

# Issue Paper 1: Mapping and Permit Review Criteria

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Selecting suitable areas for development of offshore wind energy is a multi-faceted and multi-disciplinary process. In an effort to provide regulatory guidance for the state's permitting process, and to determine the geographic areas that might accommodate future offshore wind power development in Michigan, Executive Order No. 2009-1 calls on the Great Lakes Wind Council to:

1. Identify criteria that can be used to review applications for offshore wind development.
2. Identify criteria for identifying and mapping areas that should be categorically excluded from offshore wind development as well as those areas that are most favorable to such development, and provide these criteria in a report to the governor by September 1, 2009.

The differentiation between the two types of criteria is important: criteria for permit review are utilized to determine the extent to which a project meets relevant laws, rules, and regulations. Identifying criteria (such as shipping lanes) are used to map areas that should be categorically excluded from offshore wind development, as well as those areas that are most favorable; they provides the basis for the selection and evaluation of sites. Collectively, these criteria will help guide development in Michigan's Great Lakes.

Given the inherent complexities of identifying permitting and siting criteria, and because offshore wind development is a relatively new concept in the Great Lakes basin, a good starting point for discussion is to examine approaches and build upon the experience of other jurisdictions. Following are examples of area-wide planning efforts carried out in the Great Lakes basin, all of which are currently supported by geographic information system (GIS) mapping tools.

## ***Ontario Power Authority***

Under contract to the Ontario Power Authority, Helimax Energy Inc. performed a technical assessment and ranking of 64 offshore sites in Ontario's Great Lakes that are considered to have favorable potential for wind project development. To locate the most favorable areas for development, Helimax mapped physical and biological features. Certain features—for example, Canadian National Park boundaries—were used to categorically remove selected areas from consideration for development. Waters more than 100 feet deep or less than 15 feet deep were also removed from consideration. Many of the remaining geographically describable features—for example, shipping lanes—were assigned buffer zones in an attempt to rank areas more or less suitable. Once all constraints were identified, a post-constraints-analysis map of the province's Great Lakes was created; this map became the basis of the site selection process. The remaining areas were categorized by factors “generally known to influence developers’ selection of offshore sites....” These factors were jointly determined by the Ontario Power Authority and Helimax, using the best available GIS and wind resource information.

Helimax used publicly available data sources to build its GIS decision support tool. Data layers and sources for the Ontario study include:<sup>1</sup>

Great Lakes coastal wetlands	Institute for Fisheries Research of Environment Canada
Shorelines	Great Lakes Geographic Information System; NOAA
Environmental Areas of Concern	Great Lakes Information Network (GLIN)
Water depths	Great Lakes Information Network (GLIN)
Important bird areas	BirdLife International
Radio communication systems	Industry Canada
Protected shipwrecks	Ontario Ministry of Culture; Internet sources
Airports	Ontario Ministry of Natural Resources
Conservation reserves	Ontario Ministry of Natural Resources
National parks	Ontario Ministry of Natural Resources
Provincial parks	Ontario Ministry of Natural Resources
Submerged utility lines	Ontario Ministry of Natural Resources
Wind speeds	Ontario Ministry of Natural Resources
Commercial waterways and ferry routes	Ontario Ministry of Natural Resources; various Internet sources
Protected areas	Ontario Ministry of Natural Resources (Aquatic Conservation Blueprint layer)
Population density	Statistics Canada

While the data layers are considered adequate for area-wide planning, the report points to the need for continuing refinement of site-specific data when siting or permitting any particular offshore project.

### ***Ohio Department of Natural Resources***

A slightly different approach was used in late 2008 by the State of Ohio, Department of Natural Resources, when it created a new wind suitability mapping system and published the Wind Turbine Placement Favorability Analysis Map. Organizing the lake into a grid with individual cells, this map was generated with GIS by applying weighted values to numerous indicators, or limiting factors, and then calculating the total sum of weights by grid cell. The cumulative scores of weighted values, by cell, illustrate the most favorable and least favorable locations in Lake Erie for wind turbine placement. The tool's developers gathered area-wide data from public sources. Data layers are described in a comprehensive narrative for each potential limiting factor, which includes abstracts, detailed weighting methodologies, and GIS source information. Factors, or criteria, in the Ohio GIS tool include:

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<sup>1</sup>Analysis of Future Offshore Wind Farm Development in Ontario (Montréal, Québec, Canada: Helimax Energy, 2008), 13, Table 2.2.

- Shipping lanes and navigable waterways
- Distance from shore
- Shoreline/open water
- Proximity to raptor nests
- Important bird areas
- Natural heritage observances
- Fish habitat/fish community and bathymetry
- Reefs, shoals, and artificial reefs
- Lakebed substrates
- Salt mine and sand and gravel operations
- Military exercise area and danger zones
- Confirmed shipwrecks
- Sport fishery effort
- Commercial fishery effort

The Ohio Favorability Analysis Map includes mathematical weighting to reflect issues and values known to ODNR staff and other professionals. For example, weighting scores for “distance from shore” were established as follows:

- Distance from shore 0 to 3 miles: weighting score = 0
- Distance 0 to 3 miles from uninhabited islands: weighting score = 1
- Distance from shore 3 to 6 miles: weighting score = 2
- Distance from shore 6 to 10 miles: weighting score = 3
- Distance from shore greater than 10 miles: weighting score = 4

Similar weighting was applied by the ODNR to most of the other factors used in the Ohio GIS decision support tool. Of special interest to avian biologists, factor weights in the grid cells within one-half-mile proximity to a raptor nest were manually assigned an absolute value of zero (categorically excluding these areas).

The Ohio map shows thousands of acres of Lake Erie water surface that scores favorable for wind development. It also provides locations of coastal power stations and jurisdictional boundaries.

### ***Michigan GIS Lakebed Alteration Tool***

In 2008, The University of Michigan and the Michigan Department of Natural Resources Institute for Fisheries Research (IFR) initiated work on a Lakebed Alteration Decision Support Tool, created with support from the Michigan Department of Environmental Quality, Coastal Zone Management Program, to identify bottomland areas that support fish production. It grew out of a study supported by the Great Lakes Fishery Commission and was augmented as a result of the Michigan offshore wind permitting dry run. It contains several data layers, including wind speeds and bathymetry, from a variety of sources that can be used to map area-wide offshore wind suitability. The council will be provided with a demonstration of how these data can be applied, and some of the tool’s limitations and strengths will be discussed by its developers. The support tool has expanded, and many of the data layers contained in the tool are listed below to highlight the type of criteria that might be considered when assessing the most and least desirable areas to site wind turbines in the offshore.

These criteria, and the data layers that support them, may not currently be as robust and exhaustive as they could be to identify suitable areas. However, this mapping tool

provides a strong foundation for the council's work and can illustrate the impact of using different criteria. The council could also shape future development of the tool and its data inputs through its recommendation of criteria.

**Base features**

- Urban areas
- Federal/state/tribal lands
- Transmission lines/substations
- Shipping routes
- Military areas
- Harbors/marinas
- Islands
- National parks/lakeshore

**Biological features**

- Fish spawning sites
- Bird nesting sites/stopovers

**Environmental features**

- Areas of Concern (AOCs)
- Confined disposal sites

**Physical features**

- Shoreline
- River mouths
- Substrate
- Bathymetry
- Coastal wetlands
- Wind power and speed
- Sand dunes
- Ice thickness
- Shore hardening

**Protected features**

- Refuges
- Shipwrecks
- Protected shorelines
- Protected bottomlands

**Fisheries data**

- Commercial fishing sites
- Recreational fishing sites

## DISCUSSION

The list of the criteria used in the three GIS tools highlighted above is compiled in the following sections to facilitate council discussion and selection of criteria that will be used to determine site suitability for offshore wind energy development in Michigan. It is anticipated that the council may suggest and discuss additional criteria not listed.

When recommending the institution of a council to address site suitability and permitting criteria, participants in the dry run report suggested that

[the] Council should not be expected to get into fine-scale detail about siting criteria, it should be charged to anticipate and then accept expert detailed agency input during the permitting process [in coming years].

### ***Potential Criteria for Determining Site Suitability***

#### *Base features*

- Airports
- Urban areas, population density
- Federal/state/tribal lands
- Transmission lines/substations
- Shipping routes (shipping lanes and navigable waterways)
- Radio communication systems
- Military exercise areas and danger zones
- Harbors/marinas
- Islands
- National parks/lakeshore

#### *Biological features*

- Fish spawning sites, fish habitat/fish community
- Bird nesting sites/stopovers, proximity to raptor nests, important bird areas

#### *Environmental features*

- Areas of Concern (AOCs)
- Confined disposal sites

#### *Physical features*

- Shoreline, distance from shore, shoreline/open water
- River mouths
- Lakebed substrate
- Bathymetry (depth, reefs, shoals, artificial reefs)
- Coastal wetlands
- Wind power and speed

- Sand dunes
- Ice thickness
- Shore hardening
- Salt mine and sand and gravel operations

*Protected features*

- Refuges
- Shipwrecks, confirmed shipwrecks
- Protected shorelines
- Protected bottomlands
- Natural heritage observances
- National, state, and local parks and wilderness areas

*Fisheries data*

- Commercial fishing sites, level of effort
- Recreational fishing sites, level of effort

***Proposed Process to Develop Final Recommendations on Criteria***

The criteria for identifying the most and least desirable areas for offshore development and for reviewing permit applications are interrelated and are a central part of the council’s work.

One possible approach to moving forward in developing the mapping criteria is as follows:

- On April 23, the council will learn more about the criteria and underlying data used in other wind energy siting tools. The council will also discuss and review a list of criteria used in mapping tools to determine:
  - 1) Criteria that are objective (e.g., bathymetry) and are recommended for inclusion on a master list;
  - 2) Criteria that are less objective and/or more complicated and require additional discussion and review.
- During this meeting, the council may also designate a work group consisting of six to ten members of the council to work with staff on the mapping criteria, as well as any other appropriate criteria. The group would conduct additional research and prepare recommendations on the mapping criteria for the full council prior to the June 10 meeting.

**DEVELOPMENT OF PERMIT CRITERIA**

Because the current law does not contemplate offshore wind development projects, MDEQ staff, since participating in the dry run permit exercise, requested guidance regarding permitting criteria that should be used to approve or deny applications for offshore wind energy development. It is likely that the criteria for reviewing permits will be related to, and an extension of, the criteria developed to determine site suitability.

These criteria could include filing or information requirements (such as plans for monitoring and decommissioning, environmental studies, documentation of outreach efforts) as well as evaluation criteria to ensure that the public trust is protected during and after construction.

Provisions for permitting use and occupation of bottomlands are currently found in the Michigan Natural Resources and Environmental Protection Act (NREPA), Great Lakes Submerged Lands, Part 325 of Act 451 of 1994, M.C.L. 324.32512. This law and the subsequent Administrative Rule 322.1001 *et seq.* established the MDEQ “Joint Permit” process for all Great Lakes bottomland alteration projects and conveyances, and a standard permit application is now in use.

The current permit and the full text of related administrative rules are available on the council’s website, <http://www.michiganglowcouncil.org>, under “Staff Recommendations for Council Member Reading.” For additional discussion on permitting criteria, please refer to *Issue Paper 3: Michigan’s Great Lakes Bottomlands and Wind Energy*.