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# Wind Turbine Placement Favorability Analysis Map

Methodology Narratives

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– Contents –

1

Explanation of the Grid System and Study Region

2

Explanation of Limiting Factors and Weighting System

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– 1 –

## **Explanation of the Grid Cell System and Study Region**

The Lake Erie offshore “Wind Turbine Placement Favorability Analysis” map was generated by applying weighted values to numerous potential indicators, or limiting factors, and then by calculating the total sum of weights by grid cell. As a result, the comprehensive scores of summed weighted values provide an illustration showing the most favorable and least favorable locations in Lake Erie for wind turbine placement.

*See the “Explanation of Limiting Factors and Weighting System” section (Section 2) for complete narratives of each potential limiting factor.*

### **One-Minute Quadrangle Grid Cell**

Each grid cell represents a geographic extent that is equal to one minute of latitude by one minute of longitude, or a “one-minute quadrangle.” The four corners of each quadrangle can be easily and individually identified with latitude-longitude coordinates, to the minute.

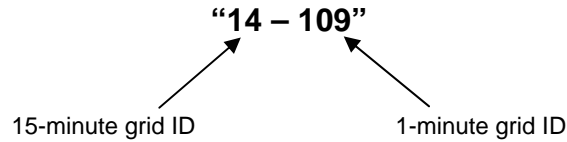
On the ground, one minute of distance is equal to one nautical mile. Although the angular dimensions of each grid cell are identical, they do not represent a square nautical mile. This is due to Lake Erie’s mid-latitude position on Earth where quadrangles are more rectangular on the ground, and are taller than they are wide. Lines of longitude taper as they converge at the North and South poles (from the equator), which causes narrower quadrangles in mid-latitude regions. The area of a one-minute quadrangle in the map’s study region is equal to approximately 634 acres, whereas the area of one square nautical mile is equal to approximately 847 acres.

### **Grid Cell Identification System**

For identification purposes, the one-minute quadrangle grid cells were grouped into 15-minute by 15-minute quadrangles (225 one-minute quadrangles, at most, per 15-minute quadrangle). Within each 15-minute quadrangle, the smaller units were numbered 1 through 225, horizontally, from the upper-left corner to the lower-right corner. Further, each 15-minute quadrangle was also given a number, from 1 through 34. As a

result, each one minute grid cell is easily identified with a unique indexing number:

*Example:*



## Study Region

The map’s study region is comprised of all Ohio Lake Erie waters, including Maumee Bay and Sandusky Bay. Only the one-minute quadrangle grid cells that are located completely inside or are partially contained inside the boundary of Ohio’s portion of Lake Erie were factored in the analysis. In total, there are 3,915 one-minute quadrangle grid cells in the study area, which is equal to approximately 2,482,110 acres.

Farthest angular extents of the grid matrix:

- |                         |  |
|-------------------------|--|
| <b>North:</b> 42° 20’ N | Located in the extreme northeast corner of Ohio’s Lake Erie waters in Ashtabula County               |
| <b>South:</b> 41° 22’ N | Located in Berlin and Vermilion townships in Erie County, near Old Woman Creek State Nature Preserve |
| <b>East:</b> -80° 31’ W | Paralleling the Ohio-Pennsylvania state line   |
| <b>West:</b> -83° 29’ W | Located in Toledo and Washington Township in Lucas County  |

– 2 –

## Explanation of Limiting Factors and Weighting System

The following provides a comprehensive narrative for each potential limiting factor, which includes abstracts, detailed weighting methodologies and GIS source information.

### 1. Shipping Lanes and Navigable Waterways

Abstract:

A shipping lane is a designated path through open water used for commercial freight vessel passage and so noted on a nautical chart. Similarly, a fairway is also a navigable channel in a body of water, but dredged for sufficient passage through shallower water. Dredged harbor channels are marked with buoys and are deep to avoid ships from running aground.

The locations of shipping lanes and fairways, ferry routes, harbors, and other navigable waterway features are identified as highly limiting factors to wind turbine placement due to the potential obstruction with large freight and passenger vessel transportation routes.

Weighting:

**(0)** One-minute quadrangle cells that are intersected by a shipping lane, fairway, ferry route, or other navigable waterway were given a weight of zero (“0”) to indicate as an extensive limiting factor. These areas are likely to be highly impacted by freight and passenger transportation routes.

In the final, comprehensive calculation of *all limiting factor weights*, the grid cells originally weighted “zero” due to shipping lane obstruction were manually assigned an absolute value of **zero**.

**(2)** One-minute quadrangle cells that are not directly intersected by a shipping lane, fairway, ferry route, or other navigable waterway, but are completely or partially contained within a one-nautical mile buffer were given a weight of two (“2”). This weight was assigned to signify grid cells that are close to a maritime transportation route to provide margin for error.

**(4)** One-minute quadrangle cells that are not intersected by a shipping lane, fairway, ferry route, or other navigable waterway, and are not completely or partially contained within a one-nautical mile buffer, were

given a weight of four (“4”). This weight indicates the grid cell areas in Lake Erie that are not a direct or marginal impediment to maritime transportation routes, and therefore present less of an impact for wind turbine placement.

Weight values of one (“1”) and three (“3”) were not used for this factor.

GIS Data Sources:

Ferry Routes – ODNR Division of Real Estate and Land Management, 2003; updates: ODNR Office of Coastal Management, 2004-2008

Fairways/Navigable Waterways – ODNR Office of Coastal Management, 2007 (digitized from NOAA Navigation Charts)

Shipping Lanes – ODNR Office of Coastal Management, 2008 (digitized from NOAA Navigation Charts)

## **2. Distance from Shore**

Abstract:

Distances from shore are factored into the analysis to consider the aesthetic significance of wind turbine and large-scale commercial wind farm placement. It is presumed that wind turbines and large-scale commercial wind farms placed closer to shore will present a greater aesthetic hindrance than turbines located farther from shore. In the analysis, buffers of the natural shoreline are established at 3-miles, 6-miles and 10-miles, thus creating four shoreline buffer zones of 0-3 miles, 3-6 miles, 6-10 miles and beyond 10 miles.

The buffer lines took into account the entire Lake Erie shoreline, which includes the Ohio mainland, all islands (Ohio and Ontario, Canada) and out-of-state mainland (Michigan, New York, Pennsylvania and Ontario).

Weighting:

**(0)** One-minute quadrangles that are completely or partially contained within the 3-mile buffer of the mainland or within a 3-mile buffer from Ohio’s inhabited islands were given a weighted value of zero (“0”). This value is applied to stress that placing a great quantity wind turbines, i.e. large-scale commercial wind farm development, inside the nearest buffer zone from shore is highly unfavorable, aesthetically. A lower weight was also applied to the 0-3 mile buffer due to habitat concerns, as identified by the ODNR Division of Wildlife.

Inhabited islands include: Ballast, Johnson's, Kelleys, Middle Bass, North Bass, Rattlesnake, South Bass and Sugar.

**(1)** One-minute quadrangles that are completely or partially contained within a 3-mile buffer of Lake Erie's uninhabited islands were given a weighted value of one ("1").

Uninhabited islands include: Green, Middle, Turtle, West Sister and Canada's smaller island groups.

**(2)** One-minute quadrangle cells that are completely or partially contained within the 3-to-6 mile buffer zone from shore (with exception to grid cells intersected by the 3-mile buffer) were given a weighted value of two ("2").

**(3)** One-minute quadrangle cells that are completely or partially contained within the 6-to-10 mile buffer zone from shore (with exception to grid cells intersected by the 6-mile buffer) were given a weighted value of three ("3").

**(4)** One-minute quadrangle cells that are completely located beyond the 10-mile buffer were given a weighted value of four ("4"). This weight indicates the grid cell areas in Lake Erie that present the least aesthetic impact, and therefore are most favorable for wind turbine placement.

GIS Data Source:

Lake Erie Natural Shoreline – National Oceanic and Atmospheric Administration, 2000 (buffer lines geo-processed by ODNR Office of Coastal Management)

### 3. Shoreline / Open Water

Abstract:

This breakdown analyzes one-minute quadrangle grid cells that are located completely within open water areas of Lake Erie, and which grid cells are intersected by the natural shoreline. This factor piggybacks the "distance from shore" aspect, and puts emphasis on the opinion that large-scale commercial wind turbine and farm development should not occur near the shore. In this case, grid cell areas closest to shore are identified as least favorable placement locations.

Weighting:

**(0)** One-minute quadrangle grid cells intersected by the natural shoreline were given a weighted value of zero ("0"). This weight does not pertain to small-scale residential wind turbine placement.

(1) One-minute quadrangles that are completely located in the open waters of Lake Erie were given a weighted value of one (“1”).

The Shoreline/Open Water factor is essentially a ‘Yes’ or ‘No’ category. Weight values of two (“2”), three (“3”) and four (“4”) were not used for this factor.

#### 4. Proximity to Raptor Nests

Abstract:

The proximity to protected raptor species nests was identified as a limiting factor for wind turbine placement. Raptor species include: bald eagle, osprey and peregrine falcon. Weighting designations were applied as a result of onshore monitoring protocols conducted by the ODNR Division of Wildlife.

The bald eagle, federally listed as a “threatened” species, can commonly be found near sizeable bodies of water. In Ohio, the marshy, western Lake Erie basin area is a very popular stronghold for bald eagle habitat. Osprey nesting areas are often found near shallow bodies of water with abundant fish populations. The osprey often soars high above lakes, ponds and rivers while searching for fish. The peregrine falcon is currently on the state threatened species list. This bird’s prime habitat includes forested river valleys, coastlines, tall cliffs and even the steep façades of skyscrapers<sup>3</sup>.

Weighting:

(0) One-minute quadrangle grid cells that are completely or partially located within a one-half mile buffer radius of a raptor nest were given a weighted value of zero (“0”). It is emphasized by the ODNR Division of Wildlife that placement of a wind turbine within a one-half mile buffer of a raptor nest should be strictly prohibited.

In the final, comprehensive calculation of *all limiting factor weights*, the grid cells originally weighted “zero” due to one-half mile proximity to a raptor nest were manually assigned an absolute value of **zero**.

(1) One-minute quadrangle grid cells that are completely or partially located within a two mile buffer of a raptor nest, and beyond the one half-mile buffer criteria, were given a weighted value of one (“1”). The ODNR Division of Wildlife states that further monitoring of raptor pairs is required if a wind turbine is proposed within a two-mile radius of the nest.

**(2)** One-minute quadrangle grid cells that are located completely beyond the two-mile raptor nest radius were given a weight of two (“**2**”). Areas beyond this buffer are more favorable for wind turbine placement.

Weight values of three (“**3**”) and four (“**4**”) were not used for this factor.

GIS Data Source:

Raptor Nests – ODNR Division of Wildlife, 2008

3 Web citation: “ODNR Division of Wildlife’s A to Z Species Guide – Birds,”  
[http://www.dnr.state.oh.us/Home/species\\_a\\_to\\_z/AZBirds/tabid/17911/Default.aspx](http://www.dnr.state.oh.us/Home/species_a_to_z/AZBirds/tabid/17911/Default.aspx)

## 5. Important Bird Areas

Abstract:

Located at the intersection of the Atlantic and Mississippi flyways, Lake Erie is a significant destination and stopover site for many migratory birds. Consequently, many areas along Ohio’s shore have been designated “important” to avian habitat.

An Important Bird Area (IBA) is a site that provides essential habitat to one or more bird species during some portion of the year – breeding season, spring migration, fall migration and wintering season. IBAs are part of a global network of sites identified by BirdLife International and partners, including its American partner, the Audubon Society. An IBA may range in size from just a few acres to hundreds of thousands of acres. Ohio’s IBA program is part of the global initiative to identify and protect critical, high-priority sites for conservation<sup>1</sup>.

In Ohio, ten (10) IBAs extend into Lake Erie, including the massive “Western Lake Erie Basin” IBA, which includes entire portions of the Western Basin, all Ohio islands, Marblehead Peninsula, Sandusky Bay and large tracts of mainland in Lucas, Ottawa, Sandusky and Erie counties.

Weighting:

**(1)** One-minute quadrangle grid cells that are completely or partially located within a designated Important Bird Area were given a weighted value of one (“**1**”). Zero values were not used for this factor due to potential geographic extent ambiguity of some IBAs.

**(3)** One-minute quadrangle grid cells that are completely located outside a designated Important Bird Area were given a weighted value of (“**3**”). These areas are presumed more favorable for wind turbine placement.



Weight values of zero (“0”), two (“2”) and four (“4”) were not used for this factor.

GIS Data Sources:

Important Bird Areas – Ohio Audubon Society, 2005

1 *“Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007*

## 6. Natural Heritage Observances

Abstract:

Rare species observances are cataloged in the Natural Heritage Database which is maintained and managed by the ODNR Division of Natural Areas and Preserves. The database contains more than 17,000 records representing the known locations of rare plants and animals, high quality plant communities and other natural features in Ohio. This information is incorporated into the wind turbine placement favorability analysis as a potential limiting factor if a proposed turbine is located near a documented natural heritage record.

Weighting:

**(1)** One-minute quadrangle grid cells that are completely or partially contained by natural heritage observance were given a weighted value of one (“1”). Since natural heritage records are sometimes illustrated as large areas in the mapping product, zero values were not used for this factor due to potential record ambiguity.

**(2)** One-minute quadrangle grid cells that are completely located outside the extent of a natural heritage observance were given a weighted value of two (“2”).

Weight values of zero (“0”), three (“3”) and four (“4”) were not used for this factor.

GIS Data Source:

Natural Heritage – ODNR Division Natural Areas and Preserves, Natural Heritage Database, 2008

## 7. Fish Habitat / Fish Community and Bathymetry

### Abstract:

Habitat is defined as the physical location or type of environment in which an organism or biological population resides or occurs. Wildlife communities depend on the natural setting – their habitat – for food, water, security, reproduction, protection and other survival essentials. Lake Erie comprises an essential resource for many aquatic species, including walleye and yellow perch<sup>1</sup>. When considering potential locations for wind turbines in Lake Erie, it is vital to take into account fish communities – i.e. prime spawning areas, nursery areas and adult habitat.

### Weighting:

For this analysis, fish habitat is broken into four classes based upon previously defined depth strata, using Lake Erie bathymetry data, and existing fish community data collected by the ODNR Division of Wildlife.

**(1) Walleye Larval/Juvenile Production Areas:** These areas are delineated where juvenile walleye were collected from bottom trawls in the Western and Central basins. This work was conducted by the ODNR Division of Wildlife in June 2008. Further definition of this area involves relating to the lake's physical characteristics. Walleye nursery habitat is typically located within shallow (less than 10-feet) waters with low clarity.

One-minute quadrangle grid cells that are completely or partially contained within areas delineated as walleye larval/juvenile production areas were given a weighted value of one (“1”). For wind turbine placement, these areas are defined as least favorable.

**(2) Adult Walleye Habitat:** These areas are defined by delineating the seven (7) fathom bank, which is currently used by the Lake Erie Commission for classifying adult walleye habitat and for quota allocation purposes.

One-minute quadrangles that are completely or partially contained within this delineation (with exception to those bordering grid cells intersected by the farthest extent of the walleye larval/juvenile production area) were given a weighted value of two (“2”).

**(3) Walleye/Perch Habitat:** These areas are defined by delineating the 55-foot bathymetry depth contour. This contour is generally the area where the thermocline intersects the bottom of Lake Erie and is normally the extent of influence the “Dead Zone” has on fish habitat.

One-minute quadrangles that are completely or partially contained within this habitat delineation (with exception to those bordering grid cells intersected by the farthest extent of the adult walleye habitat) were given a weighted value of three (“3”).

**(4)** Dead Zone: The term “Dead Zone” refers to areas in Lake Erie’s Central Basin where the bottom waters are prone to becoming anoxic, or without oxygen. As a result, fish habitat is not abundant. The dead zone is delineated as bathymetric depths greater than 55-feet of water, which is typically the area most affected by bottom hypoxia.

One-minute quadrangle cells that are completely contained within the Dead Zone delineation were given a weighted value of four (“4”), suggesting areas most favorable for wind turbine placement.

**(0)** One-minute quadrangle cells with insufficient or lacking information were given a weighted value of zero (“0”). This weight indicates the need for further fish habitat/community research.

GIS Data Sources:

Lake Erie Bathymetry – National Oceanic and Atmospheric Administration, 2000

Fish Habitat and Community – ODNR Division of Wildlife, 2008 (delineations determined by ODNR Division of Wildlife)

<sup>1</sup> “Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007

## **8. Reefs, Shoals and Artificial Reefs**

Abstract:

A reef is a rocky outcrop that rises to or near the water’s surface and serves as a stable structure for organisms to attach to and find refuge. As a result, fish are also attracted to reefs to take advantage of the readily available food source and shelter. A reef’s cobble-pebble-gravel composition provides an ideal substrate material for prime walleye, smallmouth bass and white bass reproduction<sup>1</sup>.

A shoal is a sandy area located in relatively shallow water. Shoals provide a well-oxygenated substrate material for burrowing organisms, and like reefs, a major food source location for fish. Shoals also are good spawning sites for fish including smallmouth bass<sup>1</sup>.

Weighting:

**(0)** One-minute quadrangle grid cells intersected by and fully contained by an applied one-nautical mile buffer of any reef, shoal or artificial reef were given a weighted value of zero (“0”). This weight indicates that wind turbines should not be placed on or near any of these prime aquatic habitat features.

**(1)** One-minute quadrangles that are completely located beyond the one-nautical mile buffer of any reef, shoal or artificial reef were given a weighted value of one (“1”).

Weight values of two (“2”), three (“3”) and four (“4”) were not used for this factor.

GIS Data Source:

Reefs and Shoals – ODNR Office of Coastal Management, 2006

1 “Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007

## 9. Lakebed Substrates

Abstract:

Lakebed sediments comprise the soft and mucky particulate matter that accumulates on the bottom of the lake. Aquatic species and organisms adapt to living in all areas of Lake Erie’s water and bottomlands, but for many, certain lakebed sediments are more favorable for specific life cycle events<sup>1</sup>.

Weighting:

For this analysis, lakebed substrates are broken into four classes based upon currently available, coarse-level substrate mapping of Lake Erie (Haltuch, et al), with wind power development having higher potential impact on coarser substrates, such as bedrock reefs and sand/gravel resources. Finer materials, such as mud and glacial till have minimal potential impact.

**(1)** Bedrock, Sand/Gravel: One-minute quadrangle grid cells that are completely or partially contained within areas of bedrock or sand/gravel were given a weighted value of one (“1”).

**(2)** Sand/Mud: One-minute quadrangle grid cells that are completely or partially contained within areas delineated sand/mud (with exception to those grid cells intersected by bedrock, sand/gravel) were given a weighted value of two (“2”).

**(3) Glacial Till:** One-minute quadrangle grids cell that are completely or partially contained within areas delineated glacial till (with exception to those grid cells intersected by the sand/mud substrate) were given a weighted value of three (“**3**”).

**(4) Mud:** One-minute quadrangle cells that are completely contained within mud delineation were given a weighted value of four (“**4**”), suggesting areas most favorable for wind turbine placement.

GIS Data Source:

Lakebed Substrates – Ohio Sea Grant, 1999 (delineations determined by ODNR Division of Wildlife, 2008)

<sup>1</sup> *“Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007*

## 10. Salt Mine and Sand & Gravel Operations

Abstract:

Ohio is one of the top salt-producing states, mining nearly four-million tons of salt each year. Salt is extracted from beneath Lake Erie, nearly 2,000 feet below the surface, at two active rock salt mining operations: Cargill Salt Mine in Cleveland and Morton Salt Company in Fairport Harbor<sup>1</sup>.

There are also material extraction operations that occur above the lakebed surface. Specifically, sand and gravel dredging. There are three areas in Lake Erie where authorization has been issued (by the State of Ohio) to the Pennsylvania-based Erie Sand Steamship Company to remove sand and gravel from the lake bed.

Weighting:

**(1)** One-minute quadrangle grid cells completely or partially contained within the geographic extents of a sand and gravel operation lease boundary were given a weighted value of one (“**1**”). This weight indicates that wind turbine placement is less favorable, and potentially restricted, due to an existing lease agreement with the State of Ohio.

**(2)** One-minute quadrangle grid cells completely or partially contained with the geographic extent of a salt mine operation were given a weighted value of two (“**2**”).

**(3)** One-minute quadrangles that do not interfere with a sand & gravel or salt mine operation were given a weighted value of three (“**3**”). These areas do not conflict with any existing material extraction lease

agreements and therefore are more favorable locations for wind turbine placement.

Weight values of zero (“0”) and four (“4”) were not used for this factor.

GIS Data Sources:

Salt Mine Boundaries – ODNR Division of Geological Survey, 2003

Sand and Gravel Lease Agreement Boundaries – ODNR Office of Coastal Management, 2009

<sup>1</sup> “Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007

## 11. Military Exercise Area and Danger Zones

Abstract:

Military Exercise Areas/Danger Zones are used for ground based exercises. These are areas of caution where military craft may be operating and firing artillery rounds. There are two contiguous Danger Zones (I and II) in Lake Erie, located in the Western Basin, primarily offshore of Ottawa County<sup>2</sup>.

For wind turbine development, placement within this area is presumed strictly prohibited.

Weighting:

**(0)** One-minute quadrangle grid cells intersected by and fully contained by the Military Exercise Area/Danger Zones in Ottawa and Lucas counties were given a weighted value of zero (“0”). This weight indicates that wind turbines should not be placed under any circumstances.

In the final, comprehensive calculation of *all limiting factor weights*, the grid cells originally weighted “zero” due to direct obstruction were manually assigned an absolute value of **zero**.

**(1)** One-minute quadrangles that are completely located beyond the Military Exercise Area/Danger Zones were given a weighted value of one (“1”).

Weight values of two (“2”), three (“3”) and four (“4”) were not used for this factor.

GIS Data Source:

Military Exercise Zone / Danger Zones – ODNR Office of Coastal Management, 2006 (digitized from NOAA Navigation Charts)

2 Web citations: <http://cfr.vlex.com/vid/850-erie-ordnance-depot-lacarne-19766940>; see also: [http://edocket.access.gpo.gov/cfr\\_2003/julqtr/pdf/33cfr334.850.pdf](http://edocket.access.gpo.gov/cfr_2003/julqtr/pdf/33cfr334.850.pdf)

## 12. Confirmed Shipwrecks

Abstract:

Since the 17<sup>th</sup> Century, the Peachman Lake Erie Shipwreck Research Center in Vermilion, Ohio has documented at least 1,750 shipwrecks (600 in Ohio waters). Of the known wrecks, only 245 (60 in Ohio) have been positively identified<sup>1</sup>. Shipwrecks are important, historic and archaeological landmarks, popular SCUBA-diving destinations and even artificial fish habitat.

In this analysis, “confirmed” shipwrecks are identified by the Ohio Sea Grant<sup>2</sup>. This inventory of wrecks includes less than 30 shipwrecks, a small fraction of the number of sunken vessels actually submerged in Lake Erie. Although this dataset lacks comprehensiveness, it is the most reliable in terms of wreck locations (latitude and longitude coordinates).

Weighting:

**(1)** One-minute quadrangle grid cells where a confirmed shipwreck is located were given a weighted value of one (“1”). This weight signifies that wind turbines should not be placed on or near any sunken vessels and indicates that further research should be conducted within that cell to identify the exact location of the shipwreck (and other wrecks).

**(2)** One-minute quadrangle grid cells that are completely or partially contained within a one-nautical mile buffer of any confirmed shipwreck were given a weighted value of two (“2”). Similar to the “1” weight, this weight signifies that wind turbines should not be placed on or near any sunken vessels and indicates that further research should be conducted within that cell to identify the exact location of the shipwreck (and other wrecks).

**(3)** One-minute quadrangle grid cells that are completely located beyond the one-nautical mile buffer of any confirmed shipwreck were given a weighted value of three (“3”).

Weight values of zero (“0”) and four (“4”) were not used for this factor. Due to the incompleteness of this dataset, further shipwreck research should be conducted in all grid cells.

GIS Data Source:

Confirmed Shipwrecks – Ohio Sea Grant, 2007

1 *“Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007*

2 Web citation: *“Shipwrecks & Maritime Tales of the Lake Erie Coastal Ohio Trail,”* <http://www.ohioshipwrecks.org/Shipwrecks.php>

### 13. Sport Fishery Effort

Abstract:

Lake Erie is Ohio’s greatest fishing resource and ranks as one of the best freshwater fishery centers in the country. Lake Erie sport fishing is a popular tourism draw and consequently a vital and profitable industry for local and state economies. Diverse fish habitats equate to an abundance and variety of Lake Erie’s sport fishery. The Western Basin is one of the most productive natural spawning and nursery areas on the Great Lakes and is often referred to as the “Walleye Capital of the World.” In addition to walleye, yellow perch, smallmouth bass, steelhead trout are also popular sport fish that are commonly sought after<sup>1</sup>.

Weighting:

“Sport Fishery Effort” is a measure of the average number of targeted walleye and yellow perch, by hour, from 2000 to 2006. This evaluation was calculated and cataloged by the ODNR Division of Wildlife and is measured by 10-minute quadrangle grid areas.

The weighting system in this analysis provides the recommendation that in areas where more hours of targeted percid (walleye and yellow perch) effort were documented, the less favorable those areas are for wind turbine placement.

**(1)** 106,000 to 700,000 hours of targeted percid effort: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of one (“**1**”). This value represents some of the most popular sport fishing locations, and therefore presents higher impact for wind turbine placement consideration.

**(2)** 25,000 to 106,000 hours of targeted percid effort: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of two (“**2**”).



**(3)** 4,000 to 25,000 hours of targeted percid effort: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of three (“**3**”).

**(4)** 0 to 4,000 hours of targeted percid effort: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of four (“**4**”). This value represents some of the least popular sport fishing locations, and therefore presents lesser impact for wind turbine placement consideration.

**(0)** One-minute quadrangle cells with insufficient or lacking information were given a weighted value of zero (“**0**”). This weight indicates the need for further research.

GIS Data Source:

Sport Fishery Effort – ODNR Division of Wildlife, 2008 (delineations determined by ODNR Division of Wildlife, 2008)

<sup>1</sup> *“Ohio Coastal Atlas, Second Edition,” Ohio Department of Natural Resources, Office of Coastal Management, 2007*

## 14. Commercial Fishery Effort

Abstract:

Similar to sport fishing, commercial fishing is also an important and profitable Ohio industry. Commercial fishing in Lake Erie continues for yellow perch, white bass and a variety of other species<sup>3</sup>.

Weighting:

“Commercial Fishery Effort” is a measure of the average number of targeted commercial fishery trap-net lifts, from 2000 to 2006. This evaluation was calculated and cataloged by the ODNR Division of Wildlife and is measured by 10-minute quadrangle grid areas.

The weighting system in this analysis provides the recommendation that in areas where more targeted commercial trap-net lifts were documented, the less favorable those areas are for wind turbine placement.

**(1)** 600 to 2,900 targeted trap-net lifts: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of one (“**1**”). This value represents some of the most visited commercial fishing locations, and therefore presents higher impact for wind turbine placement consideration.

**(2)** 250 to 600 targeted trap-net lifts: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of two (“**2**”).

**(3)** 32 to 250 targeted trap-net lifts: One-minute quadrangle grid cells that were located within this 10-minute quadrangle delineation were given a weighted value of three (“**3**”).

**(4)** 0 to 32 targeted trap-net lifts: One-minute quadrangle grid cells that were located within these 10-minute quadrangle delineation were given a weighted value of four (“**4**”). This value represents some of the least visited commercial fishing locations, and therefore presents lesser impact for wind turbine placement consideration.

**(0)** One-minute quadrangle cells with insufficient or lacking information were given a weighted value of zero (“**0**”). This weight indicates the need for further research.

GIS Data Source:

Commercial Fishery Effort – ODNR Division of Wildlife, 2008 (delineations determined by ODNR Division of Wildlife, 2008)

3 Web citation: “ODNR Division of Wildlife, Lake Erie Strategic Plan”

<http://www.dnr.state.oh.us/Home/FishingSubhomePage/fisheriesmanagementplaceholder/fishingfairportstratplan/tabid/6167/Default.aspx>

## 15. International, State and County Boundaries

Abstract:

In Lake Erie, Ohio shares a border with the Canadian province of Ontario to the north, the state of Michigan to the northwest and the state of Pennsylvania to the east. Additionally, the following county boundaries extend into Lake Erie to the International border: (1) Lucas-Ottawa county line, (2) Ottawa-Erie county line, (3) Erie-Lorain county line, (4) Lorain-Cuyahoga county line, (5) Cuyahoga-Lake county line, and (6) the Lake-Ashtabula county line.

Weighting:

**(0)** One-minute quadrangle grid cells that are intersected by the International border or either of the state lines were given a weighted value of zero (“**0**”).

In the final, comprehensive calculation of *all limiting factor weights*, the grid cells originally weighted “zero” due to direct intersection of the

International border or state lines were manually assigned an absolute value of **zero**.

**(2)** One-minute quadrangle grid cells that are intersected by county boundary were given a weighted value of two (“**2**”).

**(3)** One-minute quadrangle cells that are not directly intersected by a political boundary, but are completely or partially located within a one-nautical mile buffer were given a weight of three (“**3**”).

**(4)** One-minute quadrangle grid cells that are located completely beyond the one-nautical mile buffer of boundaries were given a weight of four (“**4**”). Areas beyond this buffer are more favorable for wind turbine placement.

The weight value of one (“**1**”) was not used for this factor.

GIS Data Source:

County Boundaries – Ohio Department of Transportation, 2008

## 16. State of Ohio

Weighting:

**(0)** One-minute quadrangle grid cells that are not entirely located within the Ohio state border were given a weighted value of zero (“**0**”). These grid cell results parallel the zero weighted quadrangles identified in the International, State and County Boundary criteria.

**(1)** One-minute quadrangles that are completely located within the boundaries of Ohio were given a weighted value of one (“**1**”).

Weight values of two (“**2**”), three (“**3**”) and four (“**4**”) were not used for this factor.