

General Background: Offshore Wind and Humboldt Bay's Offshore Wind Port



CMANC 2023
5/18/23

Rob Holmlund, Development Director, HBHRCD

What?



What is offshore wind?

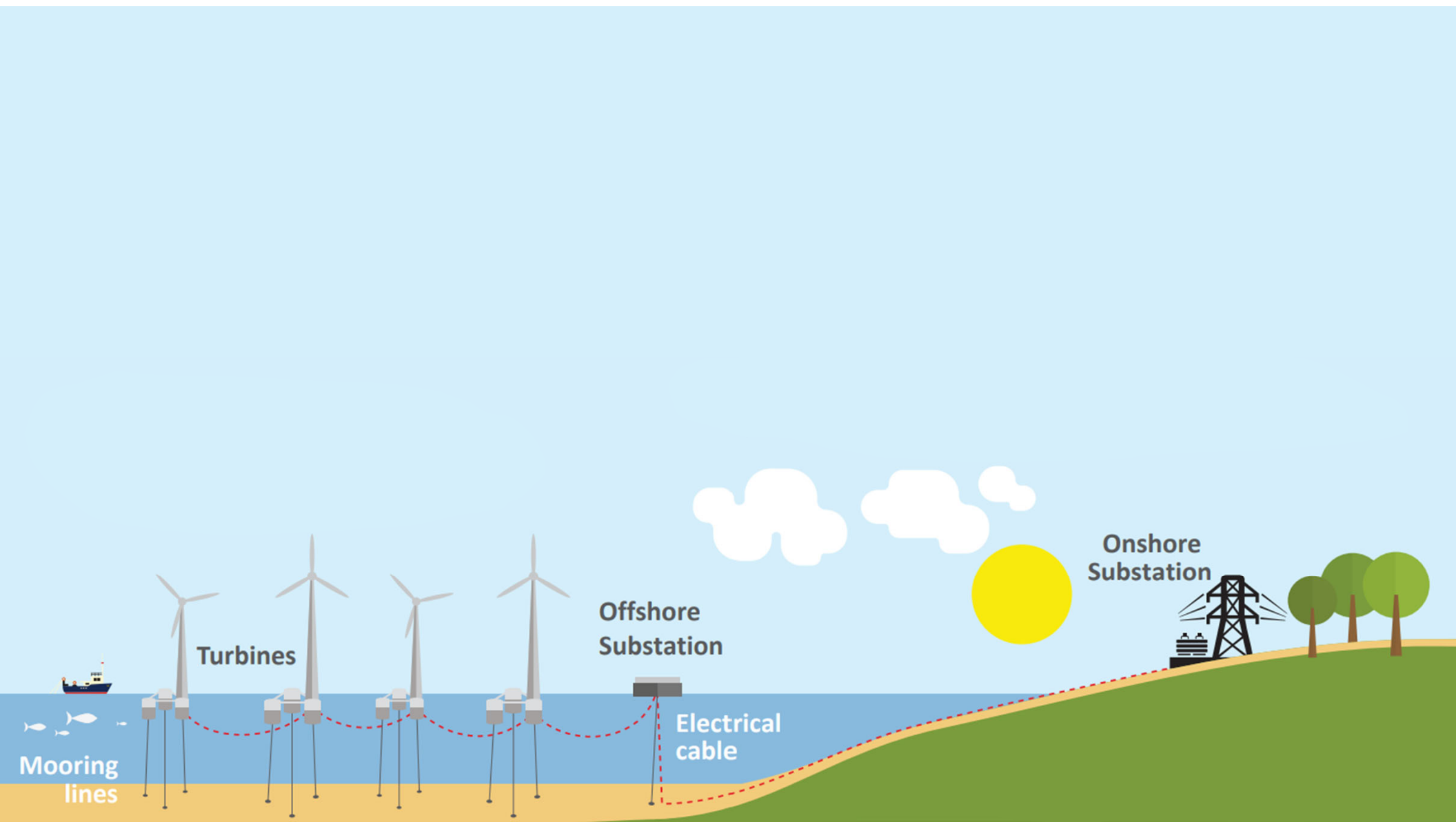


This is a
coal-fired
power
plant

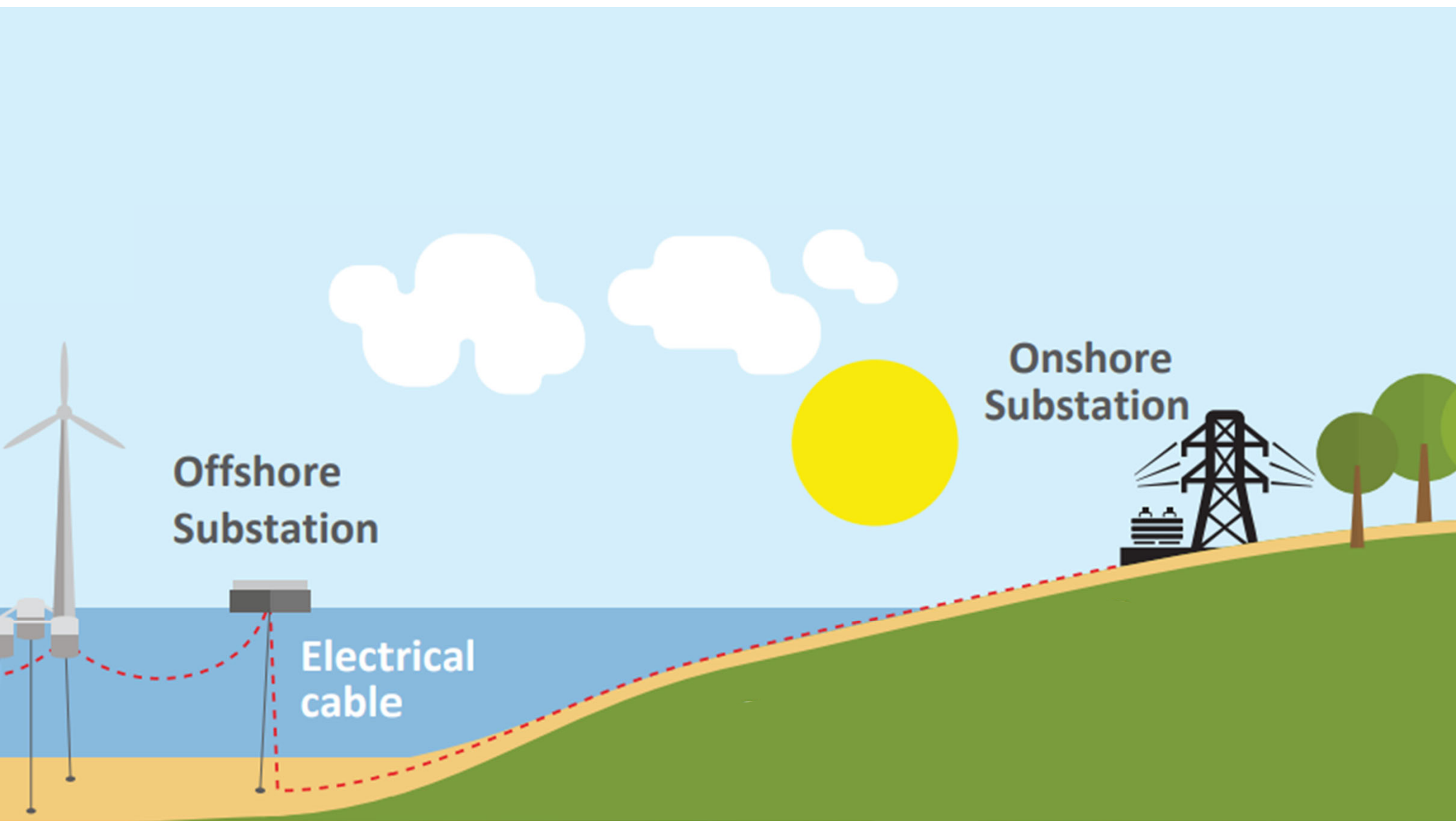


This is an offshore wind “power plant”









**Offshore
Substation**

**Electrical
cable**

**Onshore
Substation**

WHY?

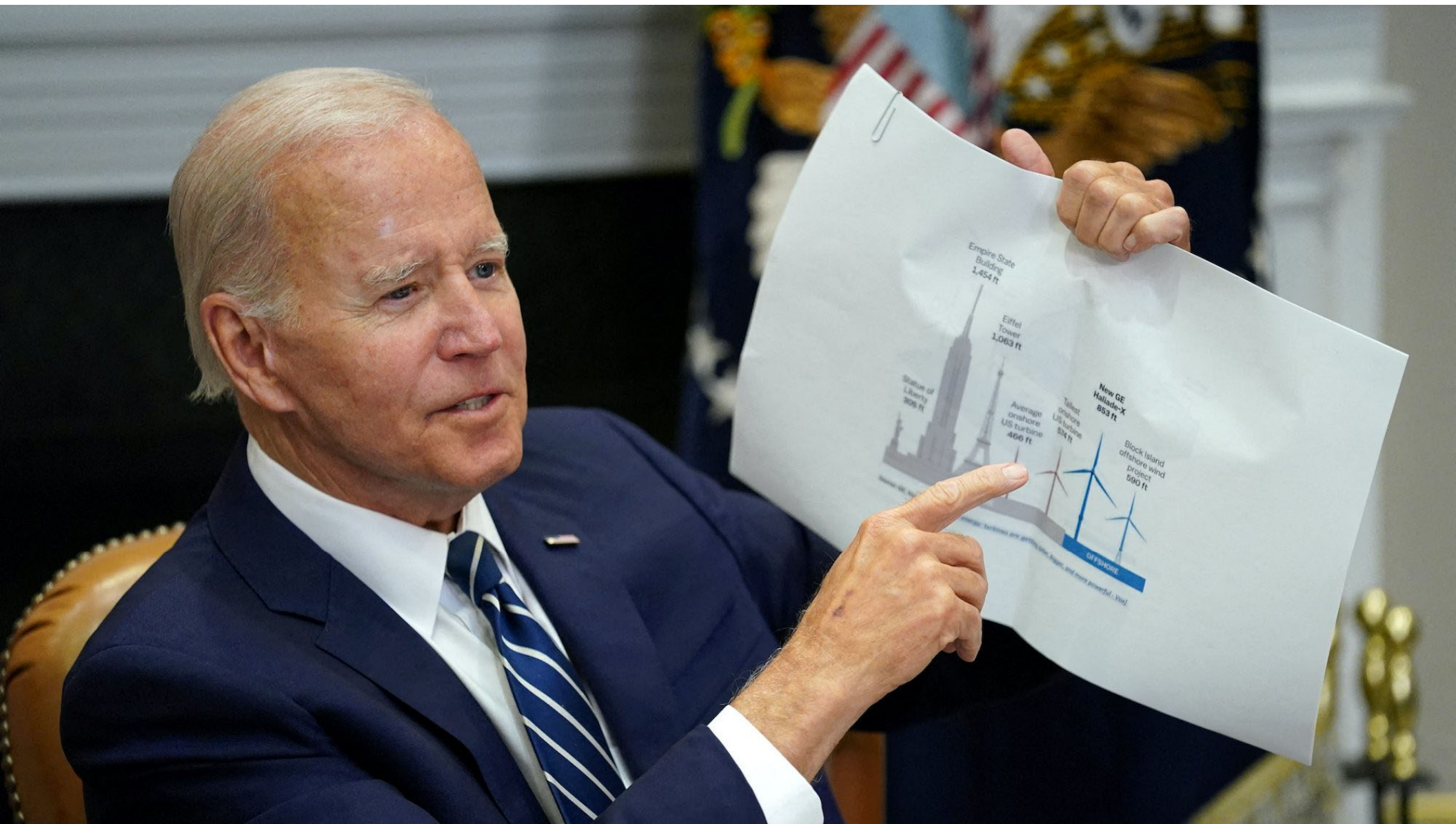


WHY OFFSHORE WIND?



The
coming
end
of
carbon-
based
power





SEPTEMBER 15, 2022

FACT SHEET: Biden-Harris Administration Announces New Actions to Expand U.S. Offshore Wind Energy



► BRIEFING ROOM ► STATEMENTS AND RELEASES

Departments of Energy, Interior, Commerce, and Transportation Launch Initiatives on Floating Offshore Wind to Deploy 15 GW, Power 5 Million Homes, and Lower Costs 70% by 2035

Today, the Biden-Harris Administration is launching coordinated actions to develop new floating offshore wind platforms, an emerging clean energy technology that will help the United States lead on offshore wind. In tandem with President Biden's economic and clean energy agenda, these actions will create good-paying jobs, lower energy costs for families, and strengthen U.S. energy security. Since taking office, President Biden's vision and leadership has jumpstarted the American offshore wind industry and made America a magnet for clean energy investments. The President set a [bold goal](#) of deploying 30 gigawatts (GW) of offshore wind by 2030, enough to power 10 million homes with clean energy, support 77,000 jobs, and spur private investment up and down the supply chain.

30 gigawatts (GW) of offshore wind by 2030

HOW TO MEASURE

ONE GIGAWATT

A gigawatt is a unit of electricity, but at a grand utility scale. It's the horsepower of 1.3 million horses, or the output of 4.6 million solar panels. How else can you measure a single gigawatt? Here are some more numbers to give you perspective.



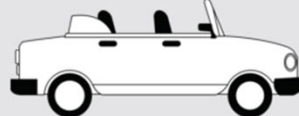
500 WIND TURBINES

That's how many utility scale turbines you need to produce a single gigawatt.



200,000-500,000 HOMES

A single gigawatt can power up to a half million homes, depending on weather conditions.



2,000 SPORTS CARS

Imagine 2,000 sports car engines revving simultaneously. They would produce about 1 gigawatt of power. Seriously.

100 MILLION LED BULBS

A typical LED bulb draws 10 watts of electricity. With a gigawatt of power you could light up 100 million of them.



Texas Coalition for Affordable Power

WWW.TCAPTX.COM

HOW TO MEASURE

**ONE
GIGAWATT**

30 GW = 15M homes



**200,000-500,000
HOMES**

**A single gigawatt can power up to
a half million homes, depending on
weather conditions.**

30 GW =

60 average coal-fired power plants



Countries Leading in Offshore Wind Installations

Cumulative offshore wind capacity as of 2020 (gigawatts)



Source: Global Wind Energy Council.

COUNCIL on
FOREIGN
RELATIONS

Countries Leading in Offshore Wind Installations

Cumulative offshore wind capacity as of 2020 (gigawatts)



35 GW







2021 SB 100 Joint Agency Report Summary

Achieving 100% Clean Electricity in California

An Initial Assessment



March 2021

Progress to 100% Clean Electricity

Percent renewable and zero-carbon electricity serving CA

100
90
80
70
60
50
40
30
20
10
0

41%

- 9% Large Hydro
- 22% Renewables
- 10% Nuclear

2013

59%

- 13.9% Large Hydro
- 34.5% Renewables
- 10.6% Nuclear

2020













100%

2045



California

Clean Electricity Resources

| | | Existing Resources | Projected New Resources | |
|---|-------------------------|--------------------|-------------------------|---------|
| | | 2019* | 2030** | 2045** |
|  | Solar (Utility-Scale) | 12.5 GW | 16.9 GW | 69.4 GW |
|  | Solar (Customer) | 8.0 GW | 12.5 GW | 28.2 GW |
|  | Storage (Battery) | 0.2 GW | 9.5 GW | 48.8 GW |
|  | Storage (Long Duration) | 3.7 GW | 0.9 GW | 4.0 GW |
|  | Wind (Onshore) | 6.0 GW | 8.2 GW | 12.6 GW |
|  | Wind (Offshore) | 0 GW | 0 GW | 10.0 GW |
|  | Geothermal | 2.7 GW | 0 GW | 0.1 GW |
|  | Biomass | 1.3 GW | 0 GW | 0 GW |
|  | Hydrogen Fuel Cells | 0 GW | 0 GW | 0 GW |
|  | Hydro (Large) | 12.3 GW | N/A† | N/A† |
|  | Hydro (Small) | 1.8 GW | N/A† | N/A† |
|  | Nuclear | 2.4 GW | N/A† | N/A† |

2019* 2030** 2045**



Solar (Utility-Scale)

12.5 GW

16.9 GW

69.4 GW



Solar (Customer)

8.0 GW

12.5 GW

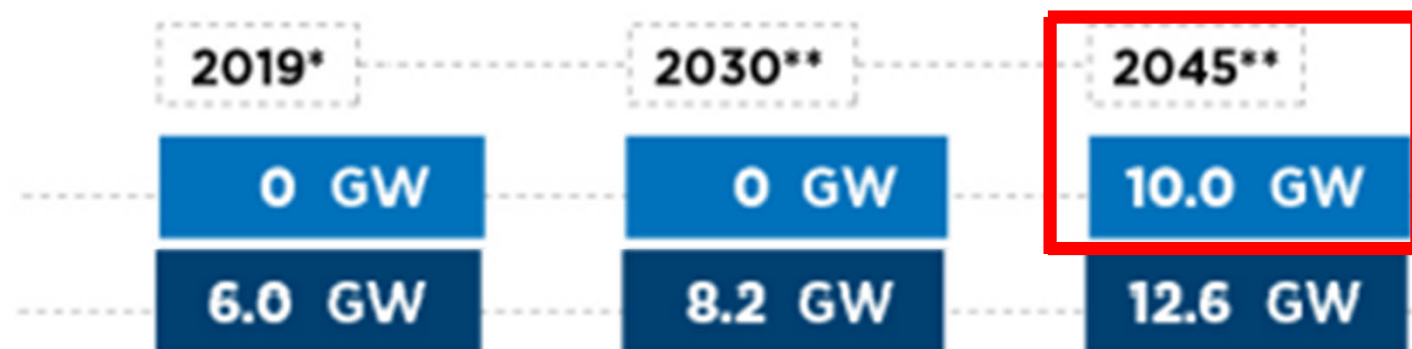
28.2 GW



Wind (Offshore)



Wind (Onshore)

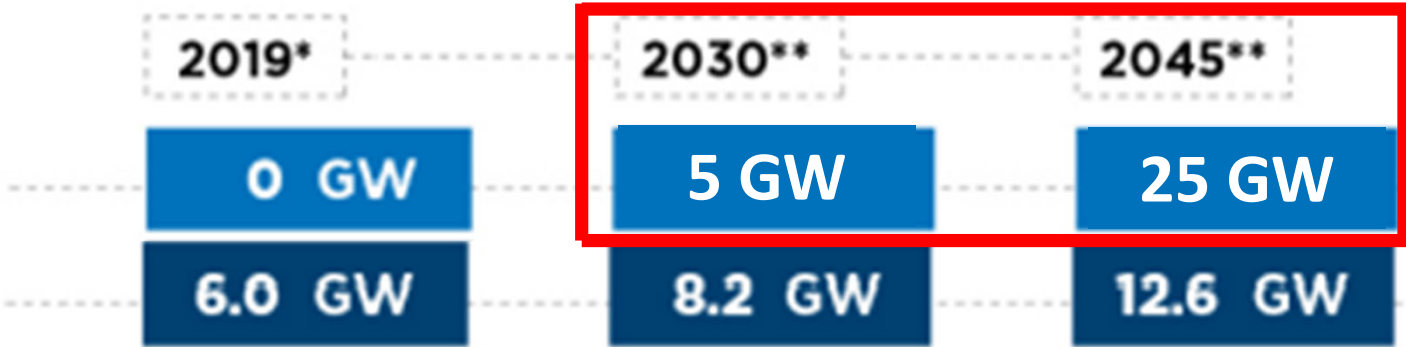




Wind (Offshore)



Wind (Onshore)



2030

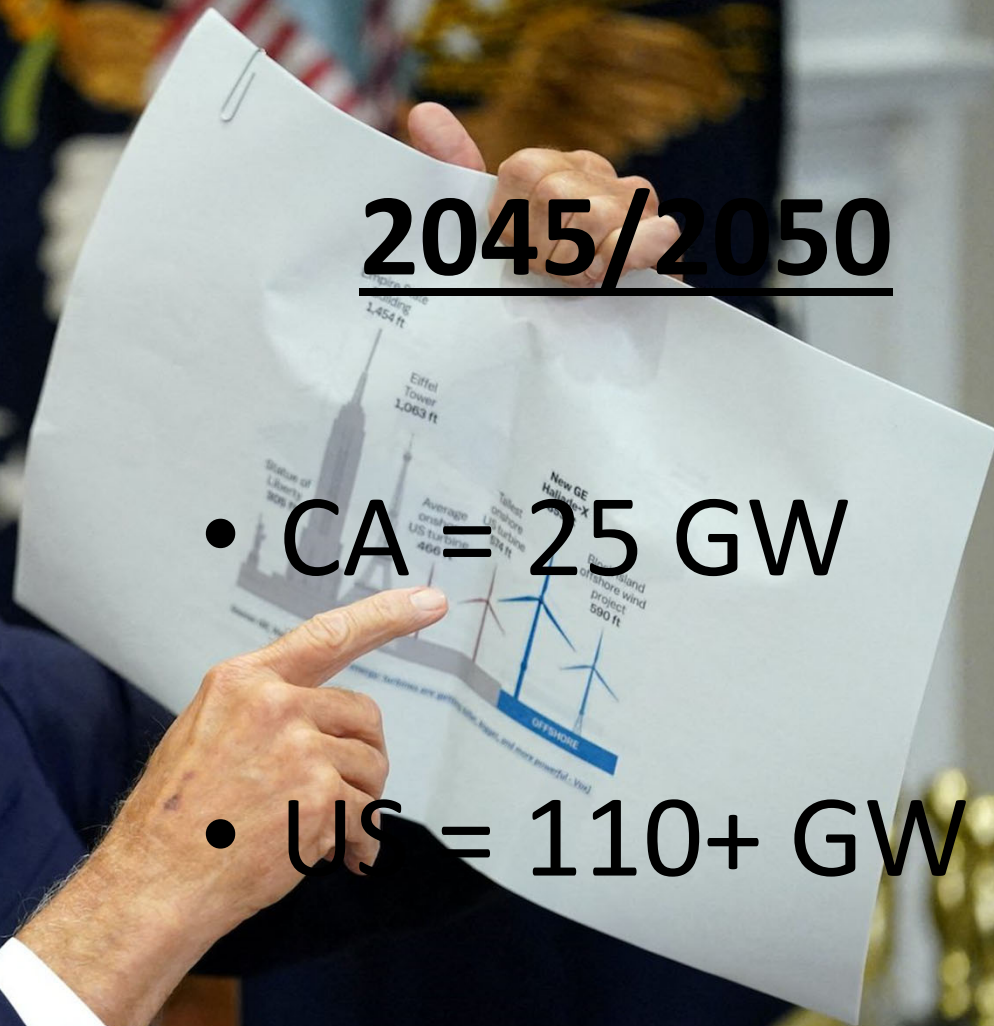
• CA = 5 GW

• US = 30 GW

2045/2050

• CA = 25 GW

• US = 110+ GW

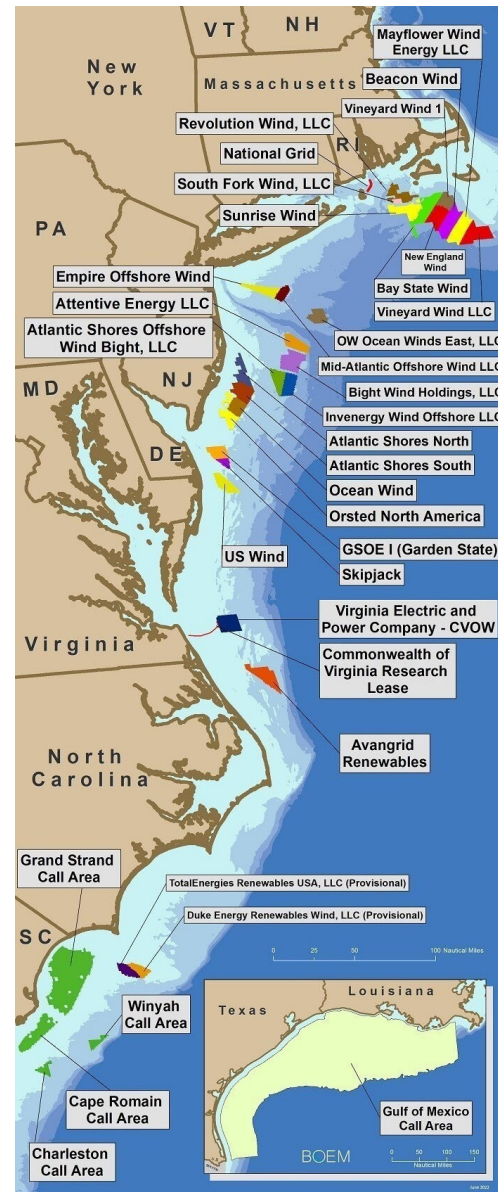
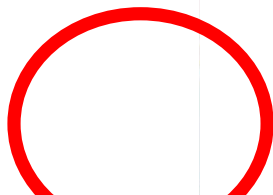


Where?

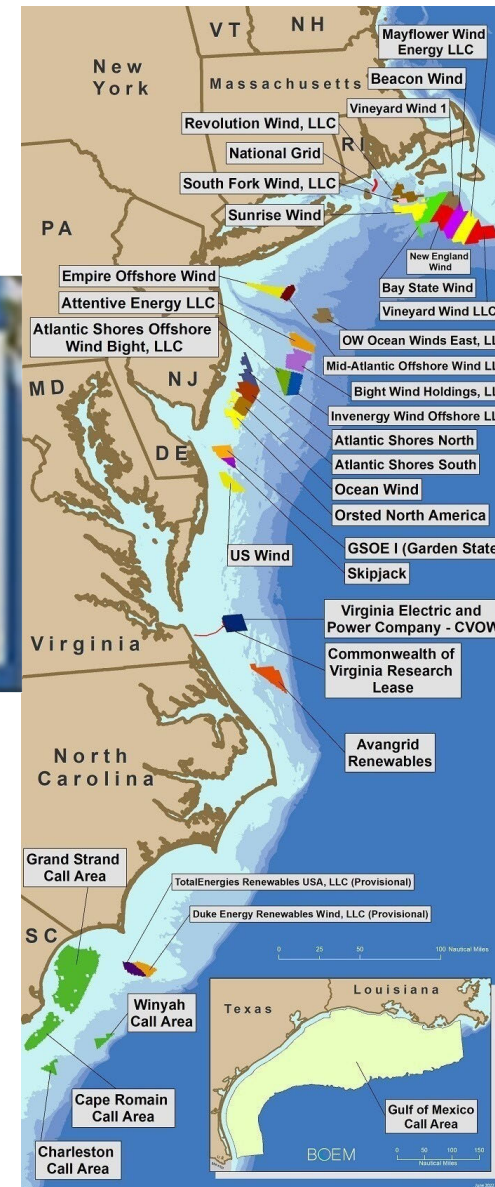
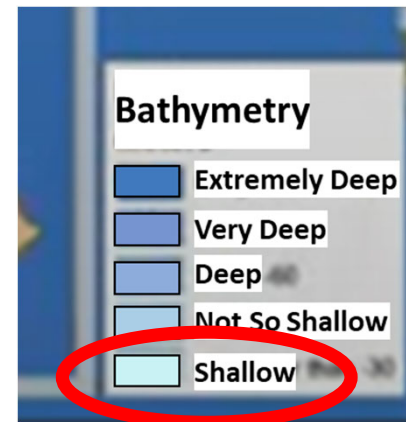


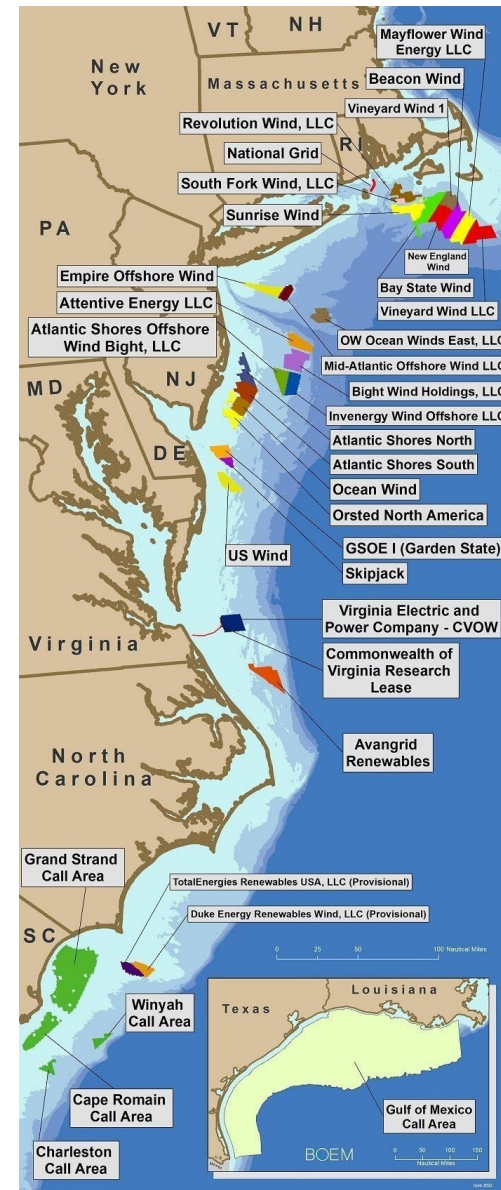
Where will offshore wind occur?

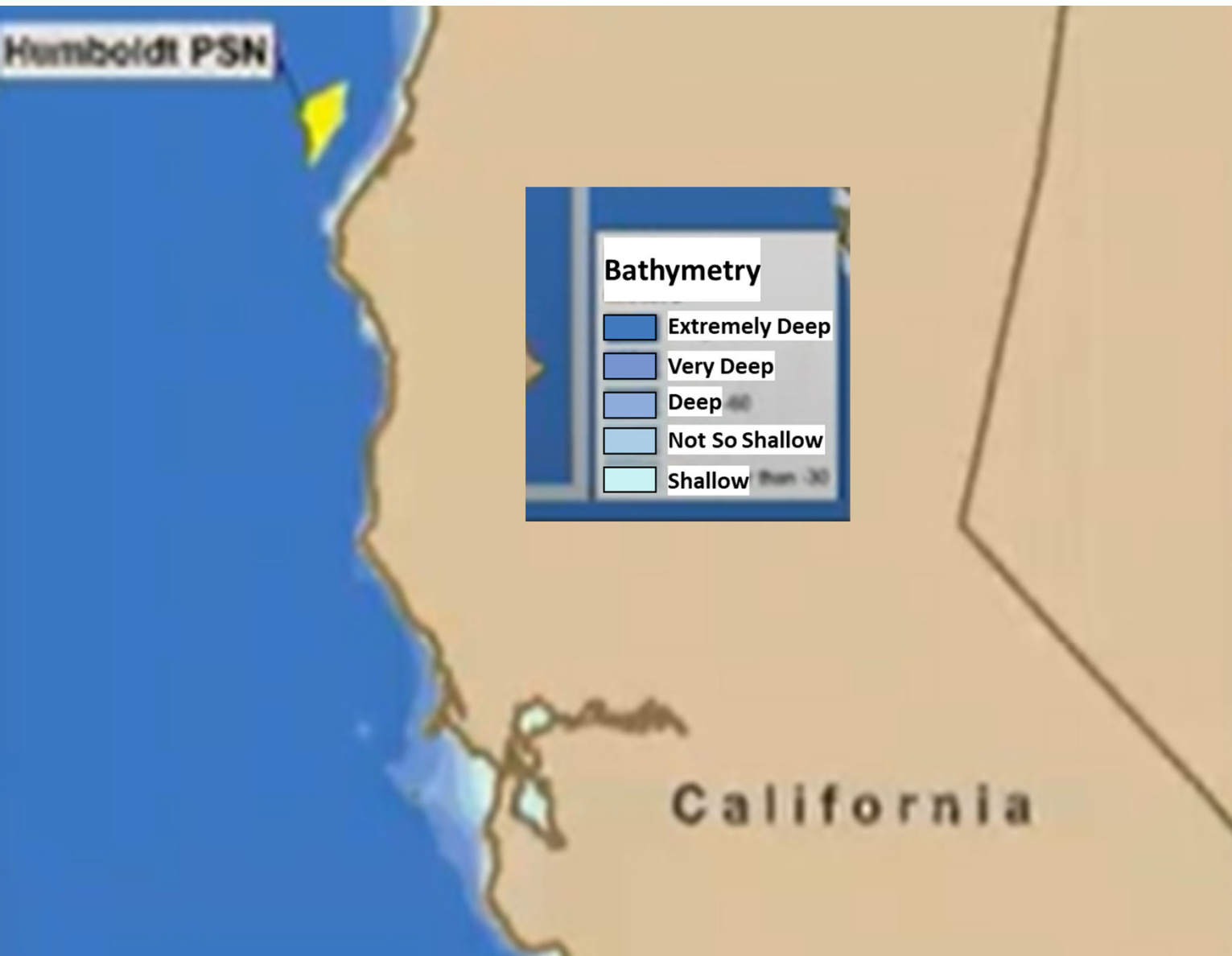


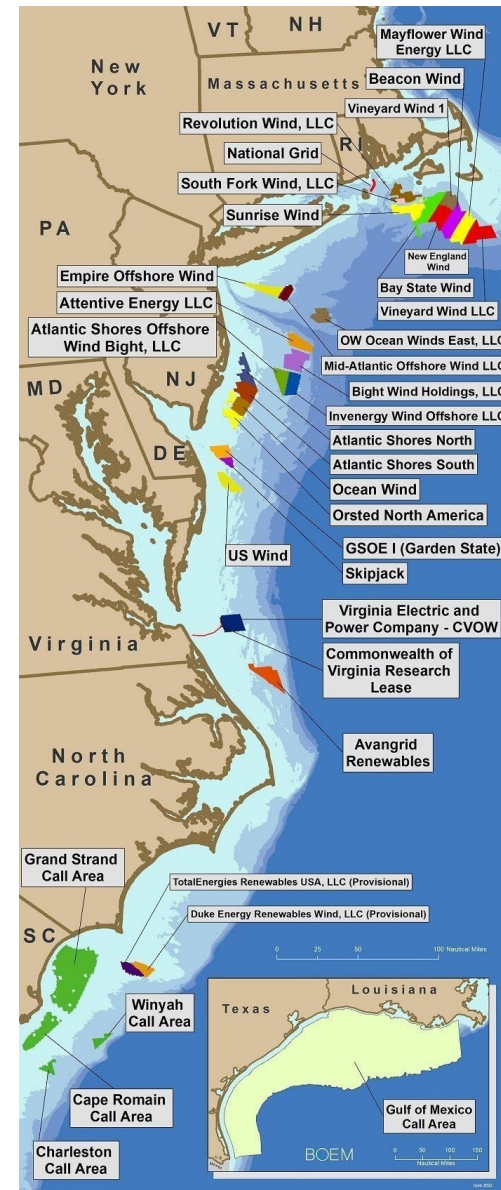




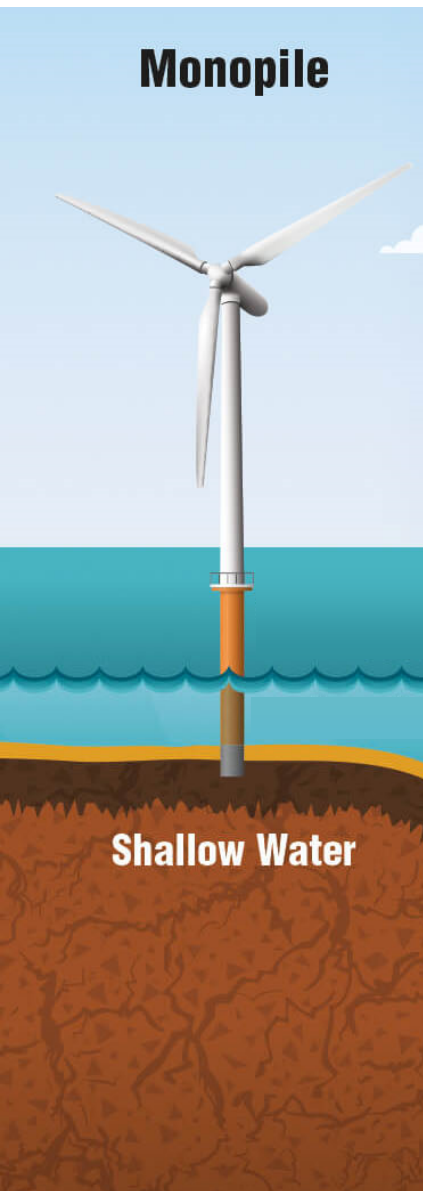




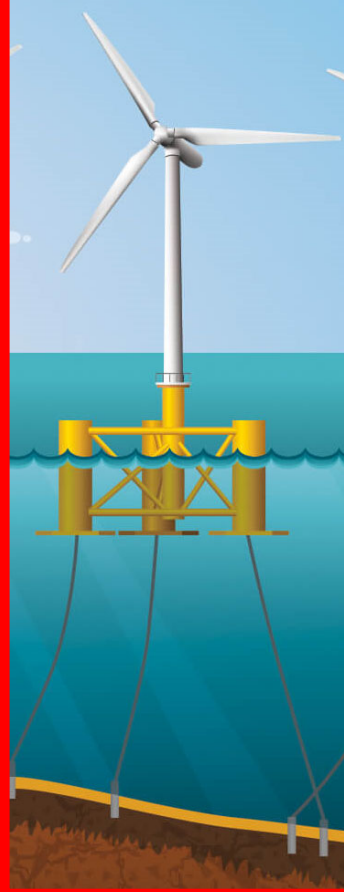




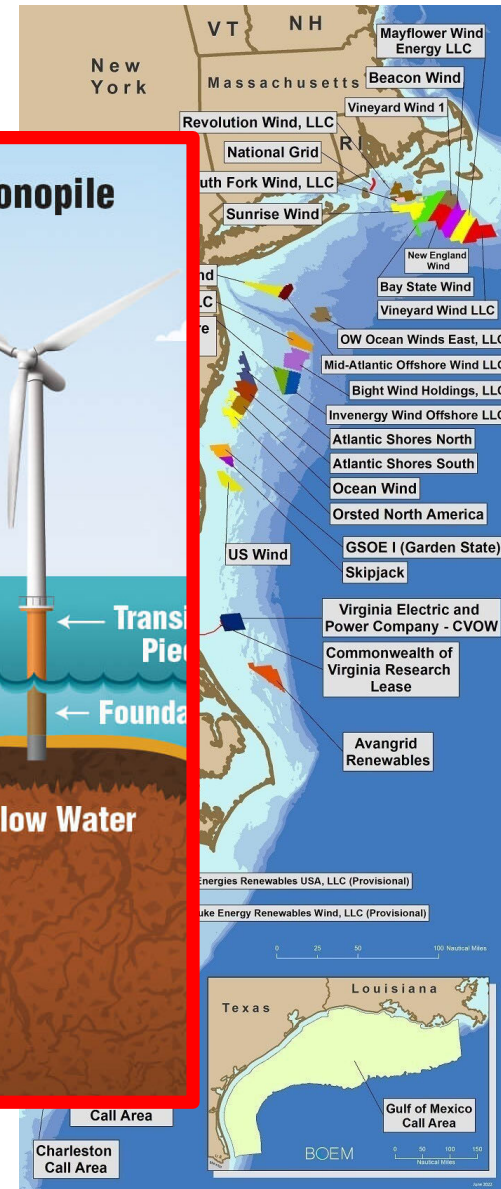
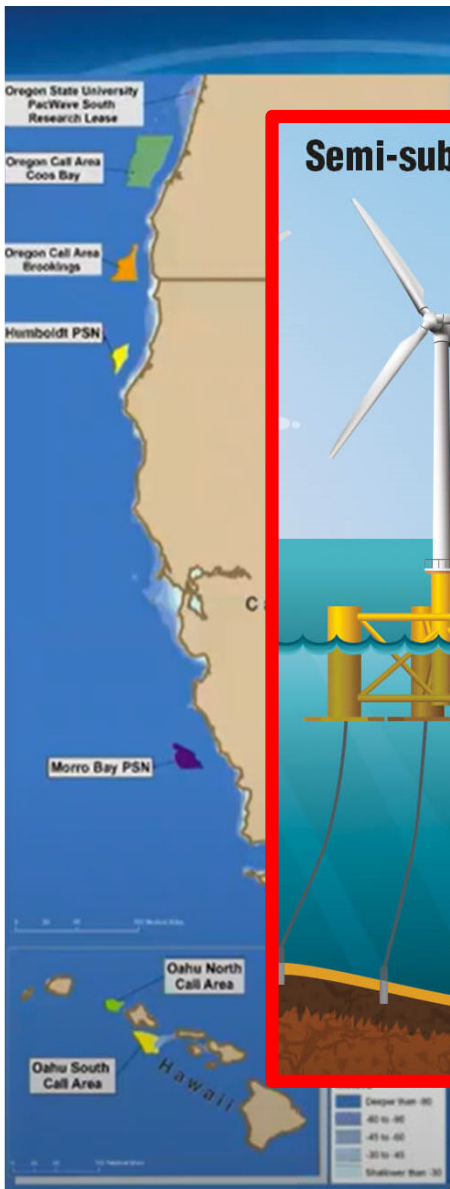
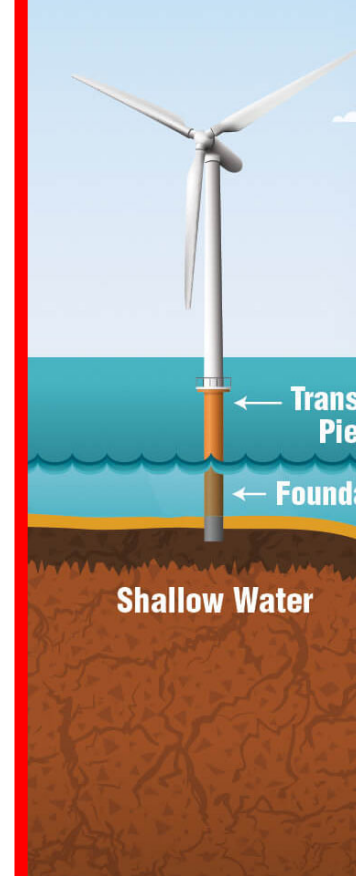
Monopile

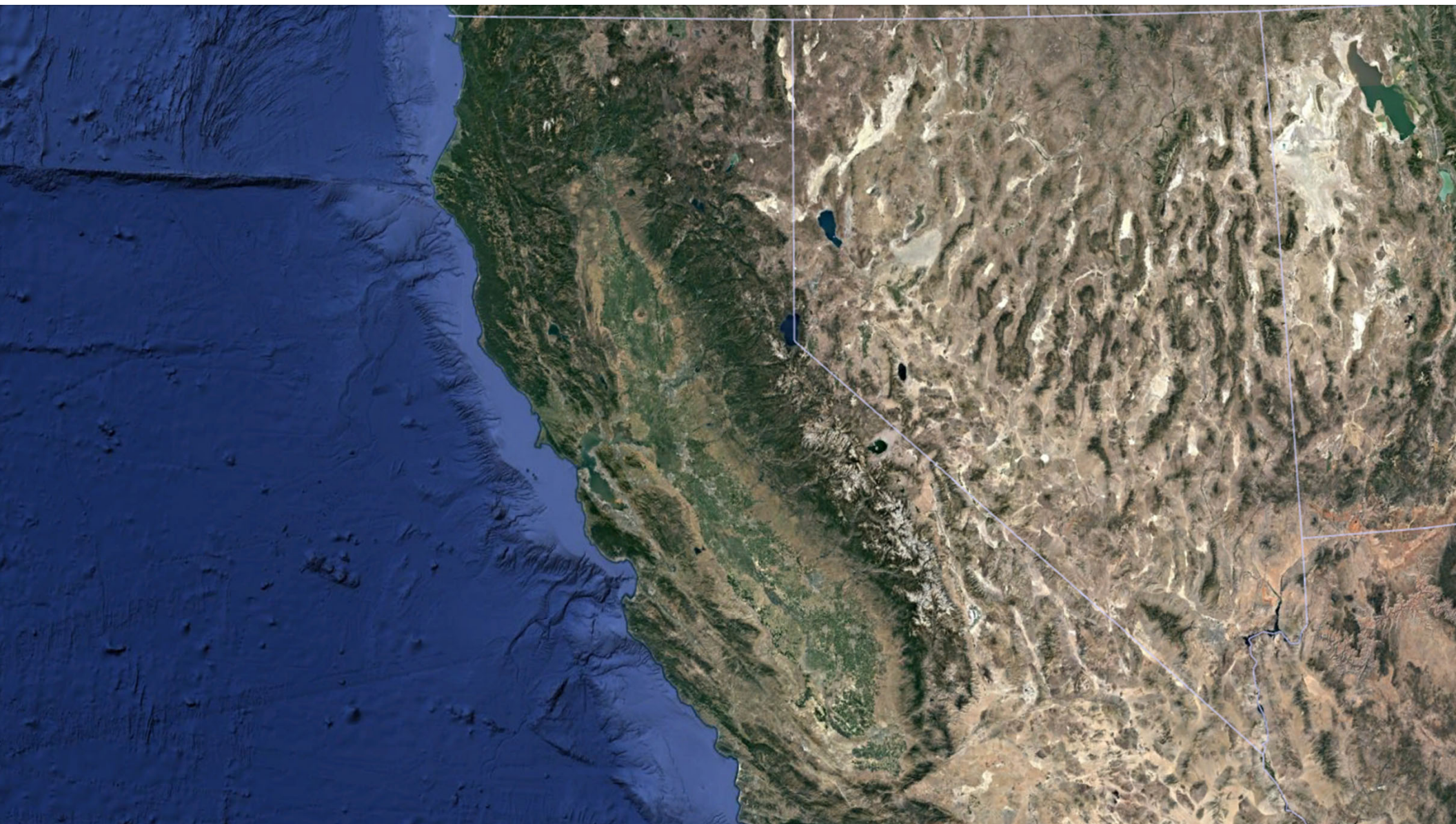


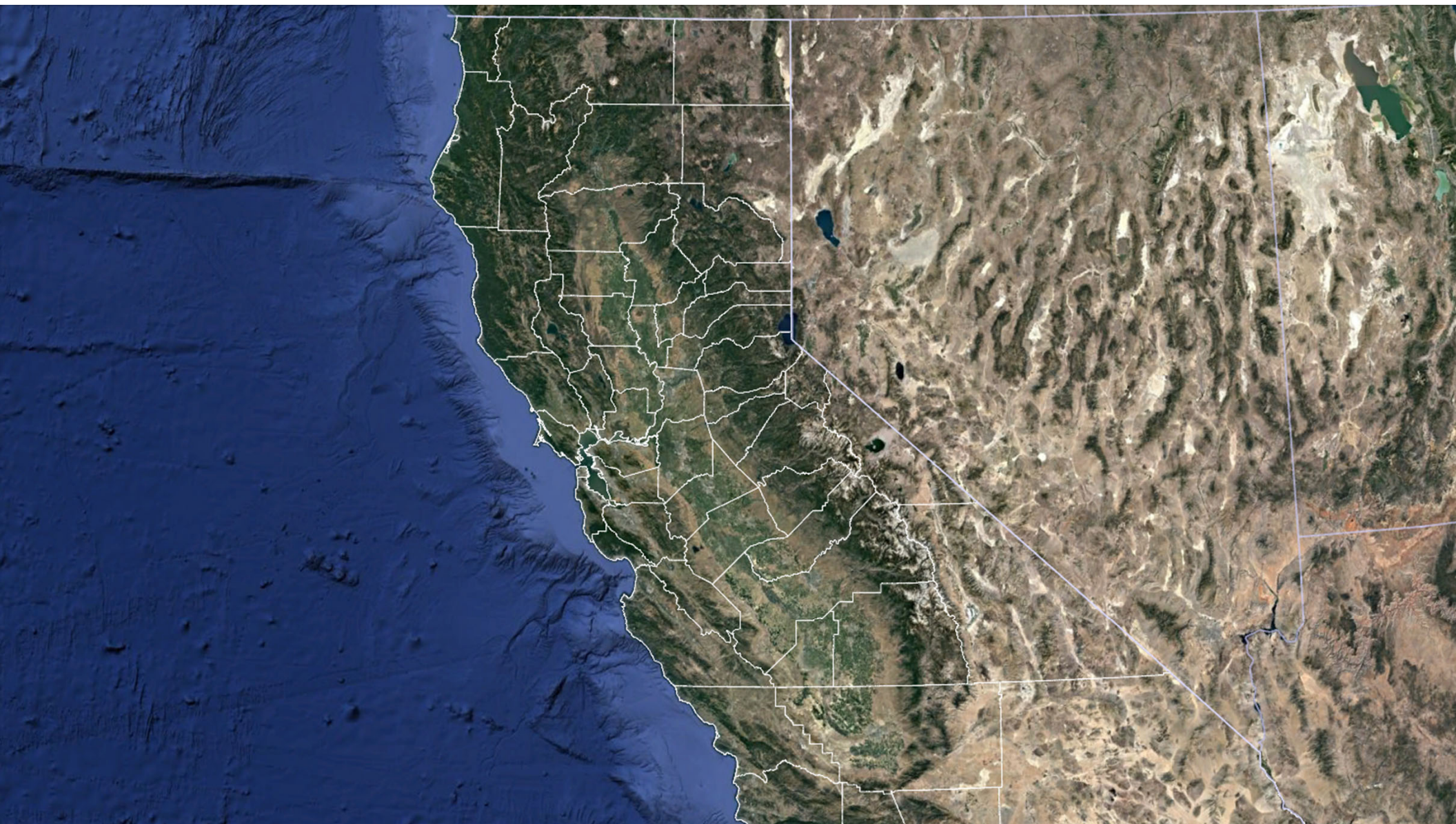
Semi-submersible



Monopile



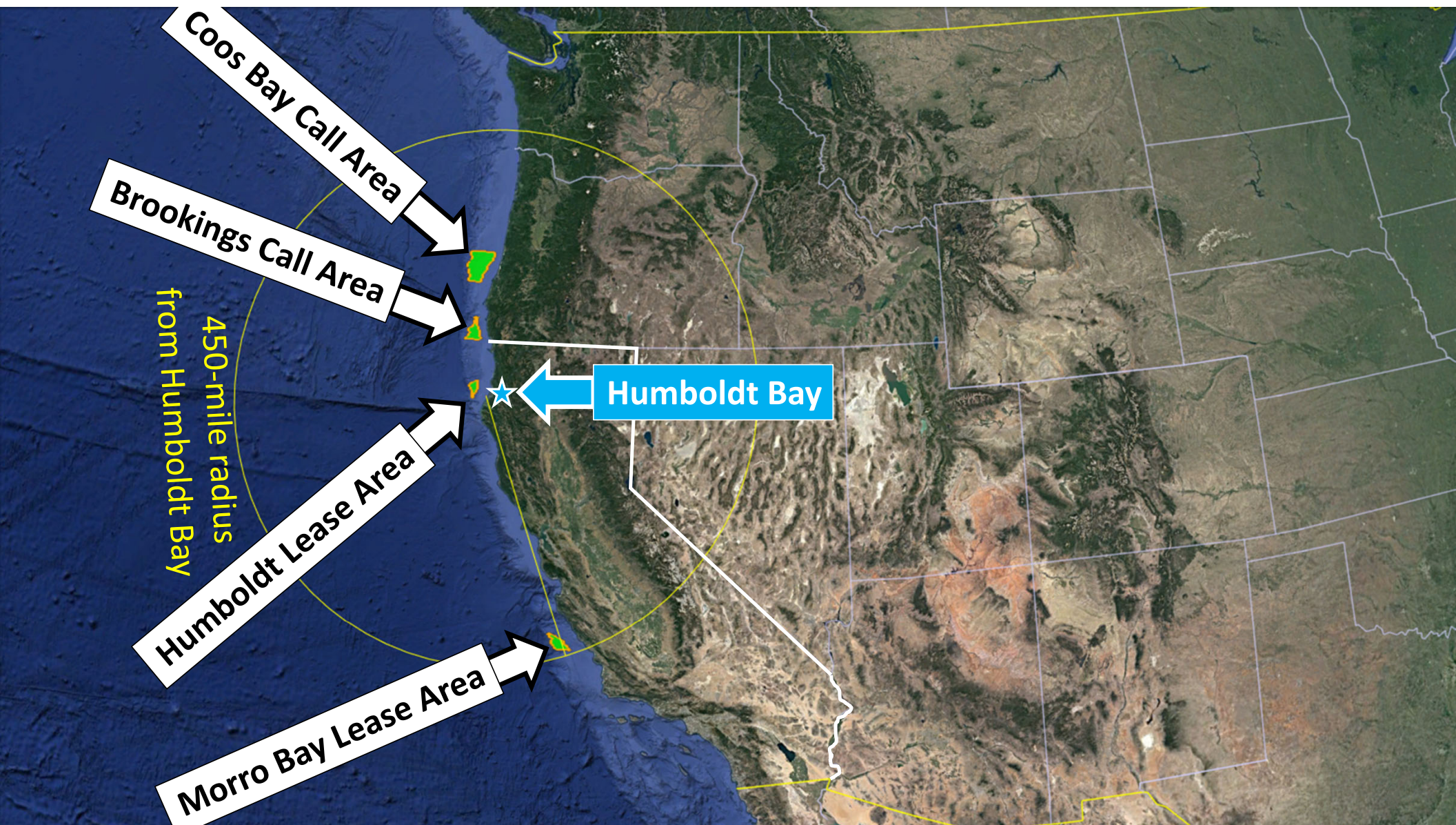




**Humboldt OSW
Lease Area**

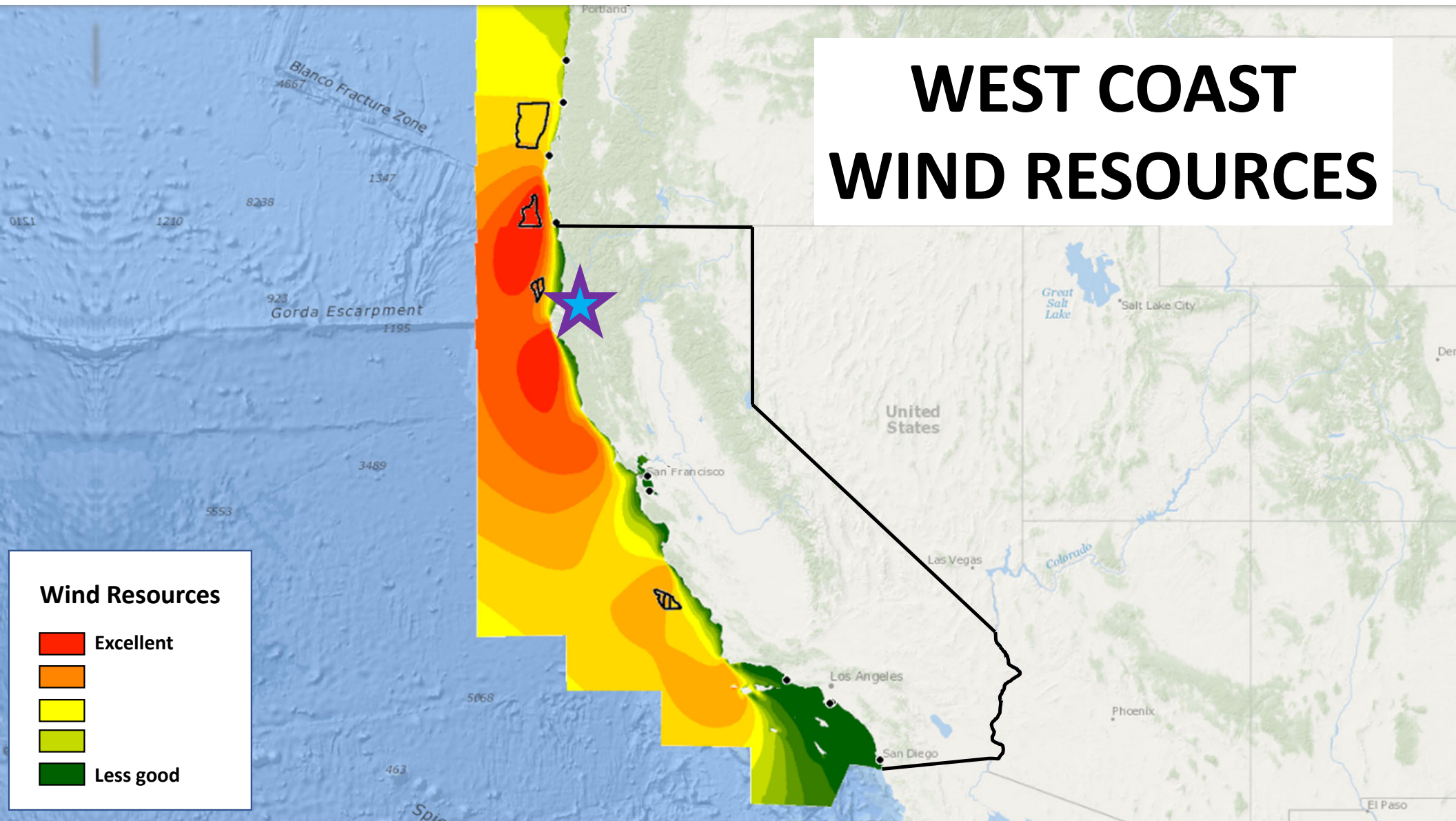
Morro Bay OSW Lease Area





WEST COAST WIND RESOURCES

Wind Resources



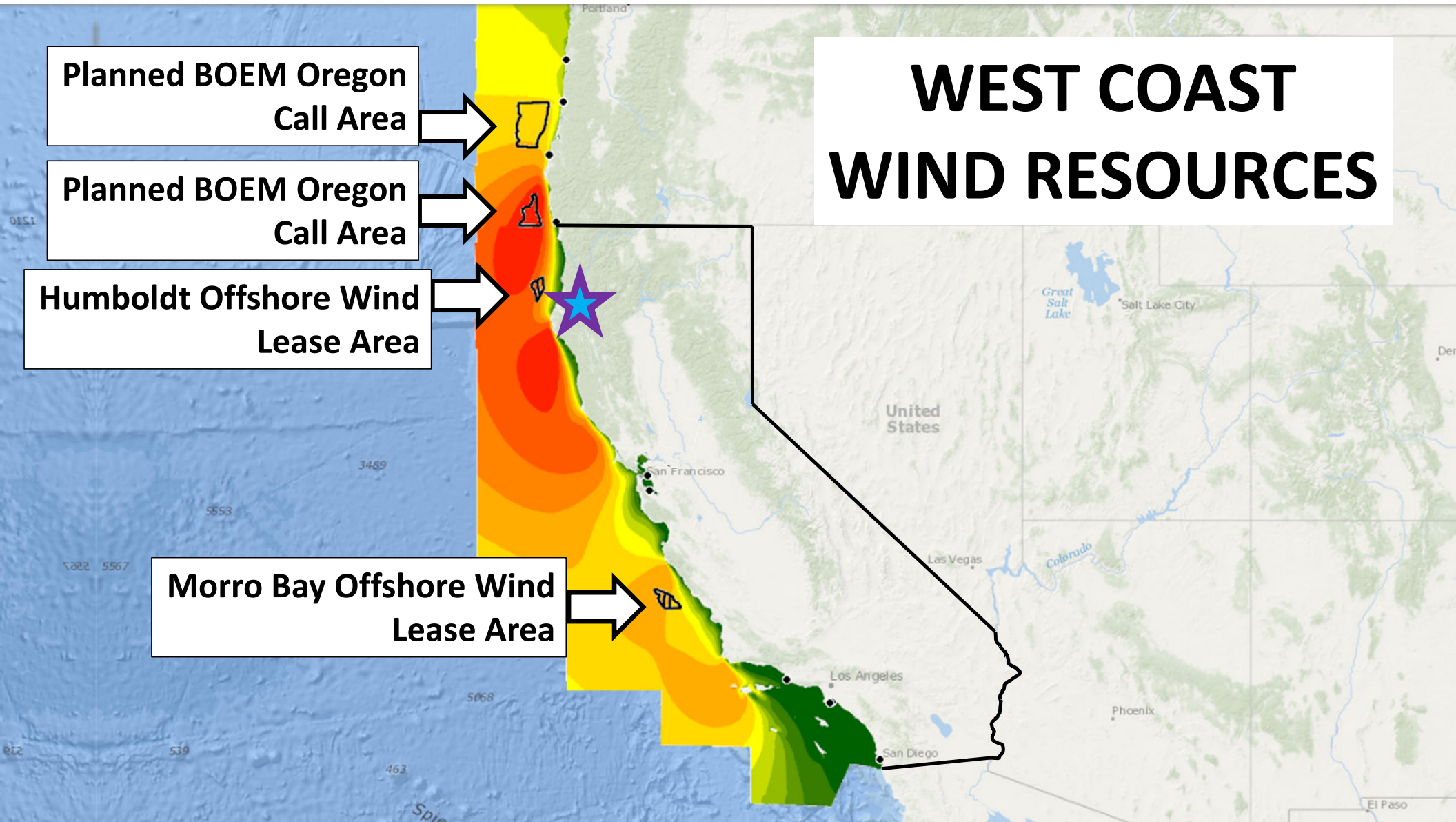
WEST COAST WIND RESOURCES

Planned BOEM Oregon
Call Area

Planned BOEM Oregon
Call Area

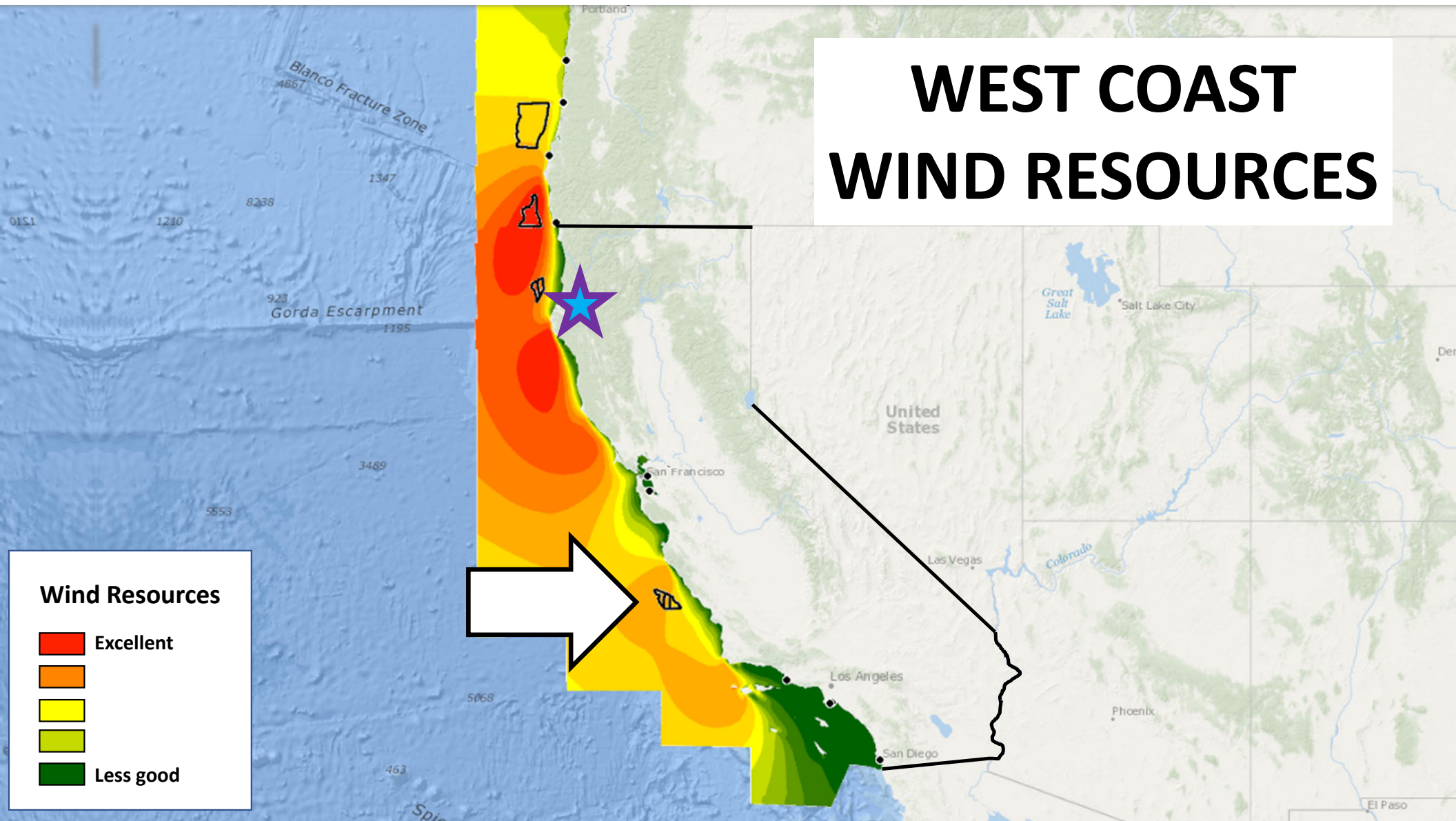
Humboldt Offshore Wind
Lease Area

Morro Bay Offshore Wind
Lease Area



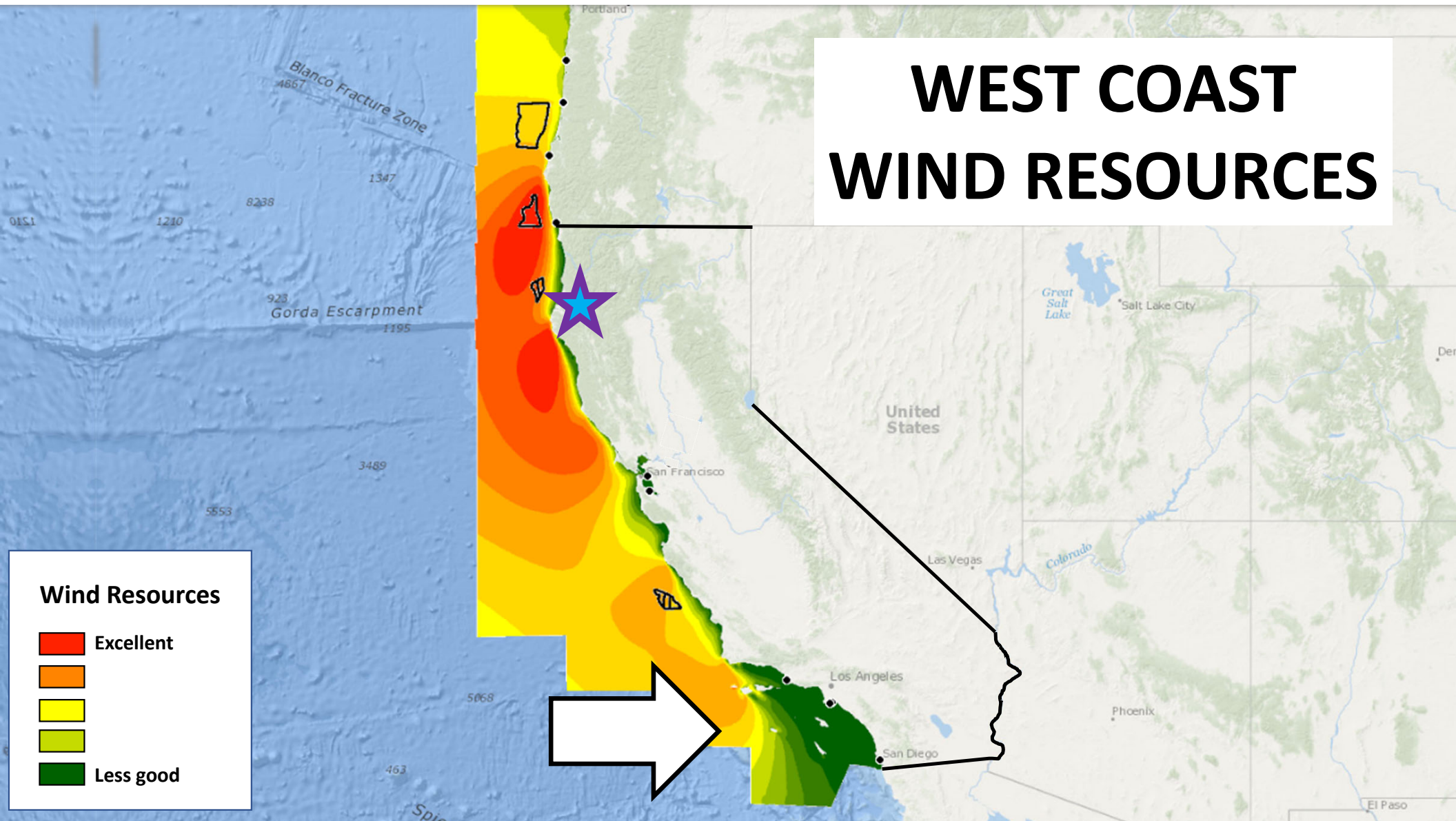
WEST COAST WIND RESOURCES

Wind Resources



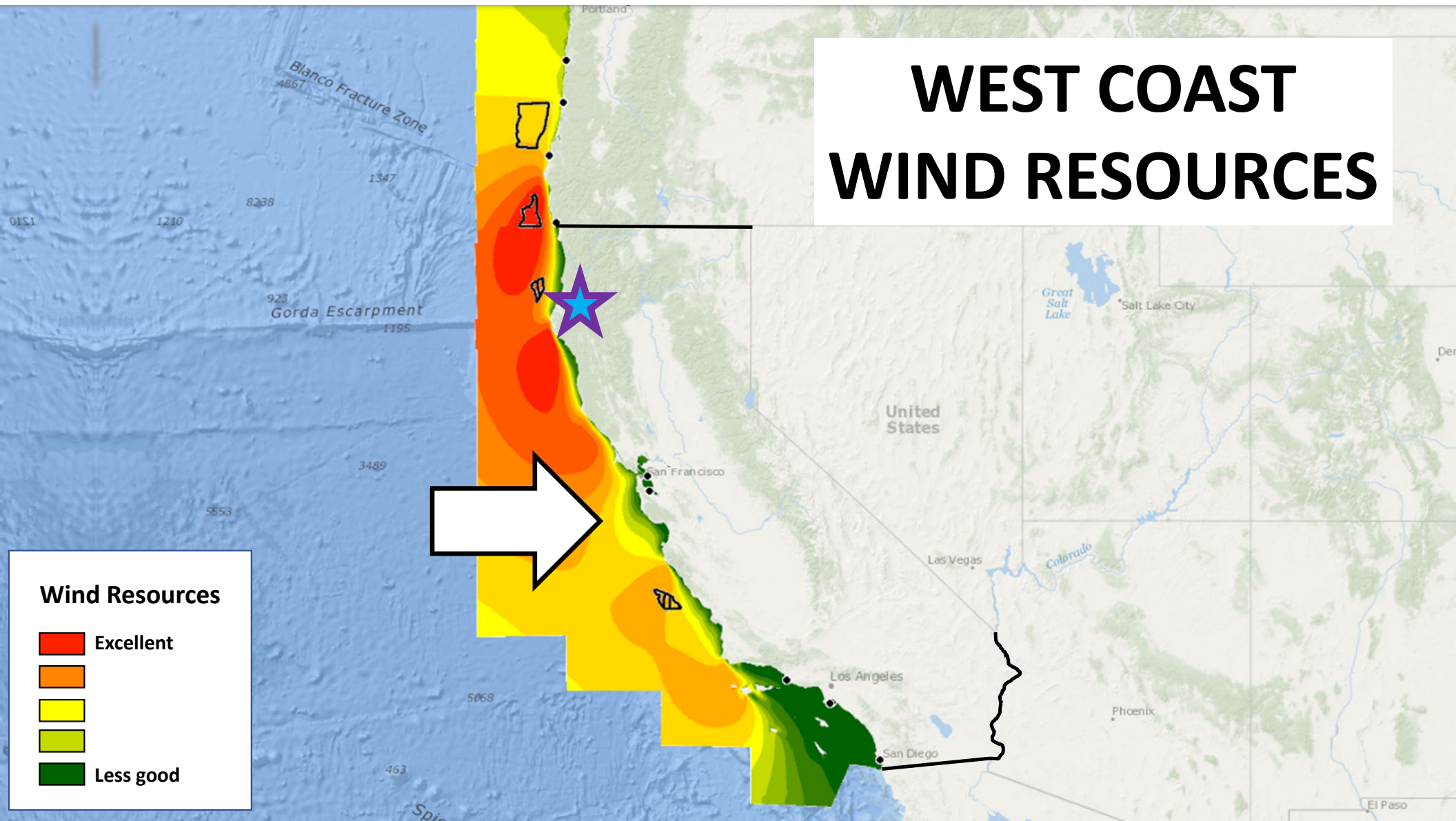
WEST COAST WIND RESOURCES

Wind Resources



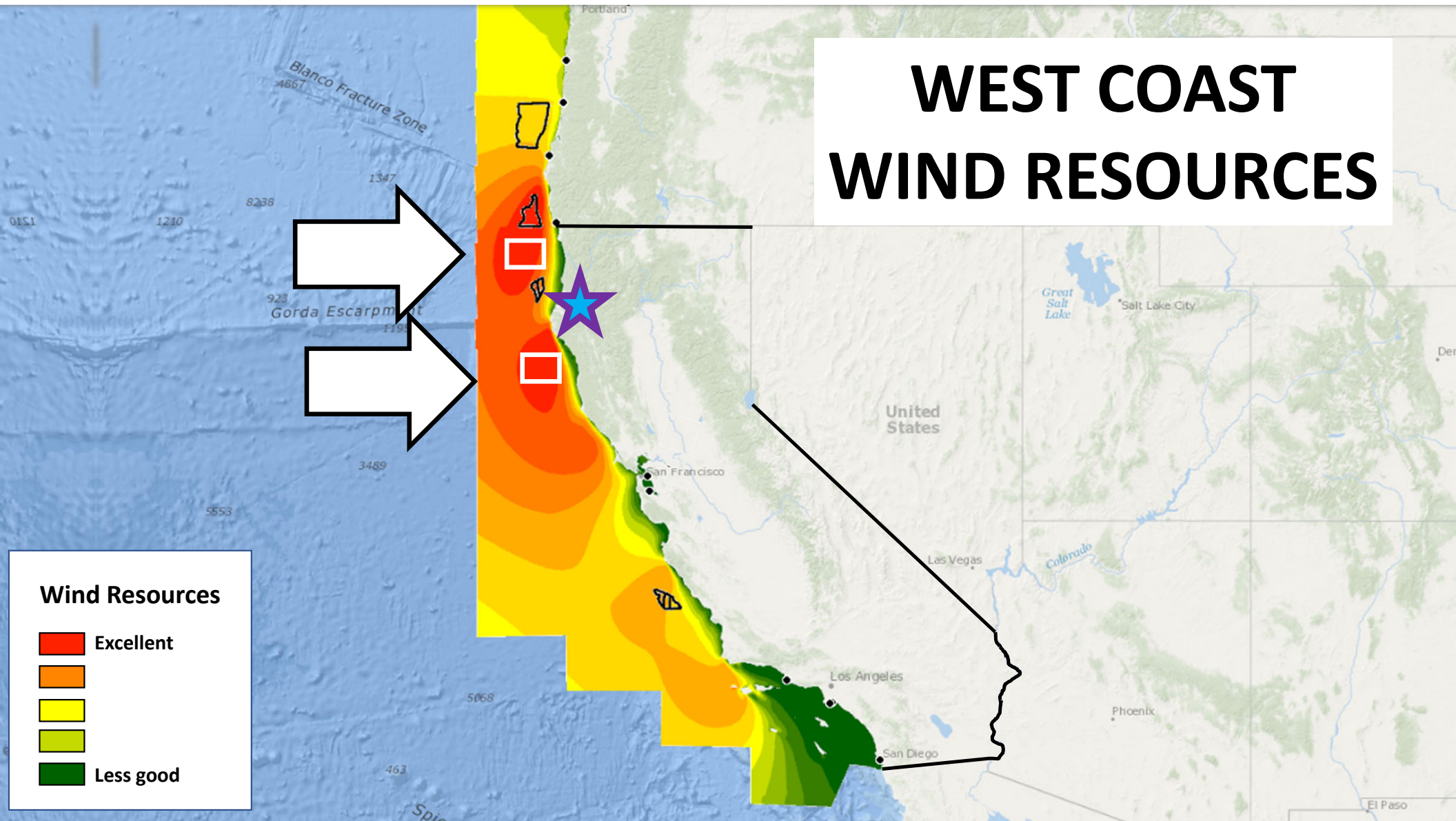
WEST COAST WIND RESOURCES

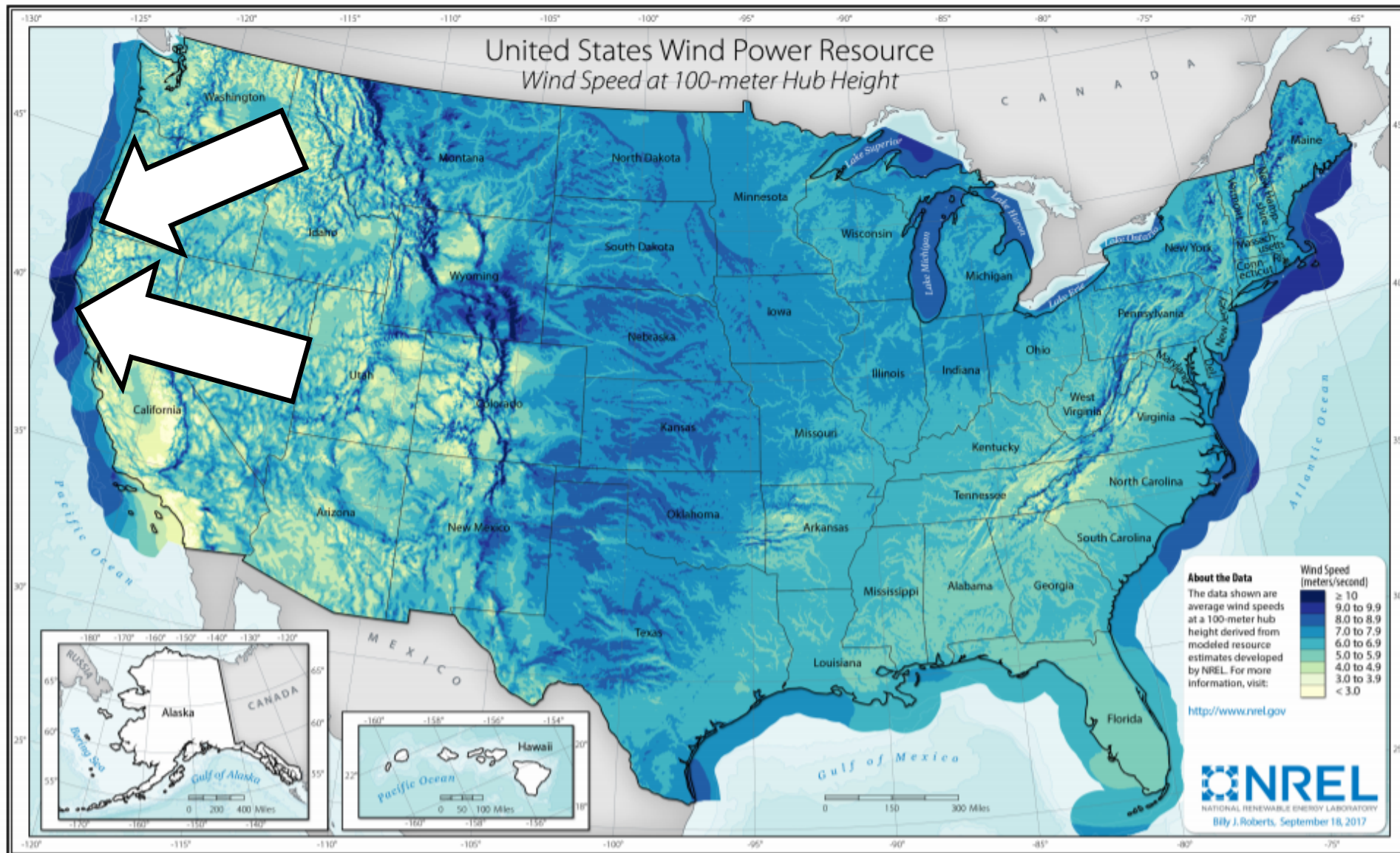
Wind Resources



WEST COAST WIND RESOURCES

Wind Resources

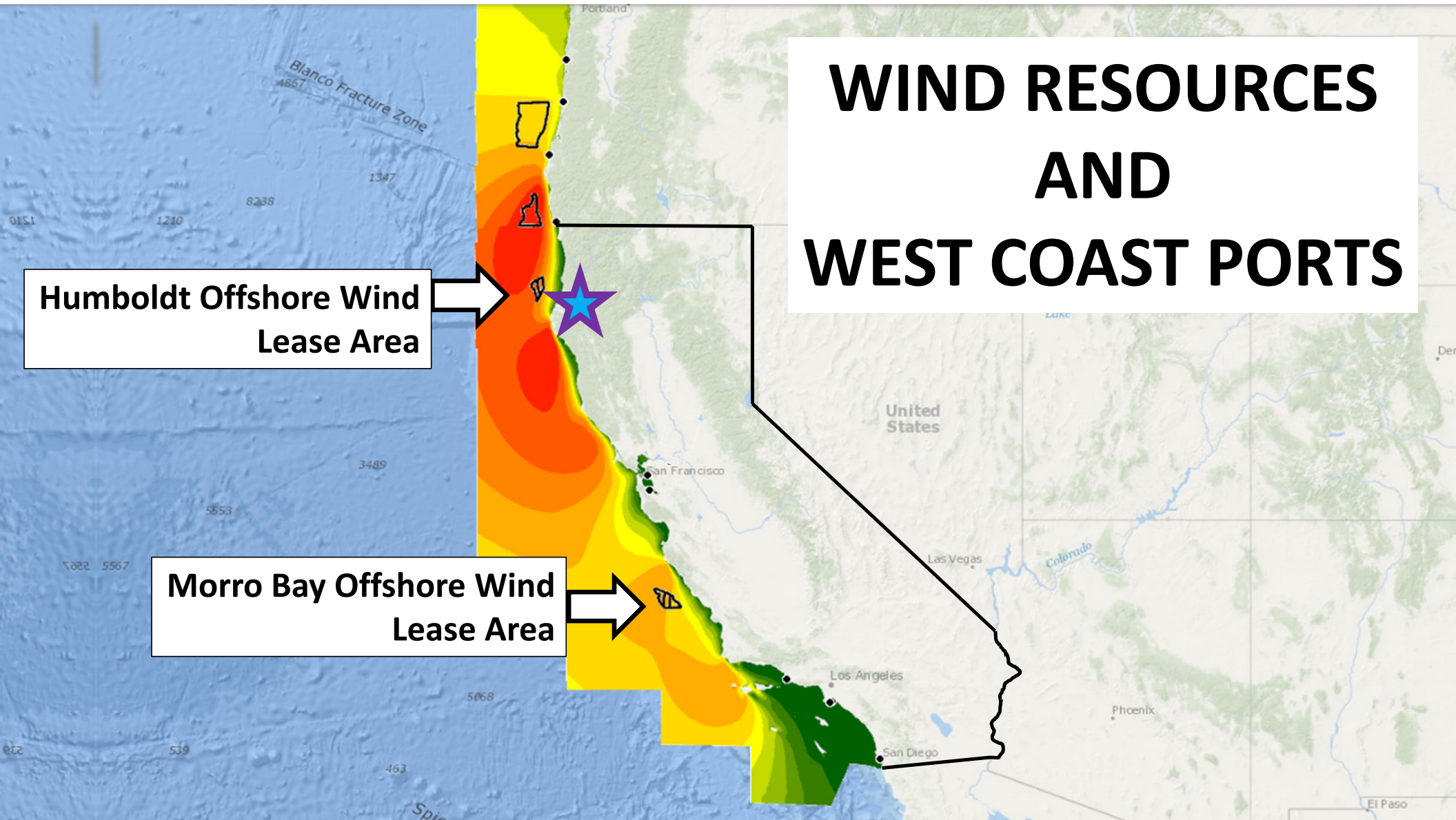




WIND RESOURCES AND WEST COAST PORTS

**Humboldt Offshore Wind
Lease Area**

**Morro Bay Offshore Wind
Lease Area**



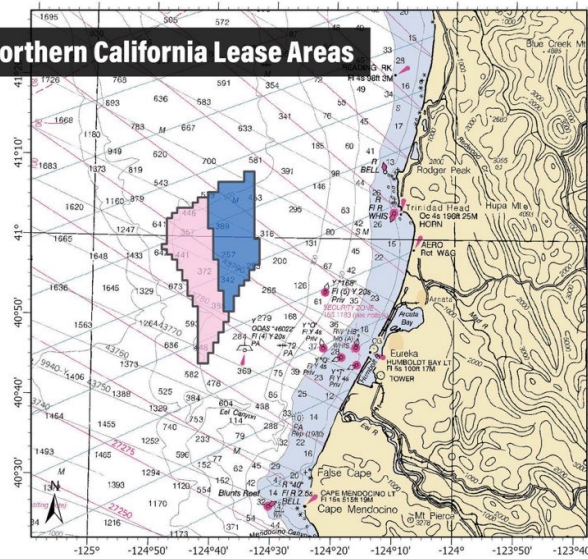
**Humboldt OSW
Lease Area**

Morro Bay OSW Lease Area

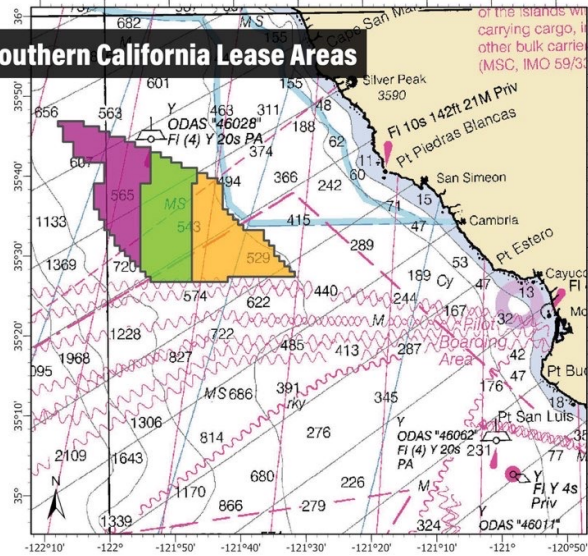




Northern California Lease Areas



Southern California Lease Areas





LEASE
AREA

Provisional Winners of the California Lease Areas, \$757,100,000 in High Bids

OCS-P0561

RWE Offshore Wind Holding, LLC

\$157,700,000

OCS-P0562

California North Floating LLC

\$173,800,000

OCS-P0563

Equinor Wind US LLC

\$130,000,000

OCS-P0564

Central California Offshore Wind LLC

\$150,300,000

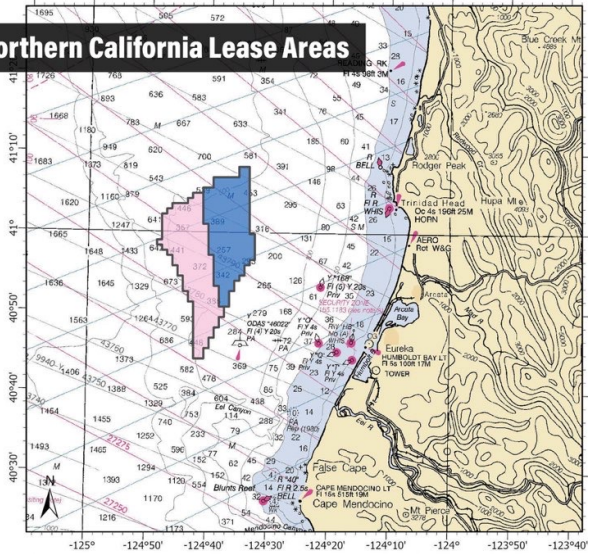
OCS-P0565

Invenergy California Offshore LLC

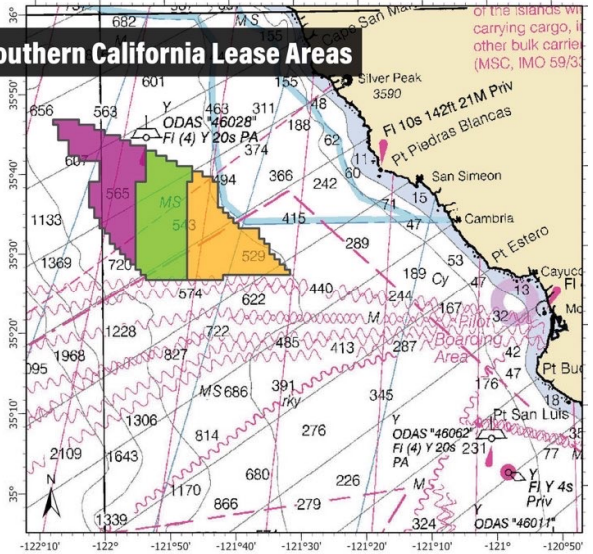
\$145,300,000

BOEM Bureau of
Ocean Energy Management

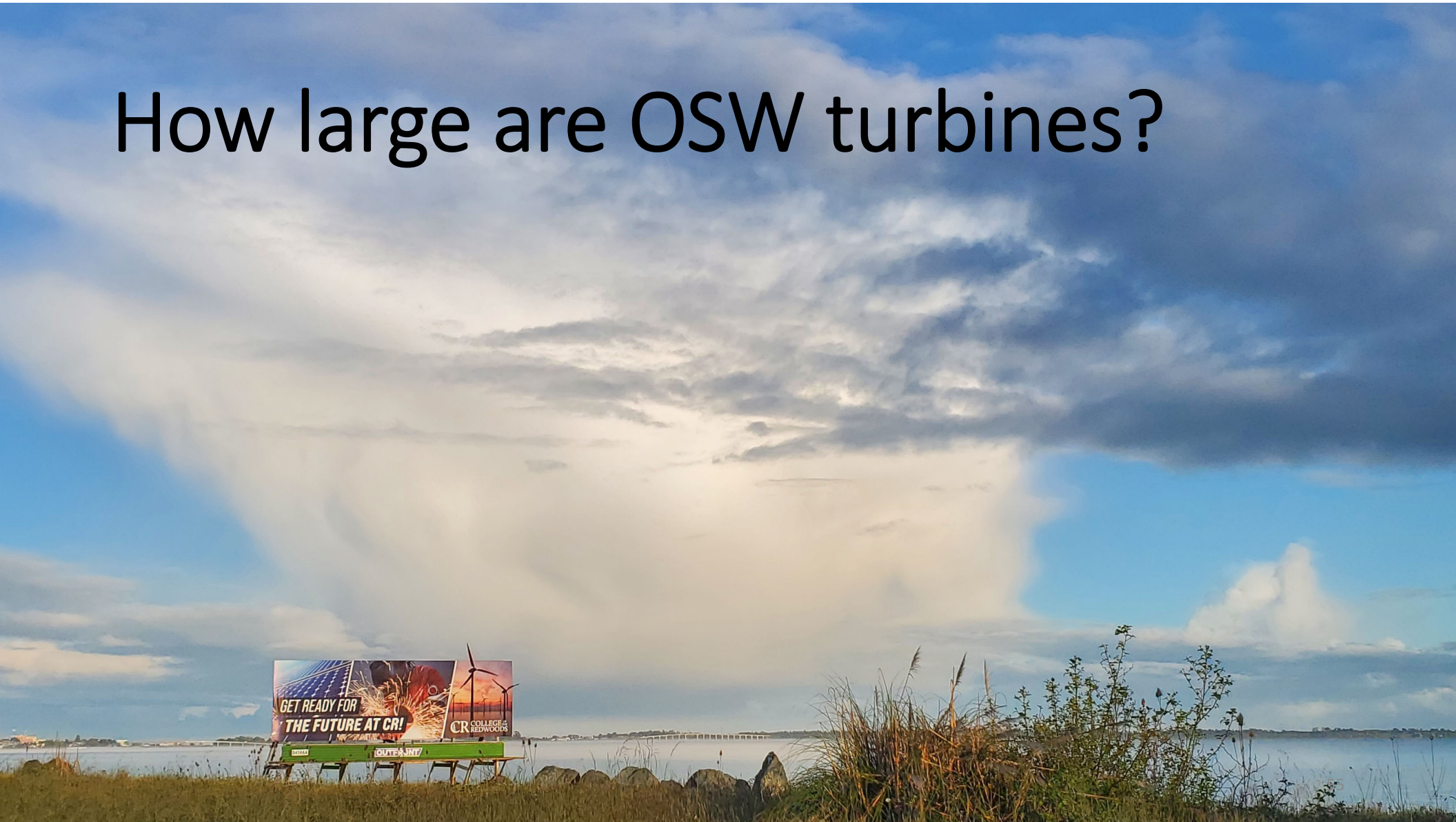
Northern California Lease Areas



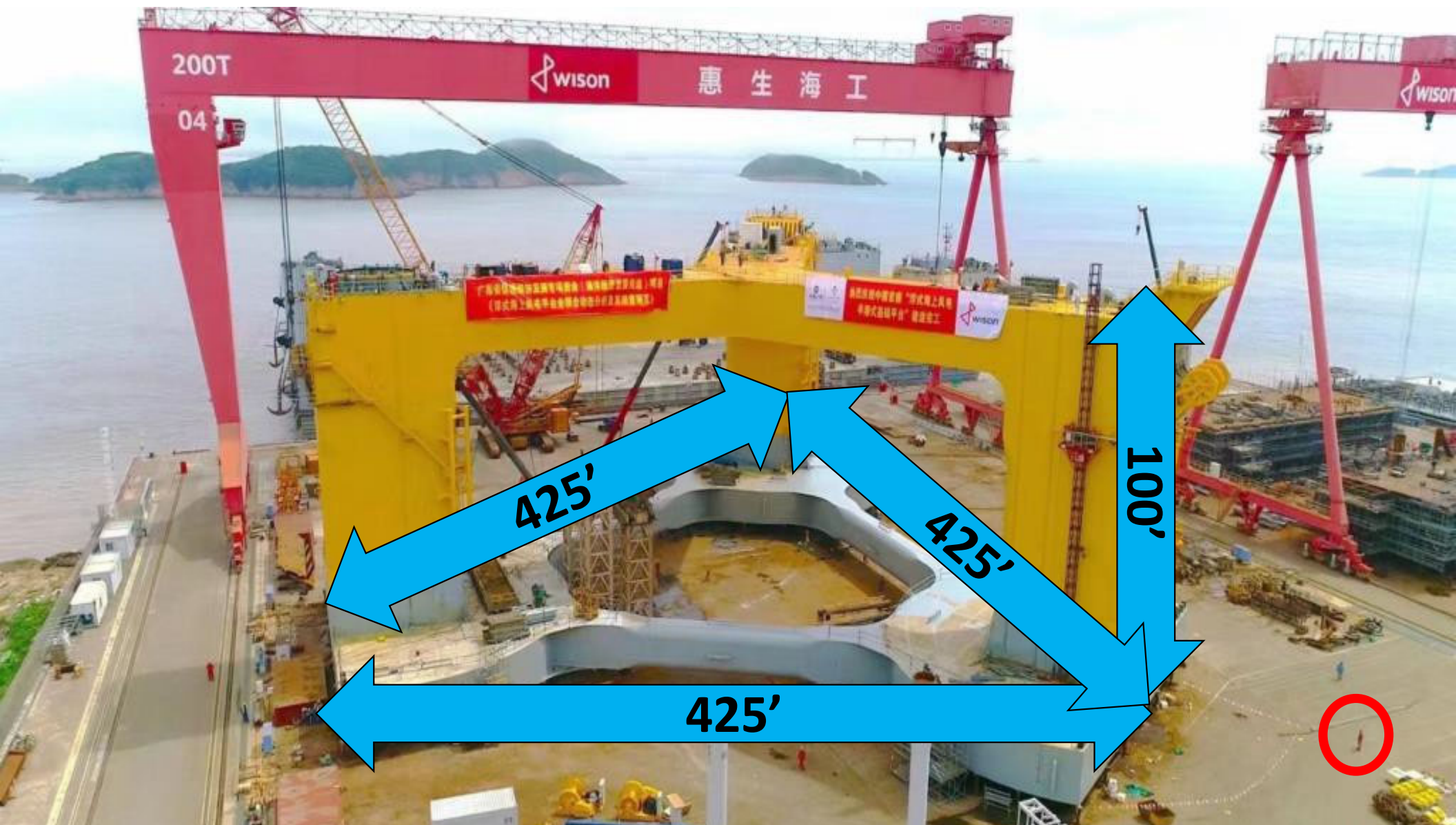
Southern California Lease Areas



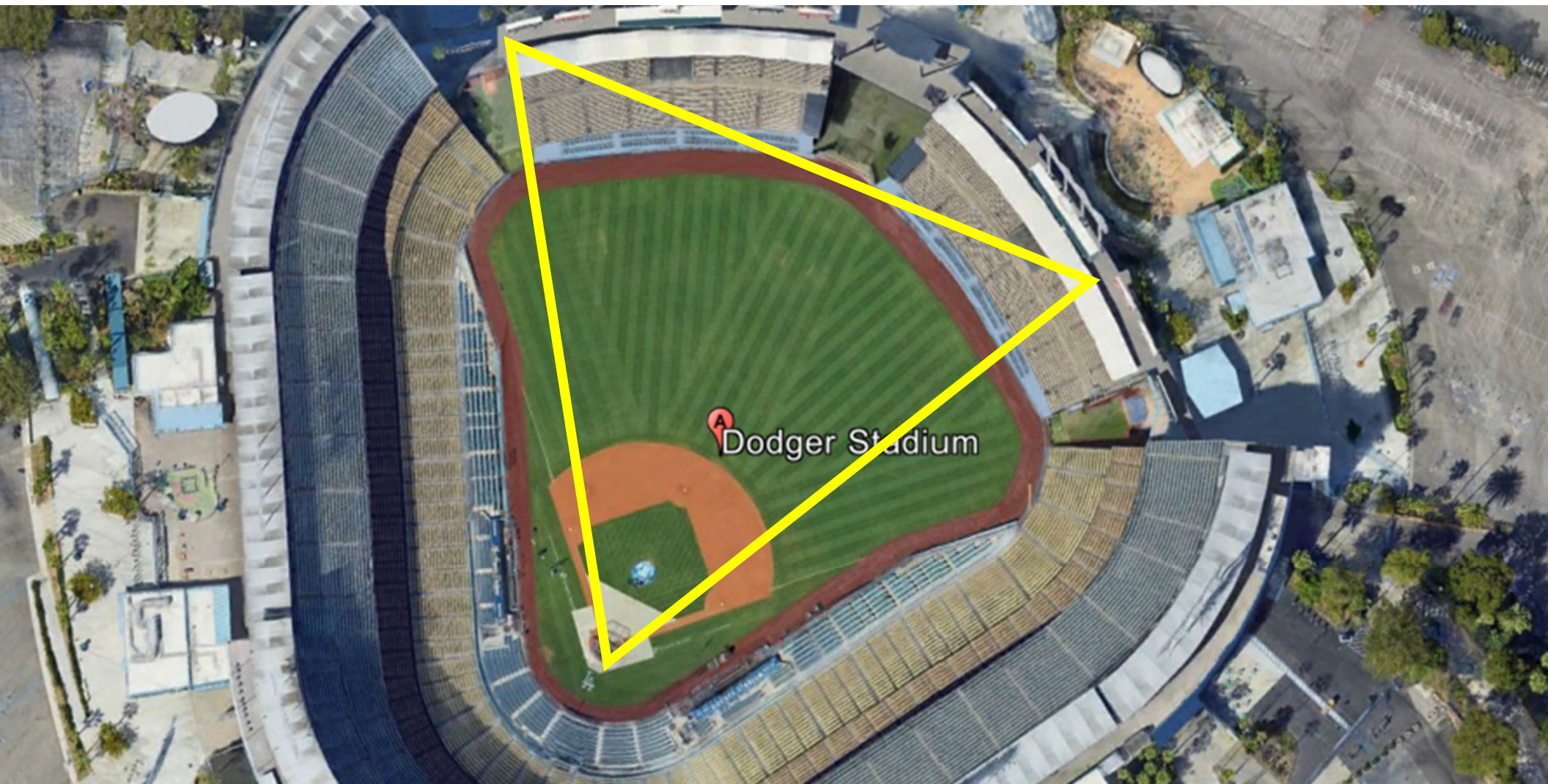
How large are OSW turbines?







Floater Footprint & Dodger Stadium



Floater Footprint & Oracle Stadium



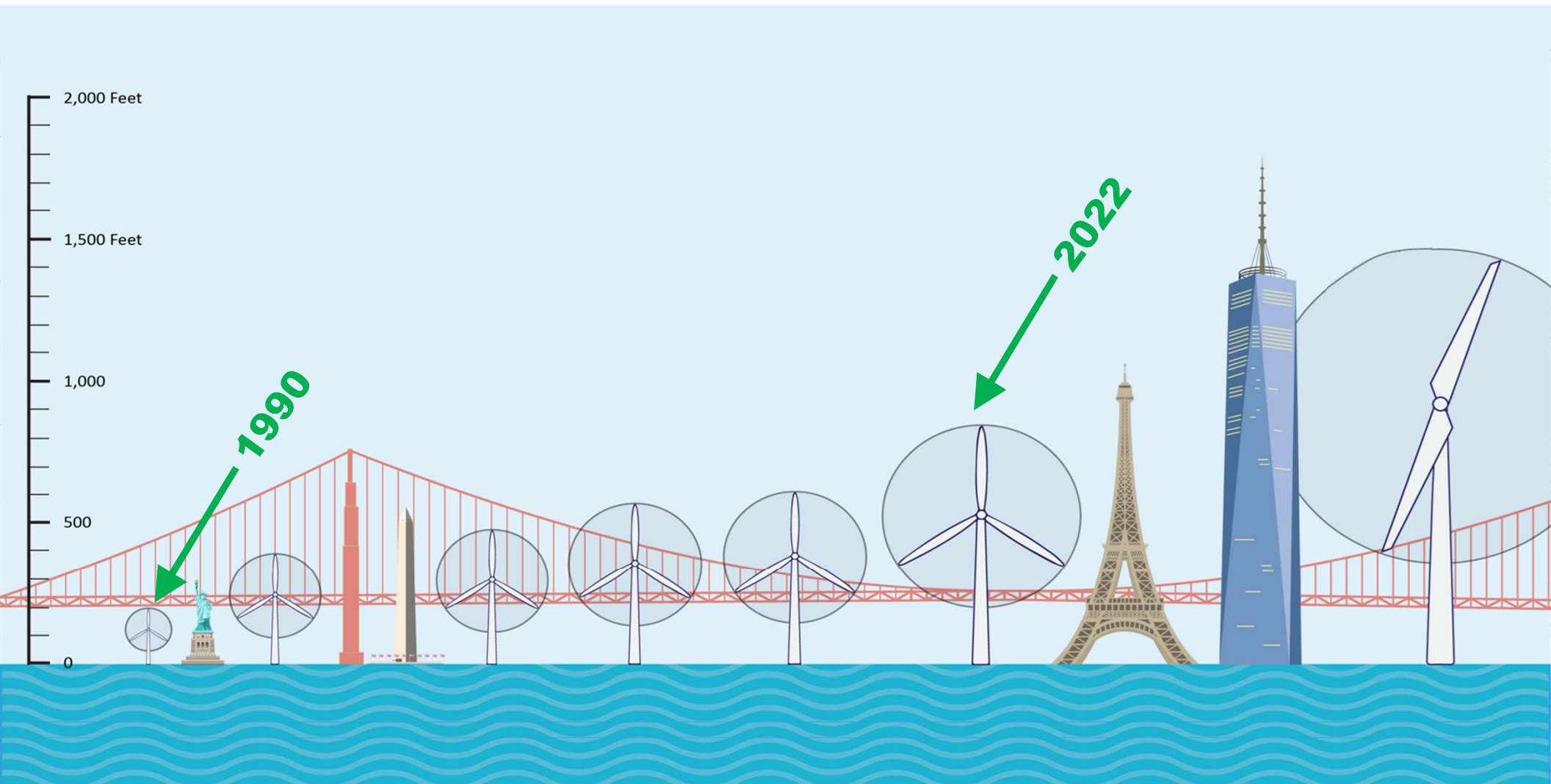


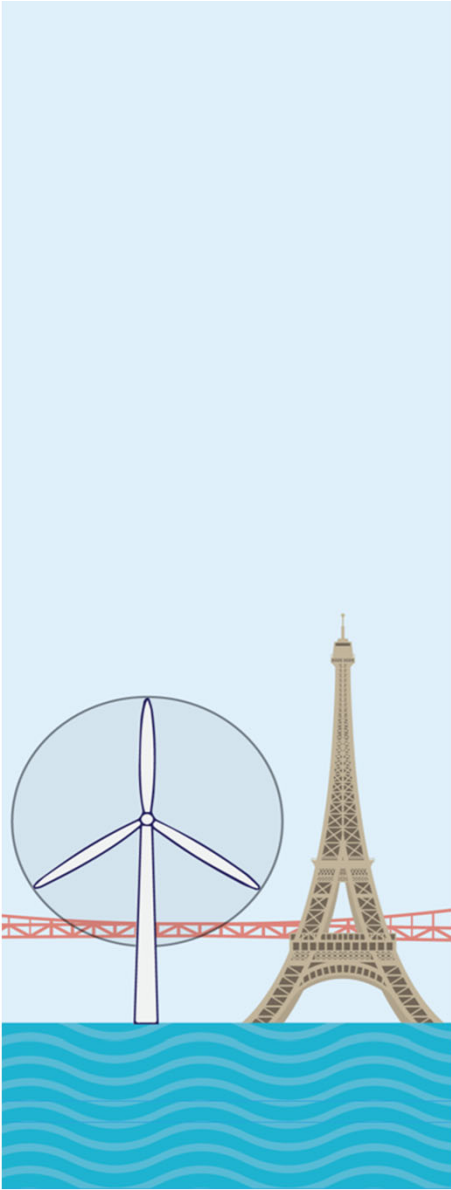
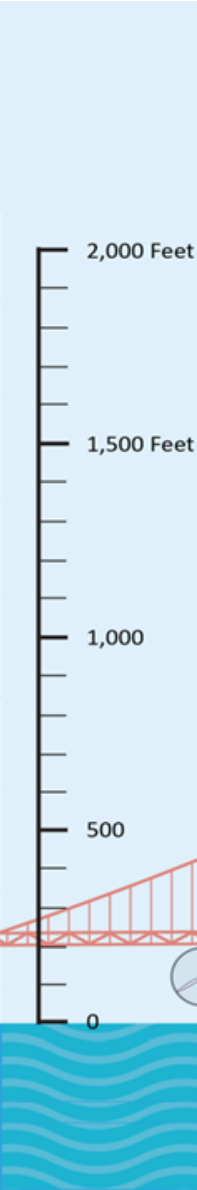






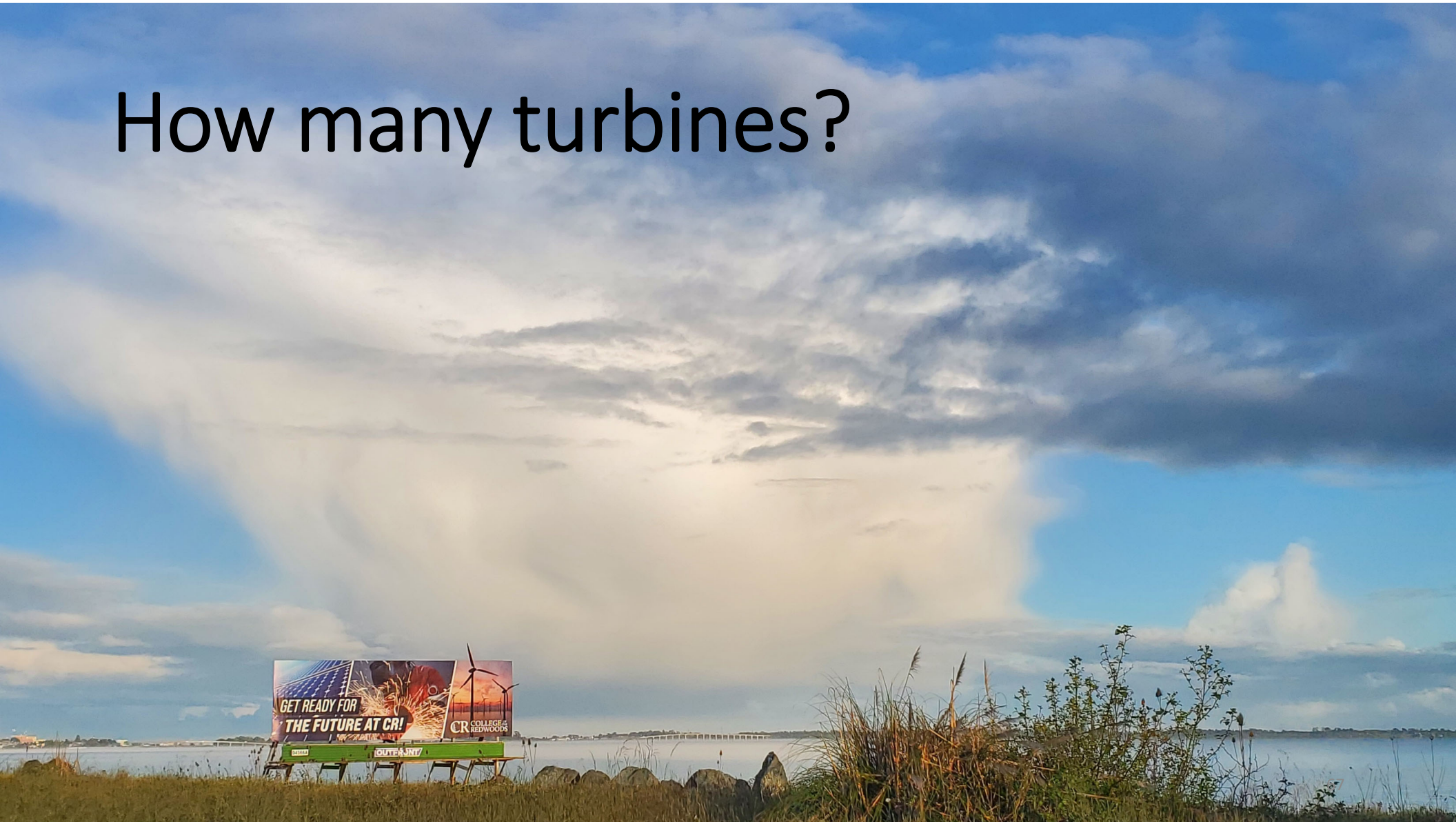
Evolution of Offshore Wind Turbine Sizes







How many turbines?



How many of these need to be manufactured?

Blade

Nacelle

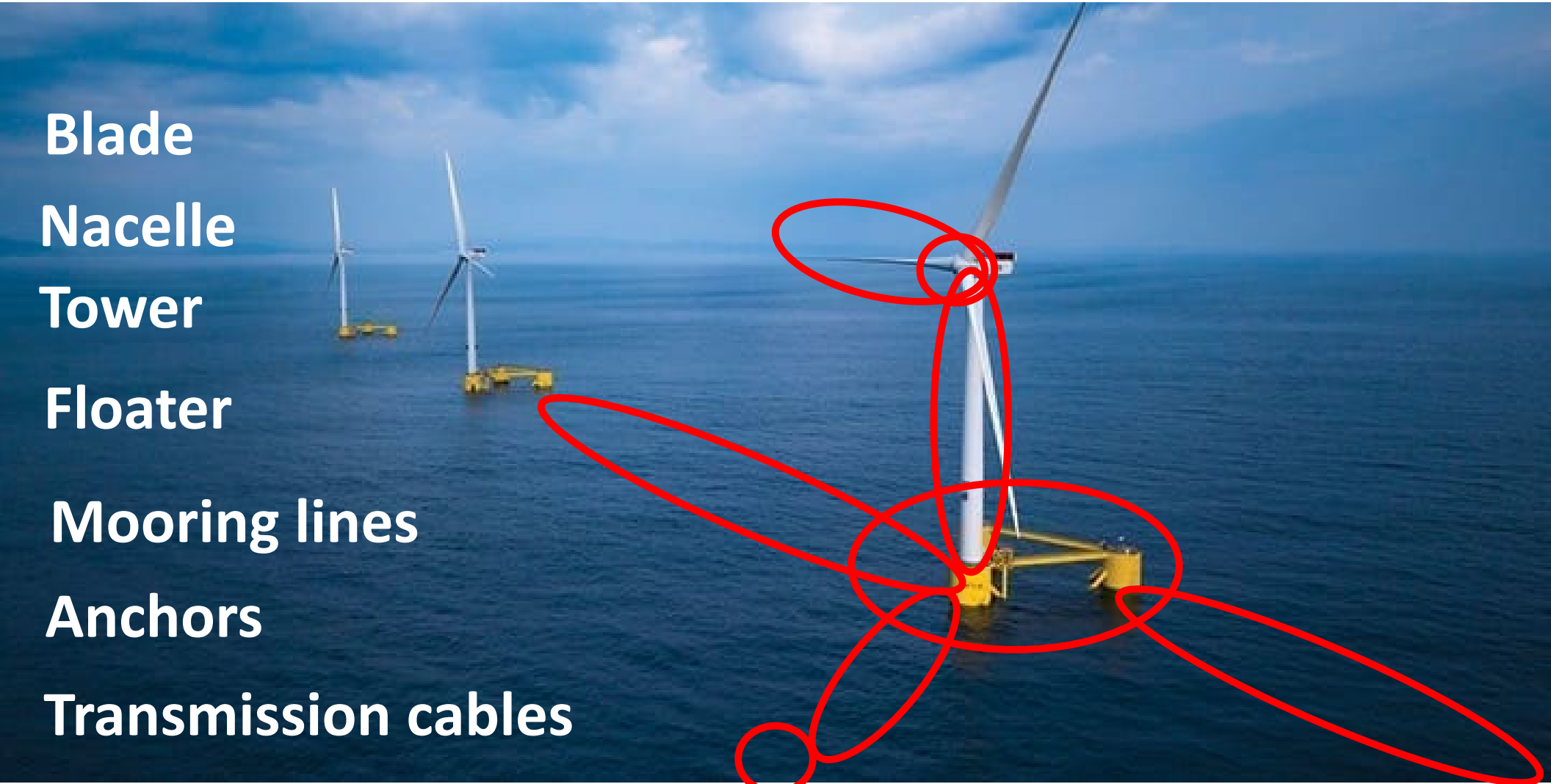
Tower

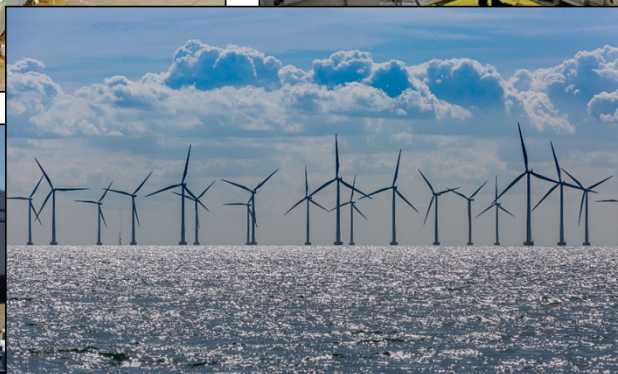
Floater

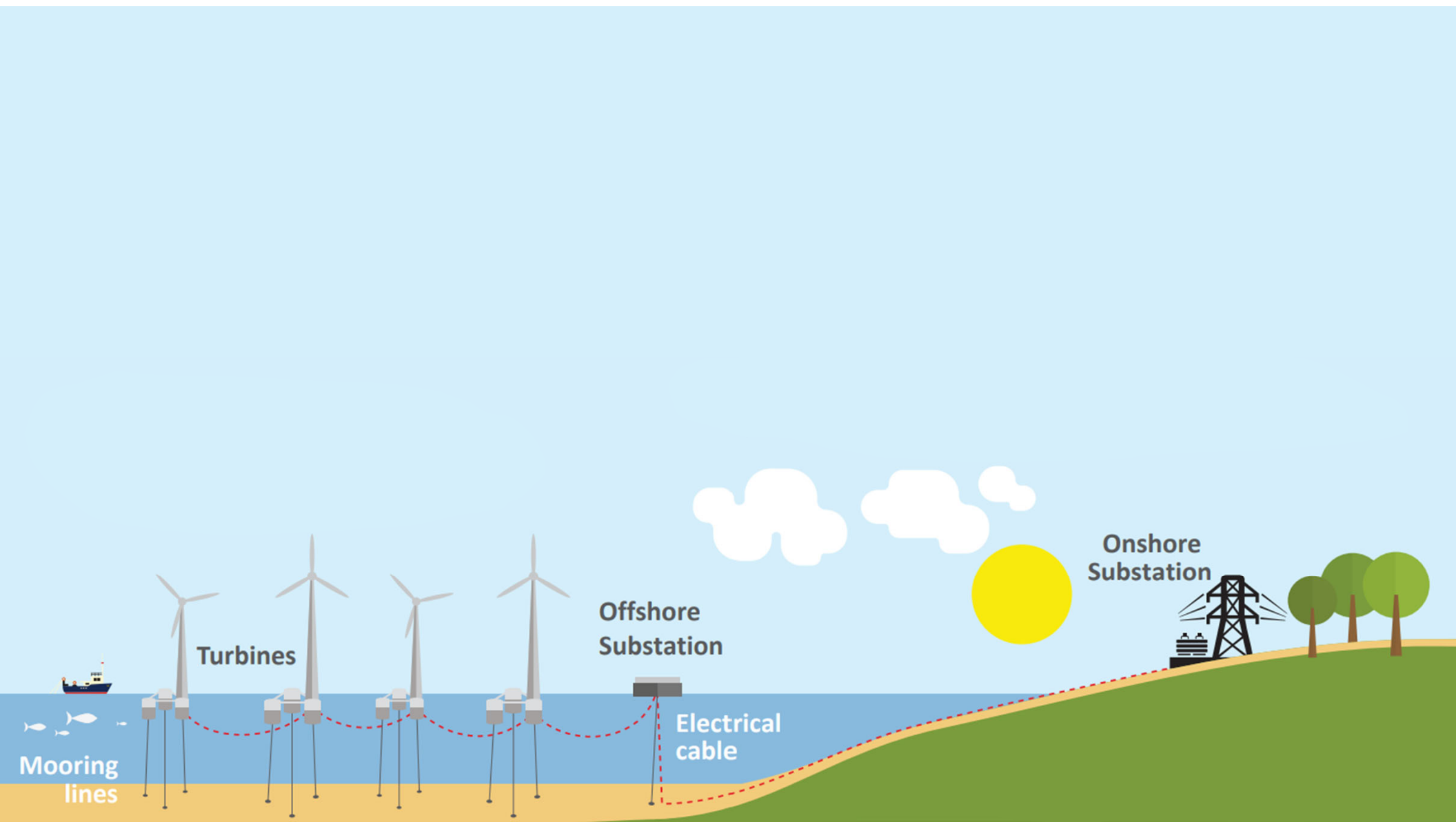
Mooring lines

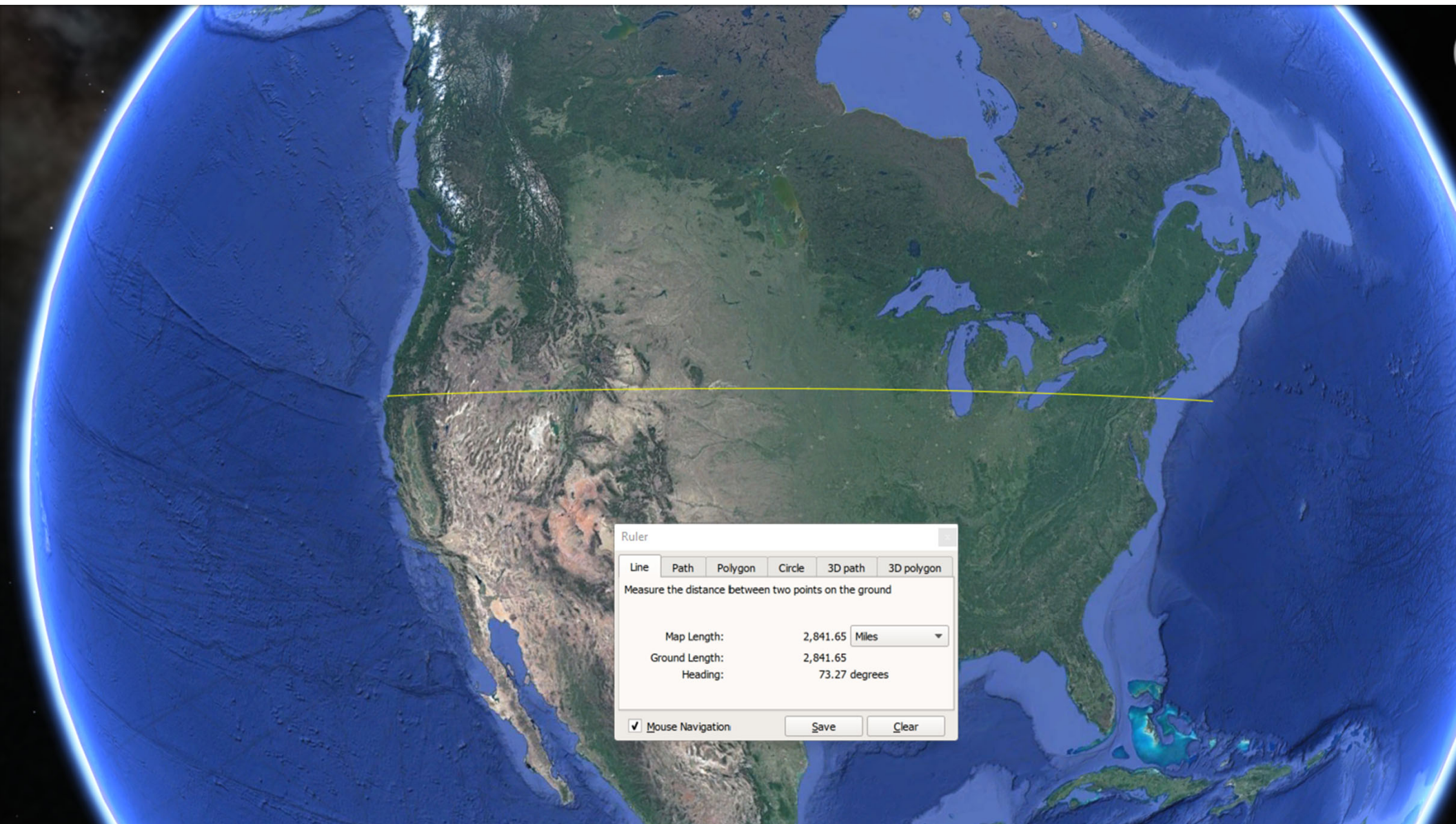
Anchors

Transmission cables









Ruler

Line Path Polygon Circle 3D path 3D polygon

Measure the distance between two points on the ground

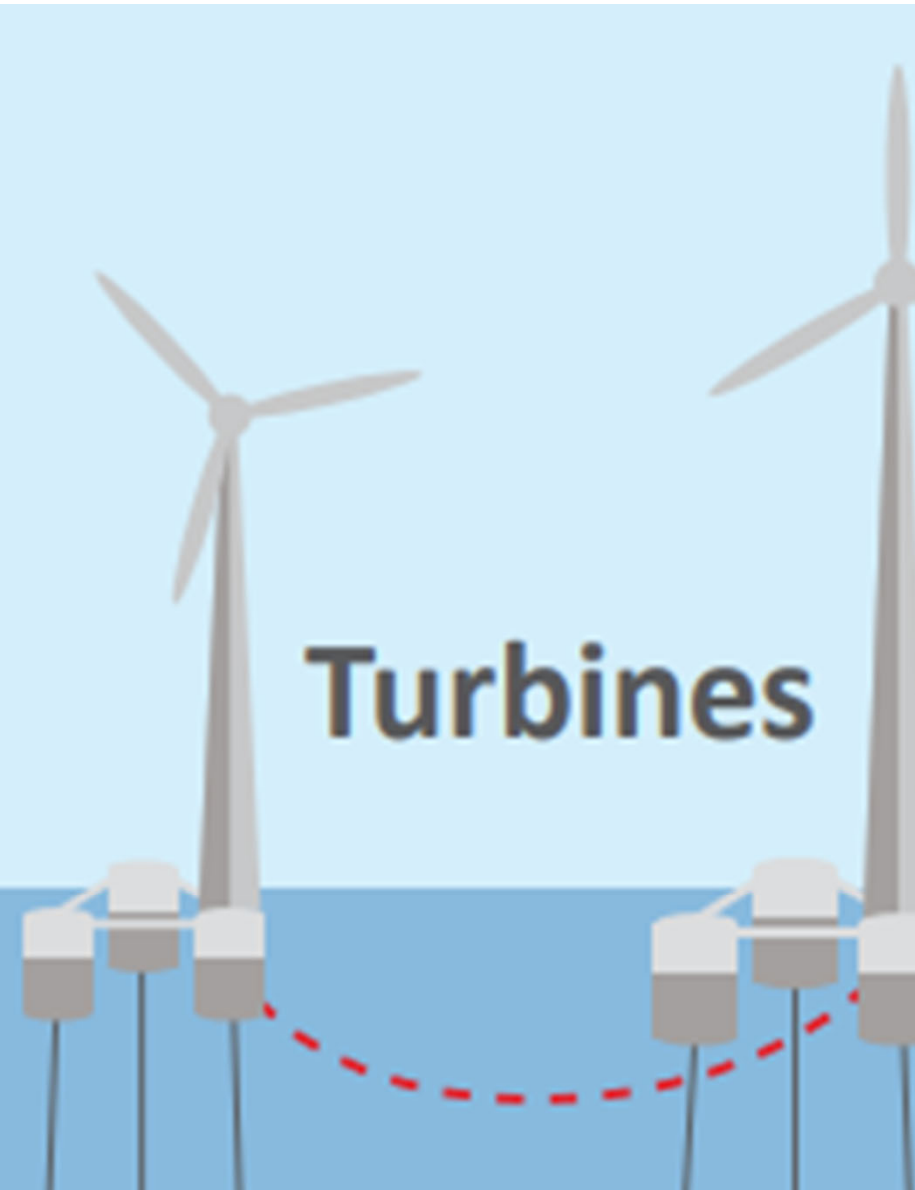
Map Length: 2,841.65 Miles

Ground Length: 2,841.65

Heading: 73.27 degrees

☒ Mouse Navigation

Save Clear



- 1,667 floaters
- 1,667 turbine/nacelles
- 5,000 blades
- 1,000,000 feet of towers
- ??? miles of transmission cables

Growing a Wind Energy Cluster



Supply Chain Activities

- Project development and management
- Manufacturing
 - Nacelle, hub, and assembly
 - Blades
 - Tower
 - Foundation supply
 - Array cable supply
 - Export cable supply
 - Onshore and offshore substation supply
 - Operational infrastructure
- Installation
 - Turbine installation
 - Foundation installation
 - Array cable installation
 - Export cable installation
 - Other installation
- Operation, maintenance, and service
 - Wind farm operation
 - Turbine maintenance and service
 - Foundation maintenance and service
 - Subsea cable maintenance and service
 - Substation maintenance and service
- Decommissioning

- **Manufacturing**
 - Nacelle, hub, and assembly
 - Blades
 - Tower
 - Foundation supply
 - Array cable supply
 - Export cable supply
 - Onshore and offshore substation supply
 - Operational infrastructure
- **Installation**
 - Turbine installation
 - Foundation installation
 - Array cable installation
 - Export cable installation
 - Other installation
- **Operation, maintenance, and service**
 - Wind farm operation
 - Turbine maintenance and service
 - Foundation maintenance and service
 - Subsea cable maintenance and service
 - Substation maintenance and service

Tower Manufacturing



Nacelle/Turbine Manufacturing



DRAW-EMBEDDED ANCHOR



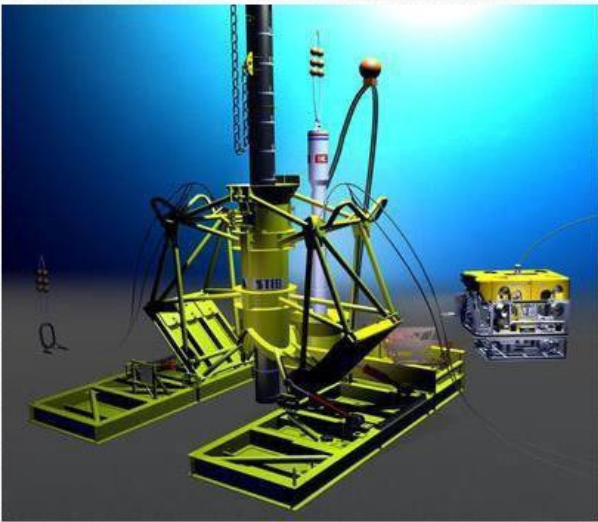
GRAVITY-BASE ANCHOR



SUCTION ANCHOR



DRIVEN PILE ANCHOR



DRIVEN ANCHOR PLATE



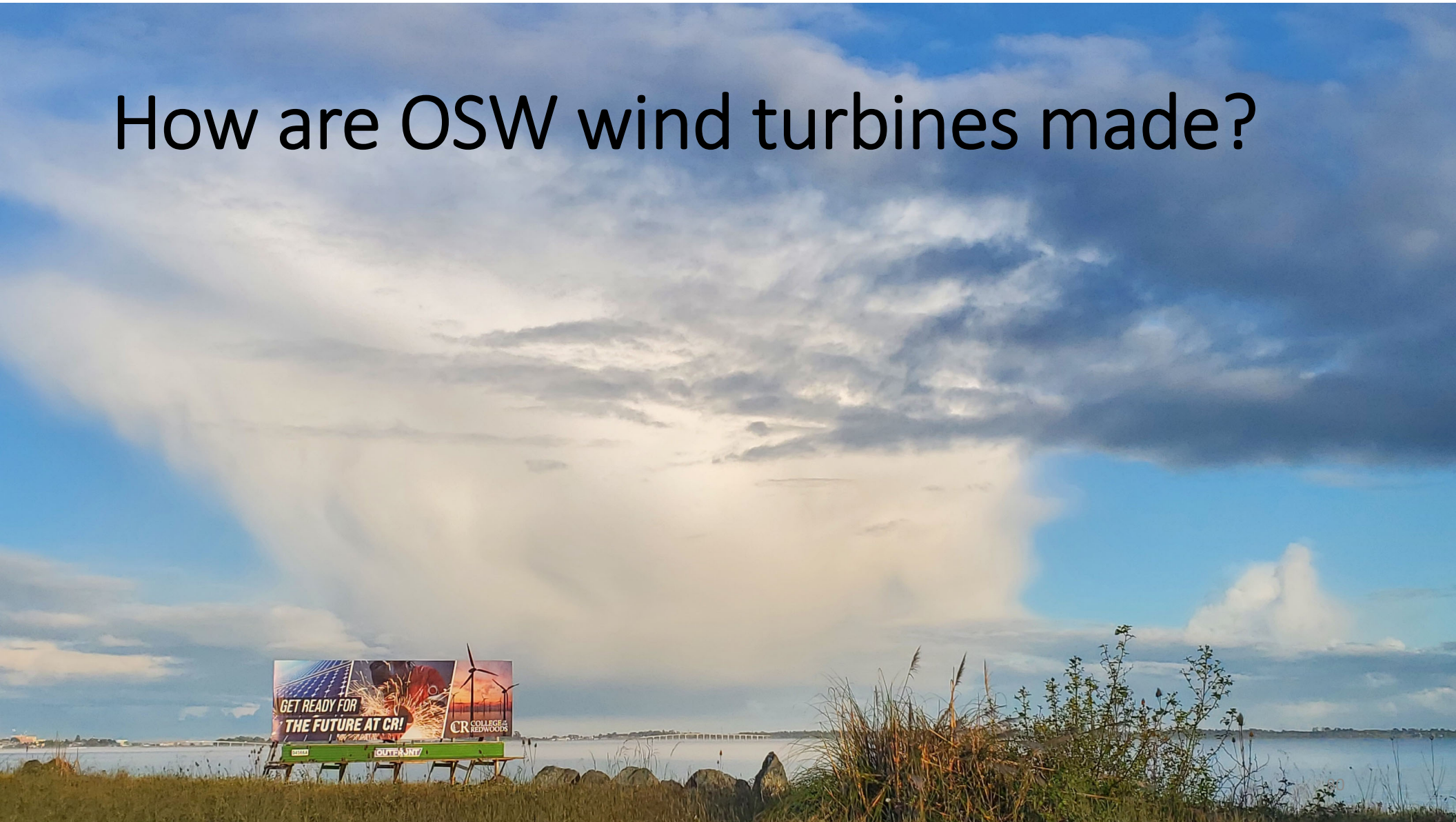
Required Speed and Quantity of Production

- The State's goal is 25GW by 2045.
- If each turbine is 15MW, then 1,667 turbines will need to be produced.
- If production starts in 2027...
- ...then 93 turbines would need to be produced per year...
- ...or an average of 1.8 turbines per week, every week, for 18 straight years.
- That's just for California.

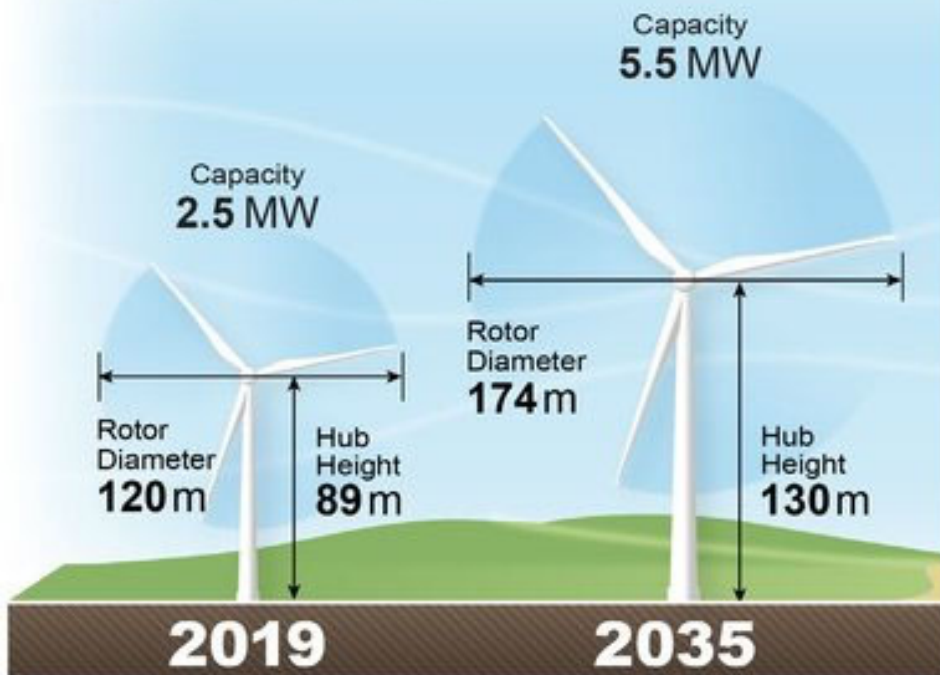
How?



How are OSW wind turbines made?

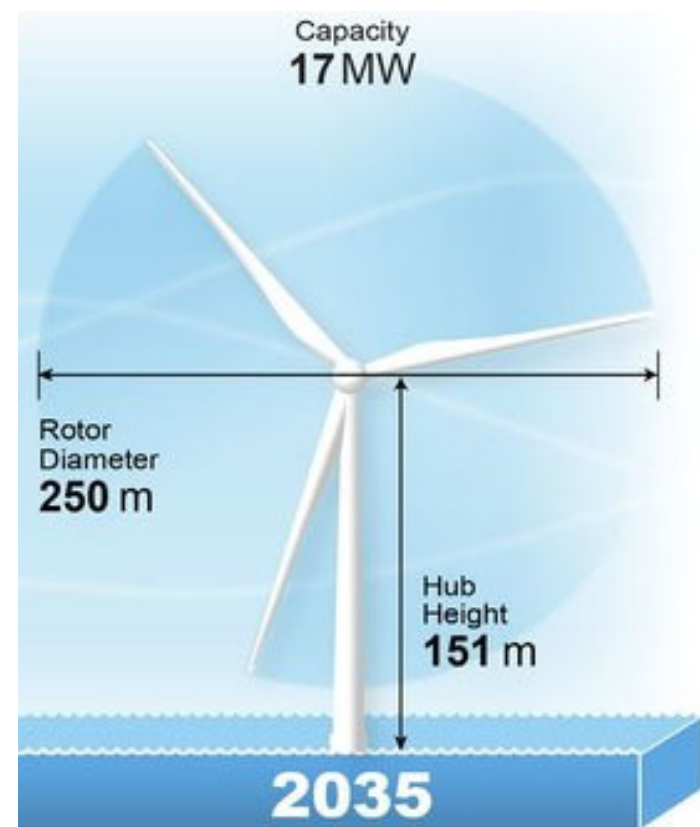


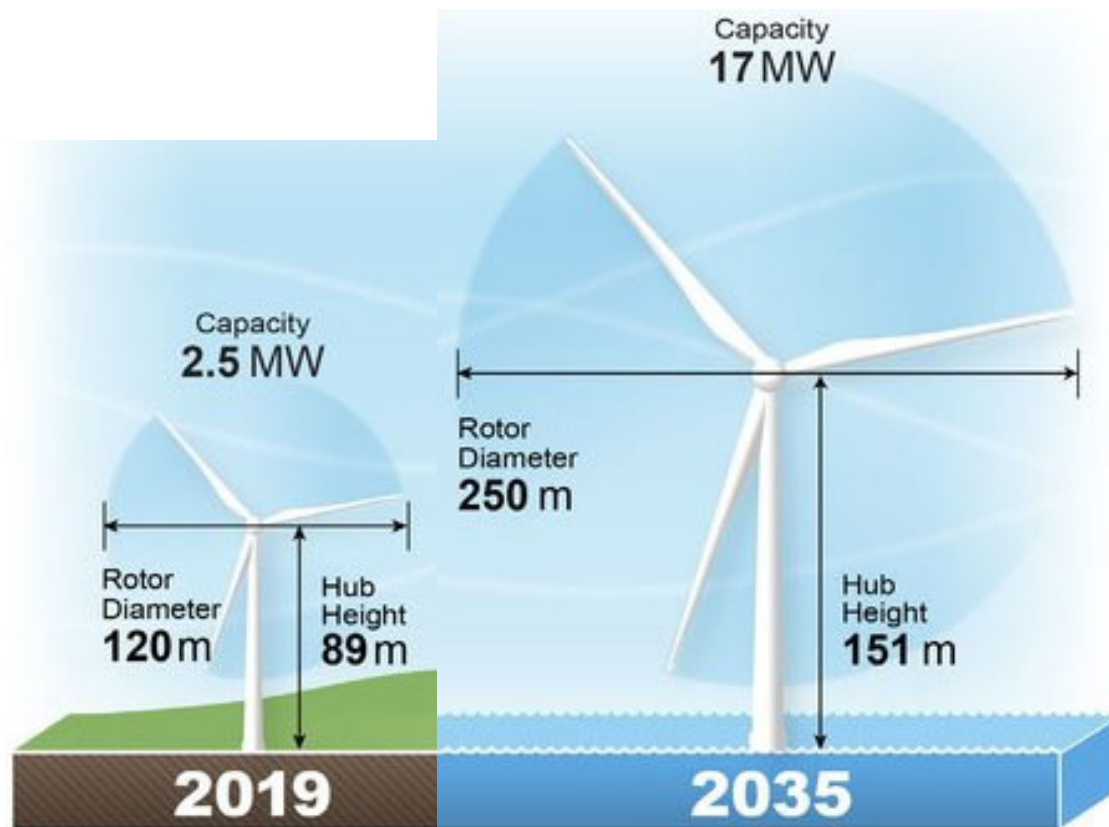
Onshore Wind Turbines



Offshore Wind Turbines

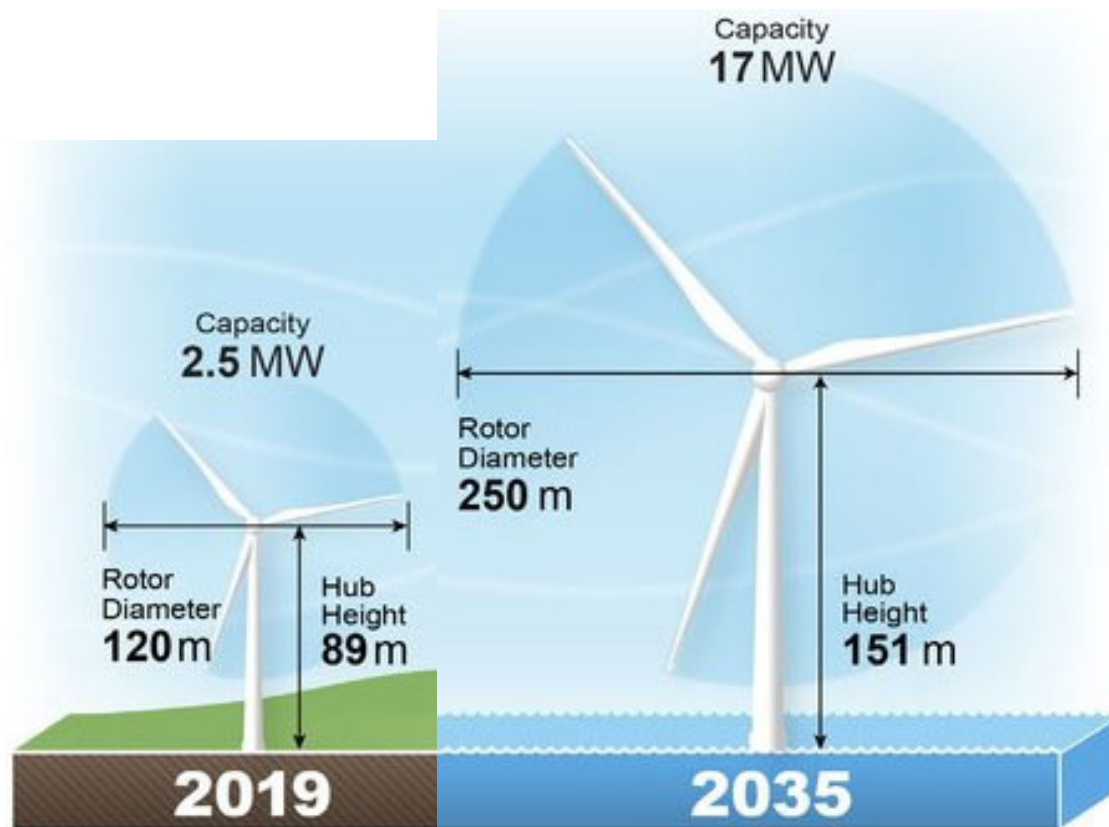






Rotor
Diameter
120 m

Rotor
Diameter
250 m





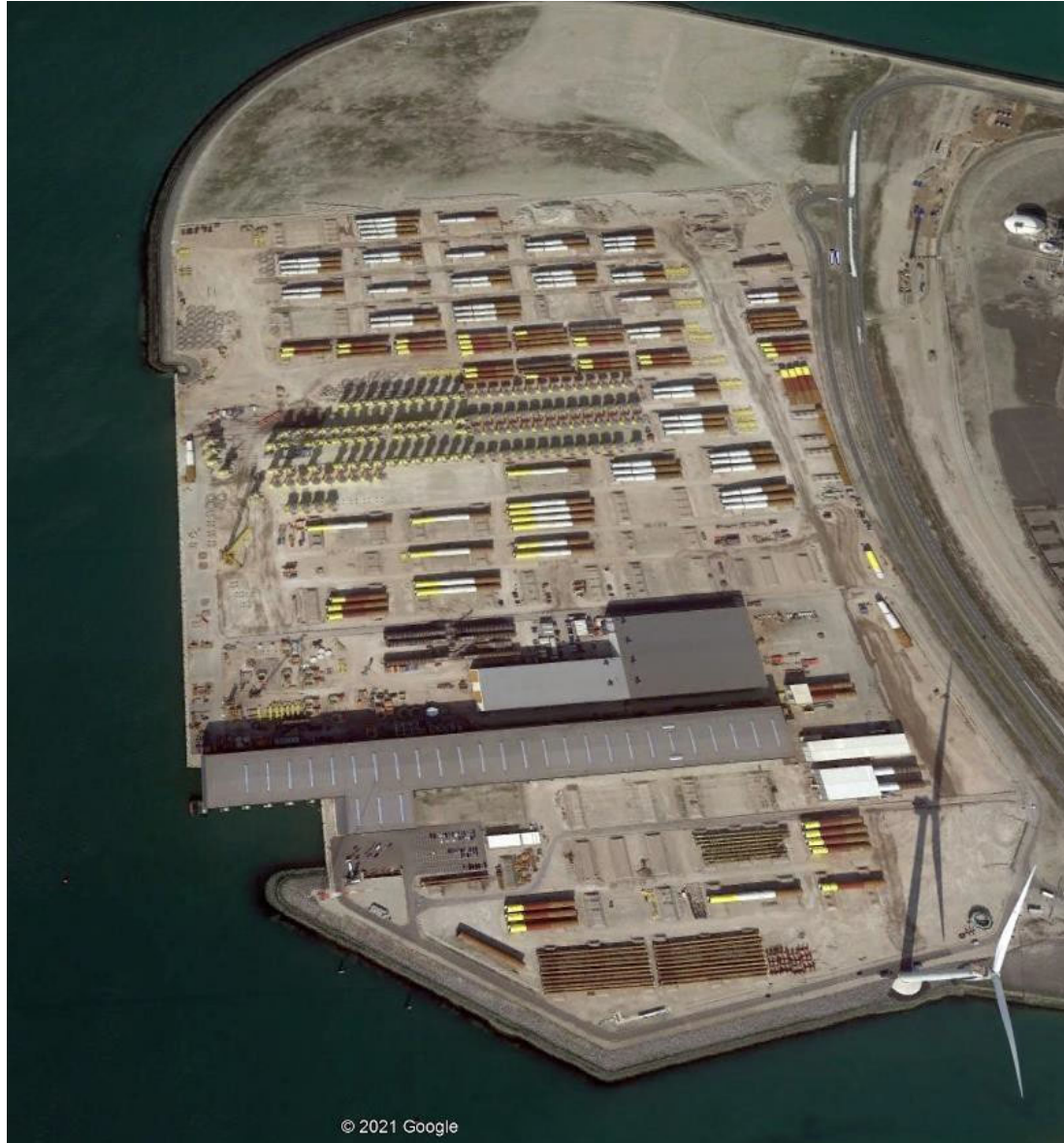












© 2021 Google

Port of Rotterdam Netherlands'

Offshore Wind Tower Fabrication
Port Facility

Construction Starts on America's Largest Offshore Wind Manufacturing Hub

April 20, 2021, by Adnan Durakovic



Source: Office of NJ Governor



Source: Office of NJ Governor.

Albany New York

Tower Manufacturing



Construction of an approximately \$350 million wind components manufacturing complex, known as Beacon Island, is scheduled to break ground in the first quarter of 2022 .



Salem Mass
(Crowley)

How are OSW turbines manufactured?



How do they get to their operational location in the ocean?

Step 1: Component Manufacturing

Step 2: Staging and Integration (“Vertical Assembly”)

Step 3: Operations and Maintenance

Step 1: Component Manufacturing



Step 1: Component Manufacturing



Step 1: Component Manufacturing



Step 1: Component Manufacturing



Step 1: Component Manufacturing



Step 2: Staging and Integration (“Vertical Assembly”)



5 to 10x the bearing capacity
(strength)
of a standard shipping
container wharf.

Blade
Nacelle
Tower

Floater

Heavy-lift crane

Multi-use terminal/wharf









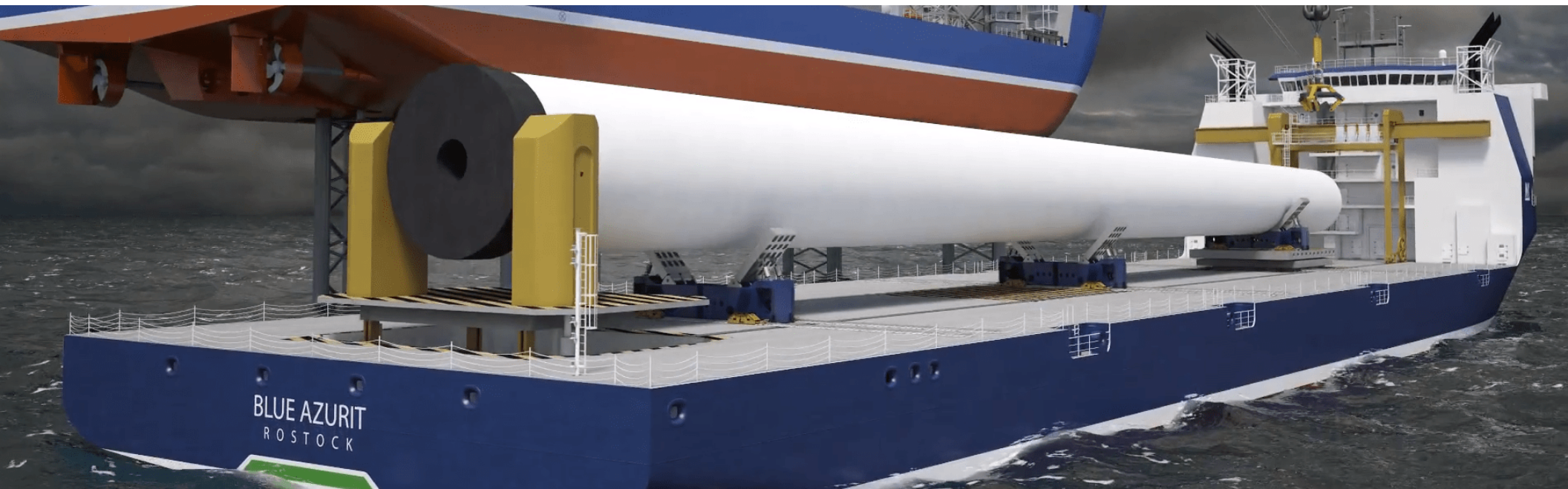


Manufactured on-site or shipped.

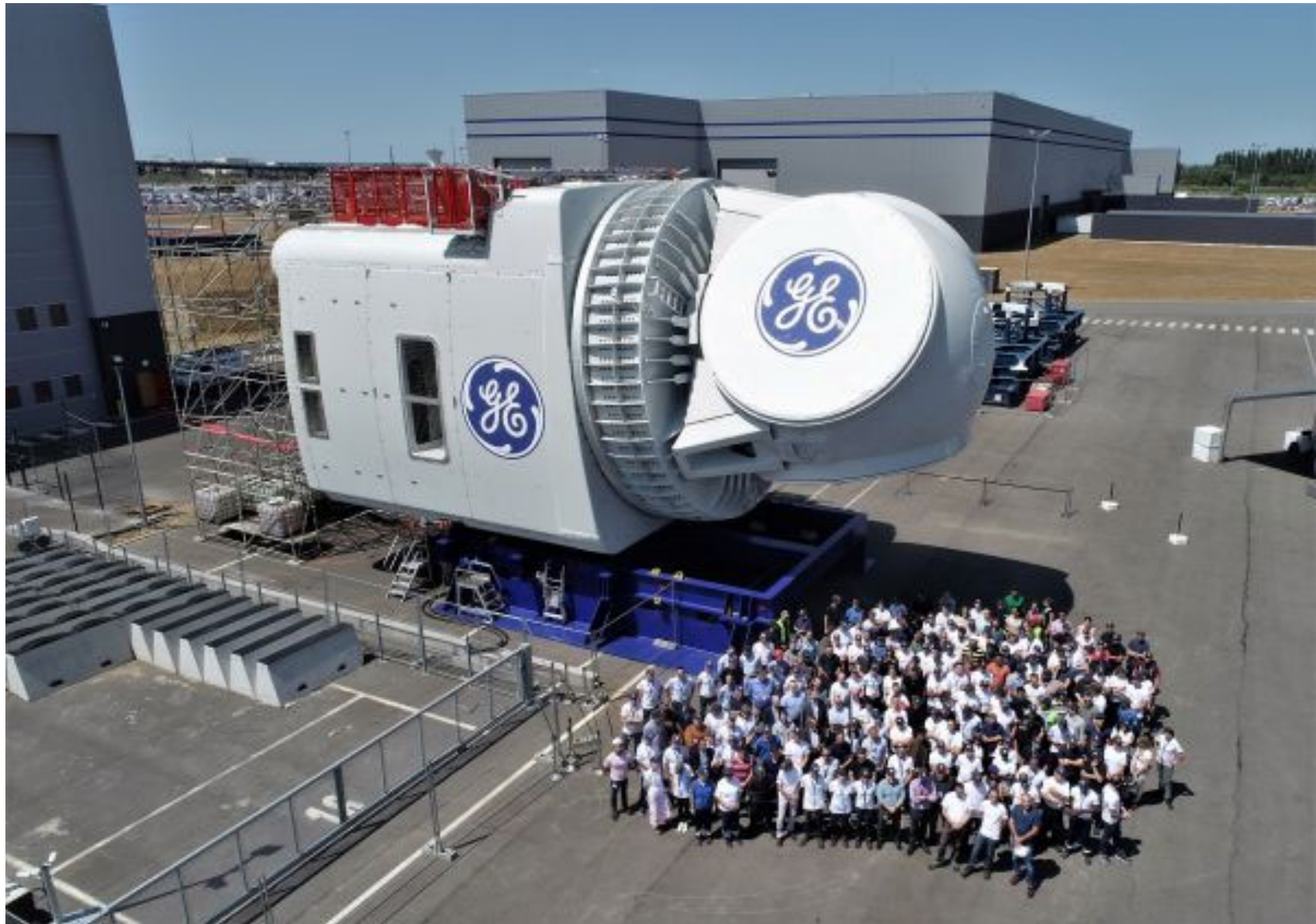




Manufactured on-site or shipped.







Manufactured on-site or shipped.



Manufactured on-site or shipped.



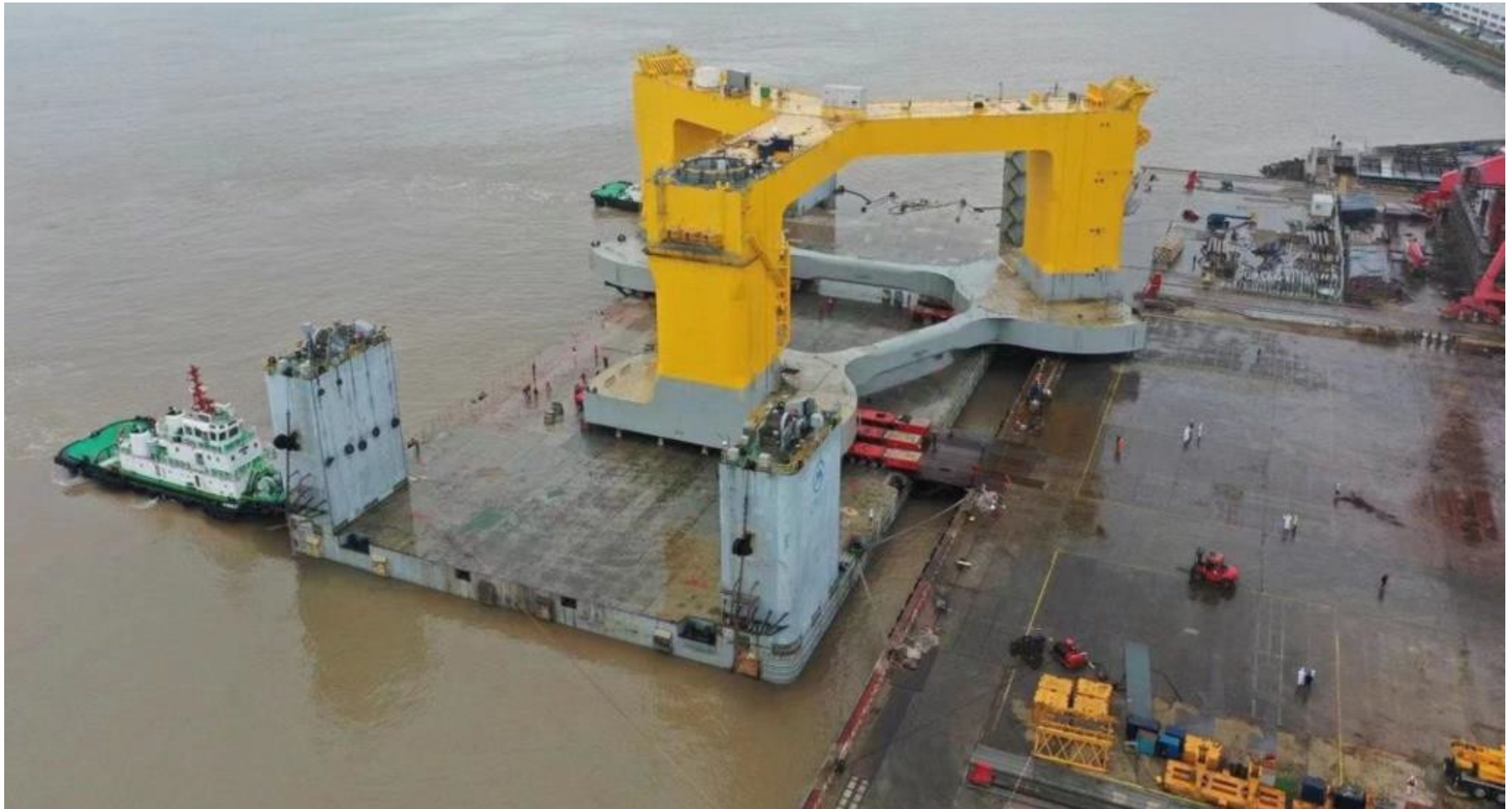
Step 2: Staging and Integration (“Vertical Assembly”)

Step 2a: Gather all of the manufactured parts at the assembly terminal



Step 2: Staging and Integration (“Vertical Assembly”)

Step 2b: Assemble and launch the floater at the assembly terminal



Step 2: Staging and Integration (“Vertical Assembly”)

Step 2c: Vertically assembly of all the components



Step 2: Staging and Integration (“Vertical Assembly”)

Step 2d: Tow the fully-assembled turbine to sea



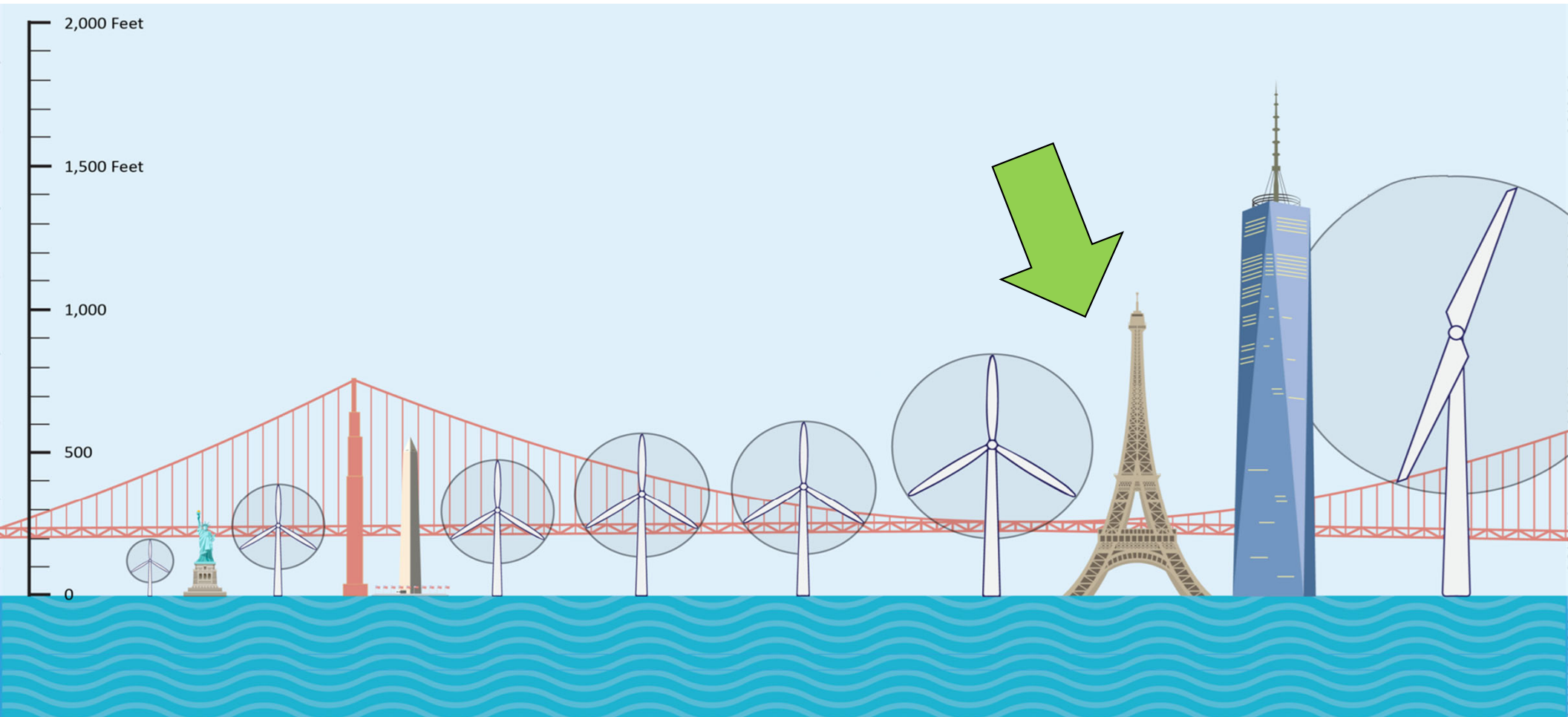
Step 2: Staging and Integration (“Vertical Assembly”)

Vertical draft restrictions will limit some ports

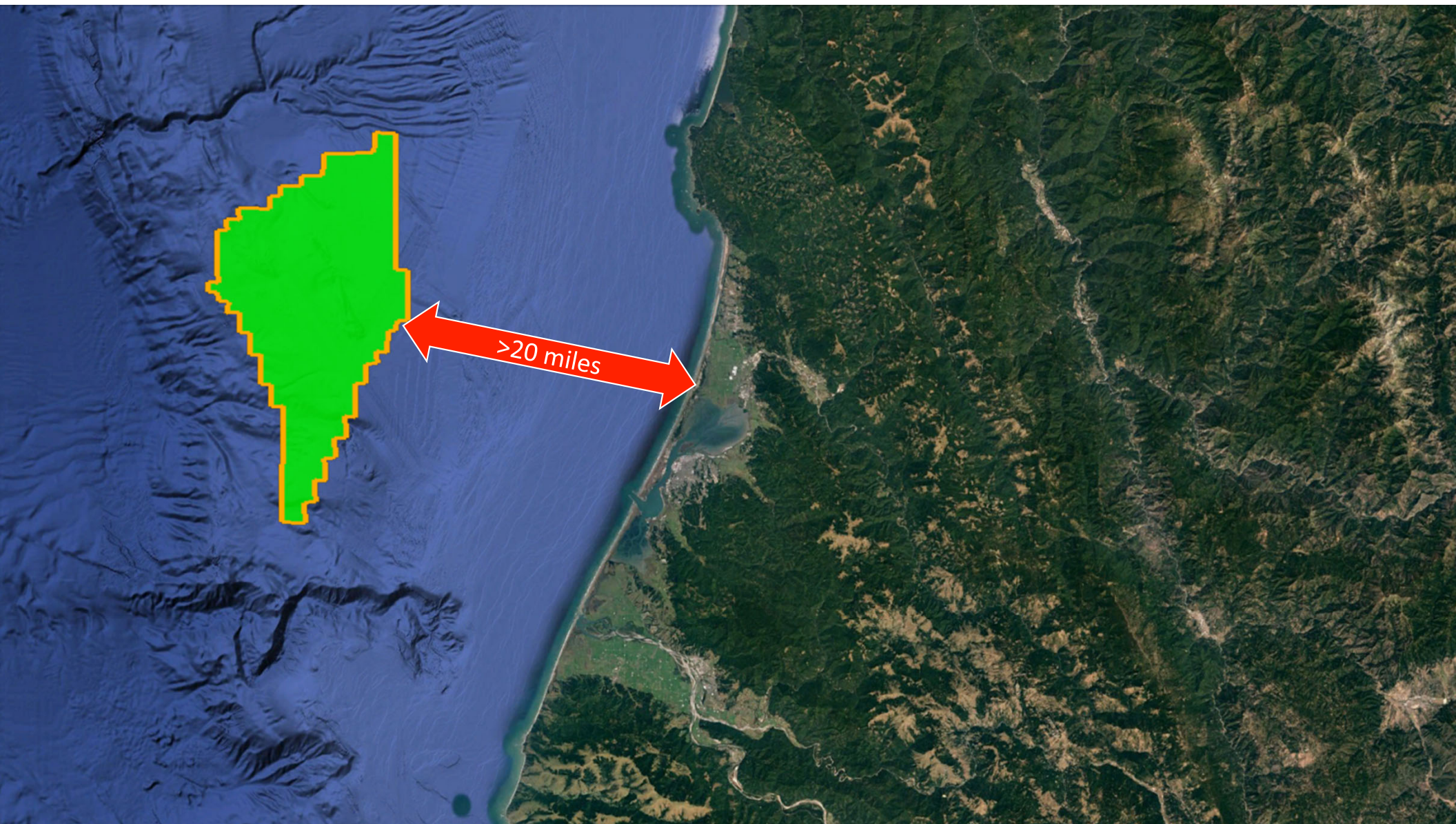


Step 2: Staging and Integration (“Vertical Assembly”)

Vertical draft restrictions will limit some ports











Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



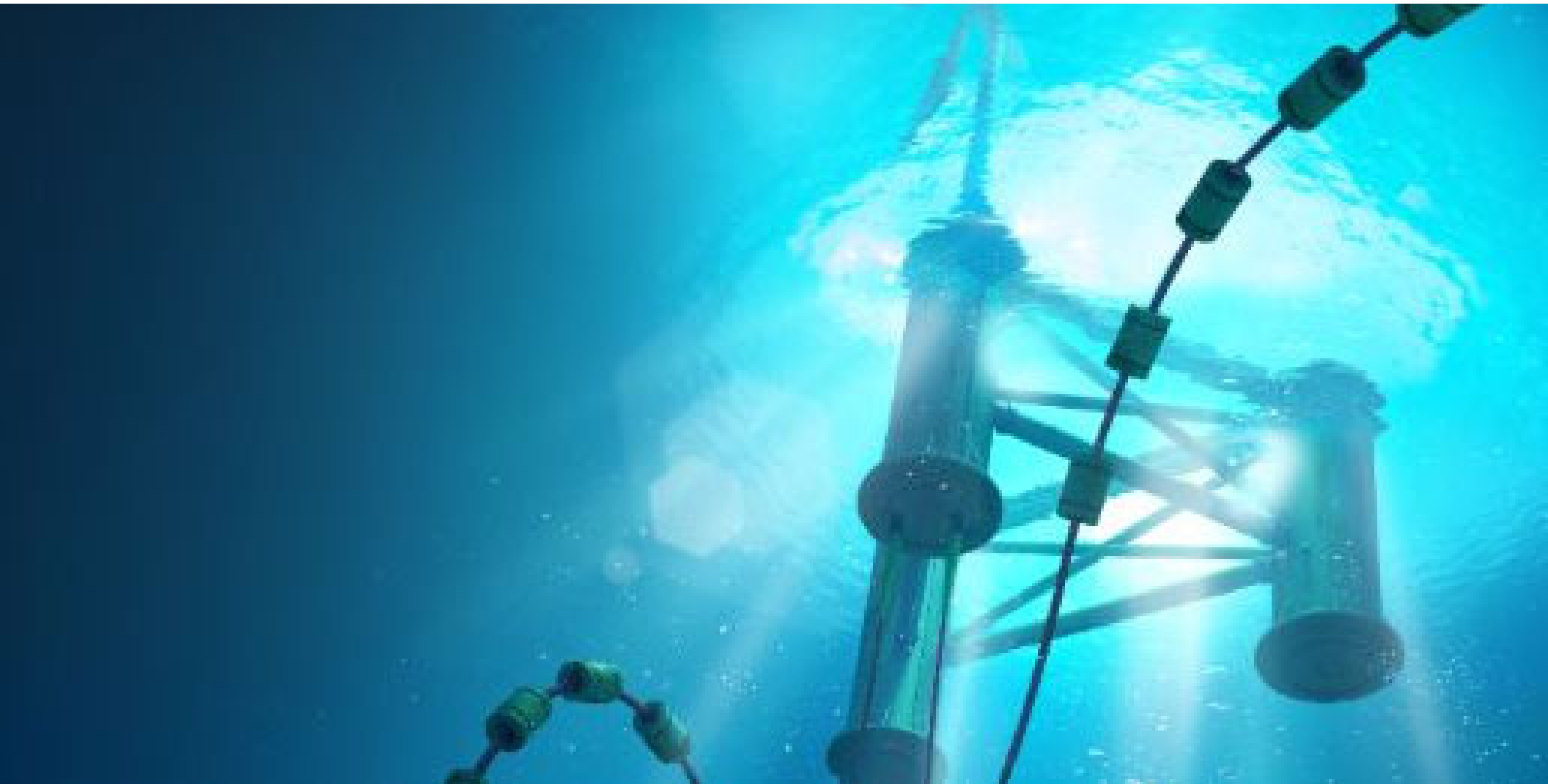
Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



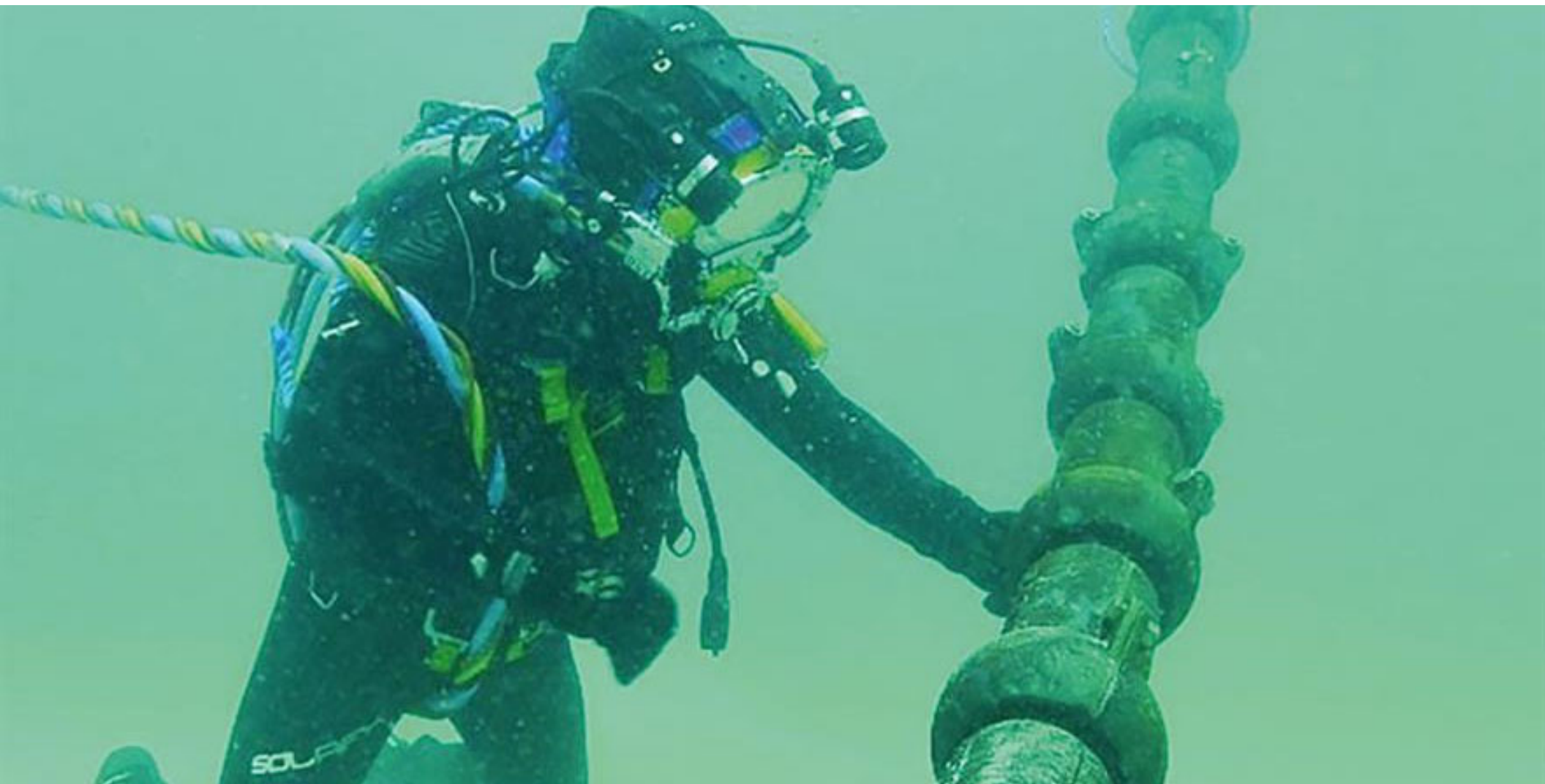
Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Step 3: Operations and Maintenance



Who?



Who is going to build turbines?





Offshore wind farm operations



Offshore wind component
manufacturing and deployment

A photograph of an offshore wind farm with several wind turbines visible against a blue sky with white clouds. The foreground shows the shimmering surface of the ocean.

BOEM & Energy Companies



Ports and Port Operators



Project Type 1:
The Operation of a Power Plant

Project Type 2:
The Manufacturing and
Assembly of Equipment





Project Type 1:
The Operation of a Power Plant

Project Type 2:
The Manufacturing and Assembly
of Equipment



Project Type 3:
Power Transmission



Project Type 1:
The Operation of a Power Plant

Project Type 2:
The Manufacturing and Assembly
of Equipment

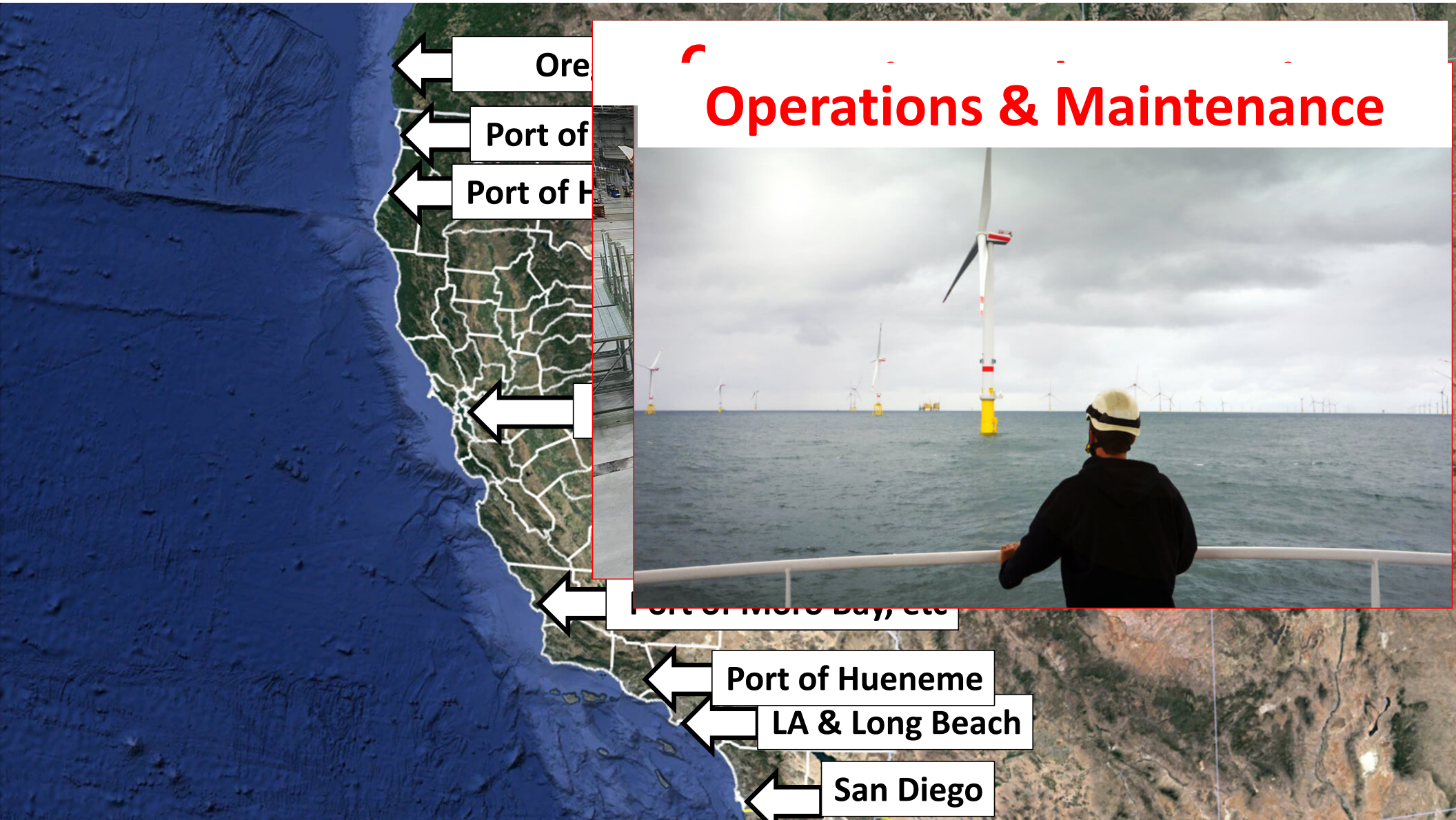


Project Type 3:
Power Transmission



Ports and Port Operators

Operations & Maintenance



Staging and Integration



Port of Crescent City

Port of Humboldt

SanFran Bay Ports

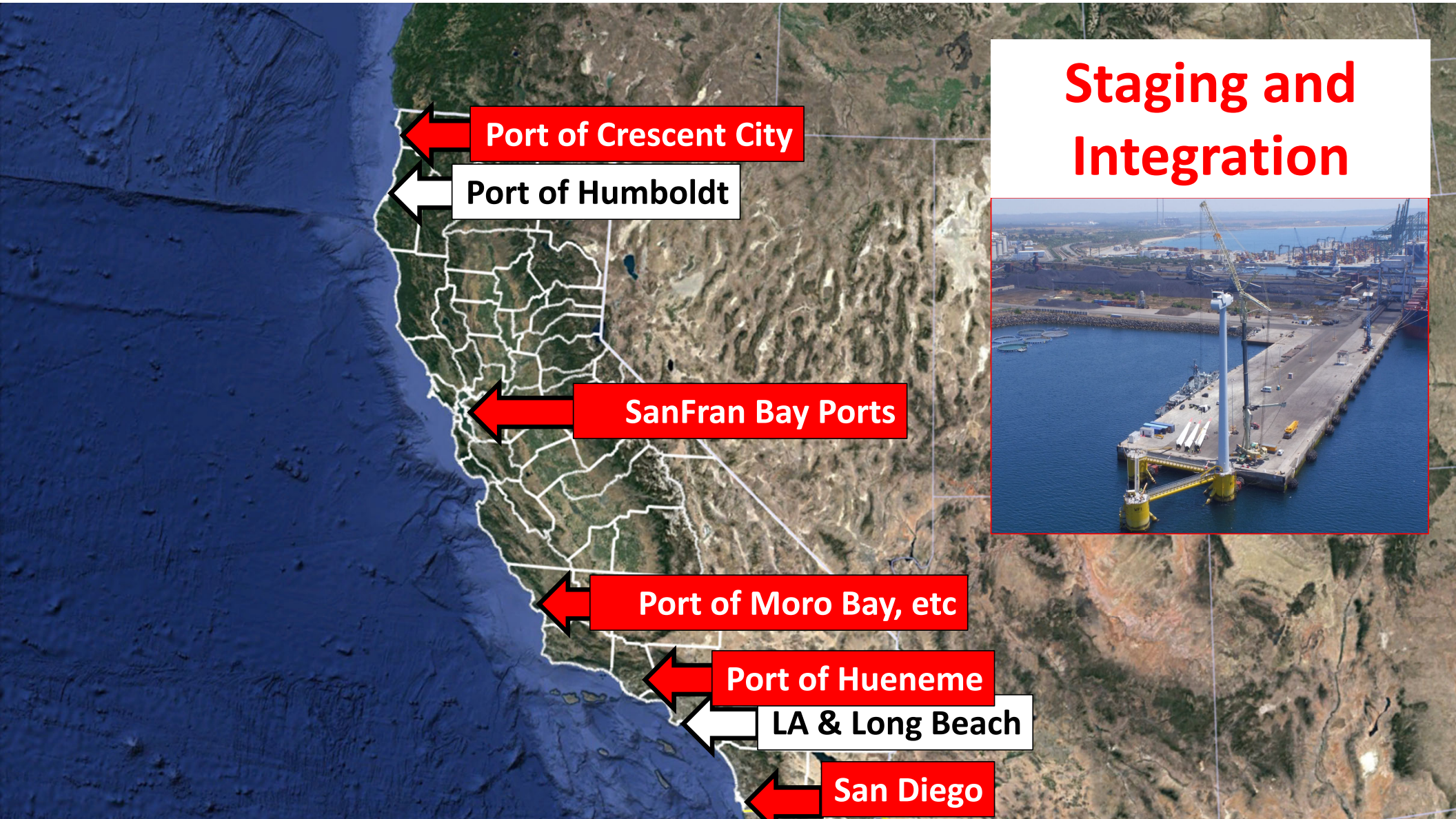
Port of Moro Bay, etc

Port of Hueneme

LA & Long Beach

San Diego

Staging and Integration



Staging and Integration



Necessary Conditions for Vertical Assembly

1. Channel width
2. Channel depth
3. No vertical draft restrictions
4. Large development areas (100+ acres)

Port of Crescent City

Port of Humboldt

SanFran Bay Ports

Port of Moro Bay, etc

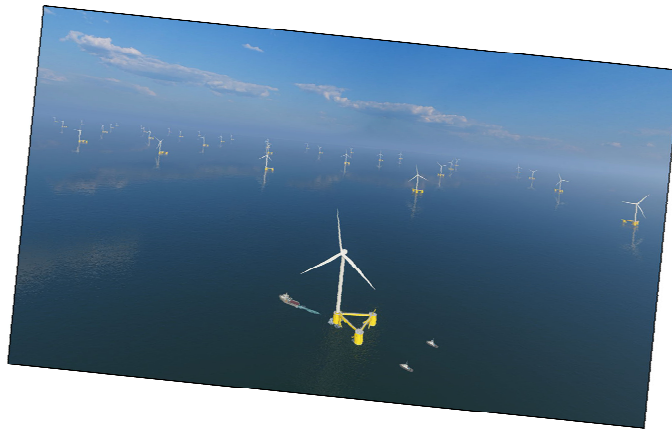
Port of Hueneme

LA & Long Beach

San Diego

OCS Study
BOEM 2023-010

California Floating Offshore Wind Regional Ports Assessment



U.S. Department of the Interior
Bureau of Ocean Energy Management
Pacific OCS Region, Camarillo, CA

BOEM
Bureau of Ocean Energy
Management

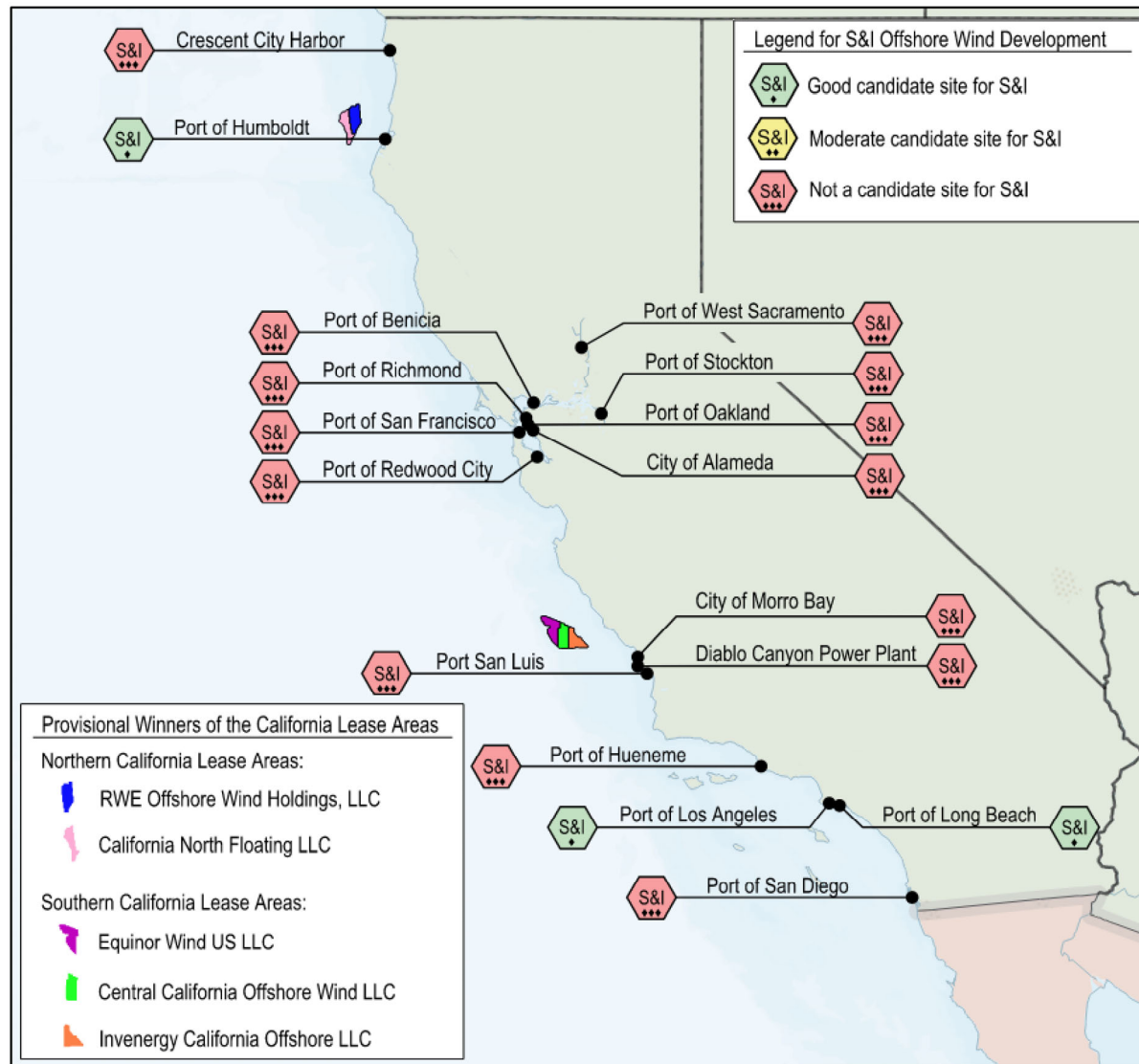


Figure 4. Staging and integration (S&I) candidate status of each port

Legend for S&I Offshore Wind Development



Good candidate site for S&I



Moderate candidate site for S&I



Not a candidate site for S&I

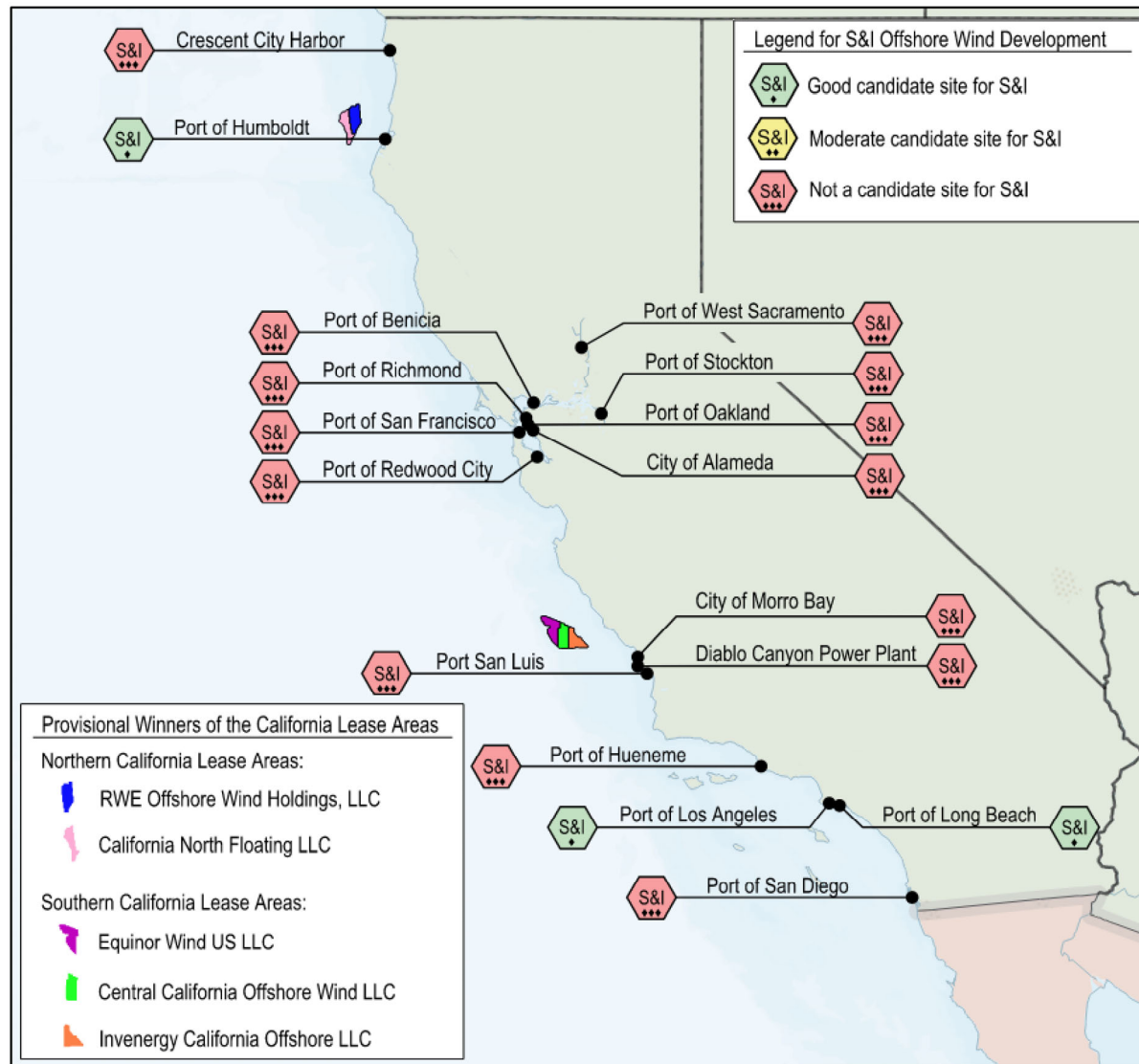


Figure 4. Staging and integration (S&I) candidate status of each port

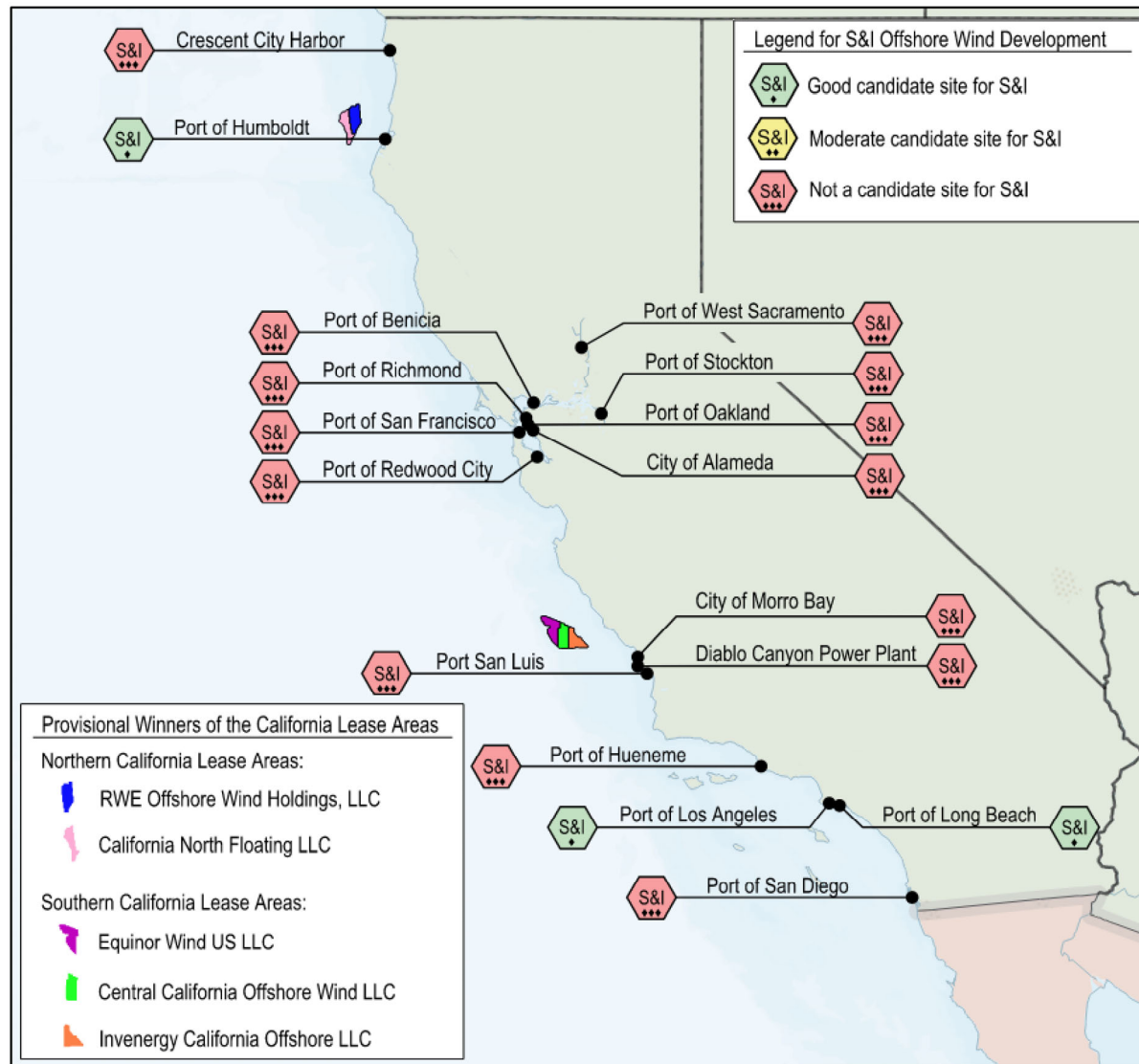


Figure 4. Staging and integration (S&I) candidate status of each port

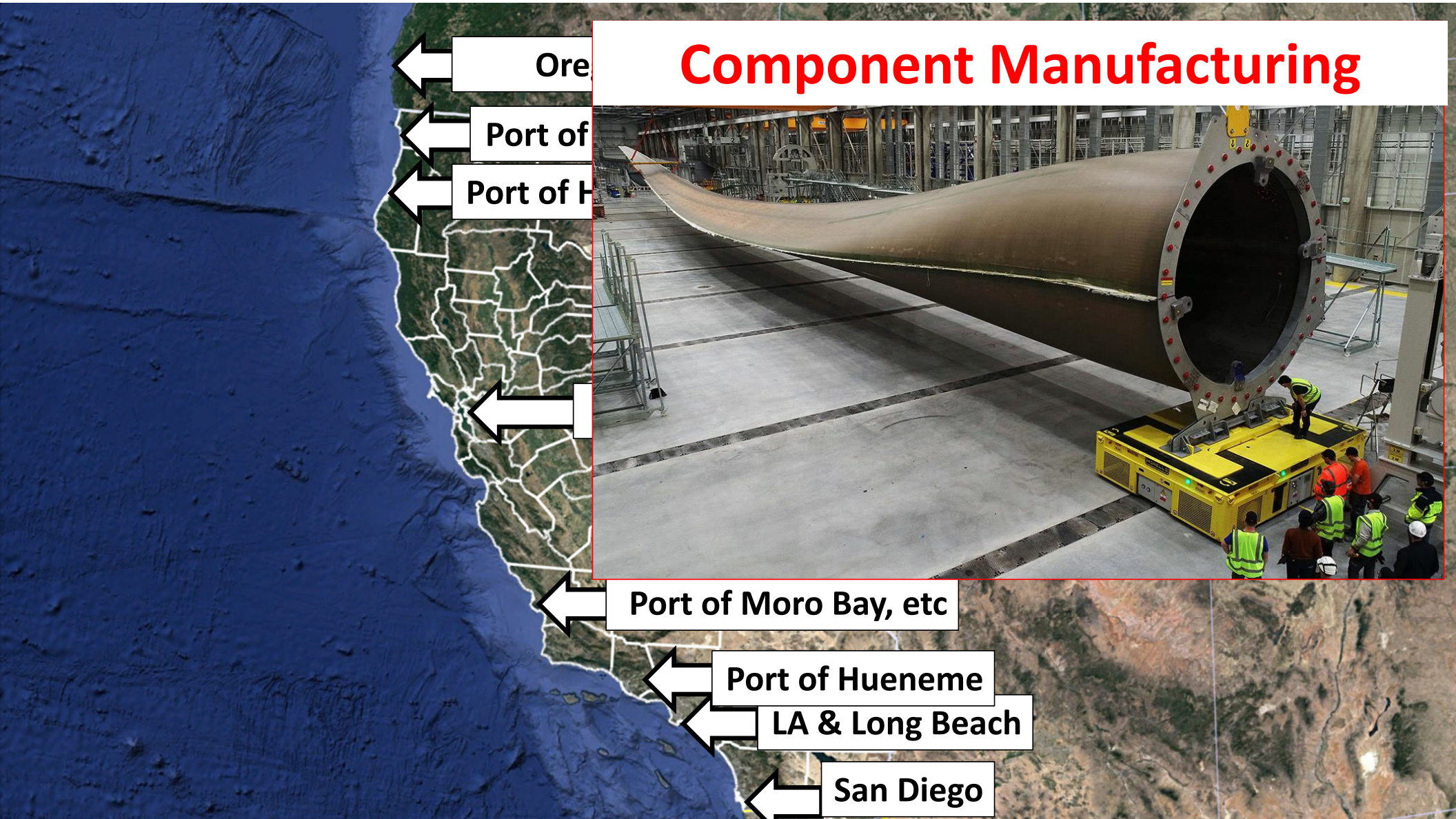
Staging and Integration

Port of Humboldt

LA & Long Beach



Component Manufacturing



Component Manufacturing



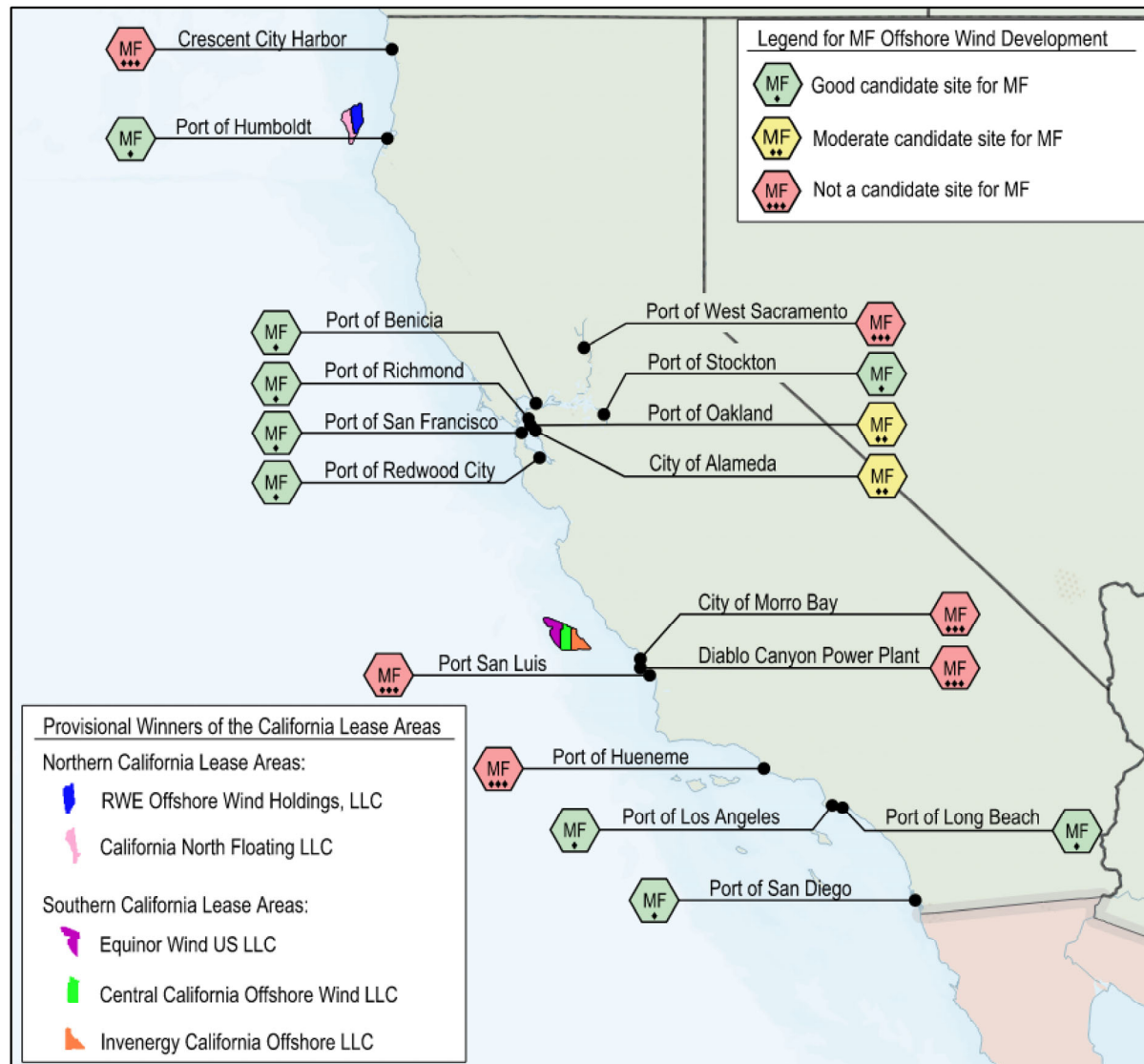


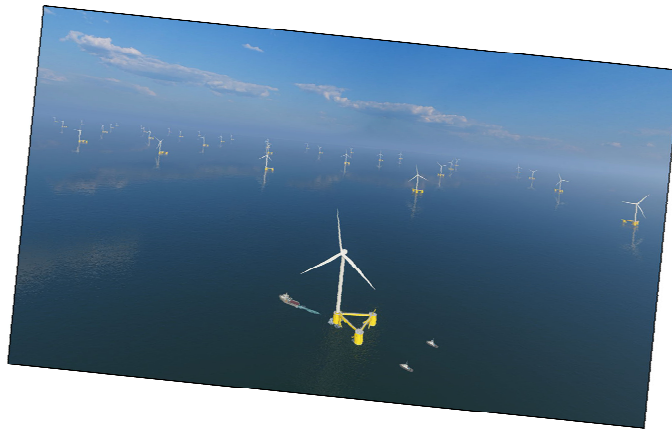
Figure 5. Manufacturing / fabrication (MF) candidate status of each port

Operations and Maintenance



OCS Study
BOEM 2023-010

California Floating Offshore Wind Regional Ports Assessment



U.S. Department of the Interior
Bureau of Ocean Energy Management
Pacific OCS Region, Camarillo, CA

BOEM
Bureau of Ocean Energy
Management

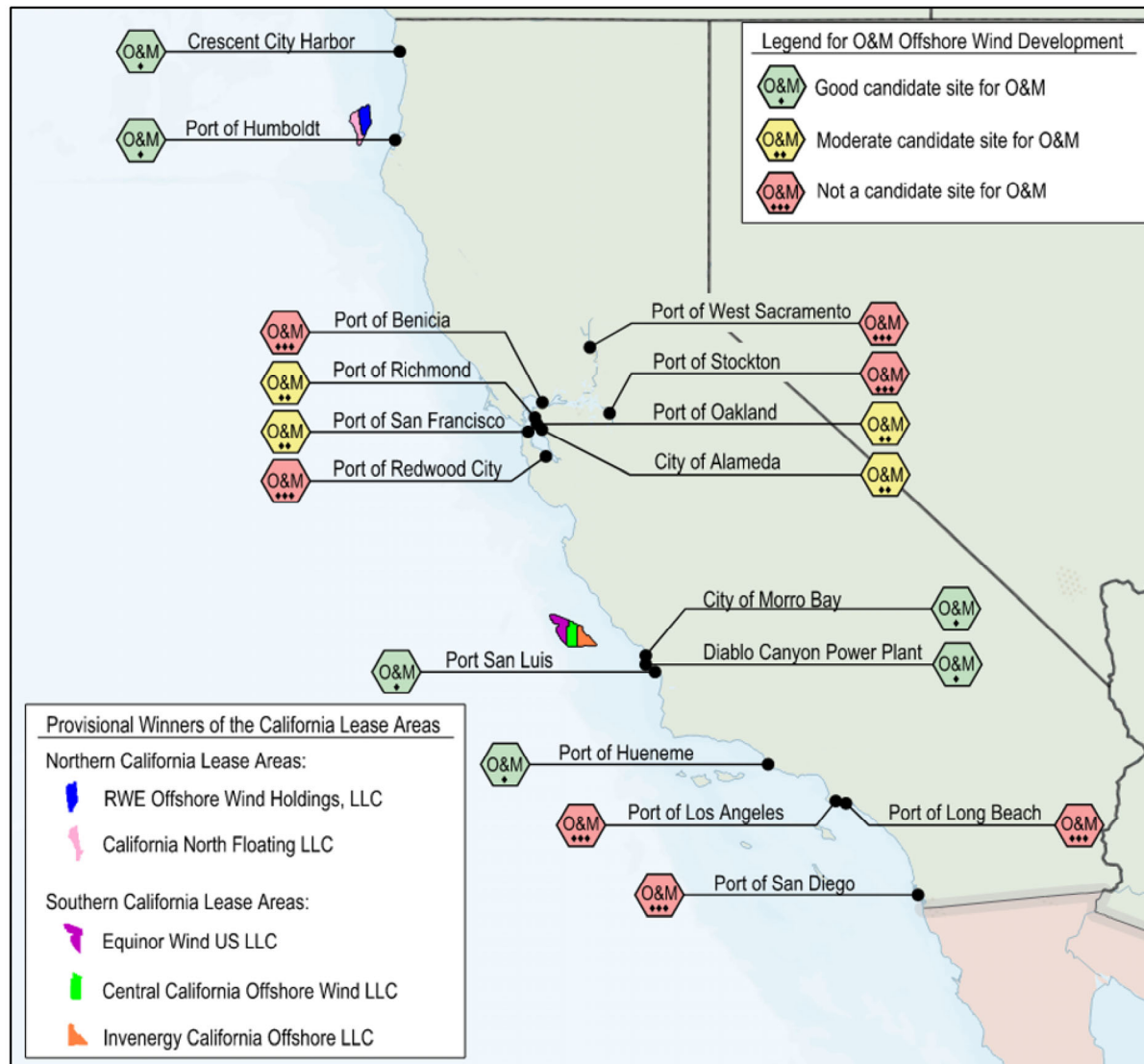
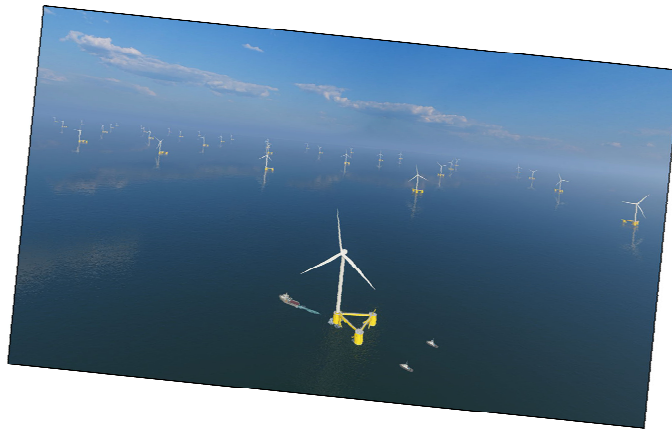


Figure 6. Operation and maintenance (O&M) candidate status of each port

OCS Study
BOEM 2023-010

California Floating Offshore Wind Regional Ports Assessment



U.S. Department of the Interior
Bureau of Ocean Energy Management
Pacific OCS Region, Camarillo, CA

BOEM
Bureau of Ocean Energy
Management

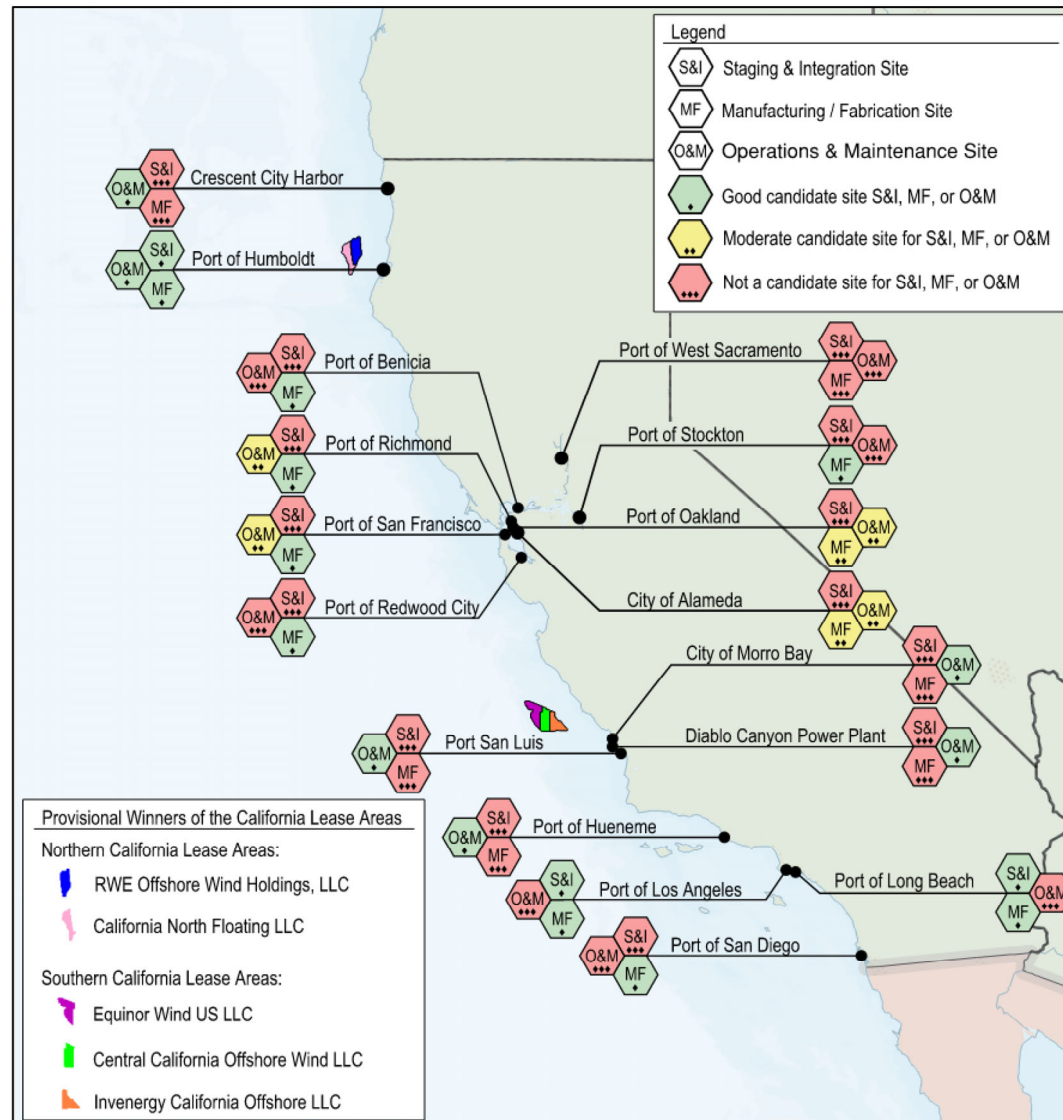
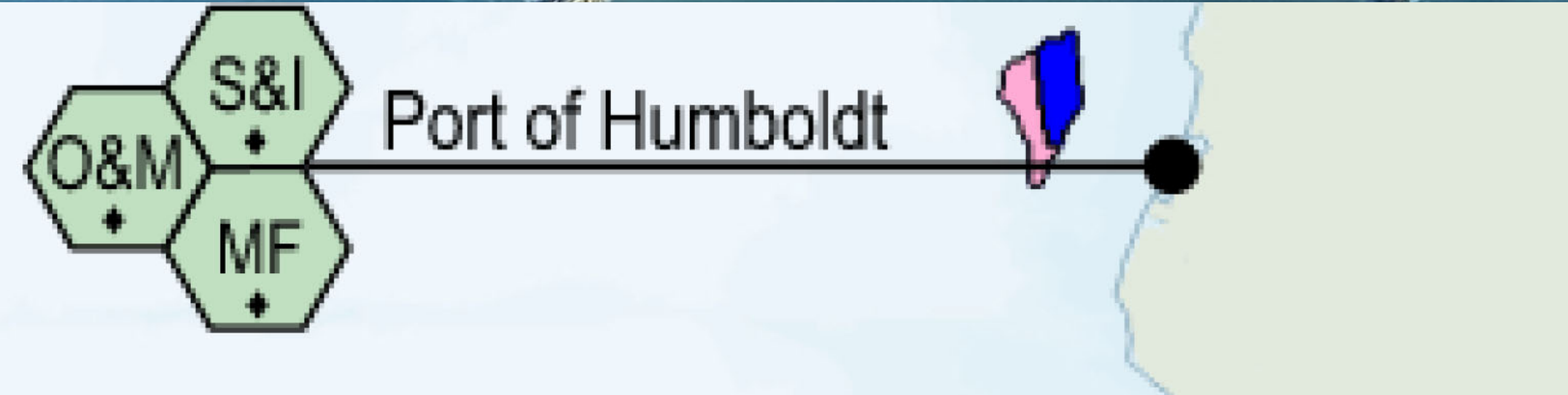


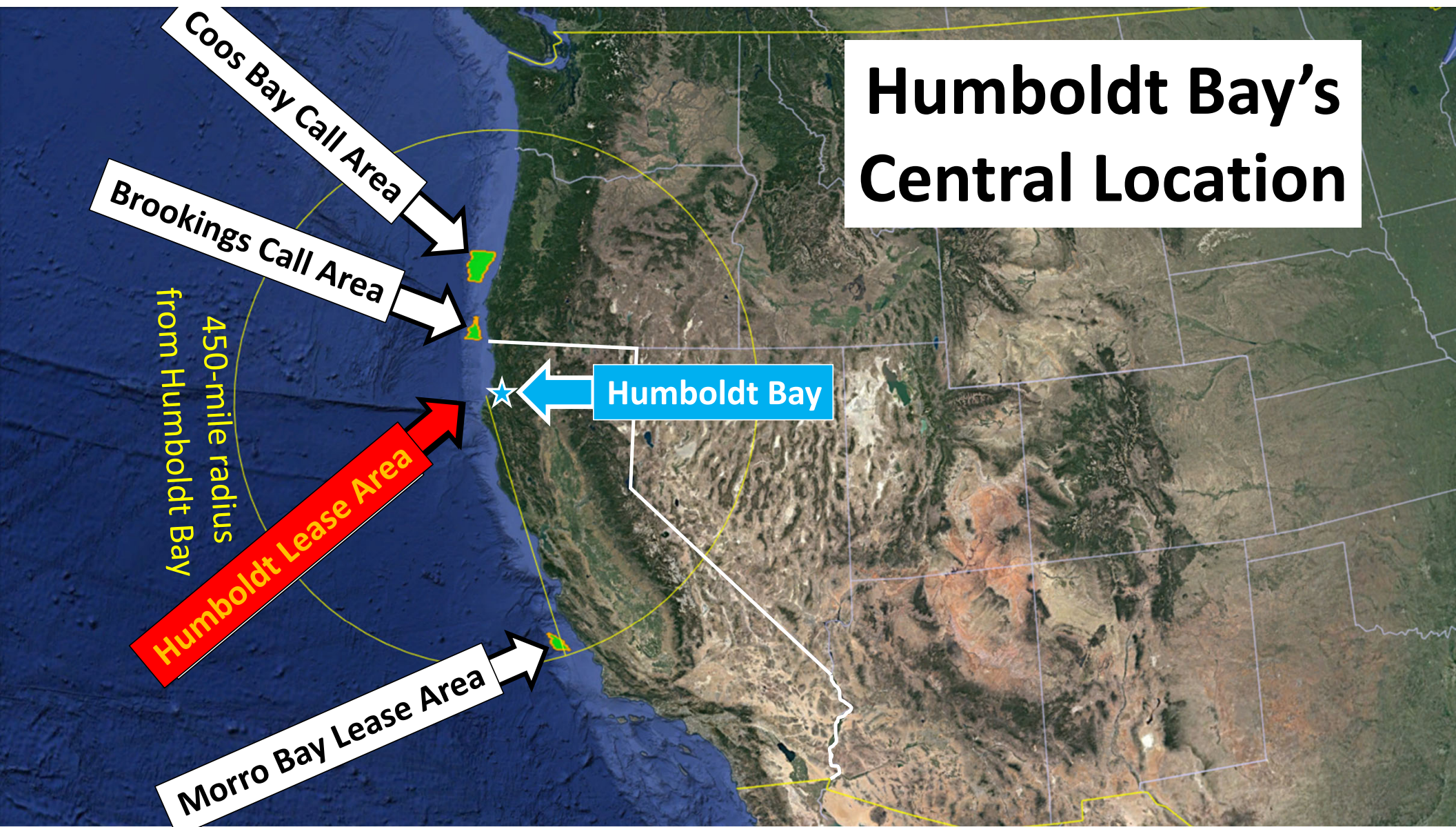
Figure 7. S&I, MF, and O&M candidate status for each port



OVERVIEW OF HUMBOLDT BAY AND THE PROPOSED PROJECT



Humboldt Bay's Central Location



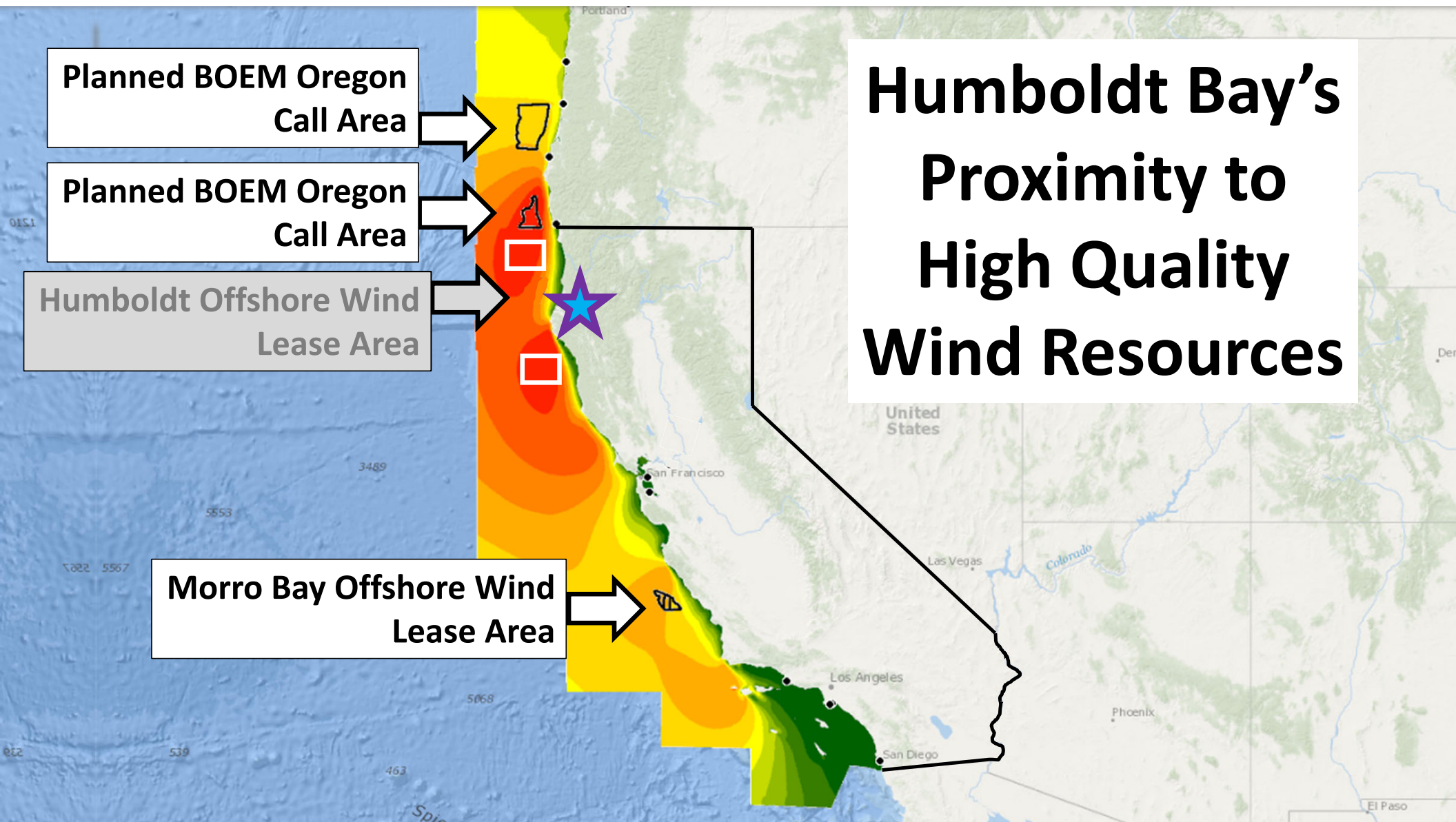
**Planned BOEM Oregon
Call Area**

**Planned BOEM Oregon
Call Area**

**Humboldt Offshore Wind
Lease Area**

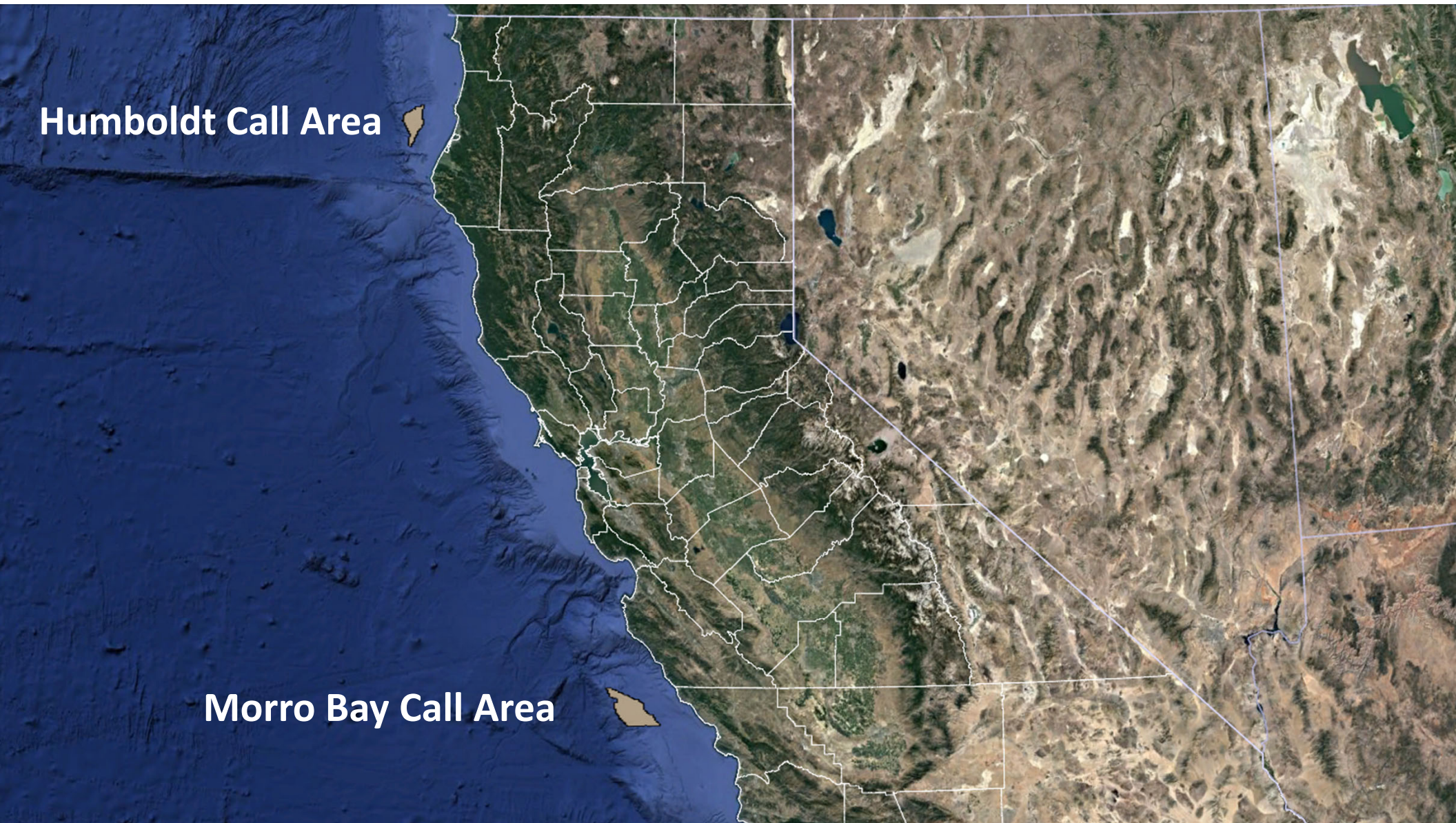
**Morro Bay Offshore Wind
Lease Area**

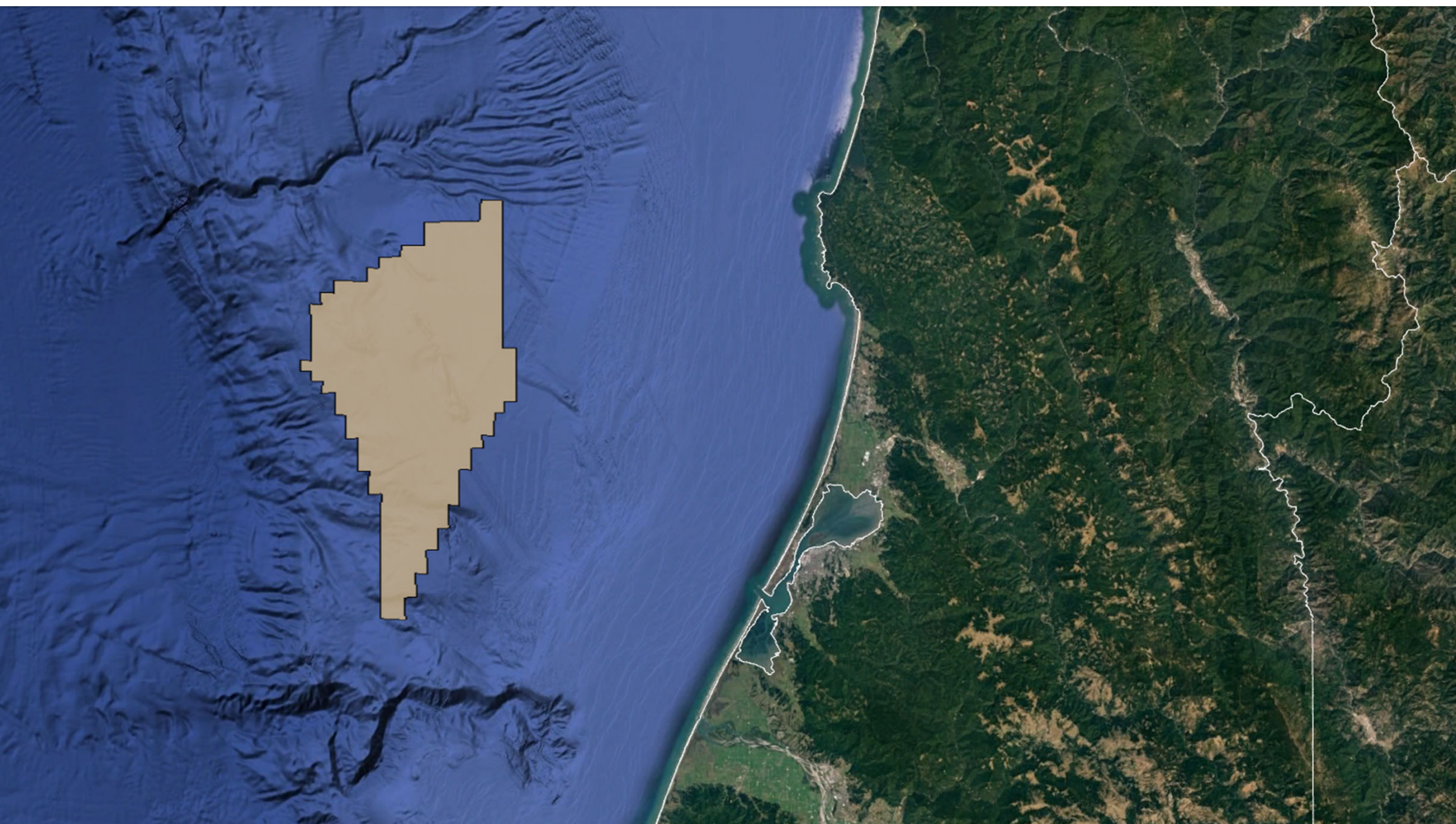
**Humboldt Bay's
Proximity to
High Quality
Wind Resources**



Humboldt Call Area

Morro Bay Call Area







Arcata & CalPoly Humboldt

Eureka

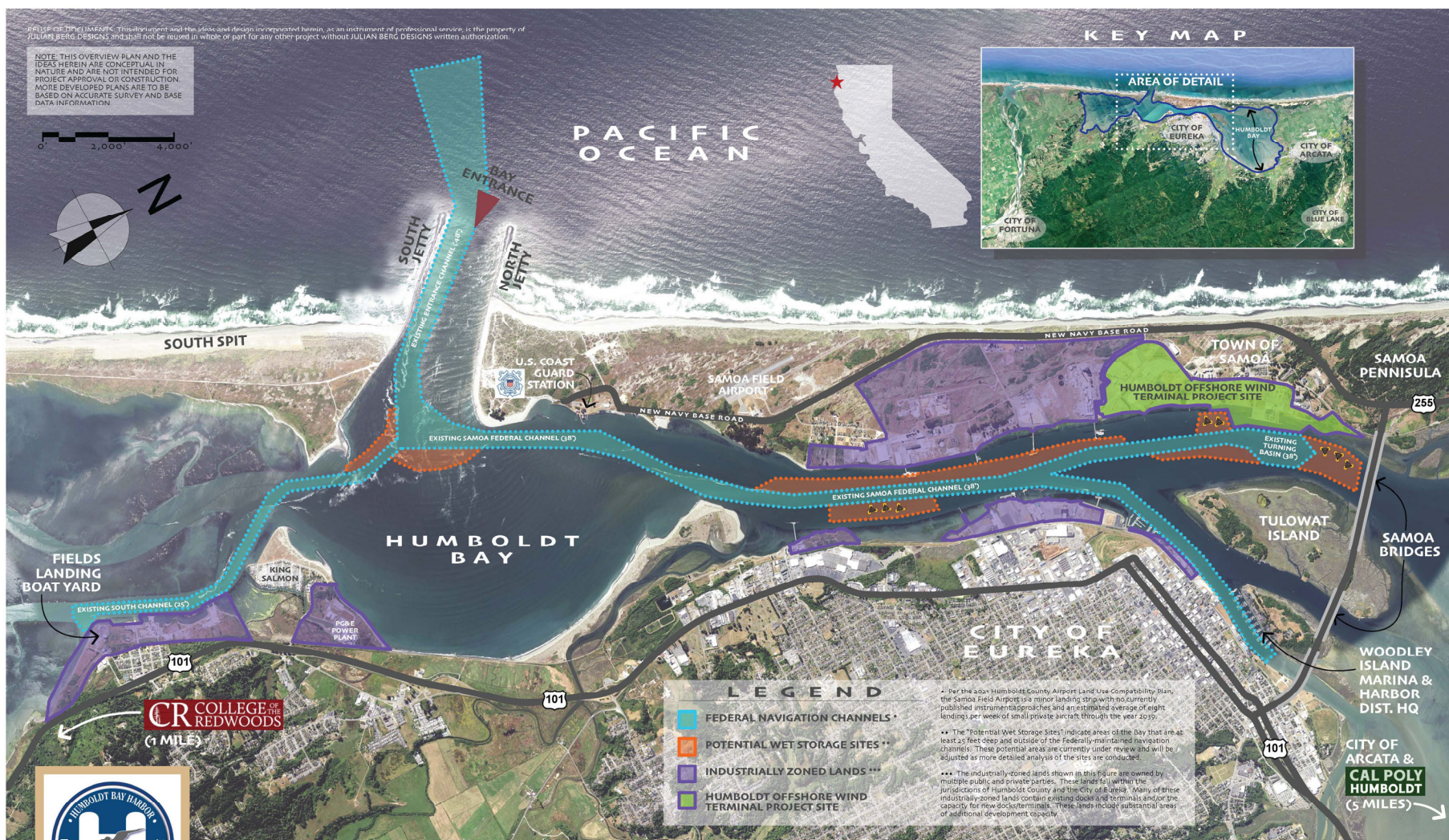
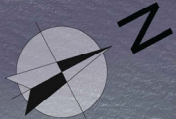
Wiyot Tribe

College of the Redwoods

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0' 2,000' 4,000'



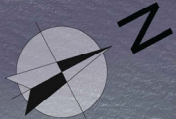
HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL OVERALL BAY VIEW

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6.5.22

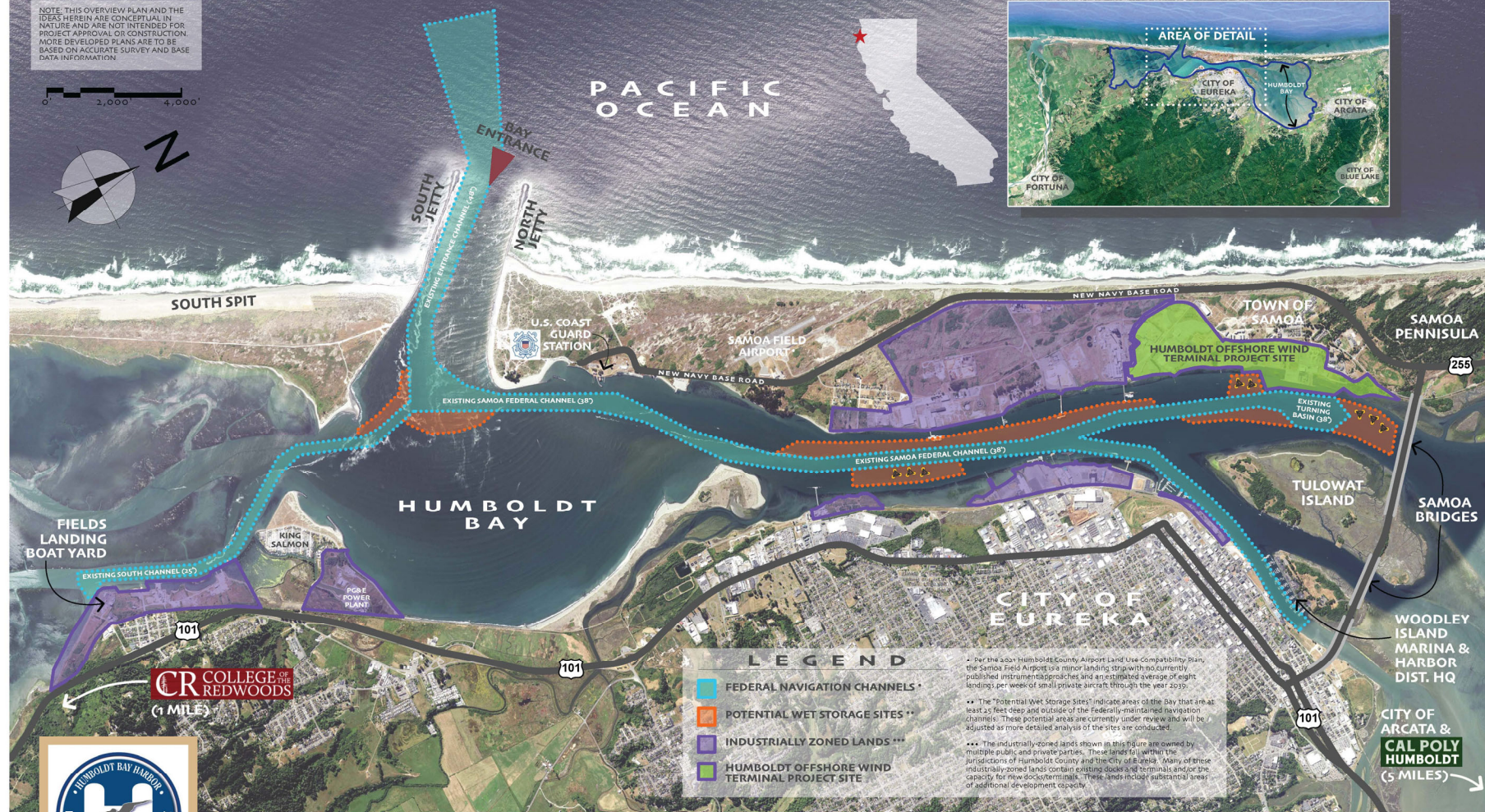
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0' 2,000' 4,000'



KEY MAP



LEGEND

- FEDERAL NAVIGATION CHANNELS *
- POTENTIAL WET STORAGE SITES **
- INDUSTRIALLY ZONED LANDS ***
- HUMBOLDT OFFSHORE WIND TERMINAL PROJECT SITE

* For the San Humboldt County Airport Land Use Compatibility Plan, the Samoa Field Airport is a minor landing strip with no currently published instrument approaches and an estimated average of eight landings per week of small private aircraft through the year 2030.

** The "Potential Wet Storage Sites" indicate areas of the Bay that are at least 20 feet deep and outside of the federally-maintained navigation channels. These potential areas are currently under review and will be adjusted as more detailed analysis of the sites are conducted.

*** The industrially-zoned lands shown in this figure are owned by multiple public and private parties. These lands fall within the jurisdictions of Humboldt County and the City of Eureka. Many of these industrially-zoned lands contain existing docks and terminals and/or the capacity for new dock/terminals. These lands include substantial areas of additional development capacity.



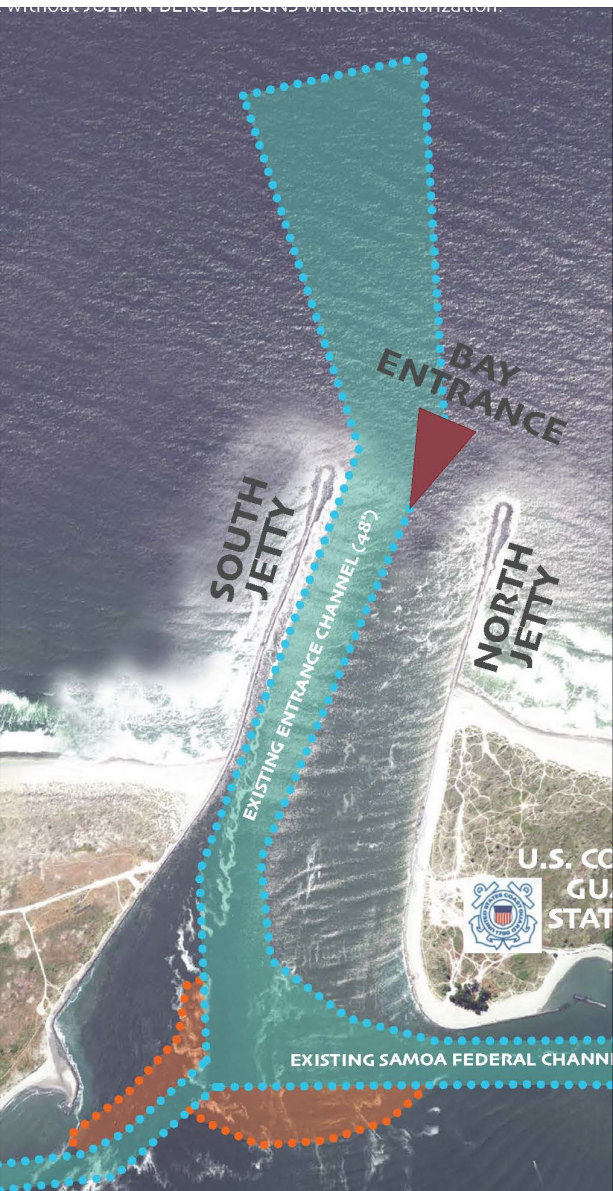
HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL OVERALL BAY VIEW



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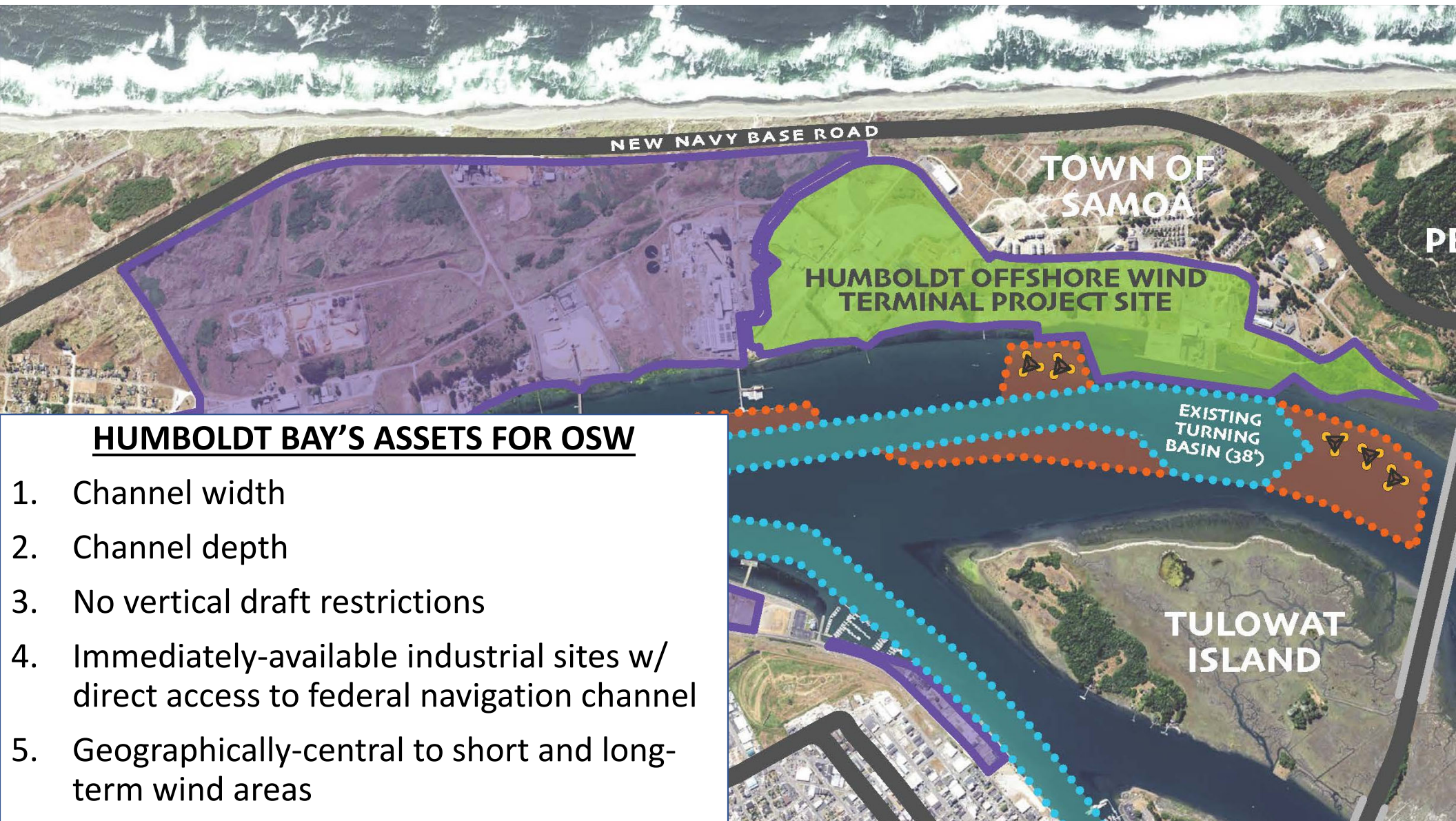
without SOLARBERS DESIGN'S written authorization.







CITY OF
EUREKA

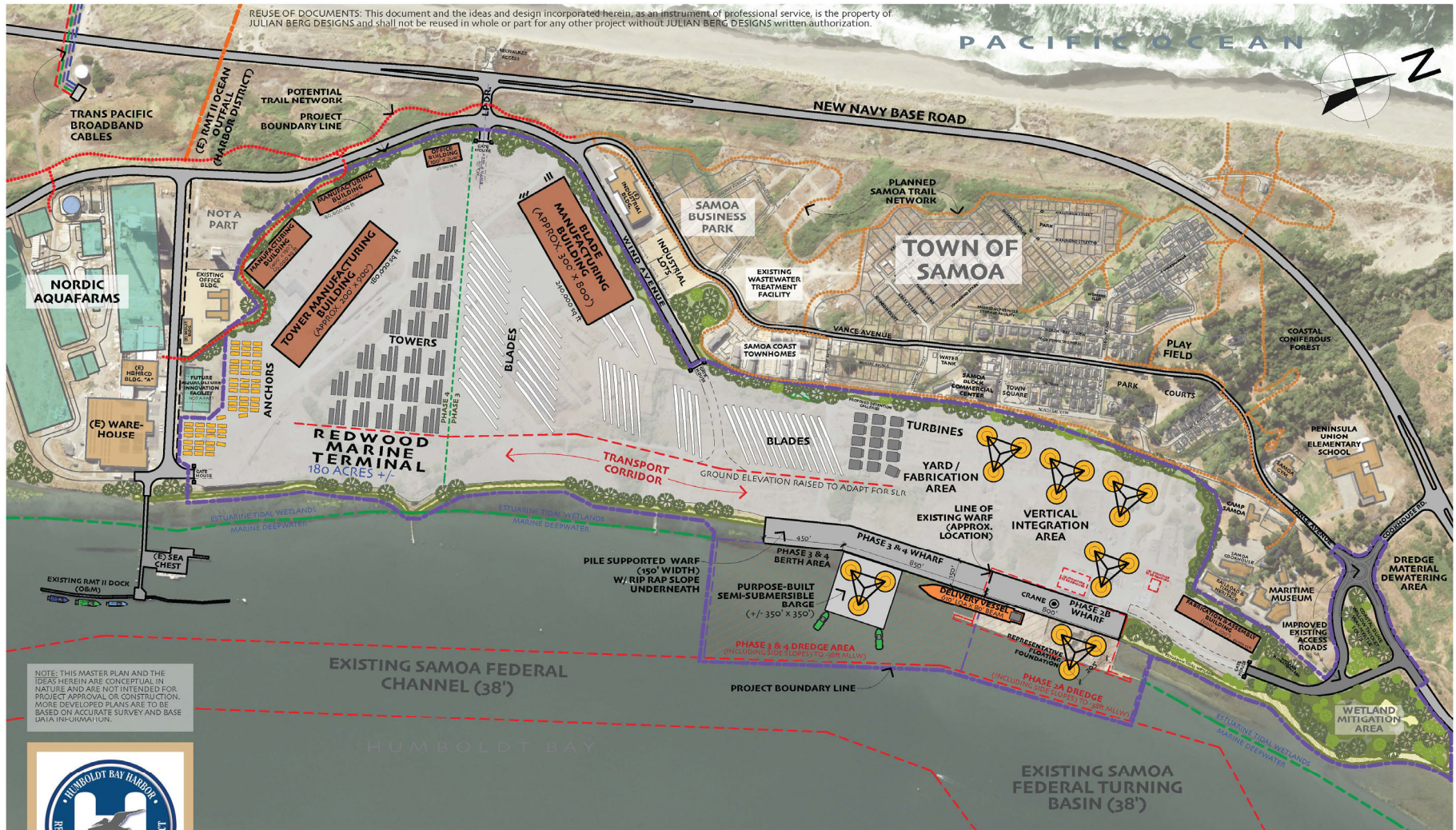


HUMBOLDT BAY'S ASSETS FOR OSW

1. Channel width
2. Channel depth
3. No vertical draft restrictions
4. Immediately-available industrial sites w/ direct access to federal navigation channel
5. Geographically-central to short and long-term wind areas

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PACIFIC OCEAN



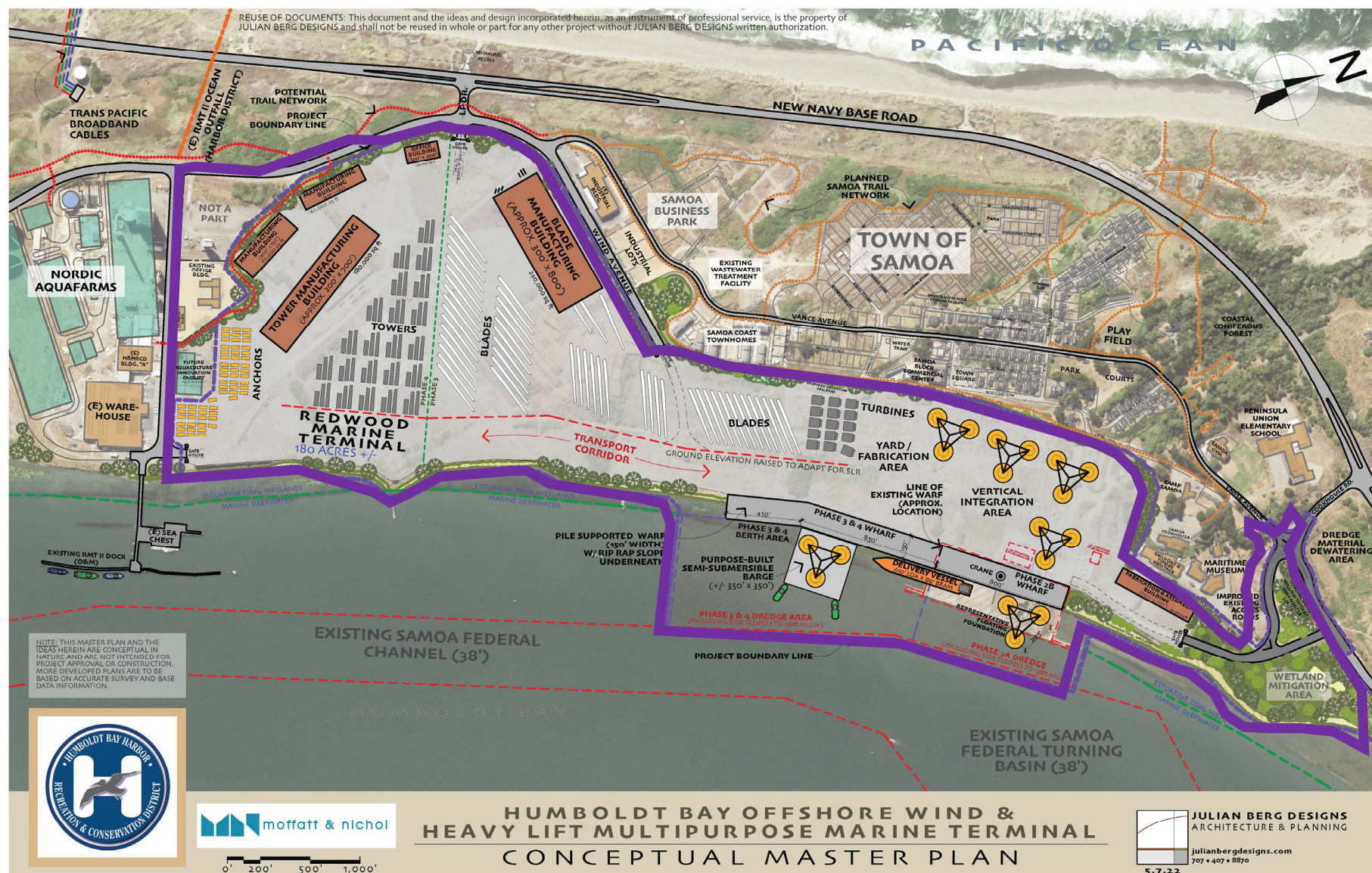
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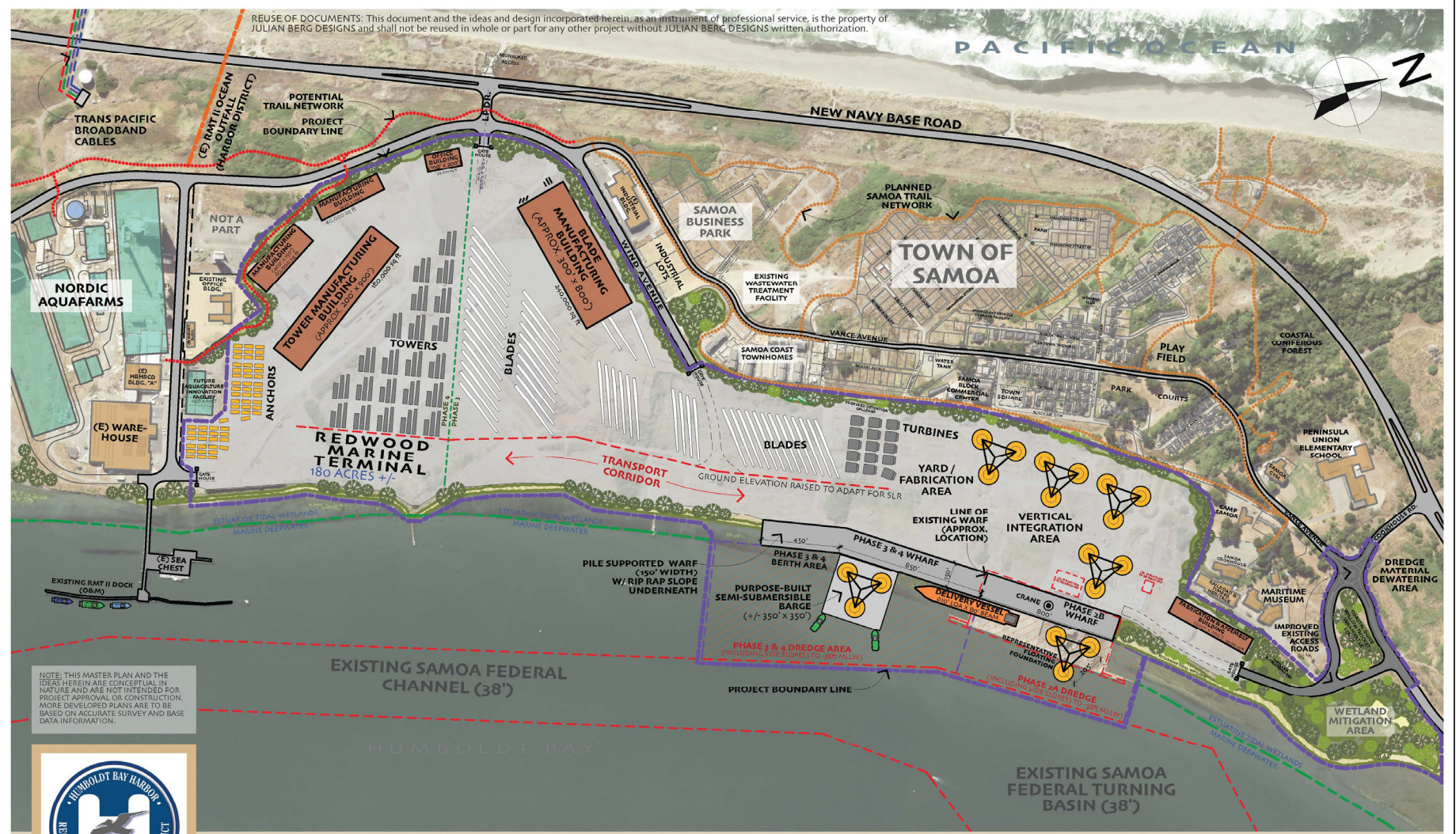


moffatt & nichol

HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL CONCEPTUAL MASTER PLAN

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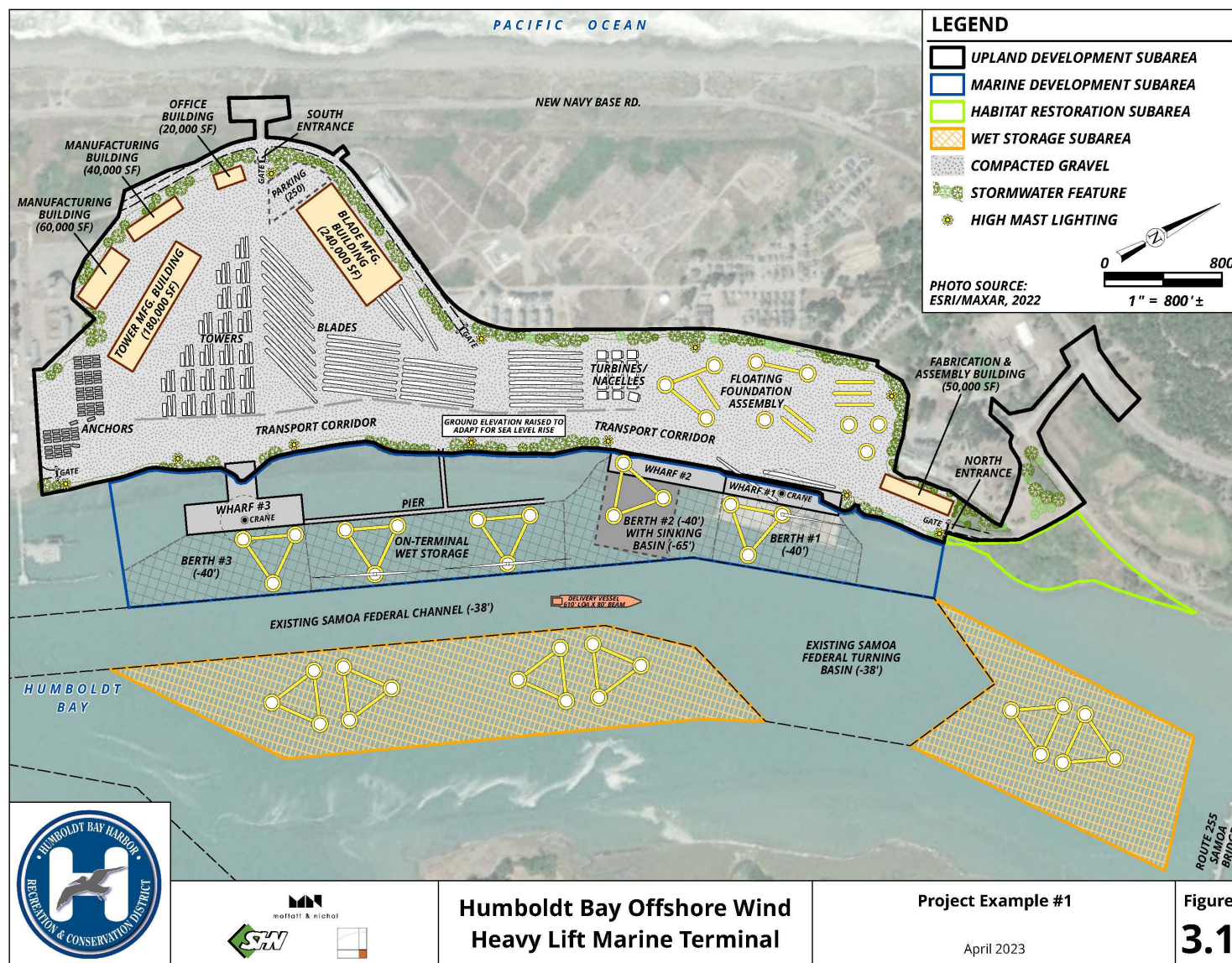
moftatt & nichol

0' 200' 500' 1,000'

HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL CONCEPTUAL MASTER PLAN

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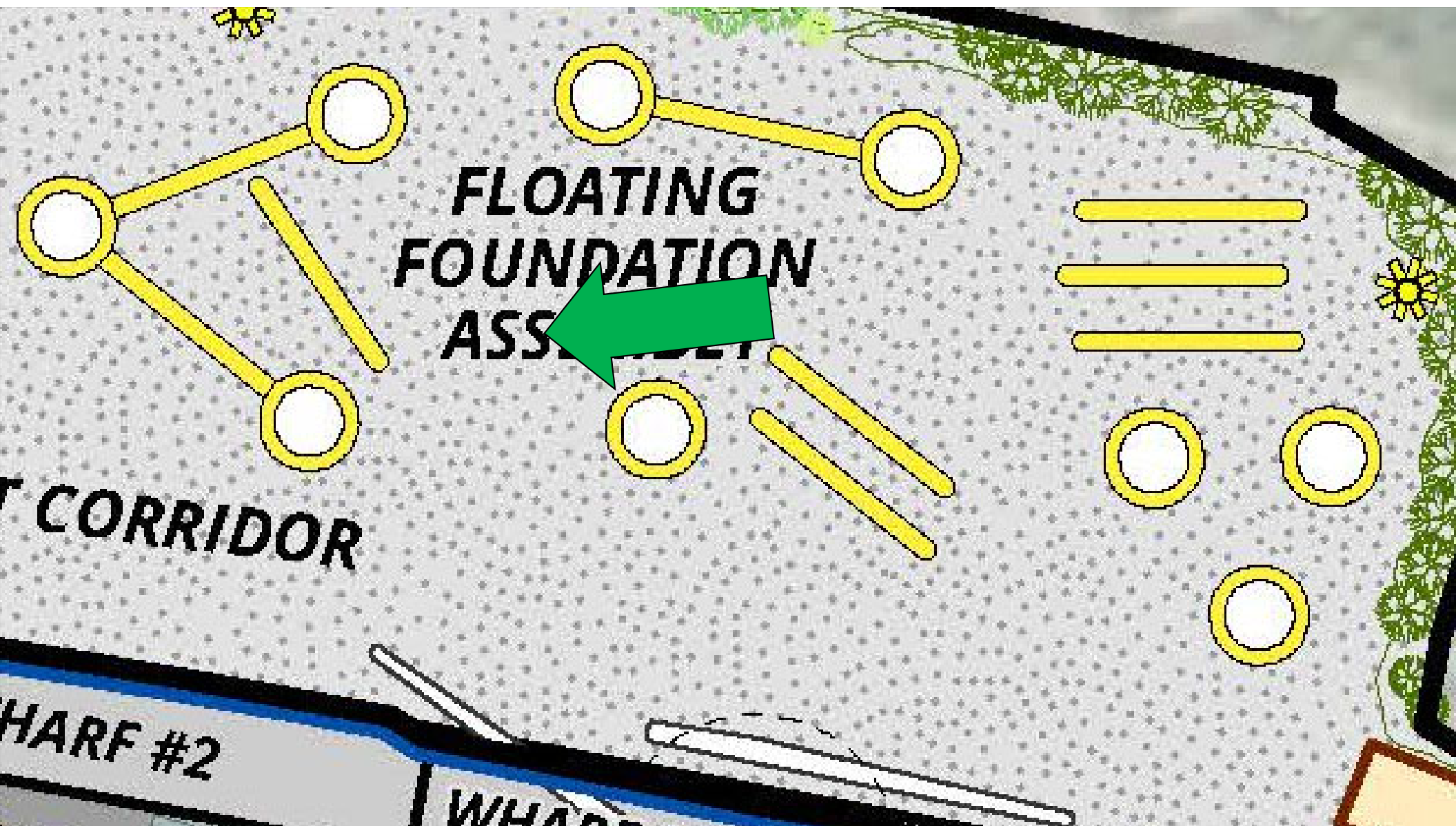


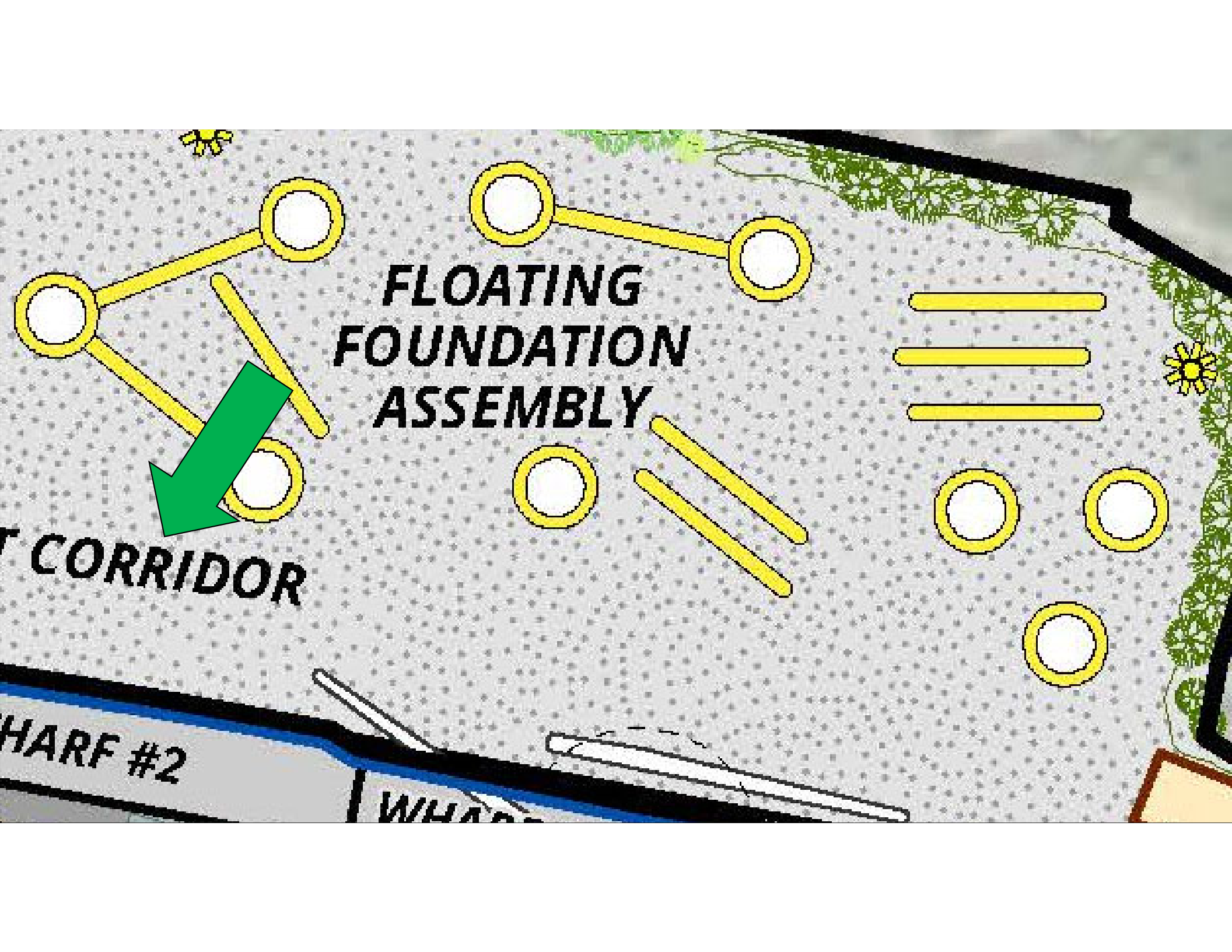
MANUFACTURE
BUILD
(60,000



CREATE







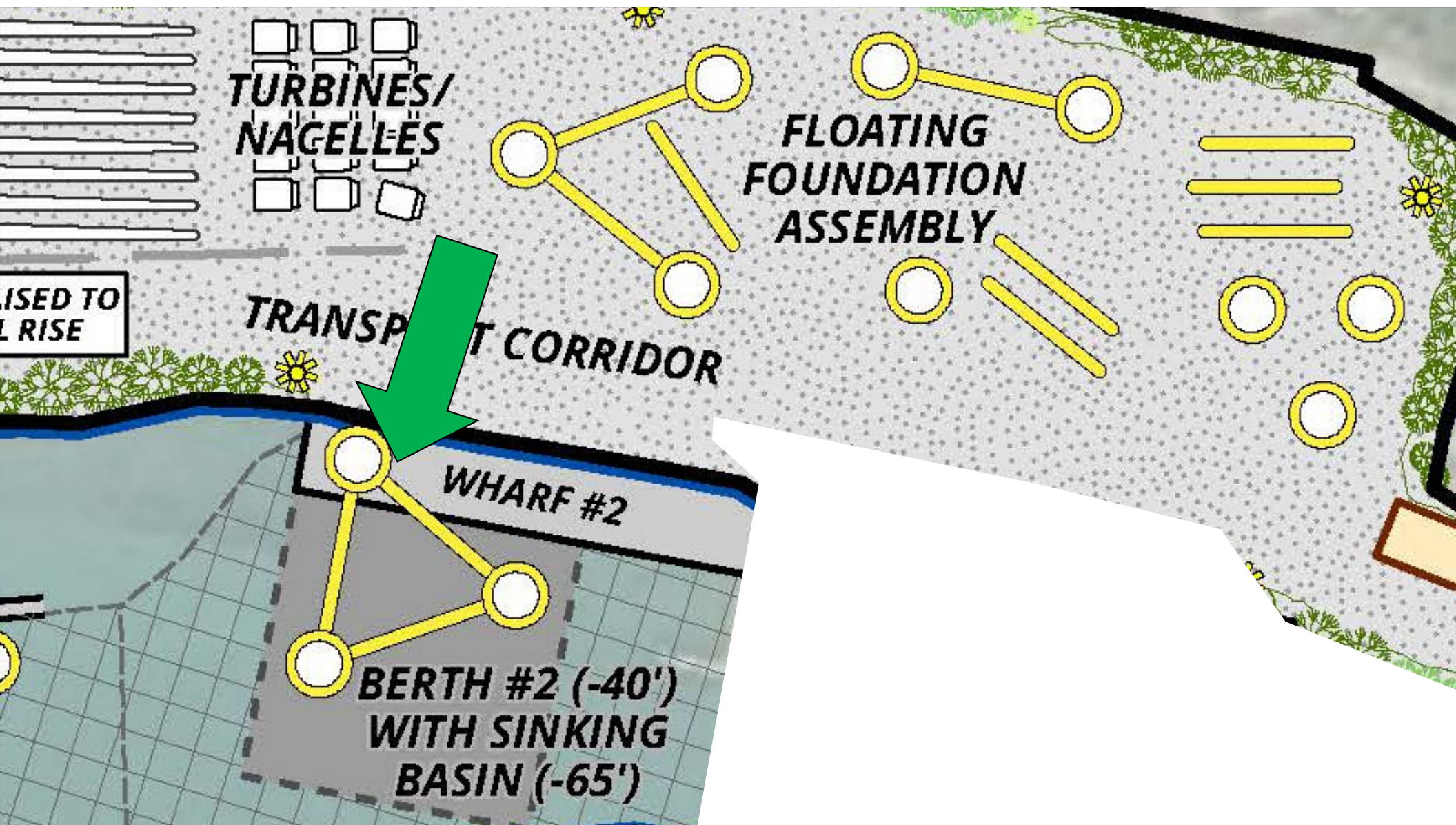
The diagram illustrates a floating foundation assembly on a grey, dotted surface. It features several yellow circles connected by yellow lines, forming a network. A large green arrow points from this network towards the bottom left. To the right, there are three horizontal yellow bars and two parallel yellow lines. Further right, there are four more yellow circles. At the bottom left, a blue line represents a water body, with a grey area labeled 'WHARF #2' and a white area labeled 'WHARF'.

FLOATING FOUNDATION ASSEMBLY

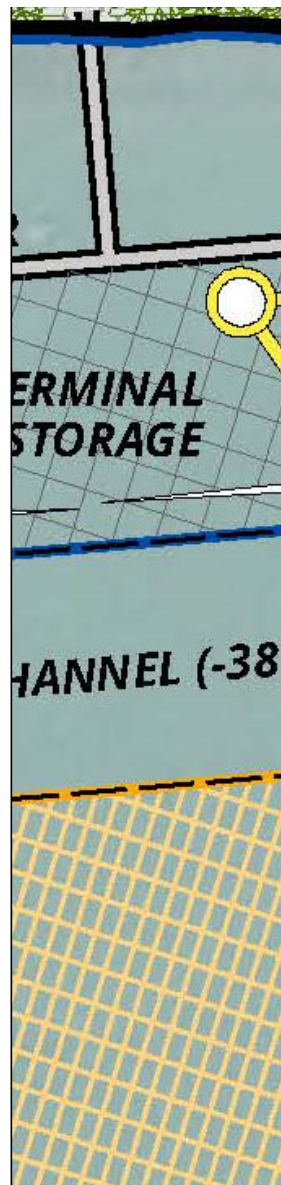
T CORRIDOR

WHARF #2

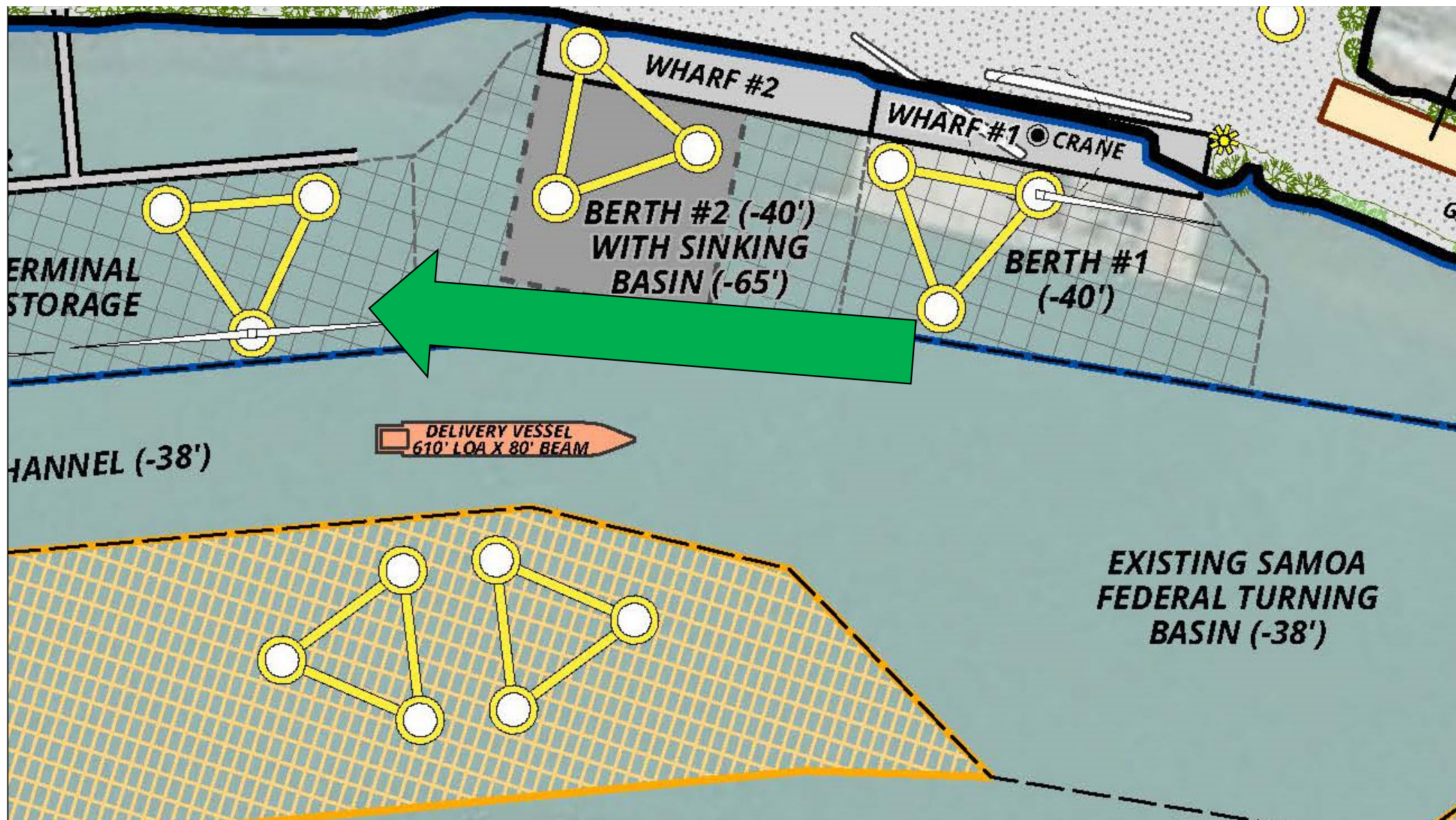
WHARF









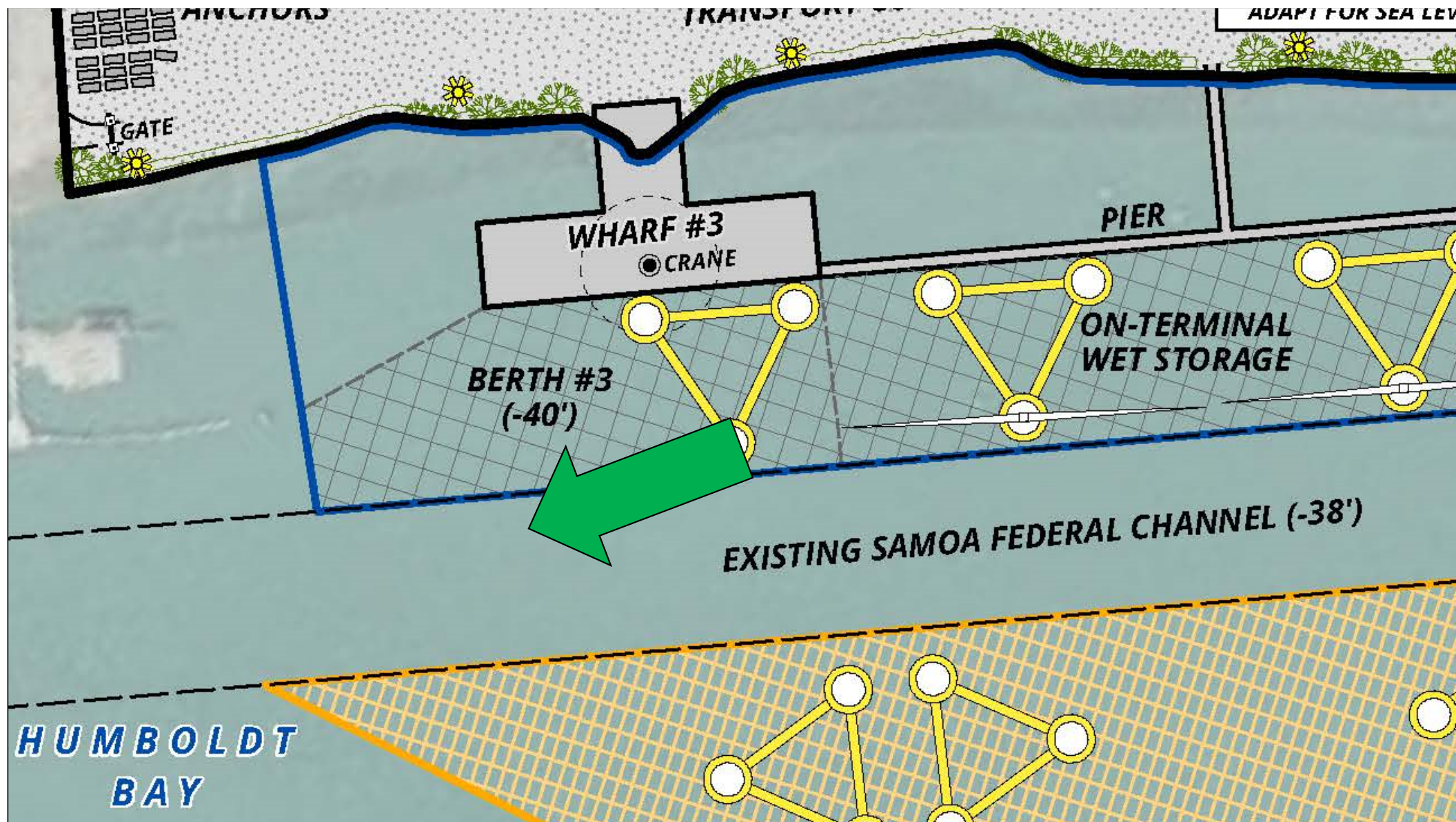


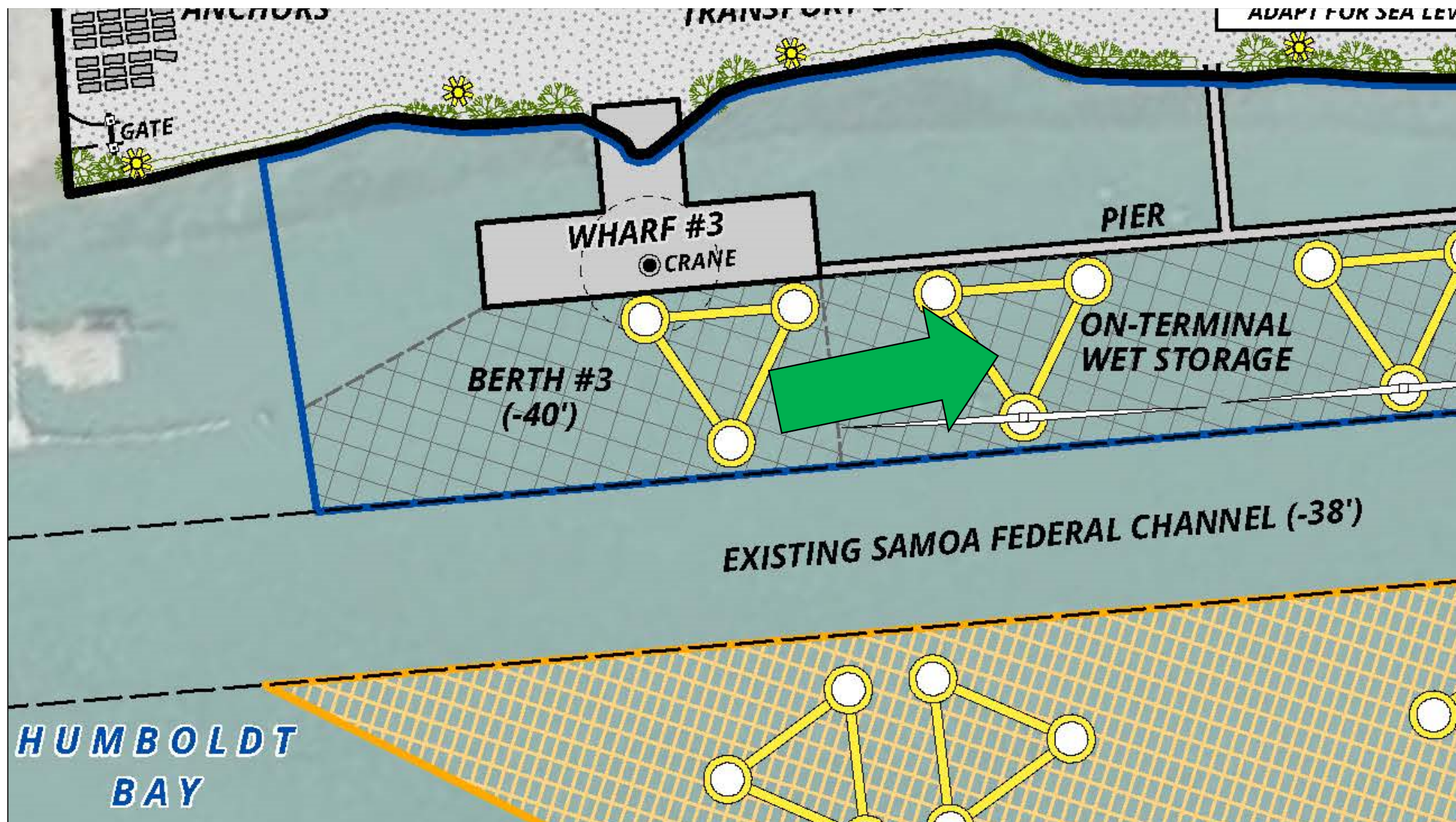
PIER

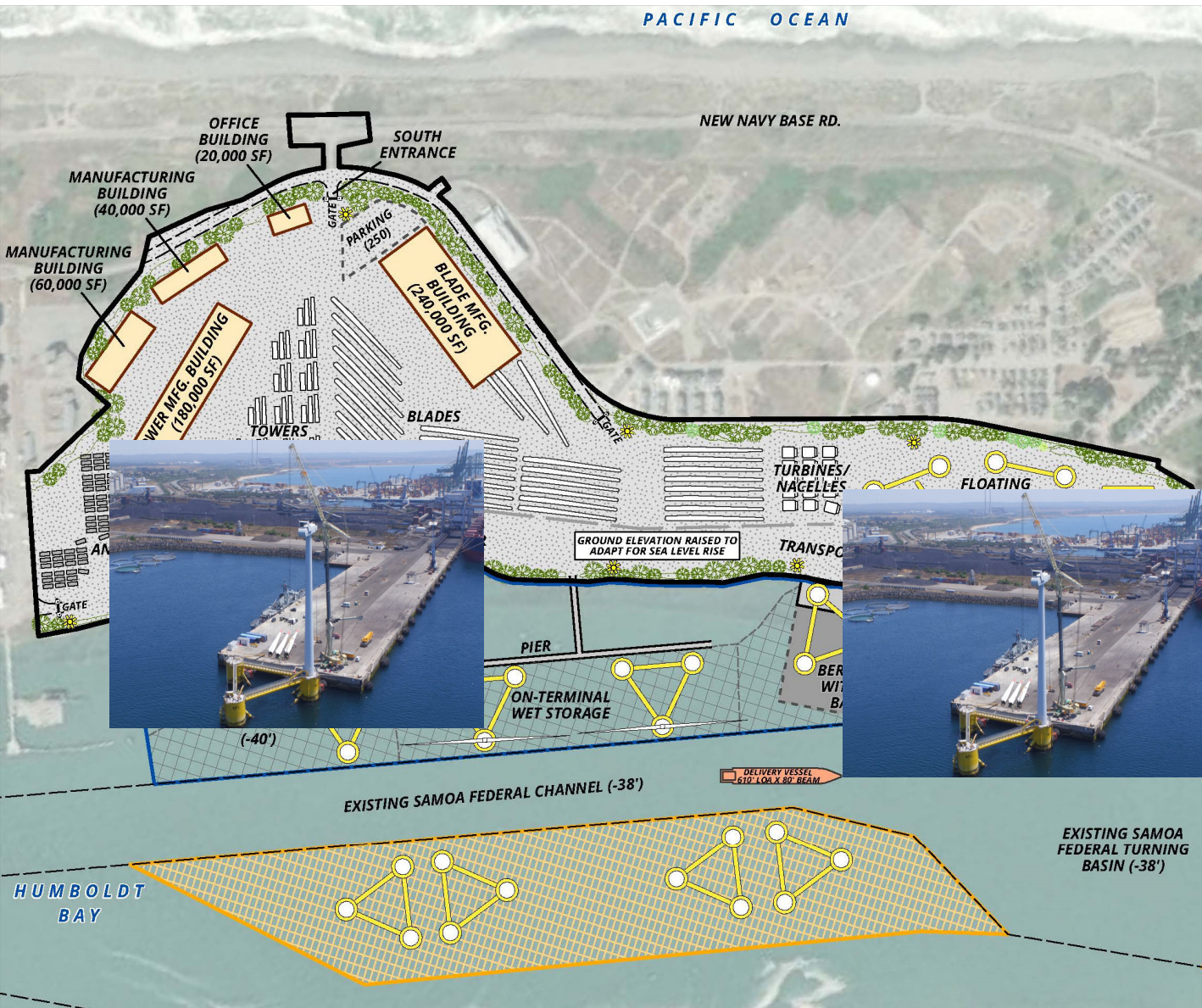
**ON-TERMINAL
WET STORAGE**

SAMOA FEDERAL CHANNEL (-38')

**DELIVERY V
610' LOA X 8'**





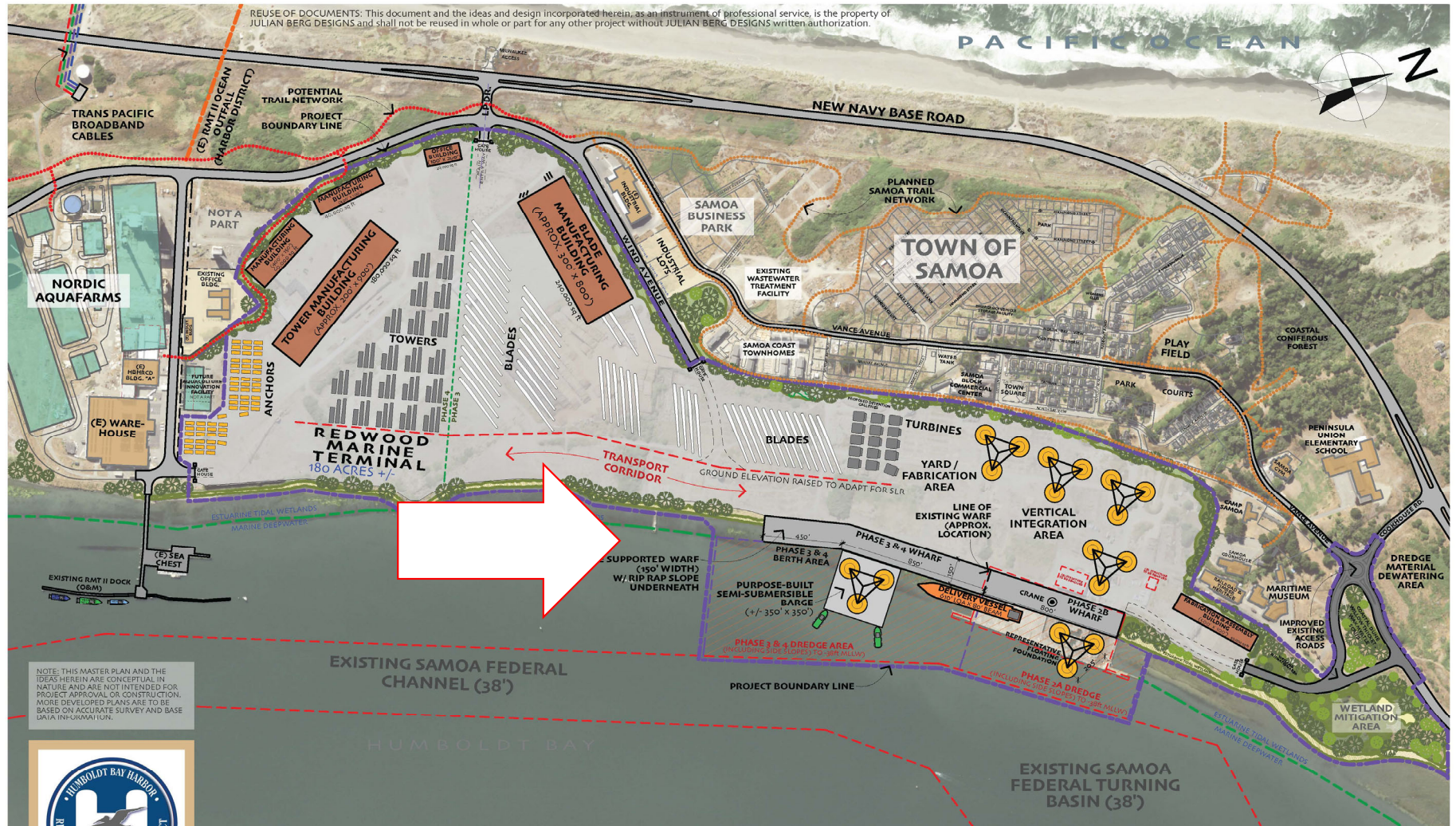


Project Objectives

1. Support State/Fed goals
 - a) S&I Terminal (x3?)
 - b) MF site
 - c) O&M Terminal
2. Redevelop a largely unutilized site
3. Establish Humboldt Bay as a global leader in addressing climate change.
4. Build to green standards: GHG, onsite energy, buildings, electrification of terminal, etc.
5. SLR

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PACIFIC OCEAN



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0' 200' 500' 1,000'

HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL CONCEPTUAL MASTER PLAN

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Summary of Progress to Date

- Topographic and Hydrographic Surveys
- Geotechnical Investigation (preliminary)
- Cultural Surveys
- Wetland Delineations and Terrestrial Biological Surveys
- Marine Resources and Aquatic Habitat Assessments
- Phase I Environmental Site Assessment (hazardous materials)
- Dredge Sediment Characterization
- Basis of Design Report
- Traffic Analyses
- Power/electrical/stormwater/utility options evaluations
- Shoreline Planning and Sea Level Rise Analyses





Anticipated Project Benefits

- Humboldt will be a leader in energy decarbonization and addressing climate change.
- Vast diversity of new jobs and economic development.
- Redevelopment and revitalization of vacant/blighted site.
- Stimulation of other projects around the bay.
- Opportunity to create a green port, electrification, onsite renewable energy generation, green building materials, etc.
- Opportunity to implement a first-of-its-kind project in preparing for sea level rise.
- Stimulating a 12-month all-season port through increased ship traffic and more attention from the USACE for dredging.
- New revenue to the Harbor District that can be used for other purposes, such as dredging, conservation, and recreation.
- Tourism?



Plans for 2023

- Identify strategy to support as many call areas as possible
- Determine needs/options for wet storage
- Stakeholder and public engagement
- CEQA
- NEPA
- Permits
- >30% design
- Channel tow-out modeling
- Finalize field surveys
- Acquire construction funding
- Stimulate additional projects throughout Humboldt Bay

General schedule and opportunities for involvement

- CEQA NOP – April 2023
- Stakeholder meetings throughout 2023 and early 2024
- Regulatory agency meetings throughout 2023 and early 2024
- Public meeting(s) during 2023
- Complete CEQA/NEPA/permits in 2024







youtube.com/@humboldtбайharbordistrict

Thank You

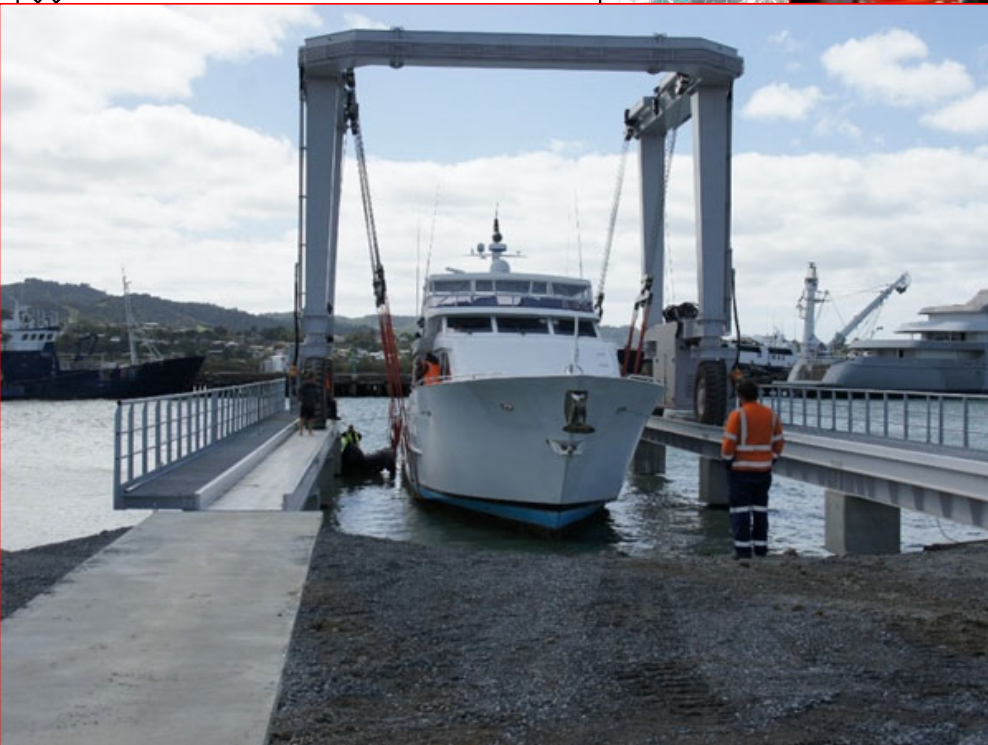
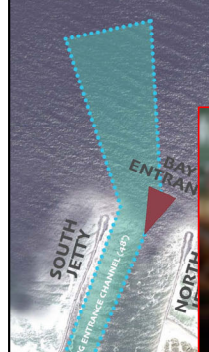


BAYWIDE MASTER PLANNING

POTENTIAL PROJECTS

-  = Vertical Assembly Site
-  = OSW Component Manufacturing Site
-  = O&M Site
-  = Workforce Training Center
-  = Upgraded Ship Repair
-  = Battery Storage


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HUMBOLDT BAY OFFSHORE WIND MULTIPURPOSE MARINE TERMINAL

OVERALL BAY VIEW

LEGEND

-  FEDERAL LANDS
-  POTENTIAL PROJECT SITES
-  INDUSTRIALLY ZONED LANDS ***
-  HUMBOLDT OFFSHORE WIND TERMINAL PROJECT SITE

ARCATA & CAL POLY HUMBOLDT (5 MILES)

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Thank You



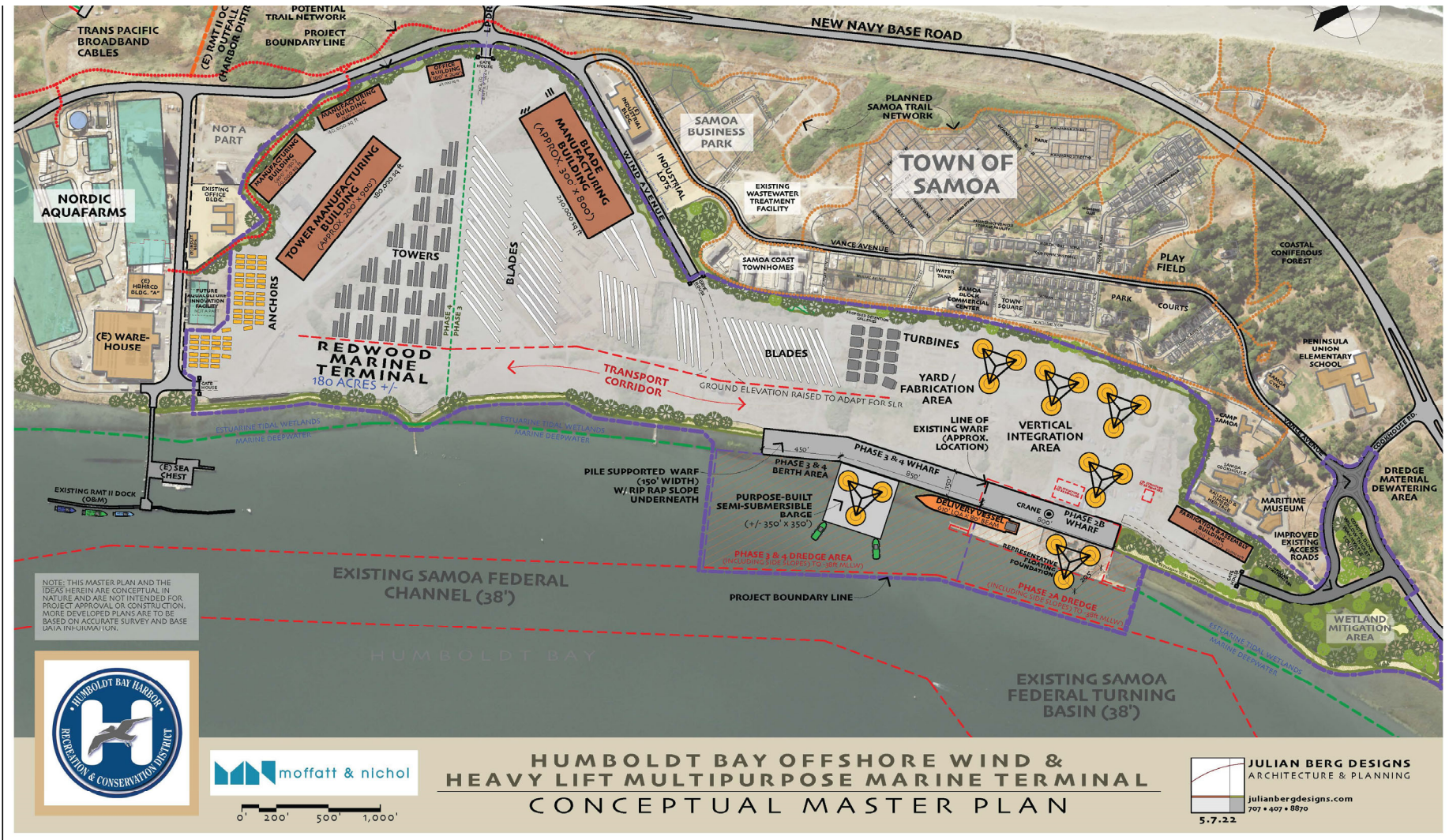
Frequently Asked Questions



Is the District Operating a Wind Farm?

No

This is the District's project



This is not the District's project



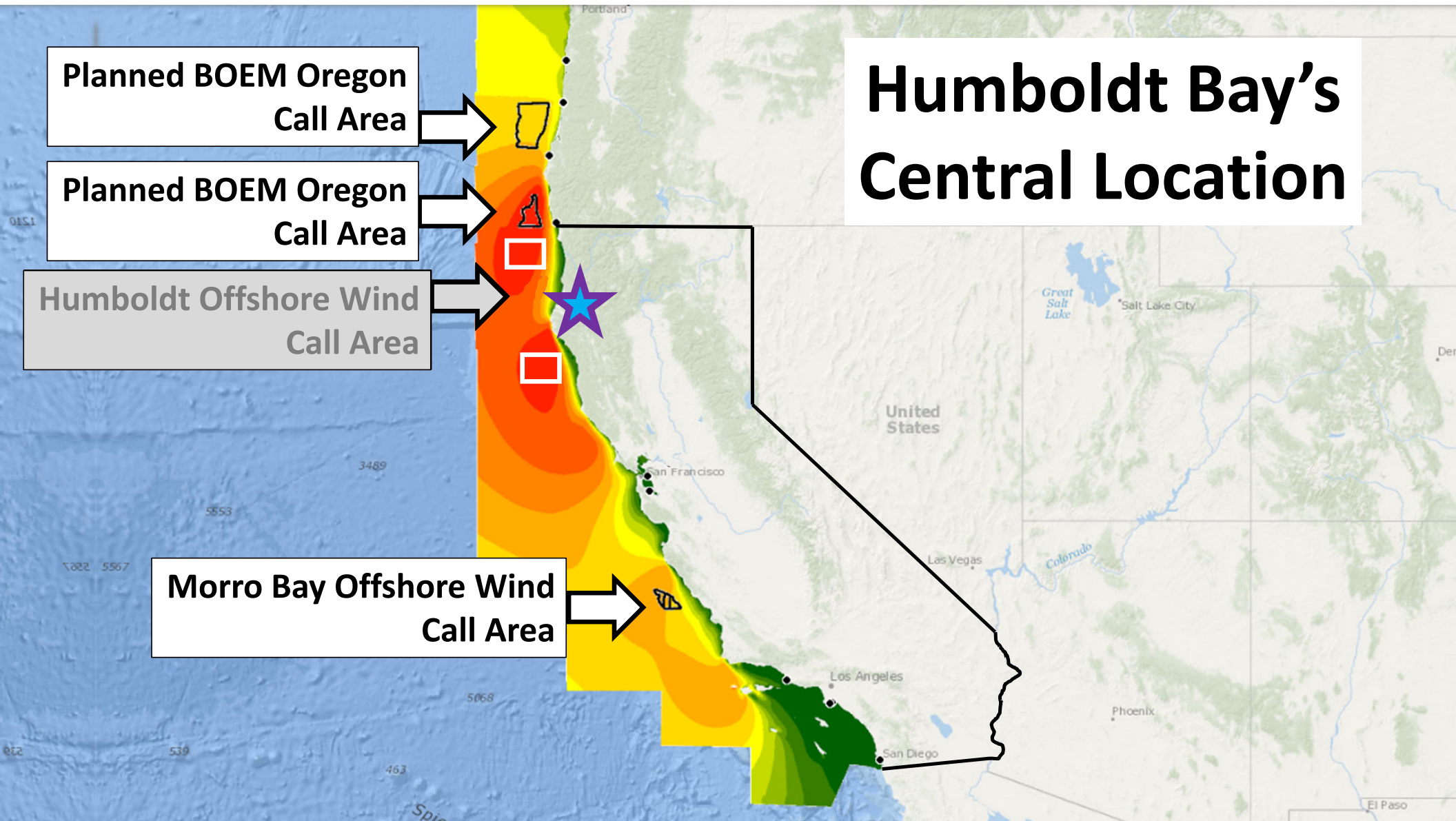
**Planned BOEM Oregon
Call Area**

**Planned BOEM Oregon
Call Area**

**Humboldt Offshore Wind
Call Area**

**Morro Bay Offshore Wind
Call Area**

Humboldt Bay's Central Location





Offshore wind farm operations



Offshore wind component
manufacturing and deployment



BOEM



Ports and Port Operators

Example: Opening a new brewery



Opening a new brewery



**Factory across the country that
manufactures brewery equipment**



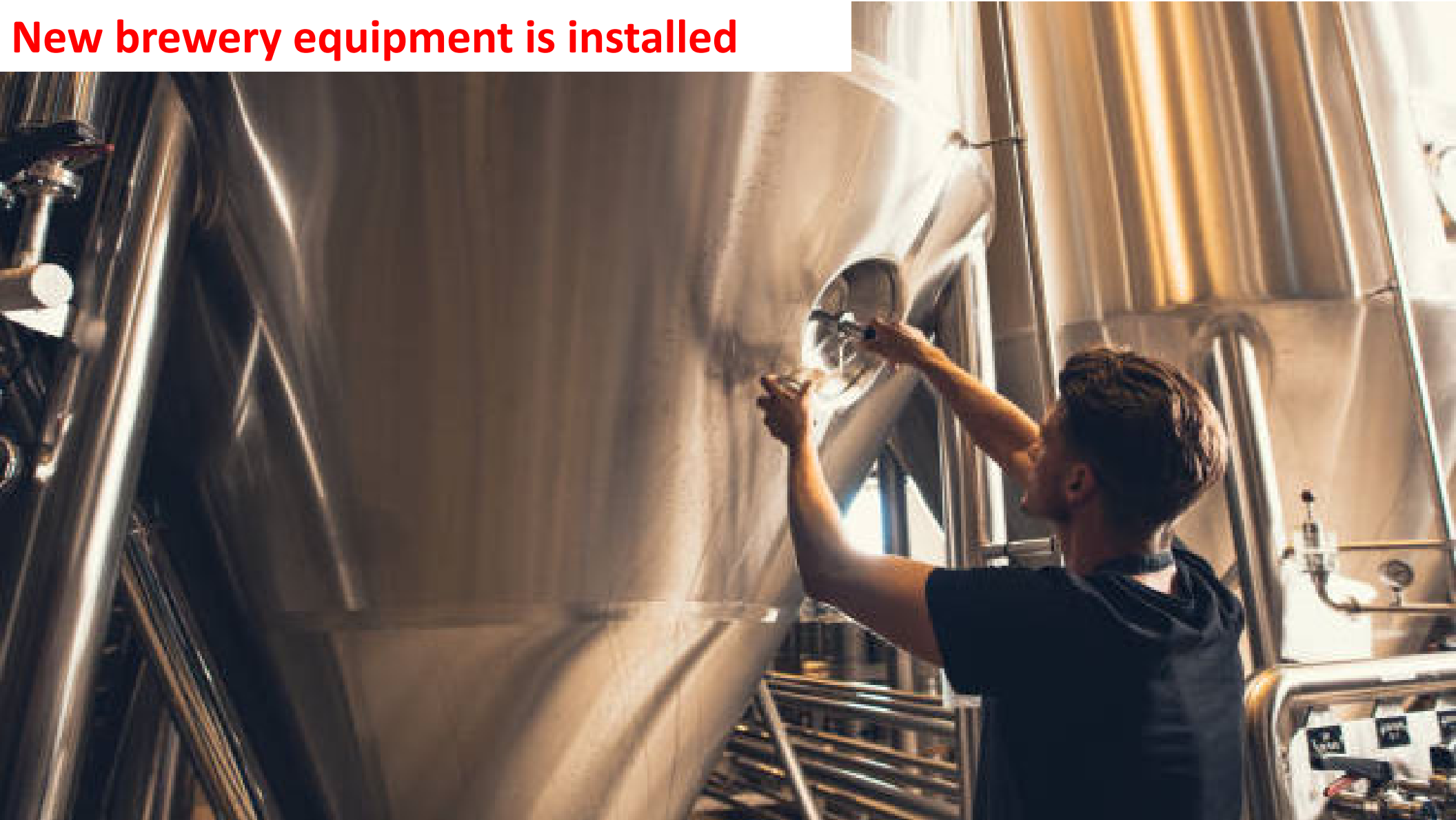
New brewery equipment is shipped



New brewery building is constructed



New brewery equipment is installed



Project #1: Build the factory than produces the equipment





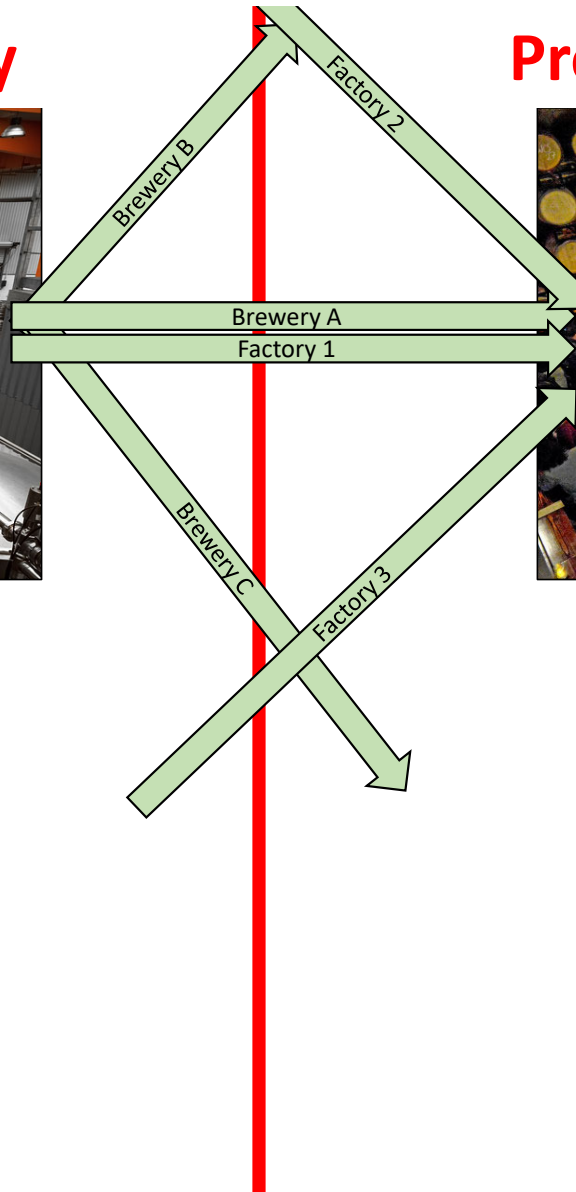
Project #2: Build the brewery



Project #1: Build a factory



Project #2: Build a Brewery



Project #1: Build a factory



Unique set of impacts

Unique set of permits

Unique public engagement process

Project #2: Build a Brewery



Unique set of impacts

Unique set of permits

Unique public engagement process

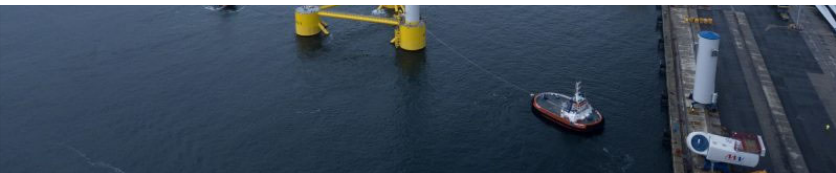
Project #1: Build a factory



Project #1: Build a factory



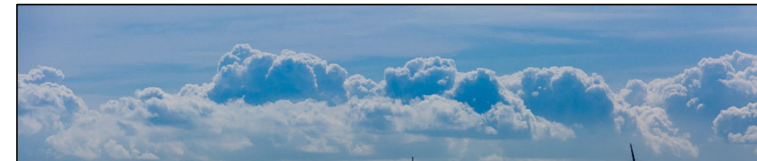
HARBOR DISTRICT



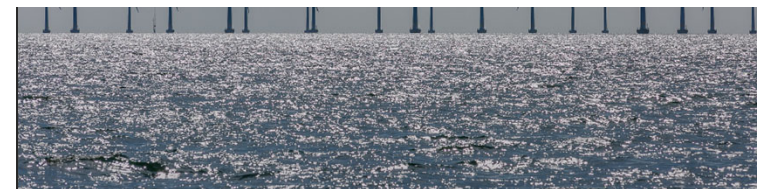
Project #2: Build a Brewery



Project #2: Build a wind farm



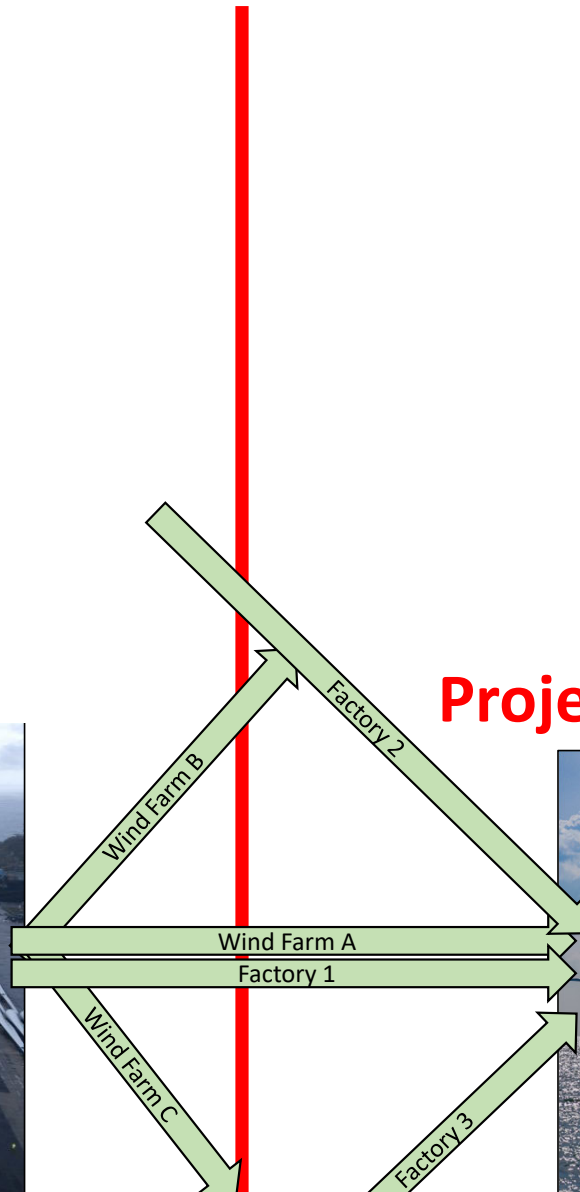
BOEM



Project #1: Build a factory



Project #2: Build a wind farm



Unique set of impacts

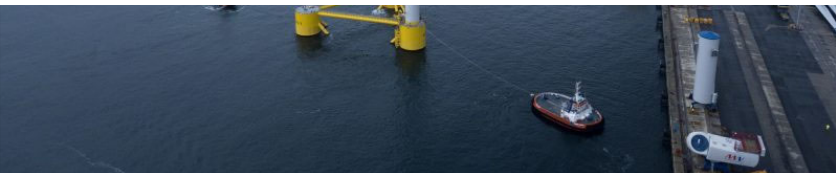
Unique set of permits

Unique public engagement process

Project #1: Build a factory



HARBOR DISTRICT

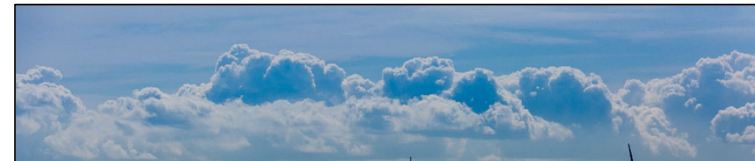


Unique set of impacts

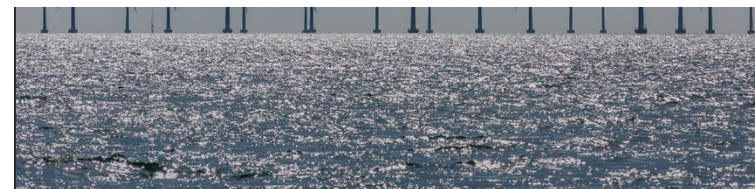
Unique set of permits

Unique public engagement process

Project #2: Build a wind farm

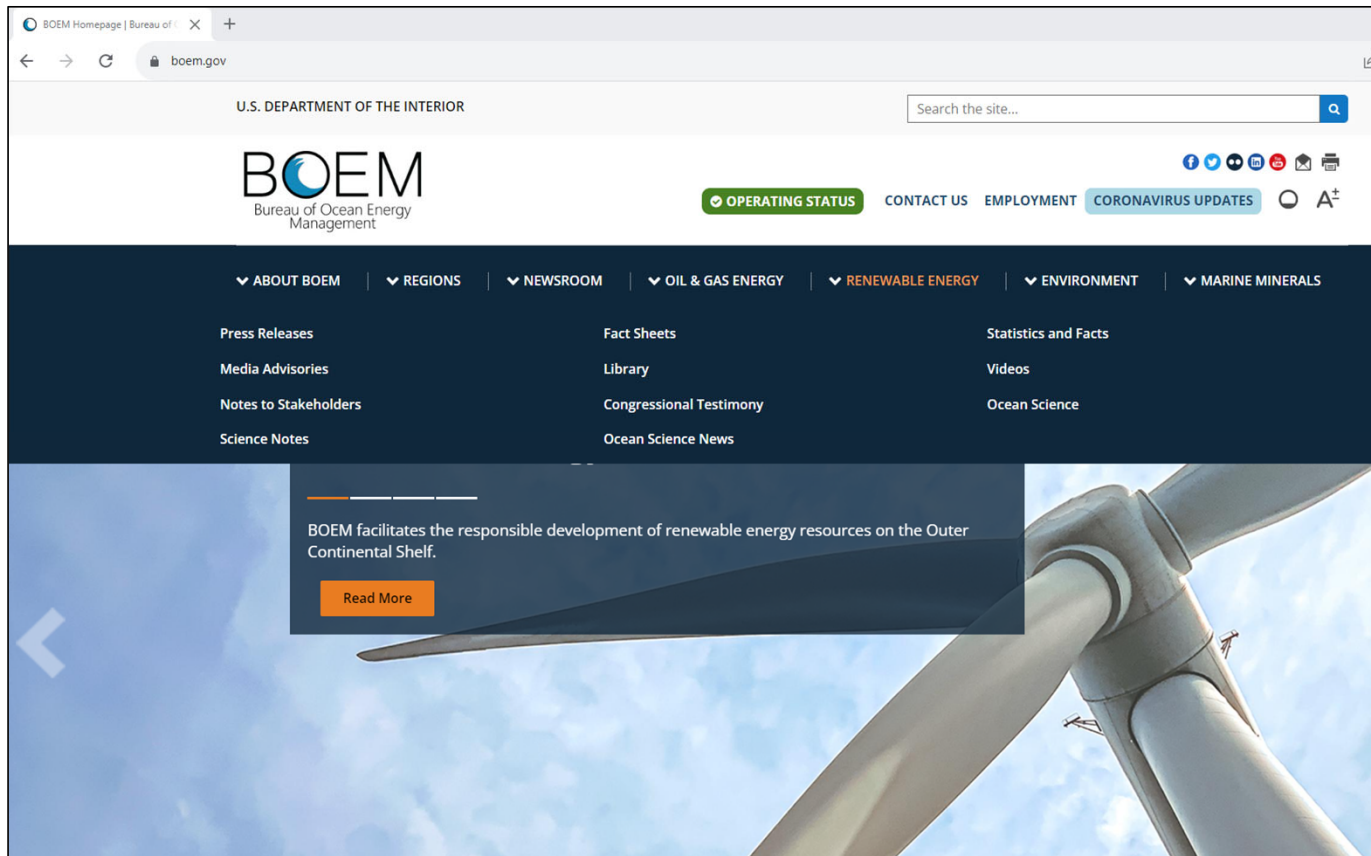


BOEM



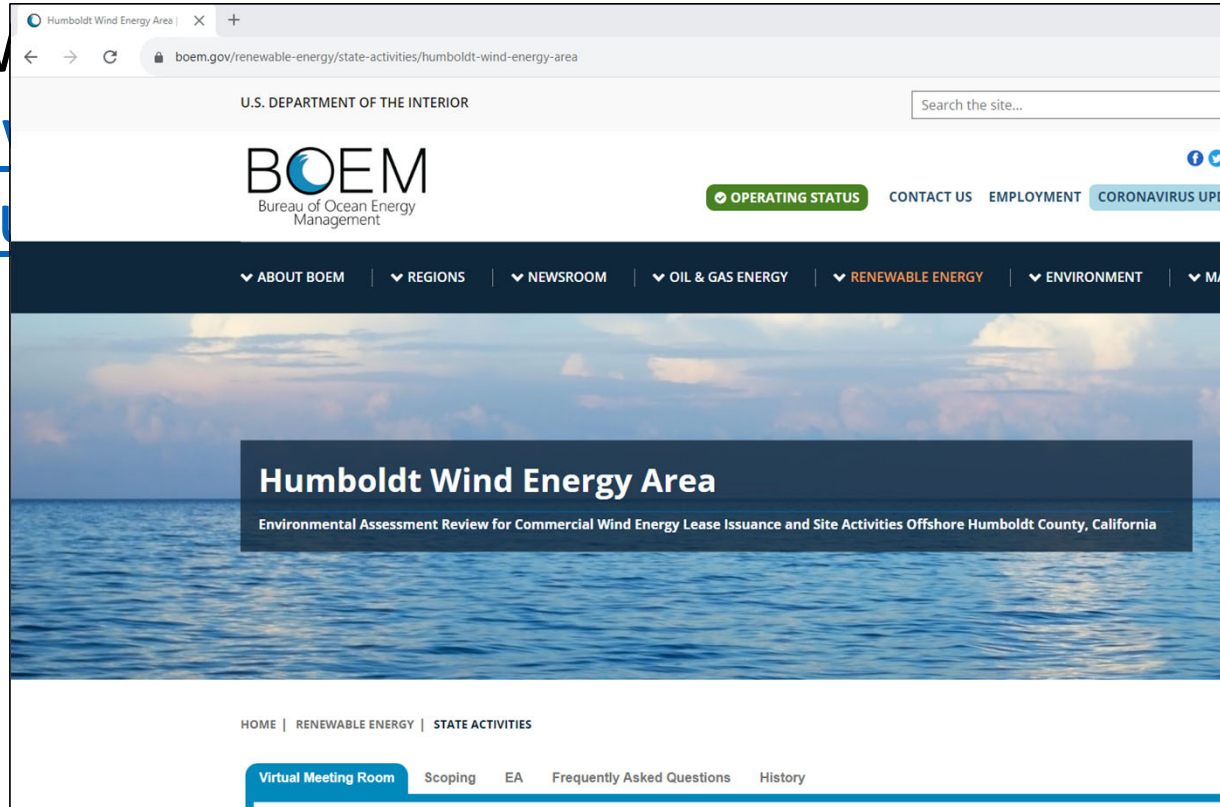
How to get involved in BOEM's project

- <https://www.boem.gov/>



How to get involved in BOEM's project

- Humboldt W
- <https://www.boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area>



Humboldt Wind Energy Area | X +

boem.gov/renewable-energy/state-activities/humboldt-wind-energy-area

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Humboldt Wind Energy Area

Environmental Assessment Review for Commercial Wind Energy Lease Issuance and Site Activities Offshore Humboldt County, California

HOME | RENEWABLE ENERGY | STATE ACTIVITIES

Virtual Meeting Room

Scoping

EA

Frequently Asked Questions

History

Is Crowley Operating a Wind Farm?

No

Crowley is a port operator.



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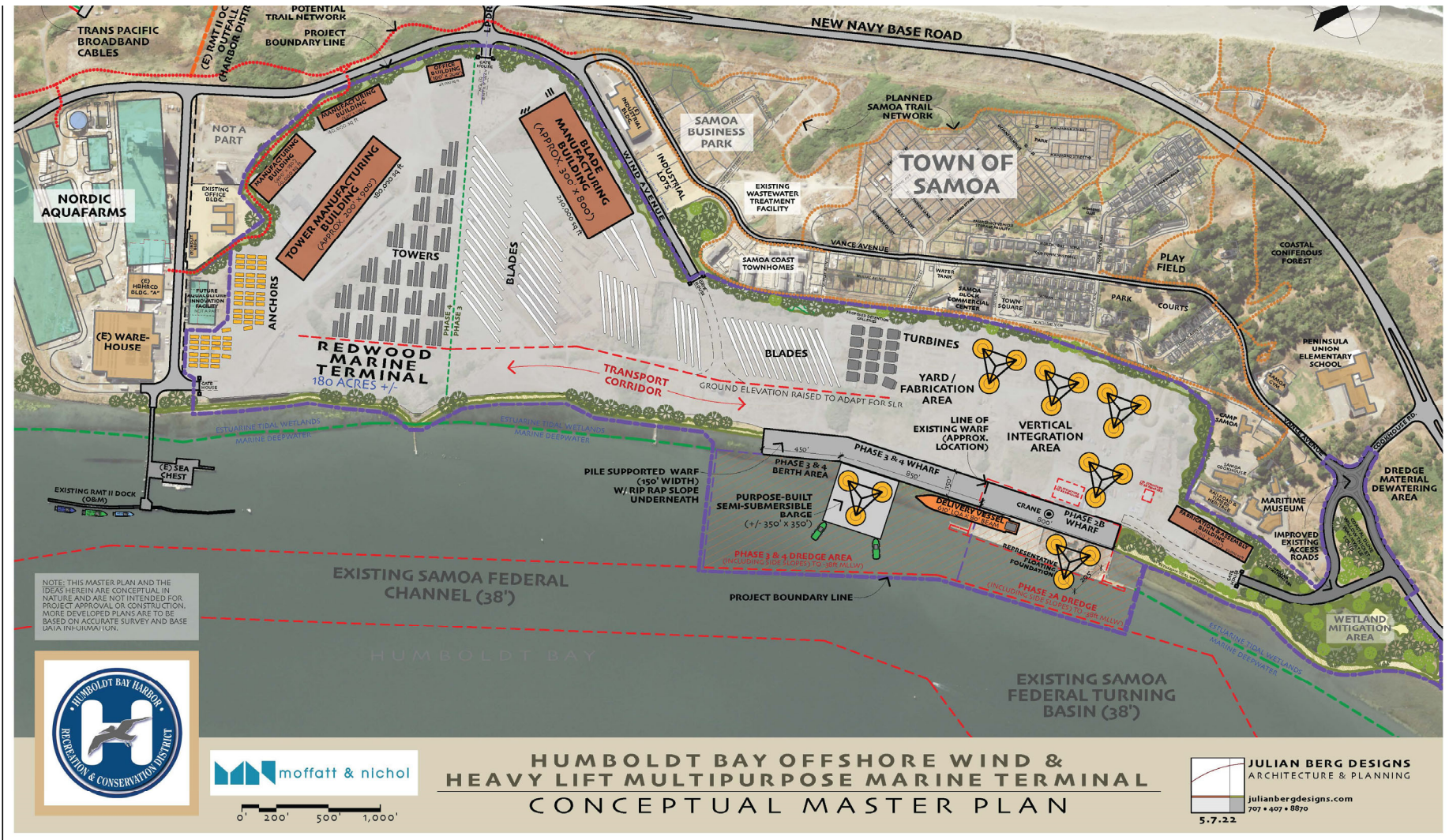
Worldwide Logistics, Government, Marine and Energy Solutions





What about the “Community Benefits”
program?

This is the District's project



This is not the District's project

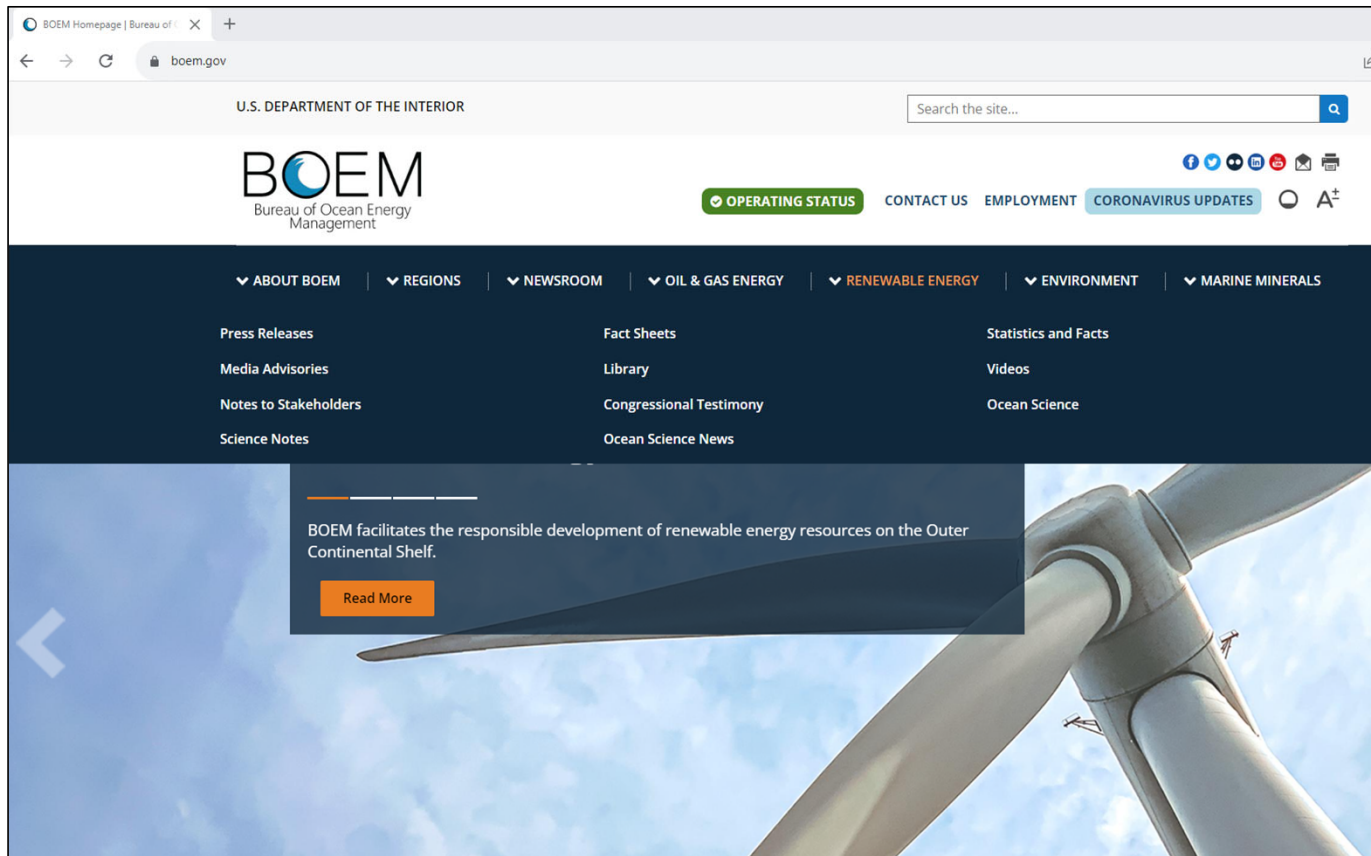


The BOEM process includes a “Community Benefits” component.



How to get involved in BOEM's project

- <https://www.boem.gov/>





Recent reports and publications

Our latest reports

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Offshore wind energy

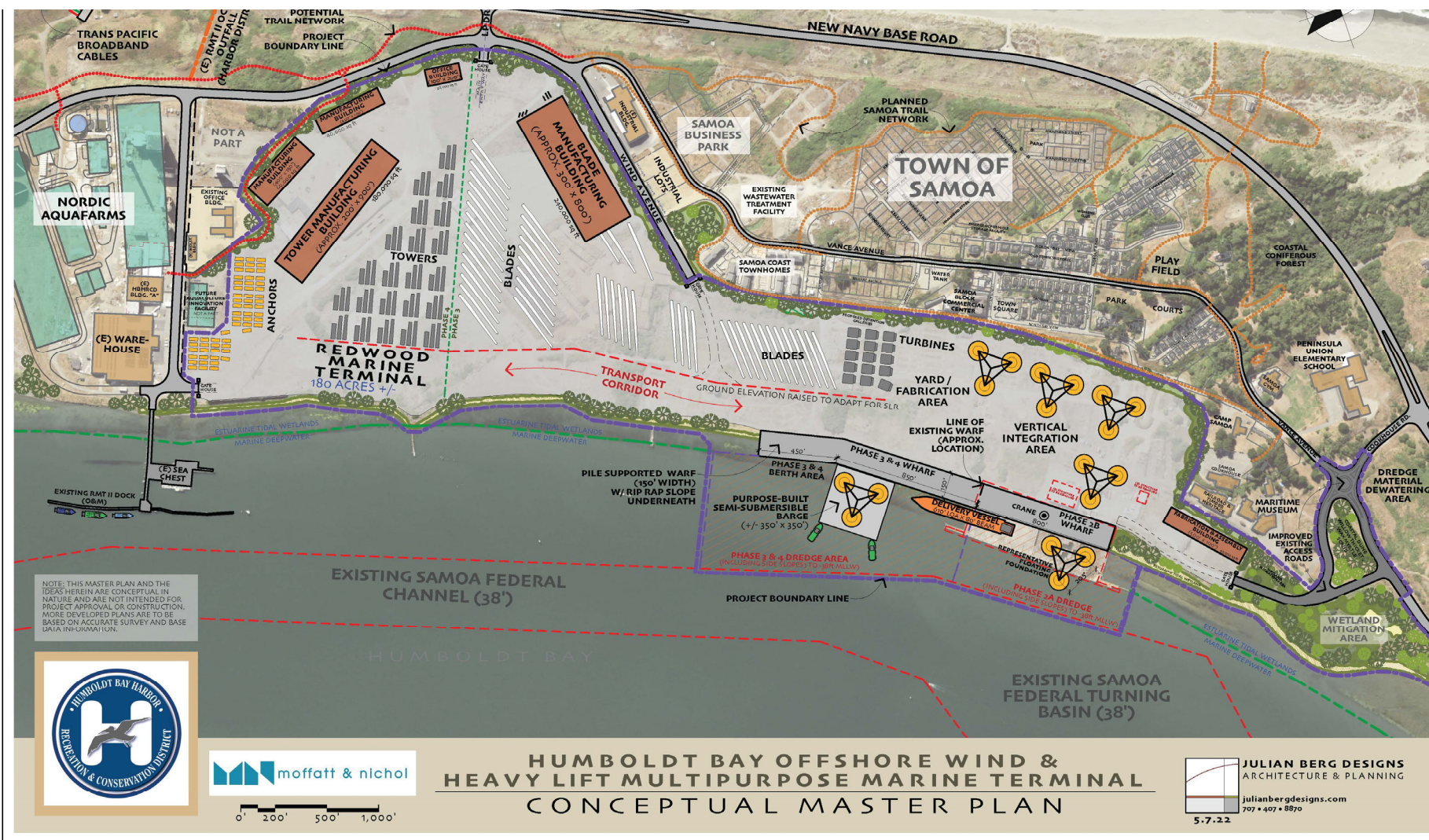
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Does this project include Community Benefits?



Yes

Anticipated Project Benefits

- Humboldt will be a leader in energy decarbonization and addressing climate change.
- Vast diversity of new jobs and economic development.
- Redevelopment and revitalization of vacant/blighted site.
- Stimulation of other projects around the bay.
- Opportunity to create a green port, electrification, onsite renewable energy generation, green building materials, etc.
- Opportunity to implement a first-of-its-kind project in preparing for sea level rise.
- Stimulating a 12-month all-season port through increased ship traffic and more attention from the USACE for dredging.
- New revenue to the Harbor District that can be used for other purposes, such as dredging, conservation, and recreation.
- Tourism?



HUMBOLDT BAY HARBOR, RECREATION, & CONSERVATION DISTRICT

A Special District of the State of California

[About](#)[Meetings & Notices](#)[Recreation](#)[Conservation](#)[Harbor/Port](#)[Conditions](#)[Contact](#)

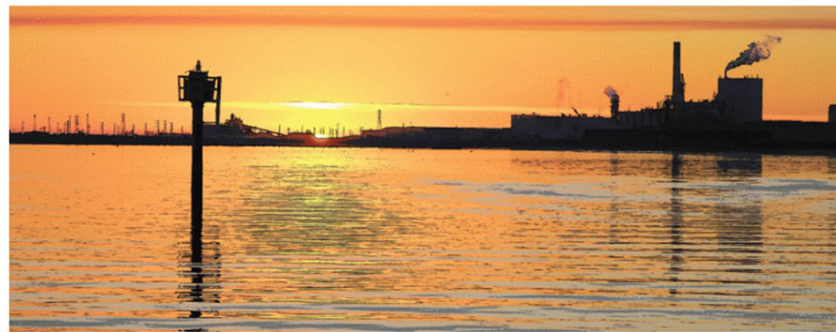
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Meetings & Agendas

- March 9, 2023 Development Association Special Meeting Agenda
- March 9, 2023 Regular Board Meeting Agenda
- February 9, 2023 Regular Board Meeting Agenda
- January 18, 2023 Humboldt Bay Development Association Agenda
- January 12, 2023 Amended Regular Board Meeting Agenda
- January 12, 2023 Regular Board Meeting Agenda
- January 7, 2023 Special Board Meeting Agenda
- December 21, 2022 Humboldt Bay Development Association Agenda
- July 20th 2022 HBDA-Agenda Packet
- July 14th 2022 Agenda
- July 14th 2022 Agenda Packet
- April 27, 2022 Special Board Meeting Agenda
- April 14, 2022 Regular Board Meeting Agenda
- March 10, 2022 Regular Board Meeting Agenda
- February 10, 2022 Regular Board Meeting Agenda
- January 13, 2022 Regular Board Meeting Agenda
- December 9, 2021 Regular Board Meeting Agenda
- November 4, 2021 Special Board Meeting Agenda
- October 14, 2021 Regular Board Meeting

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Current Items



Public Comment Period for offshore Wind Energy in Humboldt Bay

Please find attached a [link](#) to the Federal Register seeking public comment on the Pacific Coast Port Access Route Study, PAC-PARS. There are specific inquiries within the Federal Register pertaining to the BOEM Wind Energy Call Area offshore of Humboldt Bay. **Comment period closes May 26, 2022.**

Request for Qualifications:

Redwood Marine Multipurpose Terminal Replacement Project - Design and Permitting

[Access
Me](#)

Purpose of the HBHRCD

- It's all related to community benefits

CHAPTER 1283

An act to provide for the establishment of the Humboldt Bay Harbor, Recreation, and Conservation District; to provide for the calling of elections therefor; describing the powers, duties, and functions thereof, authorizing the district to borrow money and issue bonds for district purposes; to provide means of raising revenues for the operation, maintenance and bond redemption of the district; and to provide for the transfer to such district of tide and submerged lands.

[Approved by Governor September 17, 1970 Filed with
Secretary of State September 17, 1970]

The people of the State of California do enact as follows:

CHAPTER 1. GENERAL PROVISIONS

SECTION 1. This act shall be known and may be cited as the Humboldt Bay Harbor, Recreation, and Conservation District Act. The district created in accordance with the provisions of this act is a public corporation created for the purposes set forth herein.

SEC. 2. It is hereby declared to be the policy of the State of California to develop the harbors and ports of this state for multiple purpose use for the benefit of the people. A necessity exists within Humboldt County for such development. Because of the separate cities and unincorporated populated areas in the area hereinafter described, only a specially created district can operate effectively in developing the harbors and port facilities, and in developing and protecting the natural resources of the area. Because of the unique problems pre-

bond, and salaries of members of the board, salaries of subordinate officers or employees, audit of books, statement of finances, and meetings of the board shall be governed by the provisions of Sections 6055, 6056, 6060, 6061, 6062 and 6063 of the Harbors and Navigation Code.

SEC. 17.5. Commissioners shall be subject to recall pursuant to the provisions of Chapter 2 (commencing with Section 27200) of Division 14 of the Elections Code.

SEC. 18. Upon the establishment of the district, the Cities of Eureka and Arcata may convey to the district all their right, title and interest in and to such tidelands and submerged lands, together with any improvements or facilities therein or thereon, upon and subject to such terms and conditions as shall be mutually agreed upon by the district and the cities, including reasonable commitments by the district to pay to the cities the cost of maintenance or improvement of such tidelands and submerged lands during such time as the same were subject to the jurisdiction and control of the cities. Nothing herein contained shall be construed to impose any obligation upon the district to accept the conveyance of any tidelands or submerged lands from the Cities of Eureka and Arcata. Upon establishment of the district, the state shall grant to the district any ungranted tidelands and submerged lands owned by the state located within the boundaries of the district. Thereafter the title to such lands shall reside in the district, and the district shall hold such lands in trust for the uses and purposes and subject to the terms and conditions which are set forth in this act.

Article 2 Powers and Duties of the Board and of the District

SEC. 19. The board of commissioners shall draft a master plan for harbor and port improvement and for the use of all of the tidelands and submerged lands which shall be conveyed to the district pursuant to the provisions of this act and other laws or areas subject to its jurisdiction. The board may from time to time modify the master plan by a majority vote of the board.

The provisions in the master plan shall not override or supersede any local existing zoning ordinance which was in effect on the effective date of this act; provided, that if any local zoning ordinance is repealed, or expires, or becomes nonoperative for any reason, thereafter the provisions of the master plan adopted by the board shall control as to all lands and waters under the jurisdiction of the district.

The district shall improve the Humboldt Bay Harbor for navigation and commerce through maintenance and construction of channels, shipways, berths, anchorage places, turning basins, breakwaters, bulkheads, wharves, processing plants, warehouses, roads, spur tracks or beltline railways, and any other work that is deemed necessary that would not otherwise be accomplished by other public or private agencies.

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The district shall plan, designate, and protect wildlife habitats, establish open space areas and areas provided for recreational use with open access for the public, protect, conserve, supervise, and improve the wildlife and fish resources of, and control and enhance the aesthetic appearance of the area.

The district shall regulate the use of Humboldt Bay by control of pollution, dredging, and filling within the area subject to its jurisdiction under the provisions of Section 5.5.

The district shall work closely with the planning agencies of the adjacent corporate bodies in the exercise of such powers and duties.

SEC. 20. The board shall establish a fiscal year for its operations and shall prepare and adopt a budget for each fiscal year.

At the end of each fiscal year or as soon as possible after the end of each fiscal year, the board shall make a complete report of the affairs and financial condition of the district for the preceding fiscal year, which shall show the sources of all receipts and the purposes of all disbursements during the year. The report shall be verified by the chairman of the board and the secretary thereof. The board may, at its discretion, use the statement of finances prepared pursuant to Section 17 to satisfy the requirements of this section.

SEC. 21. The board may pass all necessary ordinances and resolutions for the regulation of the district.

The enacting clause of all ordinances passed by the board shall be in substantially the following form:

"The Board of Commissioners of the Humboldt Bay Harbor, Recreation, and Conservation District do ordain as follows:"

All ordinances and resolutions shall be signed by the chairman of the board and attested by the clerk.

All ordinances and resolutions shall be entered in the minutes. All ordinances passed by the board shall be published, within 15 days from the passage thereof, with the names of the members voting for and against them at least once in some daily newspaper of general circulation printed and published in the district.

SEC. 22. Ordinances passed by the board shall not go into effect until the expiration of 30 days from their publication except ordinances ordering or otherwise relating to the following which shall take effect upon their publication.

- (a) An election.
- (b) The adoption of the annual budget.
- (c) The bringing or conducting of suits or actions.
- (d) The condemnation of private property for public use.
- (e) The immediate preservation of the public peace, health or safety, which ordinance shall contain a specific statement showing its urgency and be passed by a two-thirds vote of the board.

SEC. 23. All grants, franchises, leases, permits, rights or privileges shall be made in accordance with such rules and

The district shall plan, designate, and protect wildlife habitats, establish open space areas and areas provided for recreational use with open access for the public, protect, conserve, supervise, and improve the wildlife and fish resources of, and control and enhance the aesthetic appearance of the area.

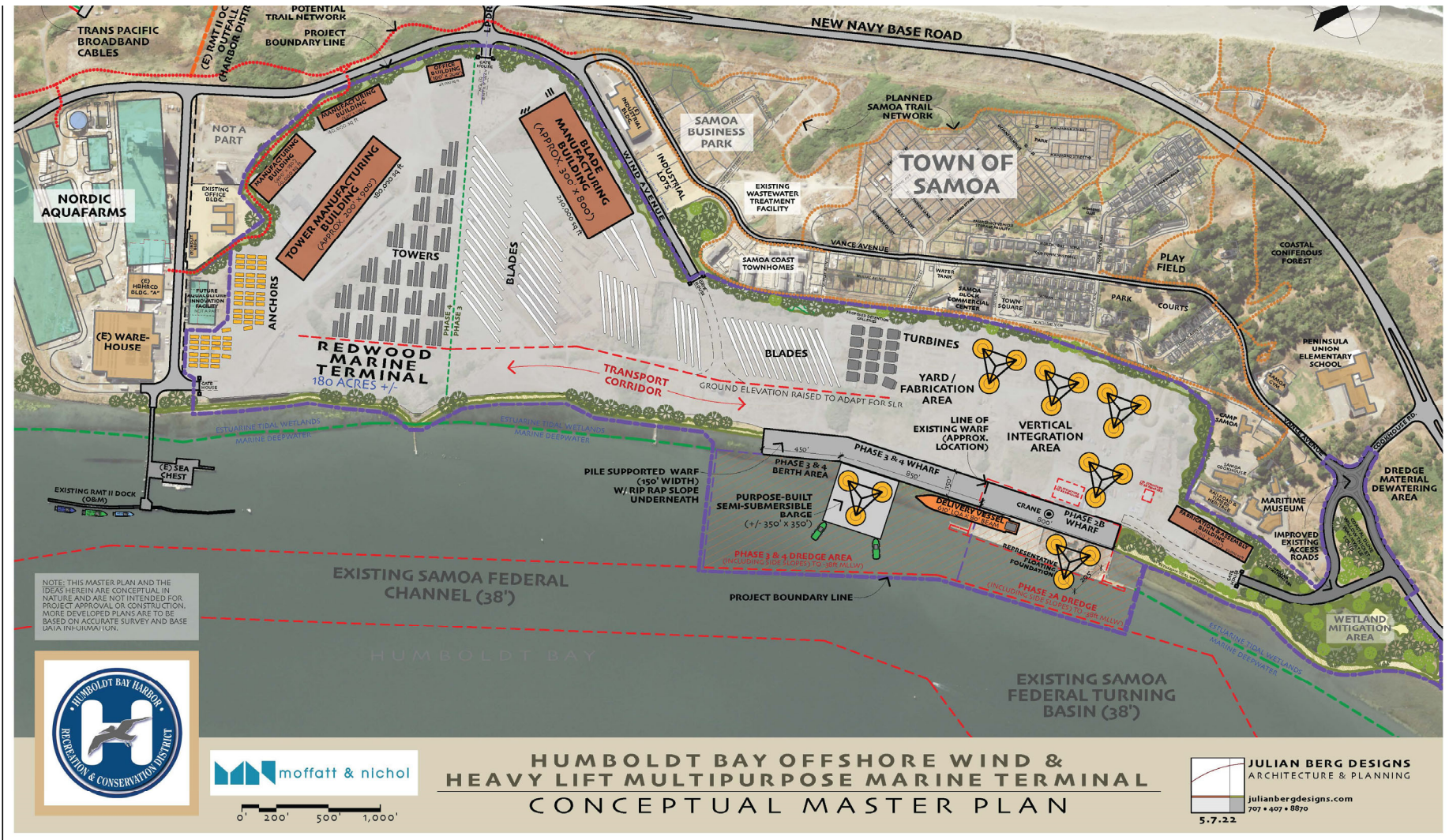
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This is not the District's project



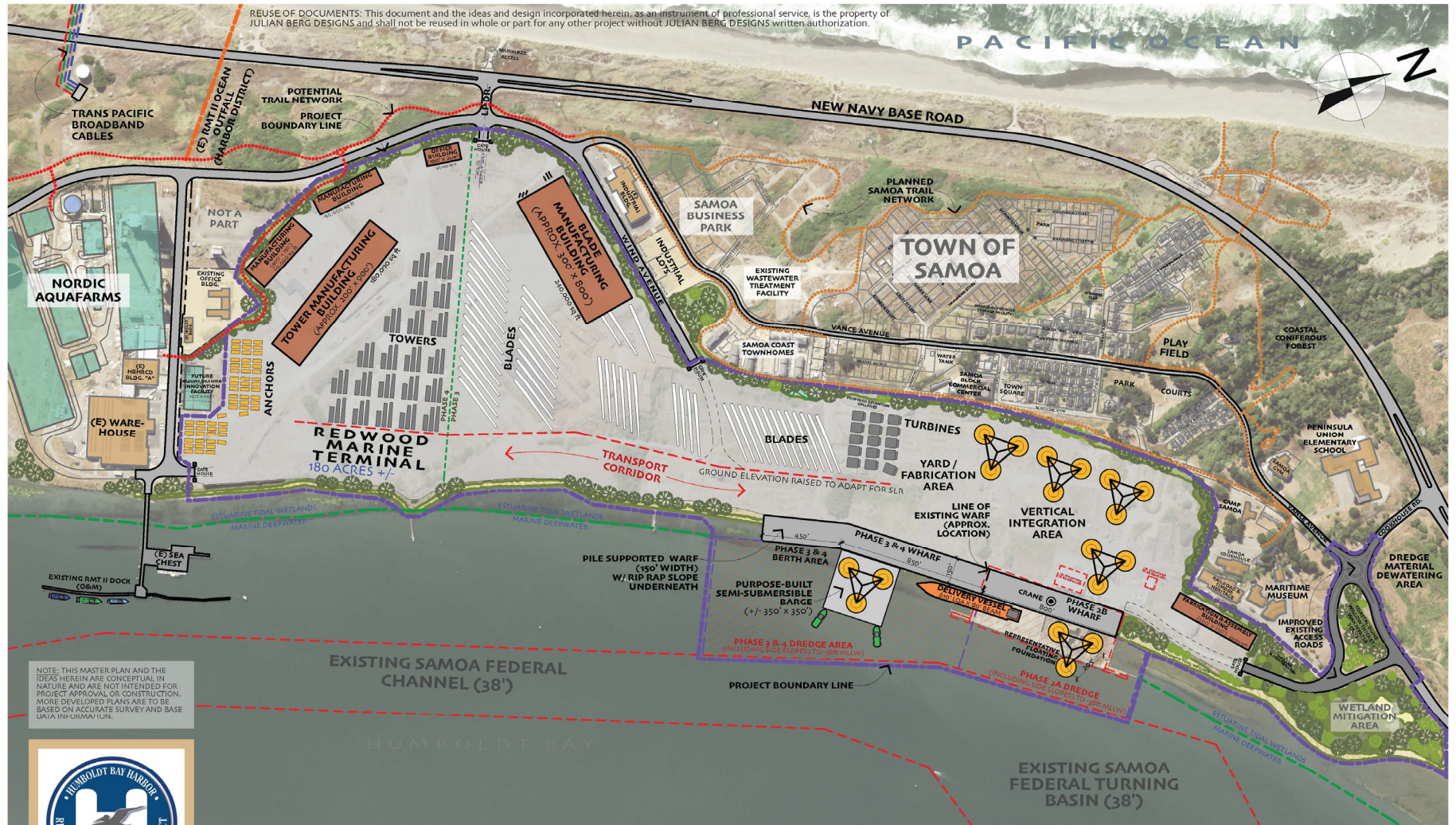
This is the District's project



What impacts will the Harbor District Project Have?

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PACIFIC OCEAN



NOTE: THIS MASTER PLAN AND THE IDEAS HEREIN ARE CONCEPTUAL IN NATURE AND ARE NOT INTENDED FOR PROJECT APPROVAL OR CONSTRUCTION. MORE DEVELOPED PLANS ARE TO BE BASED ON ACCURATE SURVEY AND BASE DATA INFORMATION.



moffatt & nichol

0' 200' 500' 1,000'

HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL CONCEPTUAL MASTER PLAN

JULIAN BERG DESIGNS
ARCHITECTURE & PLANNING
julianbergdesigns.com
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5.7.22

We don't know yet.

That will be answered in the CEQA process
over the coming 12 to 18 months.

How can I submit other questions about the
Harbor District project?

How can I get involved?

How can I submit questions/comments?

Watch the Harbor District's web page
and get involved in the CEQA process
when that process begins.

How and where will the power cable get
from the wind farm to the land?



Recent reports and publications

Our latest reports

- [Competitive Offshore Wind Leases on the U.S. Outer Continental Shelf: A Review of the Use of Multiple-Factor Auctions and Nonmonetary Credits](#) (2023)
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Offshore wind energy

Transmission Alternatives for California North Coast Offshore Wind

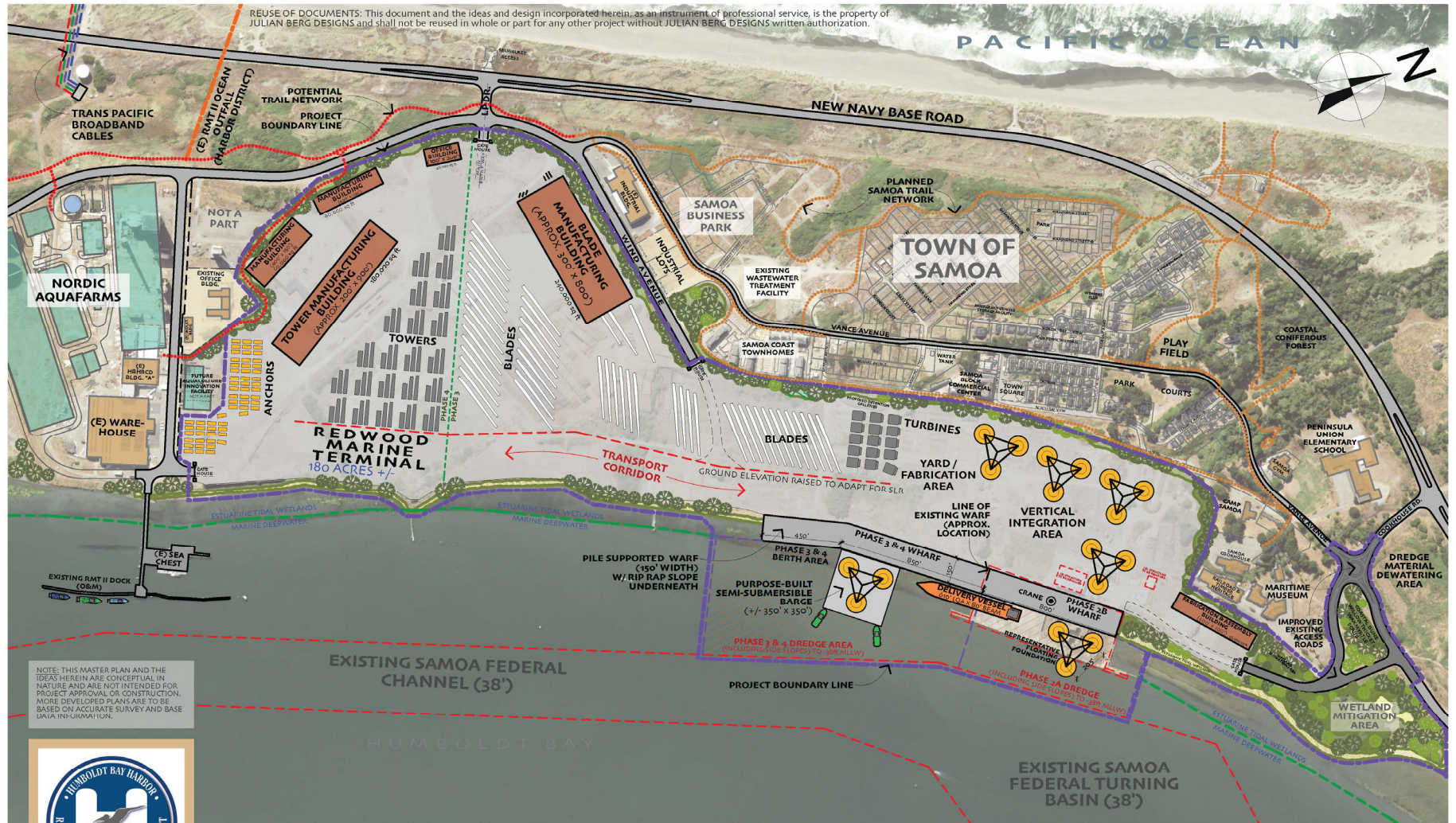
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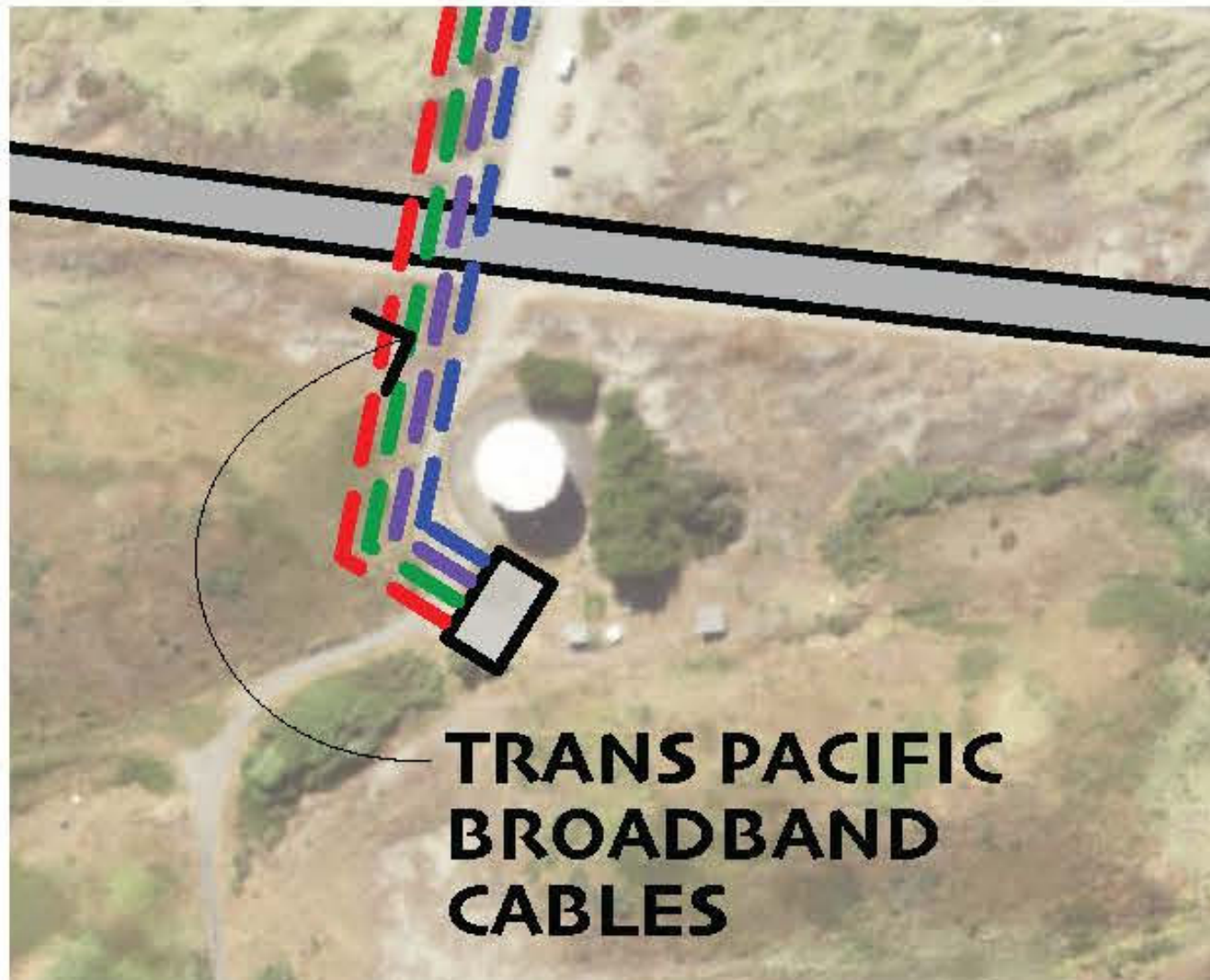
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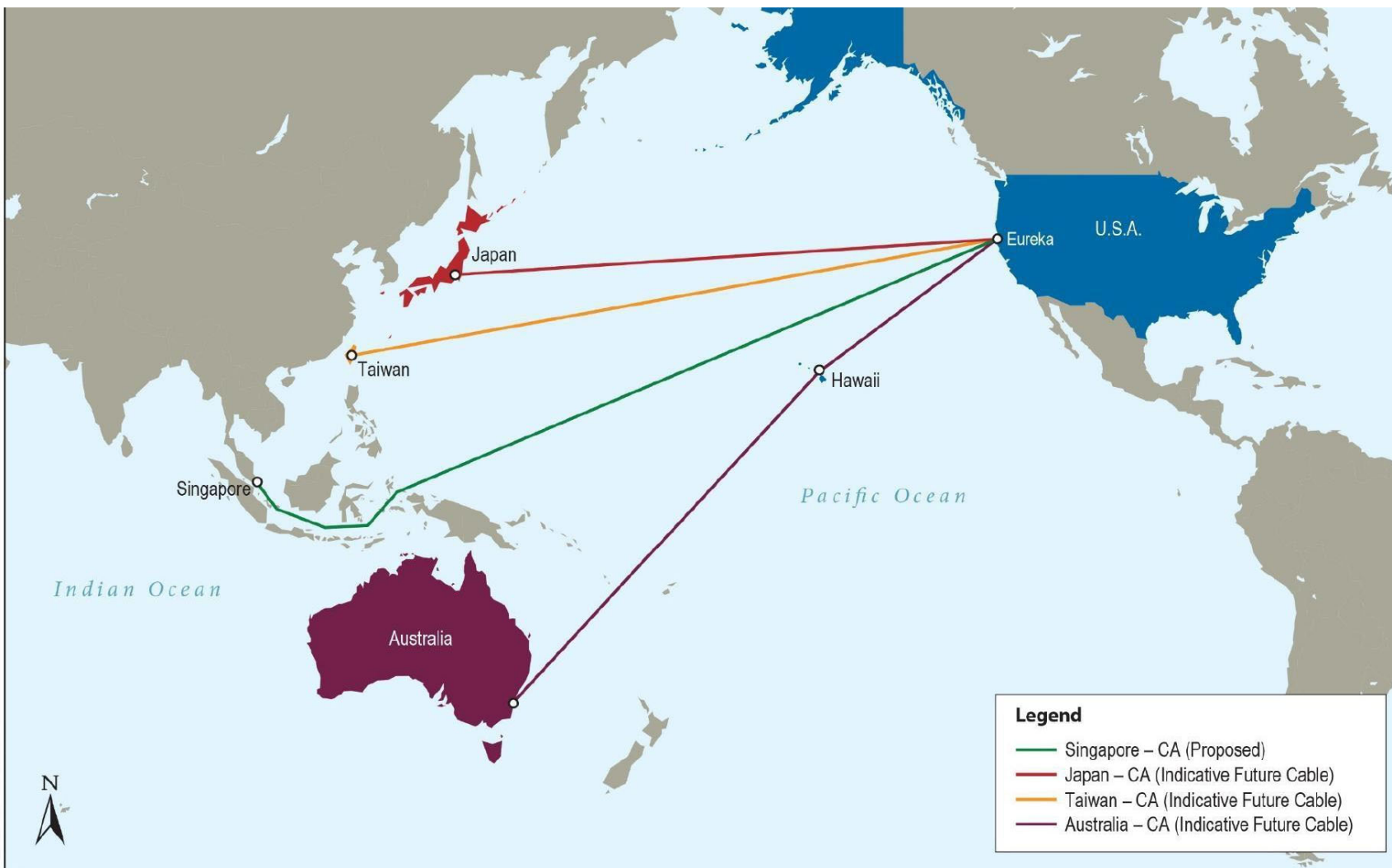
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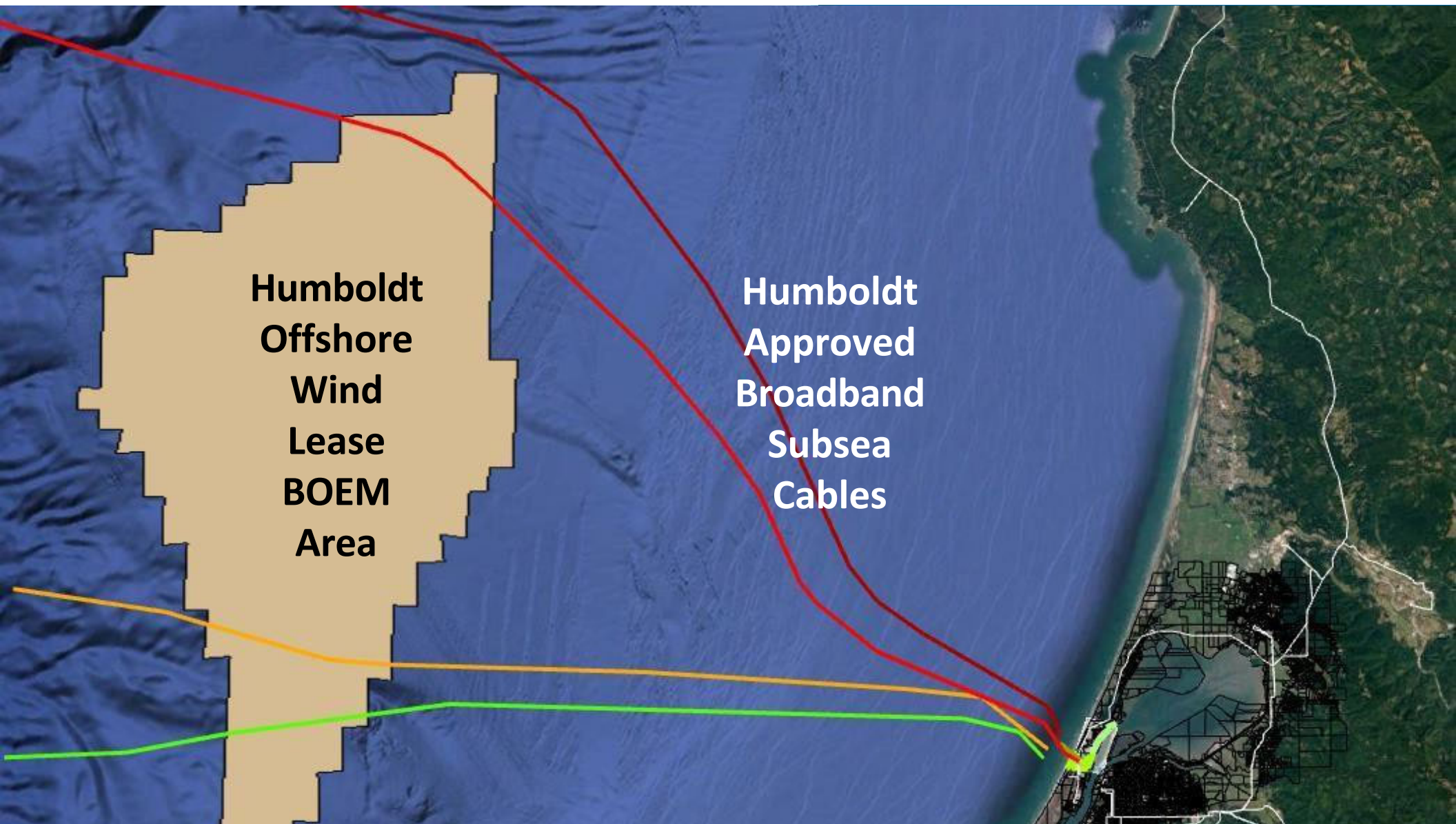
HUMBOLDT BAY OFFSHORE WIND & HEAVY LIFT MULTIPURPOSE MARINE TERMINAL CONCEPTUAL MASTER PLAN

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Broadband Cable Approved Connections







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What types of ships will be required to service offshore wind?

Central Coast Emerging Industries Waterfront Siting + Infrastructure Study

December 15, 2022

REACH

M M
MOTT
MACDONALD

SERVICE OFFSHORE VESSEL (SOV):

Supports multi-day O&M trips to FOW farm.

Length: 200-400ft (61-122m)

Draft: 16-25ft (5-8)

Beam: 50-80ft (15-24m)

Offshore duration: 2+ weeks



Source: Triton Knoll OSW Farm

SERVICE ACCOMODATION TRANSFER VESSEL (SATV):

Intermediate between SOVs and CTVs, with ability to sleep on board for multiday trips.

Length: 100-130ft (30-40m)

Draft: 10-16ft (3-5m)

Beam: 30-50ft (9-15m)

Offshore duration: ~4-5 days



SIEMENS Gamesa
RENEWABLE ENERGY

CREW TRANSFER VESSEL (CTV):

Supports transfer of crew and light supplies for day trips to the FOW farm.

Length: 65-90ft (20-27m)

Draft: 5-10ft (2-3m)

Beam: 22-30ft (7-9m)

Offshore duration: <1 day



Source: Rampion Offshore Wind

SMALLER AHTV

Length: <200ft (<61m)
Draft: 16-22ft (5-7m)
Bollard Pull: $\leq \sim 120T$



MEDIUM AHTV

Length: 210-270ft (64-82m)
Draft: 18-25ft (5-8m)
Bollard Pull: $\leq \sim 205T$



LARGER AHTV

Length: >270ft (>82m)
Draft: 22-28ft (7-9m)
Bollard Pull: $\leq \sim 430T$





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How many jobs will these projects create?

What will be the economic impact?

What about housing?

County of Humboldt,
especially County Economic Development
is seeking to answer these questions.



<https://www.gohumco.com/>



Offshore Wind (OSW), Workforce Demand Chart


Direct Jobs: OVERVIEW





Offshore Wind (OSW), Workforce Demand Chart

Direct Jobs: OVERVIEW



Offshore Wind (OSW), Workforce Demand Chart

Direct Jobs: OVERVIEW

| | |
|---|---|
| OSW FTE Creation by Company Type | |
| Company Type | Supply Projection of Total Jobs per Project |
| R&D, Engineering and design | 8% |
| Turbine and component manufacturing | 18-21% |
| Installation, operation and maintenance | 20-41% |
| Services and supply | 31-55% |



Offshore Wind (OSW), Workforce Demand Chart Direct Jobs: OVERVIEW

| Company Type | Field of Activity | Skilled | Semi-Skilled | Un-skilled | Representative Job Profiles |
|---|--|---------|--------------|------------|--|
| Planning and Development | Management | X | | | Economists, Engineers, Lawyers, Meteorologists Project managers |
| Design and Manufacturing | Wind Turbine and Turbine component producers | X | X | | Engineers, Health and Safety Experts Iron Workers, Metal Workers, Millwrights, |
| Construction and Installation | Building the Wind Farm | X | X | X | Electricians, Engineers, Health and Safety Experts, Iron workers, Marine Operators, Painters, Pile drivers |
| Operations and Maintenance and Repair | Regular Inspection, Operations and Repair | X | X | X | Crane operators, Electricians, Iron workers, Longshoremen, Marine Operators, Painters |
| Technical, Financial and Legal Expertise | Diverse Specialized Professional Activities | X | | | Engineers, Lawyers, Meteorologists, Policy Experts, Programmers, Support Staff |
| Ship Building and Retrofitting | Specialized, Jones-Compliant Vessels for Installation/Repair | X | X | X | Engineers, Maritime Operators, Ship Building Construction Trades, Support Staff |

Source: 22,23

European Wind Energy Association. (2009, January). Wind at Work: Wind energy and job creation in the EU.
Retrieved from:
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/Wind_at_work_FINAL.pdf
23 Gerard Dhooge, President, Maritime Trade Council, (personal communication, December 6, 2011)



Coos Bay Call Area

Crescent City Call Area

Humboldt Call Area

Morrow Bay Call Area

Labor and workforce
"Pull Zone"

8 Hour Drive Time
From Humboldt Call Area

Major workforce
markets within 8 hour
drive of Humboldt call
area with a minimum
of 100,000 industrial
workers

Bay Area - 1M
Sacramento Area - 500K
Silicon Valley - 500K
Portland OR - 500K
Sonoma Area - 100K
Solano Area - 100K



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especially County Economic Development
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<https://www.gohumco.com/>



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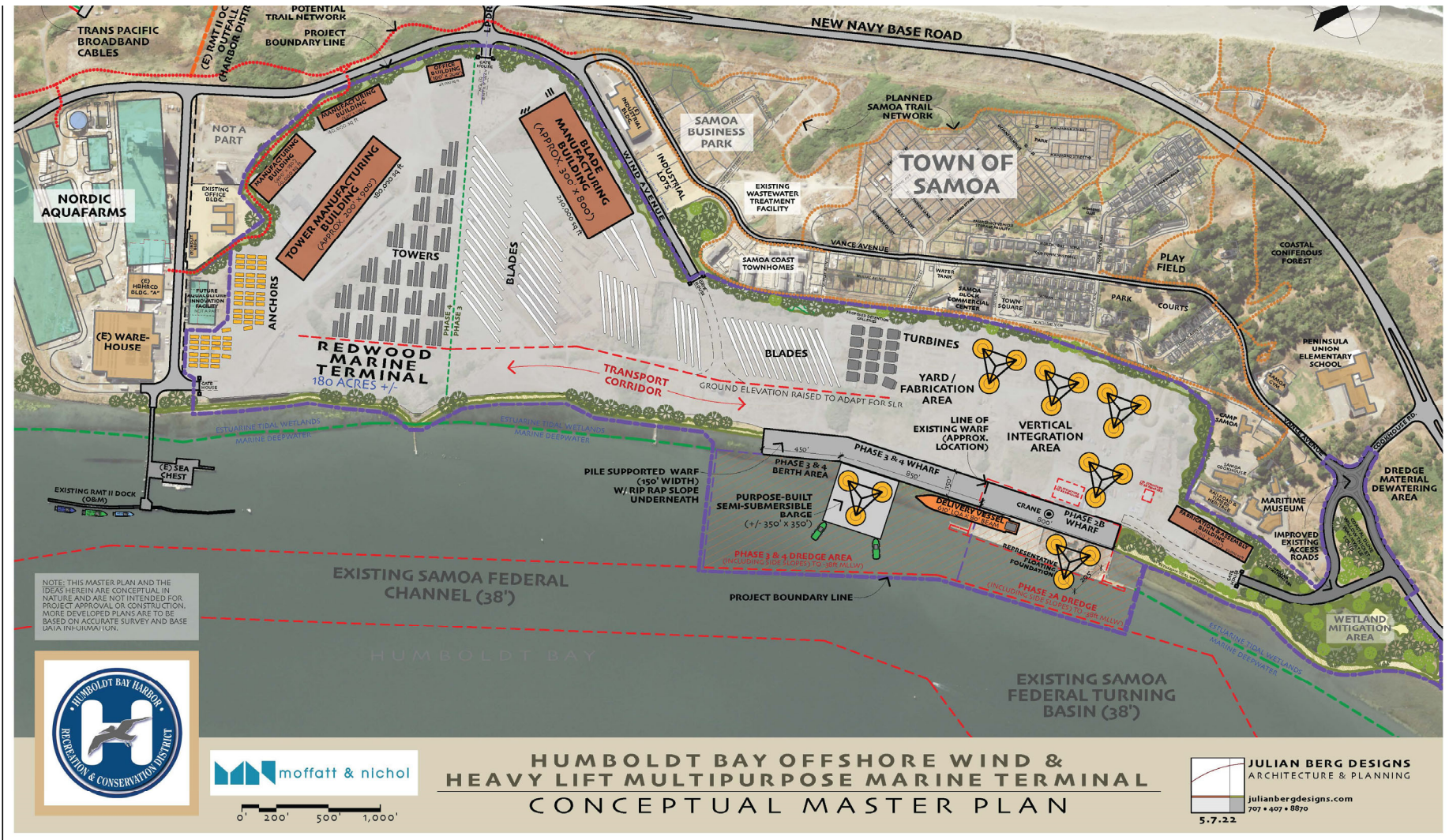
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Isn't there a limitation with transmission?
How will excess power leave Humboldt
County?

This is the District's project



This is not the District's project





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REDWOOD COAST
EnergyAuthority

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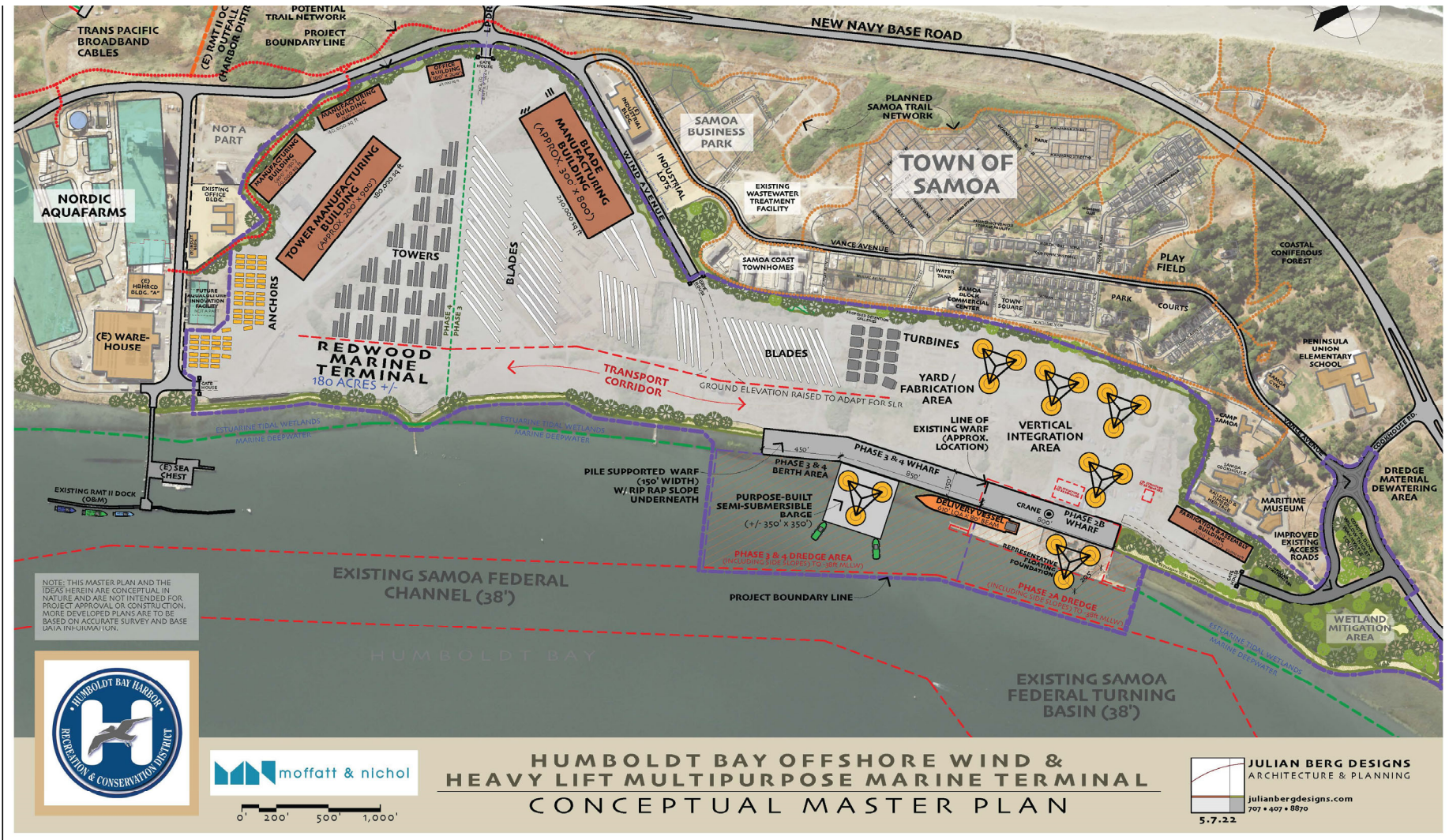
Redwood Coast Energy Authority is a local, not-for-profit government agency that procures electricity. We are

Energy Innovation, Efficiency, and Sustainability for Humboldt County



Will Offshore Wind Increase Energy Prices?

This is the District's project



This is not the District's project



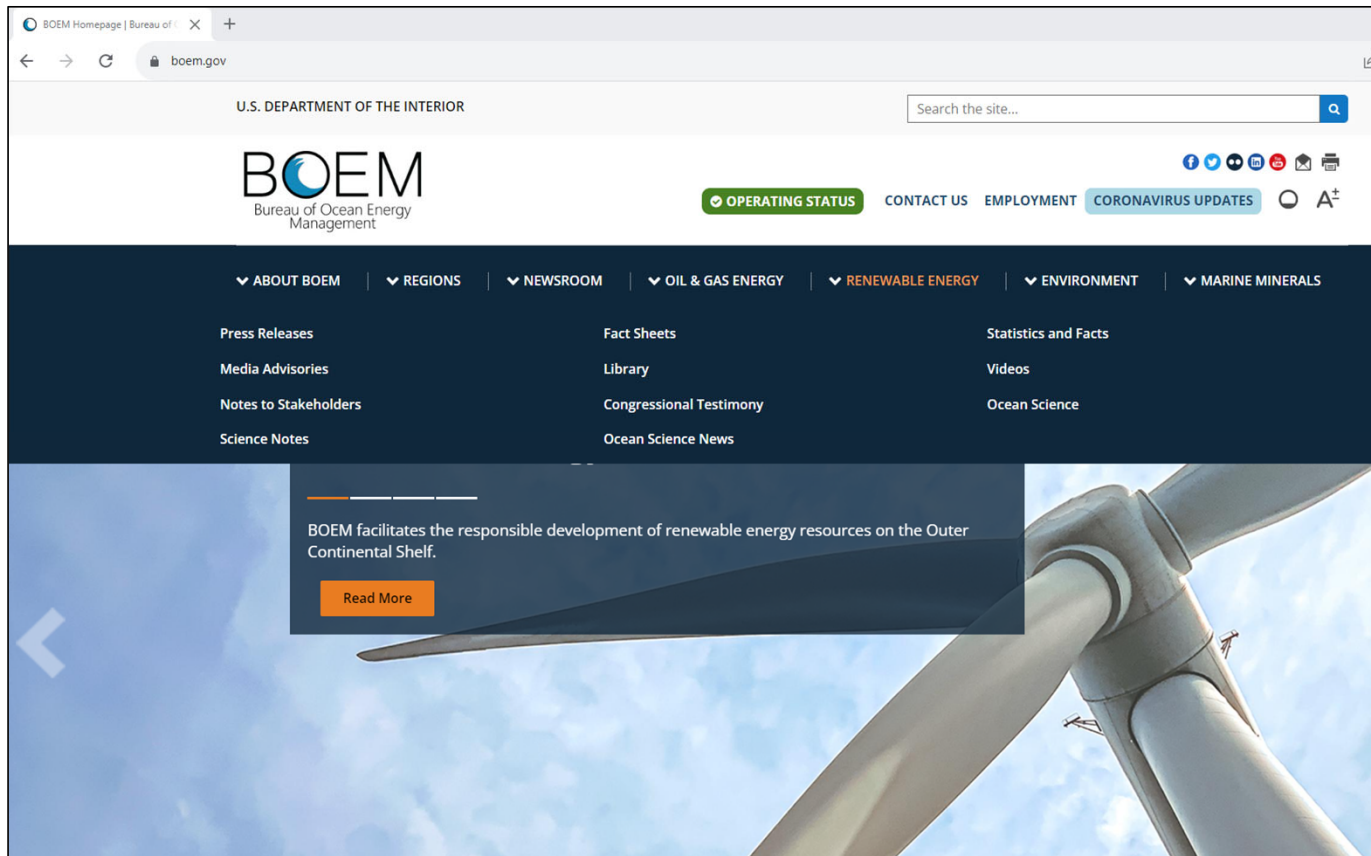


The factory that manufactures
brewery equipment
does not set the price of beer
at the various breweries that buy
their manufacturing equipment.



How to get involved in BOEM's project

- <https://www.boem.gov/>





U.S. DEPARTMENT OF
ENERGY

Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY

Offshore Wind Market Report: 2022 Edition

Offshore Wind Energy Technology Trends

Offshore wind turbines in the 15-MW class are advancing toward commercial production.

After the three leading wind turbine manufacturers announced their plans to develop wind turbines in the 15-MW class last year, a leading Chinese manufacturer, MingYang, announced its plans to deliver a 16-MW wind turbine for the commercial market by 2024. These 15-MW-class wind turbines are under full development at Siemens Gamesa, Vestas, and General Electric, with intentions to have them available for purchase by 2024 or sooner. Industry announcements indicate that developers will be depending on these turbines for most U.S. projects.

Offshore Wind Energy Cost and Price Trends

The levelized cost of energy estimated for U.S. fixed-bottom offshore wind energy projects in 2021 has declined to \$84/megawatt-hour (MWh) on average, with a range of \$61/MWh to \$116/MWh globally.

This cost decline in fixed-bottom offshore wind farms (i.e., wind turbines connected rigidly to the seafloor) represents a reduction of 13% on average compared to 2020 U.S. estimates, bringing the total cost reduction to more than 50% since 2014 (Wiser et al. 2021). For representative market scenarios, leading research entities and consultancies estimate that levelized cost of fixed-bottom offshore wind energy will be \$60/MWh on average by 2030.

Record-setting lease auction prices in the New York Bight were followed by auction format changes to benefit states and local stakeholders.

The \$4.37 billion paid for leases in the New York Bight was unprecedented. While signaling strong confidence in the offshore wind energy market, those high lease prices translate to about \$763/kilowatt and raise concerns about higher electricity costs from offshore wind energy. In May 2022, the BOEM auction rules were modified for the Carolina Long Bay auction using multifactor bidding criteria that allow bidding credits to be allocated for local supply chain commitments. A multifactor approach is also planned in the next upcoming lease auction in California scheduled for late 2022 that will allow bidding credits for local benefits.

Future Outlook

Although still at the beginning stages in the United States, offshore wind is now recognized globally as one of the principal energy sources to combat climate change. Offshore wind energy deployment is forecast by 4C Offshore and BloombergNEF to increase globally to about 260 GW or more by 2030 (4C Offshore 2022a; BloombergNEF 2021a), and the number of countries currently generating power from offshore wind energy is expected to double over the next decade (Ferris 2022).

U.S. domestic offshore wind energy deployment is expected to follow global growth trends, driven by robust state-level procurement targets, and a national target of 30 GW of offshore wind energy by 2030, set in March 2021. Following BOEM's October 2021 announcement to ramp up offshore leasing in Federal waters, and the record-setting lease prices observed in the New York Bight auction in February 2022, the U.S. industry is signaling rapid growth, and expanding to

Offshore Wind Energy Cost and Price Trends

The levelized cost of energy estimated for U.S. fixed-bottom offshore wind is

Future Outlook

Although still at the beginning stages in the United States, a



U.S. DEPARTMENT OF
ENERGY

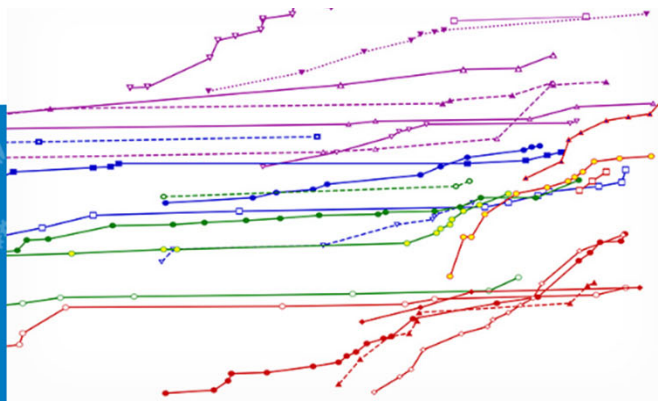
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Offshore Wind Market Report: 2022 Edition

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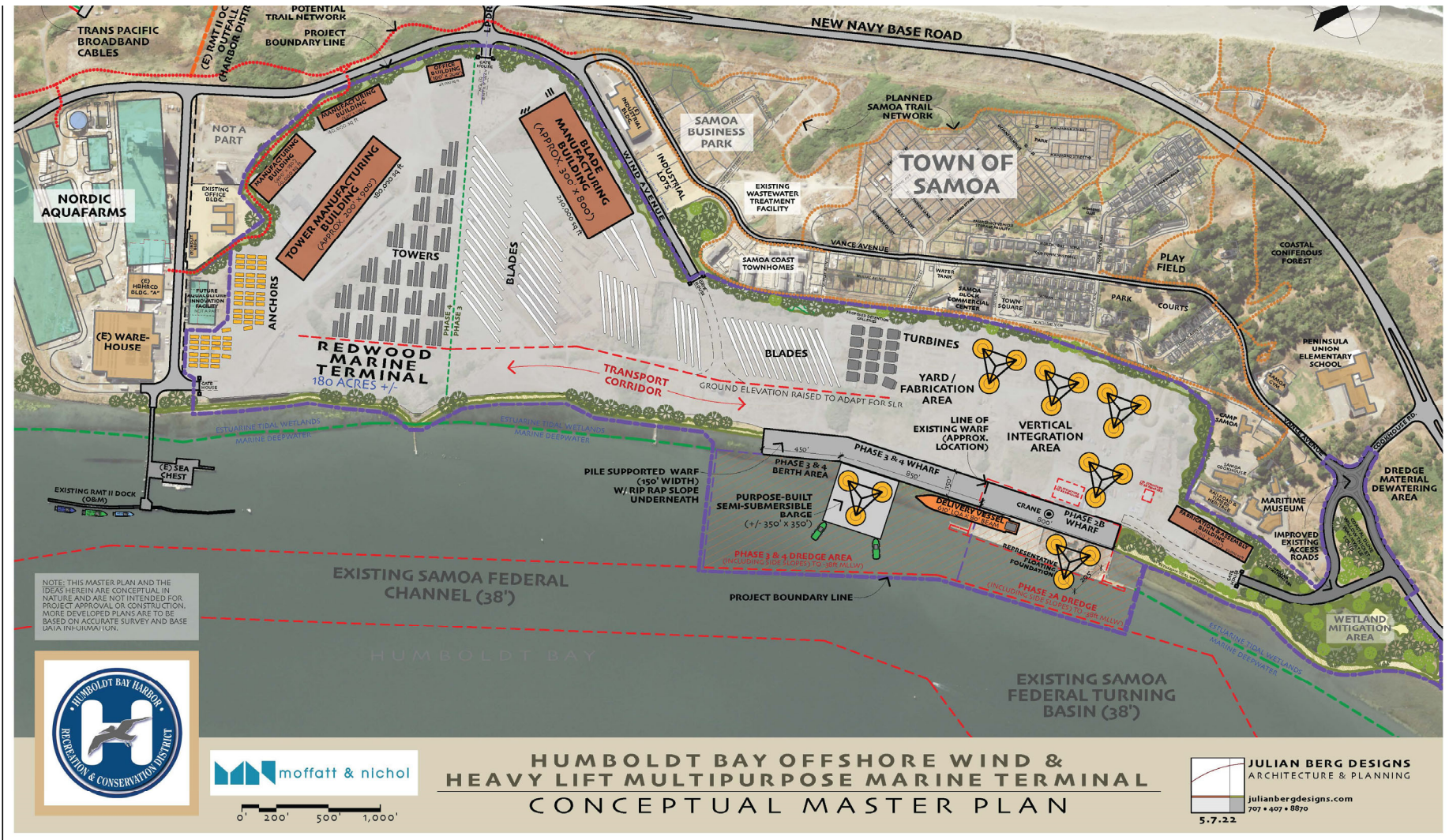
Redwood Coast Energy Authority is a local, not-for-profit government agency that procures electricity. We are

Energy Innovation, Efficiency, and Sustainability for Humboldt County



Will the District's Project Impact Birds/Whales?

This is the District's project

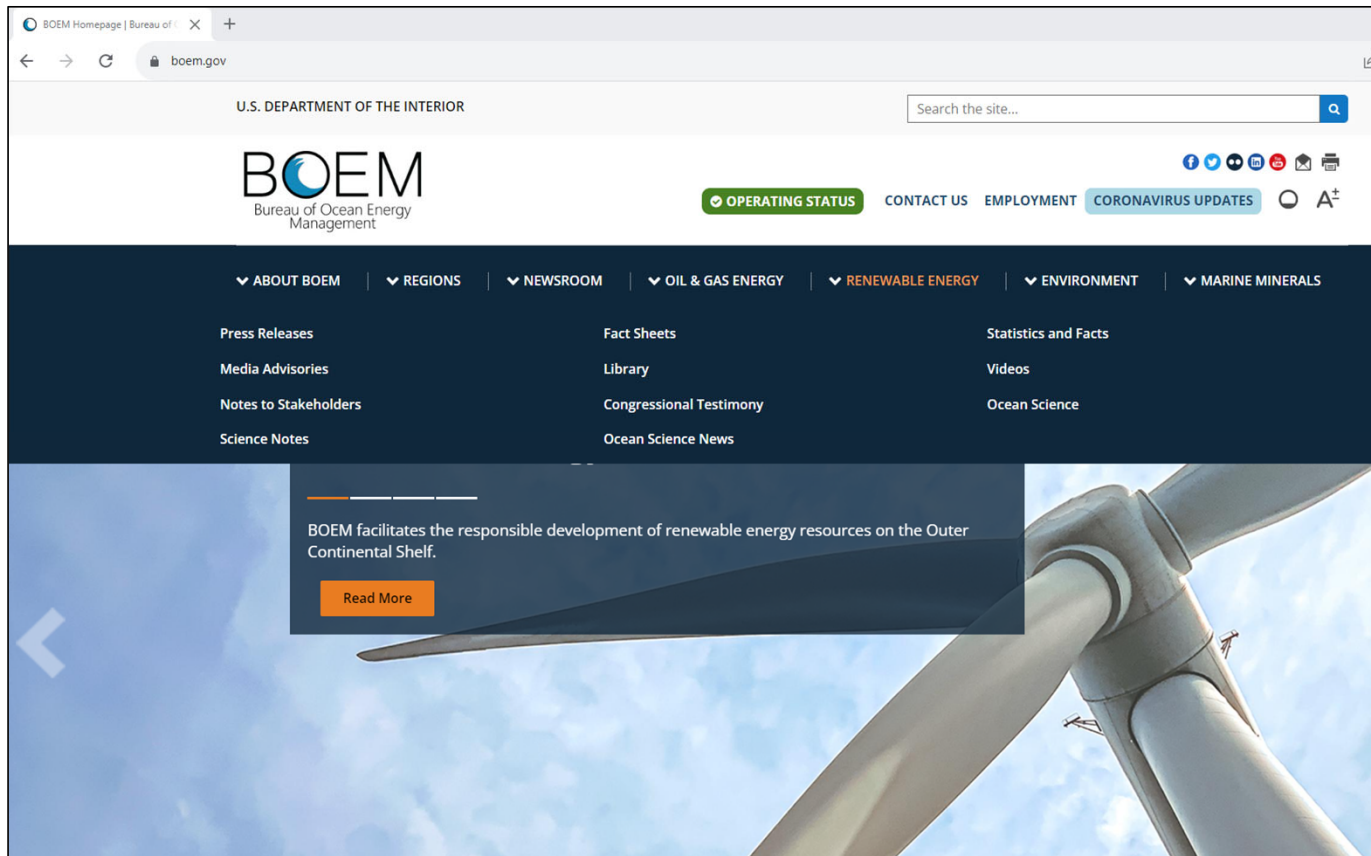


This is not the District's project



How to get involved in BOEM's project

- <https://www.boem.gov/>





Th8a

CD Filed: 1/24/2022
60th Day: 3/25/2022
Extended to: 4/08/2022
Staff: HW-SF
Staff Report: 03/17/22
Hearing Date: 04/07/22

STAFF REPORT: REGULAR CALENDAR

Consistency Determination No.: CD-0001-22

Applicant:

Bureau of Ocean Energy Management

Location:

In federal waters offshore of Humboldt County,
approximately 20 miles off Eureka

Project Description:

Conduct a lease sale for up to 132,369 acres
of federal waters for the future development of
offshore wind energy facilities. Permit lessees
to conduct site characterization and
assessment activities and submit a
construction and operations plan for
development of offshore wind energy on their
leases.

Staff Recommendation:

Conditional Concurrence.

Hearing Date:

04/07/22

- Monthly Agenda
- Live Stream
- Schedule
- Workshops
- Rules & Procedures
- Future Agenda Items
- Archives

- Agendas
- Videos



Spanish / Español

Translate This Website

Public Counter Update

Please note that public counter hours for all Commission offices are currently suspended due to the pandemic. However, the Commission remains open for business and staff is available by phone, email, and regular mail (see staff contact information at www.coastal.ca.gov/contact). Please make sure to send a copy of all correspondence or comments electronically by email to the relevant Commission staff, in addition to the regular means required



California Governor
Gavin Newsom



**Commissioners
& Alternates**



Executive Director
John Ainsworth



Th8a

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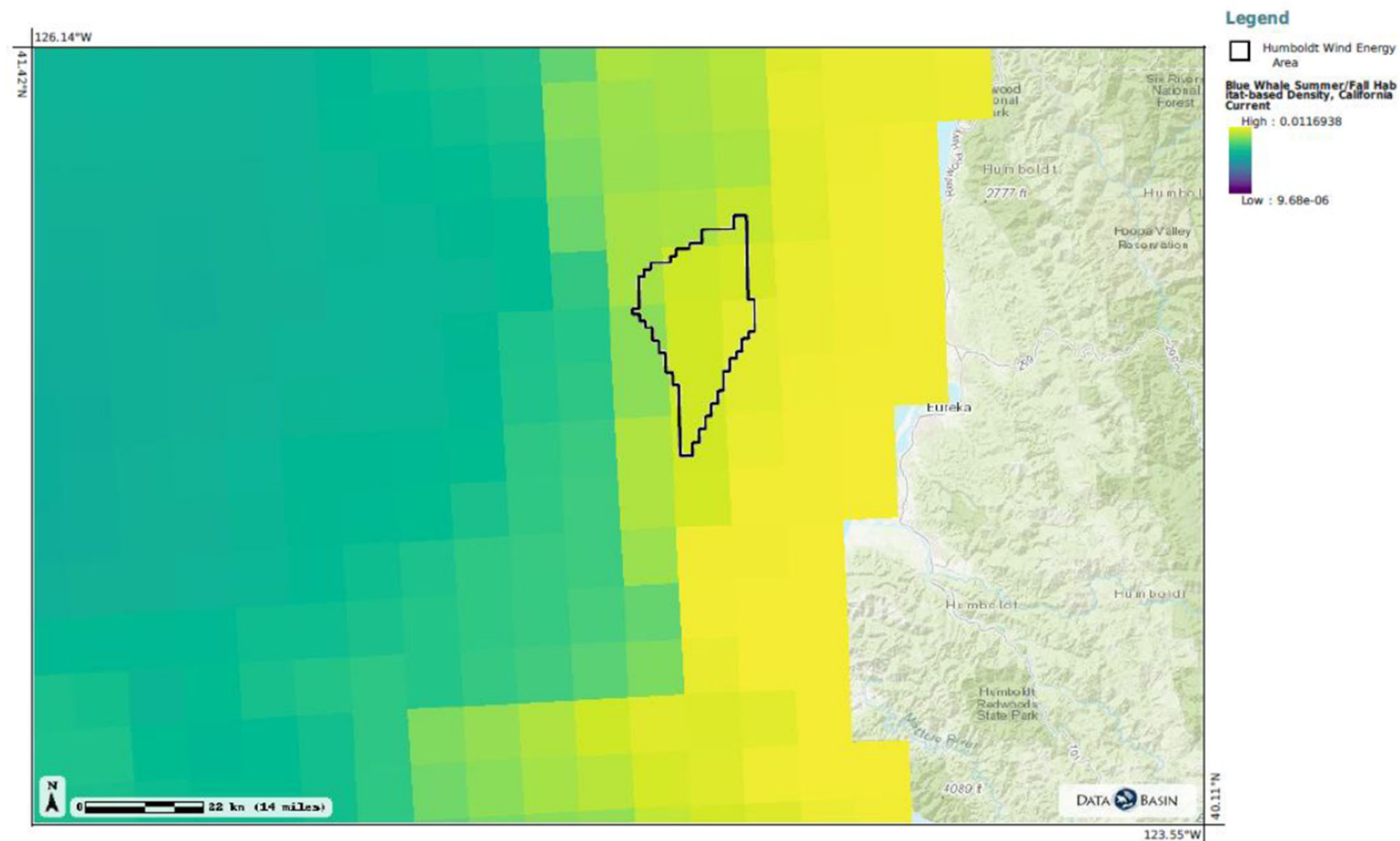
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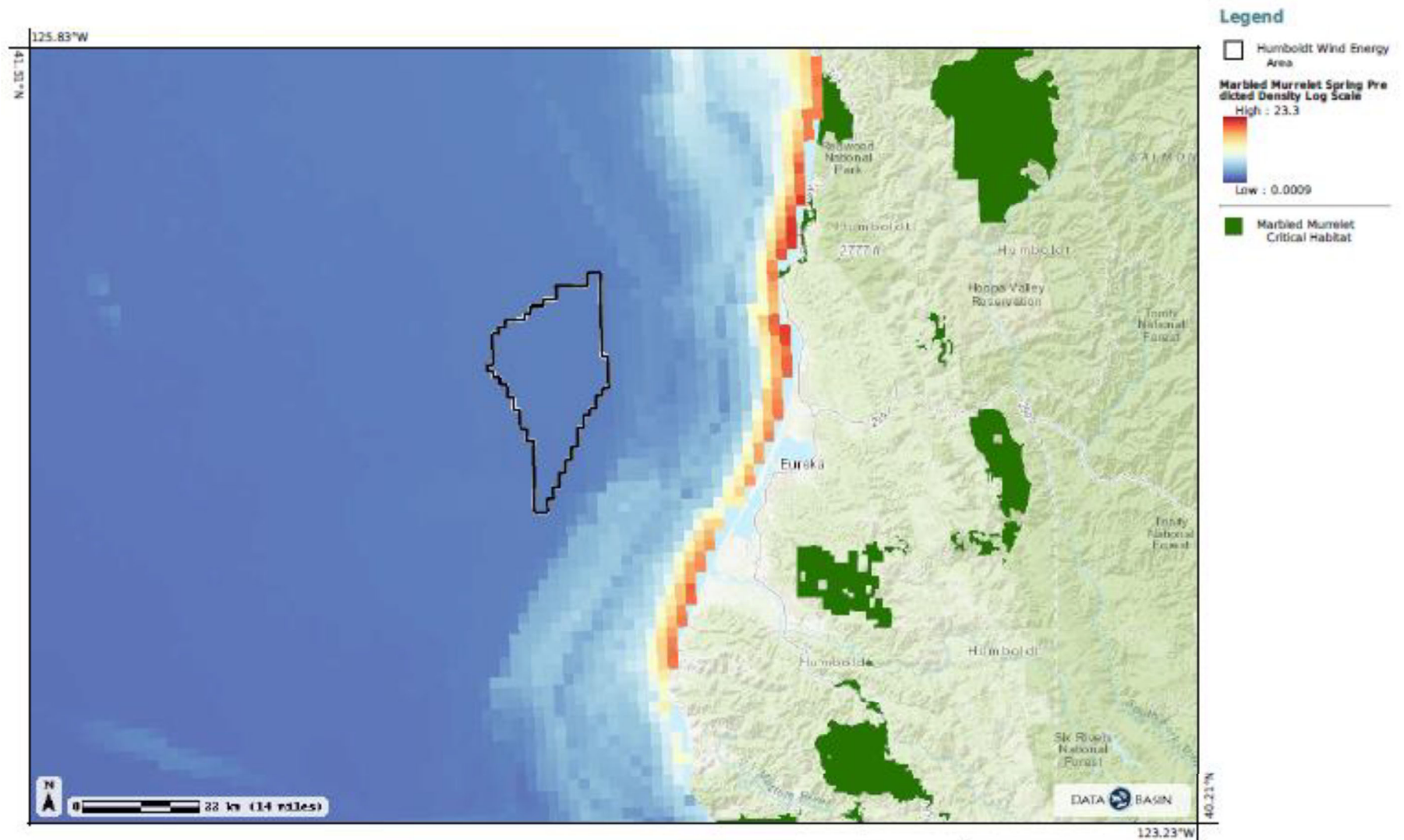
Staff Recommendation:

Conditional Concurrence.

Blue Whale Summer/Fall Density (number of whales per km²) in the Vicinity of the Humboldt WEA



Marbled Murrelet Density – Spring, and Critical Habitat





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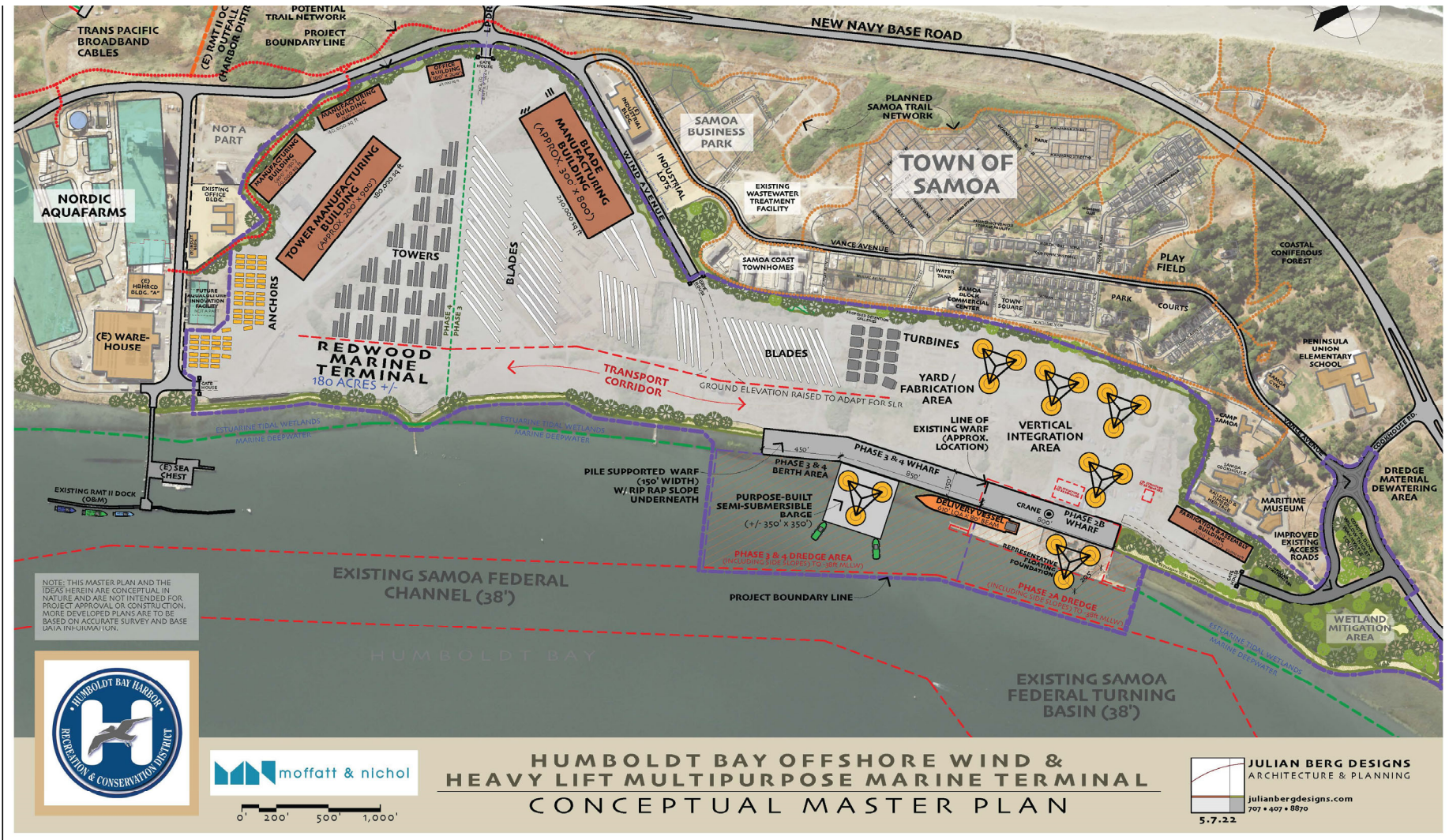
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This is not the District's project



Will the District's Project Impact Fishermen?

This is the District's project



This is not the District's project





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Location:

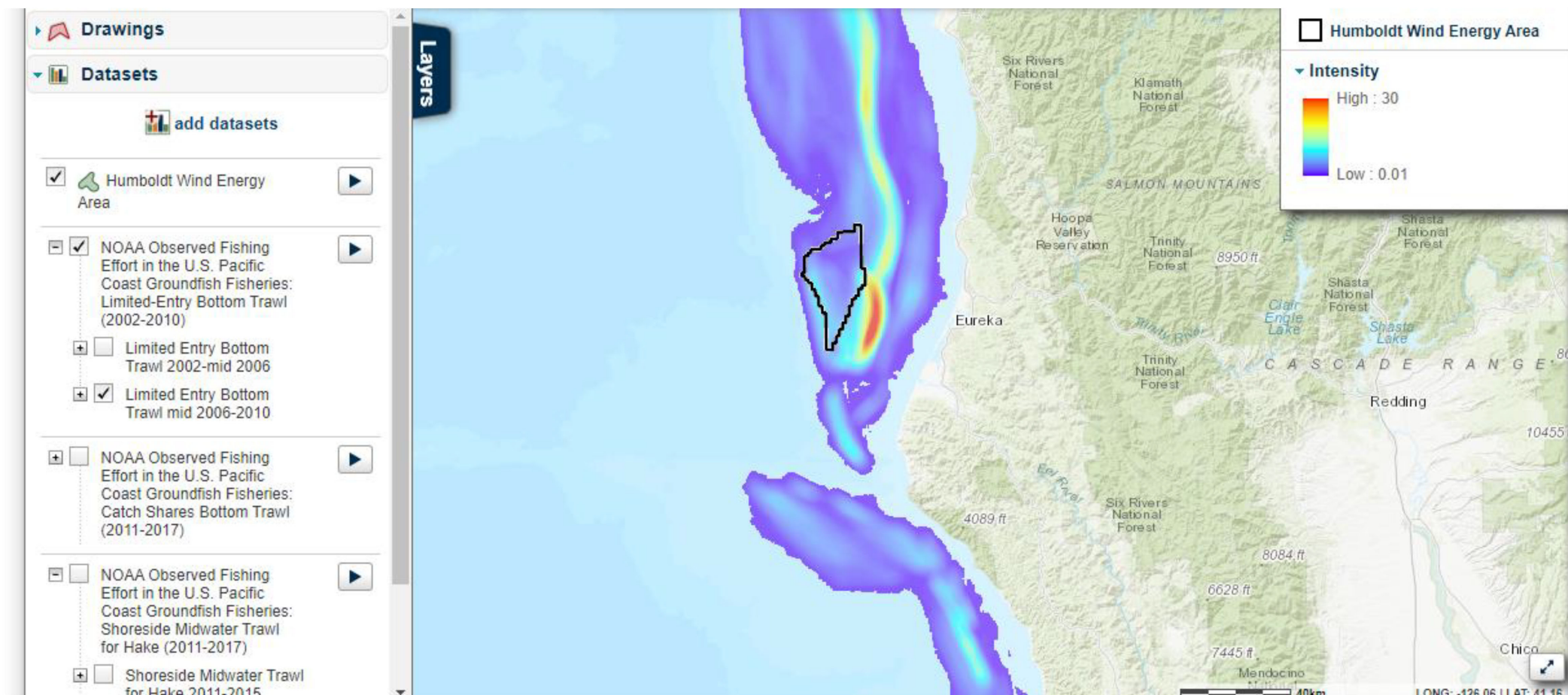
In federal waters offshore of Humboldt County,
approximately 20 miles off Eureka

Project Description:

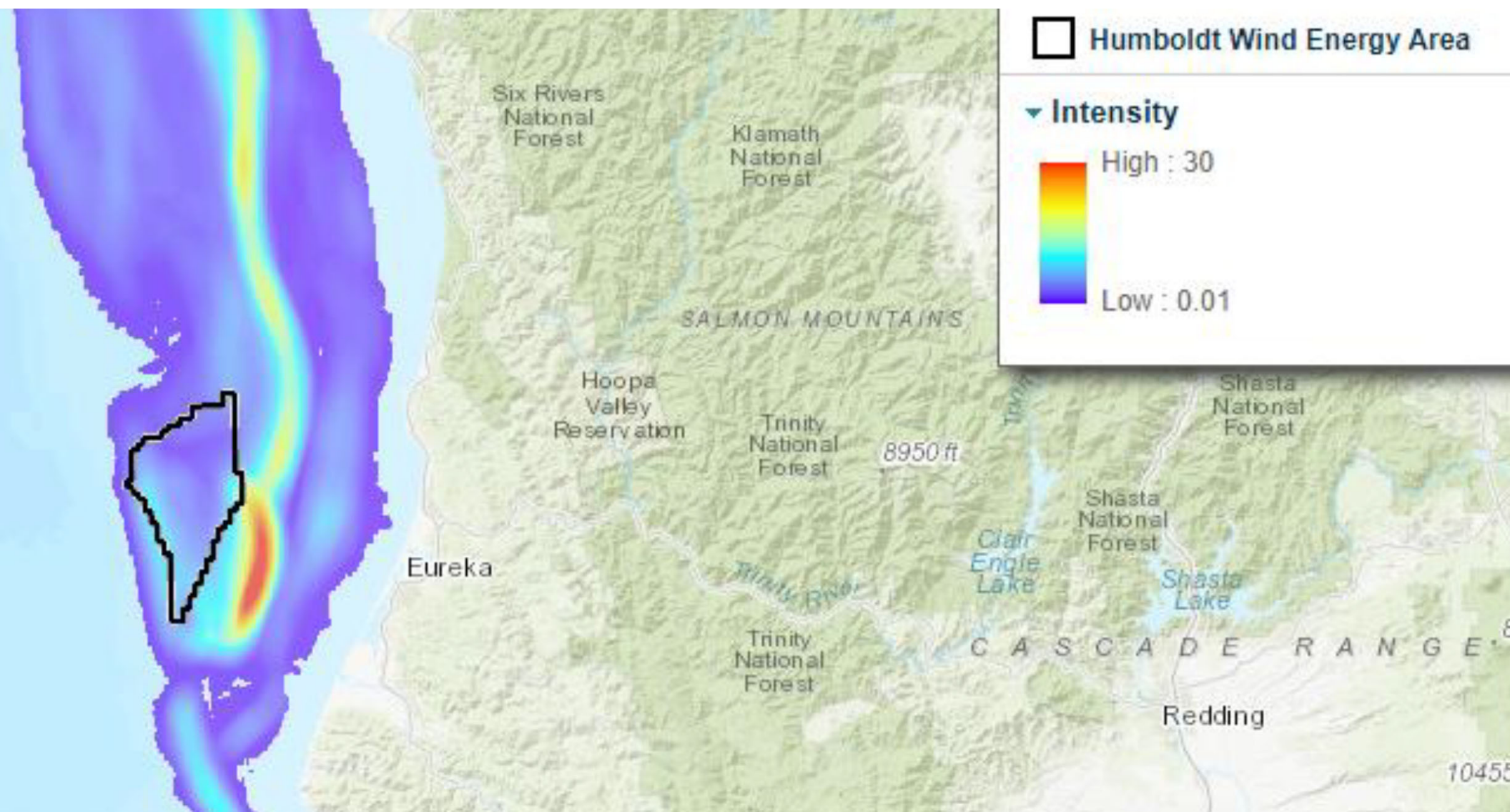
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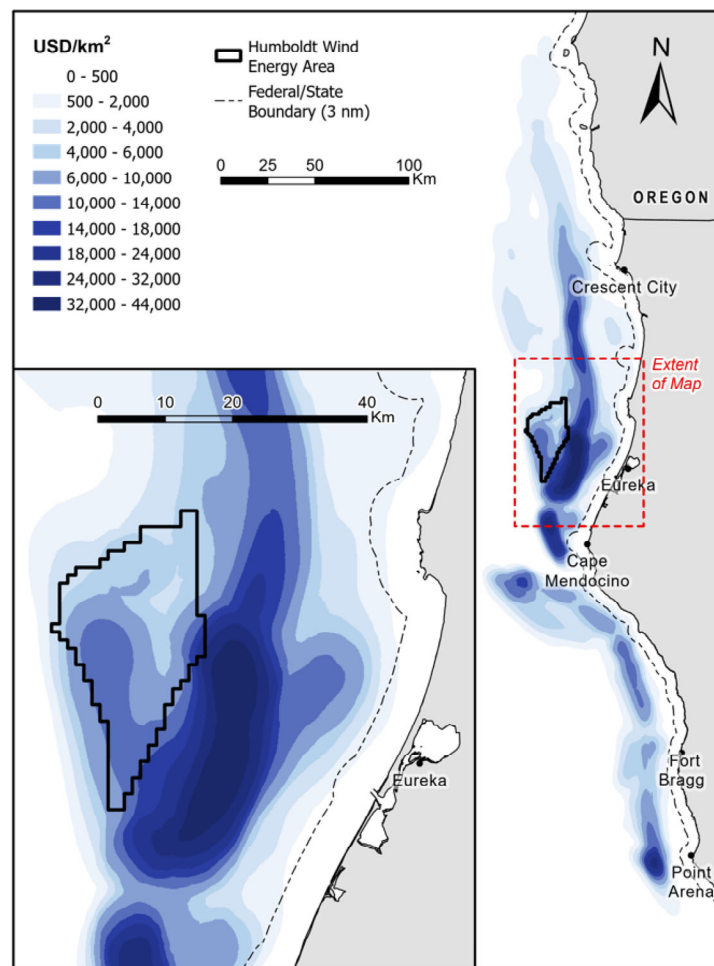


NOAA observed fishing effort in the Pacific Coast Groundfish Fisheries: Catch Shares Bottom Trawl. Top: 2002-mid 2006, and Bottom: mid 2006-2010.
Source: Northwest Fisheries Science Center via California Offshore Wind Energy Gateway



NOAA observed fishing effort in the Pacific Coast Groundfish Fisheries: Catch Shares

CDFW trawl log data 1997-2015



USD/km²

0 - 500

500 - 2,000

2,000 - 4,000

4,000 - 6,000

6,000 - 10,000


10,000 - 14,000


14,000 - 18,000

18,000 - 24,000

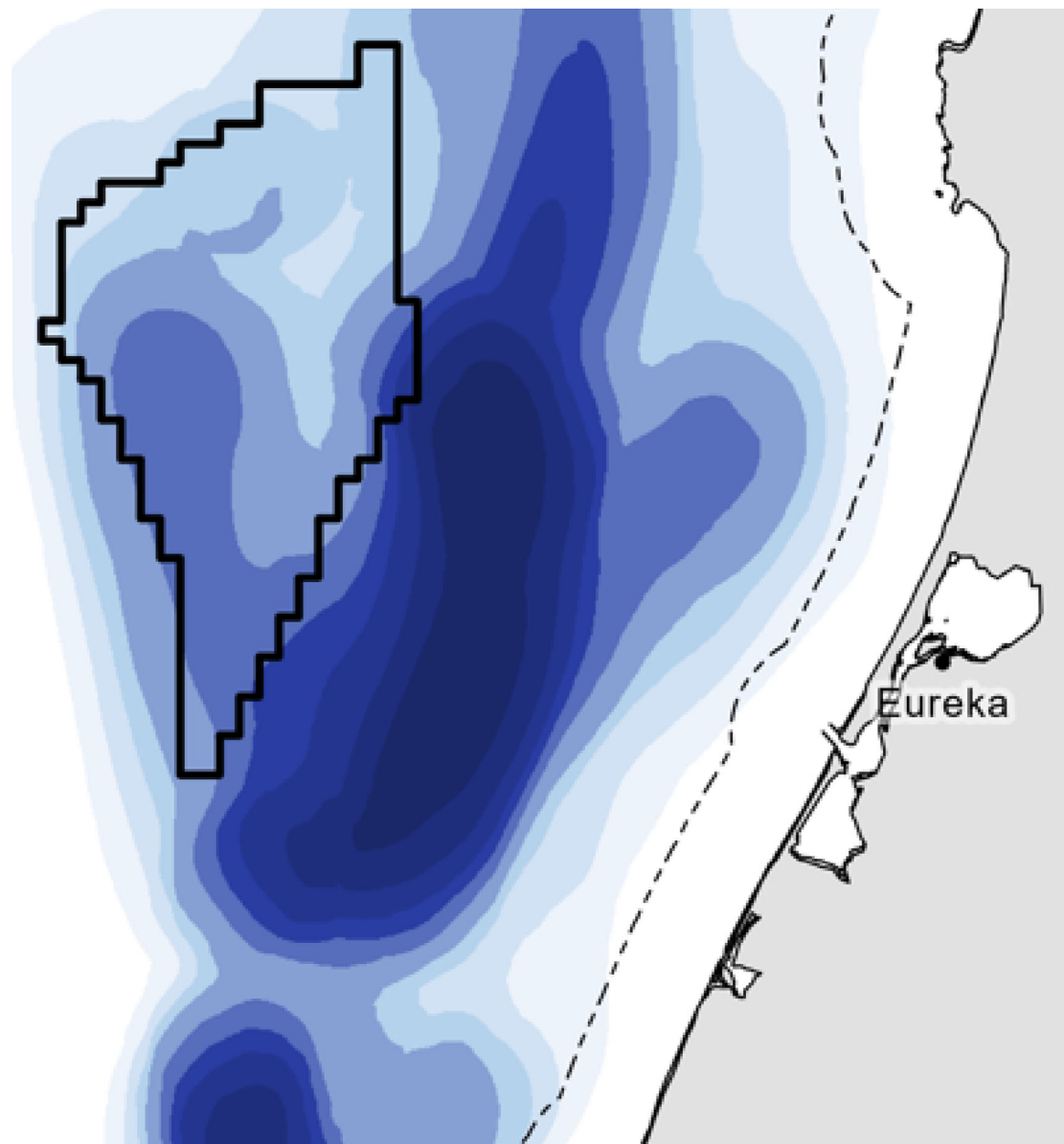
24,000 - 32,000

32,000 - 44,000

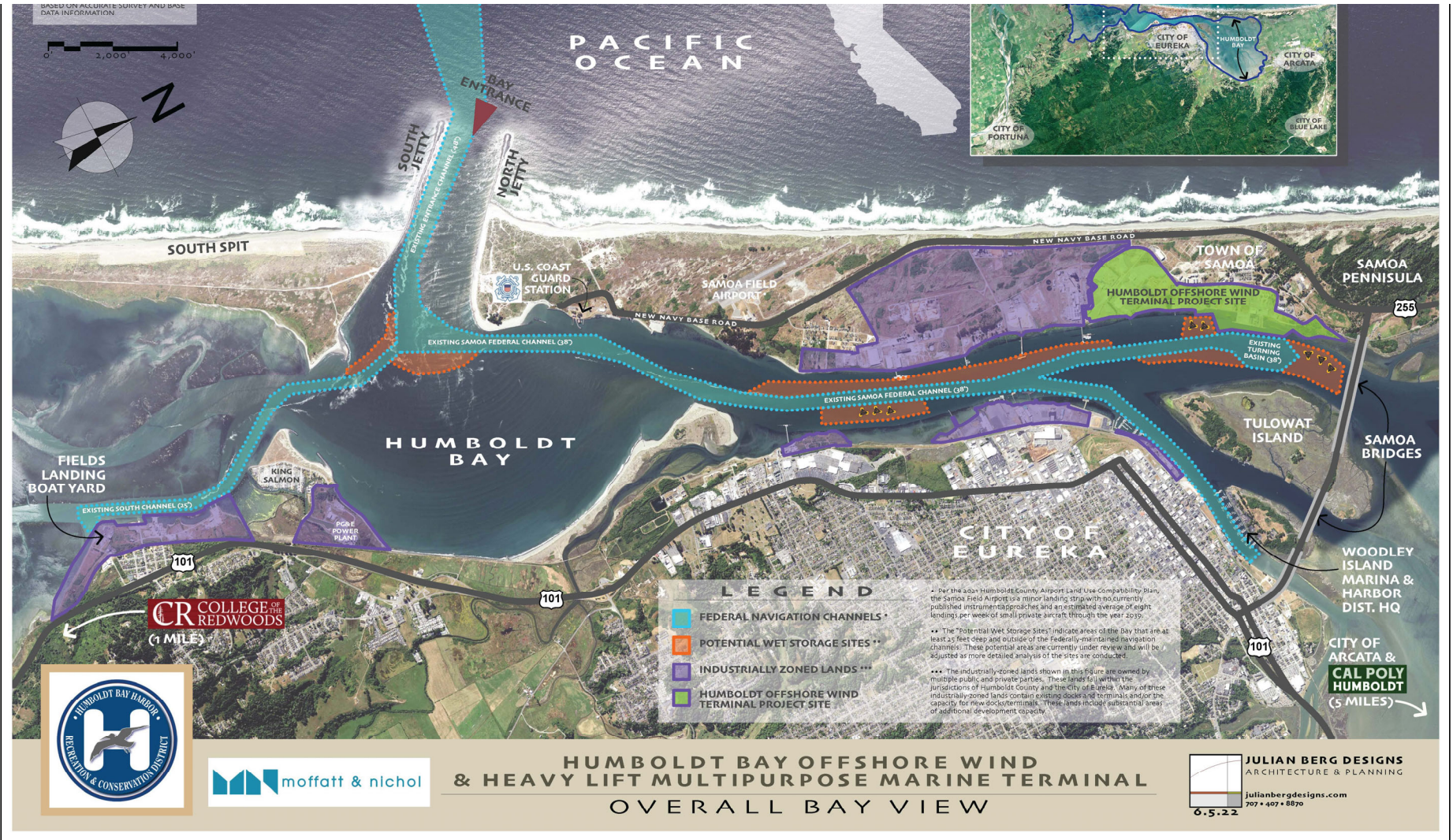
 Humboldt Wind
Energy Area

 Federal/State
Boundary (3 nm)

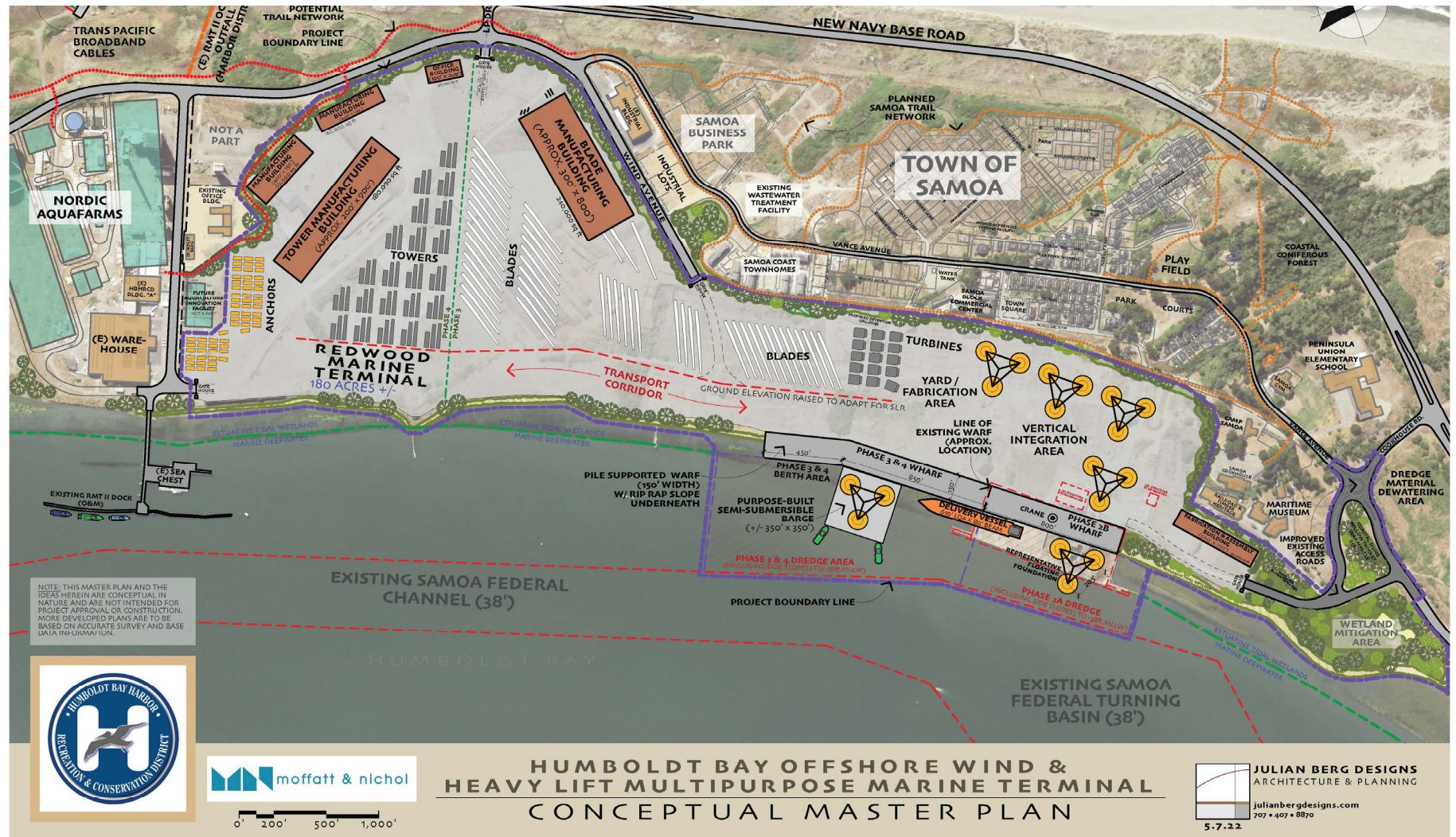
0 25 50 100 Km



Impacts of tow-out tbd.

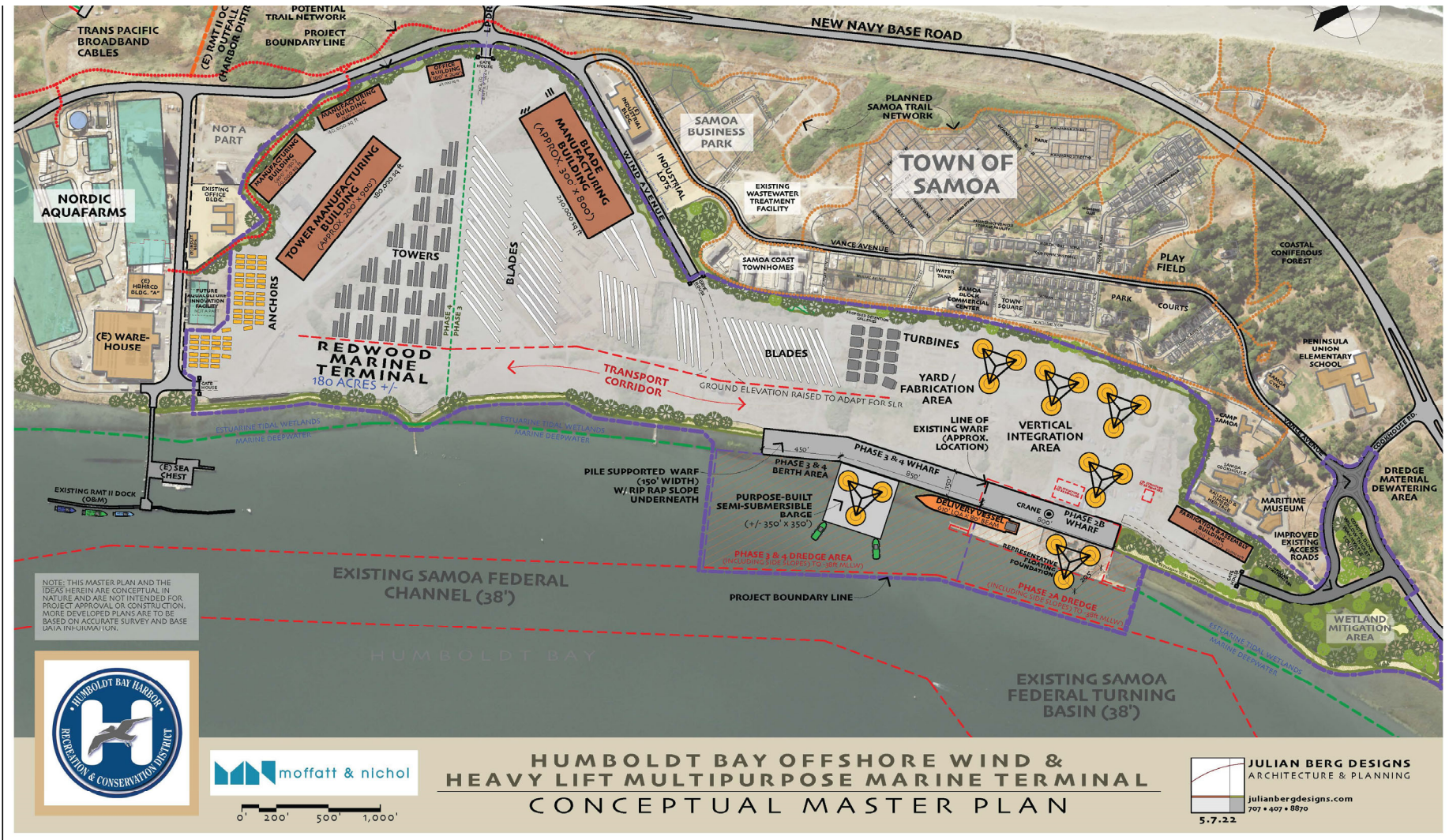


Fisherman use of this site to be relocated...



Won't the creation of all of this new infrastructure have a large carbon footprint? Is wind power really better for reducing impacts to the global climate?

This is the District's project



This is not the District's project



A clean energy
solution –
from cradle
to grave

Environmental Product Declaration
SG 8.0-167 DD

SIEMENS Gamesa
RENEWABLE ENERGY

Environmental footprint



Low greenhouse gas emissions

Greenhouse gases such as CO₂ and methane contribute to global warming. Electricity produced by wind turbines contributes significantly less to global warming than electricity produced by fossil fuels. During its lifetime, the wind power plant emits less than 1% of the CO₂ emitted per kWh by an average power plant using fossil fuels.

7.4 months energy payback time

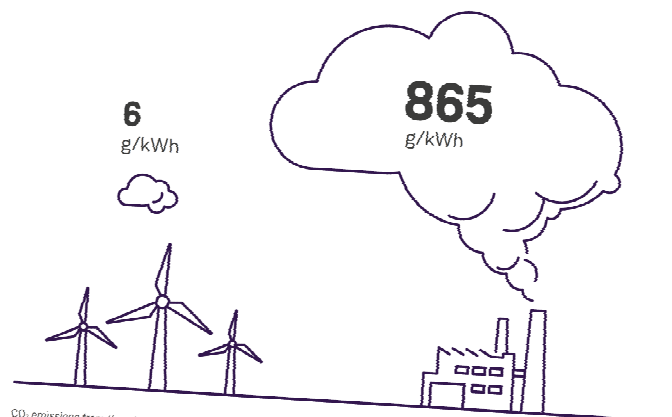
The energy payback time for the wind power plant in this assessment is less than 7.4 months. That is the length of time the wind power plant has to operate in order to produce as much energy as it will consume during its entire lifecycle.



During its entire lifecycle the wind power plant produces 41 times more energy than it consumes.

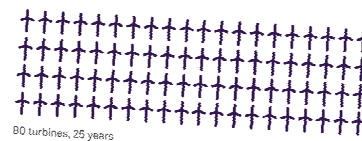
Global warming is ...

... an environmental impact caused by the increased concentration of greenhouse gases in the atmosphere. Each of these gases radiates different amounts of heat, which can be quantified in units of carbon called carbon dioxide-equivalent (CO₂ eq.). (IPCC: ref)



CO₂ emissions from the wind power plant versus global fossil power production (IEA World Energy Outlook, 2012).

58,400,000 t
of CO₂ savings



80 turbines, 25 years

1,667 km²
forest area



During its estimated lifetime the wind power plant produces 68,035,000 MWh and saves 58,400,000 tonnes of CO₂, which is equal to the amount of CO₂ absorbed by a forest with an area of 1,667 km² over 25 years.

“According to this report, even though there is a carbon impact to manufacture, transport, assemble (etc.) turbines and turbine components, the overall (net) carbon *savings* is substantial when compared to fossil fuel power production.

- Mining and raw material acquisition

The construction and manufacturing produces nearly 80% of a turbine’s emissions. The transportation of materials and turbines additionally creates a sustainability challenge. In the U.S., the transportation sector generates 29% of all greenhouse gas emissions. But nearly all of the carbon impact for wind power ceases after assembly and deployment. This is because the carbon output per kWh (when running) for a wind turbine is so low (less than 1%). I.e., wind’s carbon impact virtually stops once it begins operation. Wind turbines average just 11 grams of CO2 emission per kilowatt-hour of electricity generated. That compares with 44 g/kwh for solar, 450 g for natural gas, and 1,000 g for coal.”

25%

2%

1%

A clean energy
solution –
from cradle
to grave



Environmental Product Declaration
SG 8.0-167 DD

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Energy Innovation, Efficiency, and Sustainability for Humboldt County



I would like to learn more about offshore
wind in general.
What is the best source?



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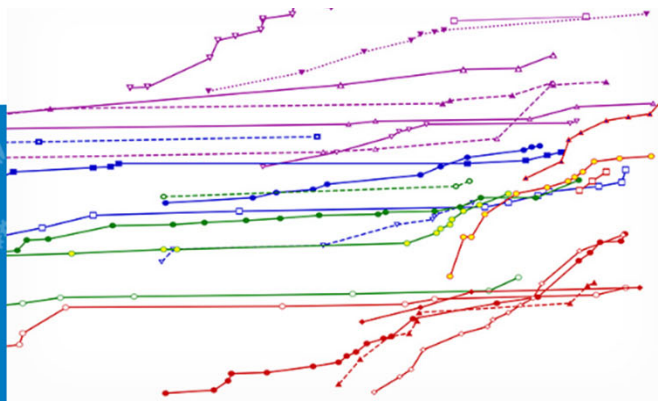
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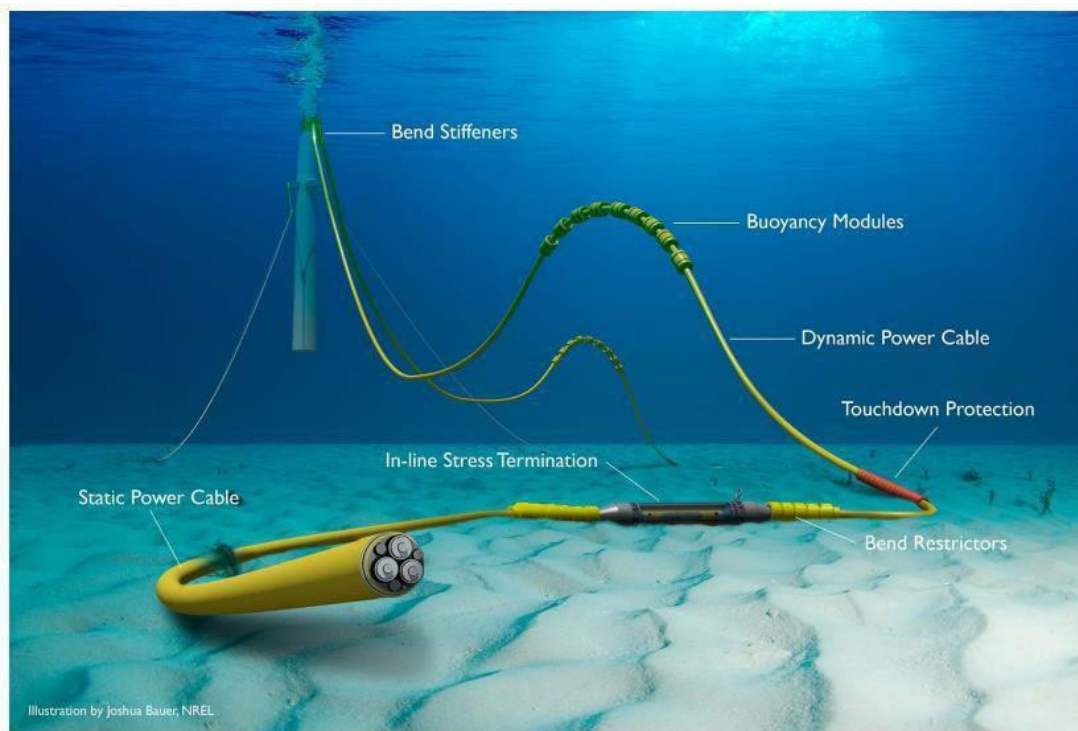
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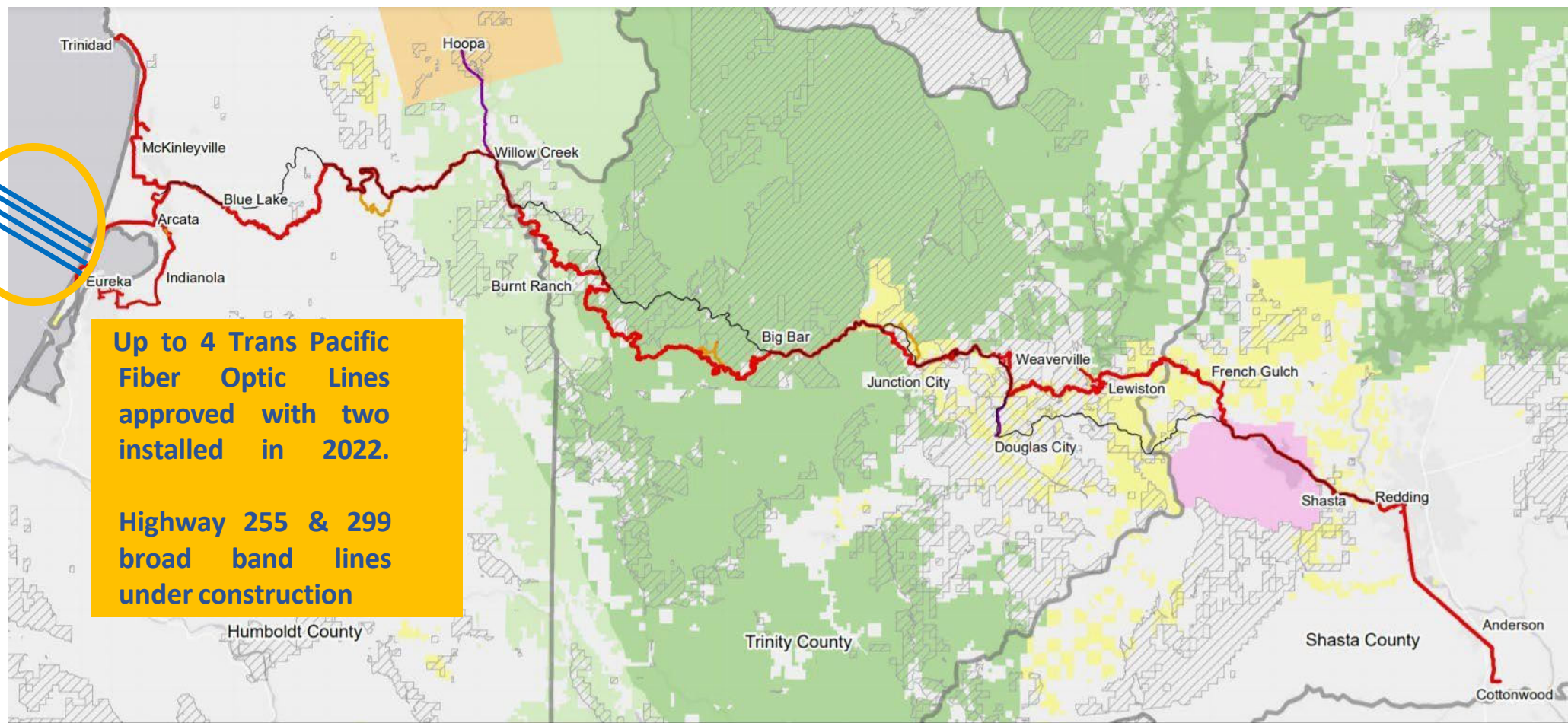


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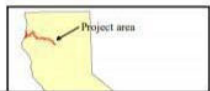
Undersea Electrical Power Cables





Up to 4 Trans Pacific
Fiber Optic Lines
approved with two
installed in 2022.

Highway 255 & 299
broad band lines
under construction



Legend

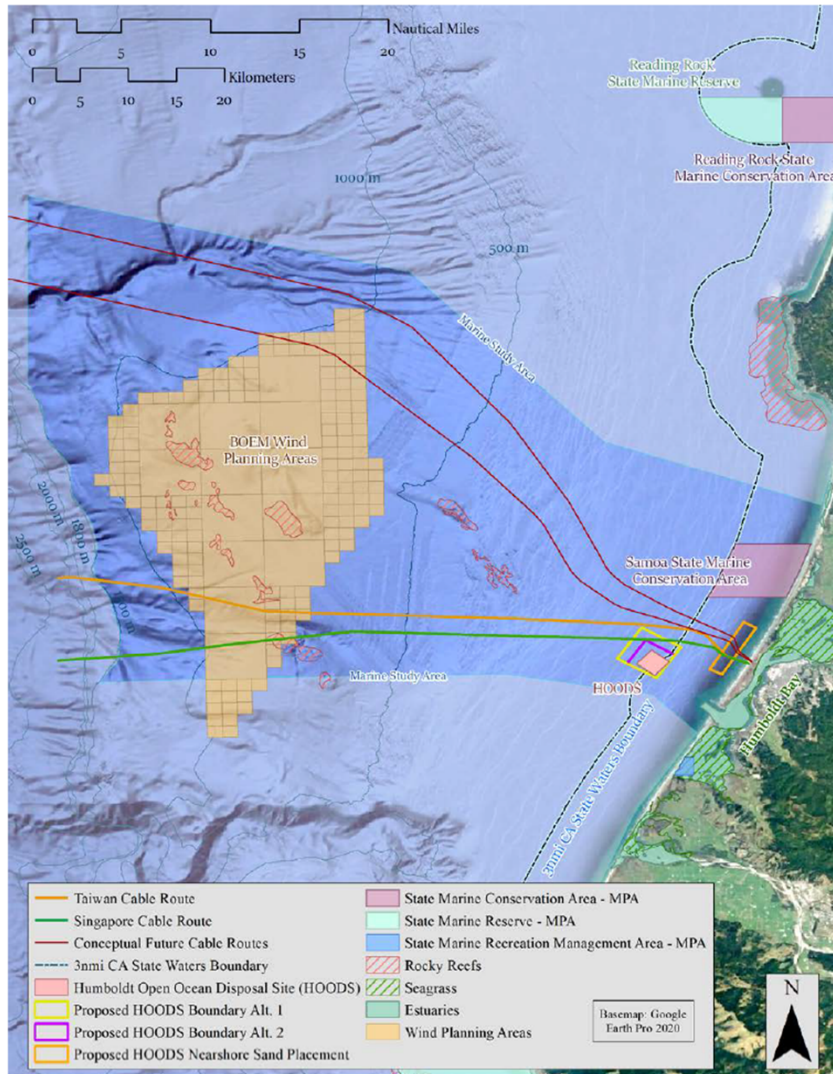
— Digital 299 Proposed Alignment

— Bureau of Land Management

— Hoopa Valley Reservation

Project Overview Map
Digital 299 Broadband Project

Figure 3.4-3. Marine Biological Study Area

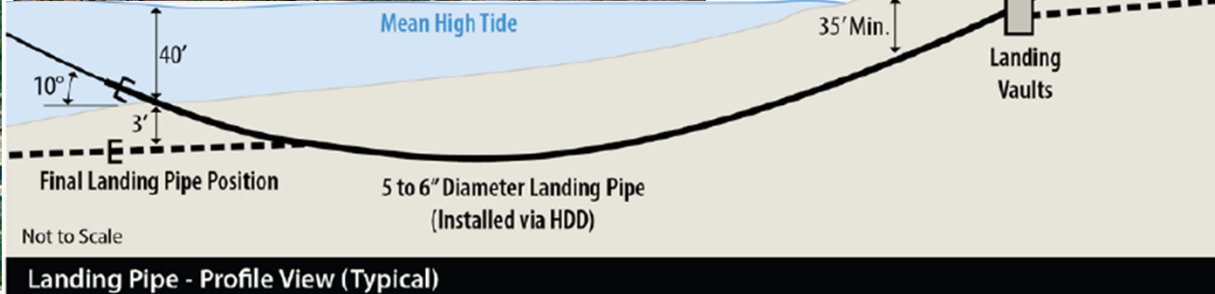
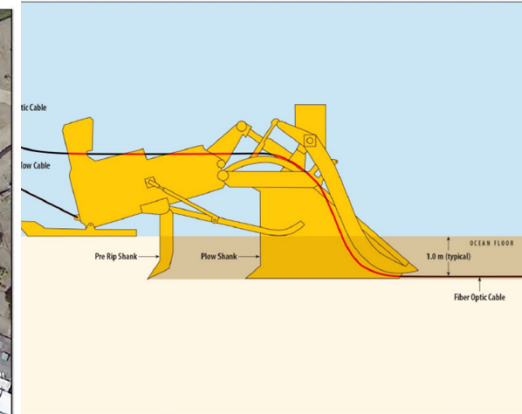


Humboldt Cable Landing

Figure 2-1. Terrestrial Project Components



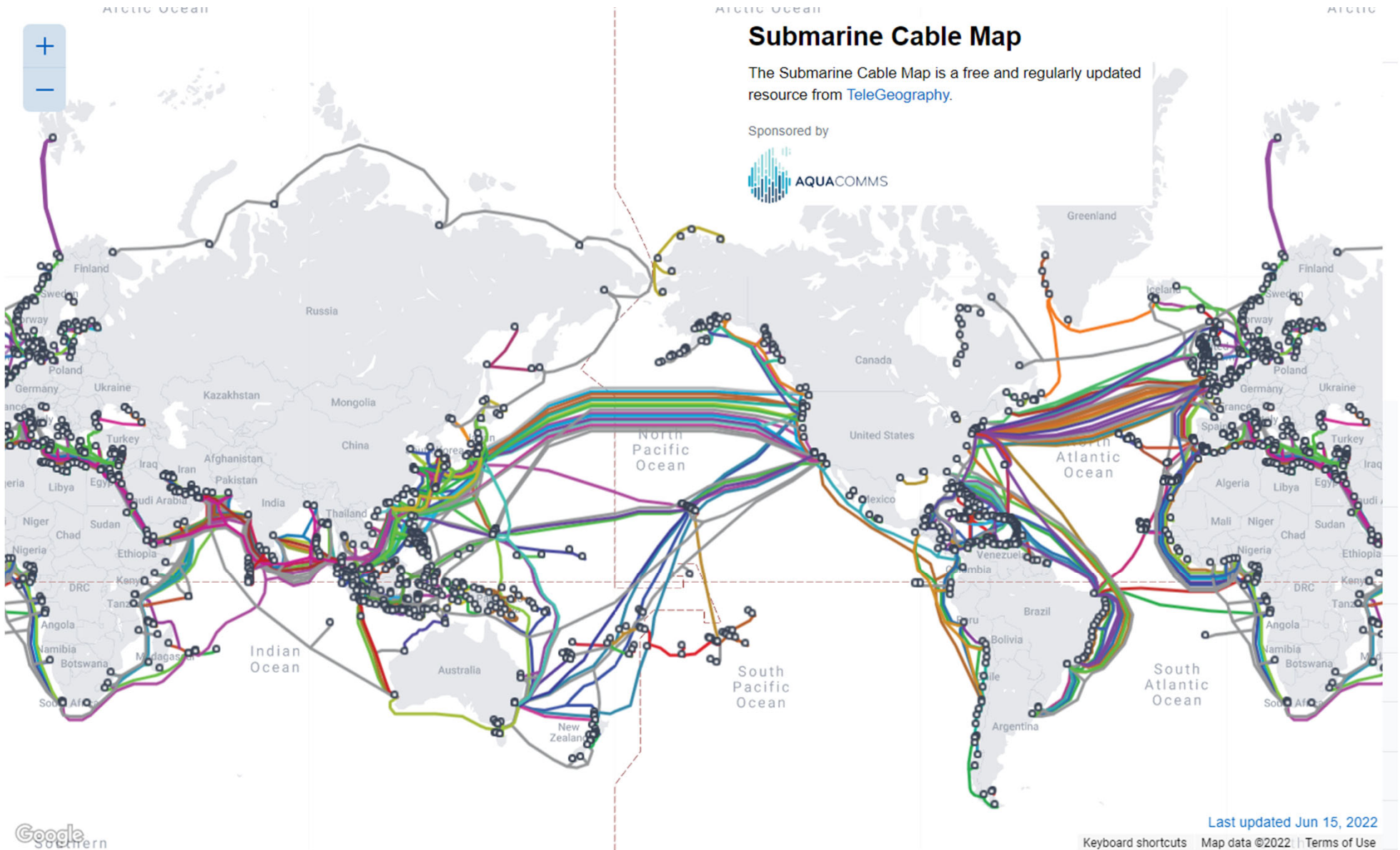
-8. Sea Plow for Burying Marine Fiber Optic Cables on Ocean Floor



Submarine Cable Map

The Submarine Cable Map is a free and regularly updated resource from [TeleGeography](#).

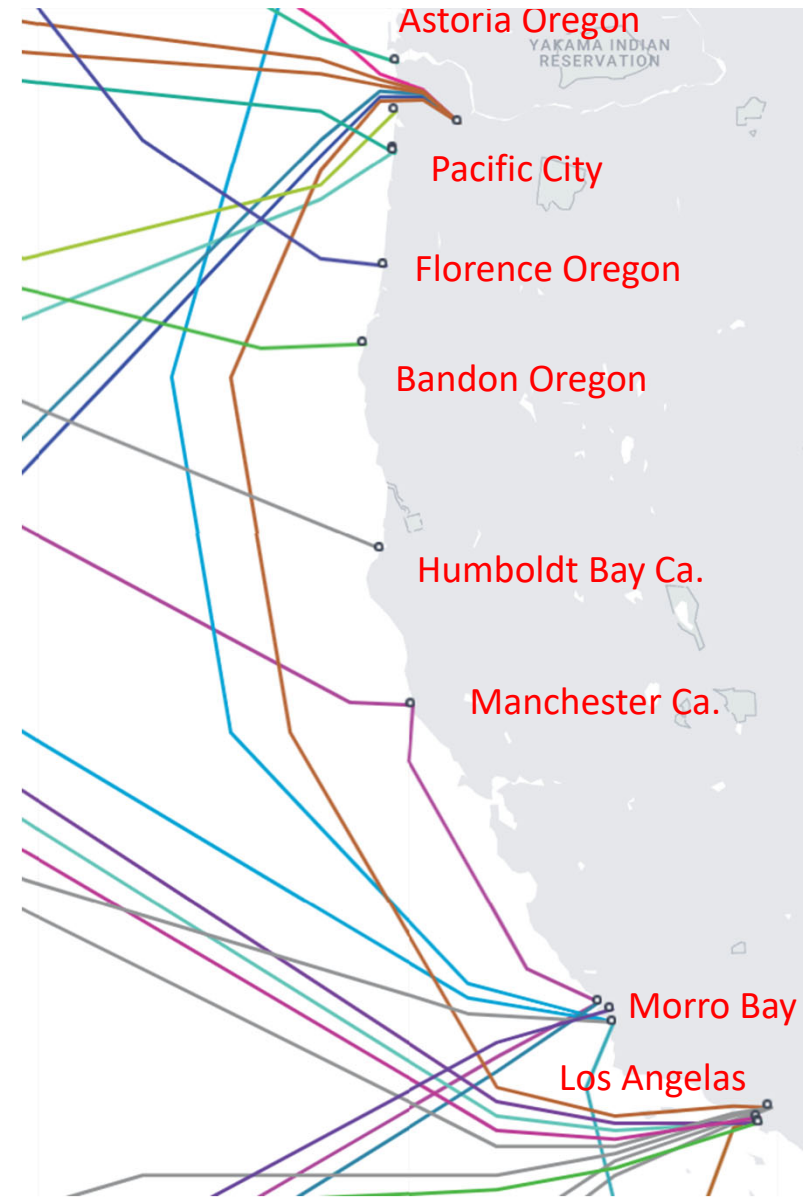
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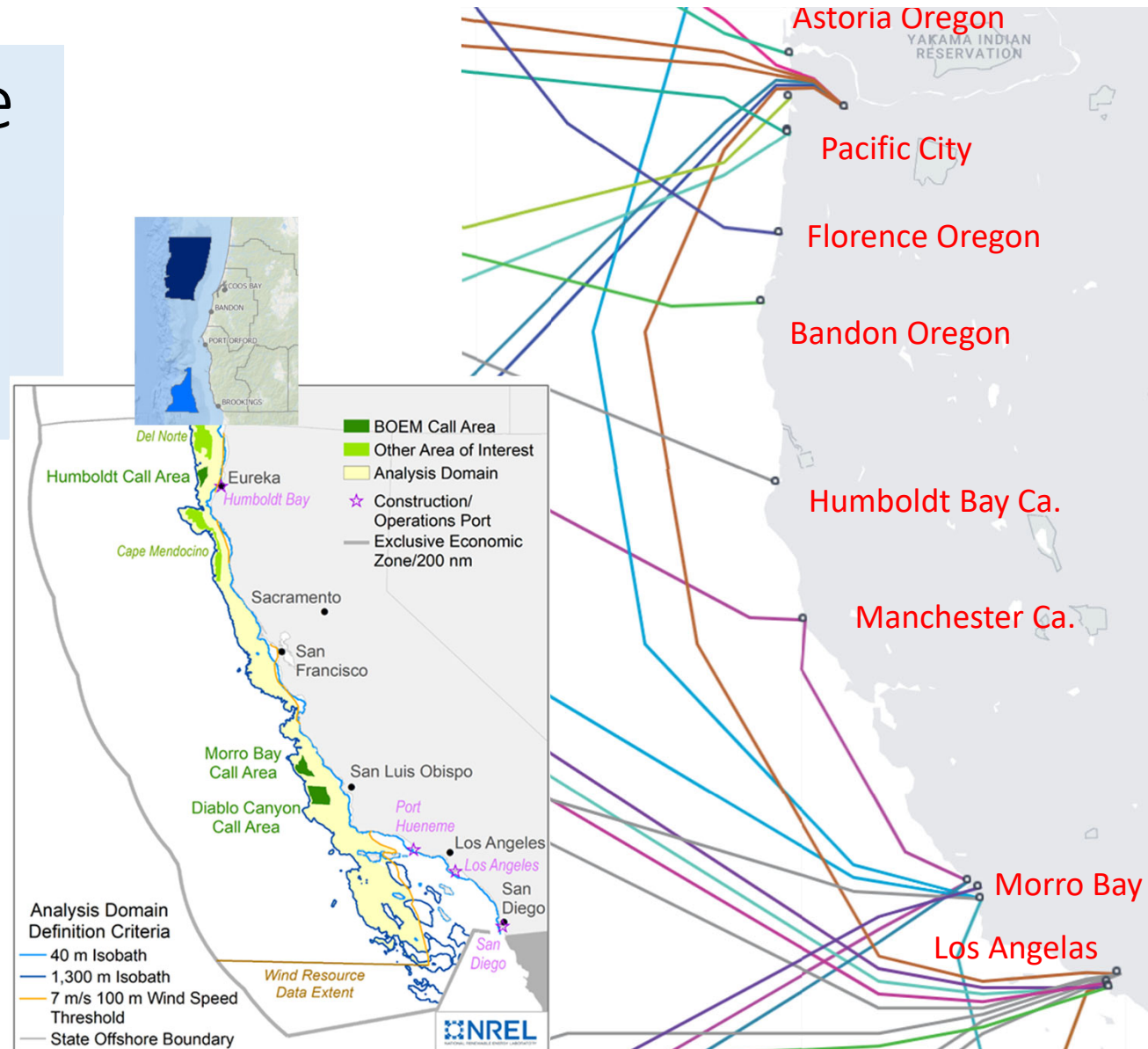
Last updated Jun 15, 2022

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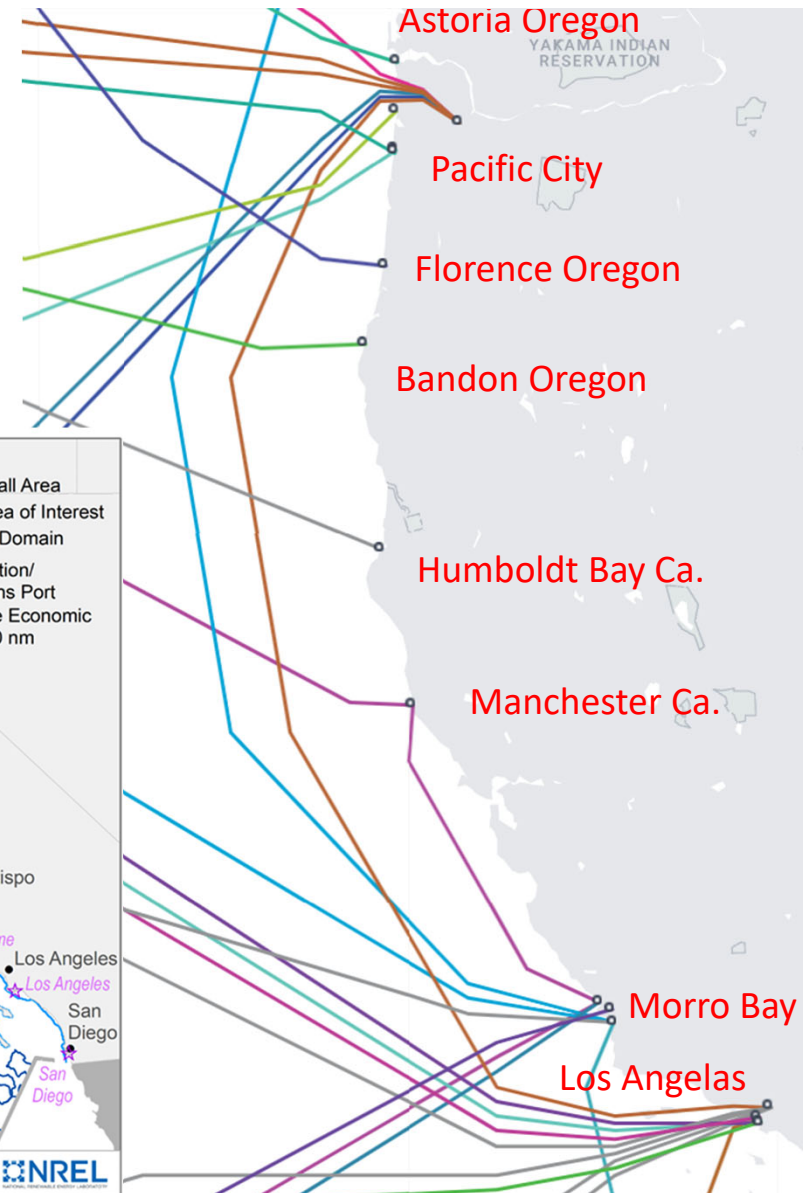
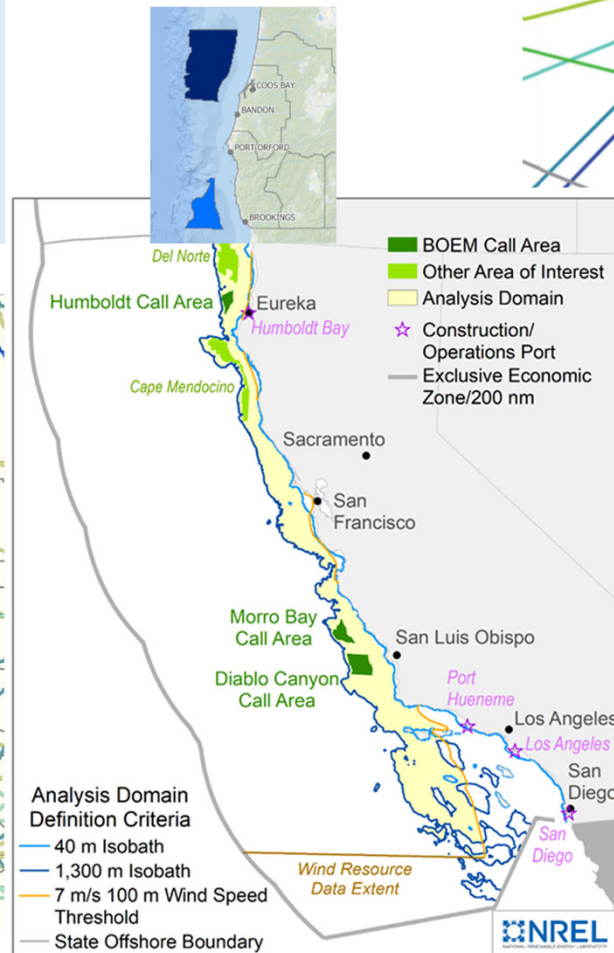
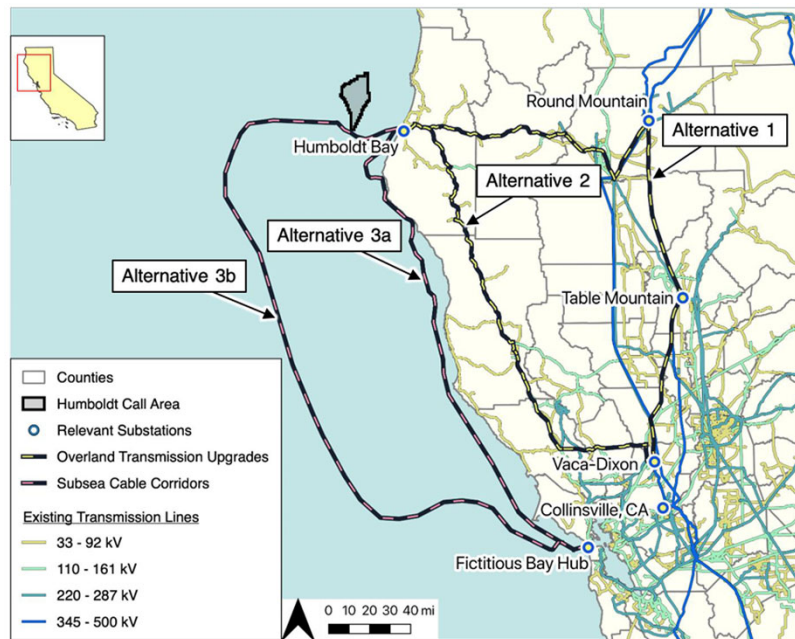
West Coast Cable Routes



West Coast Cable Routes & Offshore Wind Lease Areas



West Coast Broad Band Cable Routes Offshore Wind Call Areas, & Electrical Transmission Grid



Thank You



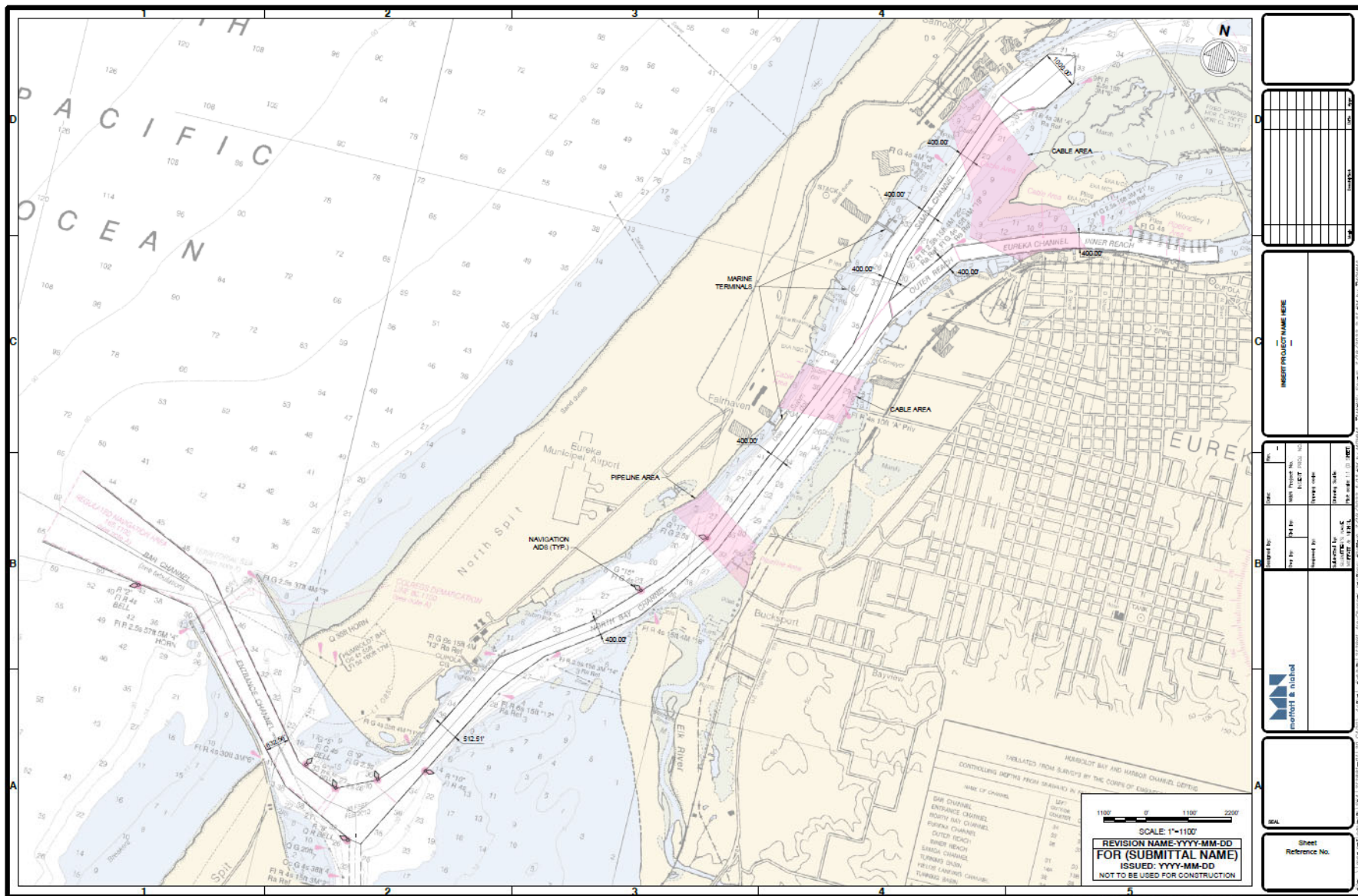
Primary Impacts Categories?

- GHG
- Aesthetics
- Air quality
- Noise
- Osprey
- Eelgrass
- Pile driving
- Dredging (berth, nav channel, and wet storage)
- Stormwater
- Tsunami/seismic
- Contamination/clean-up
- Wetland/ESHA
- SLR
- Shoreline
- Wet storage
- Traffic
- EJ
- Building heights
- Impacts to recreational boating/surfing

Biology/Wetlands/ESHA (preliminary)

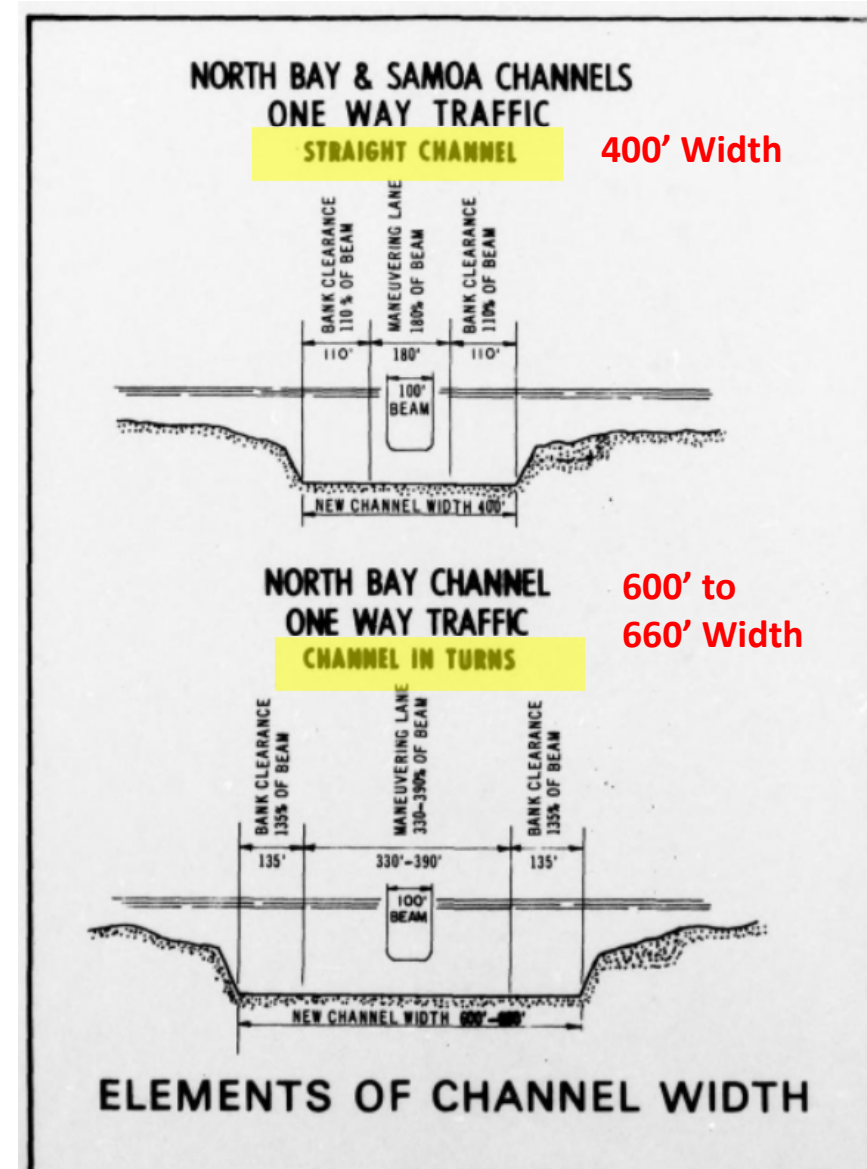
Eelgrass Strategy

Channel and Dredging (preliminary)



| | |
|---|--|
| Sheet Reference No. | |
| SEAL | |
| PROJECT NAME HERE PROJECT NO. HERE DATE HERE DRAWN BY HERE CHECKED BY HERE ISSUED BY HERE SCALE HERE SHEET NO. HERE TOTAL SHEETS HERE | |

Navigation Channel – Existing Channel (Width)



Navigation Channel – Tow Out Operations

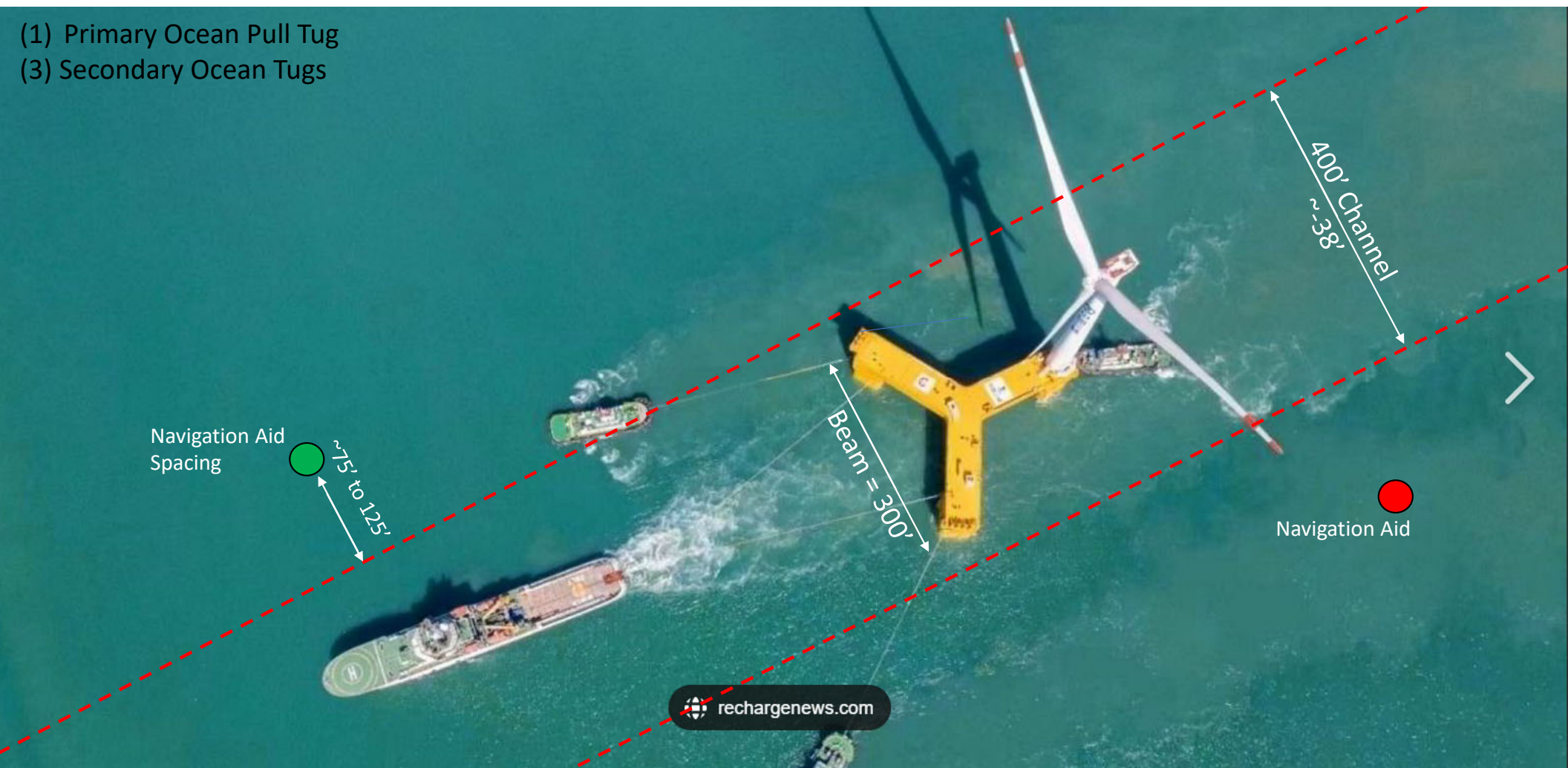
Source: 3 Gorges Offshore Floating Wind Farm Project



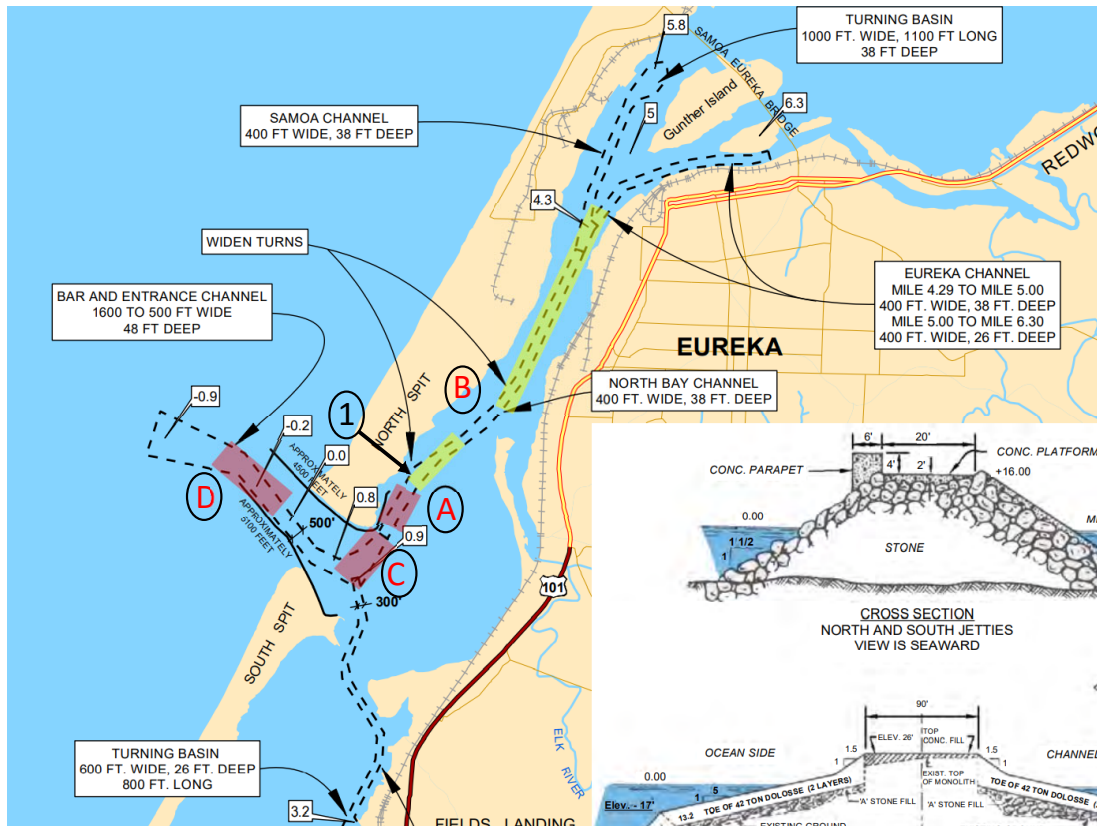
Prototype Example – Tow-out to Ocean (Samoa Channel Superimposed; approx. scale)

Source: Three Gorges Offshore Floating Wind Farm; China; circa Summer 2021.

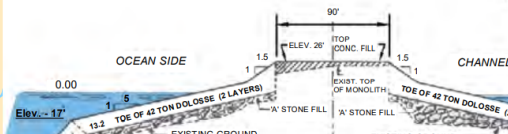
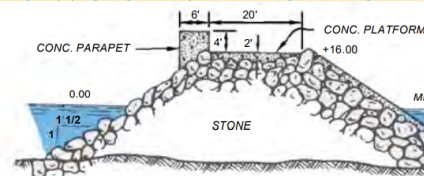
- (1) Primary Ocean Pull Tug
- (3) Secondary Ocean Tugs



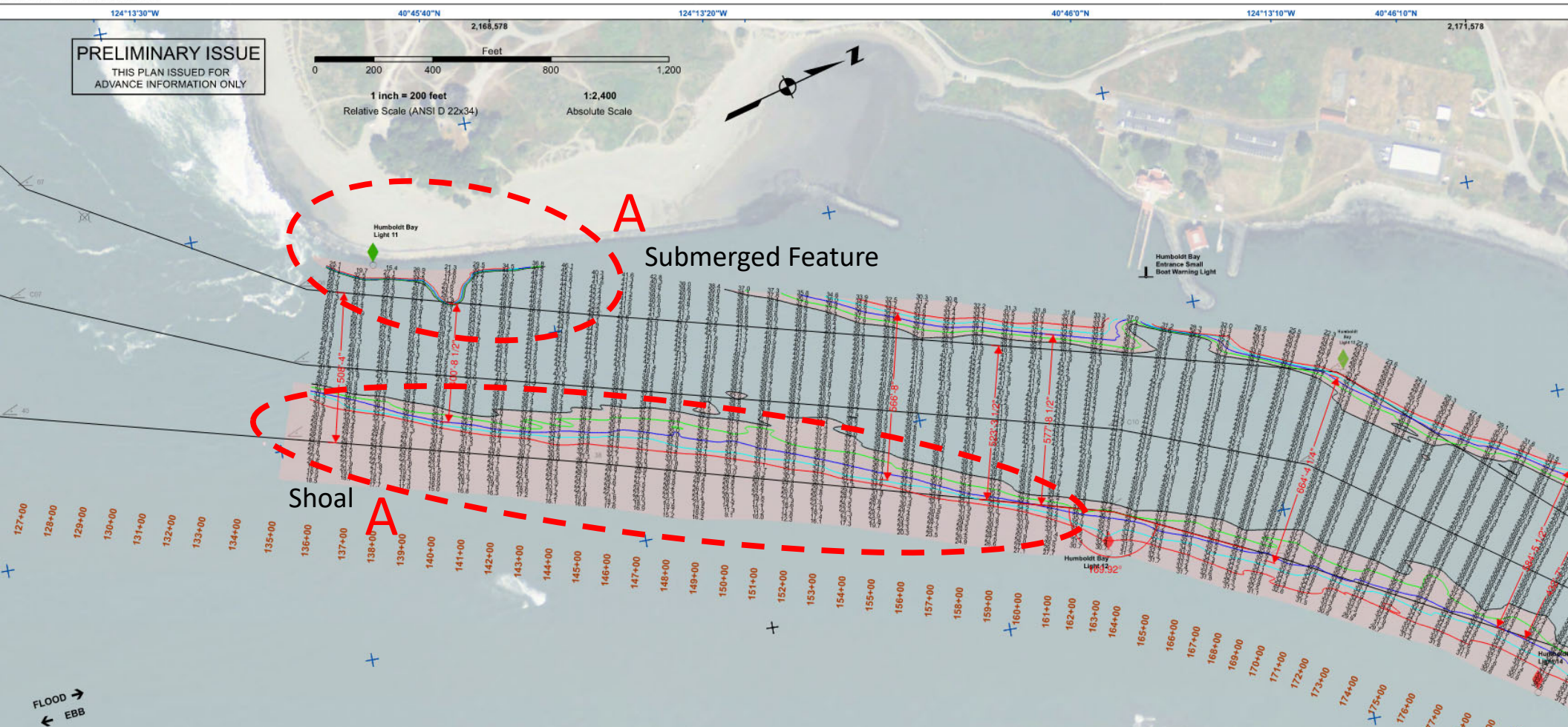
Navigation Channel – Width/Depth & Maneuvering



- = Area of Higher Concern
- = Area of Medium Concern
- = Area of Lower Concern



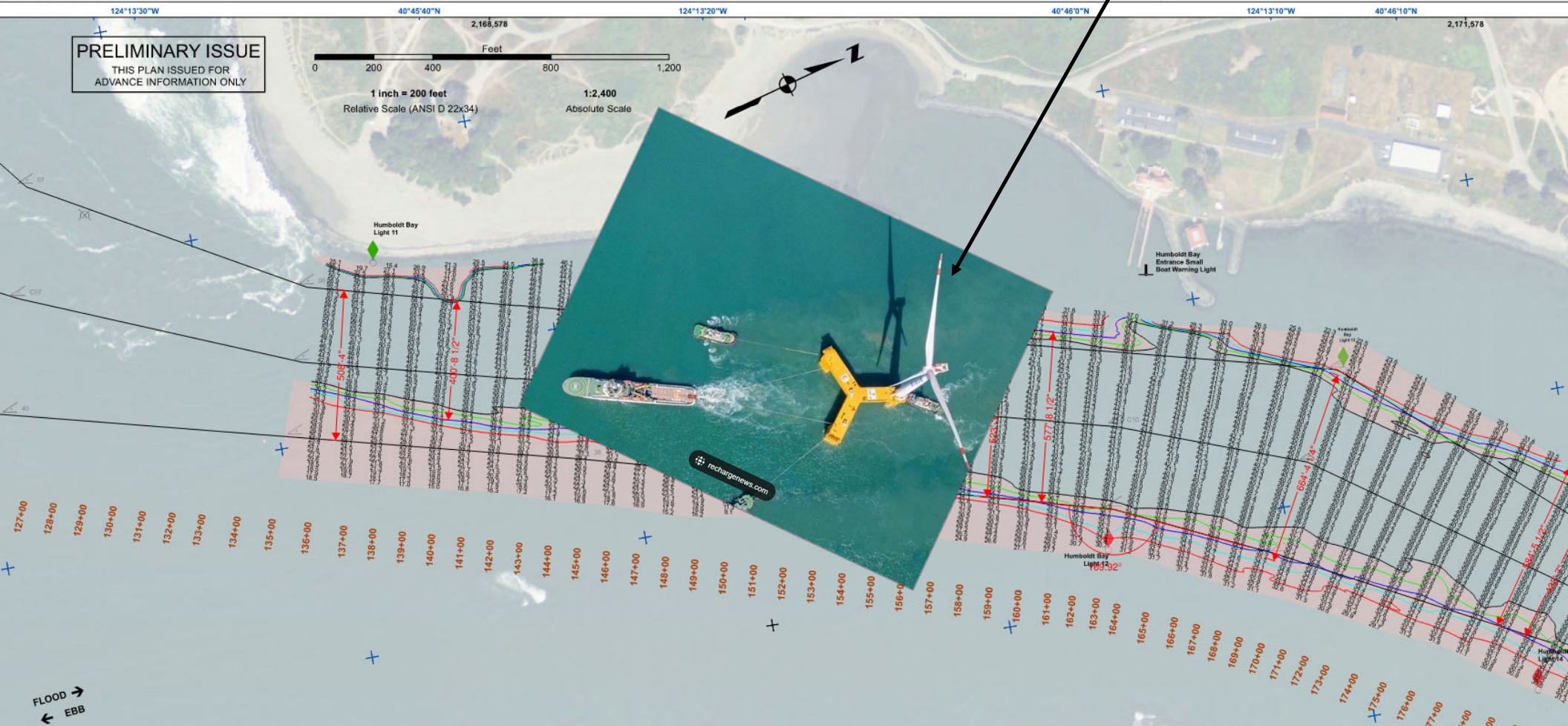
ENGINEERS

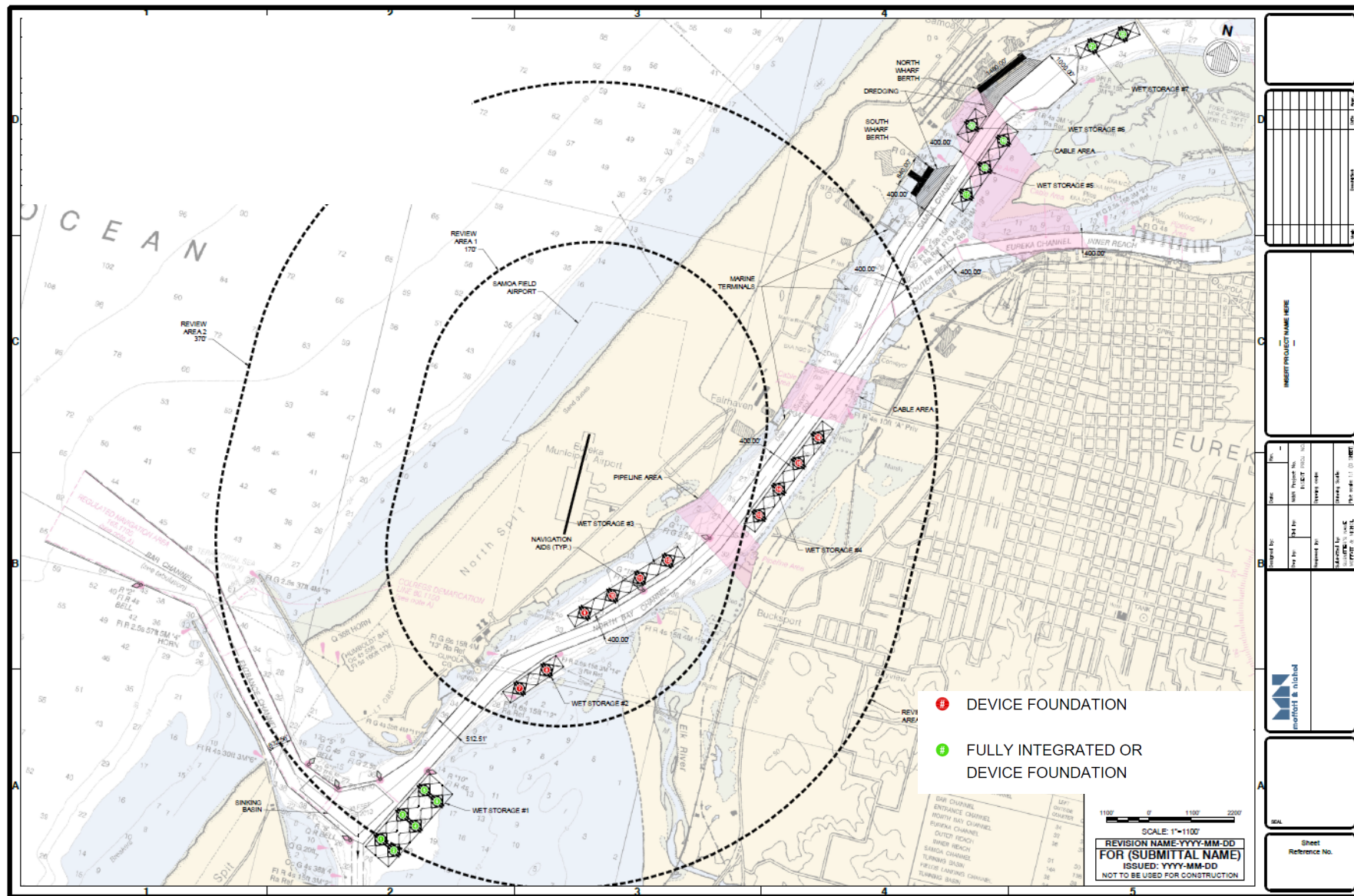


Navigation Channel – Notation A

3 Gorges Project Floater Scaled to ~300' Beam

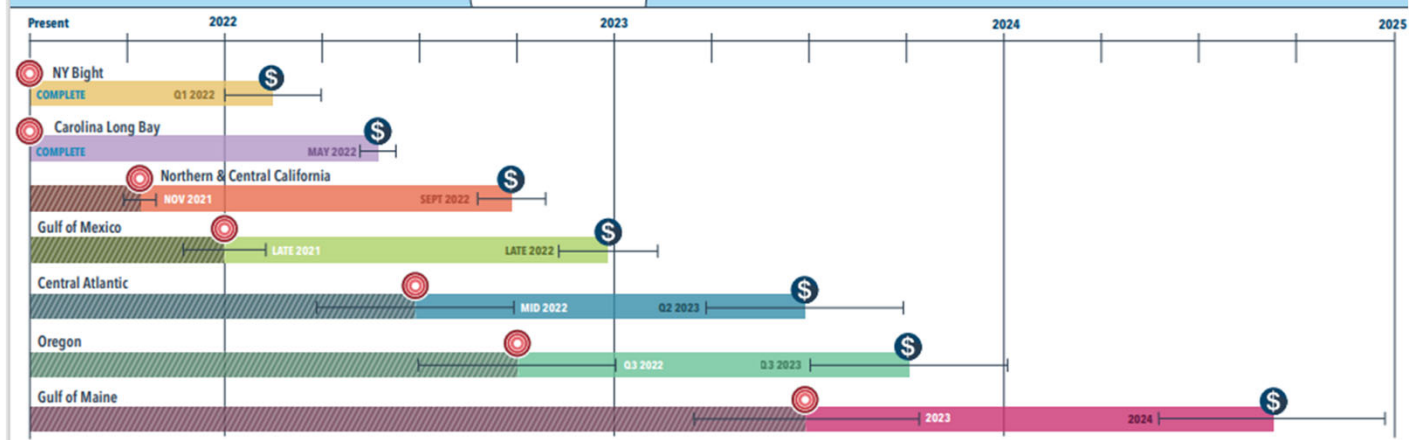
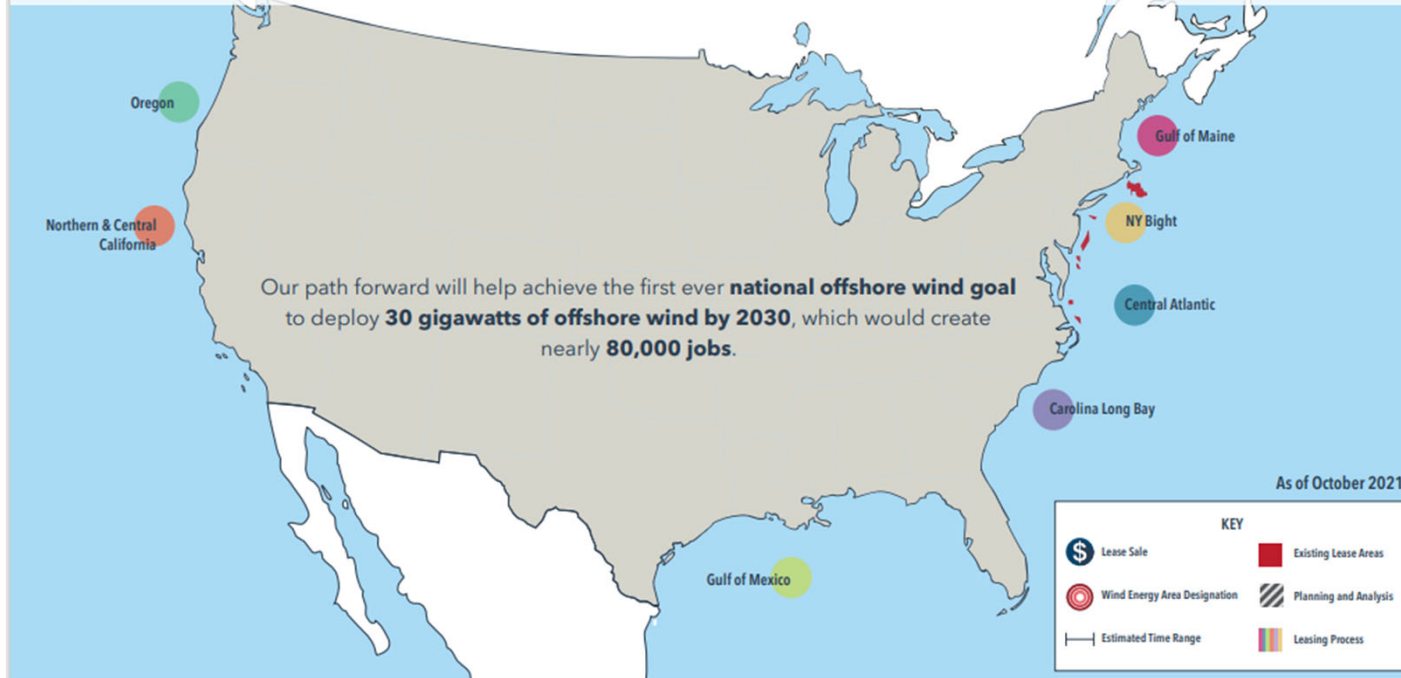
PS OF ENGINEERS





Workforce

Offshore Wind Leasing Path Forward 2021-2025



Offshore wind industry in California

- 14,000+ potential direct construction and operations jobs
- \$20-50B in state GDP growth from construction, operations, and support functions.
- Shipyard infrastructure investment and ship construction can revitalize industrial port areas.

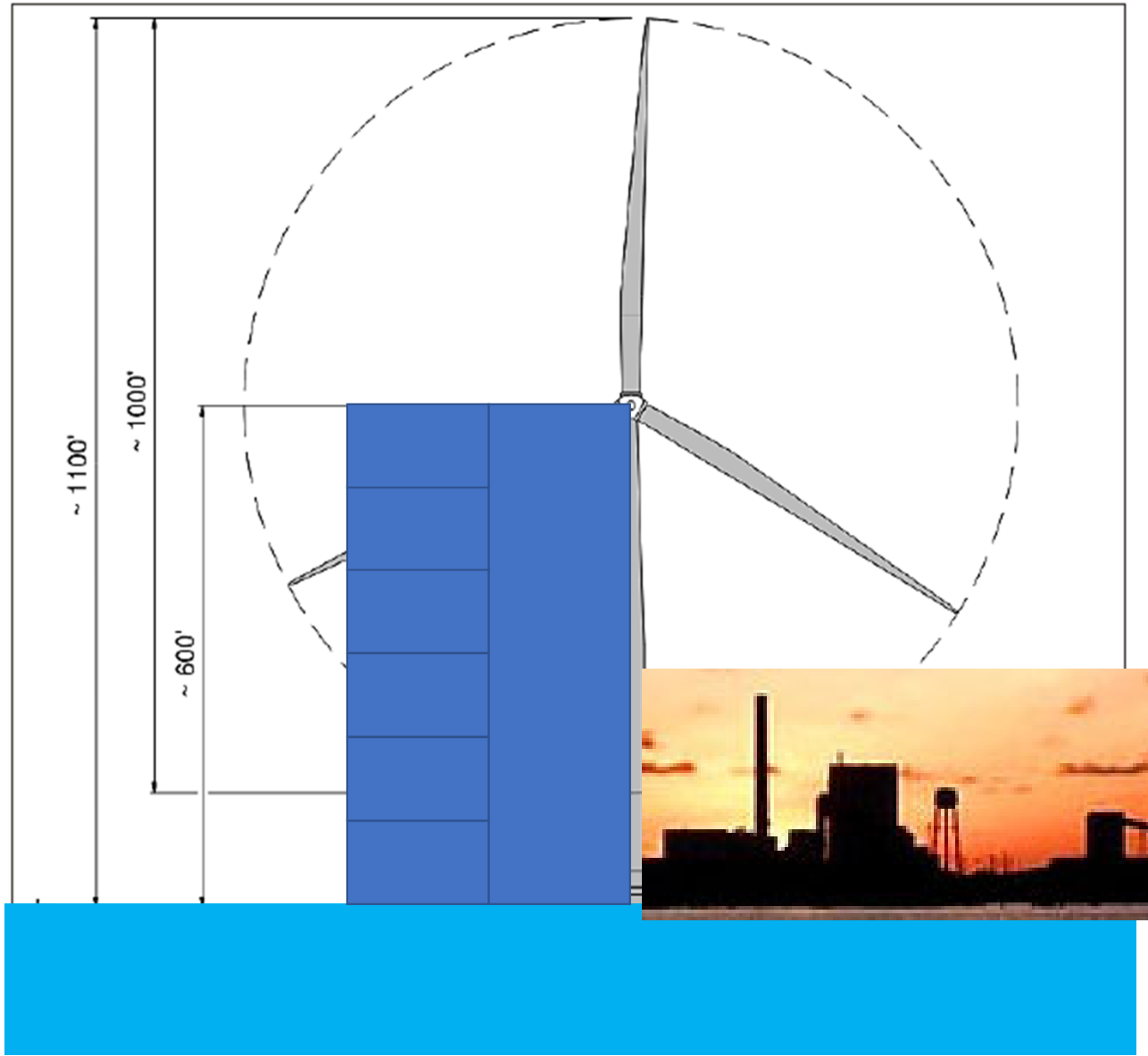


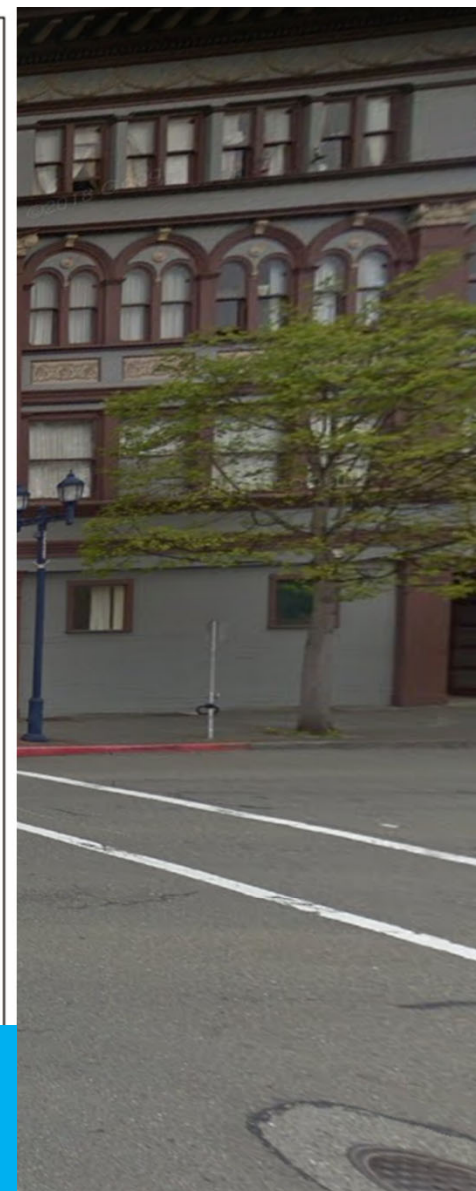
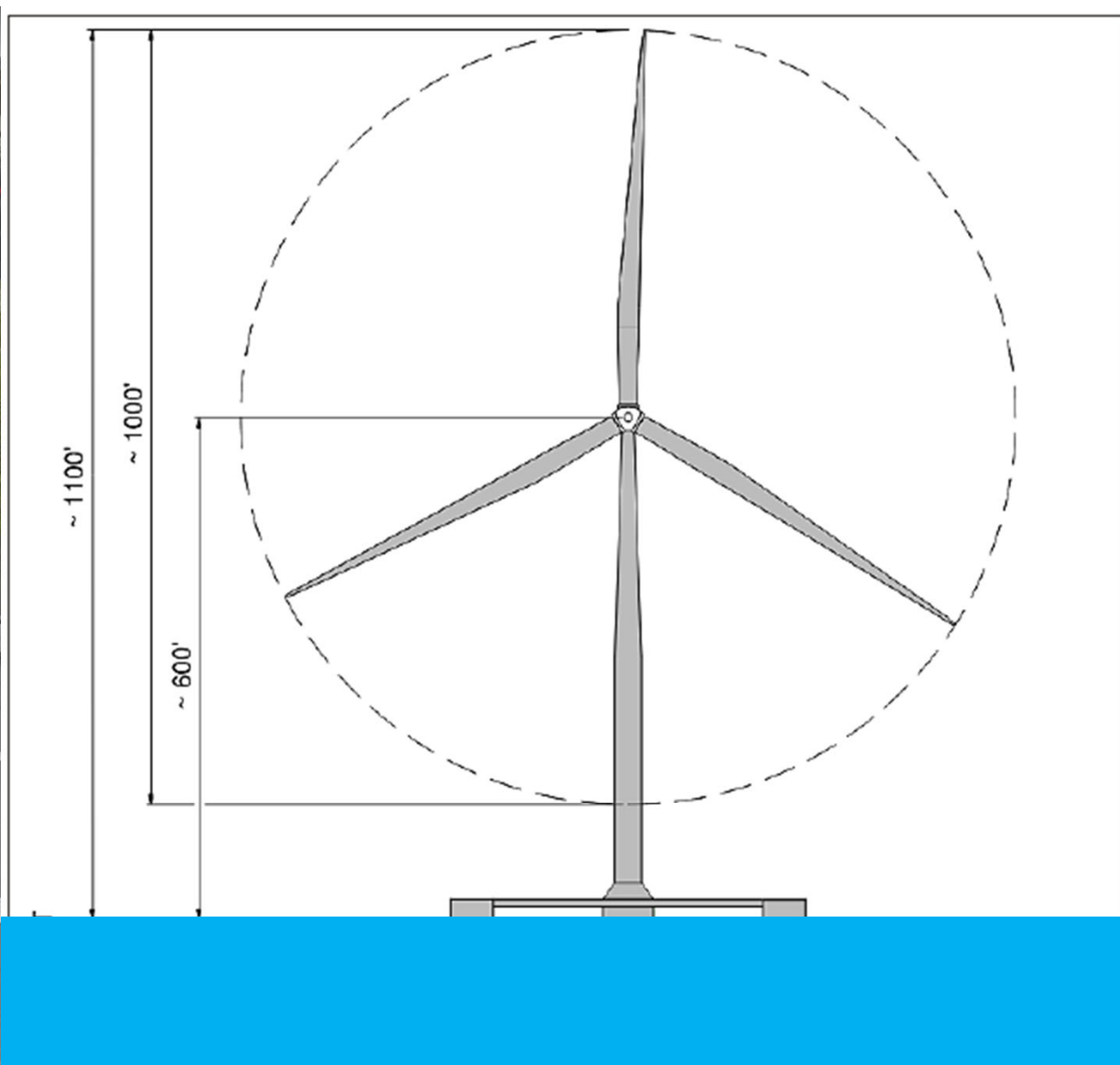
Growing a Wind Energy Cluster



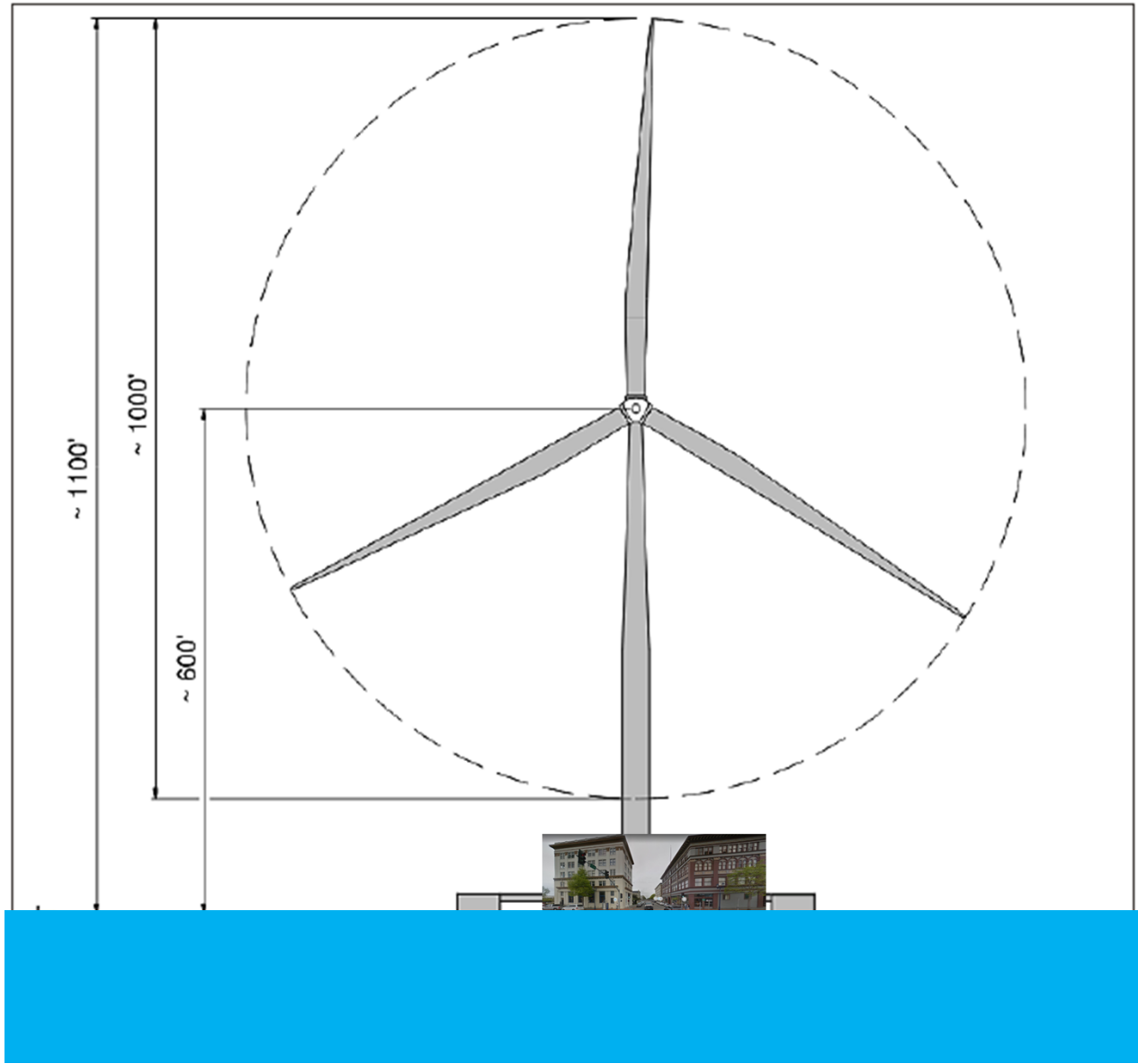
Supply Chain Activities

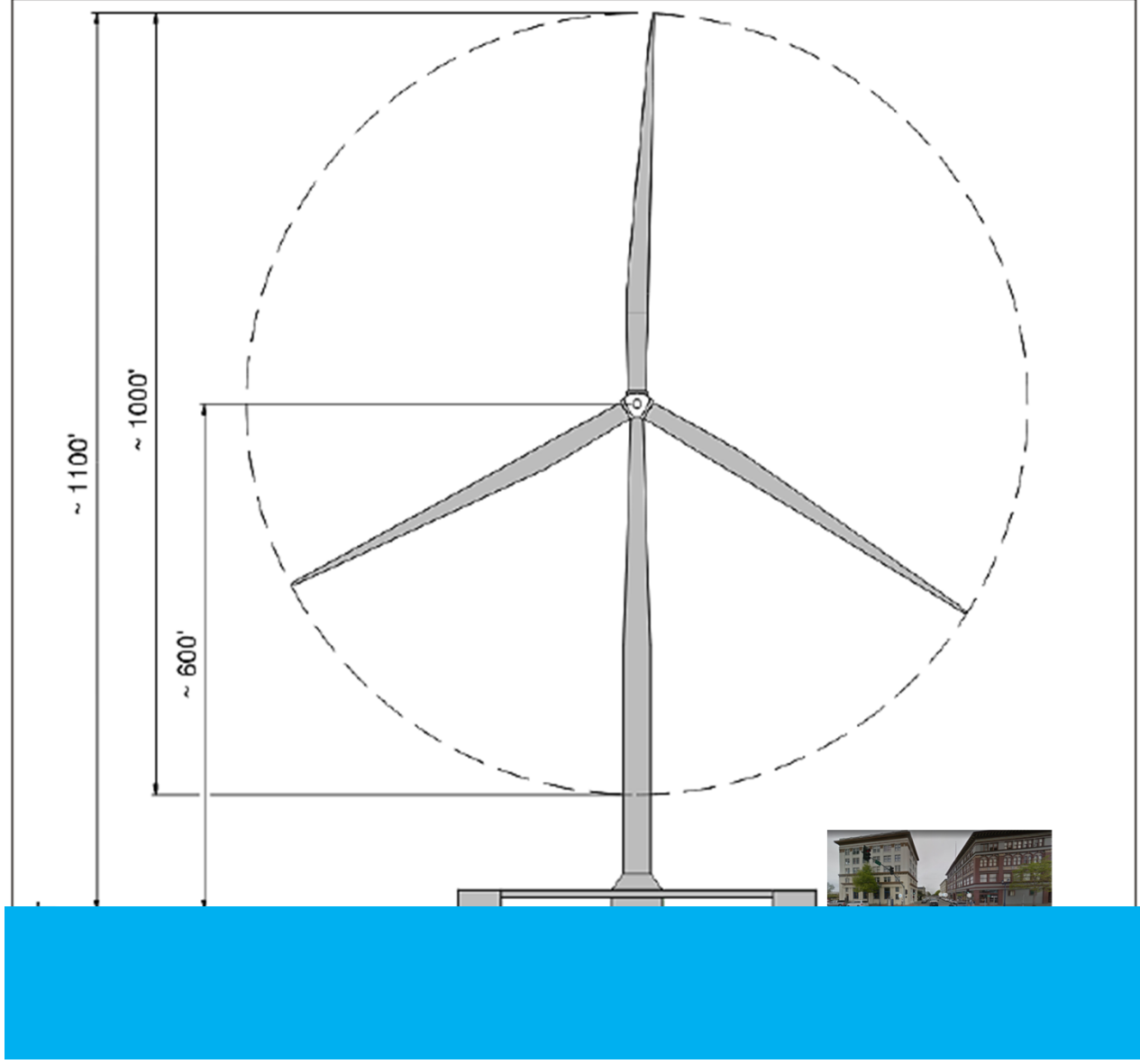
- Project development and management
- Manufacturing
 - Nacelle, hub, and assembly
 - Blades
 - Tower
 - Foundation supply
 - Array cable supply
 - Export cable supply
 - Onshore and offshore substation supply
 - Operational infrastructure
- Installation
 - Turbine installation
 - Foundation installation
 - Array cable installation
 - Export cable installation
 - Other installation
- Operation, maintenance, and service
 - Wind farm operation
 - Turbine maintenance and service
 - Foundation maintenance and service
 - Subsea cable maintenance and service
 - Substation maintenance and service
- Decommissioning

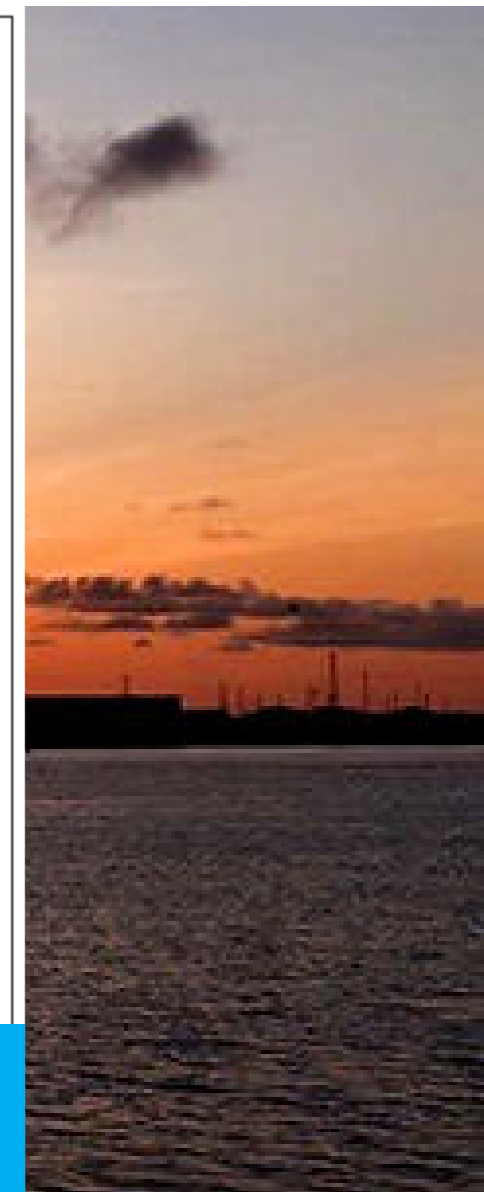
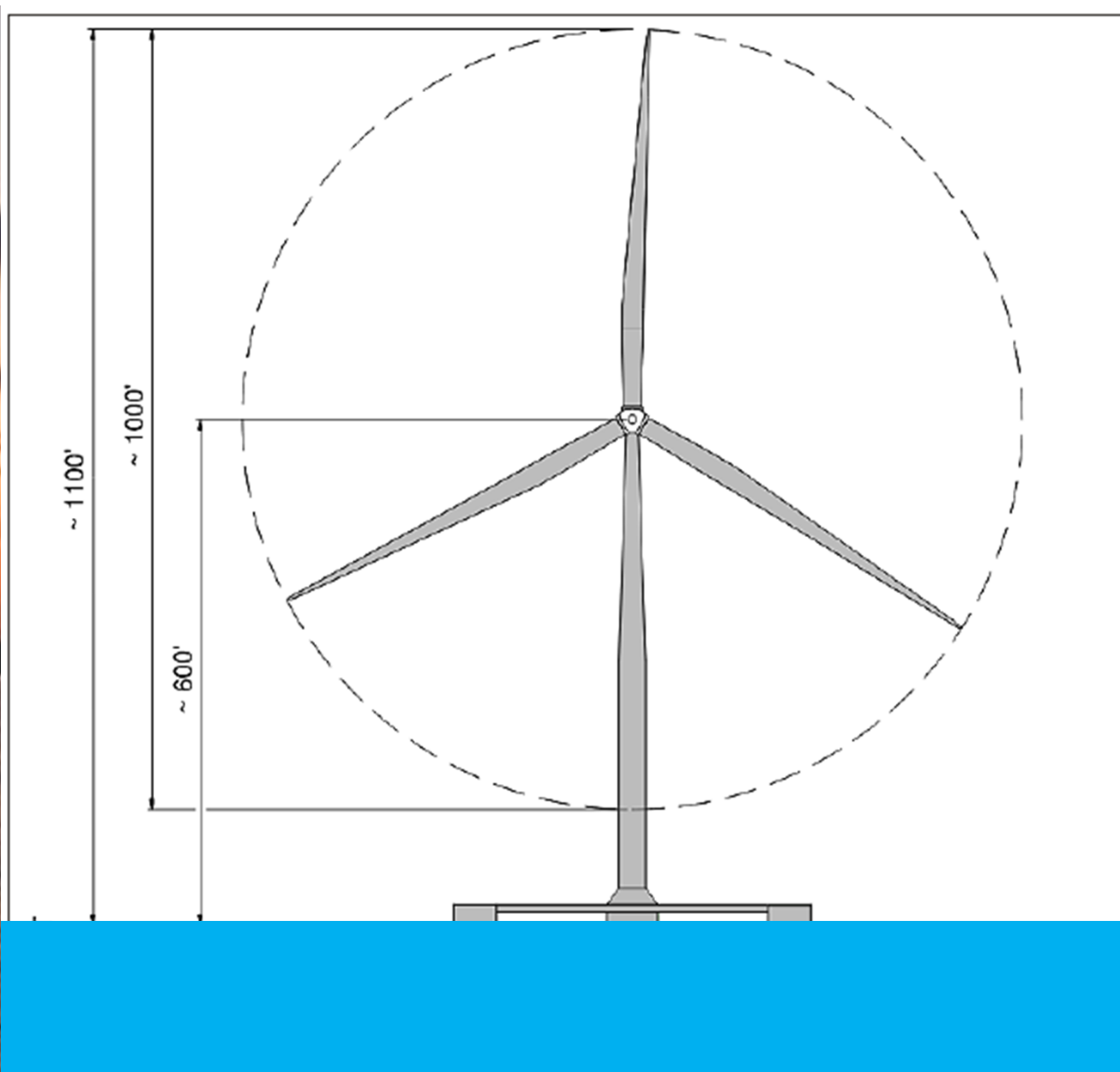




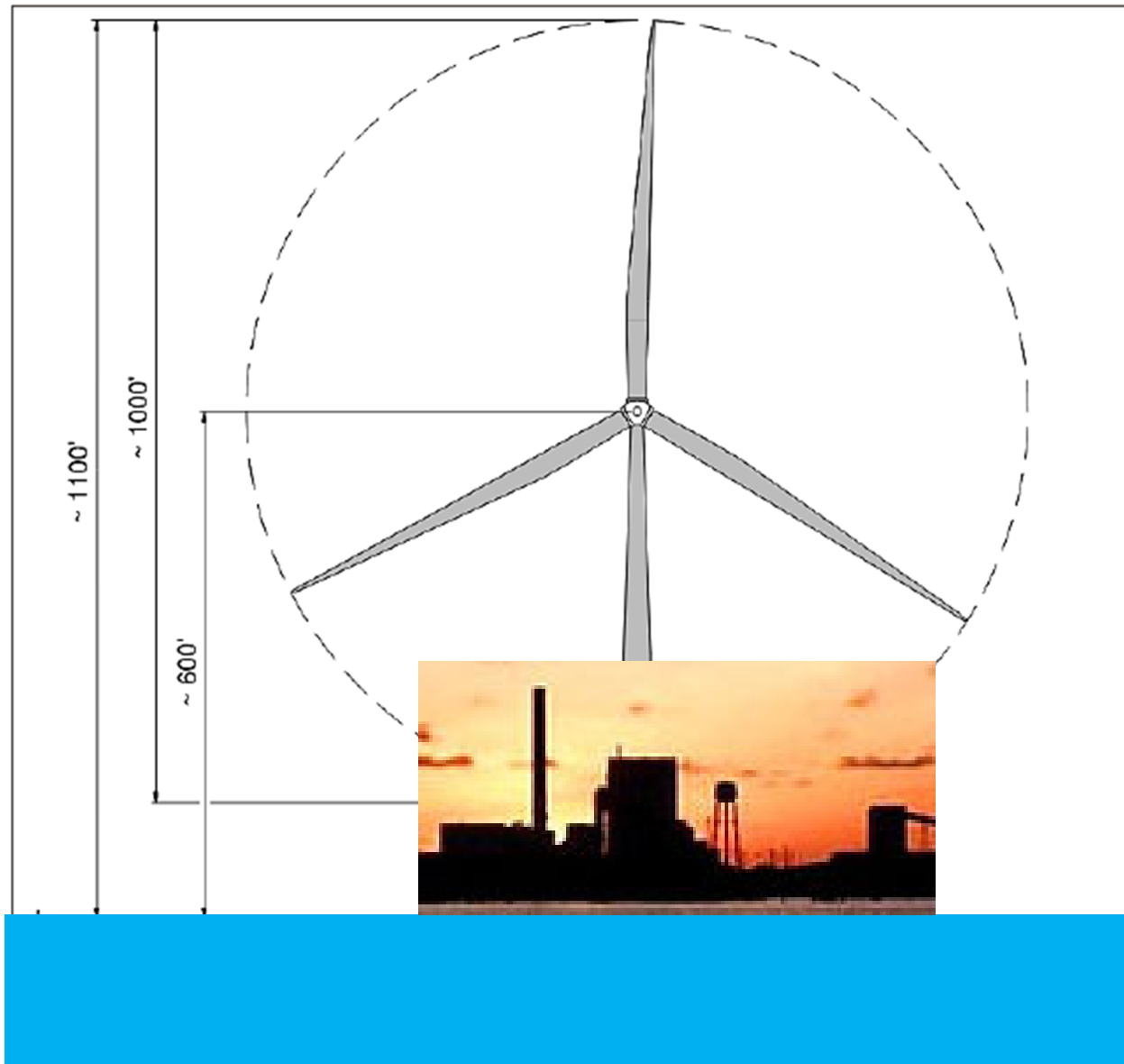


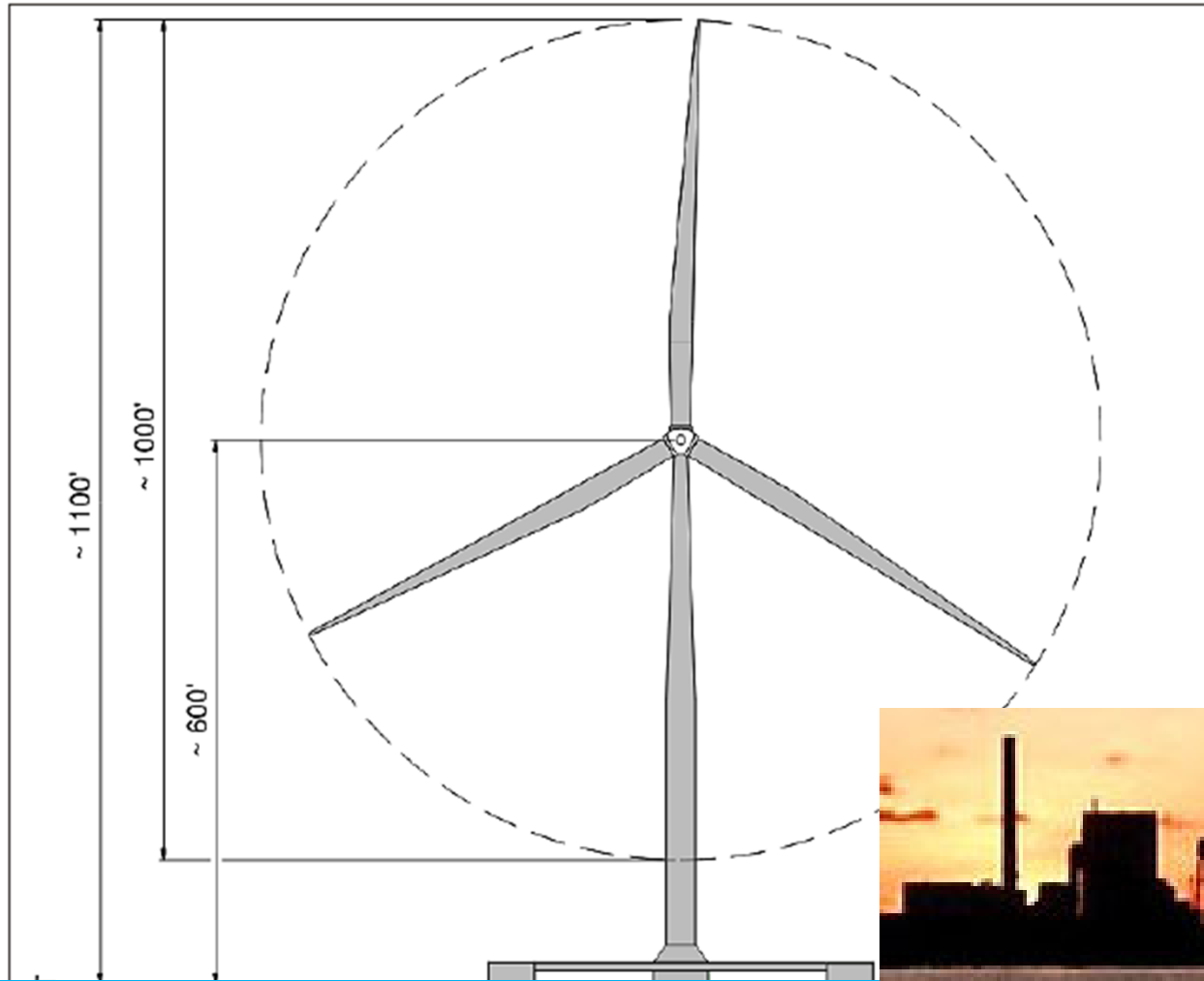












Costs include Clearing, Excavation, Stone, Tarmacadam / Paving, Concrete, PC Concrete, Reinforcement, Form work, Structural Steel, Safety Barriers, Labor, Construction Equipment, Detailed Design & Construction Management / Inspection. (Accuracy +/-20%).

Major road, 2 lanes, 12' wide each lane & 2 # 3' wide shoulder, no bridges, N.E. USA \$5.34 million per mile. \$3.34 million per km.

Major road, 2 lanes, 12' wide each lane & 2 # 3' wide shoulder, no bridges, S.E. USA \$ 6.04 million per mile. \$ 3.78 million per km.

Major road, 2 lanes, 12' each lane wide & 2 # 3' wide shoulder including (1) 2 lane overpass bridge, S.E. USA \$6.46 million per mile. \$ 4.04 million per km.

Major road, 2 lanes, 12' wide each lane & 2 # 3' wide shoulder including (1) 2 lane overpass bridge, S.E. USA \$ 6.75 million per mile. \$4.22 million per km.

Addition of 12' lane & 1 # 3'wide shoulder to existing major road in Mid-West USA. \$1.43 million per mile. \$0.89 million per km.

Addition of 12' lane & 1 # 3'wide shoulder to existing major road in Central USA. \$1.63 million per mile. \$1.02 million per km.

Major Freeway / Interstate 4 lanes 12' wide lane & 2 # 3' shoulder, including (1) 2 lane overpass bridge, in N.W. USA. \$19.22 million per mile. \$12.01 million per km.

Major Freeway / Interstate 4 lanes 12' wide lane & 2 # 3' shoulder, including (1) 2 lane overpass bridge, in S.E. USA. \$20.31 million per mile. \$12.69 million per km.

Elevated Major Freeway / Interstate, 4 lanes 12' wide each lane & 3' shoulder, urban location in Central USA. \$68.45 million per mile. \$42.78 million per km.

Elevated Major Freeway / Interstate, 4 lanes 12' wide each lane & 3' shoulder, urban location in S.E. USA. \$71.33 million per mile. \$44.58 million per km.

For further information contact, John G. McConville CCP – Operations Director – Compass International Telephone in USA (609) 577 4505

Additional data & information can be found in our 2018 US & International Construction Costs Yearbooks that details a broad range of construction costs in the USA & 100+ countries, data includes construction labor & A/E – engineering hourly rates, construction management, bulk material unit costs, city location factors, productivity values, inflation rates, import duties / taxes, plant hire rates and much more.