III. Access Assessment

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Access Assessment Contents

List of Figures

List of Tables

Introduction

The purpose of having access to the Life Saving Station on Wood Island is to provide a suitable and safe recreational landing site for kayakers, canoes, and small water craft. Located of the coast of Fort Foster, Kittery, Maine, this island is unattended with no access location points. The Department of Interior (DOI) has addressed the issue of the island having limited access with the Town of Kittery. The DOI would like to see recreational use of the Island increased. Recreational use of the island includes scenic views of; Whale Back Island, Portsmouth Harbor, Kittery (ME), New Castle (NH), Portsmouth (NH), Fort Foster (ME), Odiorne Point State Park (NH); observation of marine wildlife, water fowl, and to have the occasional picnic on the island. Increasing leisurely visits to the island provides liability issues because of the current condition of the Life Saving Station and the poison ivy rampantly growing on the island.

The proposal of a dock will address the issue of providing a set location for kayakers, canoes, and small water craft to land on the island. The removal of poison ivy will create usable area on the island.

Conditions Assessment

Poison Ivy

As required by the Department of Interior (DOI), Wood Island must be transformed and maintained in order to be considered a recreational area for the Town of Kittery, Maine. In order to fit this requirement certain tasks must be completed, first, of which is the island environment. Since the habitat poses a threat to all visitors in the spring and summer months all poison ivy should be removed. Currently 50% of the island is covered by the plant, affecting unaware explorers wishing to get a closer look at the life-saving structure.

Proper removal techniques should be employed when removing the poison ivy. Under no circumstances should poison ivy be burned.

Analyses Conducted

Site Obstacles

The Island is barren with the exception of a seawall and the lifesaving station. The coverage of poison ivy is a hazardous growth and the predominant site obstacle. Other obstacles include lead paint and asbestos coated pipes which pose a health threat. Another obstacle to overcome relates to getting material off to the island. Maintenance of the island and/or the structure is another problem which is made more difficult due to its location at sea versus on mainland.

Figure 55: Eastern Aerial View

Site Alternative Energy

The previously mentioned investigation reveals that the island's hazards should be mitigated in order to allow safe recreation on the site. At the time of this report it was unclear if the island is insured. In order to promote a safe environment for recreation, safety should be a prominent concern and injury situations should be minimized. An energy source such that enough watts could be produced in order to provide lighting to both the structure as well as the proposed dock in the event that a visitor extends their stay past dusk. Such a feature would assist in making the island safe and minimizing option for injury.

The Lifesaving Station serves as an icon to the surrounding public; however, this is only during the daytime hours. By providing an energy source to the island we can restore this structure's iconic significance providing more photo opportunities and a greater sense of historical unity within the town.

Wind Energy Option

As the world turns to more renewable energy sources to produce electricity, wind energy is at the forefront as stated by the DOE, "wind energy systems are one of the most cost-effective home-based renewable energy systems."

There were two options for energy output, a wind energy option and a solar energy option, as the island's location and environment allows both to be successful. More specifically, looking into the wind energy option, preliminary investigations were necessary.

Wind production is categorized in Classes, 1-7 with Class 7 indicating the highest wind speeds. The Department of Energy suggests that Class 4 and above are good resources and should be further explored. Initial investigation concludes there would need to be a 50m windmill in order to absorb the 6.4 to 7.5 m/s winds.

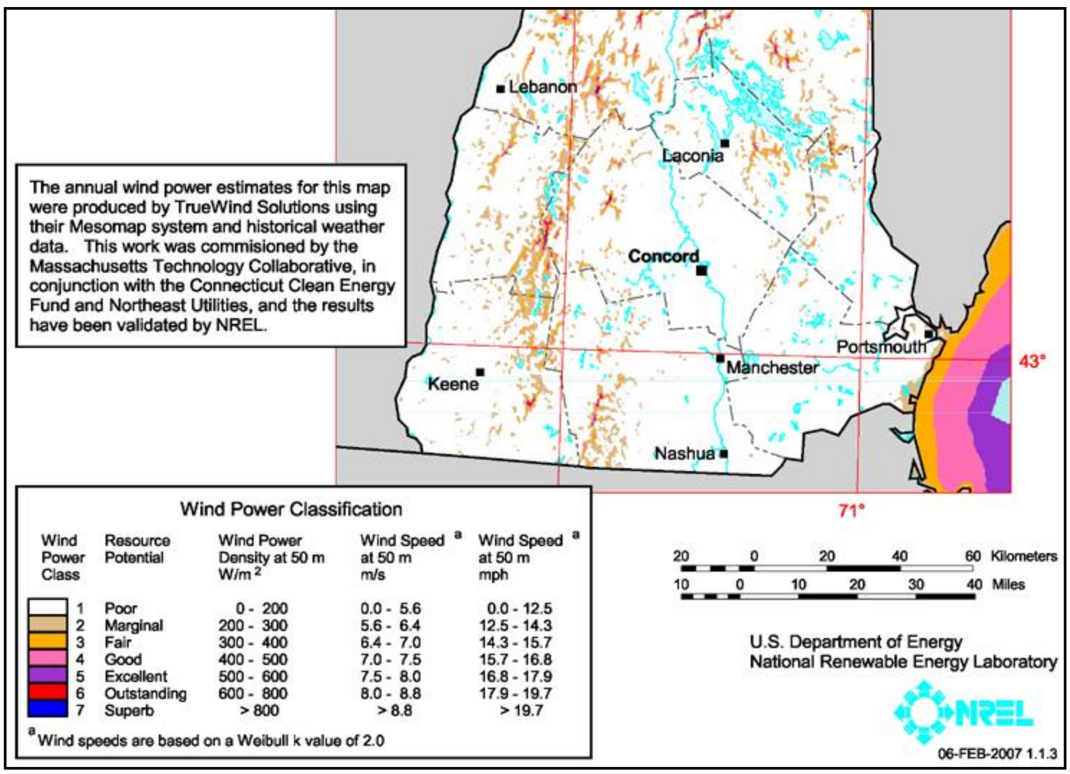

Figure 56: Seacoast Wind Power Classification

Figure 56: Seacoast Wind Power Classification, taken from the U.S. Department of energy, shows that Wood Island, located in the Portsmouth Harbor, would fall in the category of a fair/good power classification. However this data shows wind speed estimates at 50m above the ground and be useful for large wind turbines. Assumptions were made based on a comparison of Wood Island's characteristics

to determine the appropriate wind turbine size. The analysis concluded that a 20 meter wind turbine is required to successfully harvest 5-6 m/s wind speeds (Appendix).

Wind Direction

Subsequently, following an initial investigation of wind production, data also needed to be found on which direction the wind was coming from and if or if not this changes throughout the course of the year.

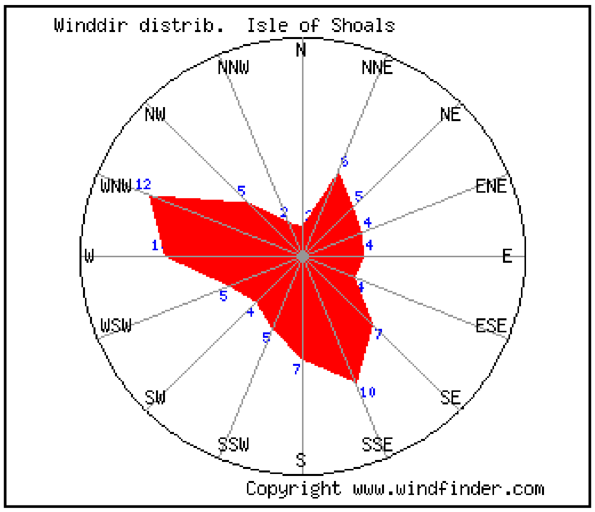

Figure 57: Average Yearly Wind Direction

There was limited data regarding wind direction and distribution for the exact location, which is why data was taken for the Isle of Shoals. Figure 57: Average Yearly Wind Direction shows that throughout the course of a year the wind direction is nearly 360 degrees, with an average of 7m/s. To get a feel for the environmental effect of specific wind speeds, refer to Table 1 in the Appendix (Windfinder). More specifically a breakdown by months taken from January 2007 to December 2008 can be seen in Table 3, showing the summer months with the lowest wind speeds of 5 m/s.

Table 3: Isles of Shoals Wind Directional and Speed Data (Windfinder, 2009)

Wind Statistic | Wave Report | Wind Report | Forecast | Super Forecast

Isle of Shoals (SHOALS)

Stats based on observations taken between 1/2007 - 12/2008 daily from 7am to 7pm local time.

Month of year	Jan 01	Feb 02	Mar 03	Apr 04	May 05	Jun 06	Jul 07	Aug 08	Sep 09	Oct 10	Nov 11	Dec 12	SUM 1-12
Dominant Wind Dir.													
Wind probability > = 4 Beaufort (%)	74	72	76	69	67	61	44	52	52	57	73	77	64
Average Wind Speed (kts)	16	17	17	15	14	13	11	11	12	13	16	17	14
Average Airtemp. (°C)	-2	-1	2	7	13	18	22	20	18	13	6	1	9

Wind Turbines

Wind turbines convert the kinetic energy from the wind into mechanical power that runs a generator which then produces electricity. The rotor (blades and hub) rotates as the wind hits, which spins the low-speed shaft along with the gear box, ultimately spinning the generator creating electricity, all of which can be seen in the figure. The electricity can then be put to use or stored in batteries on site.

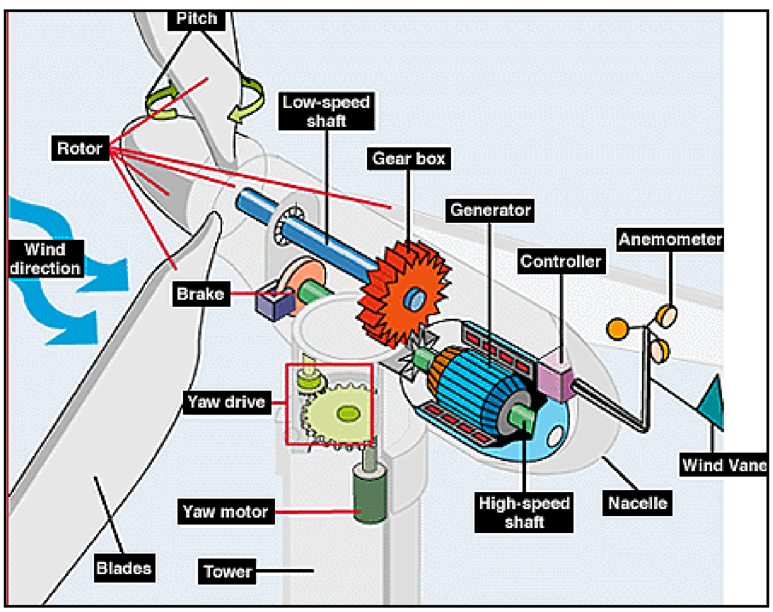

Figure 58: Mechanics of a Wind Turbine

Once the data was analyzed, a list was comprised noting the specific characteristics that would make wind energy a competitive alternative energy source on Wood Island:

- <20m height
- Minimum wind speed 5 m/s
- Utilize 360 degrees of wind direction
- Low maintenance
- Low cost
- 1 kW energy production
- Silent
- Aesthetic

With these specifications in mind, two turbines were found that would make the best fit: Quietrevolution and Windspire.

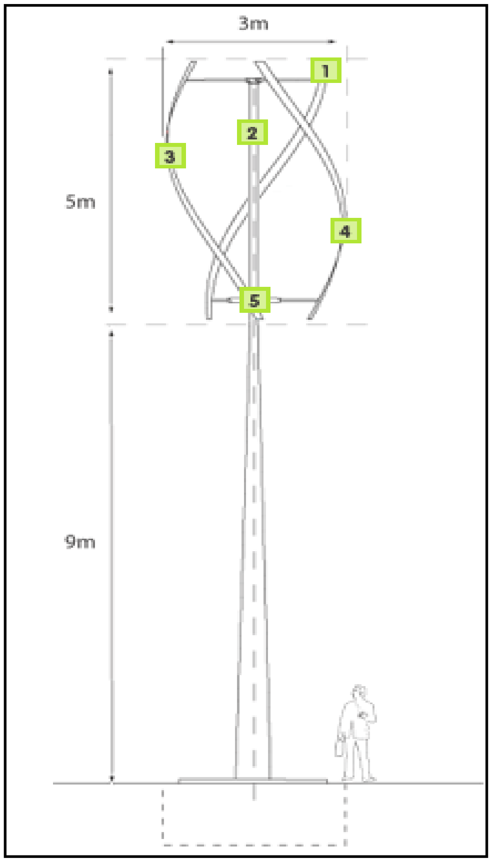

Figure 59: Quiet Revolution (Quietrevolution, 2009)

Figure 60: Windspire (Mariahpower, 2009)

Solar Energy Option

A second renewable energy source would make use of solar panels to create electricity. By harnessing the suns photons with semiconductors, in most cases silicon, within the solar panel atoms are set off. As an atom's excitement heightens it will eventually lose an electron. Once an electron is lost, it turns to a free movement role where it can be captured and turned to energy. Solar Panels can come in all sizes depending on a client's energy consumption. In this case since there would only be a need for a small production of energy in order to power lighting, an extravagant array of panels would be unnecessary.

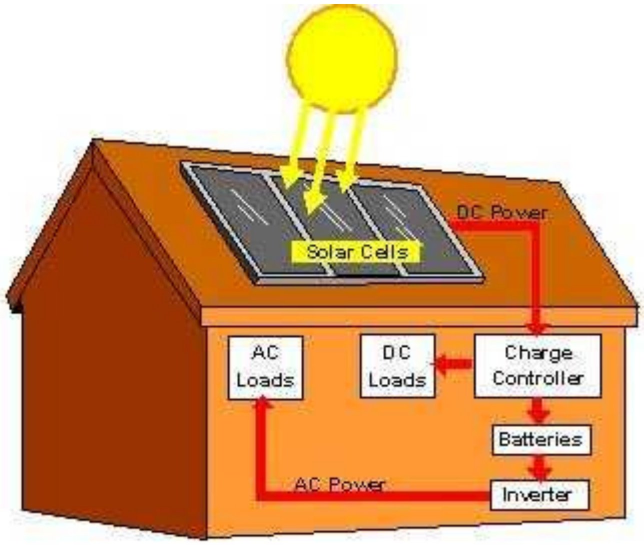

Figure 61: Solar Energy Diagram (Saferenvironment.wordpress, 2009)

Cost of Supplying Light

With today's push to better the world through the power of renewable energy, the Database of State Incentives for Renewable Energy (DSIRE) offers ways for Commercial, Industrial, Residential, Nonprofit, Schools, Local Governments, State Governments and Agricultural sectors to receive refunds, grants and/or rebates depending on eligible renewable technology, system size, system use, and fund availability.

The state of Maine has many funding opportunities for those interested in renewable technology, for instance, the Voluntary Renewable Resource Grant, supported by the state's Voluntary Renewable Resource Fund and administered by the Maine Public Utilities Commission (PUC) provides funding to a maximum of $50,000 for communities looking to educate the public on the benefits of renewable energy through small-scale demonstration projects (Appendix 1).

This however would require a complete change in the perception of Wood Island, because it would be turned from an uninhabited visit at your own risk, to more of an educational understanding of the steps communities are taking to "go green." The advantage of this scenario lies in the fact that the youth in the community would become closer and more aware of the history in their town, Wood Island in particular, while at the same time learning how electricity on the island is powered by none other than the wind and sun they feel outdoors.

Dock Analysis

Two types of docks were analyzed. The first is a traditional wooden dock. The second option is a modular dock system.

The initial wooden dock was designed having a 65psf live load and a dead load of 10psf. The length of the dock was 24 feet long and 8 feet wide. The piers are six by six descending into the drilled concrete piers. The beams had an initial size of two by ten inch. The girders were two by twelve inches. The surface of the dock was sized with 5/4 inch pressure treated boards. The total cost of the initial design was $15,000. However, this design would not fulfill the length requirement.

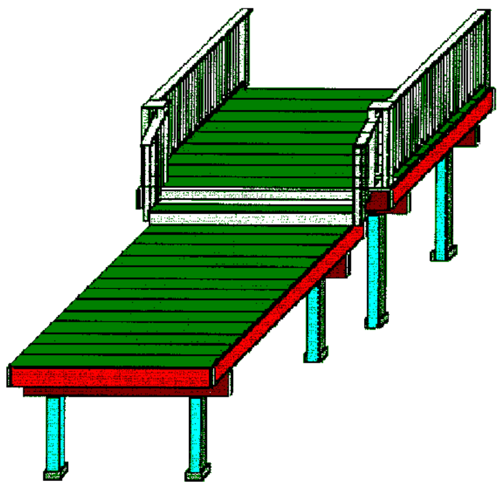

Figure 62: Initial dock design (see appendix for details)

The redesign changed the decking to three inches, twelve by twelve columns four by twelve inches joists and six by twelve inch girders. The length would have been increased 56 feet. The estimated cost for the redesign was over fifty thousand dollars. This type of dock was abandoned due to the extreme cost.

The second analysis consisted of two different manufactures of a modular dock system.

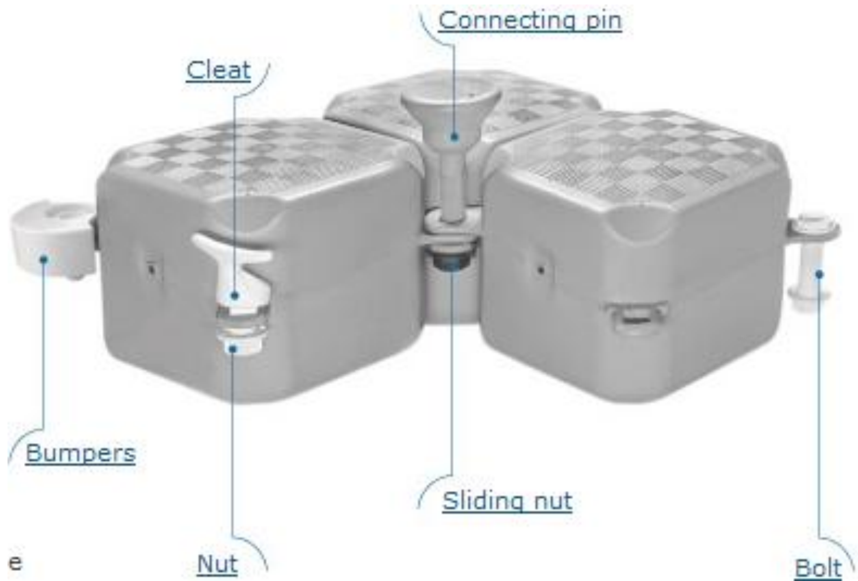

Figure 63: CanDock, Inc. image

The first manufacturer, CanDock, Inc. product is made from high density polyethylene, the weight of each cube is 14 lbs, the dimensions are 19”x19”x16” tall, it can support 200 pounds, has a non-skid surface, and comes with a lifetime warranty.

Figure 64: Proposed location

The Dock is four cubes wide, approximately 60 feet long with a height of the L greater than 15 feet.

This product is virtually maintenance free. It can be left unattended in the winter months. It can withstand waves of four to six feet.

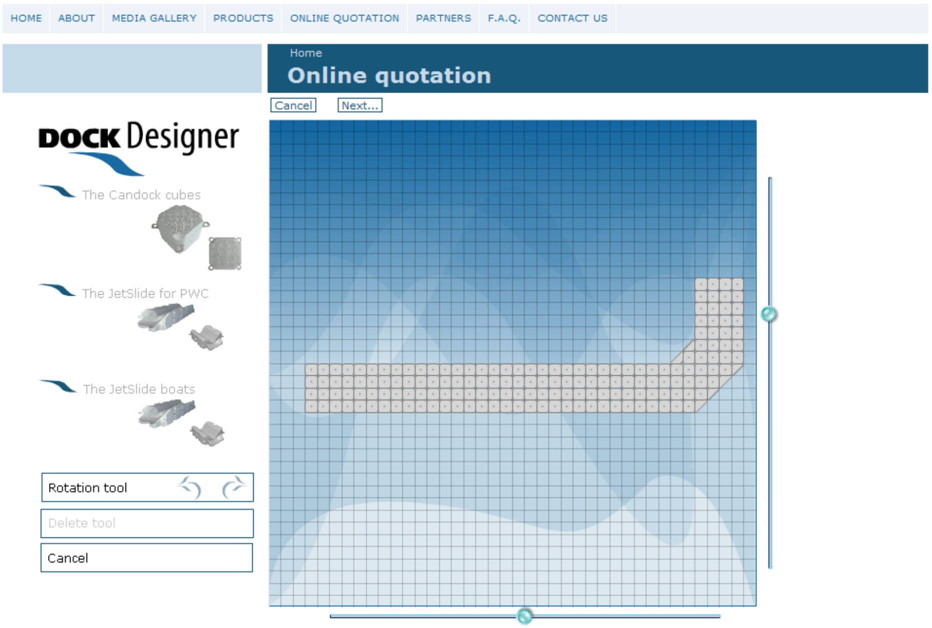

Figure 65: Modular Dock design

The anchoring structure will be constructed of the Seaflex mooring system. This is a unique system that is virtually maintenance free, dampens the effect of waves, and keeps the structure in place. The moorings are self-regulating and are specially designed for the area of where they will be used.

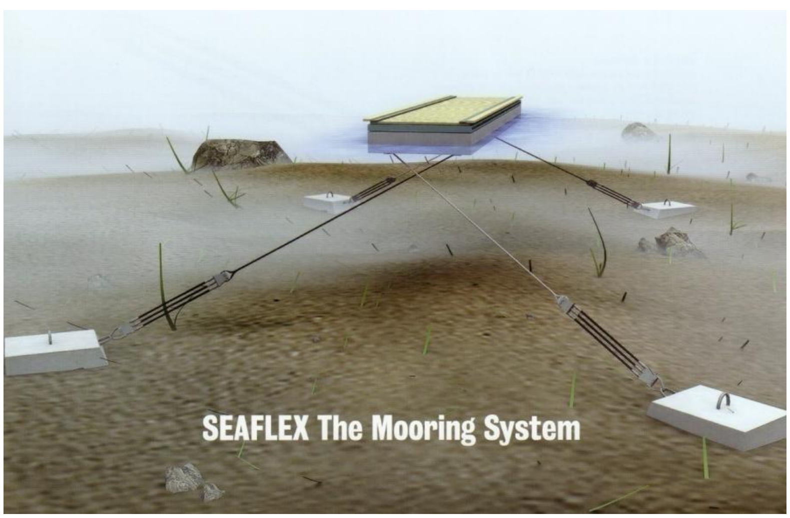

Figure 66: Seaflex Mooring System

The second manufacture studied was EZ Dock. This modular dock system boasts; Low maintenance, a variety of dock anchoring options, versatile modular design, secure connection couplers, strength and flexibility, slip resistant dock surface and four season accessibility.

The EzDock design is flawed, it cannot withstand rough seas (greater the two foot waves) without breaking. Therefore this product cannot be considered as a solution.

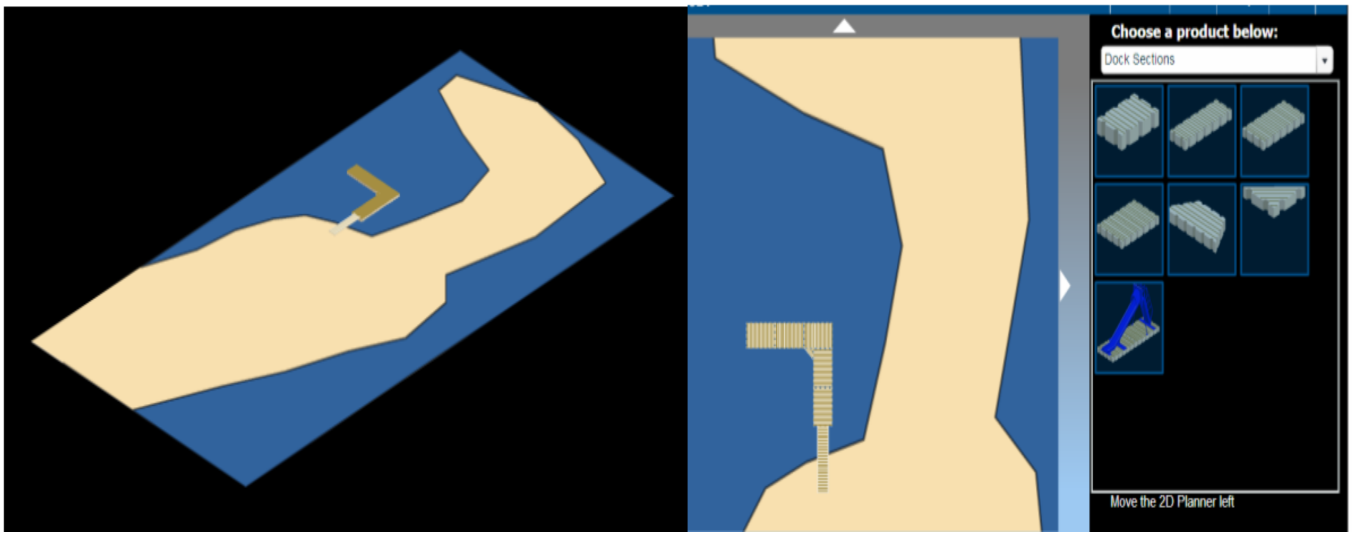

Figure 67: EzDock design

Solutions Considered

Alternative Energy

Wind Energy

Wind energy solutions were costed without the State incentives. Prices were obtained from quotes through direct conversation with the turbine manufacturers.

Since, the island would require a turbine capable of 360 degrees of wind direction, the two options were the Quiet Revolution and the Windspire. Though both were similar in size and price at approximately $25,000 as quoted by company dealers, much of the energy each would be able to produce would go unused. After analyzing and approximating possible energy consumption as a result of lighting the structure versus turbine energy production the conclusion was made that these systems are much too large for such a small-scale project. Though there is a way to send the surplus back to a grid system, this too was ruled out because the location would be out at sea.

Solar Energy

The solar energy solutions were not fully costed, because of the same issue as the wind turbines, which was more energy than necessary. Rather, an extremely low-scale option was researched and the result was a $54.99 Solar Flood Light (3-Pack). Such lights have the option to be nailed directly to the structure while at the same time moving the solar panel to another location within 20 feet if obstruction hinders solar consumption. Product Specifications can be seen in the Appendix.

Figure 68: Integral Solar Flood Light - 3 Pack

Dock

The Candock modular dock system with the seaflex mooring system is the most feasible solution to provide a safe access location point to the island. At sixty dollars per cube and thirteen dollars for the fasteners, the dock will cost approximately $10,600. The Seaflex mooring system is roughly $10,000. The other additional cost is transporting the material out to the island which is approximately $5,000. The modular dock option will cost roughly $25,600.

Recommendations

The Wood Island Feasibility Study was done with the assumption that the Department of Interior required improved access to the recreation site. Visitors provided with a place to dock their boats without having to struggle and worry about the tide affecting its location increases safety.