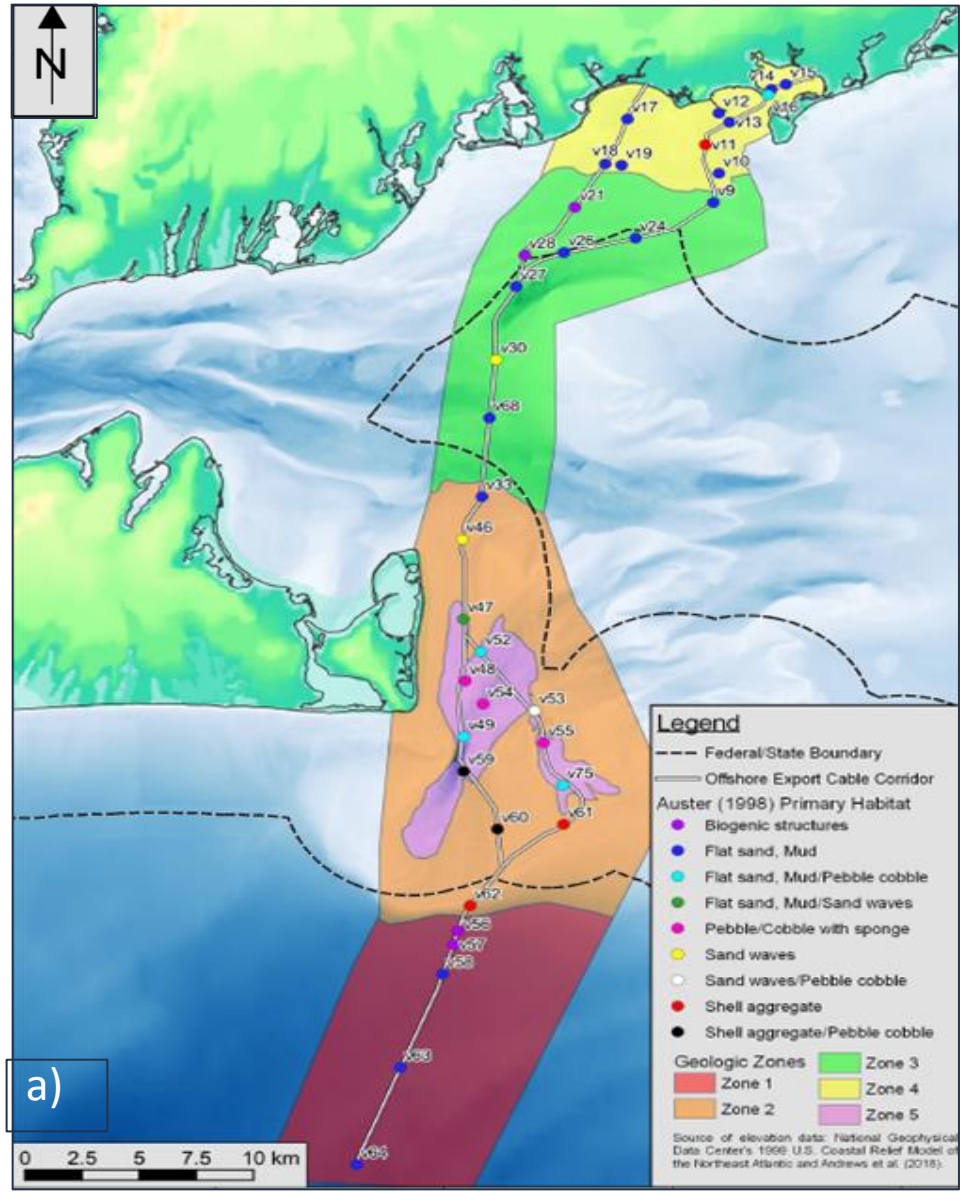
Scale 1:39,000
1 inch = 3,250 feet

0 1,625 3,250
Feet

BENTHIC HABITAT MONITORING

- Geological and biological sampling began in the Vineyard Wind Project area in 2016.
- 6 major habitat zones have been identified
- 5 zones are in the Offshore Export Cable Corridor (OECC)

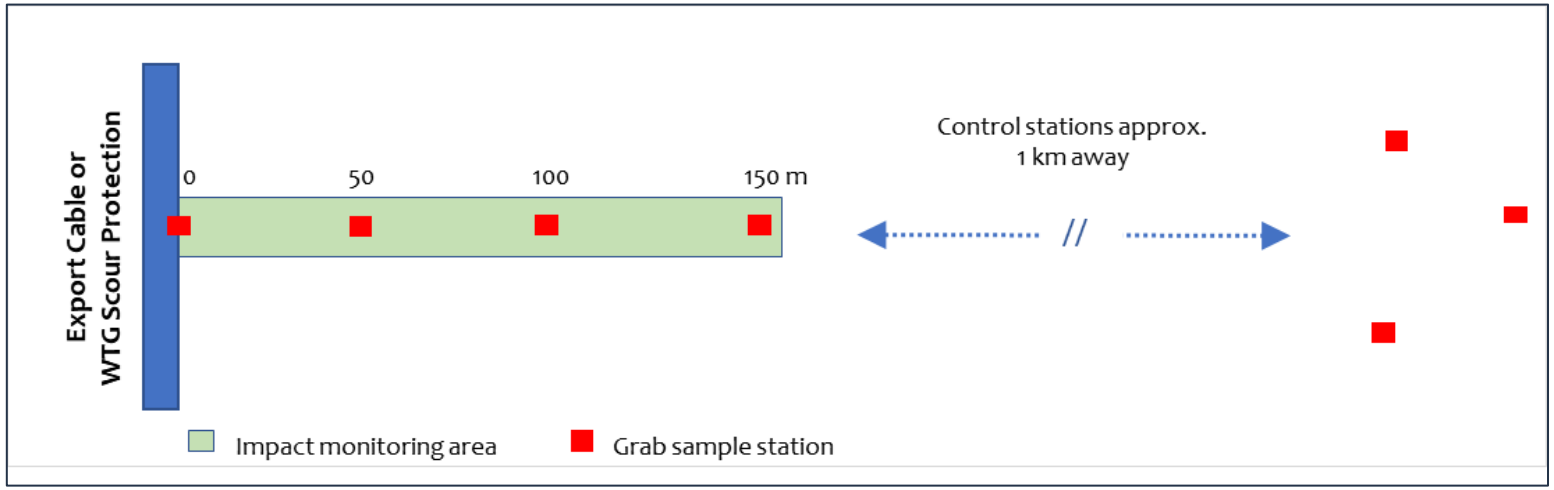
Project Region and Habitat Zone	Habitat Type
WDA – 1	Flat fine/silty sand habitat, deeper water offshore (30-50 m) within the WDA
OECC – 1	Flat sand-mud habitat, deeper water offshore (>20 m), along the OECC segment nearest the WDA
OECC – 2	Sand and gravel with patches of course materials with some small sand waves/ mega ripples, waters from 6-30 m, along the OECC between Martha's Vineyard and Nantucket
OECC – 3	Mainly featureless sandy bottom with some patches of dense shell hash and high ripples/sand waves, waters from 10-20 m along the OECC in Nantucket Sound
OECC – 4	Flat, featureless sand with some silty areas, shallow water depths from 1-10 m) along the OECC nearest shore
OECC – 5	High relief bottom topography with abundance of coarser material and hard bottom areas, high currents, water depths between 6-15 m, along the OECC in the middle of Muskeget Channel



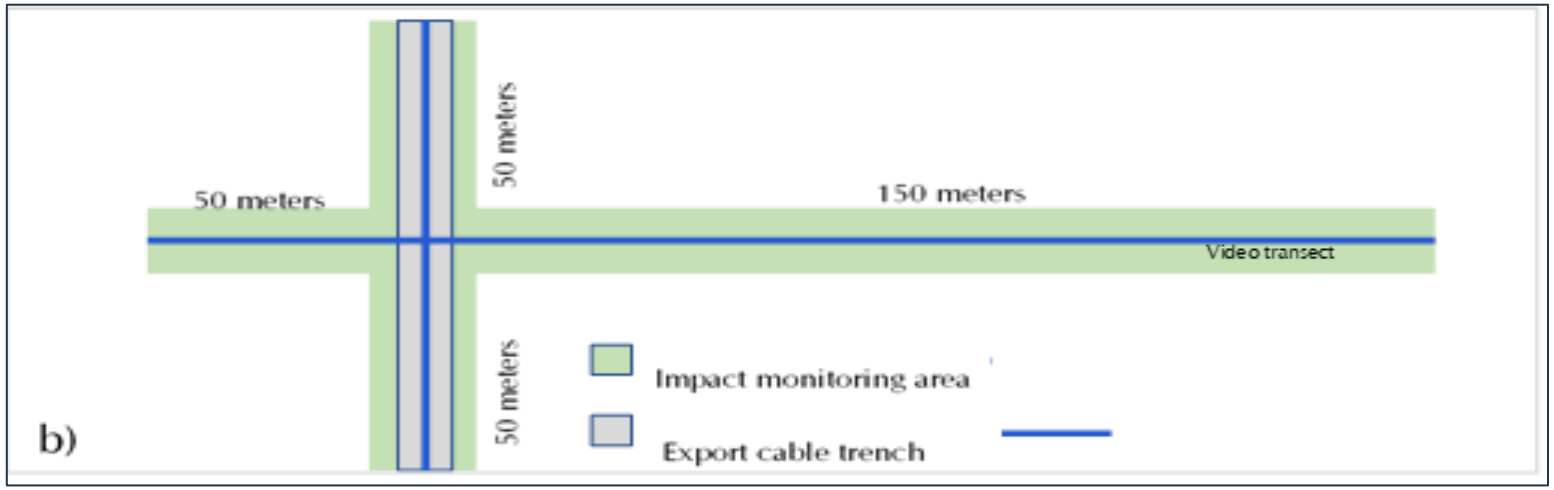
BENTHIC HABITAT MONITORING

Post-construction monitoring planned in years 1, 3 and, if needed, year 5.
Two impact transects per each of the 6 habitat zones.

- Benthic grab sampling will be along each transect at: 0m, 50m, 100m, and 150m from potential impact.



- Video survey will be captured along 300m of each impact monitoring transect - perpendicular & parallel



Multibeam depth sounding coverage will be collected on the entire cable corridor area

POST-INSTALLATION CABLE MONITORING

- Precise location and burial depth of cable is recorded as installation occurs
- Post-installation cable monitoring:
  - Occurs annually for first three years and then every third year thereafter
  - Cable temperature is monitored constantly
    - Changes in temperature may indicate changes in burial depth
  - Geophysical surveys (bathymetry, sonar, imaging, etc)
    - Comparison of bathymetry data sets shows changes in the seafloor
- If needed, reburial may be attempted

FISHERIES SCIENCE

FISHERIES RESEARCH & OFFSHORE WIND DEVELOPMENT

OBJECTIVE:
MONITOR IMPACTS OF OFFSHORE WIND FARMS ON FISHERIES

1. Establish baseline data pre-construction
2. Minimize disruption during construction
3. Document impacts post-construction

WORKING WITH LEADING RESEARCH INSTITUTIONS

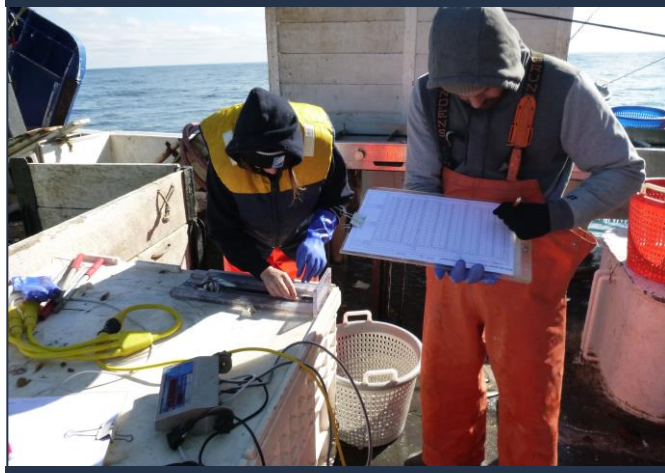
University of Massachusetts Dartmouth SMAST

Collaborations with the UMass Dartmouth School for Marine Science & Technology (SMAST) since 2017.

New England Aquarium
Protecting the blue planet

Partnership with New England Aquarium to document highly migratory species in offshore wind lease areas.

SMAST researchers conduct drop camera surveys in Vineyard Wind lease areas in 2019

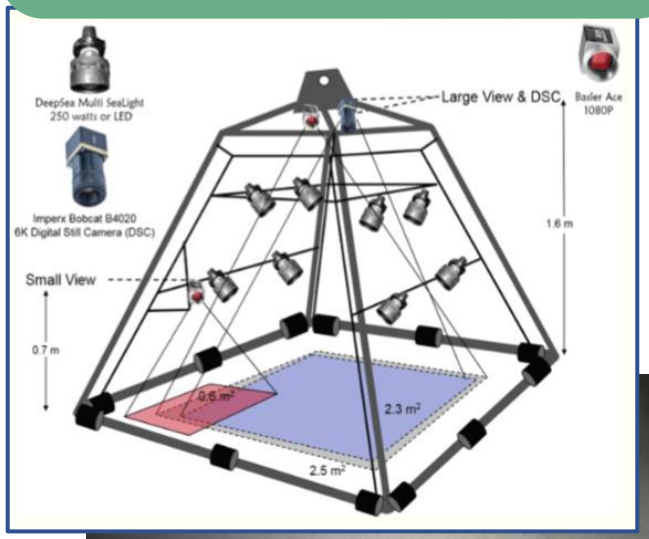


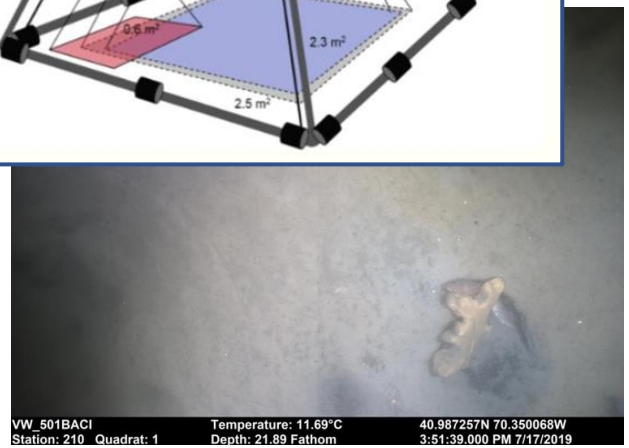
SMAST researchers on the F/V Heather Lynn conduct trawl surveys in Vineyard Wind lease areas in February 2020

FISHERIES SCIENCE

DROP CAMERA SURVEY:

Uses high-resolution video equipment to analyze seafloor habitat and count species present.



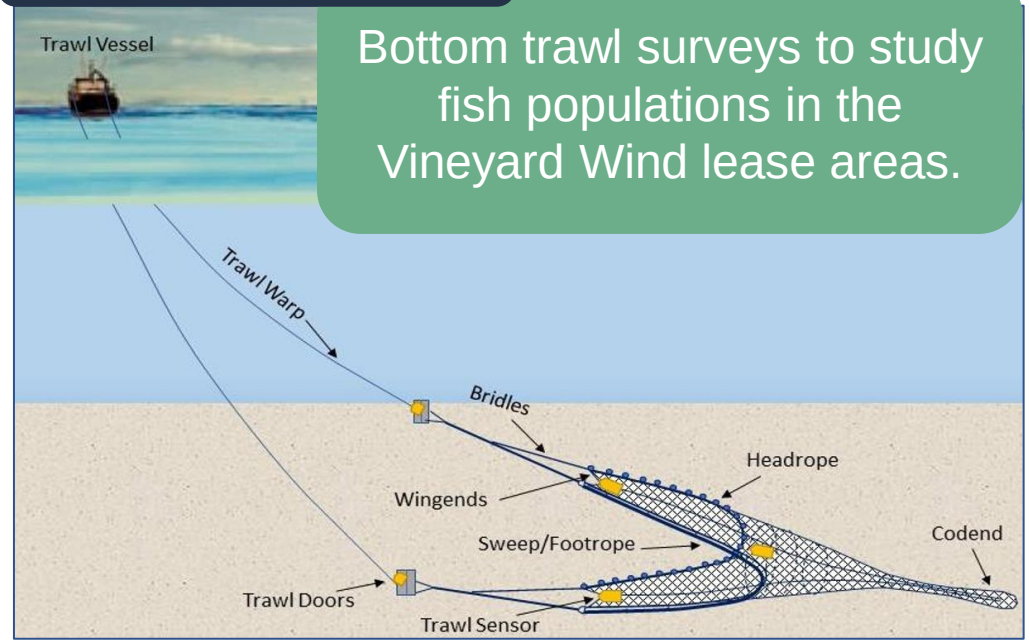


VENTLESS TRAP SURVEY:

- Examines lobster and other crustacean populations using modified “ventless” lobster traps.
- Includes lobster tagging and a concurrent study of black sea bass populations and their stomach contents.

TRAWL SURVEY:

Bottom trawl surveys to study fish populations in the Vineyard Wind lease areas.



PLANKTON SURVEY:

Conducted with the Ventless Trap Survey, plankton sampling uses towed neuston nets.

FISHERIES COMMUNICATIONS

Fisheries Representatives

Vineyard Wind partners with Fisheries Reps who work in a variety of fisheries to help share information about Vineyard Wind projects. They receive compensation but are not employees of Vineyard Wind.

- Jim Kendall, New Bedford Seafood Consulting
- Michael Theiler, Coastal Asset Management
- Beth Casoni, Mass. Lobstermen's Association
- Fred Mattera, Commercial Fisheries Center of RI
- Martha's Vineyard Fisheries Preservation Trust
- New Bedford Port Authority

Responsible Offshore Development Alliance (RODA) Joint Industry Task Force

- Vineyard Wind is a member of RODA's Joint Industry Task force.
- This group was created to improve communications between the commercial fishing industry and offshore wind energy developers.
- Goal: provide a more structured process to explore improved approaches to project siting, design, and operations between the two industries.
- RODA is a broad membership-based coalition of fishing industry associations and fishing companies.

FISHERIES COMMUNICATIONS

SIGN UP FOR UPDATES

Vineyard Wind sends notices about the vessels and equipment deployed in the lease areas.

VINEYARD WIND

OFFSHORE WIND MARINER UPDATE NO. 23

WINTER FISHERIES TRAWL SURVEY PLAN

During the month of February, 2020 the University of Massachusetts Dartmouth School for Marine Science and Technology (SMAST) is conducting a fisheries trawl survey following the Northeast Area Monitoring Assessment Program (NEAMAP) protocols within the Vineyard Wind Lease Areas (501 North; 501 South; 522) and a control area (see attached chart).

The first trip will survey in lease area 501 North with 20 tows inside the lease area and 20 tows in the adjacent control area. Subsequent trips will survey in lease areas 501 South and 522 with 10 tows in each.

Date(s)

(Multiple Trips throughout the month of February)

Location(s)

All Lease areas: 0501 North; 0501 South; 522 and a control area.

Vessel: F/V HEATHER LYNN
Port: Point Judith, RI
Boat Contact Info:
SAT Phone: 1-254-460-4763
Boatracs: Heatherlynn@boatracs.com
Standing by on VHF channel 16 & 13

Please contact Crista Bank, Fishery Liaison, for latest information.
Cell: 508-525-0421 • Email:cbank@vineyardwind.com

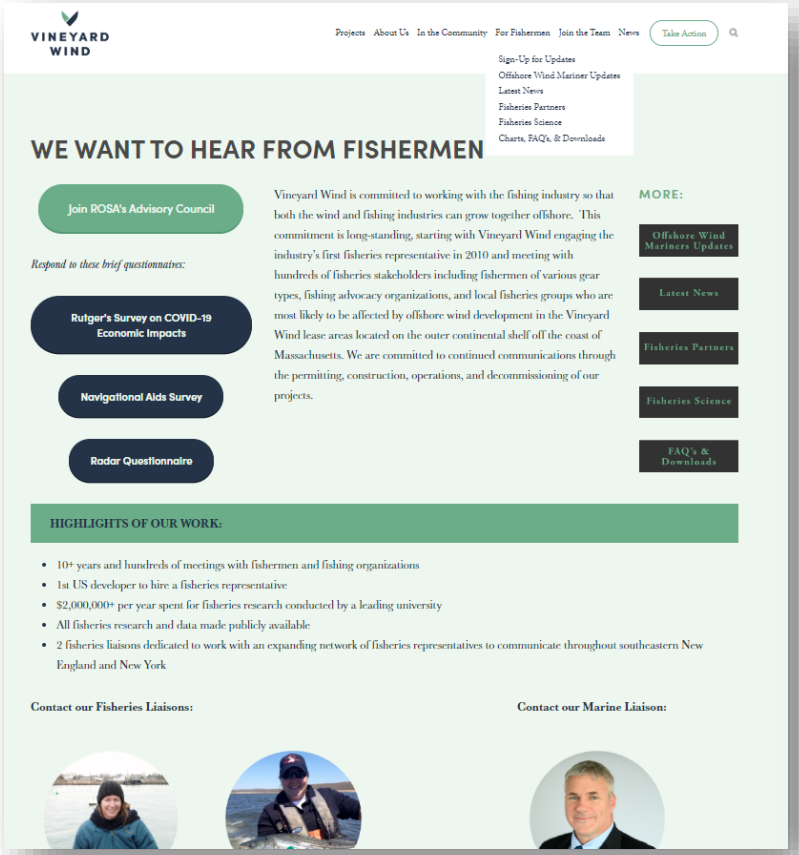
VineyardWind.com • info@vineyardwind.com • 508-717-8964
700 Pleasant Street, Suite 510 • New Bedford, MA 02740

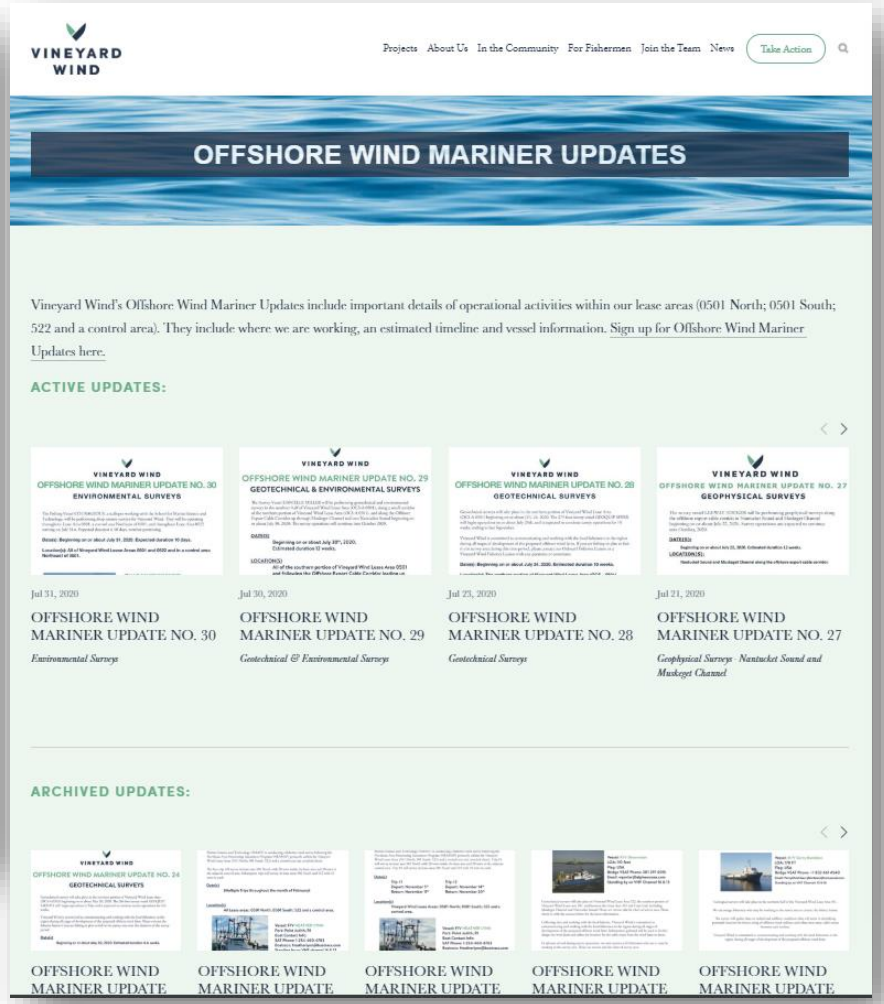
WEBSITE RESOURCES FOR FISHERMEN

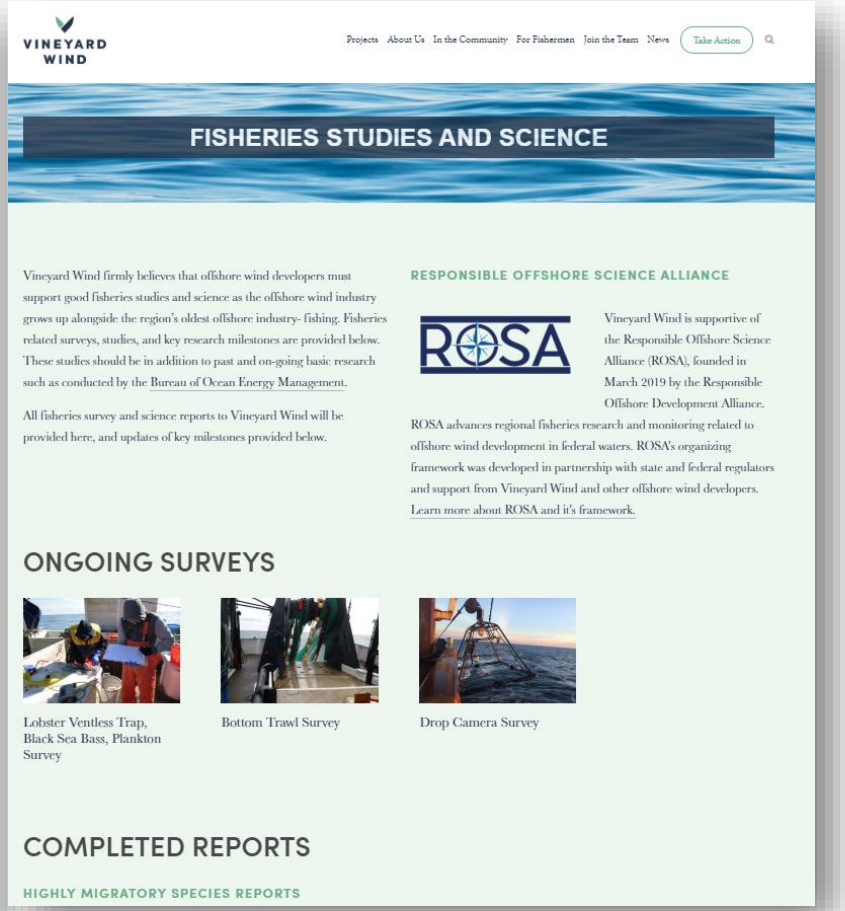
vineyardwind.com/Fisheries

vineyardwind.com/offshore-wind-mariner-updates

vineyardwind.com/fisheries-science







Contact us:

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QUESTIONS?

Summary of Questions & Answers

Note: The following is a summary of the questions submitted by attendees at Vineyard Wind's Virtual Information Session For Fishermen on August 25, 2020. Included below are Vineyard's Winds responses to those questions.

Q: In areas where there are shifting sand waves, how do you bury the cable to the 5-8' target burial depth? Muskeget Channel has such intense currents and tides. How do you know that there will not be washouts or scouring?

A:The cables will be buried below the stable seabed beneath the trough of any sand waves. Extensive study of the seabed conditions and comparison of data from multiple years has been used to determine where the stable seabed exists, and the cable will be buried at least 5 feet below this level; therefore, washout or scour along the cable is not expected.

Q: You have described multiple cable burial jet plow tools. What is their maximum cable burial depth achievable? How do you deal with boulders? Can these jet plow tools be switched out on the fly?

A: Extensive survey data has been collected to help identify where boulders are present. The routes for the cables have been designed to avoid as many boulders as possible. Where boulders are present, they will be moved to the side using a submarine tool immediately prior to installation. No, these tools cannot be switched out on the fly – that is why it is important to have so much data about the seabed conditions prior to installation. Extensive surveying has provided a road map of where we will use each tool. The currently planned tool, the vertical injector, can achieve a depth of more than 20 feet and are particularly useful in areas with sandwaves since it eliminates the need to dredge.

Summary of Questions & Answers (continued)

Q: How do the cables shield Electromagnetic fields?

A: Cables have built in metal shielding and will be buried to depth of 5 to 8 feet which provides further shielding. Electric Fields (EF) are negligible for buried cables. Magnetic fields (MF) are significantly reduced for buried cables. Modeling of MF from project-specific submarine cables indicated magnetic fields from both AC and DC cables would be much lower than the Earth's magnetic field and likely only able to be sensed, if at all, directly over the cable centerline. Modeling also confirmed that EMF from cables decreases with distance.[1]

Q: In the post installation monitoring how will the EMF be monitored; will this be measured at the same frequency as the burial depth?

A: EMF will not be monitored because the expected Magnetic Fields (MF) are expected to be low (less than the Earth's own natural magnetic field) and because recent, comprehensive studies of EMF show that impacts to bottom-dwelling invertebrates and other fauna are negligible.[2]

Q: What are the plankton tow surveys measuring? Do you measure Chlorophyl?

A: Plankton tows occur twice a month from June through October during the lobster survey. Chlorophyl is not measured. Bottom temperature, pH, dissolved oxygen and salinity sensors are attached to the lobster traps and remain there for the season.

Q: Are the export cables armored and grounded?

A: Yes, each cable has multiple layers of insulation and armoring, and is grounded at each end, at the electric service platform and at the beach landfall.

[1] *Gradient Corporation. (2017). Electric and Magnetic Field (EMF) Modeling Analysis for the Vineyard Wind Connector Project. Prepared for Epsilon Associates, Inc. and Vineyard Wind LLC.*

[2] *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England. U.S. Dept. of the Interior, Bureau of Ocean Energy Management, Headquarters, Sterling, VA. OCS Study BOEM 2019-049. 59 pp.*

Summary of Questions & Answers (continued)

Q: What is the total number of possible foundation locations is in your OCS-A-0501 lease area with the 1 x 1 E-W grid?

A: We estimate approximately 200 turbines and/or ESP locations in the Vineyard Wind 501 lease area with a 1 by 1 nautical mile layout. However, the exact number of turbines will vary because not every turbine location is buildable and the final layout is yet to be determined for all of the project areas as there may be further consultation through the permitting processes

Q: Are cables within the wind farm buried at the same depth as transmission cables from the grid to the shore?

A: Yes, with the exception of the cable at the landfall which is buried up to 30 feet below the beach.

Q: I have seen images from the North Sea wind farms that show significant sediment plumes downstream of the monopiles. What has your analysis shown as to the changes in the water column vertically?

A: The conditions necessary to create sediment plumes are absent at the Vineyard Wind Lease Area. The Vineyard Wind site has deeper water, slower currents, and very low sediment mobility compared to the North Sea and other European sites where sediment plumes have been observed. As such we do not expect sediment plumes to form.

Q: For clam dredges operating near cables, what are the hazards and responsibilities?

A: We are not aware of any cases of electrocution coming from vessels and subsea equipment striking submarine cables. If an impact occurs which exposes the core the system would trip. The cable metallic shield and seawater will act to dissipate any electric potential along chains or cables before reaching the vessel.

Q: What is the voltage being transmitted through the buried power cable?

A: The offshore export cable is 220-275 kV HVAC, and the interarray cable is 66 kV HVAC.