Offshore Wind Port Planning

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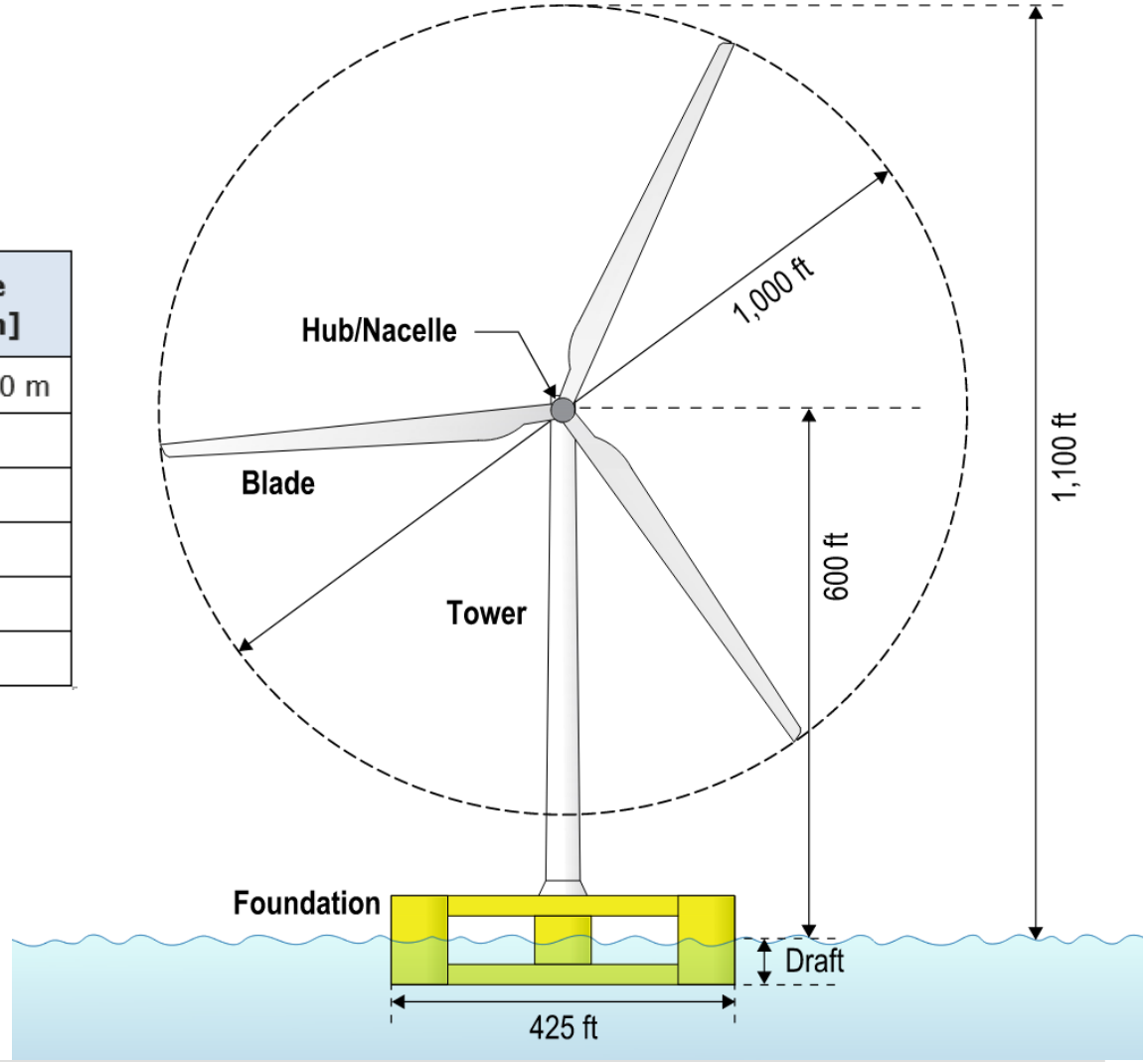
Offshore Wind Requires Ports

- **What is needed for Offshore Wind?**
  - Wind Resource
  - Electrical Grid
  - Ports and Port Terminals
- **Construction, Operations, and Maintenance of OSW farms requires Ports:**
  - Sheltered harbor areas
  - Large laydown areas
  - Deep, navigable water
  - Heavy load capacity
- **There are no existing port terminals on the US West Coast that can currently support OSW**
  - Requires significant investment and development
  - Requires a multi-port strategy
  - Adding a new maritime industry without displacing or replacing existing maritime uses

Floating OSW Turbine Dimensions

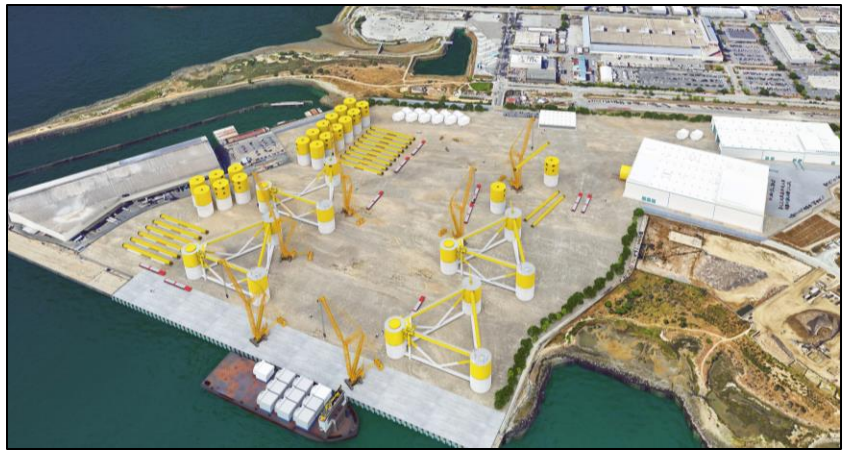
Floating Offshore Wind Turbine	Approximate Dimension [ft]	Approximate Dimension [m]
Foundation Beam / Width	Up to 425 ft x 425 ft	Up to 130 m x 130 m
Draft (Before integration)	15 to 25 ft	4.5 to 7.5 m
Draft (After integration)	20 to 50 ft	6 to 15 m
Hub/Nacelle Height (from Water Level)	Up to 600 ft	Up to 183 m
Tip Height (from Water Level)	Up to 1,100 ft	Up to 335 m
Rotor Diameter	Up to 1,000 ft	Up to 305 m



Types of OSW Port Terminals

- **Staging and Integration (S&I) Site:** a port site to receive, stage, and store offshore wind components and to assemble the floating turbine system for towing to the offshore wind area.
- **Manufacturing/Fabrication (MF) Site:** a port site that receives raw materials via road, rail, or waterborne transport and creates larger components in the offshore wind supply chain.
- **Operation and Maintenance (O&M) Site:** a base of wind farm operations with warehouses/offices, spare part storage, and a marine facility to support O&M vessels for crew transfer

Staging and Integration



Manufacturing Port (Foundations Shown)

Operations & Maintenance

Source for O&M Figure: Reach & Mott MacDonald

Floating OSW Port Requirements

Design Requirement	Staging and Integration (S&I)	Manufacturing (MF)	Operations & Maintenance (O&M)
Acreage, minimum	30 – 100 acres	30 – 100 acres	2 – 10 acres
Wharf Length	1,500 ft	800 ft	300 ft
Minimum Draft at Berth	38 ft	38 ft	20 – 30 ft
Draft at Sinking Basin	40 – 100 ft	40 – 100 ft	Not Required
Wharf Loading	> 6,000 psf	> 6,000 psf	100 – 500 psf
Uplands / Yard Loading (for WTG components)	2,000 – 3,000 psf	2,000 – 3,000 psf	100 – 500 psf

Identify Potential Port Sites

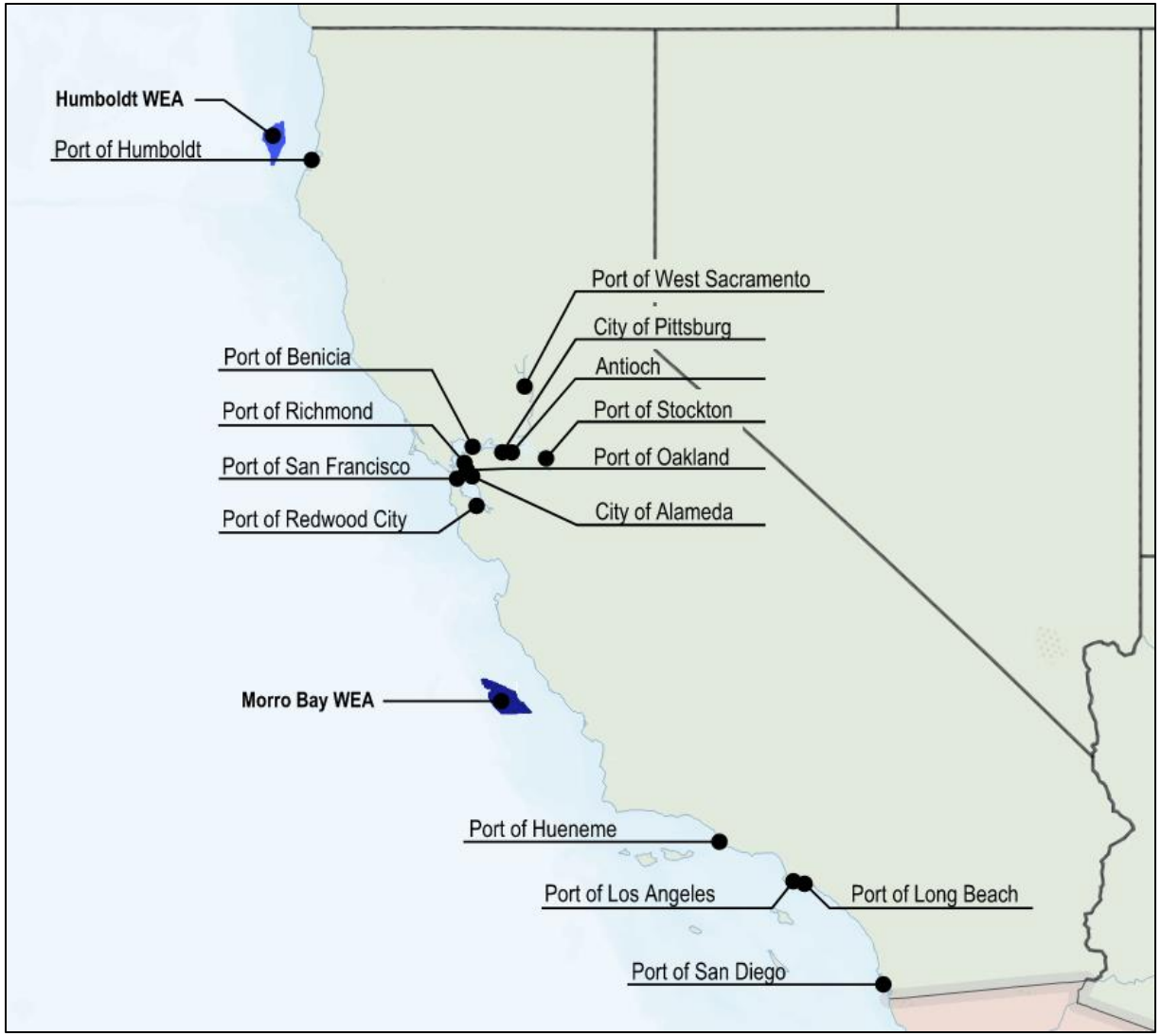
Options for OSW Port Sites in California

1. Use Existing Ports & Harbors – Upgrade port infrastructure within an existing port or harbor
2. Create a New Port or Harbor – Construct a new port at undeveloped site or at a former industrial site outside of existing ports (alternative option)

Existing Ports

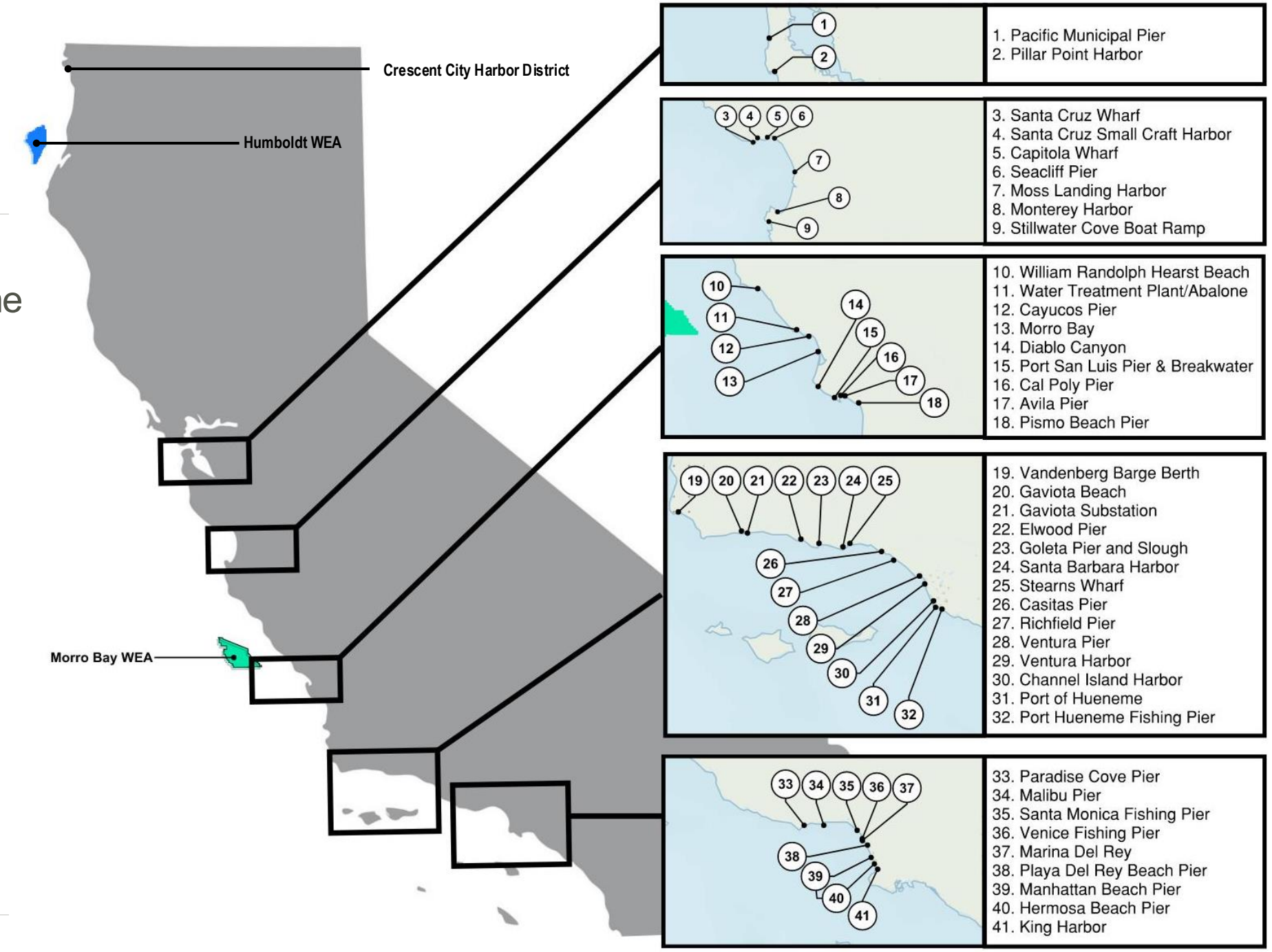
Existing Ports

- 11 deep water ports
- 4 industrial port areas



Existing Harbors

- Existing harbors along the North and Central Coast



Alternative Port Site Screening

Site Screening Criteria

- Exclude the following sites:
  - Residential / Urban Areas
  - California Marine Protected Areas
  - State Parks
  - National Forest
  - Military Base
  - Vandenberg Danger Zone
  - Airspace Restrictions
  - Islands (e.g. Catalina, San Nicolas, San Clemente)
  - Existing offshore oil & gas platforms
- Consider Existing and Proposed National Marine Sanctuaries
- Consider Engineering Feasibility
- Consider Permitting and Environmental Impacts

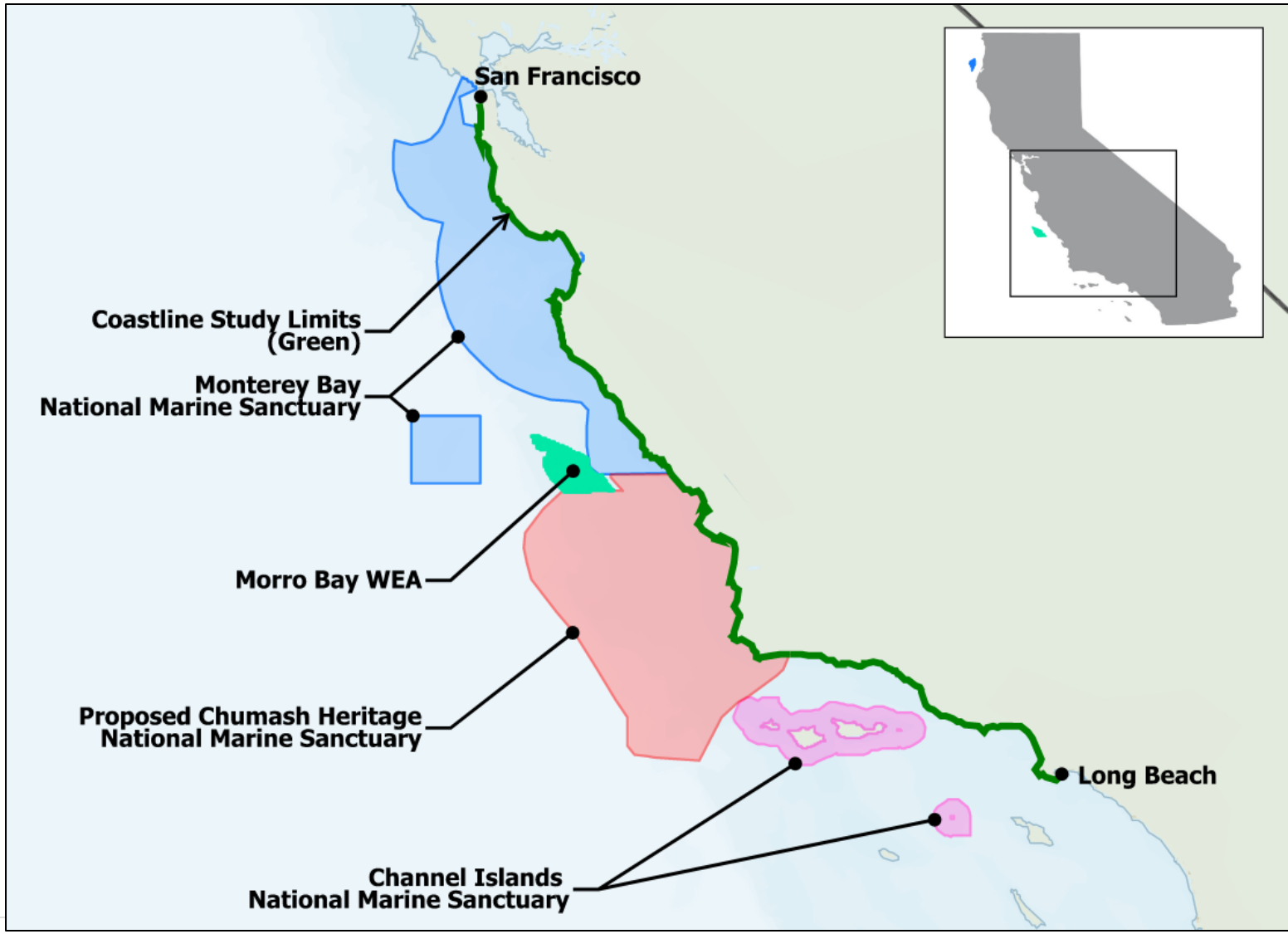
Screening Results

- Red = portion of coastline eliminated from consideration = ~77%

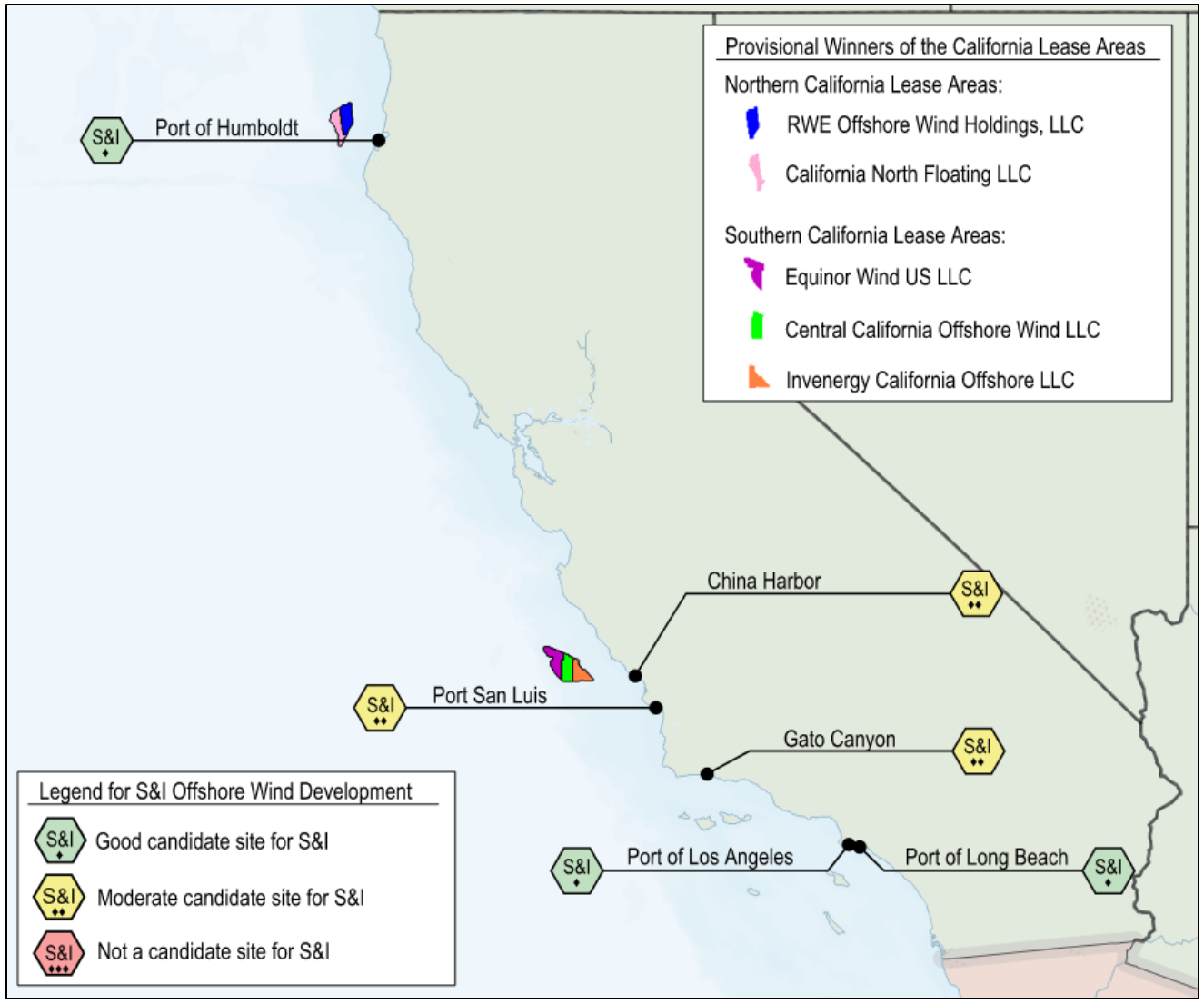
Primary Screening Criteria	Approx. % Shoreline*
Residential Zones	26%
State Marine Protected Areas	24%
Military Base	8%
Vandenberg Evacuation Area	9%
State Parks	34%
National Forests	5%
Airspace Restrictions	13%
Total	**~77%**

National Marine Sanctuaries (NMS)

- ~ 49% Existing NMS
- ~ 75% Existing & Proposed NMS
  - **Existing NMS**
    - Monterey Bay NMS
    - Channel Islands NMS
  - **Proposed NMS**
    - Proposed Chumash Heritage NMS

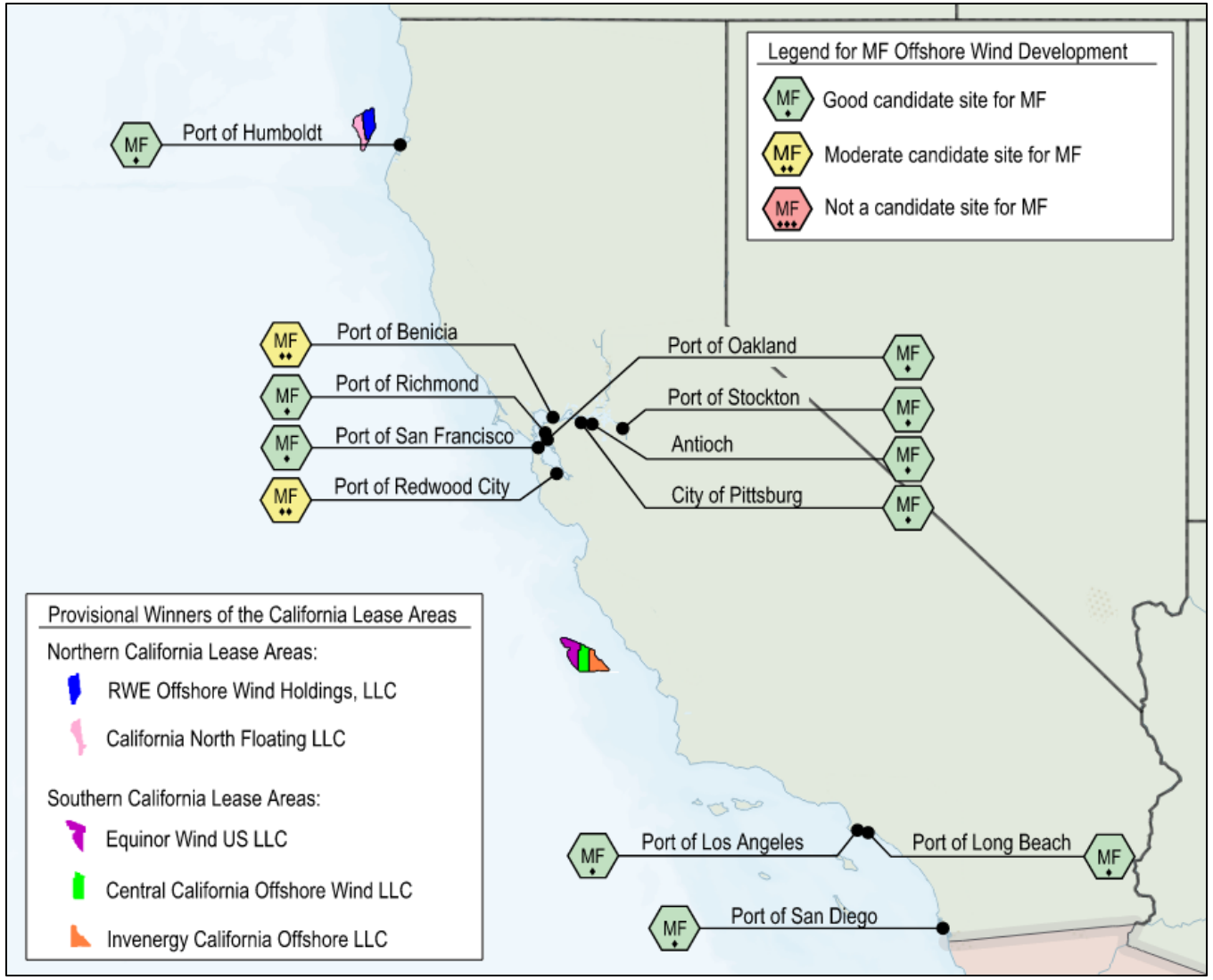


Best CA Port Sites – Staging & Integration



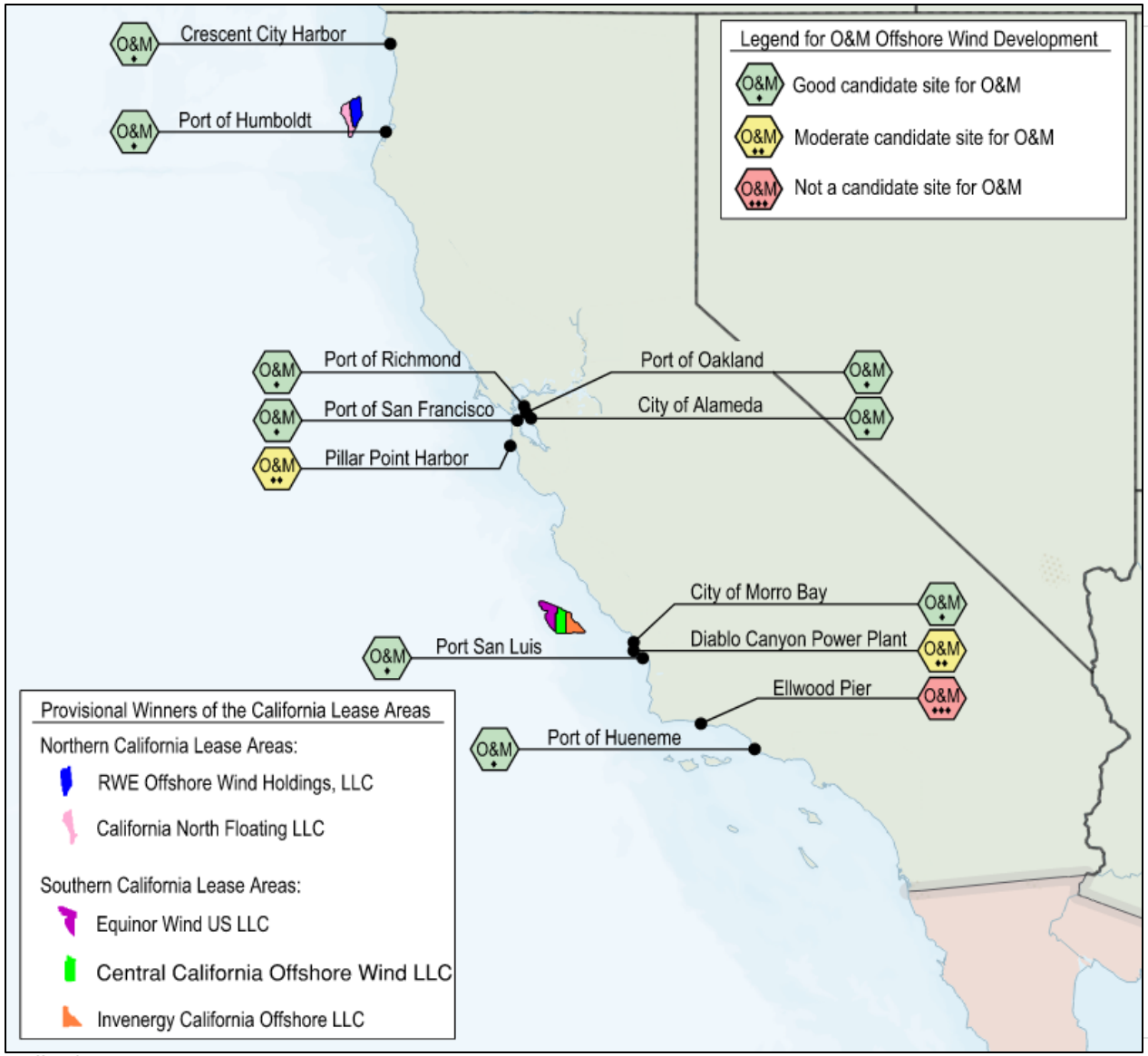
- Without these type of sites, OSW development is not possible
- Port of Humboldt and Port of Long Beach are in the environmental document and preliminary engineering phase of their projects

Best CA Port Sites – Manufacturing



- These type of sites provide significant job creation and economic impact
- It is possible for CA to provide all the MF sites required to support the state goals (blades, towers, nacelle assembly, foundation subcomponents)
- The State will need to determine how much MF will occur in CA and how it will incentivize or drive this investment

Best CA Port Sites – Operations & Maintenance



- Sites required both on North Coast and Central Coast to

Multi-Port Strategy to Achieve State Offshore Wind Planning Goals

Type of Site	Medium (25 GW)
S&I Sites	3
MF Site (Blade)	2
MF Site (Tower)	1
MF Site (Nacelle Assembly)	1
MF Site (Foundation Assembly)	2
SOV berths for O&M Activities	9 to 16
Mooring Line & Anchor Storage Sites	20 to 40 ac
Electrical Cable Laydown Sites	12 to 22 ac

- Need approximately 10 large port sites (>80 acres) and 10 small port or harbor sites (2-10 acres) to meet CA targets by 2045
- Strategizing the development of manufacturing port sites in California will maximize job creation and economic impact to the State
- California ports and harbors can be ready to support the OSW industry with adequate and timely investments

Thank you

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