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Sears Island FOSW Port- Description of project

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Project Name:	Sears Island FOSW Port
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1. **Project description:**

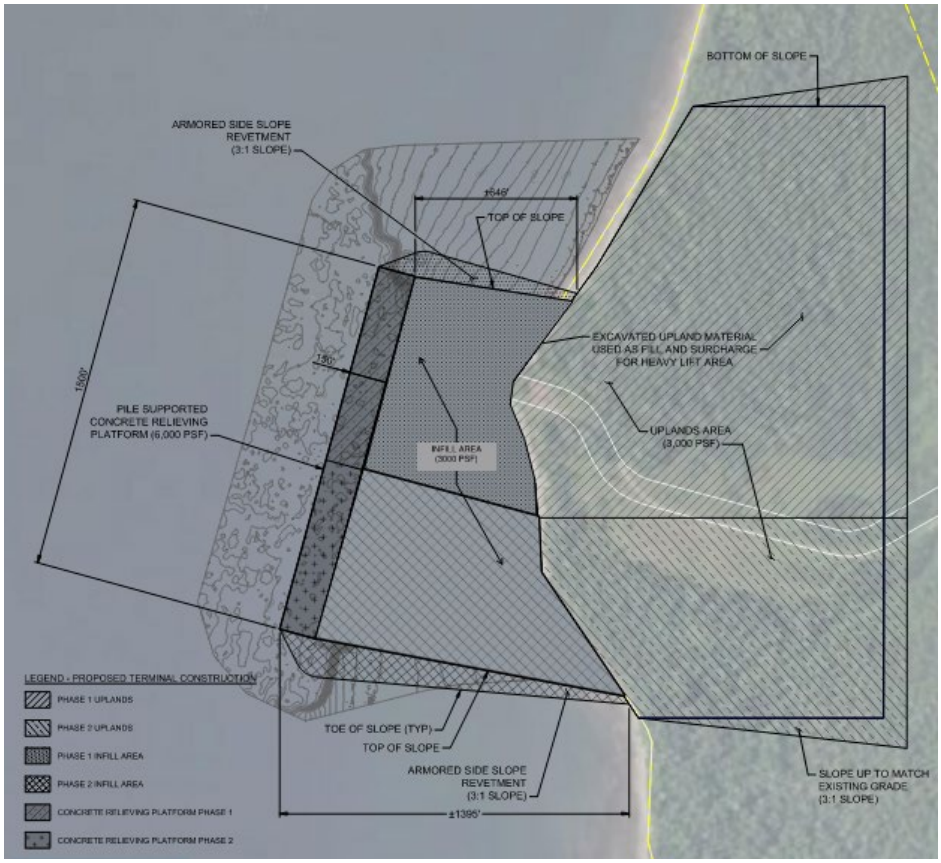
Sears Island Floating Offshore Wind (FOSW) port, situated on the eastern side of Sears Island, Maine, aims to bolster the offshore wind (OSW) industry along the eastern seaboard. Currently, all existing and planned future large-scale offshore wind projects along the east coast, excluding the Gulf of Maine, utilize fixed-bottom foundations for turbine support. These foundations are suitable for water depths up to approximately 200 feet (+/- 60 meters) and are well-suited for the shallow continental shelf characteristic of the eastern US seaboard. However, in waters deeper than 200 feet, such as those found in the Gulf of Maine, installing fixed-bottom foundations becomes economically unfeasible, leading to the emergence of floating OSW turbines as a solution.

The advancement of floating OSW technology necessitates the development of specialized offshore wind port facilities capable of importing wind turbine generation (WTG) components, fabricating/assembling the floating foundations, staging the WTG components in the upland yard, integrating the WTG components onto the floating foundation, and commissioning the fully assembled turbine units.

In addition, the facility will need to provide wet storage for both completed foundations and fully integrated turbine units. The foundation wet storage is required to mitigate against just-in-time supply line limitations. The wet storage of foundations creates an inventory which ensures that the foundation production assembly line can continue working if the integration berth becomes delayed and vice versa. The fully integrated units require specific wind and wave environments during the tow out and anchor hook up operations. They are held in wet storage until these acceptable conditions materialize.

2. **Port Layout and Functionality**

The port will be constructed in 2 phases. Phase 1 will support a demonstration project of approximately 150 MW to 200 MW (approximately 10 -12 units) while phase 2 will be capable of supporting a full-scale commercial farm installation (over 1000 MW). Both Phase 1 and 2 of the port buildout, will be within the bounds of the Sears Island Transportation Parcel. Figure 1 shows the proposed port layout and phasing plan.



Sears Islan FOSW port Layout- Phase 1 and 2

The port criteria to support a FOSW demonstration project is variable and depends on the number of turbine units, foundation and WTG construction and assembly methodology, timeframe of the project and foundation launching methodology. The Phase 1 demonstration project Sears Island buildout criteria has been set based on discussions with the project developer, Diamond OSW. In order to support the Phase 2 commercial scale floating offshore wind the port requires the following criteria:

- 100 acres of flat (slope <3%) uplands area
- Uplands uniform live load capacity of 3000 psf
- 1500 ft of wharf
- Heavy lift wharf capacity of 5000-6000 psf
- Access channel minimum width of 600 ft and depth of 40 feet.
- Wharf berthing area dredged to a minimum of 40 feet
- Electrical and water utilities able to support commercial port operations

A prior, unconstructed, container terminal project on the same proposed site completed dredging in the area shown below in Figure 1. This dredged area directly links with the federal channel and meets the required criteria for a FOSW port. The proposed project's heavy lift wharf has been positioned to take full advantage of this dredged area and direct deep water channel access. This will effectively remove dredging activities from the proposed project. This advantageous wharf position places the wharf

approximately 1100 feet (average distance) from the existing shoreline. This area between the wharf and the shoreline (infill area) will be created using the material cut from the Sears Islands Uplands.

The approximate area of each phase is as follows:

- Phase 1
    - Upland: Total acreage of 46 acres
    - Infill: Total acreage of 11 acres
    - Pile supported platform: 150 ft wide x 800 ft long

- Phase 2
    - Upland: Total acreage of 24 acres
    - Infill: Total acreage of 14 acres
    - Pile supported platform: 150 ft wide x 700 ft long.

The Sears Island FOSW port facility will receive offshore wind foundation and WTG components via barge or delivery vessel form domestic or international supply sources. These components will be moved onto the wharf via large crane and then moved to the uplands area using self-propelled modular transporters (SPMTs).

The foundation components or raw materials will be used to fabricate the floating foundation on the terminal uplands. This foundation can consist of steel or concrete of some percentage of both materials. This is typically done in a serial production line where the units are moves from the uplands towards the wharf as the assembly advances. The finished foundation is moved to the quayside when it is ready to be launched into the waterway.

The WTG components are stored in the uplands and then moved to the wharf pre-assembly area. This area stages the components that will be installed on the next available assembled foundation. Depending on the installation methodology, the tower sections may also be assembled in the pre-assembly area.

The assembled foundation is launched into the waterway using a semi-submersible barge. The foundation is moved onto and deposited on the barge using SPMTs. The barge is then moved, under tug power, to a sinking basin where it is sunk, and the foundation becomes free floating. This floating foundation is then moved to either wet storage or directly to the berth with the WTG components are integrated onto the foundation via a large ring crane. This barge will have an active ballasting system that can maintain the appropriate deck levels during all stages of loadout and transit.

Once the unit is fully integrated it can be towed, via ocean going tugs, to the installation site. If weather conditions are not favorable for this tow the fully integrated unit can be placed into wet storage.

3. Port Components

<u>Upland:</u>

The upland area consists of approximately 65 acres and will be developed on the existing Sears Island footprint. This area is within the Transportation/Marine development parcel owned by Maine DOT. This area will be cleared, graded and compacted and will be utilized for component storage, foundation assembly and construction of a warehouse/office building. A +/- 3 ft thick topping surface of dense graded aggregate will be installed to provide load spreading and serve as a wearing surface for the terminal.

Infill:

The infill area consists of approximately 35 acres and will be created using the uplands cut material. The infill will run from the existing shoreline to the wharf. This fill will be pushed into place and supported on the north and south sides by an armored rock slope and on the west side by a steel sheet pile bulkhead. The material is then compacted and topped with a +/- 3 ft thick surface of dense graded aggregate will This surface will provide load spreading and serve as a wearing surface for the terminal.

Pile Supported platform (Wharf):

An approximately 1500 ft long quay is required to service various activities listed below:

- Delivery of WTG components and/or raw materials to the facility
- Transfer of fabricated foundation from the quay to the water via a semi- submersible barge
- Berthing of floating foundation during installation of WTG components
- Integration of WTG components onto the floating foundation

This quay will provide the berthing face for the delivery vessels, semisubmersible barge and the floating foundation. It will also provide a heavy lifting area to support the large cranes, foundations and WTG components. This platform will be 150 ft wide to provide adequate space for offshore wind (OSW) operations. Depending on the configuration, the wharf may be wider at certain locations to accommodate the ring crane footprint. The platform will be pile supported and topped with a concrete superstructure. A +/- 3 ft thick topping surface of dense graded aggregate will be installed on top of the platform. This surface provides load spreading and serves as a wearing surface for the terminal.

This length of wharf will allow for the launching of foundations, delivery of components and integration of WTG components onto foundations to occur concurrently. These simultaneous activities provide for efficient OSW port operations.

4. Loading Criteria

Based on the assumed activities at the terminal, the loading criteria has been divided into upland/infill area and heavy lift area. The loading levels were set based on similar activities in the fixed bottom foundation offshore wind market.

The uplands and infill area will be designed to accommodate fully loaded SPMT 40 to 50 ton axle lines. This will accommodate the transport and storage loading associated with both Wind Turbine Generator (WTG) components and floating foundation components. The heavy lift wharf must accommodate the lifting of WTG components by large crawler or ring cranes. Based on these requirements below loading criteria was established for the design:

Upland/Infill Area: 3000 psf
Heavy Lift Platform: 5000-6000 psf

5. Port Construction

This section provides a brief overview of each port component as detailed in section 3, along with a summary of the construction sequence for each component:

Phase 1:

Forty Acres of the upland area will be cleared, graded and compacted to create a usable area for operations. This will require clearing trees and cutting into the hillside to remove approximately 1,328,000 cy of soil. Based on the analysis of Sears Island geotechnical information and soil classification, this soil will be used as the infill material for the wharf, embarkments and the surcharge program. The extra soil will be stored in the designated area which will be coordinated by Maine DOT.

The earth embankments running along the north and south sides of the infill will be built using soil sourced from the upland area, alongside armor and bedding stones. Approximately 516,000 cy of infill will be placed in the wet behind a sheet pile bulkhead wall on the western side and the northern/southern embarkments. This will create approximately 11 acres of usable space. Once this fill is in place, the ground improvement program will be implemented. First, wick drains will be installed to provide the consolidation of the underlying soils to the proposed loading level. Once the soil reaches the required consolidation, the surcharge will be removed and placed with the extra soil from the upland cut.

An approximately 700 ft long pile supported platform will be constructed on the eastern side of the infill. The platform will consist of 4 rows of land side (interior)steel pipe piles. These piles will be driven prior to the installation of the eastern bulkhead to laterally support the wall and will be integrated and support the platform once the construction is complete. A slope protection/ revetment composed of heavy stones will be constructed in front of the bulkhead wall and the water side steel piles will be driven. The following steps involve the construction of the concrete bent cap, water side and bulkhead wall caps which will be followed by the installation of precast concrete panels and placement of concrete deck. Energy-absorbing fenders and mooring bollards will be installed on the waterside bent cap every 50 to 75 ft to support mooring/berthing of floating foundations and delivery vessels. Dense graded aggregates will be installed over the entire terminal.

Phase 2:

Phase 2 terminal will be built as an addition to the phase 1 terminal. Phase 2 will add another 26 acres to the upland and 14 acres to the infill area and extend the length of the pile supported platform/quay to 1500 ft long. Similar approach to phase 1 will be taken to clear, grade and compact the existing upland to create a usable area for operations. This will require clearing trees and cutting into the hillside to remove approximately 798,000 cy of soil. Similar to phase 1, this soil will be used as infill material for the wharf, embarkments and the surcharge program. The extra soil will be stored in the designated area which will be coordinated by Maine DOT.

The existing southern embankment created in phase 1 will be buried in the phase 2 infill and a new similar southern embankment will be built using the upland area soils in addition to armor and bedding stones. Similar to phase 1a sheet pile bulkhead wall supported by the landside steel pipe piles will be constructed. The new infill consisting of approximately 658,000 cy of soil l will be supported by this bulkhead wall on the east side, the phase 1 infill on the northside and the new southern embarkment.

An approximately 700 ft long pile supported platform will be constructed as part of phase 2. As described in phase 1, the construction of the platform involves driving the waterside piles, construction of bent/waterside and bulkhead wall caps, installation of precast concrete panels and placement of concrete deck. Energy-absorbing fenders and mooring bollards will be installed on the waterside bent cap every 50 to 75 ft to support mooring/berthing of floating foundations and delivery vessels. Dense graded aggregates will be installed over the entire terminal.

All steps outlined above for both phases, will be sequence such that they could facilitate the installation of site water, wastewater and electrical facilities including but not limited to below:

- Installation of site storm water collection and treatment system
- Installation of potable and fire suppression water systems
- Installation of perimeter fencing and associated lighting and security
- Installation of new high mast lighting grid
- Installation of electrical service to meet site requirements.
- Installation of elevated outlet racks for nacelles
- Installation of electrical infrastructure to facilitate cold ironing of delivery and installation vessels.