U.S. Army Corps of Engineers Permit Application

Submitted to the Buffalo District Office of the U.S. Army Corps of Engineers

For the

Icebreaker Wind Project

Lake Erie, City of Cleveland
Cuyahoga County, Ohio

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1.0 OVERVIEW AND PROJECT PURPOSE

Icebreaker Windpower Incorporated ("Icebreaker Windpower" or the "Applicant") is proposing to construct the Icebreaker Wind Project (the "Project"), a demonstration-scale offshore wind farm located in Lake Erie, 8 to 10 miles from the shoreline in the City of Cleveland, Cuyahoga County, Ohio.

The Project would be an approximately 21 megawatt ("MW") offshore wind facility, consisting of the following:

- Six wind turbines,
- Five buried electric collection cables interconnecting the turbines ("inter-array cables"),
- One buried electric collection cable ("export cable") connecting the turbines to the Project substation, and
- A new Project substation located at the Cleveland Public Power ("CPP") Lake Road Substation in Cleveland, Ohio.

The general purpose of the Project is to produce wind-powered electricity that would maximize energy production from local wind resources to deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers. The Project would add fuel diversity and reliability to the state's and region's electric supply mix; help reduce air pollution in an area that historically has been in non-attainment for 2.5-micron particulate matter, lead, and ozone; reduce greenhouse gas emissions; and create local jobs and spur economic development. The electricity generated by the Facility would be transferred to the transmission grid owned by CPP. Two-thirds of the Facility's output has been sold to CPP under a long-term power purchase agreement. The balance of the power could be delivered to the grid operated by PJM Interconnection, LLC and sold in the wholesale market or under bi-lateral power purchase agreement(s).

The U.S. Department of Energy ("DOE") is proposing to authorize the expenditure of federal funding to design, permit, construct, and decommission the Project. The DOE seeks to provide support for regionally-diverse Advanced Technology Demonstration Projects through collaborative partnerships. By providing funding, technical assistance, and government coordination to accelerate deployment of these demonstration projects, DOE can help eliminate uncertainties, mitigate risks, and help create a robust U.S. offshore wind energy industry. The Advanced Technology Demonstrations Program for Offshore Wind began in 2012 with the selection of seven projects, including Icebreaker Wind (referred to at the time as Project Icebreaker). In December 2016, DOE determined that two of these projects (including the Project) had demonstrated significant progress toward being successfully completed and producing power. If all appropriate criteria are completed and milestones are met, Icebreaker Windpower would be eligible to receive additional federal funding.

The U.S. Army Corps of Engineers ("USACE") is the agency responsible for reviewing and issuing permits pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Through a permit review process, Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into waters of the United States. While efforts were made during the siting, planning, and design processes to avoid and/or minimize potential impacts to jurisdictional water resources, the Project would result in minor unavoidable impacts to Lake Erie. These impacts are described in this Application and in additional detail in the Draft Environmental Assessment ("Draft EA")[1], prepared by DOE. While the Project is referred to in this Application as "Icebreaker Wind," the DOE uses the original Project name, "Project Icebreaker" in the Draft EA. "Project Icebreaker" and "Icebreaker Wind" are synonomous, and refer to the same Project. The Applicant is submitting this Application for a Section 404 Permit for any aspect of the project the USACE determines it has jurisdiction over pursuant to Section 404.

By way of example, over the past 10 years, several submerged cables have been installed and/or permitted to be installed in Lake Erie including:

- Kerite Cable to South Bass Island (2007)
- Kerite Cable to Middle Bass Island (2009)
- ITC Lake Erie Connector (anticipated construction - 2020).

The Applicant is aware that at least two of these projects, Kerite Cable to South Bass Island and ITC Lake Erie Connector, have sought and received Section 404 permits from the U.S. Army Corps of Engineers prior to construction.

Section 10 Permits are required for the construction of any structure in or over any navigable water of the United States. The Applicant is also submitting this Application for an Individual Section 10 Permit for the installation of the MB foundations, turbines, and electrical collection cable

In addition to the Section 10 and 404 regulatory and permitting authority, Section 114 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 ("Section 408") requires permission for any alterations to, or temporary or permanent occupation or use of, USACE federally authorized civil works

[1] The Draft EA is available at: https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment

projects. Icebreaker Windpower submitted its Section 408 Request on February 3, 2017, and is awaiting a decision from the USACE by August 31, 2017.

The DOE is responsible for providing federal funding and is serving as the lead agency for the Project's review under the National Environmental Policy Act ("NEPA"). The U.S. Coast Guard ("USCG") and USACE are cooperating agencies for the NEPA review. As a part of the NEPA process, the DOE along with the USCG and USACE, prepared a Draft EA to evaluate the potential impacts of the Project (available at: https://energy.gov/nepa/downloads/ea-2045-draft-environmental-assessment). The following application describes the proposed Project, its potential impact on Waters of the United States, and actions taken to avoid and minimize these impacts.

2.0 PROJECT LOCATION & SITE DESCRIPTION

2.1 Project Location

The Project turbines would be sited in Lake Erie, 8 to 10 miles off the coast of the City of Cleveland, Ohio (see Figures 1 and 2). The turbines would be arranged in a southeast to northwest linear alignment with 750 meters (2,480 feet) between each turbine. An electric collection system, approximately 12 miles in length, would be buried in the lakebed and connect the turbines to the Project substation, located along the lakefront in the City of Cleveland (Figure 2). Construction activities would be supported by a construction staging area on the lakeshore within the Port of Cleveland. An existing building at the Great Lakes Towing ("GLT") facility on the Cuyahoga River in Cleveland, would serve as the Operations and Maintenance ("O&M") center (Figure 2). The only Project components impacting Waters of the United States would be the turbines and the electric collection system.

The Applicant has entered into a 50-year submerged lands lease ("SLL") with the State of Ohio. The SLL covers the turbine sites, cable right-of-way, and the Project substation. As per the SLL, the acreage to be used in the construction/operation of the Project consists of 0.4 acre for the substation, 4.2 acres for the six wind turbine sites, and a 100-foot wide strip along the approximately 12-mile-long cable route.

2.2 Water Resources

Lake Erie is the shallowest and warmest of the Great Lakes and also has the highest primary production, biological diversity and fish production of all the Great Lakes (Allinger & Reavie, 2013). It is the fourth largest of the Great Lakes in surface area (9,910 square miles) and the smallest by volume (116 cubic miles). The average depth of the lake is 19 meters (62 feet) and the maximum depth is 64 meters (210 feet). The lake is divided into the Western, Central, and Eastern Basins with average depths of 7.4 meters (24.1 feet), 18.5

meters (60.1 feet), and 24.4 meters (79.3 feet), respectively (Great Lakes Fishery Commission, 2003). The Central Basin, where the Project is located, is the intermediate of the three basins in terms of temperature, productivity, and depth (Ludsin & Hook, 2013). Lake Erie is used for recreation, commerce, navigation, manufacturing, and power production, and has led to intensive industrial development along its shore in places such as Cleveland, Ohio.

The geophysical characteristics, biological communities, and anthropogenic uses of Lake Erie are summarized below.

2.2.1 Geophysical

Within the Central Basin of Lake Erie, the Project is located in an area of relatively uniform lakebed topography that slopes downward from southeast to northwest, with water depth increasing linearly with increasing distance from shore. Water depth in Lake Erie in the Project Area ranges from 0 feet at the Cleveland shoreline to approximately 18 meters (61 feet) at the proposed turbine furthest from the shore (Figure 2). Immediately north of the breakwater, the water depth is approximately 10 meters (33 feet), and it steadily increases along the export cable route (CSR, 2016). Bathymetric and side scan sonar results showed that the lakebed at the proposed turbine sites is generally uniform and smooth, and is comprised of soft, silty, sediments. No evidence of ripples or other sedimentary features were observed (VanZandt Engineering, 2015). Within the vicinity of the Project, the lake-bottom sediment is predominantly composed of clay-sized particles with a lesser percentage of silt-sized particles, which trend to increase with depth. Bedrock material beneath Lake Erie may consist of shale, siltstone, sandstone and limestome and ranges from exposed to buried by more than 30 meters (98 feet) of unconsolidated sediment (McNeilan, 2017). No features or artifacts of historical significance were identified during marine archaeology surveys of the areas where Project construction activities are proposed (VanZandt Engineering, 2015, 2017).

2.2.2 Biological Communities

Lake Erie supports approximately 90 different species of fish, including commercial and recreational fisheries for important fish stocks including walleye, yellow perch, and several other species. Additional fish groups present in the basin include trout, bass, smelt, catfish, carp, herring, drum, minnows, and sunfish (ODNR, 2016b). The Central Basin of Lake Erie is dominated by cool-water species, such as yellow perch and walleye, with warm and colder water species also present to a lesser extent. However, in Lake Erie, a hypoxic zone (an area with depleted oxygen), develops at the bottom of the central basin of Lake Erie. This zone can be as large as 10,000 square kilometers (3,860 square miles) and last from July through October (ODNR, 2015). This area is classified by the Ohio Department of Natural Resources ("ODNR") as a "dead zone" due to the hypoxic conditions (ODNR, 2015). Low dissolved oxygen levels during late summer and early fall do not provide enough oxygen for fish and macroinvertebrates to function properly, so there is minimal fish activity in the area. The proposed turbines would be sited in this "dead zone." In addition, the proposed turbine sites are well away from any fish spawning reefs or key habitat. Ludsin et al. (2014) identified the spawning habitats for 24 fish species, including the most harvested commercial and/or recreational fish in Lake Erie, as well as important prey species. None of these fish species have preferred spawning habitat in the offshore region, except lake trout, which had a near-offshore presence.

Use of the lake by most bird species is strongly concentrated along the shoreline and in the nearshore area. Other than spring and fall migration by passerines, the birds known to utilize Lake Erie in the vicinity of the proposed Project are the red-breasted merganser (*Mergus serrator*), common loon (*Gava immer*), horned grebe (*Podiceps auritus*), Bonaparte's gull (*Chroicocephalus philadelphia*), ring-billed gull (*Larus delawarensis*), and herring gull (*Larus argentatus*). Aerial surveys conducted by the ODNR between 2009 and 2011 indicated that abundance of waterbirds was negligible or minimal at distances between 8 to 10 miles from shore, and that only the six species listed above were documented in the vicinity of the Project area on a somewhat consistent basis. Ring-billed gull, herring gull and Bonaparte's gull are the only bird species that utilized the Project Area and vicinity at densities generally greater than one bird observed per survey (Norris & Lott, 2011). While the Central Basin of Lake Erie has been designated an Important Bird Area by the National Audubon Society, studies have shown that the use of the Project area for anything other than migratory transit by bird species is minimal or negligible (Gordon & Erickson, 2016). Similarly, terrestrial mammals are generally confined to the lake shoreline. While bats are known to forage and migrate over open water, the use of the area 8 to 10 miles offshore is low when compared to terrestrial or nearshore portions of the lake (Gordon & Erickson, 2016).

More detail on biological communities located in the vicinity of the proposed Project and the anticipated impacts of the Project on these communities is discussed in Section 3 of the Draft EA.

2.2.3 Anthropogenic Uses

Lake Erie is utilized for a variety of anthropogenic uses including commercial fishing, drinking water, and recreational uses, such as boating, sailing, swimming, and fishing. In 2015, Ohio commercial fishermen harvested 4.6 million pounds of fish with a dockside value of $4.9 million. Yellow perch, freshwater drum, and white bass were the primary fish harvested, accounting for 28%, 20%, and 17% of the total commercial harvest, respectively (ODNR, 2016b). Cleveland is a major hub of shipping commerce in Lake Erie and the Great Lakes. The Cleveland Harbor is the 48th leading United States port with over 12 million tons of material shipped or received in 2007, and is ranked sixth among the Great Lakes ports (USACE, 2010). The Cleveland Harbor also hosts a large number of recreational vessels, including yachts, sailboats, power boats, and fishing boats. In 2015, over 474,000 boats were registered with the ODNR in the state of Ohio, with more than 25,000 in Cuyahoga County alone (ODNR, 2016a). Even though recreational boating is high around the City of Cleveland, very few boats travel 8 to 10 miles offshore, where the turbines are proposed to be sited. A 2016 study of boat usage of the Project Area indicated that only 2% of all boats counted in surveys were within 3 miles of the turbine sites (LimnoTech, 2017).

3.0 PROJECT DESCRIPTION

3.1 Project Components

Proposed components to be constructed as part of the Project include wind turbines, an electrical interconnect system, and a Project substation. Ancillary components to be leased by the Applicant include a laydown yard/construction staging area and an O&M center. Each of these components and facilities are described below.

3.1.1 Wind Turbines

The Facility would consist of six Mitsubishi Heavy Industries Vestas Offshore Wind - Vestas 3.45 MW offshore wind turbines (V126-3.45 MW), to be installed on Mono Bucket ("MB") foundations. The Facility is expected to operate for approximately 8,200 hours annually, and have an approximate capacity factor of 41%, generating approximately 75,000 megawatt-hours of electricity each year.

The MB foundation is made of steel and combines elements of a gravity base, a monopile, and a suction bucket. The interface with the lakebed would be accomplished by means of a steel skirt that penetrates the lakebed. The skirt would be welded to an upper steel transition piece and tube that resembles the elements of a standard monopile above the mudline (Figure 3). Approximate dimensions are listed in Table 1. The foundations would be installed in water approximately 18 meters (61 feet) deep.

Table 1. Approximate Foundation Dimensions

Bucket Diameter	Shaft Diameter	Overall Height
17.0 meters (55.8 feet)	4.5 meters (13.8 feet)	36.9 meters (121 feet)

Each wind turbine would consist of three major components: 1) the tower, 2) the nacelle, and 3) the rotor with blades. The tower would be comprised of multiple sections of conical steel, which would be mounted on the foundation platform, approximately 11 meters (36 feet) above the water line. The tower height for the turbines, or "hub height" (height from the chart datum water level to the center of the rotor), would be approximately 83 meters (272 feet). The main mechanical components of the wind turbine would be housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle would be housed in a steel reinforced fiberglass shell to protect internal machinery from the environment and dampen noise emissions. The housing would be designed to allow for adequate ventilation to cool internal machinery. The nacelle would be equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production. The turbine would have a rotor diameter of 126 meters (413 feet), resulting in a maximum blade tip height of 146 meters (479 feet). The lowest point of the blades would reach 20 meters (66 feet) above the lake surface. Figure 4 depicts the proposed turbine dimensions.

The majority of turbine components, including the blades, would be painted light gray (RAL 7035) consistent with Federal Aviation Administration ("FAA") and USCG guidance. One red flashing FAA obstruction warning light would be mounted on the nacelle of each turbine and would flash synchronously. In addition, synchronously flashing (flash frequency and duration to be determined) amber marine navigation lights, visible up to 5 nautical miles, would be mounted on the platforms of Turbines 1 and 6 (i.e., at each end of the turbine string). On the platforms of Turbines 2 through 5 the amber lights would have a visibility of 4 nautical miles, and a flash rate of 20 flashes per minute. Two lights would be installed on each of the six turbine platforms to provide visibility 360º around the turbines. In addition to the marine navigation lights, fog horns with visibility detectors would be installed on the platforms of Turbines 1 and 6. The signal on Turbine 1 would sound at 670 megahertz ("MHz") once every 30 seconds and at Turbine 6 the signal would sound at 670 MHz twice every 30 seconds. These would provide audible notice to vessels up to 2 nautical miles away.

3.1.2 Electrical System

The proposed Project would have an electrical system that consists of the following: 1) a system of submerged 34.5 kilovolt ("kV") cables that would collect power from each wind turbine, 2) a submerged 34.5 kV cable that would connect the turbines to the substation at the shore, 3) a Project substation to step up the power from 34.5 kV to 138 kV, and 4) an overhead/underground electrical line to carry the power from the Project substation to the existing point of interconnect ("POI") substation. Each of these components is described below, and their location indicated in Figure 2.

Inter-array and Export Cables: Five inter-array cables would connect the wind turbines together electrically, totaling approximately 2.8 miles in length. One approximately 9-mile long export cable would connect the turbines to the Project substation. The export cable would traverse from Turbine 1 in a southeasterly direction underneath the Cleveland Harbor Breakwater and under the remaining portion of the Harbor to the Project substation located at the CPP Lake Road Substation. Both the inter-array and export cables would be three-conductor, single armored underwater power cables, with an approximate overall diameter of 4.5 inches and rated at 34.5 kV (Figure 5). The cables would be composed of a three-core copper conductor with cross-linked polyethylene ("XPLE") or ethylene propylene rubber ("EPR") insulation. Optical fibers for data transmission would be embedded between the cores. The cables would be buried in the lakebed at an approximate depth of 1.5 meters (4.9 feet).

Full geotechnical and geophysical surveys were conducted in August and September 2016 along the cable corridor. Because an installer has not yet been selected, the exact cable route has not yet been finalized. The final route would be located within the envelope surveyed during the 2016 geotechnical and geophysical surveys (see Figure 2).

Project Substation: The Project substation would collect electricity transmitted through the submerged cables, step up the power from 34.5 kV to 138 kV and transfer it to an overhead electrical line. The Project substation would be located on currently developed land, adjacent to the CPP Lake Road Substation. The Project substation would include a fenced area approximately 88 feet by 110 feet in size that would enclose the station components, including bus structures, switch gear, the step-up transformer, and a 14-foot by 37-foot modular control enclosure for control equipment. There will be no impacts to waters of the U.S. from the construction and operation of the Project substation.

Overhead/Underground Electrical Line: The new Project substation would be connected to the existing 138 kV system at the CPP Lake Road Substation via an overhead uninsulated cable, then transitioned to an underground concrete duct bank. The transition from the duct bank to the termination structures would be through a pre-cast concrete pulling pit. The underground line would be a three-phase, 138 kV circuit, utilizing a 1,000-circular mil ("kcmil") EPR or XLPE insulated and shielded copper conductor. The circuit would run approximately 150 feet in a concrete encased conduit from an above grade termination structure in the Project substation to an above grade termination structure in the existing CPP Lake Road Substation. There will be no impacts to waters of the U.S. from the electrical line connecting the Project substation to the CPP Lake Road Substation.

Point of Interconnection Substation: The POI substation is the existing CPP Lake Road Substation. There will be no impacts to waters of the U.S. from the POI substation.

3.1.3 Construction Staging Area

Construction of the Project would require the development of a temporary staging area to store the major components, including the turbines, foundations, and submarine cable, during construction. The site would also be used to pre-assemble and test some of the components prior to installation. The staging area would be a 12-acre space leased from the Port of Cleveland on currently developed land. Site preparation would be limited to minor and temporary installation of security fencing, temporary office trailers, and secured storage areas. There will be no impacts to waters of the U.S. from the construction staging area.

3.1.4 Operations and Maintenance Facility

The Applicant would lease space from Great Lakes Towing ("GLT"), located on Division Road approximately 1 mile from the Cleveland outer harbor on Old River, to serve as the O&M center. No modifications to the existing structure would be made. There will be no impacts to waters of the U.S. from the O&M Center.

3.2 Project Construction

Pending the receipt of all required permits, Project construction is anticipated to occur in a single phase, which is expected to begin in the spring of 2019 and be completed by the fall of 2019. Prior to any installation work, a full mobilization of all vessels would be conducted, including installation of necessary grillage and sea fastening. Project construction would include the main elements and activities described below.

3.2.1 Foundation Construction

Foundation components would either be fabricated and shipped via barge directly to the installation site or fabricated and shipped via truck and/or barge to the Port of Cleveland, where they would undergo final assembly prior to being towed to the installation site. A heavy lift crane vessel would be utilized to perform the lifting operations related to the foundation and turbine installation process. One of the two vessel configurations described below will be selected. In every case the MB foundations and all turbine components will be transported to the site on a feeder barge that will be towed to the site.

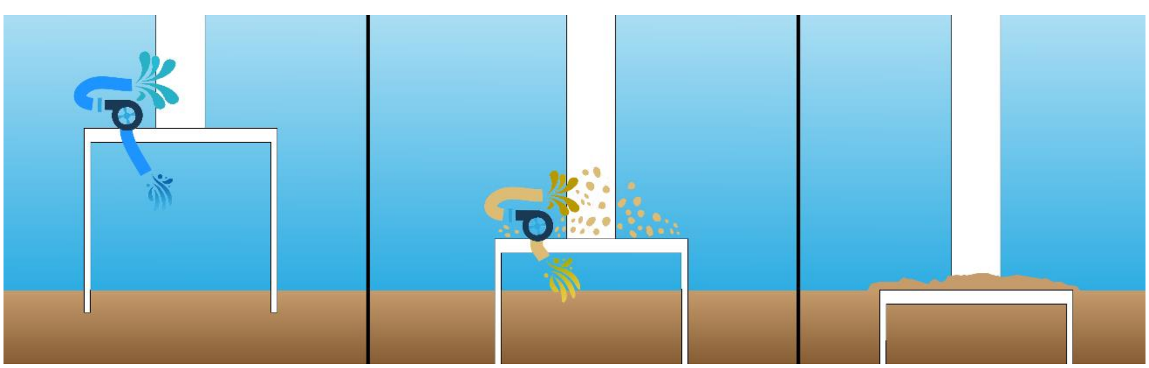
- Configuration A: A jack-up vessel would perform the heavy lift operations for both the foundation and turbine installation. A crane would be deployed on the vessel. A tug boat will be used if the vessel is not self-powered. The jack-up vessel would be a barge or hull outfitted with three to six legs that could be raised and lowered. The legs would be lowered to the lakebed and the vessel would be jacked-up via the legs to stabilize the vessel during lift operations. Each leg may have a pad on the bottom of the leg that contacts the lakebed. The maximum pad dimension anticipated is 34 feet by 18 feet (612 square feet). Assuming six pads, the maximum area that would contact the lakebed is just under 4,000 square feet.

- Configuration B: In this scenario, a non-jack-up vessel would perform the foundation heavy lift operations while a jack-up vessel would perform the turbine installation heavy lift operations. The configuration and specifications of each of the two vessels would be optimized for its specific purpose. The turbine jack-up vessel would be as described in Configuration A and would function in the same manner. The non-jack-up foundation vessel would be self-powered and would not include legs. The vessel would maintain position via anchors or dynamic positioning ("DP").

Prior to any installation work, a full mobilization of all vessels would be conducted, including installation of necessary grillage (structural load distribution elements to avoid excessive local loads on the vessels) and sea-fastening (structural elements providing horizontal and uplift support of a component during transport operations).

The MB would be lifted off the barge, and lowered to 1 meter (3.3 feet) above the lakebed. At that position, the MB would be halted to allow the water column to stabilize and then lowered until it contacts the lakebed. Once the bucket is on the lakebed, it would self-penetrate 3 to 6 feet due to its weight (500 to 600 tons). At this point, technicians in the control room of the heavy lift crane vessel would control the installation via remote operation of the click-on unit.

To achieve penetration, water would be pumped out of the bucket through an exhaust port on the click-on unit into the adjacent water. The water pumped out of the bucket through the exhaust port would be released back into the lake. The exhaust port would be directed toward the lid of the bucket so that any water and the vast majority of the associated sediment would be deposited on the bucket lid (Inset 1).



Inset 1. Sediment Deposition on to MB Foundation Lid

As the water is pumped out of the bucket, the pressure inside the bucket would decrease, which would pull the skirt into the lakebed at a rate of approximately 60 inches per hour. The entire process would be controlled by technicians on the heavy lift crane vessel. After the bucket reaches the desired depth and with the desired verticality, the process would be complete. The click-on unit would be detached remotely and lifted to the surface and onto the deck of the heavy lift crane vessel. This installation method eliminates the need for pile driving or dredging, thereby reducing noise (MB installation noise levels are 73 decibels, while pile driving produces noise levels of 191 dB; Lowara, 2012 and Elmer et al, 2007) and lakebed disturbance when compared to other foundation types (e.g., conventional monopile or jacket foundations). When compared to conventional monopile or jacket foundations, the MB foundation minimizes environmental impacts and eliminates significant installation steps, as well as equipment. Figure 6 depicts the foundation interface with the lakebed. For additional information on the jurisdictional impacts associated with foundation installation, see Section 4.1.

To maintain verticality within specifications (0.5 degrees) as the bucket penetrates the lakebed, two control mechanisms are available, water jets and clay chambers. The water jets are small water nozzles embedded in the wall of the bucket along the bottom of the skirt. The nozzles would be installed in the center of the 1-inch thick skirt and segregated into three 120-degree control zones. The water jets could be activated zone by zone and allow short pulses of water to flow through the nozzles if necessary. When the water jets are activated, the water flowing from the nozzles would loosen/lubricate the lakebed under the nozzles, thereby allowing the bucket to penetrate more readily in that zone. The other control mechanism would be a series of three independently controlled small clay chambers equidistant around the skirt. Suction or pressure could be applied to each chamber independently by the technicians controlling the installation process using remote operation of the click-on unit. This mechanism would allow for raising or lowering each zone of the skirt independently to adjust the verticality of the foundation during the entire penetration process.

3.2.2 Electrical Collection System Construction

As mentioned previously, there are two proposed submerged cable components for the Project: the inter-array cables, which would connect the wind turbines together electrically; and the export cable, which transmits the electricity generated by all the turbines to the shore.

The inter-array cables and the majority of the export cable would be installed using a deck barge with cable installation and burial equipment mobilized on board. The proposed installation technique is bury-while-lay (also referred to as simultaneous lay burial). The cable would be buried by using either a cable plow or a jetting tool. A cable plow is a tool that typically sits on skids (skis) and is pulled by a vessel. The plowshare would cut into the sediment forming a trench into which the cable is laid. A cable burying jetting tool is equipped with high-pressure water jets that assist the burial process by fluidizing the sediments within a narrow trench into which the cable would be placed (Appendix A). The targeted depth for cable burial would be approximately 1.5 meters (4.9 feet). As an installer has not yet been selected for the Project, the final installation method (cable plow versus jetting tool) has not yet been determined. The sediments that are disturbed by either process would subsequently settle back onto the lakebed, providing a degree of backfill. Figure 6 depicts the cable interface with the lakebed. For additional detail regarding jurisdictional impacts associated with the cable installation, see Section 4.1.

The proposed export cable would be brought ashore under the Cleveland Harbor and the associated breakwater through a conduit installed using horizontal directional drilling ("HDD"). HDD is a method of steerable trenchless technology commonly used in the installation of various utility pipelines and conduits using a surface-launched drilling rig. It is a common way of getting utility lines from one point to another by directionally boring under obstacles or environmentally sensitive areas. For example, HDD may be used in traversing under rivers, roadways or steep slopes where typical trenching technologies would not be feasible, cost effective, or an appropriate means of minimizing environmental impact. The use of HDD to install crossings under a vast range of surface obstacles was developed in the 1970s, combining techniques used in conventional road boring and those used in oil and gas directional drilling. This method is currently used to install pipelines for oil, natural gas, water, and wastewater, as well as conduits for electric power and fiber optic cables.

There are several advantages to HDD as opposed to traditional trenching methods, including:

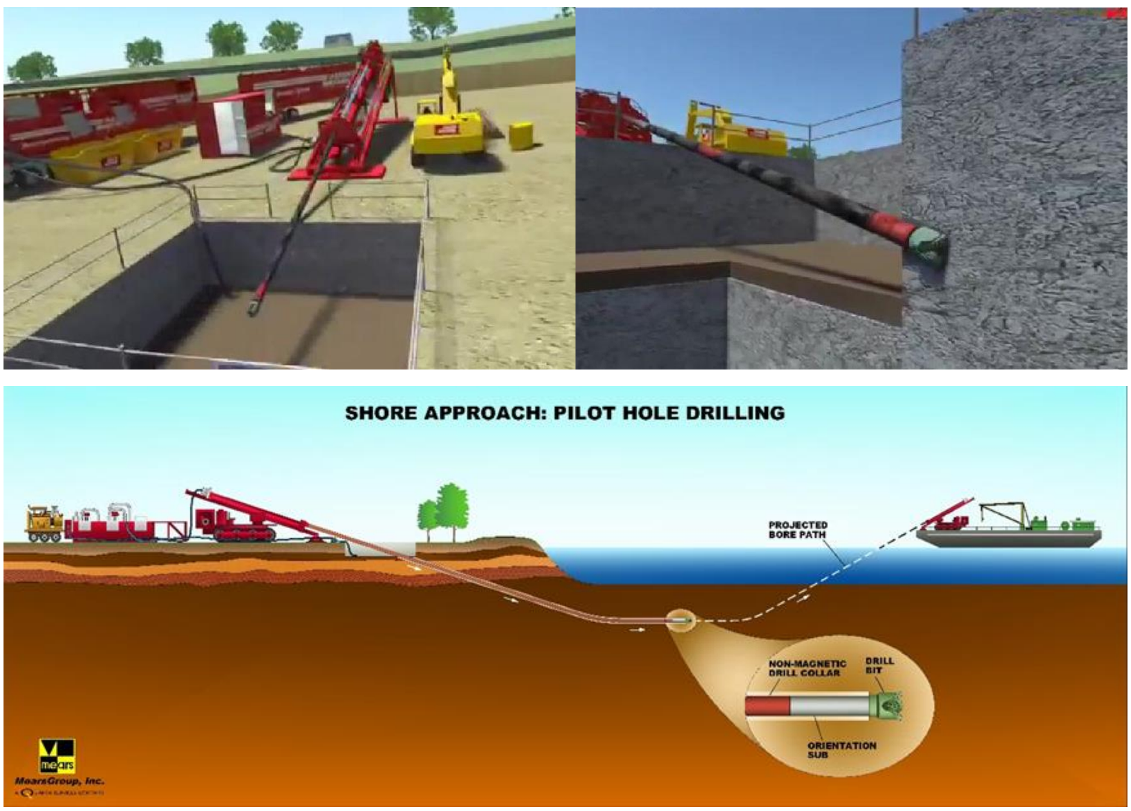
- Less invasive than the traditional open cut.
- Requires a relatively short set up time.
- Surface disruption is minimized.
- More secure than above ground or trenched installations.
- Can make deep installations and avoid surface obstacles such as rivers, railways, or highways.
- Results in less environmental impact overall.

HDD is being used for Icebreaker so that the cable can be placed in a conduit under the Cleveland Harbor Navigation Channel and Breakwater. Placement of the cable in a conduit will provide greater protection for the cable where ships and anchors are most likely to be encountered. The specific characteristics of each drilling project are important factors. For Icebreaker, the soil conditions are primarily silty clay with low plasticity. The crossing is approximately 1,100 meters (3,600 feet) in length, and the diameter of the conduit is approximately 18 inches.

The HDD sequence of events is as follows:

Pilot Hole Drilling

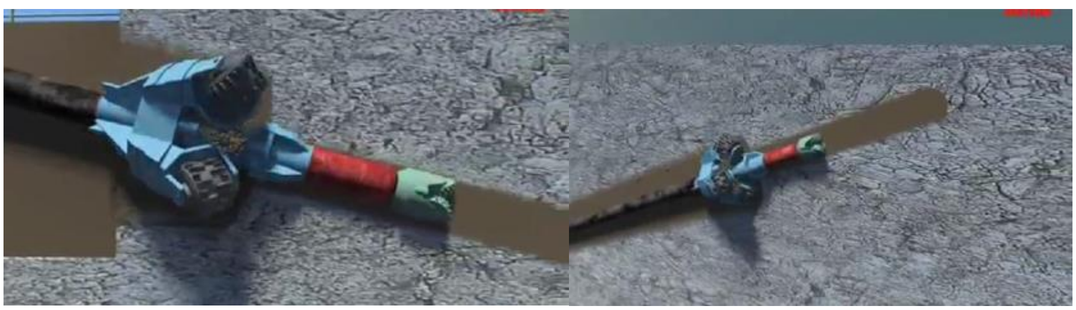
The first step is to drill a pilot hole. The drilling tools and rig equipment selected for each job are largely determined based on the results of the geotechnical investigation and the size of the crossing (length and diameter). During the pilot hole drilling, a directional guidance system is used to navigate the pilot hole along its pre-designed profile. The pilot hole is drilled from the primary drilling rig at the entry point onshore (at the substation) to the secondary rig located at the exit point offshore (outside the Breakwater) following a previously designed profile and alignment (Inset 2). For this Project, following drilling of the initial pilot hole, the "bottom hole assembly" (the drill bit and the non-magnetic drill pipe encasing the survey instrument at the end of the drill string) would be lifted to the deck of a work barge and removed.

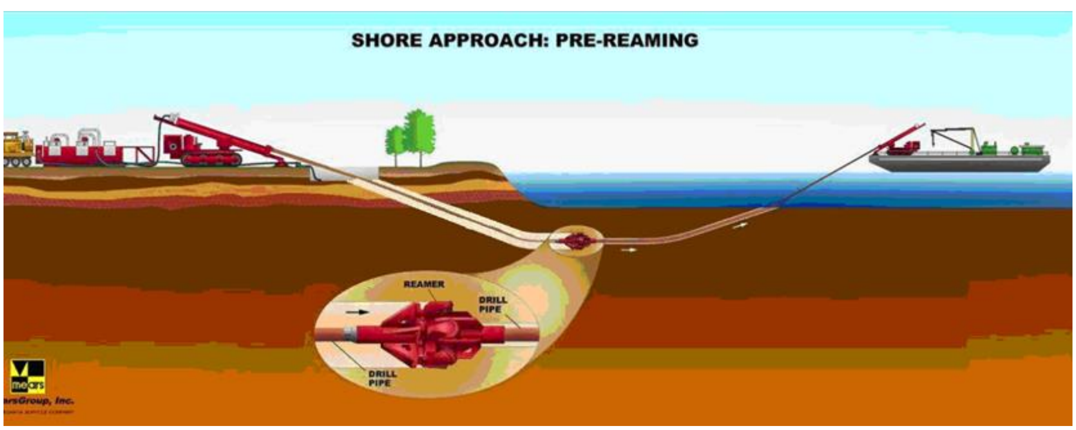


Inset 2. Shore Approach: Pilot Hole Drilling

Hole Enlargement

The pilot hole is then enlarged using a reamer. This is known as “pre-reaming” and provides a bore diameter large enough so that the conduit can be installed in the bore hole. The hole would be “pre-reamed” to approximately 12 inches larger than the outside diameter of the proposed high density polyethylene (“HDPE”) conduit (i.e., to approximately 28 to 30 inches in diameter). The driller would most likely do this by progressing the reamer (a 30 inch diameter cutter) through the drilled hole from the onshore end towards the offshore “exit” (Inset 3), thereby transmitting the large majority of the pre-ream cuttings and drilling fluid back to the land surface at the onshore drill site. Drilling operations would use drilling fluids to stabilize the bore hole and to lubricate the drilling process. The proposed drilling mud (a clay-based compound such as Bentonite) is National Sanitary Foundations (“NSF”) approved for drinking water applications such as water wells. Spent drilling fluids containing solely bentonite clay are considered “earthen material” and may be buried or land applied on-location within the right-of-way of the drilling operation or at a designated property. Drill cuttings resulting from HDD using solely bentonite clay and water are also considered “earthen material” and may be managed similarly. Based on the final desired diameter and soil conditions, this process may include one or more stages.

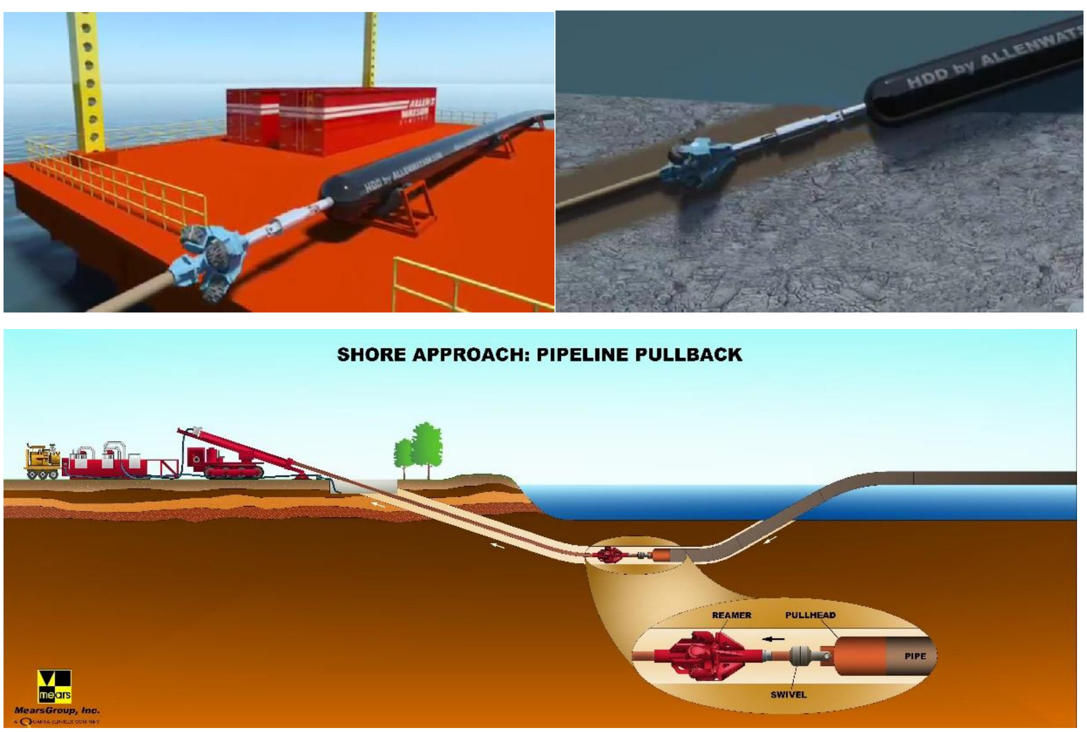




Inset 3. Shore Approach: Pre-Reaming

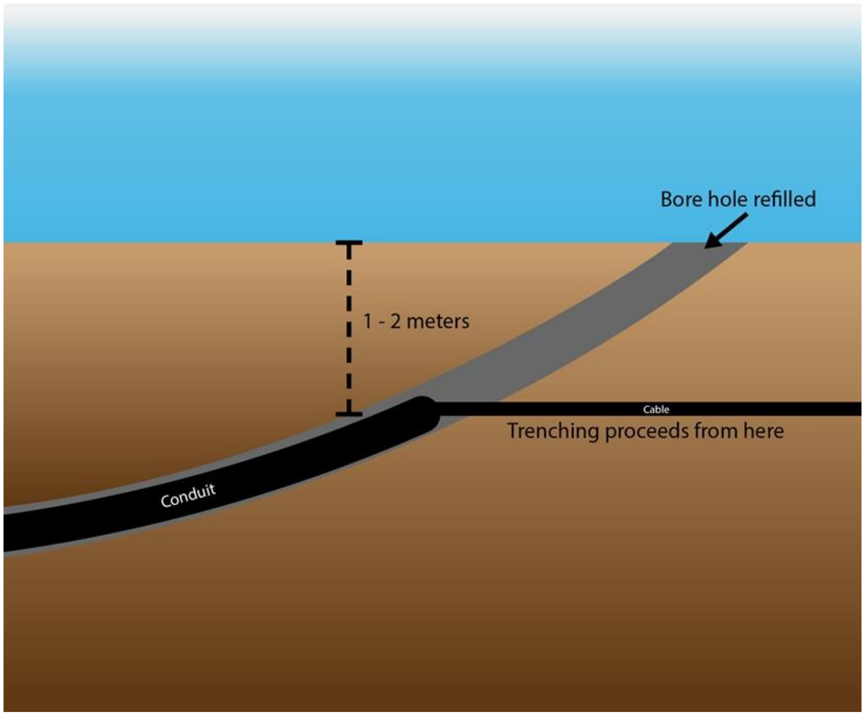
<u>Pullback</u>

Once the drilled hole has been enlarged to the required diameter, the HDPE conduit, which will have been preassembled offshore or assembled onshore and then towed offshore to the barge, is readied for installation. The conduit is pulled through the drilled hole toward the shore using the drill "string" (pipe). The conduit would be prefabricated in a single string prior to it being pulled back through the drilled and reamed hole. The driller anticipates that the HDPE string would be towed out to the exit point where, on the deck of the barge, it would be attached to the drill pipe by way of a pull-head at the front of the HDPE pipe, along with a swivel and a reamer (Inset 4). That assembly would be lowered overboard and the onshore drilling rig would then pull the HDPE pipe through the drilled and reamed hole and into the drilling pit onshore (Appendix B).



Inset 4. Shore Approach: Pipeline Pullback

The electric cable is installed from outside the Breakwater toward the shore through the conduit. The cable is pulled into the conduit from the shore entry point using the "pull string" previously placed in the conduit. The trenching/cable installation process proceeds from this point toward the turbines using a cable plow or jetting tool (Inset 5).



Inset 5. Connection Between HDD and the Export Cable

3.2.3 Wind Turbine Assembly and Erection

It is anticipated that turbine components, including the nacelle, blades, and tower, would be transported to the Port of Cleveland by barge. A heavy lift crane vessel would be utilized for turbine installation. Installation of the turbines would occur after the installation of the MB foundations and the electric collection lines is complete. The heavy lift crane vessel would already be positioned at the respective turbine site ready for turbine erection. A load-out crane in port would load tower sections for the first turbine onto the feeder barge, which would then transit to the first installation site. The tower sections would be picked off the feeder barge and installed on the foundation using the crane mounted on the heavy lift crane vessel. Assembly work inside the towers would begin as the feeder barge returns to port for the nacelle and blades. Once the feeder barge returns to the site, the nacelle and blades would be installed using the crane. Upon completion of a turbine installation, the heavy lift crane vessel would reposition to the second turbine location while the feeder barge returns to port for the load-out of towers.

3.2.4 *Substation Construction*

The Project substation would be constructed on CPP property, adjacent to the existing Lake Road Substation. The area surrounding the substation is developed, consisting almost entirely of unpaved, but previously disturbed, outdoor storage space with no significant ecological resources. The Project substation would include a fenced area approximately 88 feet by 110 feet in size that would enclose the station components, including bus structures, switch gear, the step-up transformer, and a 14-foot by 37-foot modular control enclosure for control equipment. The entire Project substation area would be excavated to a depth of approximately 3 feet for the installation of the substation grounding grid. All unused excavated backfill would be removed from site for disposal in an upland location. Compacted backfill would be placed over the ground grid with a final 18-inch layer of coarse aggregate as the final substation surface. Bus support structures, overhead line dead-end structure, and the control house would be placed upon drilled caisson foundations with elevated piers. The entire station would be enclosed by chain link fence installed around the perimeter. There will be no impacts to waters of the U.S. from the construction and operation of the Project substation.

4.0 JURISDICTIONAL ACTIVITIES

Through an iterative design process, the Project has been sited to minimize impacts to Lake Erie. In 2009, the Project was originally proposed to be located 3 to 5 miles off the coast of Cleveland. In 2009, the ODNR issued a Wind Turbine Placement Favorability Analysis Map to indicate the most favorable and least favorable locations in Lake Erie for wind turbine placement. The analysis took many factors into consideration, including shipping lanes and navigable waterways, distance from shore, fish and bird presence and habitat, natural heritage observances, reefs, shoals, and artificial reefs, lakebed substrates, salt mine and sand and gravel operations, military exercise area and danger zones, confirmed shipwrecks, sport and commercial fishery efforts, and dredge disposal areas (ODNR, 2009). After the issuance of this analysis, the Applicant shifted the proposed location of the Project further offshore to avoid limiting factors identified by the ODNR. The original layout was in an area with extensive limiting factors, as identified by the ODNR. The current proposed location is in an area that the ODNR has identified as having moderate-low limiting factors. However, unavoidable temporary disturbance and long-term loss of a small amount of lakebed would result from Project activities. These impacts are described below.

4.1 Project Component Installation

Construction of the onshore Project components, including the O&M center, the Project substation, and the temporary staging area, would not result in any impacts to water resources. All of these Project components are located entirely on currently developed or disturbed upland sites, and therefore, do not include any jurisdictional activities.

Installation of the MB foundations would not require vegetation removal, dredging or drilling prior to, or during, the installation process. Installation of the six foundations will directly disturb approximately 0.34 acre of substrate habitat for the turbine foundation. There also is potential for localized, short-term impacts as a result of water withdrawal from inside the foundations and discharge of this water to the lake.

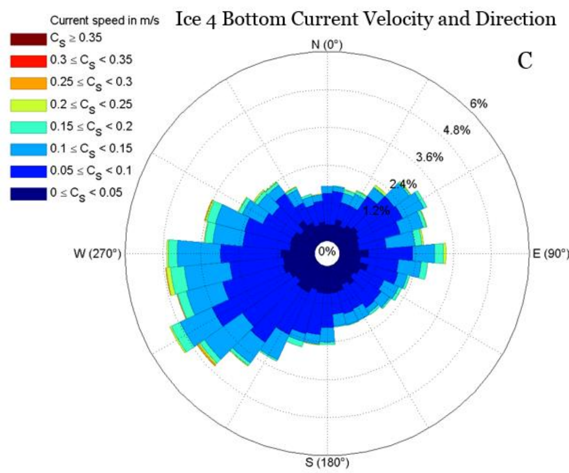
During the installation process, approximately 810,000 gallons of water would be extracted from inside the foundation bucket and released back into the lake. Sediment from the top 0.1 to 0.3 meter (0.3 to 1.0 foot) of the lakebed could be sucked into the pump and mixed with the discharge water during the last approximately 1 meter (3 feet) of the penetration process. The water and the vast majority of suspended sediment removed during the MB installation would be pumped from the inside of the bucket back on to the lid of the MB. The quantity of sediment that would be pumped out may vary by location and the particular composition of the sediment at each of the six turbine sites. Finer grained sediments would become more easily entrained in the discharge water when compared to coarser grained sediments. The amount of sediment that could potentially become entrained in the discharge water and released from the exhaust port is anticipated to be up to 75 cubic meters (98 cubic yards). The vast majority of the sediment would be returned to the lakebed on top of the MB lid, with a small amount possibly falling to the lakebed beyond the diameter of the lid (Inset 1). This fallback of sediment onto the lid would reconstitute portions of the benthic habitat that would be lost due to the installation of the MB.

Burial of the inter-array cables and export cable during construction would also temporarily impact the lakebed. The proposed inter-array cable and export cable would be installed beneath the lakebed using a cable plow or jetting tool. Along the proposed approximately 12-mile cable route, the direct disturbance resulting from cable installation would be approximately 15 feet wide. During installation of the cable, bottom sediment would become suspended within the water column; however, the impact would be short-term and localized. Lake Erie has low current velocities; therefore, bottom sediments suspended during jetting installation would be expected to settle back to the lake bottom with minimal transport of suspended sediments from the localized area. Potential impacts from suspended sediments are discussed below and in greater detail in a Sediment Transport Memo, prepared by LimnoTech and attached as Appendix __ to this Application.

The *Lake Erie Water Quality Modeling Report* prepared by HDR (2015) for a similar project in Lake Erie, the ITC Lake Erie Connector ("LEC"), was reviewed to assess the potential for increases in suspended sediment from the proposed Project. The LEC is a proposed cable route approximately 80 miles east of the proposed Project. The LEC cable route crosses a similar nearshore to offshore bathymetric gradient and water currents, and encounters a similar transition from sandy nearshore sediments to silt and clay offshore sediments as the proposed Project. Modeling conducted for the LEC project predicted that the highest total suspended solid ("TSS") concentrations would occur around the point of cable installation and then decrease rapidly as distance from the installation area increases. At a lateral distance of 30 meters (98 feet) from the cable installation point, the TSS concentration increases were predicted to be less than 3 mg/L above background conditions. TSS concentrations were predicted to drop to 100 mg/L above background TSS levels within the first hour and to less than 3 mg/L above background TSS levels within 1 to 4 hours, depending on the representative location. In the vertical direction, the model predicted that increased TSS concentrations would be limited to the bottom 5 to 11 meters (16 to 36 feet) of the water column depending on the representative location. Above these depths, the model predicted TSS concentrations of less than 3 mg/L above background conditions. Similar short-term and localized increases in TSS are expected to occur during installation of the proposed inter-array and export cables.

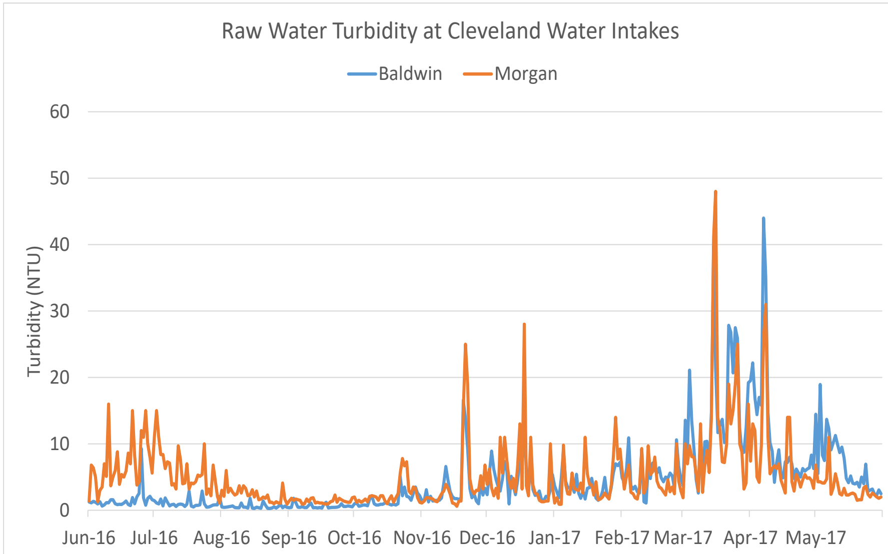
A variety of site-specific factors can affect the concentration and transport of suspended sediment, including the specific type of sediments and the speed and direction of water currents. Depending largely on the quantity of fine grained sediments suspended and the properties of these sediments after suspension, the suspended sediments could remain concentrated above background levels for minutes to many hours after installation. Near the proposed turbine locations and within 2 kilometers (1.2 miles) of the proposed turbines, surficial sediments are fine grained and typically composed of 34 to 58% clay, 34 to 50% silt, and less than 8 to 17% sand and gravel (CSR, 2016). Along much of the export cable route (i.e. from shore to 8 miles offshore), surficial sediments are sandy sediments, which when suspended during cable installation would settle immediately adjacent to the trench carrying the cable. Pockets of finer-grained sediments also exist along some portions of the proposed export cable route. These finer-grained sediments would remain suspended longer and travel farther than sands. Resuspended fine-grained surficial sediments would tend to be resuspended as flocs or masses rather than as individual particles. Consistent with this, the minimum settling rate of sediments can range from 1 meter/day (for floc settling of fine grain material) to over 100 meters/day (for coarse sand).

Ambient currents were monitored in 2016 as part of a pre-construction monitoring study conducted by LimnoTech. Lake currents from May to October 2016 were more frequently directed toward the southwest than to the northeast. Inset 6 below shows a summary of wind direction frequency for current measurements near the bottom of the lake at the proposed location of one of the Project turbines, ICE4 (the spokes represent the frequency of moving towards a particular direction). Typical persistent current speeds are low (about 4 centimeters per second). At this average current speed, fine-grained sediments (with slow settling rates) could travel 3.5 kilometers (2.2 miles) in a 24 hour period if their characteristics are such that they remain suspended for this duration. Most of the time, current speeds are less than 10 centimeters per second with occasional short-term excursions to 20 centimeters per second.



Inset 6. Bottom Current Velocity and Direction at Turbine ICE4 from May to October 2016.

Impacts on aquatic and benthic organisms including invertebrates and fish are expected to be negligible and in line with other natural and anthropogenic factors that cause temporary increases in turbidity and sediment disturbance. Ice scouring during winter months frequently creates large cuts/scars in the sediment bed that frequently disturb sediment and displace aquatic life (USACE, 2000). Wind-driven resuspension can also increase ambient turbidity levels well above background levels. Natural fluctuations in turbidity have also been measured by at the City of Cleveland at their water intake cribs in Lake Erie (Moegling, 2017, pers. comm.). Inset 7 below shows the daily average of turbidity measurements from two of the four water intakes (Morgan and Baldwin) located approximately four miles offshore during the 2016/2017 season. Frequent turbidity spikes were observed at both intake locations.



Inset 7. Turbidity Measurements at Two Cleveland Area Water Intake Cribs from June 2016 to May 2017

The closest water intake and associated Source Water Protection Area (1,000-foot radius around the intake), is between approximately 2,900 and 3,300 meters (1.8 and 2.1 miles) from the proposed export cable and approximately 6.8 kilometers (4.2 miles) from the closest proposed turbine The potential for impacting water quality at the intakes depends on the prevailing lake currents during installation, precise type of sediment encountered along the cable route, installation method (e.g., ship speed, trench depth/width, jet nozzle configuration), water intake design, and water plant pumping characteristics. Water current data collected by LimnoTech, shown in Inset 6, shows that water currents could carry sediments in the direction of the intakes, and surficial sediment data from Canadian Seabed Research show areas of fine grained sediment are located along the cable route in the region near the intakes.

Discussions with Cleveland Water indicate they frequently deal with natural increases in suspended sediment at their intakes (Inset 7). The Cleveland Water conventional surface water treatment plant removes turbidity continuously as part of their treatment process to clarify and disinfect water (clarification to remove particulates, filtration to remove finest of particles and some dissolved chemicals if biological filtration is occurring, and disinfection with chlorine). The range of turbidity to be removed is part of the design process and uses worst case scenarios (from historical turbidity data) to establish the design capacities (Moegling, 2017, pers. comm.). Inset 7 shows the range of turbidity measured at the two intakes closest to the export cable route. It ranges from very low (under 10 Nephelometric Turbidity Unit ["NTU"]) to very high (30 to 50 NTU and higher), typically after a rain event or choppy or very choppy conditions on Lake Erie. The Cleveland Water treatment plant is large and therefore can handle most short-term variations in turbidity from within the plant. For longer term events, Cleveland Water may adjust doses within the treatment process (Moegling, 2017, pers. comm.).

In addition, the configuration of the two water intakes only begins to let water flow in at depths of 5 to 10 feet above the lakebed, further limiting potential impacts.

To limit potential impacts the Applicant will work with the selected cable installation contractors to monitor and mitigate the amount of suspended sediment during cable installation. This would include careful review of selected contractor's equipment and installation method, initial monitoring of cable installation to ensure minimal impact, and adjustments to installation speed or jet pressure to limit suspension. The Applicant will continue discussions with the City of Cleveland and develop a communications and monitoring plan that would inform plant operators of construction schedule and provide field measures of turbidity to optimize water treatment plant operation (as would occur under regular operating conditions during storm events). These precautions and mitigation measures will greatly reduce the potential for any negative impacts on drinking water supply. Any temporary impacts are expected to mirror other naturally occurring sediment resuspension events on Lake Erie.

The use of HDD would minimize impacts to sensitive nearshore areas by taking the cable under the lakebed. At the offshore end of the conduit the trenching/cable installation process using either the cable plow or jetting tool would proceed (Inset 5). As such, no impacts are anticipated as a result of routine HDD installation practices. Though precautions would be taken to minimize the chances of a drilling fluid leak (i.e., an inadvertent return), there is still a potential risk of leaks through unidentified soil weaknesses. An Inadvertent Return Contingency Plan ("Frac-out" Plan) was prepared by the Applicant to address the potential risk of an inadvertent release of drilling fluids (Appendix D). The plan describes the procedure the Applicant and the contractors would implement to avoid, minimize, and remediate potential environmental impacts that could result from an inadvertent release. A final, site specific Inadvertent Return Contingency Plan will be developed by the Applicant's HDD contractor prior to the start of construction. While the Applicant will not make final plans until a contractor is selected, they will consider the following options described below.

In the rare chance of an Inadvertent Return, containment can be achieved by sealing the leak point using loss control materials ("LCMs"). The use of LCMs is an industry standard for HDD projects to control the flow of fluids that may inadvertently escape from the drill bore. LCMs are generally environmentally benign materials that slow or stop the release of fluid from the unintended opening of the HDD bore. Once selected, the Applicant's HDD contractor would provide safety data sheets ("SDS") for LCMs prior to the start of drilling. An open water frac-out can be contained through the installation of a gravity cell. The gravity cell is a box-like structure that is placed over the location of the release to prevent the migration of drilling fluids away from the location. The gravity cells are constructed of steel and, once lowered into place, provide a seal at the interface with the sea floor or lake bottom. Once the unintended return has been stabilized, the contractor will send a diver down to the gravity cell with a hose to vacuum out the contained drilling fluids. The captured fluid will be pumped to a holding tank on the work vessel for proper handling and disposal. During the HDD operation, the contractor shall have a barge with a dive team stationed offshore.

Turbidity curtains are generally ineffective for confining an inadvertent return of drilling fluids because the drilling fluids are heavier than water and turbidity curtains cannot effectively seal the interface with the sea floor or lake bottom. Released fluids will tend to sink directly to the lakebed. The gravity cells described above are the industry standard and are far more effective at containing fluids that may be released to the environment during an inadvertent return.

Sampling conducted by LimnoTech in 2016 at three of the proposed turbine locations indicate that the lake bottom dissolved oxygen levels were between 2 and 4 milligrams per liter ("mg/L") in July and dropped to near 0 mg/L in the month of August (LimnoTech, 2017). These results confirm that the proposed turbines would be located in the "dead zone" of Lake Erie. Impacts to biological resources in this "dead zone" of Lake Erie from the release of water and sediment from the MB installation would be negligible due to the short-term nature of the disturbance, the anticipated return of the vast majority of the sediment on to the lid of the bucket, and the lack of biologic organisms due to the low dissolved oxygen levels.

In addition to a temporary increase in turbidity and suspended sediment concentrations during the construction phase of the proposed Project, temporary impacts to water quality from the disturbance of potentially contaminated sediment may occur. Lake Erie bottom sediments in areas offshore of Cleveland may contain elevated levels of contaminants, including metals, hydrocarbons, and PCBs. Limited bottom sediment samples were collected during a site-specific geotechnical survey in the vicinity of the proposed turbine sites and export cable route. Sediment results were compared to ecological sediment quality guidelines following the process outlined in OEPA's *Guidance on Evaluating Sediment Contaminant Results* (2010). Results from this evaluation indicate that existing sediment quality at these four locations would pose a low potential for toxicity to aquatic receptors. Mobilization of potentially contaminated sediments could have a temporary indirect impact on water quality in the immediate vicinity of proposed Project activities, primarily related to increased turbidity/suspended sediment; however, these impacts are expected to be temporary, localized and minor when compared to the surrounding natural sediment and water quality conditions in the Project Area.

4.2 Project Operation

The onshore Project components, including the O&M center, the Project substation, and the temporary staging area, would not result in any impacts to water resources during the operational phase of the Project. All of these Project components are located entirely on currently developed or disturbed upland sites and, therefore, do not include any jurisdictional activities.

The presence of the MB foundation will result in a long-term loss of a small amount of lakebed habitat for benthic communities, as it exists in its current form. However, any sediment that becomes entrained in the discharge water during the installation of the MB foundation would be pumped back on to the lid, where the vast majority of the sediment would remain. This sediment would reconstitute a portion of that lakebed habitat on top of the MB lid. Preliminary designs indicate that the diameter of the foundation will be approximately 17.0 meters (55.8 feet; Table 1). For the proposed six foundations, this would lead to a total loss of lakebed of 0.34 acre (Figure 7). As mentioned previously, the area impacted by foundation installation includes no aquatic vegetation or significant fish habitat. In addition, the footprint of the foundations represents an insignificant loss of lakebed and aquatic habitat when compared to the total area of Lake Erie. Upon completion of the cable installation, the cable would be buried under the lakebed at a targeted depth of 1.5 meters (4.9 feet). The cable would result in no permanent impact to the lake or loss of lakebed.

The turbines would be marked and lighted in accordance with USCG and FAA regulations. A Navigational Risk Assessment was prepared for the Project and concluded that the Project would not adversely affect navigational safety in the Project area (Appendix E).

The operation of the proposed Project may also have minor environmental impacts, including impacts to birds and bats and visual aesthetics. A discussion of these impacts can be found in the Draft EA that was issued for the NEPA review.

4.3 Summary of Jurisdictional Impacts

Impacts to Lake Erie as a result of Project construction and operation are limited to the loss of 0.34 acre of existing lakebed resulting from foundation installation and temporary disturbance of 21.8 acres (63,360 linear feet x 15-foot width) of bottom sediments associated with installation of the submerged cables, as indicated in Table 2 and shown on Figure 7. The decision to use the MB foundation design, HDD to install cable in the nearshore area, and jet-plow/cable plow technologies to install the remainder of the cable, avoids and/or minimizes discharge of dredged or fill material as defined under Section 404 of the Clean Water Act. These installation methods significantly reduce construction-related discharges of any dredge or fill material and overall environmental impacts.

Table 2. Impacts from the Proposed Project

Component	Impact (acres)[1]	Impact (linear feet)[2]	Impact Type
MB Foundations (6)	0.34	--	Permanent
Electric Collection Cable	21.8	63,360	Temporary

[1] Area of impact calculated from the MB foundation diameter of 17 meters (55.8 feet), included in Table 1.
[2] Linear feet of impact calculated from the approximate length of the electric collection cable (export and inter-array) of 12 miles.

By siting the proposed turbines in an area that generally lacks sensitive environmental resources (according to the 2009 ODNR Wind Turbine Placement Favorability Analysis), making landfall in a developed area that lacks wetlands or undisturbed ecological communities, and proposing component designs and installation techniques that would minimize the disturbance/dispersal of lake sediments, the Applicant has avoided and/or minimized potential temporary and permanent impacts to jurisdictional resources to the maximum practicable extent. Temporary impacts from the Project will be limited to localized, short-term, elevated suspended sediment levels in the offshore waters of Lake Erie. A sediment quality evaluation indicated that there is a low potential for toxicity in the Project Area and, as a result, aquatic receptors are not likely to be impacted by disturbed sediment. Given the location, proposed marking and small number of proposed turbines, no significant impacts to terrestrial or aquatic biological resources, municipal water supplies, or navigation are anticipated. The Project would result in the long-term loss of approximately 0.34 acre of Lake Erie lakebed, which represents an insignificant proportion of the lakebed.

5.0 ALTERNATIVES ANALYSIS

5.1 Alternative Project Sites

5.1.1 Regional Siting Considerations

The selection of appropriate sites was constrained by numerous factors that are essential considerations for the Project to operate in an environmentally, technically, and economically viable manner. Criteria evaluated during the siting process are discussed below. Nine potential project areas and several designs were considered before selecting the ultimate Project location and design, as discussed in detail below.

<u>Existing Uses</u>

The proposed location was selected to avoid competition with, or impacts to, existing public and private uses. The turbines would be located outside of commercial shipping lanes and the flight paths of Burke Lakefront Airport and Cleveland Hopkins Airport. The location of the turbines would not interfere with NEXRAD weather radar or military radar. The turbines would also be located away from reefs, shoals, dumping grounds, a sub-lake salt mine, shipwrecks, water intakes, and sewer outfalls. The turbines would be outside of any high impact areas identified by the ODNR's Wind Turbine Placement Favorability Analysis (ODNR, 2009), and are not near any competing submerged lands leases.

Wind Resources

Wind measurements were collected at a meteorological tower stationed atop the Cleveland Water Intake Crib located 3 miles off the coast of Cleveland. Project siting took dominant wind direction into consideration in order to maximize the power output of the turbine configuration and to reduce stress on turbine components. Turbines would be oriented to the cross-wind direction north-northwest to south-southeast and would be spaced approximately six rotor diameters apart to minimize wake effects from the adjacent turbines.

Environmental Conditions

Natural resources such as water quality and avian, bat, and aquatic communities were also evaluated when considering alternate locations for the proposed Project. Avian and bat risk studies, risk assessments and radar analyses completed in 2005, 2008, 2013, 2016, and 2017 for the Project cited the small size of the Project, distance of the turbines from the coast, absence of waterbirds at the 8 to 10 mile distance from shore, considerably fewer night migrants over the Project location as compared to over land and the eastern end of the lake, rare and infrequent presence of any state- or federally-listed threatened or endangered ("T&E") species or species of special concern, and the lack of nesting/roosting and foraging areas as support for the conclusion that the Project would have minimal impacts to avian, bat, and T&E species. A risk assessment and a sampling plan for aquatic communities were also prepared in 2016 and 2017; it was concluded that risk to any aquatic resources is minimal. The Applicant has entered into two Memoranda of Understanding ("MOU") with the ODNR setting forth agreement on monitoring protocols for aquatic resources and fisheries, as well as for birds and bats, pre-, during, and post-construction to ensure that the project has no significant adverse impact on these fish and wildlife resources. These MOUs were submitted to the Ohio Power Siting Board in support of the Applicant's permit application on July 20, 2017. The geology of the lakebed was evaluated to ensure turbine foundations would be supported by the lakebed sediments, and ice conditions and wave action were studied to determine loading on the foundation and to ensure that the turbines would be able to withstand ice and wave loads.

Foundation Design

The Applicant performed a detailed comparative review of five different turbine foundation designs, resulting in the identification of two turbine foundation options; the Monopile with a Friction Wheel ("MP/FW") and the MB. After a technical assessment of the two foundations, the MB was selected as the Project turbine foundation in 2015. See Section 5.2.2 for further detail on turbine foundation selection.

Interconnection and Offshore Cabling

Offshore cabling was an important cost factor for the Project. Cable distances are dependent on the turbine location relative to the onshore interconnection location. Three potential interconnection locations were evaluated. Feasibility, cost of required equipment, and anticipated impacts were considered. The CPP Lake Road Substation was chosen as it was the closest potential interconnection location to the Project, thereby reducing cabling distance and cost. Its location in a developed/disturbed setting also minimized potential environmental impacts.

5.1.2 Potential Project Sites

In 2009, nine potential Project sites were identified 3 to 5 miles offshore (Figure 8). Each site was capable of supporting approximately 20 MW of power, but varied in location, number of turbines that could be accommodated, and available turbine spacing. The alternate Project sites were evaluated with respect to important siting criteria, including shipping channels, water depth, distance to possible onshore interconnection locations, wind resources, air navigation and radar, and the locations of lakebed factors such as dumping sites, artificial reefs and shoals, water intakes and sewer outfalls, and shipwrecks.

After these sites were evaluated, the ODNR Office of Coastal Management released its 2009 Wind Turbine Placement Favorability Analysis, and potential Project locations were subsequently re-evaluated. The ODNR Favorability Analysis identified additional siting constraints including bird habitat, fish habitat, commercial and sport fishery efforts, lakebed sediments, utilities, shipwrecks, natural heritage observances, shipping lanes, distance from shore, and industries. In general, the Favorability Analysis identified more extensive limiting factors closer to shore, and only minimal limiting factors further offshore. The Favorability Analysis was one important resource in assessing the suitability of the project sites and was relied upon extensively in the Applicant's decision to shift the Project further offshore.

In 2014, a Project consisting of six turbines sited 7 to 10 miles off the coast of Cleveland was proposed. Subsequently, the Project was shifted to the current site, located 8 to 10 miles offshore, in response to all of the siting considerations listed in Section 5.1.1.

5.2 On-Site Alternatives

5.2.1 Alternate Project Layout and Size

An optimization study was conducted by the National Renewable Energy Laboratory ("NREL") in 2014 to evaluate potential Project layouts in terms of net energy production, turbine net capacity factor, and wake losses. Potential layouts studied included linear layouts varying from five to nine turbines, two-row layouts, and a three-row layout. The linear, six turbine layout had one of the highest net energy outputs per turbine. In 2016, the Applicant selected the final layout of a linear, six turbine array spaced approximately six rotor diameters apart with the potential to generate 20.7 MW of energy located 8 to 10 miles off the coast of Cleveland.

5.2.2 Alternate Project Foundation Design and Turbine Model

A MP/FW foundation concept was the original foundation design chosen by the Applicant in 2013 after an examination of four foundation types (circular cell, tripod pile, gravity base, and MP/FW) and their performance in lakebed sediments similar to those found in the Project area. The friction wheel consists of an outer steel ring with a concentric inner ring connected via structural members to form a wheel. The wheel is embedded in the top layer of sediment surrounding the monopile and filled with aggregate to stabilize the soil and increase resistance to deformation from lateral forces in response to loads on the monopile. The monopile alone is a well-developed and established design and has been used at approximately 70% of the existing offshore wind farms in Europe. However, there are not currently any wind turbines operating on MP/FW foundations.

As the Project design progressed, the Applicant considered a fifth foundation type, the MB suction pile. The MB suction pile is also a well-proven concept for offshore foundations in the oil and gas industry, with more than 2,000 suction technology-based installations. These range in size from relatively small suction anchors to enormous suction buckets holding in place the world's largest offshore oil platforms (Troll A off the coast of Norway). The proposal to use a single large bucket suction pile foundation for a wind turbine was developed in Norway and Denmark in the late 1990's, leading to installation of a 3 MW Vestas turbine at an offshore location in 2002. As described previously, the structure consists of an open-ended steel bucket that is placed open end down on the lakebed. As described in more detail above, after a small amount of self-penetration into the sediment under its own weight, the pressure within the foundation is reduced by pumping water out of the bucket, which pushes the foundation into the seabed. Once installed, the foundation captures all of the sediment inside the bucket and acts like an embedded gravity footing. Use of this technology is increasing in Europe, where 4 to 8 MW turbines are being placed on foundations using suction buckets.

A comparative analysis between the MP/FW and the MB suction pile was completed in 2015 to determine the most suitable foundation design for the proposed Project. Selection of the preferred foundation considered all aspects of both technologies, and while the MP/FW uses well-proven monopile technology, its large size and pile driving equipment would make installation challenging, requiring three offshore lifts. Pile driving would also result in much greater underwater noise impacts (191 dB) as compared to MB installation (73 dB), and the fly wheel would require the addition of a significant amount of fill to the lakebed (Lowara, 2012 and Elmer et al., 2007). The MB would only require the use of one offshore lift, and would not require any pile driving or placement of fill. Therefore, the installation costs and environmental impacts would be significantly lower for the MB. While both foundations meet the technical performance requirements for Lake Erie's lakebed sediments and winter weather conditions, the MB would be lighter, quicker to install and can be fabricated in the U.S. By eliminating pile driving and reducing soil disturbance, the MB foundation would lessen environmental impacts when compared with conventional foundations. Given these advantages, the MB was selected as the foundation for the proposed Project in March 2015.

5.2.3 Substation Location

Three potential interconnection locations were evaluated: the Cleveland Electric Illuminating Co. ("CEI") Lakeshore Substation, the CEI Oglebay-Norton Tap, and the CPP Lake Road Substation. Feasibility, cost of required equipment, and anticipated impact were elements considered. The CPP Lake Road Substation was chosen as it was the closest potential interconnection location relative to the proposed turbines, thereby reducing cabling distance, environmental impacts, and cost. This site also requires minimal upgrades to existing infrastructure, and has sufficient land to construct necessary new substation equipment without impacts to water resources.

5.2.4 Submerged Cable Route

A comparative analysis was conducted to assess the benefits and risks of each cable route option considered for the Project (see Table 3). Cable length, utilization of HDD, potential damage from third parties, environmental aspects, permitting considerations, and potential Port of Cleveland, City of Cleveland, and USACE development plans near the shore crossing were evaluated in the analysis.

To connect the export cable to the substation, the cable route would have to cross or go around the Cleveland Harbor Breakwater, then cross the Cleveland Harbor to the substation. A man-made confined disposal facility ("CDF") is located within the harbor along the direct path to the substation. Originally, three different cable route options were assessed. These alternatives are illustrated in Figure 9, and included the following:

- Option 1 would be the most direct route. The route would be a straight path perpendicular to the general shoreline from the substation, crossing under the CDF and the breakwater to the open water of Lake Erie, and then continuing in a straight path to the nearest turbine. Within this option, three different scenarios were evaluated: a) route the cable completely under the harbor, CDF, and breakwater using HDD; b) route the cable under the harbor and breakwater using HDD and a trench across the CDF; and c) float out installation[2], trench across the CDF, and HDD from the CDF under the remaining harbor and breakwater. All options would use trenching to install the cable on the lakeside of the breakwater.
- Option 2 would include a conventional landfall at the substation, be routed around the CDF by float out installation, and utilize HDD under the breakwater. From the HDD exit point toward the turbines, the cable would be installed using trenching.
- Option 3 would include a conventional landfall at the substation, bypassing both the CDF and breakwater, the bending after the end of the breakwater to continue along a straight path toward the turbines using trenching.

A quantitative assessment and ranking of the cable route options was conducted by DNV GL. The cable route options were assessed for cable length, application of HDD, external damage by third parties, environmental aspects, thermal bottleneck, and future development plans in the region. Each option was assigned a score from 1 to 5 (1 indicating high benefit/low risk and 5 indicating low benefit/high risk). The results of the assessment are included in Table 3.

Table 3. Quantitative Assessment and Ranking of the Different Cable Route Options

Criteria	Option					Weight
	1a	1b	1c	2	3	
Cable length	1	1	1	1	2	20%
Application of HDD	3	5	3	4	1	20%
External damage by third parties	1	2	2	3	4	20%
Environmental aspects	3	3	3	4	4	10%
Thermal bottleneck	5	4	4	4	2	15%
Future development plans	1	5	5	4	3	15%
Weighted average score	2.20	3.25	2.85	3.20	2.55	-

[2] Floatation would be attached to the cable and the cable would be held in position by small workboats. Tension would be applied to the cable and a pull-in wire from a shore based pull-in winch would be connected to the cable end. The cable would be pulled through a pre-excavated trench at the shore crossing, and the floatation would be removed to allow the cable to be laid in the trench.

Criteria	Option					Weight
	1a	1b	1c	2	3	
Ranking	1	5	3	4	2	-

The table was adapted from DNV GL's Substation and Cable Route Design Report, 2016.

The assessment concluded that Option 1(a) represented the best option for cable installation. While the cost of HDD would be greater, the option would require no trenching in the harbor. Therefore, potential sediment disturbance would be minimized in potentially sensitive nearshore habitats and the cable would be completely protected during its design life, well under the specified dredge depth of the channel. As the Project progressed, a fourth option, not considered in the original evaluation, was considered and ultimately selected as the optimal route over Option 1(a). This option would route the cable under the harbor using HDD, but route the cable to the east of the CDF, instead of under the CDF. The option was selected to completely avoid the CDF, due to the uncertainty of the impact on the buried cable from future dredge material deposits in the CDF.

5.3 Alternate Construction Techniques

Because the water pumped from the interior of the MB through the exhaust port would likely include some suspended solids due to minor disturbance at the lakebed/water column interface, alternative approaches to direct discharge of pumped water to the lake were considered.

In order to ensure that the water from inside the bucket that is released into the water column outside the bucket does not contain more than *de minimis* sediment/solids, the water could be processed before being returned to the lake. In order to accomplish this, a hose between the deck of the heavy life crane vessel and the exhaust port would be employed. As the water is pumped out of the bucket, it would be pumped to the deck of the vessel. Two options are available to treat the water. The first option would be to treat the water on the vessel by filtering out the solids prior to returning the water to the lake, and disposing of the solids at an appropriate confined disposal facility. The second option would be to transport the entire solution (discharge water and sediment) to a confined disposal facility. Both alternatives were dismissed as unnecessary, given the extremely small amount of suspended sediment that would be introduced to the water column, the limited dispersal of those sediments, and the return of the vast majority of these sediments onto the MB lid. The substantial additional cost of these treatment options could not be justified given the limited impact of the preferred alternative.

The method of cable installation described in Section 3.2.2 of this application is simultaneous lay burial (SLB). Two alternative methods of cable installation (burial) were considered, post-lay burial and pre-trenching. These methods are described as follows.

Post Lay Burial: Post lay burial ("PLB") involves a temporary laydown of the cable onto the lakebed and a subsequent, separate burial operation. The burial phase of PLB can either be performed with a plow or jetting tool. The key aspect of PLB is the decoupling of work steps, which typically requires separate dedicated vessels for laying and burial. Although PLB allows for faster progress during cable laying, the cable remains unprotected for some time. On-bottom stability of the cable is a concern, and guarding may be required before full protection is achieved by burial. Cable loading (for a plow) in PLB applications may also require diver assistance for some models or applications.

Given that the PLB approach would require separate operations for laying the cable, and then for trenching and installation, more handling would be required, thus increasing the risk for damage to the cable and adding to the cost. Also, the requirement for having an exclusion zone and guard vessel over the cable during the time lag between the separate lay/burial operations is likely to be unpopular with lake users and the USCG.

Pre-trenching: Pre-trenching cable burial consists of first plowing a trench in the sediment, laying the cable in the pre-cut trench, and then finally covering the cable with the removed sediment, or allowing bottom currents to fill in the trench with mobile bottom sediments. As with PLB, each step is completed individually rather than simultaneously. Pre-trenching is usually suited to locations where the soil is suitably firm and cohesive to prevent the trench from re-filling before it is possible for the cable to be laid in it. This may be a preferred solution if the presence of rocks or boulders is anticipated. In very hard soils or rock, pre-trenching is performed by hydraulically-driven, underwater cutting wheels or chains, either mounted upon a self-propelled unit, or suspended from a barge. However, given the slow speeds of these approaches, rock-trenching is normally only appropriate for relatively short cable runs. Due to the relatively soft soils along the proposed cable route, pre-trenching is not considered a viable option for the Project.

Two alternative options for cable protection were also considered for the Project. These options were mattressing and rock dumping, which are described below.

Mattressing: If the cable does not require burial in the sediment, or if a hard/rocky substrate is present, other materials may be used to cover the cable. Under this scenario, the cable would be laid on top of the lakebed and covered with mattresses. Mattresses are flexible matrices often consisting of concrete weights or rocks encased in netting. The mattresses protect the cable from anchor drag, fishing, and other activities. Mattresses are a relatively expensive solution for a whole cable route, and are more commonly used for smaller sections where the cable cannot be buried. The Applicant does not plan to use this option; however, it will be considered by the Applicant if after installation, a portion of the cable remains unburied.

Rock Dumping: Rock dumping utilizes accurate placement of rock to cover a cable laid on top of the sediment or to backfill a pre-cut trench when the substrate is hard. This method uses a fall-pipe vessel, sometimes in conjunction to a remote-operated vehicle, to ensure accurate placement of the rock. Another installation method uses an over-the-side dumping method, which is less accurate in deeper waters.

The external protection methods described above are costly in comparison to cable burial and are typically used in areas with a hard/rocky substrate. For a project such as Icebreaker, with soft lakebed sediments along the entire cable route, these methods would not be suitable, as they add significant cost and could apply loading onto the cable as it is pushed into the lakebed. For these reasons, simultaneous cable lay and burial was selected as the preferred form of cable installation.

5.4 No Action

The purpose of the Project is to develop, construct, and operate an offshore windfarm in Lake Erie, off the coast of Cleveland, Ohio. The Project would be the first freshwater offshore wind farm in North America and would deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers while adding fuel diversity and reducing air pollution. Currently, only 2.3% of Ohio's electric energy mix is produced from renewable energy, while over 80% comes from fossil fuels that emit harmful air pollutants and greenhouse gases. The Midwest has been identified by the DOE as a region that will need significant new energy resources. The DOE has provided funding for the Icebreaker Project as an Advanced Technology Demonstration Project. By providing funding, technical assistance, and government coordination to accelerate deployment of these demonstration projects, DOE can help eliminate uncertainties, mitigate risks, and help create a robust U.S. offshore wind energy industry. Although the no-action alternative would have no impacts to certain environmental resources, because the Project would reduce emissions of air pollutants and greenhouse gases, no-action would result in higher emission levels (including emissions of mercury, which do end up in the lake) over the longer term. No action would also not meet the Project's purpose, or help the region meet its energy needs in a manner that does not exacerbate the climate change and air quality challenges posed, or provide the benefits described above.

6.0 AVOIDANCE, MINIMIZATION, AND MITIGATION

The Applicant sited and designed the Project in a manner that would achieve its purpose and benefits while avoiding and minimizing impacts to Lake Erie, and reducing construction costs by:

- Siting the onshore Project components (substation, staging areas, O&M center) on previously disturbed or currently developed land that lacks wetlands or other undisturbed ecological communities;
- Siting the proposed turbines 8-10 miles off shore to reduce potential impacts to birds and bats, as well as noise and visual impacts on shoreline residents;
- Siting the turbines in a "dead zone" of Lake Erie that lacks aquatic vegetation or significant fish habitat due to low dissolved oxygen levels at the turbine sites (see Section 4.1 for additional information);
- Selecting the substation location closest to the turbines, thereby reducing length of electric cable and associated disturbance of lakebed sediment;
- Using HDD to avoid impacts to sensitive nearshore habitats, and reduce sediment disturbance associated with cable installation;
- Utilizing a bury-while-lay installation method for the electric cable, which would reduce installation time and the duration and extent of sedimentation impacts on surrounding areas when compared to open trench installation methods;
- Limiting the Project to six turbines, thus minimizing the overall permanent impact of the Project to 0.34 acre of lakebed;
- Using a turbine foundation (MB) that requires no dredging, drilling, pile driving, and minimal lakebed disturbance prior to and during installation; and
- Conducting pre-construction ecological surveys and developing post-construction mitigation and monitoring plans to minimize and engage in adaptive management with regard to any demonstrated actual impacts on fish and wildlife resources.

6.1 Mitigation

Only 0.34 acre of lakebed would be removed during installation of the six foundations, and the vast majority of the sediments removed during the MB installation are anticipated to be redeposited on the MB lid once the installation is complete. The footprint of the Project would be insignificant when compared to the size of Lake Erie. Adaptive management and post-construction mitigation and monitoring plans have been developed for aquatic and bird and bat communities (discussed in further detail in the Draft EA prepared by the DOE, in the Application for a Certificate of Environmental Compatibility and Public Need filed with the Ohio Power Siting

Board ("OPSB")[3], and in Memoranda of Understanding between the ODNR and the Applicant). No other mitigation is proposed for the Project.

7.0 COMPLIANCE WITH THE ENDANGERED SPECIES ACT

The DOE is the lead agency for the NEPA process, and as such has prepared a Draft EA for the Project. Compliance with the Endangered Species Act is discussed in detail in the draft EA.

8.0 COMPLIANCE WITH THE NATIONAL HISTORIC PRESERVATION ACT

Compliance with Section 106 National Historic Act is discussed in detail in the NEPA Draft EA prepared by the DOE.

9.0 COASTAL ZONE CONSISTENCY

Section 307 of the Coastal Zone Management Act of 1972, also called the "federal consistency" provision, gives states a strong voice in federal agency decision-making for activities that may affect a state's coastal uses or resources. Generally, federal consistency requires that federal actions that would have reasonably foreseeable effects on any coastal use or natural resource of the coastal zone be consistent with the enforceable policies of a state's federally approved coastal management program. The Ohio Coastal Management Program ("OCMP") was developed by the State of Ohio to describe current state coastal legislation and management policies. It is made up of several Ohio natural resource protection and hazard management programs and is regulated by the ODNR Office of Coastal Management.

The 41 policies included in the OCMP are organized into the following nine issues:

- Coastal Erosion and Flooding – Policies 1 – 5,
- Water Quality – Policies 6 – 11,
- Wetlands and Other Ecologically Sensitive Resources – Policies 12 – 15,
- Ports and Shoreline Development – Policies 16 – 20,
- Recreation and Cultural Resources – Policies 21 – 26,
- Fish and Wildlife Management – Policies 27 – 29,
- Environmental Quality – Policies 30 – 33,
- Energy and Mineral Resources – Policies 34 – 38, and
- Water Quantity – Policies 39 – 41.

[3] The OPSB Certificate Application is available at: http://dis.puc.state.oh.us/CaseRecord.aspx?CaseNo=16-1871.

A Coastal Zone Consistency Analysis was prepared to assess Project consistency with the OCMP (Appendix F). As per this analysis, the Project would comply with the 41 policies detailed in the OCMP. The Coastal Zone Consistency Analysis will be reviewed by the ODNR. A Section 404 Permit will not be issued until the proposed Project receives a Coastal Zone Management Federal consistency determination.

10.0 OTHER PERMITS AND APPROVALS

10.1 Ohio Permits and Approvals

10.1.1 Ohio Power Siting Board

The OPSB regulates the siting of wind farms with a generating capacity of 5 or more megawatts. The Applicant submitted an application to the OPSB for a Certificate to Construct a Wind-Powered Electric Generation Facility on February 1, 2017. On April 3, 2017, the OPSB determined that the Applicant must file Memoranda of Understanding between it and ODNR that laid out pre-, during, and post-construction monitoring protocol for aquatic resources/fisheries and birds/bats before a determination of completeness would be made. The MOUs were filed with the OPSB on July 20, 2017. On July 31, 2017, the OPSB issued its letter finding the Application was in compliance and that the Staff could begin its review. On August 15, 2017 the OPSB issued its entry setting forth its schedule for processing the permit application.

10.1.2 Section 401 Water Quality Certification

Section 401 of the federal Clean Water Act ("CWA") delegates state agencies the authority to evaluate projects that would result in the discharge of dredged or fill material into Waters of the United States to determine whether the discharge would violate the state's water quality standards. Activities typically requiring 401 Certification include stream rerouting, culverting streams, filling wetlands, and dredging and filling in lakes. Typical projects include highway construction, marina and dock construction, shopping mall construction, strip mining operations or housing subdivisions. A Section 401 Certification is also required for activities that require a Section 404 permit. In Ohio, water quality certifications are administered by the Ohio EPA. The Applicant has had several pre-application meetings with Ohio EPA staff. Upon receiving a jurisdictional determination letter and a USACE Public Notice indicating that a Section 404 Permit is required, the Applicant will submit a Section 401 Water Quality Certification ("WQC") Application to the Ohio EPA. The USACE Section 404 Permit will not be issued until a Section 401 Water Quality Certification has been issued by the Ohio EPA.

10.2 Other Federal Permits and Approvals

10.2.1 Section 408

Section 408 provides that the Secretary of the Army may grant permission to other entities for the permanent or temporary alteration or use of any USACE Civil Works project, upon the recommendation of the Chief of Engineers. The USACE has constructed many Civil Works projects across the Nation's landscape. Given the widespread location of these projects, with many embedded within communities, there may be a need for others outside of USACE to alter or occupy these projects and their associated lands. Reasons for alterations could include improvements or making repairs to the projects; relocation of part of the project; or installing utilities or other non-project features. USACE would ensure that any alteration proposed would not be injurious to the public interest and would not affect the USACE project's ability to meet its authorized purpose. USACE accomplishes this through the authority of Section 14 of the Rivers and Harbors Act of 1899, as amended, and codified in 33 USC 408 ("Section 408").

To address the HDD installation of the export cable beneath the Cleveland Harbor breakwater and navigation channel, the Applicant submitted a Section 408 Request to Alter, Impact or Encroach upon a Buffalo District Navigation Project on February 3, 2017. Correspondence with the USACE indicated that the approval letter will be sent to the Applicant by late August 2017.

10.2.2 Federal Aviation Administration

The Federal Aviation Administration ("FAA") is the organization in the U.S. government that is responsible for the evaluation and issuance of determination on petitions on objects that penetrate the nation's airspace. The FAA conducted aeronautical studies of the proposed turbine layout under the provisions of 49 USC 44718, applicable 14 CFR 77, and Ohio Revised Code ("ORC") Section 4561.32. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard. Proposed structures over 200 feet must undergo an Obstruction Evaluation by the FAA and be permitted through a Form 7460-1 filing prior to construction. Form 7460-1 was submitted for the proposed Project on July 22, 2016. The FAA issued its determination of no hazard to air navigation if the structure is marked and/or lighted in accordance with the FAA Advisory circular 70/7460-1 L Change 1, *Obstruction Marking and Lighting* on February 22, 2017. Construction and operation of the proposed Project would be designed according to FAA standards and would not result in any adverse effects to the regional air transportation network.

Wind turbines have the potential to create clutter interference and possibly significant Doppler interference with sensitive radars fielded by the FAA, Department of Defense, NOAA, and other agencies. Written notification of the proposed Project was provided on August 11, 2016 to the National Telecommunications and Information Administration ("NTIA") of the U.S. Department of Commerce ("DOC"), which the provides plans for the proposed Project to the federal agencies represented in the Indepartment Radio Advisory Committee ("IRAC"), including the Department of Defense, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any potential Project-related concerns detected by the IRAC during the review period. A NTIA response received on October 13, 2016 identified a DOC concern regarding the proposed Project impacting its radar systems and the potential degradation of the detection of lake effect snow. Further consultation by the Applicant with DOC determined there would be minimal impacts to the radar (Appendix G). There were no concerns from any other IRAC agencies.

10.2.3 United States Coast Guard

A Private Aid to Navigation is a buoy, light, or daybeacon owned and maintained by any individual or organization other than the USCG. Private aids to navigation are designed to allow individuals or organizations to mark privately owned marine obstructions or other similar hazards to navigation, or to assist their own navigation operations. Approval for Private Aids to Navigation is regulated by USCG under Title 33 of the Code of Federal Regulations, Part 66 (33CFR66). Private aids to navigation are required to be maintained by the owner as stated on the USCG permit. The Applicant would apply for this after the NEPA process is complete and results in a Finding of No Significant Impact.

10.3 International Joint Commission

Many rivers and lakes flow along or across the border between Canada and the United States. The International Joint Commission ("IJC") was established in 1909 by the Boundary Waters Treaty ("Treaty") to help prevent and resolve disputes that may arise in these shared waters. The IJC acts as a quasi-judicial body by deciding whether certain types of projects (e.g., dams, diversions, or bridges) can be built or undertaken in rivers or lakes that flow along or across the international boundary. The IJC considers interests in both countries in accordance with the Treaty and may require that certain conditions in project design or operation be met to protect interests on either side of the boundary. If the IJC approves a project in response to an application, it issues an 'Order of Approval.' A request for approval under the Boundary Waters Treaty of 1909 was sent to the U.S. State Department on December 9, 2016. The U.S. State Department and Global Affairs Canada determined that the proposed Project would not require approval under the Boundary Waters Treaty and therefore would not require further action with the IJC.

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