Lake Erie Monitoring Plan

for the Offshore Wind Project: Icebreaker Wind

Prepared for:

Icebreaker Windpower Inc.

Prepared by:

LimnoTech

January 23, 2017

LimnoTech

Water Environment | Scientists Engineers

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1 Introduction

1.1 Background

Offshore wind (OSW) and other renewable energy sources within the Great Lakes have the potential to reduce carbon dioxide and other air emissions, water usage by power plants and associated fish mortality within the Great Lakes. However, decision makers require knowledge of the potential impacts, both physical and biological, to evaluate the extent to which OSW development might impact the fishery and ecosystem of the Great Lakes to recommend appropriate measures to protect critical habitat and preserve self-sustaining fish populations. The subject of this sampling plan is Icebreaker Wind, the offshore wind project sponsored by Icebreaker Windpower [1], which includes six 3.45 megawatt turbines and a transmission cable, proposed to be built in an area 8 to 10 miles off-shore of Cleveland, Ohio.

A workshop organized by the Great Lakes Commission through the Great Lakes Wind Collaborative was held on November 22-23, 2012 at NOAA Great Lakes Environmental Research Laboratory (GLERL) in Ann Arbor, Michigan. The purpose of the workshop was to discuss Great Lakes related research on the potential impacts, both physical and biological, of offshore wind development in the Great Lakes. The outcomes of this workshop supported the development of the Ohio Department of Natural Resources (ODNR), Division of Wildlife, Lake Erie Open Water Aquatic Sampling Protocol for Securing Submerged Land Leases Offshore Wind Power Siting, herein after referred to as the "ODNR Protocol" (ODNR, 2013).

The sampling plan presented here was developed using the ODNR Protocol and was reviewed by ODNR and US Fish and Wildlife Service (USFWS) biologists. This plan addresses the issues raised by the ODNR and USFWS related to Icebreaker Wind's potential impact on aquatic resources, and represents the parties' agreement on pre and post construction protocols required to monitor environmental impacts on the aquatic resources in the Project area. In anticipation of filing a permit application with the Ohio Power Siting Board (OPSB), ICE WP initiated pre-construction monitoring activities in 2016. This sampling plan presents a detailed description of the data that are currently being collected to meet ODNR requirements.

This Sampling Plan represents Icebreaker Windpower's best judgment and approach to capture system dynamics and fish behavior. The Plan will be continually assessed through quarterly status reports and annual summaries and reviewed with ODNR and USFWS annually. The exact parameters of the Plan are flexible and will be subject to modification over time based on results of sampling. Revisions and adjustments to the Plan, which could include changes to the location of sampling, sampling frequency and

[1] Lake Erie Energy Development Corporation (LEEDCo) created and has been advancing Icebreaker Wind (formerly known as Project Icebreaker) since the project's inception. In 2016, LEEDCo entered into an agreement with Icebreaker Windpower Inc. (Icebreaker Windpower) whereby: a) all of the assets related to the project transfer from LEEDCo to Icebreaker Windpower; b) Icebreaker Windpower assumes ownership of Icebreaker Wind; and c) ICEWP takes on responsibility for the development and construction of Icebreaker Wind. Consequently Icebreaker Windpower is the applicant for all state and federal permits required to construct and operate Icebreaker Wind. For the purpose of simplicity throughout this document, prior work and studies related to Icebreaker Wind are attributed to Icebreaker Windpower even though LEEDCo may have been the entity responsible at the time. Icebreaker Windpower will be responsible for all activities related to Icebreaker Wind going forward.

duration, and sampling parameters, will be made as appropriate, in consultation with the ODNR and USFWS.

Draft versions of the sampling plan were submitted to ODNR on May 10, 2016 and October 18, 2016. The version presented here is the final version. . Only a few minor changes to stations and sampling effort were made between the May 2016 version and the January 2017 version presented here. The sampling plan was also updated during the course of the 2016 field sampling to reflect the agreed upon sampling method and frequency discussed with ODNR and USFWS.

1.2 Plan Objectives

This Monitoring Plan describes the sampling that began in 2016 to meet the requirements of the ODNR Protocol. The plan is designed to collect physical, nutrient, and biological data at both the project and reference sites prior, during, and after construction activities. For the 2016 field season, this sampling covers the first year of pre-construction monitoring. This Plan is meant to serve as a template, which will be reviewed annually by ODNR, USFWS and LimnoTech to ensure that only necessary and relevant data are collected. The sampling protocol is organized into three major categories including:

- Fish Community/Lower Trophic Level Impacts
- Physical Habitat Impacts
- Fish Behavioral Impacts

The sections below provide a brief overview of the monitoring activities for each category as well as description of the project team and field effort.

1.3 Site Description

The proposed demonstration project, Icebreaker Wind, will include installation of six wind turbines, 8 to 10 miles offshore of Cleveland, Ohio in the central basin of Lake Erie. A 2.8 mile buried electric cable will connect the 6 turbines, and approximately 9 miles of buried electric cable will connect the turbines to the Cleveland Public Power, Lake Road substation. Figure 1 shows the project location within central Lake Erie offshore of Cleveland and the bathymetry contours. Lake Erie is generally classified as a mesotrophic system with some portions of the eastern basin considered oligotrophic and a few embayments in the western basin that are hyper-eutrophic (GLFC, 2009). The Lake provides a valuable commercial and sport fishery, including walleye and yellow perch. Invasive species -- including dreissenid mussels, round gobies, smelt, and alewives -- play substantial roles in restructuring Great Lakes ecosystems, including Lake Erie. Figure 1 depicts the proposed seven wind turbine locations (ICE1 through ICE7). There will only be six turbines, so this includes one alternate location that will be utilized if a location is determined to be unfavorable for construction and installation of a turbine. All seven proposed turbine locations have been studied by Icebreaker Windpower to determine the feasibility of each location in the event an alternative location is needed.

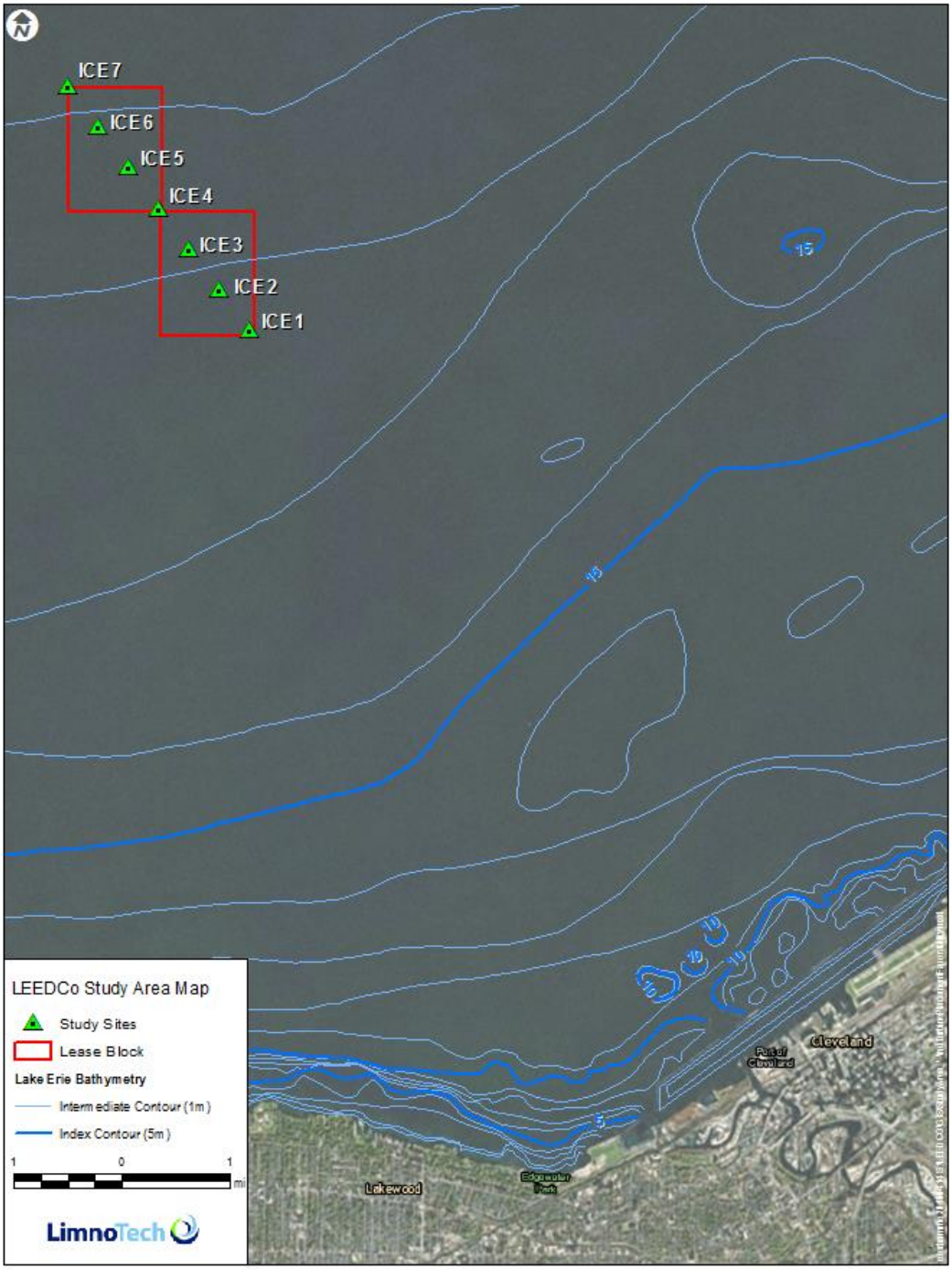

Figure 1. Project location map

1.4 Project Team and qualifications

The project team will be led by LimnoTech and supported by other scientific experts to assist with sample collection, analysis, and interpretation. Table 1 details the project team organizational chart. Dr. Lorry Wagner, Dave Karpinski and Beth Nagusky are the points of contact for Icebreaker Windpower. Ed Verhamme of LimnoTech will serve as the project manager and be the main point of contact with Icebreaker Windpower. He will coordinate all activities involving LimnoTech and other supporting team

members. A description of each team member's involvement in various components of the study is included in Table 2.

LimnoTech

LimnoTech is an environmental engineering and science firm that has provided multiple environmental services concerning water-related issues to clients throughout the United States and internationally since 1975. LimnoTech is headquartered in Ann Arbor, Michigan, with regional offices in Washington, DC, the Minneapolis-St. Paul area, and El Segundo, CA. Clients include municipalities, regional governmental units, the federal government, industry, engineering firms, legal firms, commercial clients, and private individuals. We offer our clients the latest water science and engineering in numerous specific disciplines within the broader areas of watershed and waterway management, contaminated site and sediment evaluation and restoration, permitting and regulatory assistance, water sustainability and stewardship, ecosystem studies, and applied research. Additional information on LimnoTech can be found at: http://www.limno.com/.

The LimnoTech team is led by Ed Verhamme with support from Greg Peterson, Jen Daley, Cathy Whiting, John Bratton, and Greg Cutrell. Additional staff from the Ann Arbor office will support fieldwork as needed. LimnoTech will be responsible for all project deliverables, communication with ICEWP, and management of additional team members.

The Ohio State University – Stone Lab

Established in 1895, Stone Laboratory is the oldest freshwater biological field station in the United States and the center of Ohio State University's teaching and research on Lake Erie. The lab serves as a base for more than 65 researchers from 12 agencies and academic institutions, all working year-round to solve the most pressing problems facing the Great Lakes. You can find more information on their website http://stonelab.osu.edu/about/

Justin Chaffin and Chris Winslow at Ohio State University's Stone Lab will support collection of juvenile fish and will also process the nutrient and water samples.

Cornell Bioacoustics

The Bioacoustics Research Program develops and uses digital technology, including equipment and software, to record and analyze the sounds of wildlife around the globe. By listening to wildlife, their research advances the understanding of animal communication and monitors the health of wildlife populations. Policy makers, industries, and governments use this information to minimize the impact of human activities on wildlife and natural environments. You can find more information on their website at http://www.birds.cornell.edu/page.aspx?pid=2713

Aaron Rice with Cornell Bioacoustics will assist with the development of the underwater soundscape/noise survey as well as assist with data processing and interpretation.

BSA Environmental Services

BSA Environmental Services, Inc. is an environmental consulting firm committed to providing high quality, cost-effective environmental services. Located in Beachwood, OH, BSA has served government agencies, non-profit organizations, and private clients for over 20 years. BSA has a reputation for superior performance, customer service, and cost containment. You can find more information on their website http://www.bsaenv.com/

John Beaver of BSA will assist LimnoTech with processing and identifying organisms from the phytoplankton, zooplankton, and larval fish surveys.

Aerodata

Aerodata provides aerial photography, surveys and airborne data collection for a variety of clients. John Sullivan, president of Aerodata will coordinate collection of recreational boater surveys in and around the project site. You can find more information on their website http://aerodataphoto.com/

Equipment Vendors

LimnoTech will consult with equipment vendors including VEMCO, Biosonics, and Fondriest Environmental to acquire the equipment necessary to collect the required continuous monitoring data.

Table 1. Project Roles and Responsibilities

Name/Contact Information	Role	Responsibility
Lorry Wagner **LEEDCo** **lwagner@leedco.org**	President	Project Manager
Dave Karpinski **LEEDCo** **dkarpinski@leedco.org**	Vice-President	Project Manager
Beth Nagusky **LEEDCo** **bnagusky@leedco.org**	Director	Sustainable Development
Ed Verhamme **LimnoTech** **everhamme@limno.com**	LimnoTech Project Manager Technical Lead	Project management, coordination, communication, planning, review, report preparation
Greg Peterson **LimnoTech** **gpeterson@limno.com**	LimnoTech Project Officer	Project oversight, planning, report review
Jennifer Daley **LimnoTech** **jdaley@limno.com**	LimnoTech Biological Lead	Field management and coordination, data collection, analysis and review, report preparation
John Bratton **LimnoTech** **jbratton@limno.com**	LimnoTech Project Advisor	Project oversight, technical support, planning, report review
Cathy Whiting **LimnoTech** **cwhiting@limno.com**	LimnoTech Field Manager LimnoTech Project Advisor	Provide and oversee field staff, technical support, coordination, planning, QA/QC, report review
Gregory Cutrell **LimnoTech** **gcutrell@limno.com**	Technical Support	Field collection, technical support, data review and analysis, report support
John Beaver **BSA Environmental** **j.beaver@bsaenv.com**	Taxonomy Manager	Taxonomy Management, Sample sorting, identification, QA/QC, documentation
Justin Chaffer **Ohio State University** **Chaffin.46@osu.edu**	Juvenile Fish Collection Water Quality Analysis	Support collection of juvenile fish and will also process the nutrient and water samples.
Chris Winslow **Ohio State University**	Juvenile Fish Collection Water Quality Analysis	Support collection of juvenile fish and will also process the nutrient and water samples.
Aaron Rice **Cornell Bioacoustics** **arice@cornell.edu**	Underwater Noise	Support the development of the underwater soundscape/noise survey. Assist with data processing and interpretation.
John Sullivan **Aerodata**	Aerial surveys of boat	Coordinate the collection of recreational boater surveys.

Table 2. Overview of major sampling tasks and project team responsibilities.

	Task Description	Collection	Support/Equipment	Sample Processing
Fish Community	Hydroacoustic	LimnoTech	Biosonics	LimnoTech
	Larval Fish	LimnoTech	LimnoTech	BSA Env. Serv.
	Juvenile	LimnoTech	Ohio State-Stone Lab	Ohio State-Stone Lab
	Zooplankton	LimnoTech	LimnoTech	BSA Env. Serv.
	Phytoplankton	LimnoTech	LimnoTech	BSA Env. Serv.
	Benthos	LimnoTech	LimnoTech	BSA Env. Serv.
Physical	Chemistry (discrete)	LimnoTech	LimnoTech	Stone Lab
	Chemistry (continuous)	LimnoTech	Fondriest	LimnoTech
	Substrate Mapping	LimnoTech	VanZandt*	LimnoTech
	Hydrodynamic	LimnoTech	Nortek	LimnoTech
Fish Behavior	Acoustic telemetry	LimnoTech	VEMCO	LimnoTech-OSU
	Fixed Acoustic	LimnoTech	Biosonics	LimnoTech
	Noise	LimnoTech	Cornell Bioacoustics	Cornell Bioacoustics
	Aerial Surveys	Aerodata	LimnoTech	LimnoTech

*VanZandt study completed in 2015, with follow-up in 2016

2 Scope of Work

This section describes the major tasks that will be accomplished to meet the project objectives. Work will involve the following primary tasks:

- Health and safety plan
- Sampling and analysis
- State agency coordination
- Documentation and data analysis
- Interim and final reporting

2.1 Health and Safety Plan

A Health and Safety Plan (HASP) was developed for the planned field activities in coordination with Icebreaker Windpower and all project partners. The HASP defines general applicability and general responsibilities with respect to compliance with health and safety programs. The intent is that field workers are entitled to a safe and healthful workplace; and all employees are expected to follow safe and healthful work practices, implement both required and appropriate safety and health protocols, and work in a manner which maintains high safety and health standards. Work will be founded on four Safety Guiding Principles:

- All injuries and events are preventable.
- Responsible leadership and accountable employees prevent injuries and events.
- Plan safety into our work.
- Look out for yourself and each other.

2.1.1 Training and Communication

LimnoTech and all field personnel working on the project (including sub-contractors) will be informed of and agree to the standard operating and site emergency response procedures and known fire, explosion, health, or safety hazards associated with the field work. The HASP will summarize these hazards and define protective measures planned for relevant project activities, including the Lake Erie field work. Site personnel are required to be trained in accordance with applicable work tasks to be conducted, instrumentation/equipment to be used, and applicable OSHA regulations. At a minimum, field personnel are required to be trained in the provisions of this HASP, to recognize the hazards at the site, and the responsible personnel. Additionally, daily pre-work safety meetings will be conducted to review daily tasks and required safety procedures. Documentation of these briefings will be maintained.

2.1.2 Safety and Health-Risk Analysis

The HASP defines the hazards and methods to protect personnel from those hazards as identified in previous site work or background information. The evaluation of hazards is based upon known or suspected conditions associated with the work activities to be conducted and the conditions of the site. Details of the work to be conducted are presented in this Sampling Plan.

2.2 Sampling and Analysis

This section details the specific sampling plan for each major category as defined in the ODNR Protocol. The major sections include: Fish Community/Lower Trophic Level Impacts, Physical Habitat Impacts, and Fish Behavioral Impacts. Table 3 shows a summary breakdown of the location, frequency, and project phase when sampling will take place for each category of sampling. Unless specifically noted, sampling will be conducted pre-, during-, and post- construction of the project. Sampling results will be reviewed at least annually by ODNR, USFWS, Icebreaker Windpower, and LimnoTech. Based on these results, the parties will determine whether the sampling intensity, frequency, and duration can be modified to ensure that only necessary and relevant data are collected.

Monitoring the health of the fish community and lower food web is accomplished through routine sampling of the benthos and water column. Benthic macroinvertebrates' abundance is quantified twice per year, plankton in the water column are sampled monthly using a net and later counted for abundance, small larval fish are sampled and quantified in the spring, juvenile fish are sampled using a bottom trawl throughout the summer and early fall, and estimates of total fish abundance are collected monthly using hydro acoustic equipment.

Physical and chemical characteristics of the lake are sampled using a variety of methods. On a monthly basis during the growing season (May to October), depth integrated water samples are collected and analyzed for phosphorus and nitrogen. Vertical profiles of temperature, oxygen, pH, conductivity, and turbidity are collected monthly to monitor the progression of lake stratification throughout the project site. At select locations, continuous measurements of temperature, oxygen, and light (PAR) are recorded to help interpret lake trends between monthly sampling visits. Continuous measurements of water currents, wind, and waves are also recorded at the project site. Bottom substrate is also mapped to identify key habitat areas using a side scan sonar.

The final category of sampling is related to behavior of fish and recreational boaters. A network/array of acoustic receivers is installed throughout the project site to monitor the movement of tagged fish, which will give insight into how fish interact with the various elements of the project. Hydro acoustic data collected monthly at fixed locations enables researchers to monitor the behavior of fish over a several hour period at key locations. Underwater microphones are also continuously recording noise levels to monitor for any sound/acoustic impacts the project site might have on migration patterns. An aerial survey of boaters in the region over the season will help track how recreational boaters interact with the project site.

Table 3. Review of sampling, sampling locations and frequency.

Task Description		Stations	Frequency	Phases of project
Fish Community	Hydro acoustic	3 transects	Monthly (May-Oct)	All
	Larval Fish	ICE2, ICE6, REF1	May, June, July	All
	Juvenile	ICE2, ICE6, REF1	May, August, October	All
	Zooplankton	REF 1 to 6, ICE2, ICE4, ICE6	Monthly (May-Oct)	All
	Phytoplankton	REF 1 to 6, ICE2, ICE4, ICE6	Monthly (May-Oct)	All
	Benthos	REF 1, ICE2, ICE6	Spring and Fall	All
Physical	Chemistry (discrete)	REF 1 to 6, ICE2, ICE4, ICE6	Monthly (May-Oct)	All
	Chemistry (continuous)	DO & PAR: REF 1, ICE4 DO: ICE1, ICE2, ICE7	May-Oct	All
	Substrate Mapping	Throughout	Once	Pre and Post
	Hydrodynamic	REF 1 and ICE4	May-Oct, Nov-Apr	All
Fish Behavior	Acoustic telemetry	26 receivers	Annually	All
	Fixed Acoustic	REF 1 and ICE3	Monthly (May-Oct)	All
	Noise	REF 1 and ICE4	May-Oct	All
	Aerial Surveys	Throughout	2days every 3wks May-Oct	All

All = Pre construction, during construction, and post construction phases of the project

2.2.1 Sampling Locations

Sampling stations are shown below in Table 4. The table lays out, by category, which stations or transects will be sampled for each type of sampling. A graphical depiction of the stations is shown in Figure 2. Each GPS position is shown in Table 5. The transects are located down the center (C) of the project grid, and to the east (E), and west (W) in adjacent Reference areas. The transects have a southeast to northwest orientation, and are aligned down the axis and parallel to the proposed turbines. Transect C extends from Turbine Station ICE1 to ICE7, transect W extends from Reference Station 3 to 2, and Transect E extends from Reference Station 4 to 6.

Table 4. Sampling stations by sample type.

Task Description		Reference Stations						Turbine Stations							Transects		
		1	2	3	4	5	6	ICE1	ICE2	ICE3	ICE4	ICE5	ICE6	ICE7	C	E	W
Fish Community	Mobile Acoustic														x	x	x
	Larval Fish	x							x				x				
	Juvenile	x							x				x				
	Zooplankton	x	x	x	x	x	x		x				x				
	Phytoplankton	x	x	x	x	x	x		x				x				
	Benthos	x							x				x				
Physical	Chemistry (discrete)	x	x		x	x	x		x				x				
	Chemistry (discrete sonde profiles)	x	x	x	x	x	x	x	x	x	x	x	x	x			
	Chemistry (continuous)	x						x (DO)	x (DO)		x			x (DO)			
	Substrate Mapping	See substrate mapping section															
	Hydrodynamic	x									x						
Fish Behavior	Acoustic telemetry	See acoustic telemetry section for map															
	Fixed Acoustic	x								x							
	Noise	x									x						
	Aerial Surveys	See aerial survey section for description of locations															

Table 5. Table of stations and latitude and longitude

Turbine Station	Latitude	Longitude	Reference Station	Latitude	Longitude
ICE1	41.60072	-81.80055	1	41.60867	-81.82550
ICE2	41.60616	-81.80602	2	41.62539	-81.84210
ICE3	41.61159	-81.81150	3	41.59184	-81.80890
ICE4	41.61702	-81.81697	4	41.60899	-81.79150
ICE5	41.62246	-81.82245	5	41.62493	-81.80810
ICE6	41.62789	-81.82793	6	41.63990	-81.82370
ICE7	41.63333	-81.83340			

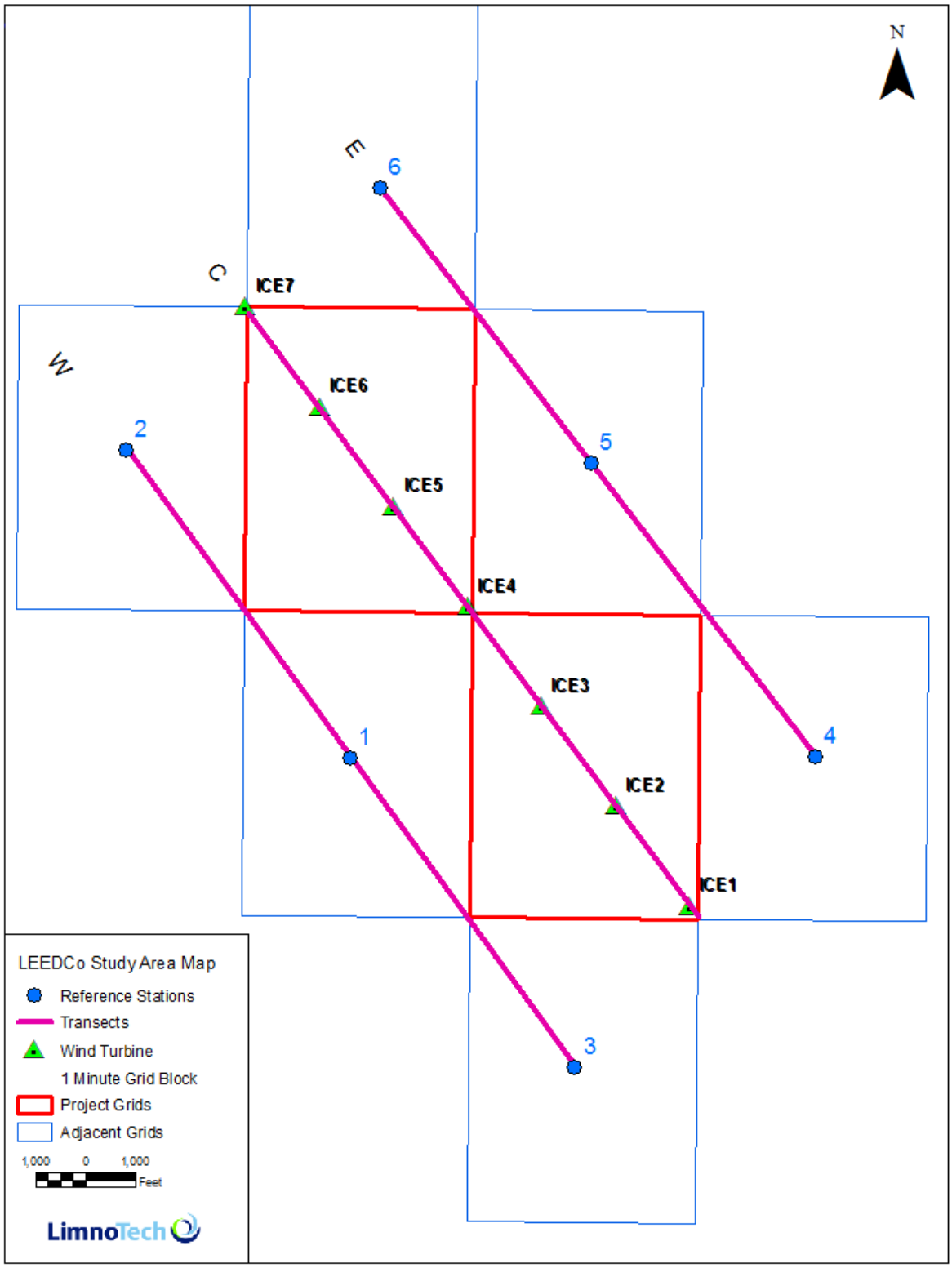

Figure 2. Map of project area, proposed turbine locations, sampling stations, and transects.

2.2.2 Fish Community/Lower Trophic Levels

The purpose of this task is to monitor the fish, zooplankton, phytoplankton and benthos abundance and composition before, during and after construction to provide a better understanding of the food web within and near the project location, as well as any impacts on it as a result of Icebreaker Wind. The sampling will support the overarching goal of the ODNR to monitor and report on the status and composition of the aquatic food web of the central basin in Lake Erie, and any project impacts.

2.2.2.a Fish Hydro Acoustic Monitoring

Hydro acoustics utilizes sonar technology for the detection, assessment and monitoring of underwater objects. Active hydro acoustics sensing involves listening for the echo from sound via an echo sounder. This method can determine the range and size of an object and is used for the assessment of fish size, distribution and abundance in an area. Acoustic monitors will be used to assess whether the turbines and cable have any impact on fish distribution, abundance, and movement in the Project area. Hydro acoustic monitoring will be conducted from May to October. Sampling will be done on three transects, one down the center of the project grid and turbine locations, and two transects in adjacent grid cells to serve as reference areas. The map in Figure 2 shows the location of the acoustic transects. Collection methods and sampling design will follow the Standard Operating Procedure for Fisheries Acoustic Surveys in the Great Lakes (FASGL; Park-Stetter et al. 2009). Briefly, a BioSonics DT-X portable echo sounder surface unit with an emitting frequency of 120kHz with a 6° split beam transducer will be pole-mounted and towed along sampling transects at appropriate speeds. Equipment will be calibrated prior to each survey following manufacturer protocols. Whenever possible the event will be completed in calm conditions, a half hour after sunset and within five days of the new moon. Unforeseen circumstances (i.e. inclement weather) may preclude this timing during certain months. Data analysis and fish density calculations will be determined using the Echoview software according to the FASGL guidelines. The main output from this task will be an estimate of the total fish densities within the project area and adjacent reference transects before, during and after construction. Sampling was conducted during 6 months in 2016. Future sampling efforts will be based upon the results of the 2016 and subsequent year's data, in consultation with the state and federal wildlife agencies.

Stations	Sampling Frequency	Equipment Summary	Data Outputs	Project Phase
Project Area (1 transects) Reference Area Transect (2 transects)	Monthly (May, June, July, August, September, October)	BioSonics DT-X Portable Echo sounder Surface Unit (120KHz, 6° Split Beam)	Fish densities per transect	All

2.2.2.b Larval Fish Sampling

Larval fish contribute both to recruitment and to the food base of adult fish. The composition of Lake Erie's larval fish community has shifted in the last several decades, due in part to the introduction of exotic species and a shift in the food web structure. Larval fish sampling was conducted once monthly during 2016, in May, June and July. Three replicate 5-minute tows will be completed at two Turbine Stations (ICE2 and ICE6) and one Reference Station (Reference 1). The stations where sampling will occur are shown in Table 3 and Figure 2. A 1X2m frame, 500micron neuston net will be used to collect the fish according to the ODNR ichthyoplankton sampling protocols. Following collection, samples will be concentrated and preserved in 95% ethanol. Samples will be brought to the BSA Environmental lab, where they will be separated for taxonomic identification. All samples will be enumerated and identified to species and a subsample of 30 individuals from each species will be measured for total length (nearest

mm). The main output from this task will be an assessment of the species composition of larval fishes within the project area and an adjacent areas.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE6) Reference Area (REF1)	3 events (May, June & July) 3 replicates per station	1X2m frame, 3m length, 500micron neuston net, ethanol	Species composition	All

2.2.2.c Juvenile Fish Sampling

Fish are mostly poikilothermic ectotherms which represent the top of the aquatic food chain and are important due to their recreational and/or commercial value. Additionally, the overall health of the fish community should signify the health of "lower" trophic levels. Juvenile fish sampling will be conducted once monthly in May, August and October. Three replicate 10 minutes tows will be conducted at two Turbine Stations (ICE 2, ICE 6) and one Reference Station (REF1), as shown in Table 3 and Figure 2. A flat-bottom otter trawl with a 10.7 meter head rope and 12-mm bar mesh in the cod end will be used to complete the bottom trawls according to ODNR bottom trawl techniques. Given the limited availability of a net with these specifications, a 9.4 m footrope; 7.8 m head rope; 12 mm bar mesh size in the cod end net will be used for the 2016 season and a larger net, with the required 10.7m head rope will be used for subsequent years. A net mensuration study will help to determine the appropriate scale factor to account for the smaller net used in 2016.

Trawl catches will be sorted by species and where appropriate age-category (AC 0-3, based on the ODNR Age Break protocol) and enumerated. A subsample of 30 individuals per species and age category will be measured for total length (nearest mm) and weight (nearest 0.1g). During days with larger waves, weights may need to be estimated in the field and a subset of species preserved (in formalin, or held on ice for 24 hours) and brought back to the lab for more precise measurements. The main output from this task will be an assessment of the species composition of juvenile fishes within the project area and in adjacent areas.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE6) Reference Area (REF1)	3 events (May, August & October) @ 3 Locations * 3 replicates =27 total samples	Flat-bottom otter trawl 10.7m meter head rope (7m head rope in 2016) and 12-mm bar mesh in the cod end	Species composition, age cohorts	All

2.2.2.d Zooplankton Sampling

Zooplankton are heterotrophs which are a vital component of freshwater food webs. Zooplankton sampling will be conducted once monthly from May through October. Samples will be collected at six reference stations and three turbine stations as shown in Table 3 and Figure 2. Sampling protocols will follow the Lake Erie Coordinated Lower Trophic Level Assessment. Briefly, a weighted zooplankton net (0.5m in diameter, 64 micron mesh), with a flow meter will be used to complete the sampling. The net will be lowered to the lake bottom and then pulled up so the plankton are collected along the way down and up. The net will be washed with filtered water so all plankton are within the collection jar. Samples will be concentrated through a 64 micron screen and preserved with 5% Lugols's Iodine solution, which is the preservative recommended by BSA Environmental. Samples will be stored in 200mL jars and three 2 to 5mL sub-samples will be removed for plankton identification to taxonomic genus and enumerated. Any exotic species found will also be identified to species level. Laboratory protocols for identification, enumeration and biomass estimates will follow the methods that BSA Environmental Services has been

using for several years. A Quality Assurance Project Plan (QAPP) was used to ensure high quality data. Methods and quality assurance plans for zooplankton enumeration are available upon request. Samples will be stored following analysis, and retained following identification. Any exotic species found will be identified to species level. The main output from this task will be an assessment of the taxonomic composition of the zooplankton community to provide a better understand productivity and food availability within the project area and adjacent areas.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE4, ICE6) Reference Area (REF 1 to REF 6)	Once monthly from May-October @ 9 Locations =54 total samples	A weighted plankton net. 0.5m diameter and 64 micron mesh, formalin	Taxonomic identification, measure of productivity	All

2.2.2.e Phytoplankton Sampling

Phytoplankton are primary producers that form the base of many food webs. Phytoplankton sampling will be conducted once monthly from May through October. Samples will be collected at six reference stations and three turbine stations as shown in Table 3 and Figure 2. Sampling and laboratory protocols will follow the Lake Erie Coordinated Lower Trophic Level Assessment. Briefly, an integrated tube sampler at 2 times the Secchi depth will be used to complete the sampling. Samples will be concentrated and preserved with 4% Lugols solution. Samples will be processed according to the BSA Environmental Services Laboratory method, which follows The Ohio State University's (OSU) Aquatic Ecological Lab processing protocols. The main output from this task will be an assessment of the taxonomic composition of the phytoplankton community to better understand productivity and food availability within the project area and adjacent areas.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE4, ICE6) Reference Area (REF 1 to REF 6)	Once monthly from May-October @ 9 Locations =54 total samples	Integrated PVC tube sampler	Taxonomic identification, measure of productivity	All

2.2.2.f Benthos Sampling

Benthic macroinvertebrates are organisms without backbones that live on the bottom substrates (rocks, sediments, debris, logs, plants, etc.) of lakes. Unlike fish, they are relatively immobile and are continuously exposed to their environments, making them very sensitive to the water quality. Many reside in the study area long enough (months to years) to reflect changing environmental conditions and serve as an important food source for fish species.

Benthos sampling will be conducted once in May or June and once in September or October. Samples will be collected in conjunction with the phytoplankton, zooplankton and water chemistry cruises. Sampling will be collected at one Reference Station and two Turbine Stations, as described in Table 3 and Figure 2. Sampling and laboratory protocols will follow the Lake Erie Coordinated Lower Trophic Level Assessment. Three replicate grabs of bottom sediment will be collected using a PONAR grab sampler. Benthos will be removed, preserved, sorted to the nearest taxonomic order or aquatic functional group and enumerated. The main output from this task will be an assessment of the taxonomic composition of the benthic community to better understand productivity and food availability within the project area and an adjacent area.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE6) Reference Area (REF1)	Twice – May or June and September or October 3 Locations * 3 replicates =18 total samples	PONAR grab	Taxonomic identification	All

2.2.3 Physical Habitat Impacts

This section summarizes data collected to understand potential project impacts on water chemistry, bottom substrate, and lake currents.

2.2.3.a Water Chemistry (Discrete)

Discrete water chemistry sampling will be conducted from May through October. Samples will be collected in conjunction with the zooplankton, phytoplankton and benthos cruises. Samples will be collected at six reference stations and three turbines stations (ICE2, ICE4, ICE6) as specified in Table 3 and Figure 2. Sampling and laboratory protocols will follow the Lake Erie Coordinated Lower Trophic Level Assessment. Additionally, vertical profiles with the YSI water quality sonde will be collected at ICE 1, 3, 5, and 7. In 2016 these were initiated in June, but will occur during every discrete sampling event in subsequent years.

Temperature and dissolved oxygen profiles will be collected from surface to bottom at 1 meter increments. A Secchi disk will be lowered into the water column until it is no longer visible to measure water clarity. A Li-COR submersible light meter will be used at the surface and at 0.5 -1.0 meters increments to determine light extinction. An integrated tube will be lowered to the lake bottom for a total water column collection that will be emptied into a stainless steel bucket and then sub-sampled into separate bottles for analysis of nitrogen, phosphorus, and chlorophyll-*a* samples.

All field probes will be calibrated prior to the first measurement. All sampling containers and field probes will be thoroughly rinsed prior to each collection. Field preservation of all samples will be limited to keeping the samples cold in coolers with ice and adding the proper preservatives. At the end of each round of sampling, the samples will be delivered to the laboratory at the end of the business day. Chain of custody forms will be completed and will accompany all samples to the laboratory. Upon receipt of samples by the laboratory, further preservation will be conducted in accordance with the laboratories' standard operating procedures.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE2, ICE4, ICE6) Reference Area (REF 1 to REF 6)	Once monthly from May-October 9 Locations * 6 months =54 total samples Additional sonde profiles at ICE 1, 3, 5,7 (June to Oct)	YSI-multi parameter data sonde, Secchi Disk, Li-COR Submersible light meter, Integrated Tube Sampler, Brown plastic and glass bottles, H2SO4 for preserving	Temperature, dissolved oxygen, total phosphorus, total nitrogen, chlorophyll-a, light extinction and water clarity	All

2.2.3.b Water Chemistry (Continuous)

Continuous water chemistry sampling monitors will be deployed throughout the field season, May-October. Underwater data loggers will be deployed at the Turbine Station (ICE4) and the Reference Station (REF1) to measure temperature (surface and bottom). Dissolved oxygen (DO) loggers will be deployed near the bottom of the lake and submersible Odyssey loggers will be deployed about 1-meter below the surface to analyze Photosynthetically Active Radiation (PAR). Additional temperature and DO sensors (miniDO$_2$T) will also be deployed at ICE 1, ICE 2, ICE 7. All field probes will be calibrated prior to the first measurement and maintained throughout the field season. The main output from this task will be to collect a continuous water quality dataset which helps provide an indication of the productivity, light transmission, and key water quality parameters within the project area and an adjacent location. In 2016, not all continuous sampling equipment was in place the entire season due to ongoing negotiations with ODNR regarding the total number of sensors and locations.

Sampling Location	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE 4, & DO & temperature only at ICE1, ICE2, and ICE7) Reference Area (REF1)	Continuous from May-October 2 Locations * 6 months Additional DO, temp sensors at ICE 1,2 and 7	Odyssey PAR Logger, HOBO Temperature Logger, YSI Optical DO Logger, PME miniDOT (DO)	Water temperature, dissolved oxygen, photosynthetic active radiation	All

2.2.3.c Substrate Mapping

Physical habitat features like substrate are an important ecosystem constituent that can impact the surrounding communities. Using technologies such as side-scan sonar in conjunction with a single or multi-beam sonar system, one can provide continuous data of a larger area which increases the accuracy and precision of substrate mapping.

A side-scan sonar survey of the lakebed within and adjacent to the Icebreaker Wind site was completed on June 24th 2015 by VanZandt Engineering. A total area of about 6700 feet (2050 m) by 100ft (305 m) was surveyed in the project area. The line spacing for the survey was 30 meters with a 50 meter range for each side, which gave over 100 percent overlap of sonar coverage line to line. An Imagenex 872 YellowFin side-scan sonar system with digital data acquisition software was used to collect the side-scan data. An additional side scan sonar survey of the proposed transmission line path was completed in August of 2016. The side scan sonar showed a generally uniform and smooth lake bottom. No features or artifacts of historical significance were identified by the survey that would pose a hazard to the construction activities

at the project site. The analyzed data also showed no areas of benthic significance. A few targets possibly representing small schools of fish were observed near the bottom but these targets may have been geologic in nature.

Results from both surveys in 2015 and 2016 will be summarized and used to complete this task in the ODNR Protocol. The main output and justification for this survey is to provide substrate classification and bathymetry maps which will help define and quantity the available habitat for fish, plankton, invertebrates within the project area and an adjacent location.

Sampling Location	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area including cable route	1 survey using data collected from 2015 and 2016.	Imagenex 872 YellowFin bathymetry survey within the project site	Substrate classification (from 2015 and 2016)	Pre and Post

2.2.3.d Hydrodynamic Surveys

The primary objective is to determine how the project might affect local and regional lake circulation patterns in Lake Erie. The secondary objective is to determine how any documented change in currents could affect water quality, the lower food web (plankton), or the upper food web (fish).

To meet the sampling objectives we propose to do a combination of monitoring and modeling of lake currents within the project study area. The monitoring will consist of measuring ambient lake currents with an Acoustic Doppler Current Profiler (ADCP) in pre-, during-, and post- construction periods of the project and will be supplemented with localized current monitoring around the turbines after installation. Two modeling exercises are planned to examine the full range of expected current impacts at near and far field scales. The near field modeling will investigate the predicted current speeds near the turbine tower under a full range of expected environmental conditions. The far field model will utilize output from the near field scale model to inform a lake wide model of Lake Erie to look at any potential impacts to regional or lake-wide circulation patterns. The monitoring and modeling approaches are described in more detail below.

Regional Current Monitoring

Two ADCPs will be deployed throughout the field season, May-October 2016, as well as through the winter of 2016 to monitor lake currents at the project and reference sites. One ADCP (Nortek AWAC AST 1MHz Aquadopp Z-cell) will be deployed at the center turbine location (ICE 4) and the second ADCP (RDI Workhorse Sentinel 1200kHz) will be deployed at the designated reference location about one mile west of the center turbine location. Both ADCPs will measure lake currents on an hourly basis in one meter increments from the surface to the bottom of the lake. The ADCP's will remain in place for the pre-, during-, and post- construction periods.

Localized Current Monitoring

After the installation of one or more turbine foundations a detailed examination of currents in the vicinity of the turbine will be conducted to identify near field current impacts. The investigation will utilize Horizontal ADCPs (HADCP) to record current velocities immediately adjacent to the turbines. The HADCP will be lowered next to the turbines and point outwards to obtain velocity measurements in one meter increments away from the turbine to a total distance of 30 meters. Figure 3 shows how the current meters will be placed around each side of the turbine. The currents meters will be placed at each location for approximately 15 minutes or until a stable current meter reading is obtained and then moved to a new location. The measurements will be taken at two turbine locations, which corresponds to the shallowest and deepest turbine sites. Two dimensional views of the current profile will be generated from the

measurements to show the current around the turbines. This monitoring approach may be modified in the field to account for local environmental conditions.

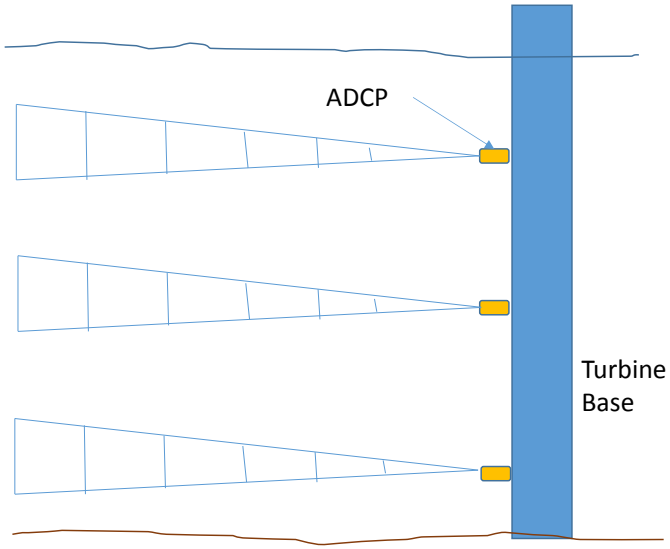

Figure 3. Current monitoring locations near turbine base.

Near Field Model

A near field model will focus on describing current conditions adjacent to the turbine base. Each turbine base is expected to cause some local changes to the ambient current field. This modeling exercise will draw on existing modeling of current movement around fixed structures in lakes and rivers. The goal of the near field model is to develop an understanding of expected current impacts under a range of ambient current conditions. Given the limited scope of the field monitoring near the turbines, a near field model can provide a more robust understanding of year round impacts of turbines as well as understand current impacts during unusual or extreme conditions that might not occur in a typical year. The model will draw on literature and simple numerical equations describing fluid flow around fixed structures.

Far field Model

The far field model will build on the near scale model by extrapolating how local changes in current conditions around the turbines could affect larger circulation patterns in central Lake Erie. LimnoTech has expertise working with local, regional, and full scale circulation models of Lake Erie. LimnoTech will coordinate with the NOAA Great Lakes Environmental Research Laboratory (NOAA GLERL) to accurately simulate expected lake currents during pre-, during-, and post- construction monitoring. NOAA-GLERL develops and maintains high resolution circulation models of Lake Erie and has coordinated with industry in the past including investigating the potential impacts of oil spills in the Straits of Mackinaw and potential impacts of aquaculture on the Great Lakes. Additional information on the NOAA circulation model can be found here http://tidesandcurrents.noaa.gov/ofs/leofs/leofs_info.html. This model is of sufficient resolution to be able to address how potential changes to characteristics of one or two model cells might affect regional or lake-wide circulation patterns.

Timeline

An approximate timeline is laid out below to show when each of the activities mentioned above will occur. The far field monitoring will occur beginning in 2016 and continue through 2017, 2018, and potentially longer into post construction monitoring. Near field monitoring will begin in 2018 or after the first turbines are placed in the lake. Near field modeling will begin with an initial literature review in 2016 and early 2017 to examine existing models on fixed structures in lakes and rivers. More detailed near field

modeling will occur in 2018, after the near field monitoring is complete. The far field modeling will begin in late 2016 and early 2017. This early component will work to develop a more detailed modeling approach and preliminary modeling in collaboration with NOAA GLERL. It is anticipated that preliminary results of the near or far field modeling will be shared immediately with ODNR in technical memorandums. Modifications to the modeling and monitoring plan could be made after review of the preliminary modeling analysis.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Construction Phase
Project Area (ICE4) Reference Area (REF1)	Continuous from May-October and October to April (begin 2016) 2 Locations (REF 1 and ICE4)	RDI Workhorse Sentinel -1200kHz Nortek AWAC AST 1MhZ Aquadopp Z-cell	Current velocity and direction	All
Project Area (various)	Near field monitoring Near and far field modeling	Horizontal Acoustic Doppler Current Profilers at each location Use near field model to estimate near field current impacts during other seasons Use far field model to extrapolate near field impacts	Current velocity and direction Model of turbulence around turbine foundation	Construction Only

2.2.4 Fish Behavioral Impacts

Fish behavior and movements are driven by several factors. Fish often make daily movements between feeding and resting habitats, seasonal movements to summer and winter habitat and annual movements to spawning areas. Fish also respond to direction and rate of water movement by their lateral line which contains nerve endings and acts as radar, allowing the fish to detect the size, shape, direction and speed of objects. Fishes may trade-off food acquisition to decrease the risk of predation, so that a habitat with lower food availability may be used to reduce risk. Understanding normal fish behavior and movement is critical to being able to predict how a population may respond to variable environmental conditions.

2.2.4.a Acoustic Telemetry

Acoustic telemetry will be used to determine if offshore wind turbines and associated buried electrical transmission cables alter fish behavior in Lake Erie. LimnoTech will use data to study fish behavior patterns in pre-, during-, and post- construction phases of the Icebreaker Wind project near the turbine sites and along the electrical transmission line running to shore using acoustic telemetry equipment.

Acoustic telemetry is used to collect information about fish movements and behaviors. An acoustic telemetry system involves two main components: the moving transmitter tags attached to fish that broadcast a unique numeric ID and the fixed hydrophone receivers that log the unique ID as fish pass by. Icebreaker Windpower will support the installation and maintenance of a local array of hydrophone receivers near the project site and transmission line. Icebreaker Windpower will not tag any additional fish as part of this project, but will rely on cooperation with active fish telemetry projects being conducted

by ODNR and the Great Lakes Acoustic Telemetry Observing System (GLATOS). There are already hundreds, if not thousands of actively tagged fish in Lake Erie including walleye, whitefish, lake trout, and other species that Icebreaker Windpower will track as they travel past the project site. Icebreaker Windpower will download data from the local hydrophone array on an annual basis and work with ODNR to interpret the tagged fish observations. LimnoTech is also working closely with Dr. Stu Ludsin and The Ohio State University (OSU) to assist with array configuration and data interpretation.

The array configuration will be developed in coordination with VEMCO, OSU, and ODNR. VEMCO is the ODNR preferred equipment vendor, which supports other telemetry projects on Lake Erie and can ensure adequate receiver coverage and transmitter tag frequency. The receiver array will be designed to have two rows of hydrophones (26 total), one on each side of the turbine/transmission line as depicted in Figure 4. This configuration is designed to monitor the behavior of tagged fish in and around the turbine site and transmission line with sufficient density to capture fish moving through the project and transmission sites. This array configuration minimizes monitoring gaps within the study area and the double line of receivers array provides a better understanding of individual fish track as it moves from one side of the project site to the other. The distance between receivers along each transect is approximately 1,500 m. The distance between the two parallel receiver lines is approximately 1,000 m. This distance is well within the limits of the receiving equipment and transmitter range data provided by ODNR but will not provide a VEMCO Positioning System. Distances between receivers might be modified slightly after range tests are conducted in the field prior to receiver installation.

Prior to deployment, a small subset of receivers will be deployed for a short period (<24 hours) and secured to a surface spar buoy. A set of transmitter tags will be towed at various distances away from the receivers to do an in-situ range test. These receivers will be retrieved and data downloaded to help estimate an appropriate detection range between receivers. Following the range testing, the full array will be installed. Each receiver will be suspended above the bottom using an anchor, underwater floats, and a drag line will be placed on the lake bottom. The drag line will be used for annual instrument retrieval and data downloading. To ensure ongoing testing and verification of the system, three acoustic (sentinel) tags will be permanently within the receiver array. These tags will allow continual range testing to occur and verify any VPS ability of the array.

Twenty six receivers will remain in place over the 2016/2017 winter period. In spring of 2017 the receivers will be remotely evaluated using the surface acoustic communication box to check on battery life and other vital statistics. The receivers will remain in the water through fall 2017. In fall 2017, receivers will be retrieved, data offloaded, batteries changed, and redeployed. This annual maintenance cycle (check status in spring and retrieve, download, and redeploy in fall) will be repeated annually during all phases of the project. Acoustic telemetry will be used to assess the degree to which the turbines and the transmission line act as impediments to fish movement, by determining the probability that resident and highly migratory fish species travel across the project area unabated. It will also help determine if the turbine area or the transmission line act as attractants or deterrents to fish by comparing the occupancy times at the project receivers to receivers in similar habitat types from the existing lake-wide GLATOS receiver grid.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (Turbine and Transmission Line Areas) - see map below	26 receivers deployed for 12 months along transmission and turbine line First deployed in Oct. 2016 and maintained annually/year-round	22 VEMCO VR2Tx receivers and 4 VEMCO VR2AR receivers	Fish tag data from receivers and range test results	All

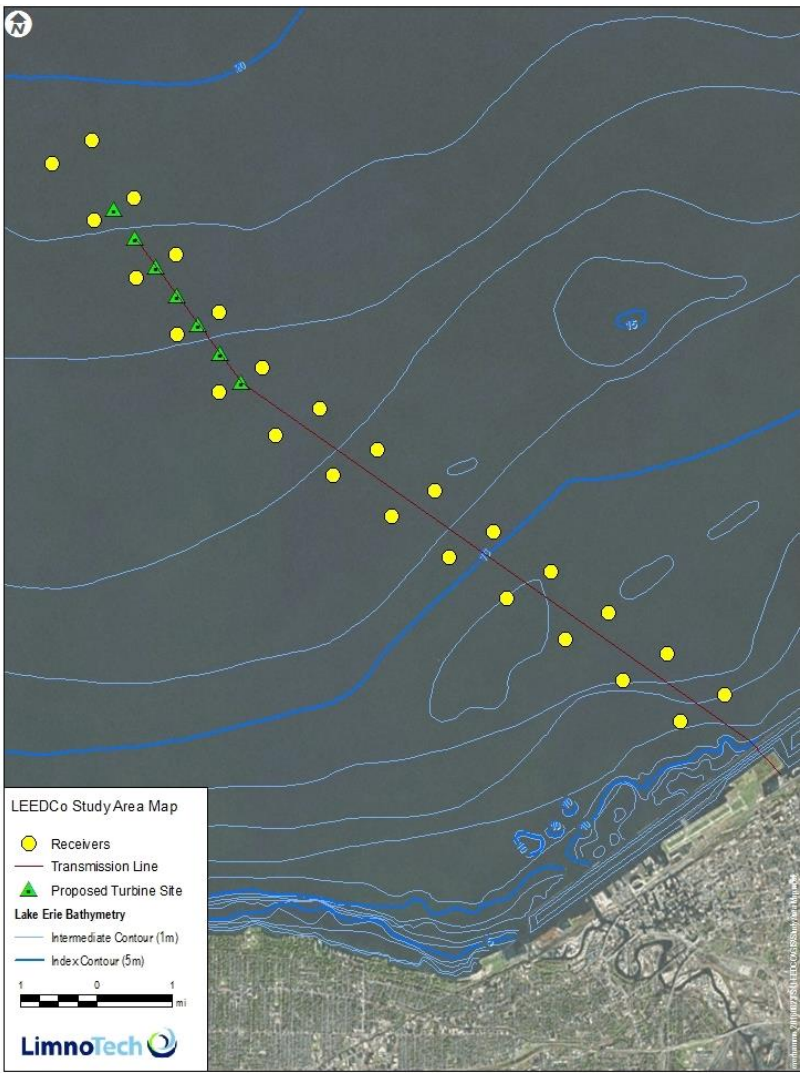

Figure 4. Map of the projected array configuration.

2.2.4.b Fixed Acoustics

Hydroacoustics utilizes sonar technology for the detection, assessment and monitoring of underwater objects including fish. Fixed hydroacoustic sampling will take place on the same nights at the mobile acoustic surveys. Fixed surveys will be completed by anchoring the boat for one hour at Turbine Station ICE3 and for one hour at Reference Station REF1. The equipment and data settings will remain the same as the mobile survey (section 2.2.2a), with the exception that the collection ping rate will be increased

from 5 pings per second to 10 pings per second. Fixed acoustic data will be collected monthly from May through October. As a result of discussions with ODNR in 2016, sampling wasn't initiated until August 2016.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Construction PhaseProject Phase
Project Area (ICE3) Reference Area (REF1)	Monthly from May - October, however in 2016 only 3 months were sampled (August, September, October)	BioSonics DT-X Portable Echo sounder Surface Unit (120KHz, 6° Split Beam)	Fish densities	All

2.2.4.c Noise Production

Sources of anthropogenic sound are extensive and include any kind of boating or shipping, seismic exploration devices, construction activities, and active sonar (used by the shipping industry, commercial and recreational fisheries, the military, and the oceanographic research community). Longer lasting sounds, such as those associated with shipping, cause a general increase in background noise in some locations. Potential effects on fish from anthropogenic sounds could include behavioral changes, such as moving towards or away from a sound source or leaving a feeding or breeding site; and increased stress. Noise production monitoring will be conducted continuously throughout the field season from May-October. Two underwater sound recorders will be deployed using Ocean Instruments Smart Hydrophone Soundtraps at Reference Station 1 and Turbine Station ICE4. The instruments will allow for the determination of a range of frequencies of ambient sound. Sound traps will be deployed within the project area and will be maintained on a regular basis. Data processing and interpretation will be supported by the Cornell Bioacoustics team. The main output from this task will be an assessment of the background noise in the project location and potential impacts on fish and other biotic organisms.

Sampling Locations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Project Area (ICE4) Reference Area (REF1)	Continuous (May-October) 2 Locations * 6 months	OceanSonics Smart Hydrophone Soundtraps	Sound recording files	All

2.2.4.d Aerial Surveys of Boating Usage/Fishing Pressure

Aerial surveys will be conducted within the project area and reference areas. Overflights will be scheduled for two times a week (one weekday and one weekend day), every three weeks from May 1st to November 1st. We are working with planes and pilots that will be stationed out of Ann Arbor and Cleveland. Aerial surveys will provide a boat count and Airborne Digital cameras will capture photos for QA/QC purposes on several trips. The surveys will be limited to good weather days when aerial visibility is adequate, and will be at the discretion of the pilot. The main output from this task will be an assessment of the boater usage at the project area and an adjacent location. A map of the counting grids is shown in Figure 5 below.

Stations	Sampling Frequency	Materials Summary	Data Outputs	Project Phase
Two 10 minute grid cells depicted in map below	2 days a week, every six weeks, from May 1-November 1	Cessna Aircraft with a Leica Airborne Digital Camera	Boat counts and digital images for QA/QC	All

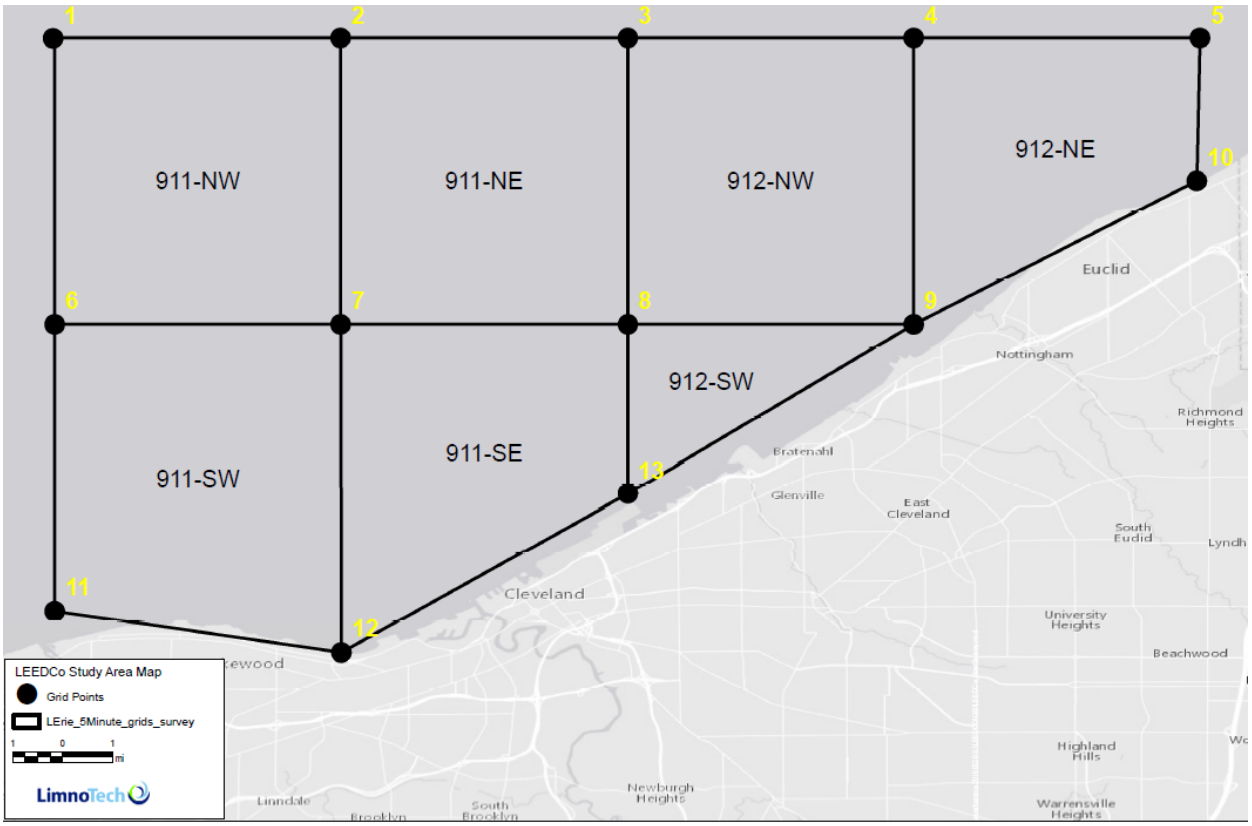

Figure 5. Map of aerial recreational boat counts in Cleveland area. The project area is in zone 911-NW.

2.3 State Agency coordination

As required by the ODNR Protocol the project team coordinated with ODNR on specific sampling requirements as well as review and acceptance of the sampling plan and monitoring approach. The LimnoTech led team and Icebreaker Windpower discussed the sampling plan development with ODNR and USFWS at the following times:

- April 11, 2016 – Initial in person meeting in Columbus, OH with OPSB, ODNR, and USFWS
- May 3, 2016 – Meeting in Columbus, OH at ODNR headquarters with OPSB (phone), and USFWS
- August 11, 2016 – Meeting in Sandusky, OH at ODNR field station with OPSB (phone), and USFWS (phone)
- September 14, 2016 – Phone call with ODNR to coordinate transition of key staff at ODNR.
- January 19, 2017 – received final and minor comments from ODNR on sampling plan.
- January 20, 2017 – Phone call with ODNR to review comments and prepare final sampling plan draft.

ODNR provided follow-up communication via email to Icebreaker Windpower and LimnoTech regarding feedback on the sampling plan development in emails dated July 28, August 25, and September 13. This sampling plan incorporates the feedback from ODNR from the emails and in person meetings and phone call mentioned above.

ODNR and USFWS will work with Icebreaker Windpower and LimnoTech at the conclusion of each field season to review monitoring data from the previous year and determine if any changes can and should be made to the sampling intensity, frequency and duration to ensure that only necessary and relevant data continues to be collected. Any changes to the sampling plan will be documented and included as an appendix to this sampling plan.

2.4 Documentation & Data Analysis

Data gathering and data analyses will follow the guidelines for data handling presented in this section. In general, these guidelines ensure that samples collected are properly labeled and the sample analyses and results can be tracked throughout the process.

Samples will be marked with the sampling location, date, time, type of sample, name of collector, and labeling exposed to formalin or ethanol will be conducted in pencil to eliminate fading of documentation.

Field data sheets and field notebooks will be used to record field sampling events and findings at the time of occurrence. Field data sheets will be filled out in the field that includes field team information, fish capture data, sample management data, water quality information, and sub-sample information. Other pertinent information that may not be directly applicable to field data sheets (e.g., photographic records of threatened or endangered specimens) will be recorded in a field notebook.

Preprocessing laboratory data sheets will also be prepared to record sample and organism condition, species identified, length and enumeration of fish larvae or eggs by species identified (to the extent possible).

A daily sampling record sheet will be prepared at the end of each day of sampling that will list for each sample, sub-sample, or laboratory sample, the sample date/time, type, collection location, identification, and storage location. The sampling record sheets will be maintained by the field crew leader or project lead to track sample collections and can form the basis for transport chain-of-custody records. A field notebook will include other observations, a record of deviations from the sampling plan, record of accidents, equipment problems, etc., or duplicate records of field data sheet information.

2.5 Interim and Final Reporting

2.5.1 Interim and quarterly reporting

The LimnoTech led team will provide quarterly reports to ODNR that detail all relevant activities from the previous three months. The reports will be formatted as technical memoranda and will include dates of fieldwork, summary of metadata from the field events (e.g. number of samples collected), and any preliminary observations or conclusions available at the time of the report. LimnoTech will work closely with other team members to ensure their relevant activities are included in the quarterly reports. When feasible, batches of samples will be processed and reported throughout the season via the quarterly reports to provide preliminary results to ODNR and the USFWS, which may facilitate further discussion between ODNR, USFWS, Icebreaker Windpower and LimnoTech and inform any potential changes in sample collection, sample frequency and duration.

If any issues arise during the field season, LimnoTech will work with Icebreaker Windpower to notify ODNR of any concerns about field data quality or modifications to methods. Summaries of any issues will be reported in the quarterly report covering that period and the annual summary report for that year.

2.5.2 Annual data report

After field data has been collected and analyzed for the season a data summary report will be prepared to summarize field activities, metadata, observations, data analysis, discussion, conclusions, and any

recommendations for future year monitoring. It is anticipated that other involved/interested agencies including USFWS and OPSB will also be engaged in the review process. The field report will be transmitted to ODNR four months after the field season. The field season ends at the end of October, so the annual report will be delivered to ODNR by March 1st following each field season. This will ensure ODNR and Icebreaker Windpower have two months to work through any concerns before the next field season begins in May.

This Plan is meant to serve as a template, which will be reviewed by ODNR, USFWS and LimnoTech through the quarterly and annual reports and annual summaries to ensure that only necessary and relevant data are being collected during every phase of the project. Revisions and adjustments to the Plan, which could include changes to the location of sampling, sampling duration and frequency, and sampling parameters, will be made as appropriate, in consultation with the state and federal agencies. Any changes to the sampling plan will be attached as an appendix to this sampling plan.

References

ODNR, 2013. Aquatic Sampling Protocols for Offshore Wind Development for the Purpose of Securing Submerged Land Leases. Ohio Department of Natural Resources. Revision 1.