Appendix T
Section 106 Geophysical Survey Review

Section 106 Geophysical Survey Review for Icebreaker Wind

Prepared for:

Icebreaker Windpower Inc.

Icebreaker Windpower Inc.
1938 Euclid Avenue, Suite 200
Cleveland, Ohio 44115

Lead Agency: Department of Energy (DOE)

Submitted by:
David M. VanZandt, MMA RPA
VanZandt Engineering
1226 Lakeland Avenue
Lakewood, Ohio 44107
216-956-2338
dvanzandt@sbcglobal.net

January 2017

Table of Contents

Figures

Tables

1.0 EXECUTIVE SUMMARY

A geophysical survey of a portion of the Lake Erie lakebed was conducted for the Icebreaker Wind project by Canadian Seabed Research Ltd. (CSR) from mid- August to early September 2016 on behalf of Icebreaker Windpower Inc. Icebreaker Wind is a six turbine 20.7 megawatt offshore wind demonstration project 8 to 10 miles off the shore of Cleveland, Ohio. The data from this survey was evaluated according to Section 106 of the National Historic Preservation Act of 1966 (NHPA) requirements. Three (3) areas of potential effects (APE) were assessed:

1. Turbine area – 4.7 km (2.9 miles) x 0.3 km (0.2 miles). Beginning about 12.9 km (8 miles) from the mouth of the Cuyahoga River, Cleveland, Ohio, Cuyahoga County, at a depth of 17-18 m (56 - 59 feet). Within this area six (6) wind turbines will be constructed and interconnected with trenched and buried cables at a depth of about 1.5 m (5 feet).
2. Export cable area – 13.2 km (8.2 miles) x 0.36 km (0.2 miles). Beginning 1.7 km (1.1 miles) west of the end of the east breakwater offshore of Cleveland, Ohio, Cuyahoga County, and running 13.2 km (8.2 miles) to the Turbine area at a water depth of 10-17 m (33 - 56 feet). Within this area the export cable from the wind turbines to east breakwater will be trenched and buried at a depth of about 1.5 m (5 feet).
3. Inner harbor area – 0.85 km (0.53 miles) x 0.36 km (0.22 miles). Beginning 1.7 km (1.1 miles) west of the end of the east breakwater offshore of Cleveland, Ohio, Cuyahoga County, and running 0.85 km (0.53 miles) to shore at the CPP power plant at a water depth of 4-10 m (13 - 33 feet). Note: The export cable route will be horizontally drilled beginning 1.7 km (1.1 miles) west of the end of the east breakwater on the north side, south to the CPP power plant at a minimum depth of 4 m (12 feet) below the foundation of the breakwater.

The geophysical survey was designed to be in compliance with the guidelines developed by the Bureau of Ocean Energy Management (BOEM) set forth in “Guidelines for Providing Archaeological and Historic Property Information Pursuant to 30 CFR Part 585,” compliance with which are directed by the Ohio State Historic Preservation Office (SHPO).

Results from the geophysical survey confirmed that there were no artifacts or properties of historical significance identified at the Icebreaker Wind's APE that would impact the construction of the Project. Nor was there any evidence from the literature search that any artifacts or properties exist at the proposed sites.

VanZandt Engineering recommends that no further archaeological investigation is warranted for the Icebreaker Wind project areas at this time and that clearance for construction be granted.

This report will be submitted to the Ohio SHPO by the U.S. Department of Energy for Section 106 review.

2.0 INTRODUCTION

David M. VanZandt of VanZandt Engineering carried out the Section 106 assessment of the geophysical survey data collected by Canadian Seabed Research from mid- August to early September 2016 for Icebreaker Wind. The following technical report presents the results of this archaeological assessment undertaken to comply with the Section 106 guidelines and the guidelines established by the Ohio State Historic Preservation Office (SHPO) and the U.S. Department of Energy (DOE).

David M. VanZandt, MMA, RPA was responsible for background research, data analysis and interpretation, and report preparation. Mr. VanZandt is qualified as a professional archaeologist by the Register of Professional Archaeologists (RPA), is on the Ohio SHPO historic archaeologists' consultants list, and a member of the Ohio Archaeology Council.

This report details the Section 106 archaeological assessment of the data acquired during the geophysical underwater remote sensing survey conducted by Canadian Seabed Research Ltd. (CSR) for the Icebreaker Wind demonstration project proposed by Icebreaker Windpower Inc. Icebreaker Wind will be the first freshwater offshore wind project in the Great Lakes and in all of North America. The project has three (3) areas of potential effects. The first APE is the Turbine area. The area is 4.7 km (2.9 miles) long by 0.3 km (0.6 miles) wide, bbeginning about 14 km (8.7 miles) offshore of Cleveland, Ohio, Cuyahoga County, at a depth of 17-18 m (56 - 59 feet). Within this area six 3.45 MW wind turbine generators (WTGs) will be located and interconnected with trenched and buried interconnect cables. The interconnect cables will be buried in an excavated trench 1.5 m (5 feet) wide by 1.5 m (5 feet) deep. Each of the WTGs will be supported by a mono-pole substructure atop a suction bucket foundation (mono-bucket). The Mono Bucket (MB), Figure 1, combines the benefits of a gravity base, a monopile, and a suction bucket. It is a Suction Installed Caisson (SICA) or “all-in-one” steel foundation system to support offshore wind turbines. The interface with the lakebed is accomplished by means of a steel skirt that penetrates the seabed. This steel skirt (or bucket) is welded to an upper steel tube and transition piece that resembles the elements above the mudline of a standard offshore wind monopile. The MB skirt for the Icebreaker Wind project will be approximately 17.5 m (57 feet) in diameter and a maximum of 10 m (33 feet) deep.

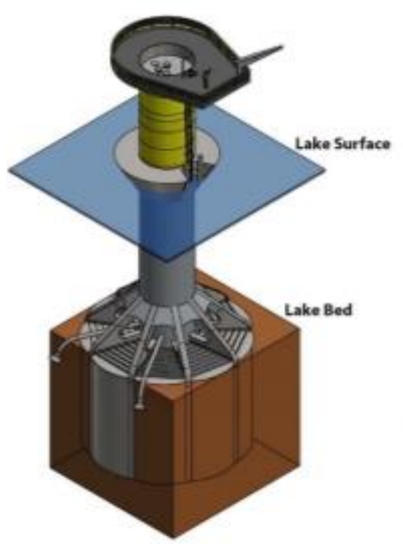

Figure 1 Mono Bucket (MB) Design

The Mono Bucket is installed (Figure 2) by means of both gravity and suction. When the steel bucket is placed on the lakebed, it initially self-penetrates by gravity about 1–2 m (3-6 feet). Suction is then applied and water is pumped from the bucket causing the foundation to penetrate into the lakebed. Once the bucket has achieved the specified penetration, the pump is stopped.

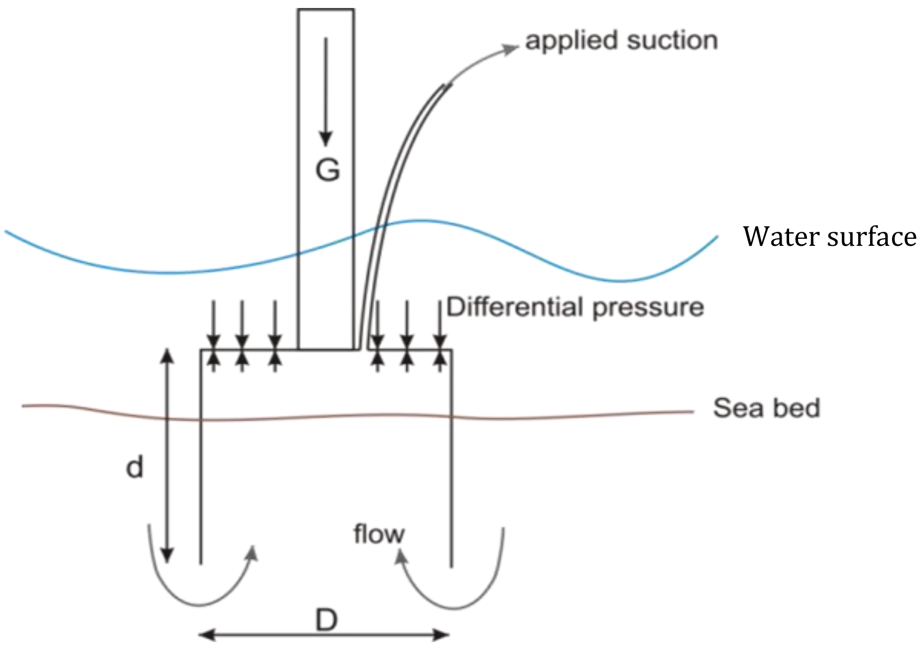

Figure 2 Mono Bucket (MB) Installation

The second APE is the Export cable area. The energy generated from the WTGs will be transmitted through an export cable from the offshore project area to shore. This area is 13.2 km (8.2 miles) x 0.36 km (0.2 miles). Beginning 1.7 km (1.1 miles) west of the end of the east breakwater offshore of Cleveland, Ohio, Cuyahoga County, and running 13.2 km (8.2 miles) to the Turbine area at a water depth of 10-17 m (33 - 56 feet). The export cables will be buried in an excavated trench 1.5 m (5 feet) wide by 1.5 m (5 feet) deep.

The third APE is the Inner harbor area. The export cable will be run in horizontal bore holes generated from Horizontal Directional Drilling (HDD) to allow the cables to pass beneath the Cleveland harbor breakwater and the commercial navigation channel east of Burke Lakefront Airport. The cable will come ashore at the Cleveland Public Power (CPP) Lake Road substation. This area is 0.85 km (0.53 miles) x 0.36 km (0.22 miles). Beginning 1.7 km (1.1 miles) west of the end of the east breakwater offshore of Cleveland, Ohio, Cuyahoga County, and running 0.85 km (0.53 miles) to shore at the CPP substation at a water depth of 4-10 m (13 - 33 feet). The HDD borehole depth will be a minimum of 4 m (12 feet) below the foundation of the breakwater.

The scope of work includes installing six WTGs assemblies, WTGs interconnect cabling, and export cabling to shore. This work would take 6 months to complete.

3.0 BACKGROUND RESEARCH

3.1 Environmental Context

3.1.1 Bathymetry

The Icebreaker Wind site lies in Lake Erie, the southernmost of the five Great Lakes in North America. The Great Lakes are shown in Figure 3, along with their profiles and surface elevations as the flow of fresh water is traced from Lake Superior to the lower lakes and eventually out into the Atlantic Ocean through the St. Lawrence River (Michigan Sea Grant, 2014).

Figure 3 North American Great Lakes (Michigan Sea Grant)

Lake Erie is the shallowest of the Great Lakes with an average depth of 19 m (62 feet) and a maximum depth of 64 m (210 feet) (NOAA, 2014a). It is also the smallest of the Great Lakes by volume (116 cubic miles, or 483 cubic km), although it is only the fourth smallest by surface area (9,910 square miles, or 25,655 square km) (NOAA, 2014a). The water retention or replacement time is 2.7 years, which is short compared to the 6 to 173 years of the other Great Lakes (NOAA, 2014a). An overall bathymetric view of Lake Erie is shown in Figure 4 (NOAA, 2014c).

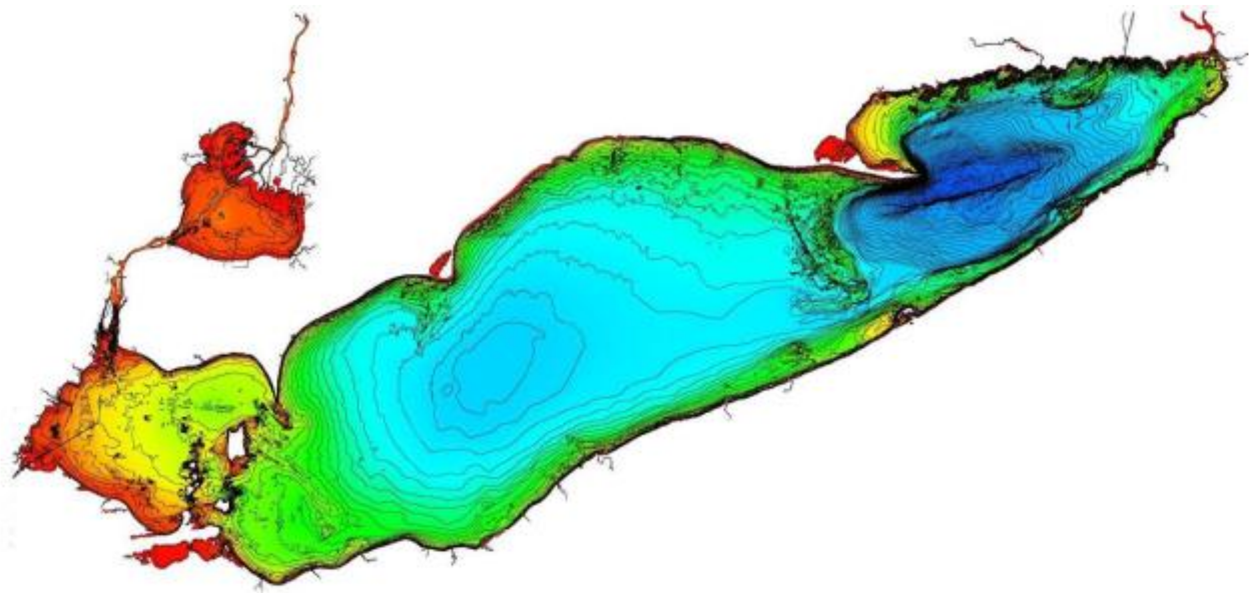

Figure 4 Bathymetric Map of Lake Erie (NOAA)

Lake Erie consists of three distinct regions: the western, central, and eastern basins. Each region has significantly different bathymetric characteristics. The western basin is the shallowest with an average depth of 7 m (21 feet) and features rocky outcrops, shoals, and islands (Waterkeeper, 2014). The central basin has a large flat bottom with an average depth of 20 m (65 feet) and a maximum depth of 24 m (80 feet) in a broad depression in the middle of the Lake (Waterkeeper, 2014)(NOAA, 2014d). In contrast, the eastern basin contains a sharp, deep gouge with several escarpments, an average depth of 24 m (80 feet), and the deepest depths of the Lake off the tip of a long sandy peninsula (Waterkeeper, 2014).

The survey areas (Figure 5) lie between 0 and 20 km (0 and 12.4 miles) offshore of Cleveland, Ohio in the central basin. Corresponding water depths are 5 to 19 m (15-60 feet) relative to the Lake Erie Chart Datum of +173.5 m (NOAA Chart 14829).

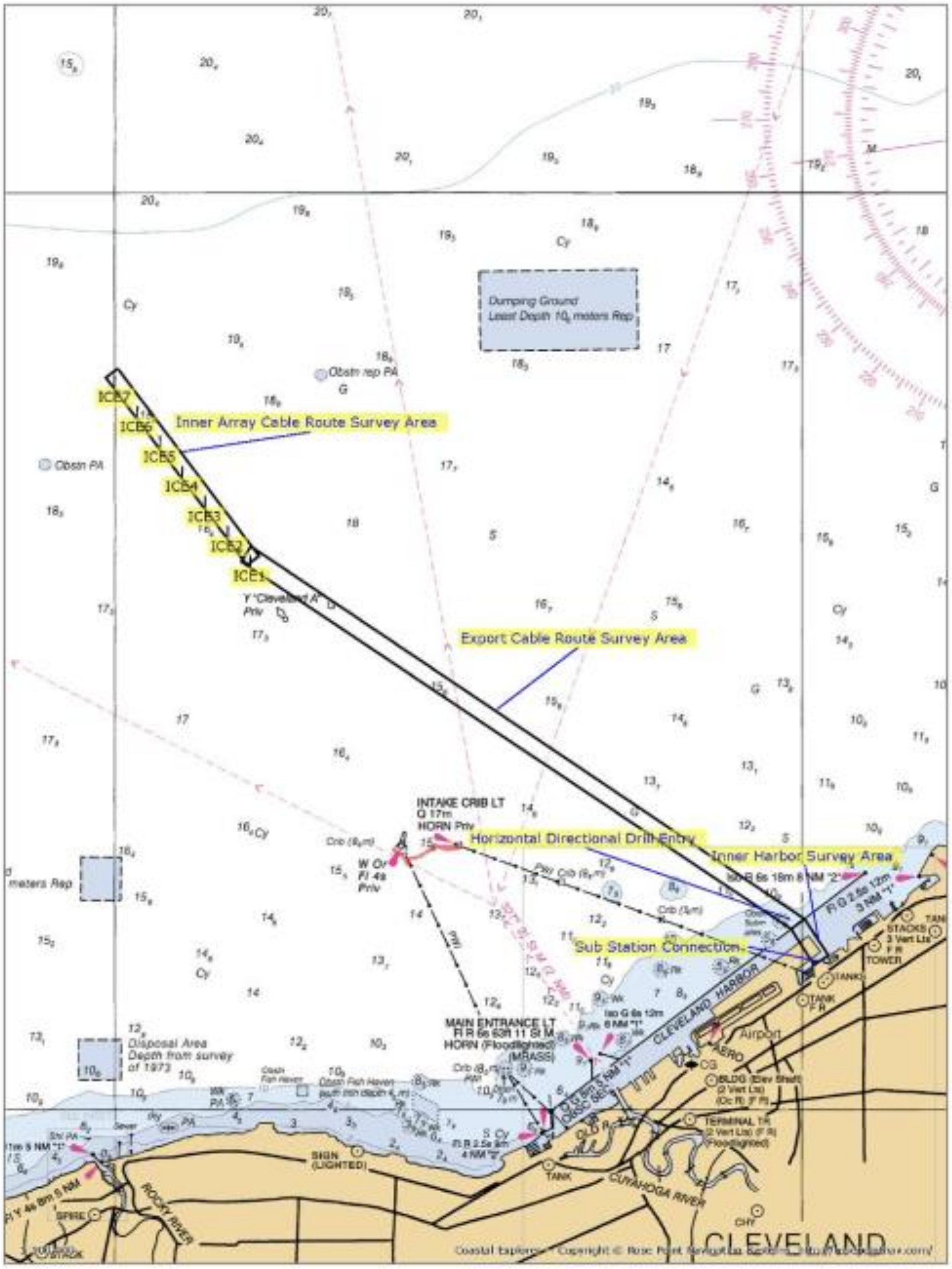

Figure 5 Icebreaker Demonstration Wind Project Site and Bathymetry (VanZandt, NOAA Chart 14829)

3.1.2 Geology

The Great Lakes were formed predominantly by glacial processes. After repeated carving by glaciers during the Pleistocene epoch, only Paleozoic sedimentary rocks remain under northern Ohio (Dames, 1974). The Paleozoic bedrock exposed under Cleveland is from the Upper Devonian period and roughly dates to between 360 and 380 million years ago (Dames, 1974). This rock is mostly shale and is exposed in cliffs along Lake Erie's shoreline both to the east and west of the City (Carter, 1982). The basin containing Lake Erie itself was carved into this bedrock by repeated Pleistocene glaciations (Dames, 1974). During the last period of Wisconsinan glaciations, the ice moved from the northeast to the southwest to create the lake basin known today (NOAA, 2014d). During the Wisconsinan ice sheet's retreat starting 14,000 years ago and ending 12,600 years ago, glacial till deposits were left behind (Carter, 1982). These deposits are generally unstratified hard clay and gravel called basal till (Carter, 1982). Additional deposits are stratified and clay-rich, and these are called flow till (Carter, 1982). They were created in a deep prehistoric lake that existed until the ice sheet fully retreated (Carter, 1982).

After the start of the Holocene 12,600 years ago, fine-grained lake sediments were deposited above the Pleistocene till layer (Carter, 1982). These post-glacial sedimentary deposits consist of either soft silt or sand in various mixtures. A cross section of Lake Erie water, silt, till, and bedrock is shown in Figure 6 running west to east, through the midpoint of the turbine area, showing the typical subbottom conditions that exist in that area. It should be noted both the bedrock and till layer thicknesses are fairly constant within the boundaries of the 300 meter (1000 foot) width of the survey area.

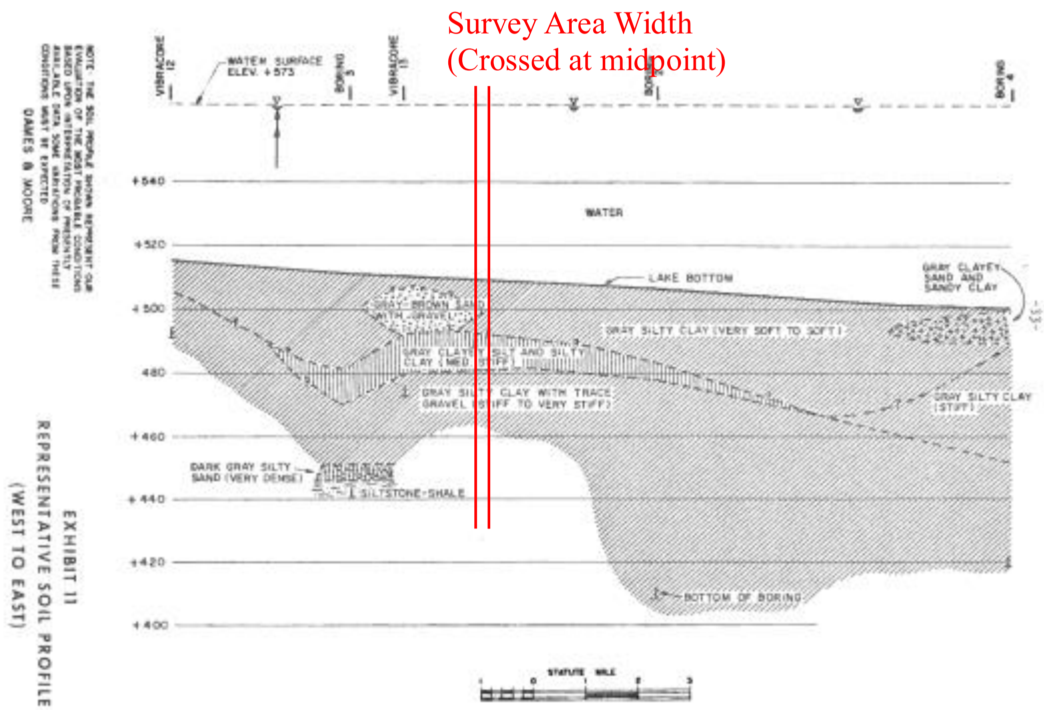

Figure 6 West to East Geologic Cross Section, Lake Erie off Cleveland, Ohio (Dames & Moore)

The geology along the 4.7 km (2.9 miles) length of the turbine area varied slightly from southeast to northwest. Isopach data for soft clay sediment from the Dames & Moore survey vary from 3 m (10 feet) at the southeastern end to 7.6 m (25 feet) at the northwestern end of the survey area (Dames, 1974). This is comparable with CSR's higher resolution multi-beam sub-bottom geology survey results of 3 to 7 m (10 to 23 feet) clay sediment layer (Unit 1) from southeastern to the northwestern end (Figure 7) (CSR, 2016, Enclosure 1).

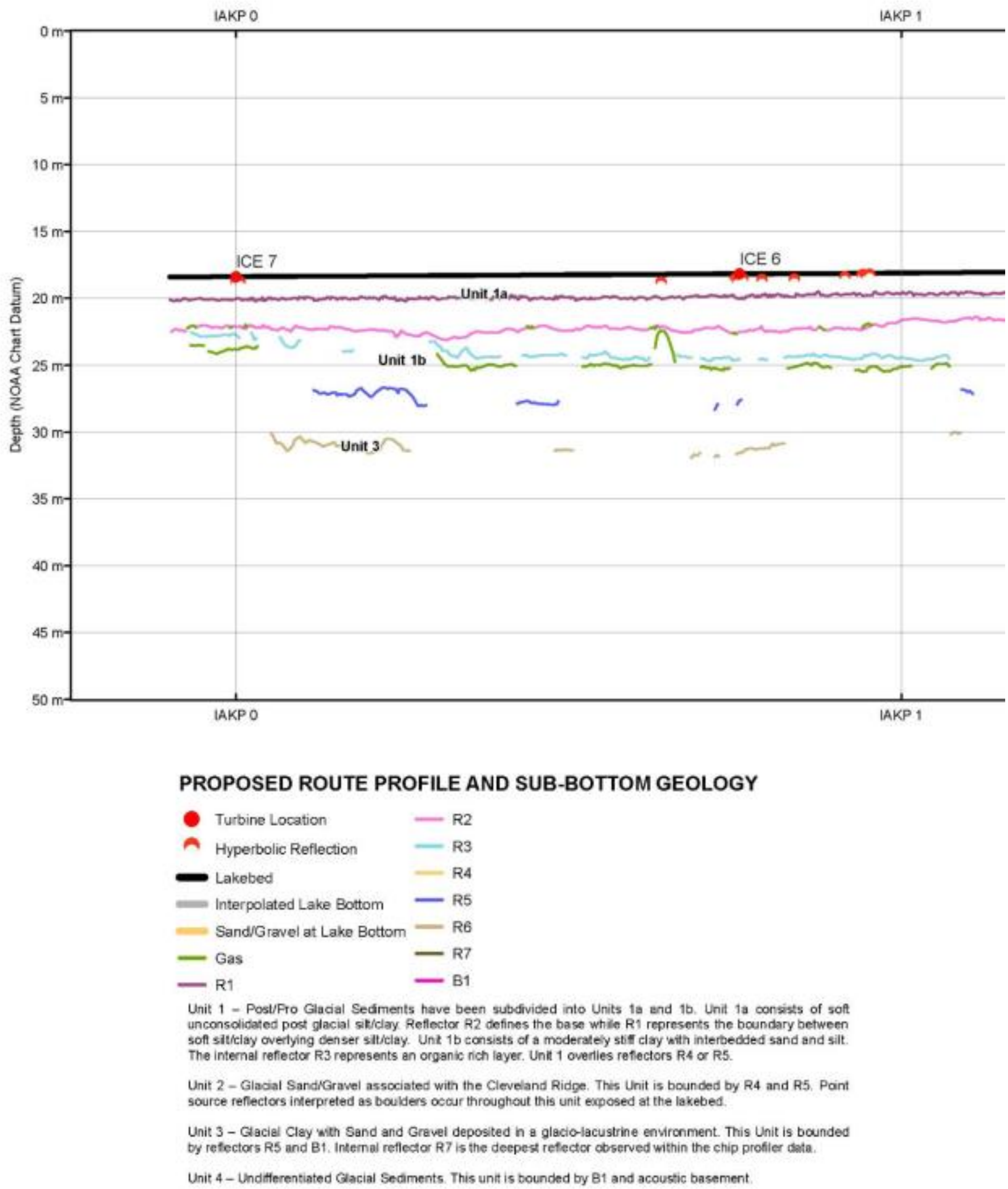

Figure 7 Typical Sub-bottom Geology Turbine Area (CSR)

The geology along the 13.2 km (8.2 miles) length of the export cable area varied slightly from southeast to northwest. The soft clay sediments (Unit 1) vary from 0 m at the southeastern end to 3 m (9 feet) at the northwestern end of the export cable area (CSR, 2016, Enclosure 2-4).

The glacial sand/gravel sediments (Unit 2) average about 5 m (15 feet) for the export cable area (CSR, 2016, Enclosure 2-4). These sediment layers are much deeper than the trench depth of the export cable of 1.5 m (5 feet).

3.1.3 Flora and Fauna

Lake Erie is the most biologically productive of all of the Great Lakes and contains a large, active freshwater fishery (Waterkeeper, 2014). The lake's productivity is due mostly to the large abundance of phytoplankton, small plants in the water column which form the basis of the food chain (NOAA, 2014b). The warm lake water temperatures due to the relatively shallow depths and an abundance of nutrients from rivers help the phytoplankton thrive. Green alga, a single celled plant, is the most important and the basis of the summer food web (NOAA, 2014b). Diatoms, flagellates, and blue-green algae (cyanobacteria) are also present, especially in the early spring or late summer months (NOAA, 2014b). An overabundance of both phosphoric nutrients combined with rain events, and summer sunlight can lead to algae blooms. These have posed significant environmental problems during recent years.

The phytoplankton serves as food for a variety of creatures in the Lake, including zooplankton and macroinvertebrates (NOAA, 2014b). Zooplankton, small animals in the water column, feed on both the phytoplankton and each other (NOAA, 2014b). Macroinvertebrates (larval insects, worms, amphipods, or mollusks) feed on the phytoplankton or detritus on the bottom (NOAA, 2014b). Foraging fish (perch, shad, drum, catfish, carp, and gobies) eat both the zooplankton and macroinvertebrates (NOAA, 2014b). These fish are then eaten by the piscivores, or the top predatory fish, such as walleye, bass, and trout (NOAA, 2014b).

Figure 8 illustrates the food web of Lake Erie (NOAA, 2014b). At the bottom of the web are the phytoplankton colored in green. The next level is comprised of the zooplankton and macroinvertebrates colored in light blue and orange, respectively. The third level is made up of the foraging fish shown in dark blue, and the top level includes the piscivores colored in purple.

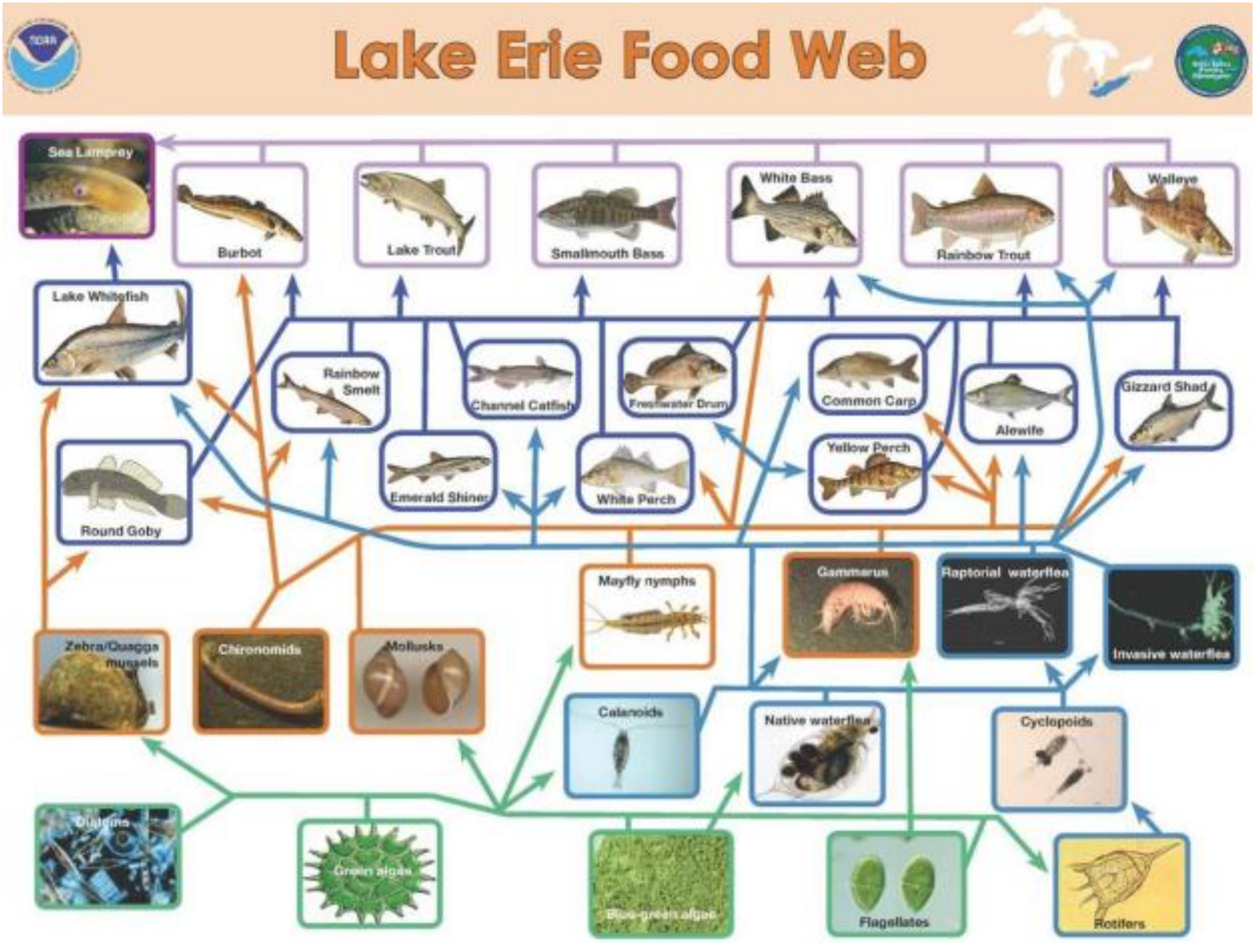

Figure 8 Lake Erie Food Web (NOAA Great Lakes Environmental Research Laboratory)

3.2 Prehistoric Context

Any prehistoric artifacts or structures predating the Holocene Epoch were either destroyed or scattered during glaciations that occurred during that time. The last of the glacial ice sheets, the Wisconsinan's, began retreating during the Pleistocene Epoch ~14,000 years before present (YBP) and ended ~12,600 YBP with glacial till deposits being left behind (Carter, 1982). These deposits generally consist of unstratified hard clay and gravel that are called basal till (Carter, 1982). Additional deposits are stratified and clay-rich, and these are called flow till (Carter, 1982). These deposits were deposited over the Lake Erie basin's shale layer. The thicknesses of the glacial till in the survey area have a range of 55 to 93 feet (Dames, 1974) and 53 to 85 feet (Alpine, 2010).

After the start of the Holocene ~12,600 YBP, fine-grained lake sediments were deposited above the Pleistocene till layer (Carter, 1982). These post-glacial sedimentary deposits consist of either soft silt or sand in various mixtures. The thickness of these soft silt and clay deposits in the survey area vary from 10 to 25 feet (Dames, 1974) and 10 to 16 feet (Alpine, 2010).

During the period from ~12,000 YBP to ~5,400 YBP the lake level was below the turbine APE, which has an elevation at the glacial till layer of +492 feet, thus exposing the land for possible human habitation or use. The lake level during that period varied from +394 feet during the post glaciations Early Lake Erie stage to +476 feet during the Middle Lake Erie stage, ~7,500 YBP (Herdendorf, 2013). At the start of the Middle Lake Erie stage, ~5,400 YBP, the lake level had risen to +525 feet, which inundated the turbine APE, placing any possible prehistoric occupation site underwater (Herdendorf, 2013). After the Middle Lake Erie stage the lake level continued to rise to its present day level of +569 feet (Herdendorf, 2013).

Paleoindian occupation of Northern Ohio was believed to have occurred between 13,000 to 11,000 YBP (Herdendorf, Klarer, Herdendorf, 2006). The earliest evidence in Ohio of occupation is at the Paleo Crossing site (33ME274) in Medina County, Ohio, which has been dated between 10,000 to 11,500 YBP (Brose, 1994).

It is possible that artifacts from early occupation could exist buried at the proposed site, but to date Lake Erie has not been a focus of archaeological research on Paleoindian culture (Stothers, Abel, 2001).

> "Paleoindian sites present a very low archaeological profile across the landscape and are representative of areas where small groups of people would perform specific tasks of short duration. Additionally in northern Ohio, Stothers and Pratt (1980) note that Early and Middle Archaic sites are usually of two types: "those in which a single or a few points are included in a collection of material from other cultural periods, and those in which Early or Middle Archaic materials predominate." The later, mixed sites, would not be represented in the areas examined. The potential for locating Early and Middle Archaic sites beneath Holocene lake sediments with today's remote sensing technologies is a factor of sedimentation depths and relict landscapes. Features such as hidden outcrops that may indicate cultural use areas, have been covered by natural lake sedimentation processes. Therefore, it would be difficult or impossible to locate sites if they existed (Gray & Pape, 2014)."

3.3 Historic Context

Lake Erie has been instrumental in historical shipping and transportation in the Great Lakes. The permanent settlement of the Ohio shores of Lake Erie occurred at a slower pace than that of the Ohio or Mississippi valleys due to the control of the lake by Great Britain (Mansfield, 1899). It wasn't until 1796 that the British relinquished control of their post commanding Lake trade (Mansfield, 1899). Since the opening of the Erie Canal in 1826 from the Hudson River to Buffalo, New York, Lake Erie has served as the crucial nexus for shipping into the upper Great Lakes region and eventually points further west. Immigrants and goods moving westwards would start in New York City; move up the Hudson River by ship, travel along the Erie Canal by boat, and then board yet another ship in Buffalo for transportation down the length of the Lake. At first, Lake Erie was the earliest of the Great Lakes' destination as immigrants from Europe and the Northern States began to settle along its shores. Eventually, however, passengers and goods continued on to the other lakes and, ultimately, Chicago, which then served as the starting point for further western expansion (Mansfield, 1899). It was estimated in 1832 that more than half of the immigrants arrived in the West by water (Mansfield, 1899).

As settlers grew crops, harvested timber, and mined copper and iron ores, these products flowed eastwards back down the lakes and across Lake Erie to be delivered to the east coast. Meanwhile, coal from Pennsylvania, new immigrants, and finished manufactured goods continued to travel westward across Lake Erie from Buffalo. In order to deliver these people and goods, many hundreds of ships operated on the Great Lakes every season in the 19th century (Mansfield, 1899). These ships were frequently made of wood and lacked radio, radar, or modern electronic navigational aids. Furthermore, there was a general lack of accurate weather forecasting, detailed bathymetric information, and other useful aids to safety. As a result, many unfortunate vessels collided with each other, ran aground, sprang leaks, caught fire, or foundered in storms. Lake Erie is the shallowest of all the Great Lakes and is known to have especially severe waves due to its lack of depth and prevailing winds, which blow along the length of the Lake and have caused many ships to succumb to its depths. The end result is a high number of shipwrecks, possibly numbering in the thousands, in Lake Erie (Frew, 2014).

The exact number and location of these shipwrecks is unknown because of the lack of accurate records for these events. There is no central governmental repository that records sinkings. In many cases the only record of a shipwreck may be a story in a local town or city newspaper. Official records are split among two national governments (United States and Canada) and multiple governmental agencies and archives, making an accurate accounting nearly impossible. This is further exacerbated by the fact that many ships were raised and put back into service without as much publicity as surrounded their sinking events, making the total number of shipwrecks left on the bottom even more uncertain. Currently, there are about 250 known shipwrecks in Lake Erie and more are found regularly (ODNR, 2009). Estimates put the total number of shipwrecks in Lake Erie at between 500 and 3,000 (Frew, 2014) (ODNR, 2009).

Historic shipwrecks consist of both wooden and metal ships, sailing vessels, sidewheel steamers, and propeller steamers. The cold fresh water of the Great Lakes tends to serve as an excellent preservative for these wrecks. There are no wood-eating organisms, such as the Teredo worm found in warm ocean environments. Cold water greatly inhibits bacterial decay, allowing wooden timbers and grain cargos to survive. The fresh water is also much less corrosive on metal artifacts, unlike the salty oceans, and the inland seas do not have storms as destructive as ocean-borne hurricanes and typhoons. Thus, many of the shipwrecks in the Great Lakes serve are well preserved archaeological sites that provide significant information about 19th century shipbuilding, shipboard life, and the associated maritime landscape associated with these wrecks.

3.4 Literature Review

VanZandt Engineering consulted the Ohio Historic Preservation Office (OHPO) online mapping system in an effort to locate any inventoried cultural resources identified within the survey area. The archival study included a review of the Ohio Archaeological Inventory (OAI), Ohio Historic Inventory (OHI), the National Register of Historic Places (NRHP), Ohio Sea Grant Shipwreck map, the Cleveland Underwater Explorers shipwreck data base, and the Cleveland Underwater Explorers historical Lake Erie nautical chart collection. Four previously-inventoried cultural resources (shipwrecks) have been identified within 3.5 nm of the survey area. These shipwrecks were the *Admiral* and *Dundee* (3.0 and 3.3 nm, respectively, from the northwest survey corner point), and the CSU wreck and East Breakwall Barge (0.5 and 1.6 nm, respectively, from the export cable area). None of these wrecks were detected within the survey area.

Results of the literature review are described below:

Ohio Archaeology Inventory:

No properties listed on the Ohio Archaeology Inventory are present within the survey area.

Ohio Historic Inventory:

No properties listed on the Ohio Historic Inventory are present within the survey area.

National Register of Historic Places:

No individual properties or districts listed on or determined eligible for listing on the NRHP are present within the survey area.

Ohio Sea Grant Shipwreck Map:

No shipwrecks on the Ohio Sea Grant Shipwreck map are present within the survey area. Four shipwrecks are located within 3.5 nm of the survey area. These shipwrecks were the *Admiral* and *Dundee* (3.0 and 3.3 nm, respectively, from the northwest survey corner point), and the CSU wreck and east breakwall barge (0.5 and 1.6 nm, respectively, from the export cable area). The shipwreck map shows the possibility of the *Dreadnaugt* (probably *Dreadnaug**h**t*) and the *Mackinaw* being close to the survey area, but these locations are unconfirmed and based off of shipwreck maps that were for sale to the public. Most of the locations derived from these maps are not verified, and therefore the ODNR did not base their offshore wind farm siting analysis on them. See, Wind Turbine Placement Favorability Analysis Map Methodology (ODNR, 2009).

Further historical research on both shipwrecks show that the *Dreadnaugt* came ashore and was abandoned and the *Mackinaw* was farther from the project APEs than the shipwreck map indicated. Thus, neither would be close to project APEs. The Cleveland

Underwater Explorers (CLUE) has recently discovered what they believe are the remains of the *Mackinaw,* and it is its located 4.4 nm east of the project site.

Cleveland Underwater Explorers Shipwreck Data Base:

No shipwrecks in the Cleveland Underwater Explorers shipwreck data base are present within the survey area.

Cleveland Underwater Explorers Historical Lake Erie Nautical Chart Collection:

No shipwrecks were found charted on any chart in the Cleveland Underwater Explorers historical Lake Erie nautical chart collection within the survey area or within 3.5 nm of the survey area.

4.0 METHODS

4.1 Survey Design

The main objectives of the survey were to identify and map surficial geology, lakebed features and sub-bottom conditions within the WTG area and the proposed submarine cable routes.

The objectives of the geophysical survey were accomplished by the collection, interpretation and subsequent reporting of geophysical data. The following types of data were collected during the marine geophysical survey (CSR, 2016):

- Differential GPS navigation was constantly recorded to provide real-time geo-referencing for all data sets acquired during the survey.
- Sidescan sonar data were acquired to identify potential hazards exposed on the surface of the lakebed (shipwrecks, pipelines, boulders, debris, ice gouging) and to categorize surficial sediment types.
- High-resolution chirp profiler data were acquired throughout the geophysical program to identify the sub-bottom geology to a depth of at least 5 m (15 feet).
- Lakebed bathymetry data was continuously logged throughout the geophysical program using a multibeam echosounder in order to determine water depths (lakebed elevations) along the route.
- Marine magnetometer data were collected to identify surface and buried ferrous targets.
- Grab samples were collected to ground truth the surficial geology interpretation.
- High resolution 50 kHz profiler data was collected over the proposed turbine locations to aid the interpretation of the near surface unconsolidated sediments.
- High-resolution single channel seismic (mid penetration "boomer") data were acquired within the Harbor and near shore areas to aid the interpretation over the HDD location.
- Sidescan sonar and magnetometer data were not collected in the harbor since the cable will be installed at depth within a HDD casing and therefore there was no requirement for archaeological clearance.

4.2 Overall Survey Layout

4.2.1 Turbine Area

Survey coverage over the Turbine Area included a 240 m (720 feet) corridor centered on the proposed route extending from WTGs ICE1 to ICE7. Overall, 22 lines were surveyed totaling 47 line km. Tie line spacing was 375 m (1,125 feet) along the Turbine Area. Figure 9 illustrates the geophysical survey track lines in the Turbine Area (CSR, 2016).

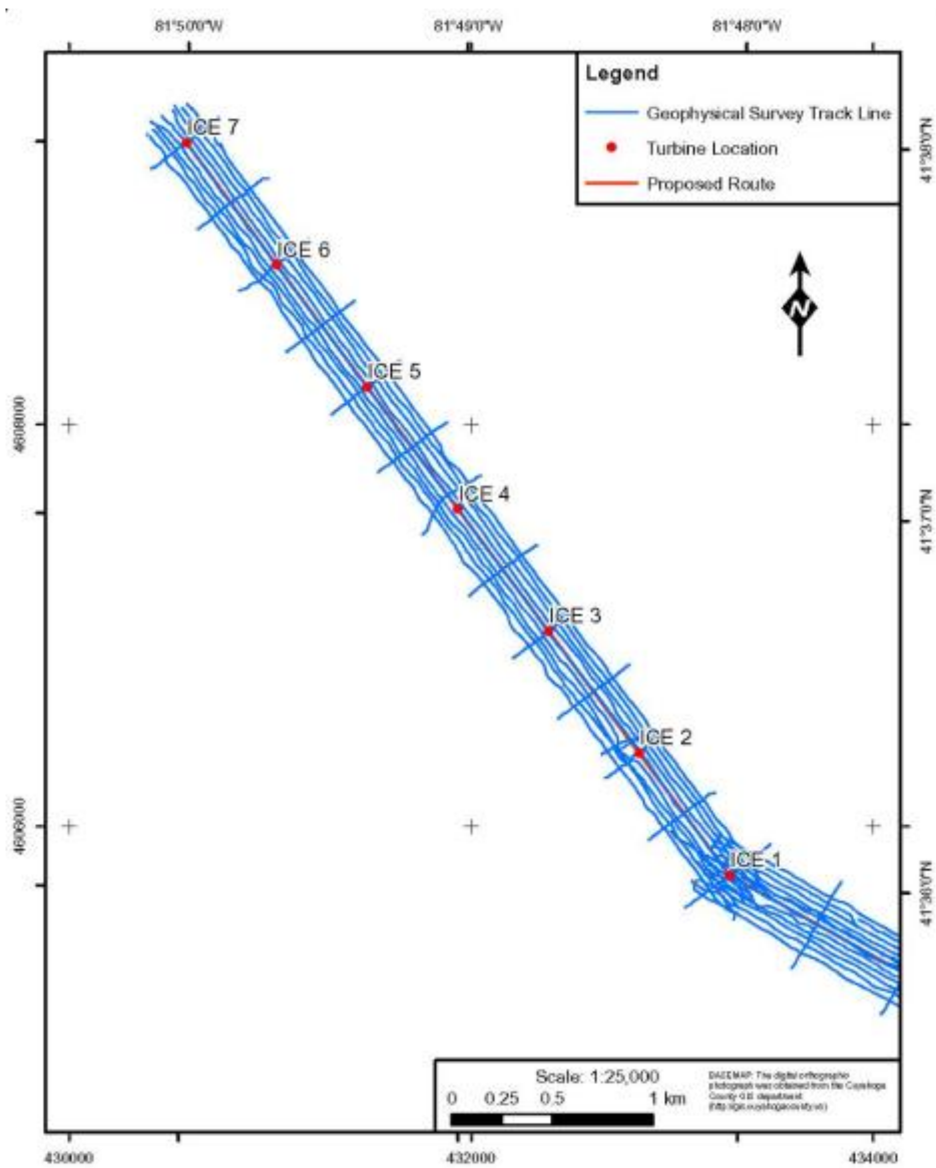

Figure 9 Geophysical survey track lines over the Turbine Area. (CSR)

4.2.2 Export Cable Area

Survey Coverage over the Export Cable Area included a 300 m (990 feet) corridor centered on the proposed route. The Export Cable Area extends from the proposed HDD exit location to WTG ICE1. The survey area was expanded north of the breakwater to TP1 and TP2 to ensure that enough data was acquired to accommodate alternative HDD exit locations. Additional lines were surveyed parallel to the breakwater to gain more information in the HDD exit area, and to map the toe of the breakwater slope. Overall, 73 geophysical survey lines were run totaling 206 line km. Figure 10 illustrates the geophysical survey track lines along the Export Cable Area (CSR, 2016).

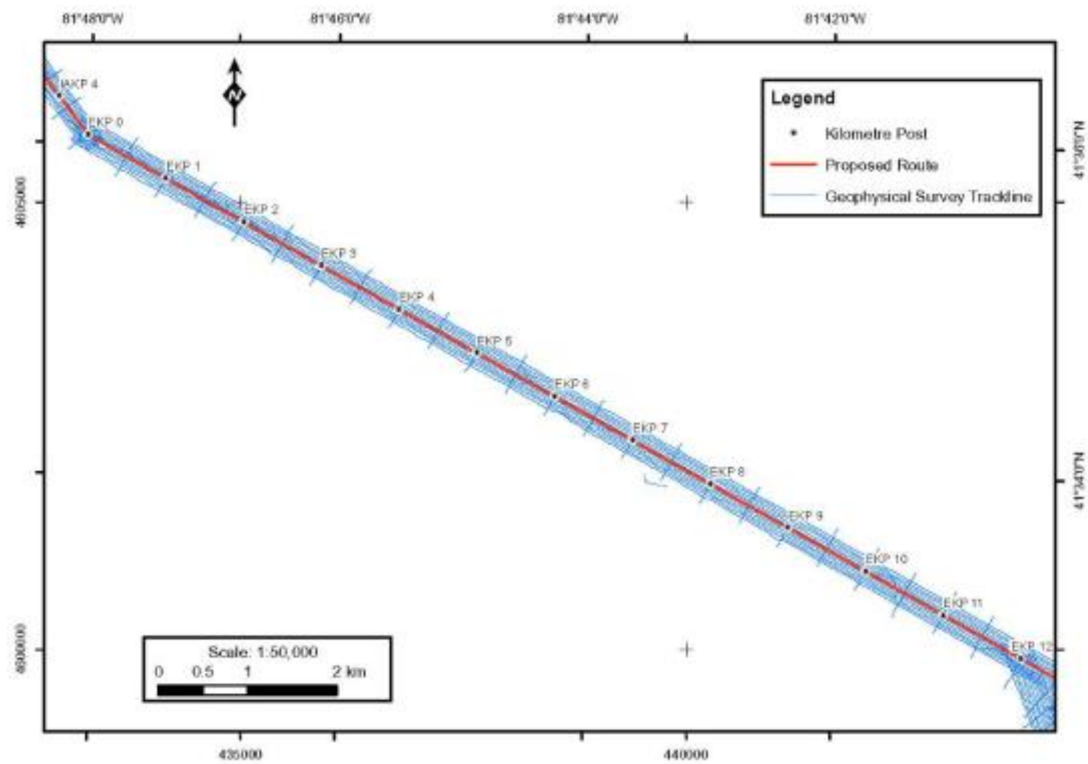

Figure 10 Geophysical survey track lines along the Export Cable Area. (CSR)

4.2.3 Inner Harbor Area

The geophysical survey lines were designed for the collection of multibeam sonar and sub-bottom profiler data along potential HDD routes between the Cleveland breakwater and the landfall. A total of 26 lines were surveyed, totaling 18 line km. Figure 11 illustrates the geophysical survey track lines within the harbor area (CSR, 2016).

Sidescan sonar and magnetometer data were not collected in the harbor since the cable will be installed at depth within a HDD casing, and therefore there was no requirement for archaeological clearance (CSR, 2016).

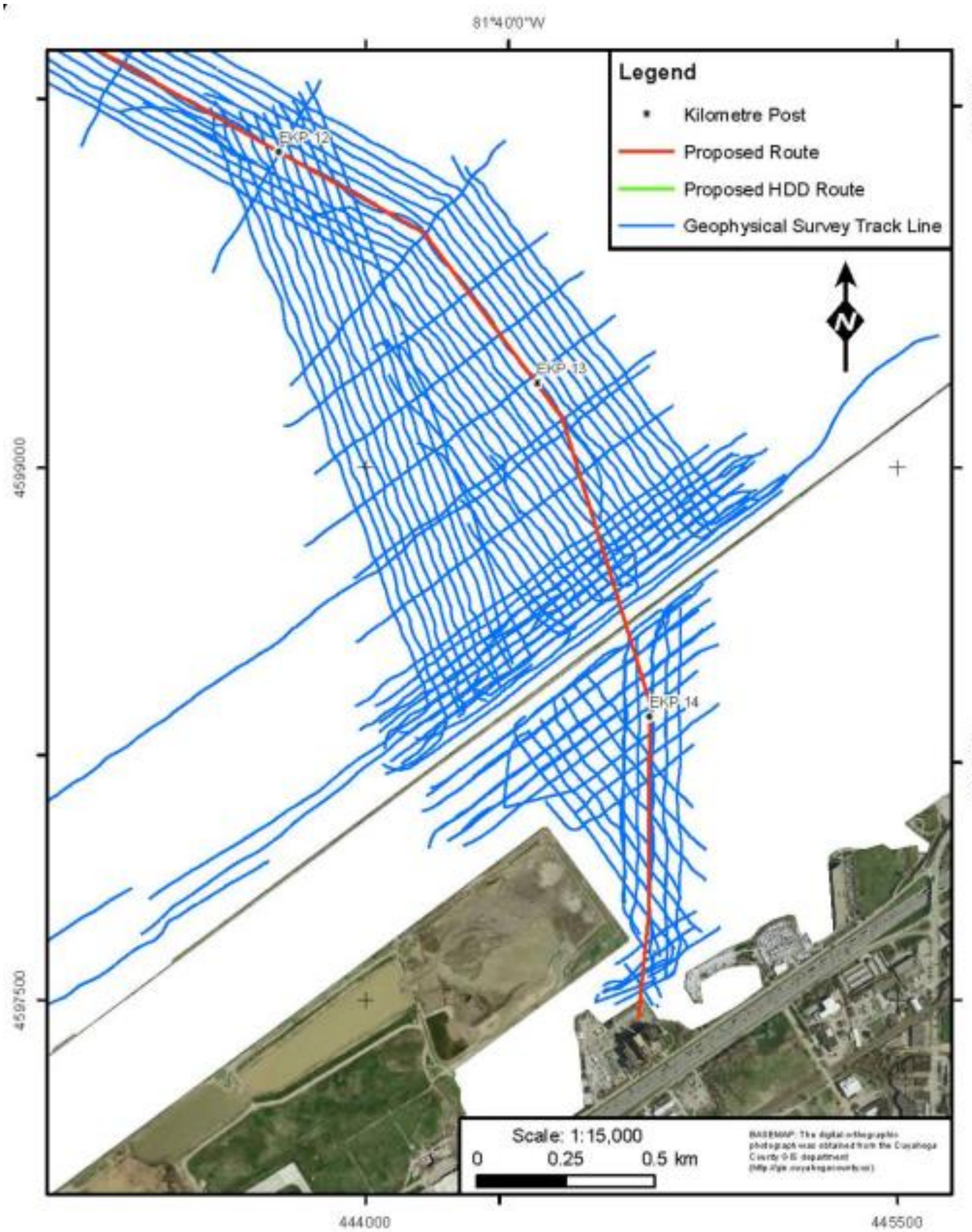

Figure 11 Geophysical survey track lines within the Harbor and over the near shore HDD exit Location. (CSR)

4.2.4 Locational Data:

Note: Locational data in decimal degrees, WGS84 geodetic and UTM, NAD27, Zone 17, M

Table 1 Wind Turbine Generator Locations:

ICE1	N41.60072 W81.80055
	433273.438E 4605537.801N
ICE2	N41.60616 W81.80602
	432823.244E 4606146.037N
ICE3	N41.61159 W81.81150
	432372.284E 4606753.200N
ICE4	N41.61702 W81.81697
	431922.235E 4607360.384N
ICE5	N41.62246 W81.82245
	431471.440E 4607968.716N
ICE6	N41.62789 W81.82793
	431020.712E 4608575.966N
ICE7	N41.63333 W81.83340 (Backup site)
	430570.906E 4609184.348N

4.3 Field Methods (CSR, 2016)

The following section describes the methodologies and equipment used to perform the data collection task required for the survey. Survey design and control was based on the guide-lines developed by the Bureau of Ocean Energy Management (BOEM) set forth in NTL No. 2005-G07.

4.3.1 Vessel

The Survey operations were conducted from Underwater Marine Contractors Inc. vessel *Salvage Chief* (Figure 12). The *Salvage Chief* is steel constructed, with an overall length of 49ft. The *Salvage Chief* had ample deck space with a knuckle boom and an extendable hydraulic A-frame, ideal for mounting winches and the deployment/recovery of geophysical equipment. CSR installed over-the-side mounts for dual frequency single beam and multibeam transducers on the starboard side of the Salvage Chief. Electronic equipment and data collection workstations were set up in the vessel's wheelhouse (CSR, 2016).

Figure 12 Salvage Chief (CSR)

4.3.2 Survey Reference

Horizontal positioning was calculated using Differential Global Positioning System (DGPS). The primary Coast Guard differential corrections were acquired from the Detroit, MI reference station. The geodetic parameters for the survey were as follows (CSR, 2016):

- Vertical Datum: Lake Erie Chart Datum (173.5 m or 569.2 ft. above IGLD 1985)
- Horizontal Datum: NAD83
- Projection: Universal Transverse Mercator, Zone 17
- Central Meridian 81°W

- False Easting: 500000.00
- False Northing: 0.000000
- Scale Factor: 0.999600
- Latitude of Origin: 0.0
- Linear Unit: Meter

4.3.3 Navigation Control

A real-time DGPS system was utilized during the geophysical survey. CSR's integrated navigation system consisted of a Hemisphere VS-330 DGPS system and the Hypack survey navigation package. The integrated navigation system included real time digital data logging of positional data, a left/right steering monitor for the helmsman, and an interface to the geophysical equipment so that all data was correctly geo-referenced (CSR, 2016).

- **Hemisphere VS-330 GNSS Receiver & Heading System**

The Hemisphere VS-330 is a dual antenna DGPS system with a horizontal accuracy of 0.3 m (1 foot) under ideal conditions. The secondary antenna (forward) is used to calculate heading to an accuracy of 0.09° RMS. The system was configured to receive Coast Guard differential corrections from Detroit, MI, which operates on a transmission frequency 319 kHz. Positions for the multibeam bathymetry were calculated based on the offset from the primary Hemisphere DGPS antenna, to the multibeam transducer (CSR, 2016).

- **Hemisphere R110 DGPS**

The Hemisphere R100 DGPS system was used in tandem with the Hemisphere VS-330 during the geophysical survey operations. The system was configured to receive Coast Guard differential corrections from Detroit, MI. The Hemisphere R100 is a single antenna GPS system with a horizontal accuracy of 0.6 m (2 feet) under ideal conditions (CSR, 2016).

Positions for the single beam bathymetry were calculated based on the offset from the Hemisphere R110 DGPS antenna to the transducer. Hemisphere R110 DGPS positioning combined with vessel heading and offset measurements were also used to georeference the sidescan sonar, chirp, and magnetometer data collected during the survey. Cable out measurements were recorded by the operator during the survey for each line with layback corrections applied during processing and interpretation (CSR, 2016).

- **Hypack/Hysweep Survey Acquisition Software**

Hypack is a complete hydrographic survey navigation software package that includes: survey preparation, data collection, data editing, cross-section display, geodesy and exporting capabilities. In operational survey mode, the system supports a helmsman display with survey line indicator, to assure survey lines are followed as accurately as possible. In addition to planned survey grid lines, the survey screen also displays bathymetric contours, coastline, navigational hazards, and target/sample locations. During survey operations all navigation information was logged in Hypack to ensure simultaneous geo-referencing of all datasets (CSR, 2016).

4.3.4 Survey Equipment

- **SURVEY NAVIGATION**
  - Hemisphere VS-330 GNSS Receiver & Heading System
  - Hemisphere R110 DGPS Receiver
  - HYPACK Survey Navigation Software
- **MULTIBEAM ECHOSOUNDER**
  - Teledyne-Odom ES3 Multibeam Echosounder (240 kHz)
  - Teledyne-TSS DMS-05 Motion Sensor
  - Teledyne-Odom DigiBar-Pro Velocimeter
  - Applied Microsystems SVPlus
  - HYSWEEP Multibeam Acquisition System
- **SINGLE BEAM ECHOSOUNDER**
  - Odom CV3 Dual Frequency Echosounder (50/200 kHz)

- **SIDESCAN SONAR**
    - Klein 3000 (100/500 kHz) Sidescan Sonar System
    - SonarPro Sidescan Acquisition Software
- **MAGNETOMETER**
    - Marine Magnetics SeaSPY Marine Magnetometer
- **SUB-BOTTOM PROFILER**
    - Klein 3000 Chirp Profiler (2-8 kHz)
- **SEISMIC REFLECTION**
    - EG&G 240 Low Frequency (400-14,000 Hz) Shallow Seismic System (Boomer)
    - Applied Acoustics CSP-300 Power Supply
    - Ministreamer with GeoSpectrum M5 Hydrophones
    - SonarWiz SBP Acquisition & Processing Software
- **TIDE GAUGE**
    - HOBOware U20 Titanium Water Level Data Logger
    - **SAMPLING**
- Van Veen Grab Sampler

4.3.5 Side Scan Sonar Survey

A Klein 3000 dual frequency sidescan system was used to complete the seabed imaging component of the Icebreaker Wind cable route assessment. The Klein 3000 consisted of a sonar instrumented towfish, a transceiver and processing unit (TPU) and an acquisition computer running Klein's proprietary Sonar Pro software. Capable of simultaneous dual frequency operation (100/500 kHz) and constructed with advanced electronics and transducers, the Klein 3000 produced superior high resolution imagery of the seafloor. High frequency (500 kHz) ranges of between 75 and 100 m on both the port and starboard channels allowed for wide area swath coverage and target detection over the route.

Frequency: 500 kHz

Range Setting: 75 m and 100 m range

Target Resolution: 10-20 cm in ideal conditions

Lane Size: 27 m

Tow Height: 5 to 6 m above the lake bottom

Rationale: 100% seafloor coverage; target detection & surficial geology mapping

During the 2016 geophysical survey, the sidescan system was integrated with the Klein 3000 chirp profiler and marine magnetometer. When the sidescan system is integrated with the chirp profiler only one frequency can be recorded. For this survey the higher 500 kHz frequency was acquired.

Calculated layback measurements were used to position the sidescan sonar system during interpretation and mapping of the data. Layback is calculated using the offset between the DGPS antenna and tow point, the height of the tow above the water line, the depth of the system below the surface, and the length of cable deployed. Where possible, feature matching between the sidescan, sub-bottom profiler and multibeam data was used to confirm layback calculations.

SonarPro was used to operate the Klein 3000 sidescan sonar and chirp systems. The system provides navigational recording, target management, and real-time display of the sidescan data. SonarPro also provides the options to adjust the towfish sensors during data acquisition, including range and transmit power, which is directly recorded with the raw data. The target management feature enabled the selection of seabed targets in both real-time and during playback following collection. The sidescan and chirp data were recorded to XTF format (CSR, 2016).

4.3.6 Magnetic Survey

A Marine Magnetics SeaSpy Magnetometer was used for the survey. The SeaSpy is a digital marine magnetometer that operates using an advanced Overhauser sensor. Measuring the ambient magnetic field, using a specialized branch of magnetic resonance technology, the SeaSpy has an absolute accuracy of 0.2 Nanotesla (nT). The sensor is capable of measuring a range of 18,000 nT to 120,000 nT in all directions, resulting in no dead zones and reliable data.

During the 2016 geophysical survey, the marine magnetometer was integrated with the Klein 3000 system (CSR, 2016).

4.3.7 Sub-bottom Mapping System

Sub-bottom geophysical data was acquired using two systems, a chirp profiler and a single channel seismic system (CSR, 2016).

The Klein system uses two Chirp transmit transducers with a single linear hydrophone. The Mills Cross configuration achieves higher resolution and deeper bottom penetration than comparable systems. The Klein 3000 chirp sub-bottom profiler (SBP) integrates with the Klein 3000 sidescan system. It mounts directly to the Klein 3000 tow vehicle and uses the existing physical connections and electrical communications. This option takes advantage of the existing Klein 3000 sidescan hardware by using the same tow cable, transceiver processor unit (TPU), workstation and towing systems. The chirp sub-bottom profiler consists of a subsea assembly used to contain the transmit projectors, receive hydrophone and SBP electronics. These components are enclosed in a fiberglass shroud with an integrated support structure to allow for combined transducer/electronics mounting and towing. The Klein 3000 tow vehicle installs into the rear portion of the shroud assembly where it interconnects with the SBP electronics. The amplifier modulates both amplitude and phase of the transmit waveform for pulse lengths up to 40 msec.

Specifications:

Chirp Frequency: 2-8 kHz

Beam Angle: 20° along track; 40° cross track @ 5 kHz

Resolution: 12.5 cm or better

Power: 1 kwatt

Source Level: 204 db @ 1 m

CSR has achieved penetration of up to 100 m (330 feet) with this system in fine grained sediments. During this survey the maximum penetration achieved was 15 to 20 m (49 to 66 feet) within post glacial and glacial fine grained sediments. The chirp signal was impeded in areas where shallow gas and coarse grained glacial sediments occurred.

Additional survey data were collected using a single channel seismic (Boomer) system. This system provides low frequency energy in the range of 400-10,000 Hz and includes four main components (boomer plate, power supply, hydrophone, and acquisition computer). The energy source for the system was the Applied Acoustics CSP-300 which has output settings ranging from 50-300 joules. The CSP supplied power to the boomer plate, which was towed in conjunction with a low frequency hydrophone streamer. The boomer plate was responsible for transmitting the sound energy through the water column and lakebed sediments. The hydrophone streamer received the reflected sound energy, transmitting the signal to the topside recording computer.

The raw and processed acoustic signal was recorded on a topside computer running SonarWiz acquisition software. DGPS positioning information was integrated with the data in real-time and recorded by SonarWiz in seismic data SEG-Y format. Acoustic frequency filters applied to the data in real time using SonarWiz were not recorded to the raw data. The frequency filters essentially “cleaned” the data allowing for better visualization and interpretation of the sub-surface sediments. Low- Cut (400 Hz) and High-Cut (4000 Hz) frequency filters were applied to the data in real time using the SPA-3 processing unit. This data was recorded to a second channel within the SGY file. In addition to filter processing, the SPA-3 unit (IKB Technologies Ltd) also controlled the firing rate of the boomer system.

During this survey the energy source was operated at an output level of 100, 200, and 300 joules with a firing rate of 1/4 second (100 joules) and 3/8 second (200 & 300 joules). The record length was synced to the firing rate within SonarWiz.

CSR has achieved penetration of greater than 100 m (330 feet) with this system in fine to coarse grained sediments. During this survey the maximum penetration achieved was 50 to 60 m (165 to 198 feet) within post glacial and glacial sediments over the HDD survey area. The boomer signal was impeded in areas where shallow gas and acoustic basement (interpreted to be bedrock) occurred.

4.3.8 Personnel

Party Chief	Colin Toole, CSR
Hydrographic Surveyor	Luke Melanson, CSR
Electronics Technician	Jon MacDonald, CSR
Vessel Captain	Joel Frazer, Underwater Marine

5.0 DATA ANALYSIS

5.1 Sidescan Sonar Data Analysis

A review of 271 line km of sidescan data showed no historic structures (such as shipwrecks) or artifacts were present within the turbine (Figure 13) and export cable (Figure 14) survey areas. (Note: For full size images see appendices)

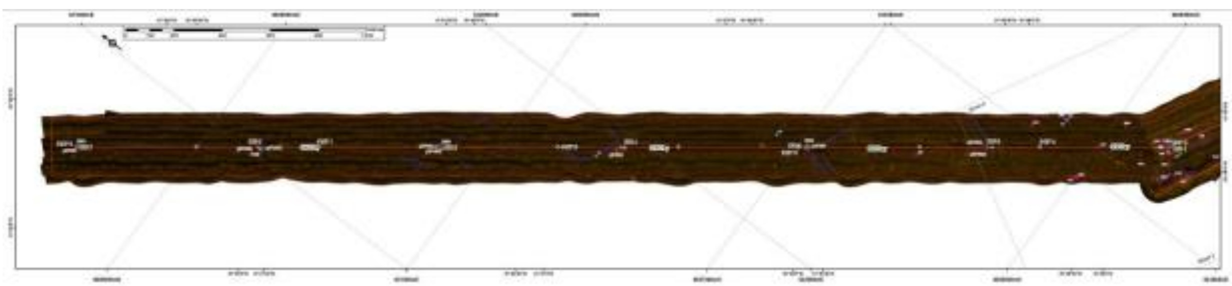

Figure 13 Turbine Survey Area Sidescan Mosaic. (CSR)

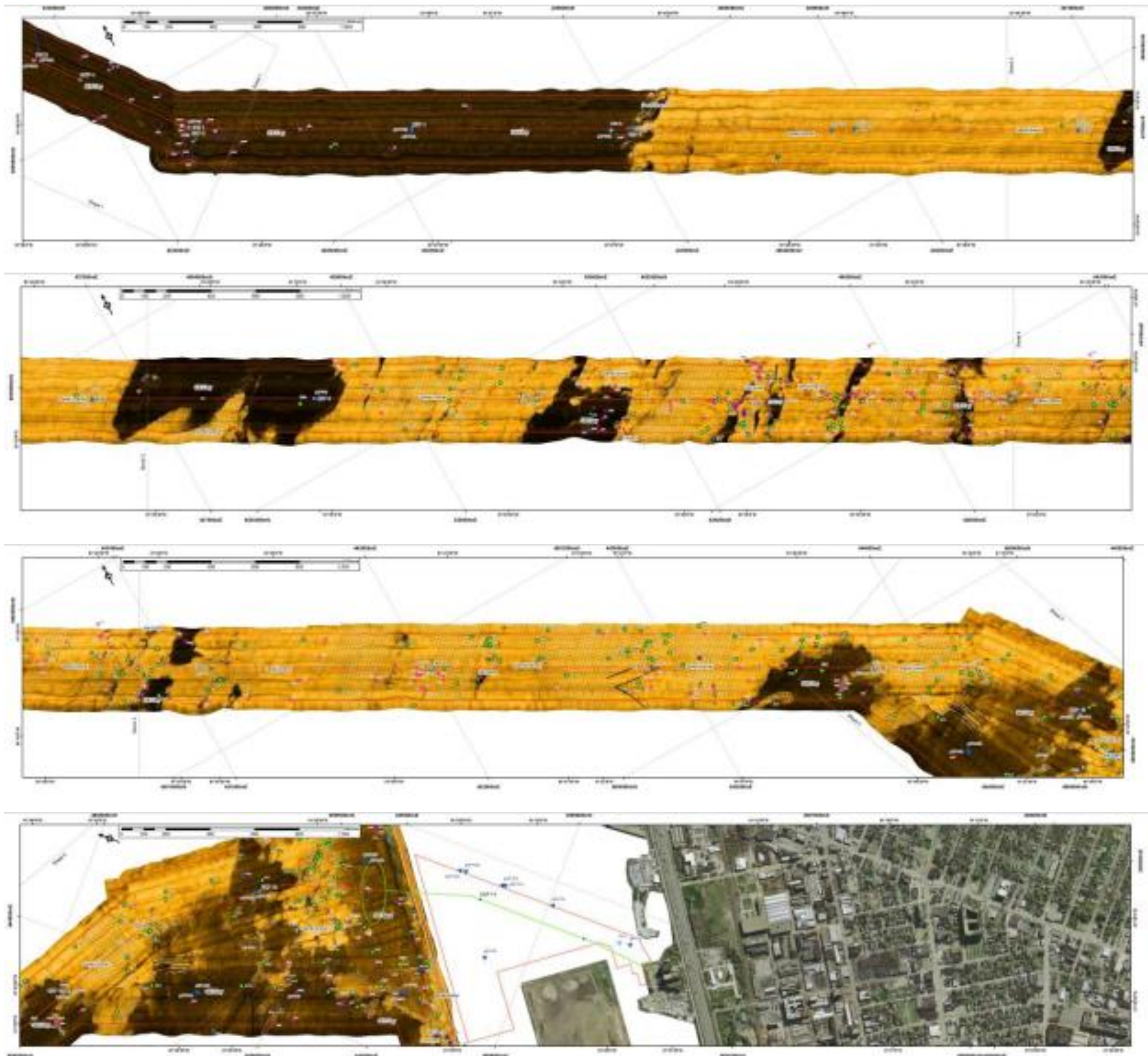

Figure 14 Export Cable Survey Area Sidescan Mosaic (CSR)

The Side Scan Sonar showed a generally uniform and smooth lake bottom. Some evidence of ripples or other sedimentary features were observed along the survey route (Figure 15) and some areas of the bottom revealed enhanced reflectivity denoting a change in geological structure (Figure 16). These locations were assigned a target number, and corresponding imagery and information can be found in Appendix A.

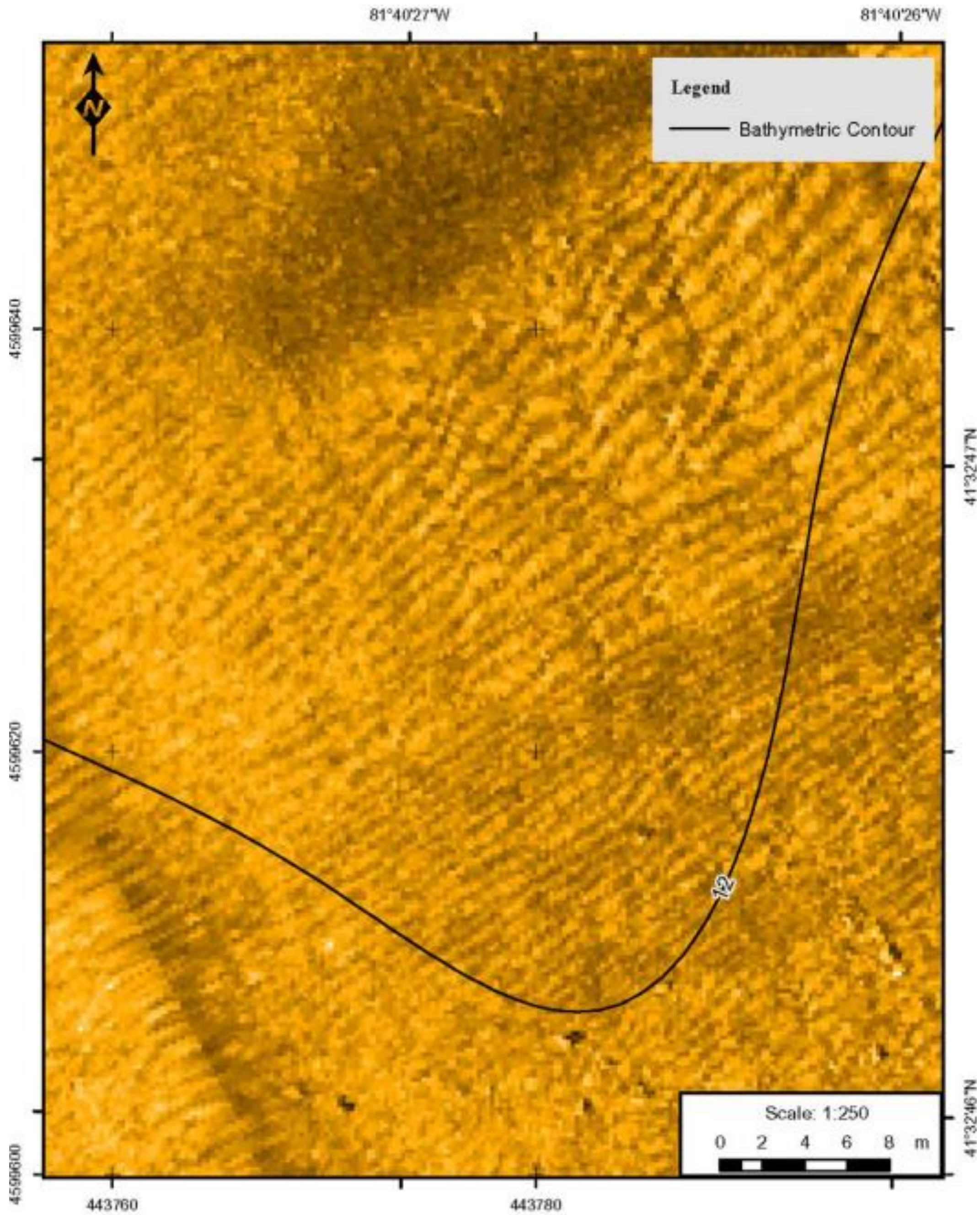

Figure 15 Sediment Rippling along Export Cable Route (CSR)

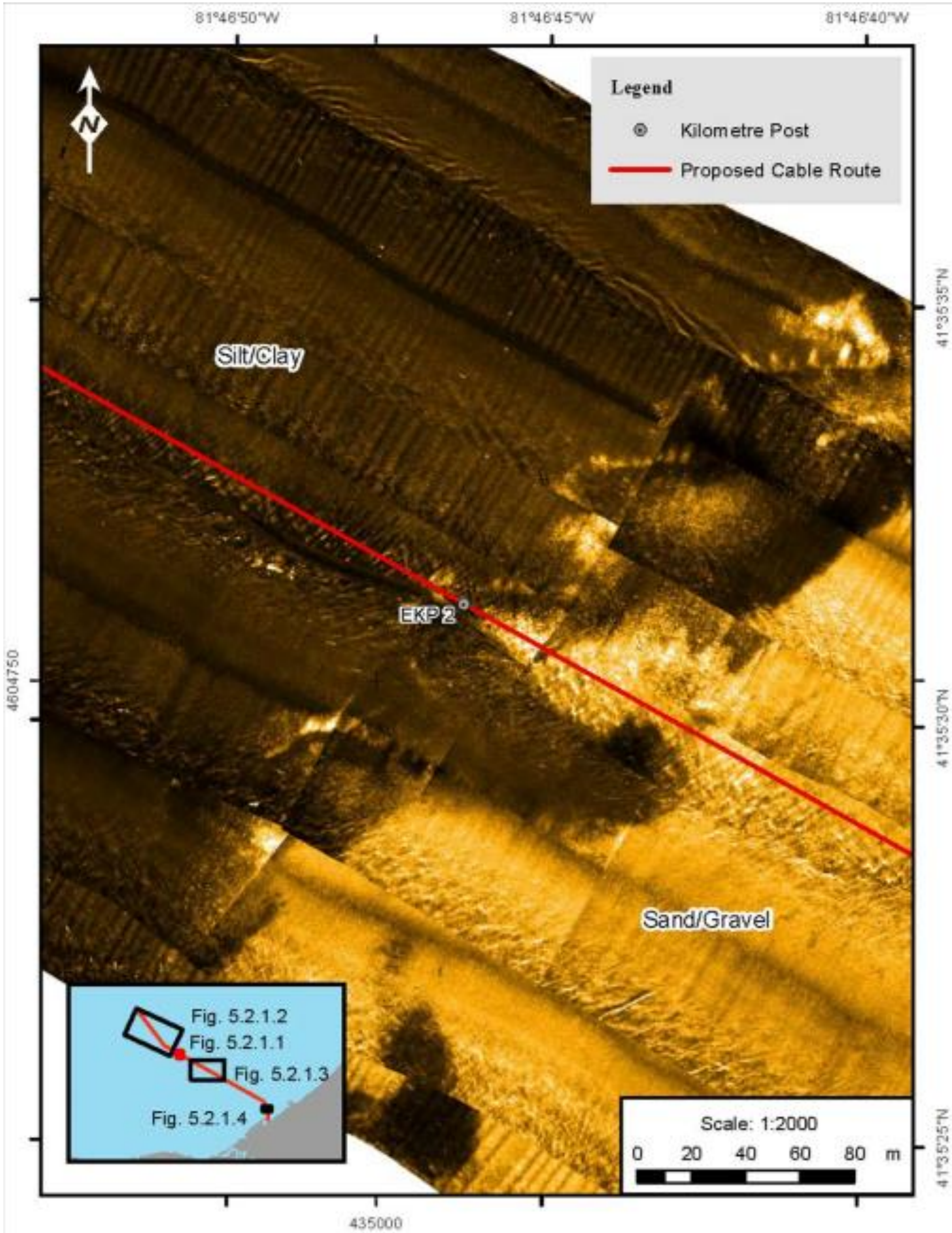

Figure 16 Sidescan Sonar Data Illustrating the Surficial Boundary between the Cleveland Ridge Sand/Gravel and Post Glacial Silt/Clay, EKP 2. (CSR)

The only targets identified were geological or the result of old trash dumpings (rectangular, circular, and linear contacts) and dredge spoil (circular contacts) in the survey areas (Figure 17). A total of 455 identified targets were analyzed and the detailed description of the targets can be found in Table 2 (Locational data in NAD83 Geographic, NAD83, Zone 17, M, and NAD83, Ohio State Plane North, US Survey Feet). See Appendix A for complete target data with images. There are a number of targets that may indicate the presence of a linear ferrous feature perpendicular to the proposed route. This feature could not be identified from the sidescan or sub-bottom profiler data acquired over this area. An analysis of the magnetic data shows that these targets are most likely buried steel or iron buoy blocks or anchors.

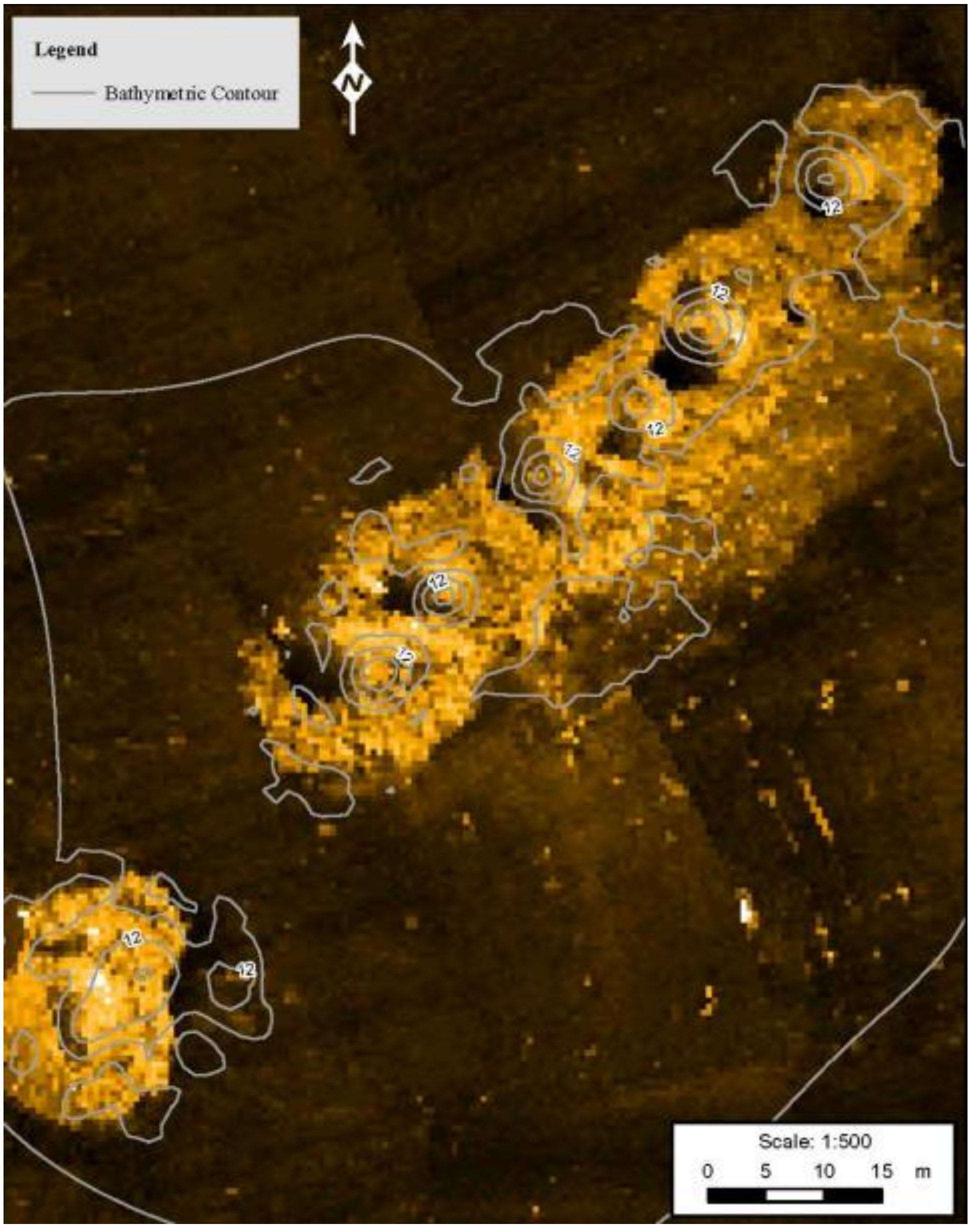

Figure 17 Sidescan Sonar Record of Dredge Spoil. Center of Data Example is Located 150 m E of EKP 12. (CSR)

Table 2 Sidescan Sonar Contacts List

Sidescan Sonar Contacts													
	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North								
ID	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)	Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
C1	41.6176293	-81.8181120	431841.5	4607606.7	2154951.3	711527.0	17.8	36.5	2.6	0.5	0.2	Linear Contact	-
C2	41.6170757	-81.8170325	431930.9	4607584.3	2155248.0	711327.6	17.7	0.9	30.0	0.2	-	Linear Contact	-
C3	41.6127124	-81.8118483	432358.2	4607095.8	2156678.1	709748.8	17.6	51.6	2.5	1.0	-	Point Source (Probable Buoy Mooring)	-
C4	41.6114662	-81.8115284	432383.6	4606957.2	2156769.2	709295.9	17.5	10.6	7.4	7.0	-	Circular Contact (Probable Buoy Mooring)	-
C5	41.6061141	-81.8060026	432838.4	4606358.7	2158295.7	707357.9	17.3	1.6	3.9	3.5	-	Circular Contact	-
C6	41.6044110	-81.8026013	433120.1	4606167.0	2159230.9	706744.1	17.2	110.5	2.2	1.2	0.6	Point Source	M84
C7	41.6043767	-81.8025480	433124.5	4606163.1	2159245.5	706731.8	17.2	111.8	1.8	0.8	0.6	Point Source	-
C8	41.6006765	-81.8006100	433282.2	4605750.8	2159786.4	705387.8	17.1	7.2	5.5	5.5	-	Circular Contact (Probable Buoy Mooring)	M49, M50
C9	41.6002432	-81.8004922	433291.6	4605702.6	2159819.9	705230.1	17.1	44.3	3.0	1.5	0.1	Rectangular Contact	-
C10	41.5975261	-81.7942784	433806.4	4605374.0	2161527.9	704180.9	16.9	79.4	3.0	1.8	-	Linear Contact	-
C11	41.5905543	-81.7802254	434970.8	4604611.5	2165392.0	701744.9	-	175.5	3.2	0.3	0.2	Linear Contact	-
C12	41.5882561	-81.7759918	435588.1	4604351.2	2167268.2	700923.0	16.0	125.3	3.5	2.4	-	Rectangular Contact	-
C13	41.5838214	-81.7591219	436723.1	4603848.3	2171185.5	699340.0	15.8	15.1	5.7	0.9	0.2	Linear Contact	-
C14	41.5831114	-81.7552133	437048.2	4603766.6	2172256.9	699090.4	16.4	102.8	19.5	8.6	-	Circular Contact (Possible Dredge Spoil)	-
C15	41.5801031	-81.7460855	437807.9	4603426.2	2174769.0	698016.3	-	177.1	3.9	2.4	-	Low Reflectivity Patch (Possible Slag)	-
C16	41.5785477	-81.7451360	437883.9	4603252.6	2175028.2	697451.3	15.9	62.8	8.1	1.4	0.6	Low Reflectivity Patch (Possible Slag)	-
C17	41.5794293	-81.7450774	437889.6	4603350.5	2175041.4	697772.6	15.9	150.9	11.0	0.4	0.0	Linear Contact	-
C18	41.5782767	-81.7449797	437896.6	4603222.2	2175071.8	697352.2	15.8	42.5	6.7	1.5	0.5	Low Reflectivity Patch (Possible Slag)	-
C19	41.5780199	-81.7445240	437934.6	4603193.6	2175197.3	697260.4	15.8	36.0	6.3	0.5	-	Linear Contact	-
C20	41.5761775	-81.7444257	437940.8	4602989.0	2175230.0	696589.3	15.7	130.4	3.2	0.2	-	Linear Contact	-
C21	41.5753894	-81.7432666	438036.7	4602900.7	2175549.6	696304.9	0.0	169.6	0.8	0.5	0.1	Circular Contact (Probable Tire)	-
C22	41.5749766	-81.7419717	438144.3	4602853.9	2175905.2	696157.6	15.7	157.8	2.7	0.7	0.5	Point Source	-
C23	41.5763451	-81.7416041	438176.2	4603005.8	2176001.5	696657.1	15.8	9.9	3.9	0.5	-	Linear Contact	-
C24	41.5767962	-81.7412561	438205.6	4603048.7	2176095.4	696800.4	15.8	42.1	9.2	0.2	0.1	Linear Contact	-
C25	41.5776837	-81.7410623	438222.6	4603149.4	2176145.6	697131.6	15.7	138.2	2.6	0.5	0.1	Linear Contact	-
C26	41.5764126	-81.7407087	438250.9	4603012.4	2176246.2	696683.8	15.8	32.6	2.0	0.8	0.4	Low Reflectivity Patch (Possible Slag)	-
C27	41.5769110	-81.7405391	438265.5	4603067.6	2176291.0	696865.8	15.8	87.9	8.1	0.4	-	Linear Contact	-
C28	41.5748967	-81.7404957	438267.2	4602837.3	2176309.5	696110.1	15.7	112.2	2.8	0.6	0.1	Linear Contact	-
C29	41.5771813	-81.7402303	438291.5	4603097.4	2176374.7	696965.1	15.7	128.6	7.7	0.4	0.2	Linear Contact	-
C30	41.5759815	-81.7387384	438415.2	4602963.2	2176788.0	696581.5	15.7	69.9	9.4	0.8	-	Linear Contact	-
C31	41.5764743	-81.7382432	438456.6	4603017.5	2176920.9	696712.2	15.7	137.6	11.1	0.3	0.1	Linear Contact	-
C32	41.5756655	-81.7376941	438501.5	4602927.3	2177073.4	696418.8	15.7	80.8	2.2	1.1	-	Low Reflectivity Patch (Possible Slag)	-
C33	41.5726019	-81.7357889	438657.4	4602585.9	2177604.4	695307.1	15.4	140.8	4.9	1.4	-	Circular Contact	-
C34	41.5727777	-81.7355758	438675.4	4602605.2	2177662.2	695371.7	15.4	115.2	2.4	2.2	0.7	Circular Contact (Probable Dredge Spoil)	-
C35	41.5731210	-81.7352714	438701.1	4602643.1	2177744.4	695497.5	15.4	69.6	6.0	5.4	-	Rectangular Contact	-
C36	41.5746357	-81.7351299	438714.3	4602811.2	2177778.2	696049.7	15.6	85.5	1.9	1.1	-	Low Reflectivity Patch (Possible Slag)	-
C37	41.5742500	-81.7351027	438716.2	4602768.3	2177786.9	695909.3	15.6	47.1	2.1	1.5	-	Circular Contact	-
C38	41.5745852	-81.7350109	438724.2	4602805.5	2177811.0	696031.6	15.6	85.4	4.5	2.9	-	Low Reflectivity Patch (Possible Slag)	-
C39	41.5732856	-81.7349705	438726.3	4602661.2	2177826.2	695558.2	15.4	41.5	4.5	3.1	-	Low Reflectivity Patch (Possible Slag)	-
C40	41.5720940	-81.7341911	438790.2	4602528.3	2178043.2	695125.9	15.3	126.2	7.0	5.6	-	Low Reflectivity Patch (Possible Slag)	-
C41	41.5748022	-81.7341269	438798.1	4602828.9	2178052.1	696112.8	15.6	140.0	2.6	1.3	0.8	Point Source (Probable Boulder)	-
C42	41.5717875	-81.7340730	438799.7	4602494.2	2178076.5	695014.5	15.2	151.3	7.3	5.4	-	Low Reflectivity Patch (Possible Slag)	-
C43	41.5719459	-81.7340659	438800.7	4602511.8	2178078.5	695072.2	15.3	135.5	3.7	3.1	-	Low Reflectivity Patch (Possible Slag)	-
C44	41.5721798	-81.7336485	438835.5	4602537.5	2178191.4	695158.5	15.3	96.8	17.9	17.4	-	Low Reflectivity Patch (Possible Slag)	-
C45	41.5722820	-81.7332410	438869.6	4602548.5	2178302.6	695196.7	15.2	69.7	4.0	0.4	0.1	Linear Contact	-
C46	41.5729978	-81.7330702	438884.5	4602627.9	2178347.0	695457.8	15.4	6.8	2.0	0.4	0.5	Point Source (Probable Boulder)	-
C47	41.5727938	-81.7330514	438885.9	4602605.4	2178352.8	695384.3	15.5	12.1	1.3	1.0	0.5	Point Source (Probable Boulder)	-
C48	41.5726638	-81.7321082	438964.4	4602590.1	2178611.3	695338.5	15.3	12.9	1.2	0.9	0.7	Point Source (Probable Boulder)	-
C49	41.5726909	-81.7312521	439035.8	4602592.5	2178845.5	695350.5	15.3	49.9	2.8	1.2	0.3	Low Reflectivity Patch (Possible Slag)	-
C50	41.5719909	-81.7311854	439040.7	4602514.7	2178866.0	695093.6	15.2	15.6	4.4	2.2	-	Low Reflectivity Patch (Possible Slag)	-
C51	41.5717612	-81.7305695	439091.8	4602488.8	2179035.2	695013.4	15.2	13.2	3.9	0.5	0.3	Linear Contact	-
C52	41.5702938	-81.7305075	439095.6	4602326.1	2179056.9	694479.6	15.5	155.3	3.6	0.5	0.0	Linear Contact	-
C53	41.5703116	-81.7300963	439129.9	4602327.5	2179169.4	694486.3	15.3	135.3	3.6	0.6	-	Linear Contact	-
C54	41.5697973	-81.7300883	439130.1	4602270.4	2179173.2	694298.9	-	185.0	13.8	6.7	-	Unknown Contact	-
C55	41.5711445	-81.7291570	439209.0	4602419.4	2179423.7	694792.1	15.3	16.5	4.0	1.7	-	Low Reflectivity Patch (Possible Slag)	-
C56	41.5711069	-81.7291492	439209.6	4602415.2	2179426.0	694778.4	15.3	19.9	2.5	1.6	-	Low Reflectivity Patch (Possible Slag)	-
C57	41.5711870	-81.7291293	439211.3	4602424.1	2179431.2	694807.6	15.3	11.3	1.7	2.3	-	Low Reflectivity Patch (Possible Slag)	-
C58	41.5710575	-81.7290973	439213.9	4602409.6	2179440.3	694760.5	15.3	22.6	2.1	1.7	-	Low Reflectivity Patch (Possible Slag)	-
C59	41.5712076	-81.7290676	439216.5	4602426.3	2179448.0	694815.3	15.3	6.8	6.1	3.6	-	Low Reflectivity Patch (Possible Slag)	-
C60	41.5711550	-81.7287678	439239.8	4602420.3	2179524.7	694796.8	15.3	0.7	3.1	0.6	0.2	Linear Contact	-
C61	41.5698265	-81.7284150	439269.6	4602272.5	2179630.8	694313.6	15.2	115.0	4.1	0.4	0.1	Linear Contact	-
C62	41.5706782	-81.7284075	439271.0	4602367.1	2179630.3	694624.0	15.2	31.8	4.2	1.2	0.4	Linear Contact	-
C63	41.5695022	-81.7283251	439276.8	4602214.2	2179657.8	694122.8	15.2	162.4	3.3	0.6	0.3	Linear Contact	M92
C64	41.5696733	-81.7283218	439277.2	4602255.4	2179657.0	694258.0	15.2	125.6	1.5	0.5	0.1	Linear Contact	-
C65	41.5706138	-81.7282603	439283.3	4602359.8	2179670.6	694600.9	15.2	32.2	3.4	1.0	-	Low Reflectivity Patch (Possible Slag)	-
C66	41.5698118	-81.7282402	439284.2	4602270.8	2179678.9	694308.7	15.2	109.4	1.9	0.5	-	Linear Contact	-
C67	41.5711946	-81.7282318	439286.2	4602424.3	2179676.7	694812.6	15.3	25.5	3.3	0.8	0.4	Linear Contact	-
C68	41.5707963	-81.7282010	439288.3	4602373.4	2179686.6	694645.6	15.2	17.9	5.2	1.5	-	Low Reflectivity Patch (Possible Slag)	-
C69	41.5706172	-81.7281394	439293.3	4602360.1	2179703.8	694602.4	15.2	27.0	8.5	3.5	-	Low Reflectivity Patch (Possible Slag)	-

Sidescan Sonar Contacts													
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)							
C70	41.5705225	-81.7280796	439298.2	4602349.5	2179710.5	694568.0	15.2	33.8	3.8	0.7	-	Low Reflectivity Patch (Possible Slag)	-
C71	41.5701074	-81.7280231	439302.6	4602303.4	2179737.3	694416.9	15.2	72.0	4.2	2.8	0.1	Circular Contact	-
C72	41.5705831	-81.7280016	439304.8	4602356.2	2179741.7	694590.3	15.2	24.8	2.6	2.1	-	Low Reflectivity Patch (Possible Slag)	-
C73	41.5701562	-81.7279966	439304.8	4602308.8	2179744.4	694434.8	15.2	66.1	4.2	1.8	-	Circular Contact	-
C74	41.5702992	-81.7279354	439310.0	4602324.7	2179760.7	694487.0	15.2	49.8	2.5	1.6	-	Low Reflectivity Patch (Possible Slag)	-
C75	41.5703090	-81.7278572	439316.6	4602325.2	2179782.1	694489.5	15.2	46.1	5.0	1.5	-	Low Reflectivity Patch (Possible Slag)	-
C76	41.5702668	-81.7278261	439319.1	4602321.0	2179790.7	694475.5	15.2	48.5	4.2	1.8	-	Low Reflectivity Patch (Possible Slag)	-
C77	41.5723950	-81.7277941	439323.8	4602567.2	2179792.6	695251.0	15.2	159.9	2.8	1.6	-	Low Reflectivity Patch (Possible Slag)	-
C78	41.5691421	-81.7270113	439386.0	4602195.5	2180017.3	694067.7	15.1	125.3	3.3	0.4	0.0	Linear Contact	-
C79	41.5694892	-81.7267636	439407.0	4602233.9	2180083.9	694194.7	15.1	81.6	1.8	1.1	-	Circular Contact	-
C80	41.5719450	-81.7264907	439432.0	4602506.4	2180150.7	695090.2	-	168.4	3.1	3.0	-	Circular Contact	-
C81	41.5718742	-81.7263764	439441.5	4602498.4	2180182.2	695064.7	15.3	166.1	7.2	4.1	-	Low Reflectivity Patch (Possible Slag)	-
C82	41.5710858	-81.7263525	439442.7	4602410.9	2180191.3	694777.5	15.3	90.3	3.0	0.6	0.1	Linear Contact	M113, M214
C83	41.5717858	-81.7262595	439451.2	4602488.5	2180214.5	695032.7	15.5	162.2	9.1	2.5	-	Low Reflectivity Patch (Possible Slag)	M82
C84	41.5707448	-81.7261001	439463.5	4602372.8	2180261.4	694653.7	15.2	67.2	2.8	1.8	0.6	Point Source (Probable Boulder)	-
C85	41.5714122	-81.7260088	439471.7	4602446.9	2180284.3	694897.2	15.2	135.9	13.6	4.2	-	Low Reflectivity Patch (Possible Slag)	M215
C86	41.5714945	-81.7259543	439476.3	4602456.0	2180298.9	694927.4	15.2	146.1	6.7	4.9	-	Low Reflectivity Patch (Possible Slag)	M216
C87	41.5709615	-81.7259081	439479.7	4602396.8	2180313.3	694733.3	15.2	96.1	10.1	0.5	0.1	Linear Contact	M112
C88	41.5705741	-81.7254051	439521.3	4602353.6	2180452.2	694593.3	15.2	78.5	9.5	0.5	0.2	Linear Contact	-
C89	41.5702816	-81.7252589	439533.2	4602320.8	2180493.1	694487.1	15.1	56.0	11.2	4.0	-	Low Reflectivity Patch (Possible Slag)	-
C90	41.5704508	-81.7251787	439540.0	4602339.5	2180514.5	694549.0	15.1	75.6	15.0	5.1	-	Low Reflectivity Patch (Possible Slag)	-
C91	41.5703843	-81.7251217	439544.7	4602332.1	2180530.3	694524.9	15.1	71.5	4.9	2.1	-	Low Reflectivity Patch (Possible Slag)	-
C92	41.5701703	-81.7245087	439595.6	4602307.9	2180698.7	694448.4	15.0	75.2	13.4	7.5	-	Low Reflectivity Patch (Possible Slag)	-
C93	41.5697466	-81.7244667	439598.7	4602260.6	2180711.6	694293.4	14.9	35.5	6.1	2.5	0.6	Low Reflectivity Patch (Possible Slag)	-
C94	41.5695610	-81.7244551	439599.5	4602240.3	2180715.4	694226.5	14.9	18.1	6.2	2.8	-	Low Reflectivity Patch (Possible Slag)	-
C95	41.5680934	-81.7244120	439601.7	4602077.3	2180731.9	693691.9	15.1	123.0	1.5	1.4	0.6	Point Source (Probable Boulder)	-
C96	41.5679699	-81.7243582	439606.1	4602063.5	2180747.0	693647.0	15.1	132.9	5.4	0.5	0.1	Linear Contact	-
C97	41.5679352	-81.7241984	439611.1	4602059.6	2180768.5	693634.5	15.1	133.8	4.9	0.5	0.2	Linear Contact	-
C98	41.5679791	-81.7240365	439632.9	4602084.3	2180835.0	693651.1	15.1	119.1	2.2	0.4	0.1	Linear Contact	-
C99	41.5691417	-81.7239699	439639.6	4602193.4	2180845.5	694074.9	14.9	3.3	6.6	5.9	-	Linear Contact	-
C100	41.5691421	-81.7270113	439386.0	4602195.5	2180017.3	694067.7	15.1	125.3	3.5	0.9	0.4	Linear Contact	-
C101	41.5676910	-81.7237505	439656.5	4602032.1	2180914.2	693546.9	15.0	135.6	2.5	0.4	-	Linear Contact	-
C102	41.5694327	-81.7237330	439659.6	4602225.5	2180913.4	694181.5	14.9	34.6	2.9	3.5	0.3	Low Reflectivity Patch (Possible Slag)	M155
C103	41.5679406	-81.7236402	439666.0	4602059.8	2180943.6	693638.1	15.0	106.9	4.2	0.3	-	Linear Contact	-
C104	41.5691801	-81.7235985	439670.6	4602197.4	2180951.0	694089.8	14.9	15.4	4.9	3.1	-	Low Reflectivity Patch (Possible Slag)	-
C105	41.5692913	-81.7235862	439671.7	4602209.7	2180954.0	694130.3	14.9	26.7	2.8	0.9	0.7	Point Source (Probable Boulder)	-
C106	41.5692118	-81.7234997	439678.9	4602200.8	2180977.9	694101.6	14.9	22.5	1.8	1.0	0.5	Point Source (Probable Boulder)	-
C107	41.5691607	-81.7234616	439682.0	4602195.1	2180988.5	694083.1	14.9	19.0	3.8	2.2	0.3	Low Reflectivity Patch (Possible Slag)	-
C108	41.5688718	-81.7233361	439692.2	4602163.0	2181023.8	693978.1	15.0	4.1	4.0	0.5	0.1	Linear Contact	-
C109	41.5694729	-81.7232421	439700.6	4602229.6	2181047.6	694197.4	14.9	58.2	2.1	1.0	0.2	Point Source (Probable Boulder)	-
C110	41.5684564	-81.7231088	439710.7	4602116.7	2181087.3	693827.3	15.0	35.4	3.8	0.7	0.1	Linear Contact	-
C111	41.5689415	-81.7231011	439711.8	4602170.5	2181087.9	694006.1	15.0	12.1	2.3	0.4	0.3	Linear Contact	-
C112	41.5675586	-81.7224835	439762.0	4602016.6	2181261.4	693501.7	14.8	97.6	4.6	3.0	-	Low Reflectivity Patch (Possible Slag)	-
C113	41.5686835	-81.7224107	439769.2	4602141.4	2181277.6	693911.8	15.0	14.8	3.8	1.7	-	Low Reflectivity Patch (Possible Slag)	-
C114	41.5687269	-81.7223625	439773.2	4602146.1	2181290.7	693927.5	15.0	20.9	3.8	1.1	-	Low Reflectivity Patch (Possible Slag)	-
C115	41.5681049	-81.7222909	439778.6	4602077.0	2181312.3	693701.0	14.8	36.8	2.8	0.7	1.0	Point Source (Probable Boulder)	-
C116	41.5685281	-81.7222826	439779.7	4602124.1	2181313.2	693855.4	14.9	4.8	4.6	1.9	-	Low Reflectivity Patch (Possible Slag)	-
C117	41.5687008	-81.7222544	439782.2	4602143.2	2181320.3	693918.4	14.9	22.7	7.4	3.5	0.2	Low Reflectivity Patch (Possible Slag)	-
C118	41.5682772	-81.7222051	439785.9	4602096.2	2181335.2	693764.2	14.8	16.5	3.6	1.5	0.3	Low Reflectivity Patch (Possible Slag)	-
C119	41.5683570	-81.7221252	439792.7	4602105.0	2181356.8	693793.5	14.9	5.6	9.1	5.4	-	Low Reflectivity Patch (Possible Slag)	-
C120	41.5682688	-81.7220727	439797.0	4602095.1	2181371.5	693761.5	14.8	12.0	4.1	0.6	0.2	Linear Contact	-
C121	41.5686324	-81.7220719	439797.4	4602135.5	2181370.5	693894.0	14.9	23.4	4.0	2.5	-	Low Reflectivity Patch (Possible Slag)	M156
C122	41.5696807	-81.7219585	439807.8	4602251.8	2181398.1	694276.2	14.9	129.9	12.2	10.8	-	Low Reflectivity Patch (Possible Slag)	-
C123	41.5683659	-81.7219348	439808.5	4602105.8	2181408.9	693797.2	14.8	3.0	3.2	3.1	-	Low Reflectivity Patch (Possible Slag)	-
C125	41.5684611	-81.7217073	439827.6	4602116.2	2181470.8	693832.4	14.8	21.3	1.2	1.0	1.0	Point Source (Probable Boulder)	M211
C126	41.5664987	-81.7215501	439838.9	4601898.2	2181520.2	693117.8	-	163.3	2.8	1.2	1.1	Rectangular Contact	-
C127	41.5684775	-81.7215392	439841.6	4602117.9	2181516.8	693838.7	14.8	29.7	1.5	1.5	0.5	Point Source (Probable Boulder)	-
C128	41.5678129	-81.7215361	439841.3	4602044.1	2181519.8	693596.7	14.7	34.9	1.6	1.0	0.5	Point Source (Probable Boulder)	-
C129	41.5682537	-81.7212608	439864.6	4602092.9	2181593.7	693758.0	14.8	19.1	1.3	0.4	0.5	Point Source (Probable Boulder)	M157
C130	41.5677909	-81.7207627	439905.7	4602036.7	2181731.6	693576.0	14.8	9.8	3.7	0.5	0.1	Linear Contact	-
C131	41.5661169	-81.7201661	439953.9	4601854.9	2181900.2	692982.1	14.6	144.9	4.4	2.8	-	Low Reflectivity Patch (Possible Slag)	-

Sidescan Sonar Contacts													
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)							
C132	41.5659769	-81.7201452	439955.5	4601839.3	2181906.4	692931.1	14.6	157.7	8.2	5.7	-	Low Reflectivity Patch (Possible Slag)	-
C133	41.5686979	-81.7201278	439959.5	4602141.4	2181902.3	693922.6	14.8	107.8	2.4	1.2	1.0	Rectangular Contact	-
C134	41.5676314	-81.7200550	439964.6	4602023.0	2181925.6	693534.2	14.8	7.0	2.0	0.6	0.5	Point Source (Probable Boulder)	-
C135	41.5676987	-81.7197246	439992.2	4602030.2	2182015.8	693559.5	14.9	26.8	3.7	2.1	-	Low Reflectivity Patch (Possible Slag)	-
C136	41.5675313	-81.7196271	440000.2	4602011.5	2182043.1	693498.7	14.8	14.4	2.1	1.1	0.6	Point Source (Probable Boulder)	-
C137	41.5667830	-81.7196209	440000.0	4601928.5	2182047.2	693226.1	14.6	58.2	3.7	0.9	-	Linear Contact	M192
C138	41.5676191	-81.7195825	440004.0	4602021.3	2182055.0	693530.8	14.8	24.7	6.8	4.5	-	Low Reflectivity Patch (Possible Slag)	M158
C139	41.5674205	-81.7195334	440007.9	4601999.2	2182069.1	693458.6	14.8	7.4	2.5	1.7	-	Low Reflectivity Patch (Possible Slag)	-
C140	41.5689599	-81.7194864	440013.2	4602169.6	2182076.9	694018.2	14.8	158.7	3.6	2.4	0.5	Linear Contact	-
C141	41.5668873	-81.7193049	440026.4	4601938.8	2182133.3	693264.9	14.7	35.4	2.6	0.4	-	Linear Contact	-
C142	41.5684296	-81.7191049	440044.5	4602110.9	2182183.0	693827.3	14.9	122.8	3.5	0.4	-	Linear Contact	-
C143	41.5673780	-81.7189203	440059.0	4601994.0	2182237.0	693444.6	14.8	27.8	3.4	0.6	0.1	Linear Contact	-
C144	41.5660761	-81.7183361	440106.5	4601849.1	2182401.1	692971.7	14.8	75.4	4.0	0.4	-	Linear Contact	-
C145	41.5665241	-81.7181643	440112.9	4601898.8	2182419.3	693135.1	14.8	28.9	3.0	0.3	0.3	Linear Contact	-
C146	41.5665197	-81.7181509	440122.3	4601898.2	2182450.3	693133.8	14.8	24.8	1.0	0.8	0.6	Point Source (Probable Boulder)	-
C147	41.5643673	-81.7171889	440200.5	4601658.6	2182720.6	692351.9	-	195.6	5.7	0.3	0.1	Linear Contact	-
C148	41.5663584	-81.7147141	440408.7	4601877.9	2183391.3	693083.4	14.5	97.5	3.7	0.5	-	Linear Contact	-
C149	41.5663363	-81.7139193	440475.0	4601874.9	2183608.8	693077.4	14.4	127.2	6.8	0.2	-	Linear Contact	-
C150	41.5642624	-81.7135349	440505.1	4601644.4	2183720.8	692322.6	14.2	59.1	4.0	0.9	0.3	Point Source (Probable Boulder)	-
C151	41.5654100	-81.7132571	440529.3	4601771.6	2183799.1	692741.5	14.3	63.7	2.9	0.6	0.1	Linear Contact	-
C152	41.5654492	-81.7120650	440628.8	4601775.2	2184119.2	692758.7	14.4	115.4	10.6	3.1	-	Low Reflectivity Patch (Possible Slag)	-
C153	41.5652723	-81.7120203	440632.3	4601755.5	2184132.0	692694.4	14.4	100.0	1.6	1.5	0.9	Point Source (Probable Boulder)	-
C154	41.5650956	-81.7119548	440637.6	4601735.8	2184150.5	692630.1	14.4	85.4	1.4	0.8	0.7	Point Source (Probable Boulder)	-
C155	41.5622040	-81.7115199	440687.9	4601414.4	2184333.8	691578.1	-	170.5	2.4	0.6	0.2	Linear Contact	-
C156	41.5636074	-81.7112257	440697.1	4601570.1	2184354.9	692089.7	14.5	30.1	3.8	0.3	-	Linear Contact	-
C157	41.5645572	-81.7111407	440705.0	4601675.5	2184375.0	692436.0	14.5	65.7	8.0	0.5	0.1	Linear Contact	-
C158	41.5621918	-81.7108161	440729.9	4601412.6	2184471.7	691574.7	14.4	151.5	17.8	0.4	0.3	Linear Contact	-
C159	41.5633610	-81.7104062	440765.2	4601542.2	2184580.0	692001.9	14.4	21.2	4.9	0.5	0.1	Linear Contact	-
C160	41.5632394	-81.7102922	440774.6	4601528.6	2184611.6	691957.9	14.4	28.5	5.2	0.4	0.1	Linear Contact	-
C161	41.5632090	-81.7101770	440784.2	4601525.2	2184643.2	691947.1	14.4	26.8	2.9	0.4	-	Linear Contact	-
C162	41.5641429	-81.7101760	440785.1	4601628.8	2184640.4	692287.4	14.5	64.1	8.3	4.0	0.3	Low Reflectivity Patch (Possible Slag)	-
C163	41.5636117	-81.7101548	440786.4	4601569.8	2184648.0	692093.9	14.4	13.5	1.2	1.1	0.6	Point Source (Probable Boulder)	-
C164	41.5643818	-81.7101038	440791.3	4601655.3	2184659.4	692374.6	14.5	90.8	12.4	6.4	-	Low Reflectivity Patch (Possible Slag)	-
C165	41.5645768	-81.7100824	440793.3	4601676.9	2184664.6	692445.6	14.5	110.1	4.8	2.8	-	Low Reflectivity Patch (Possible Slag)	-
C166	41.5647895	-81.7099927	440801.0	4601700.5	2184688.4	692523.5	14.5	134.6	10.4	4.3	-	Low Reflectivity Patch (Possible Slag)	-
C167	41.5620329	-81.7098601	440809.5	4601394.4	2184733.8	691519.4	14.4	120.5	1.8	1.6	0.4	Point Source (Probable Boulder)	M144
C168	41.5635947	-81.7096064	440832.1	4601567.6	2184798.1	692089.1	14.4	33.7	2.7	0.6	0.1	Linear Contact	-
C169	41.5630841	-81.7093632	440851.9	4601510.7	2184866.3	691903.6	14.4	6.3	5.0	0.5	0.6	Linear Contact	-
C170	41.5625297	-81.7090747	440875.4	4601449.0	2184947.1	691702.4	14.4	48.6	7.2	0.4	-	Linear Contact	-
C171	41.5617026	-81.7090549	440876.3	4601357.1	2184955.2	691401.0	14.5	128.3	7.2	1.0	-	Linear Contact	-
C172	41.5627621	-81.7087721	440900.9	4601474.6	2185029.1	691787.8	14.4	13.9	7.3	0.6	0.2	Linear Contact	-
C173	41.5628261	-81.7081814	440941.9	4601481.3	2185166.2	691812.3	14.4	12.1	7.7	0.6	0.1	Linear Contact	-
C174	41.5634166	-81.7078989	440974.3	4601546.6	2185265.9	692028.4	14.4	84.9	4.0	0.6	-	Linear Contact	-
C175	41.5609433	-81.7065854	441081.6	4601271.2	2185633.6	691130.5	14.1	108.0	4.4	0.5	0.2	Linear Contact	-
C176	41.5607966	-81.7061521	441117.6	4601254.6	2185753.6	691078.1	14.1	99.9	1.1	0.8	0.5	Point Source (Probable Boulder)	-
C177	41.5610431	-81.7058256	441145.0	4601281.7	2185841.2	691168.8	14.0	62.8	1.8	0.4	0.1	Linear Contact	-
C178	41.5610523	-81.7057347	441152.6	4601282.7	2185866.0	691172.4	14.0	58.3	4.0	0.5	-	Linear Contact	-
C179	41.5611467	-81.7055942	441164.4	4601283.1	2185904.1	691207.1	14.0	43.4	2.3	0.7	0.8	Point Source (Probable Boulder)	-
C180	41.5609036	-81.7047237	441236.4	4601221.1	2186144.5	690975.0	14.0	71.0	1.4	0.9	0.6	Point Source (Probable Boulder)	-
C181	41.5604539	-81.7046716	441240.7	4601215.5	2186158.9	690957.0	13.9	75.8	2.2	1.1	0.4	Point Source (Probable Boulder)	-
C182	41.5600491	-81.7045812	441247.9	4601170.5	2186185.0	690809.7	13.9	109.5	1.1	0.7	0.5	Point Source (Probable Boulder)	-
C183	41.5597743	-81.7044097	441261.9	4601139.9	2186232.9	690710.0	13.9	129.4	0.9	0.6	0.5	Point Source (Probable Boulder)	-
C184	41.5608965	-81.7036724	441324.4	4601264.0	2186430.9	691120.7	13.9	9.4	1.0	0.6	0.6	Point Source (Probable Boulder)	-
C185	41.5618126	-81.7036052	441330.9	4601365.6	2186446.2	691454.7	13.9	101.3	3.0	0.7	0.8	Linear Contact	-
C186	41.5617893	-81.7035322	441336.9	4601363.0	2186466.3	691446.4	13.9	101.9	1.8	0.8	0.5	Point Source (Probable Boulder)	-
C187	41.5614265	-81.7033929	441348.2	4601322.6	2186505.6	691314.5	13.9	72.2	2.2	0.7	0.5	Point Source (Probable Boulder)	-
C188	41.5614252	-81.7033161	441354.6	4601322.4	2186526.6	691314.3	13.8	75.2	1.6	0.9	0.6	Point Source (Probable Boulder)	-
C189	41.5592663	-81.7033146	441352.8	4601082.7	2186534.2	690527.6	13.6	134.8	1.1	0.7	0.6	Point Source (Probable Boulder)	-
C190	41.5608771	-81.7006706	441574.4	4601259.8	2187251.4	691121.2	13.3	127.9	2.3	0.4	0.2	Linear Contact	-
C191	41.5583372	-81.7003013	441603.2	4600977.6	2187362.0	690196.7	13.2	104.2	4.0	0.5	-	Linear Contact	-
C192	41.5590858	-81.6991500	441699.0	4601059.9	2187674.6	690472.3	13.2	14.9	0.7	0.4	0.6	Point Source (Probable Boulder)	-
C193	41.5590139	-81.6989471	441716.8	4601051.8	2187730.5	690446.6	13.5	16.0	1.2	0.7	0.6	Point Source (Probable Boulder)	-
C194	41.5591477	-81.6985757	441764.3	4601066.2	2187888.3	690496.8	13.4	52.0	1.4	0.9	0.6	Point Source (Probable Boulder)	-
C195	41.5582604	-81.6979033	441803.1	4600967.4	2188018.5	690174.7	13.5	19.4	1.9	0.7	0.5	Point Source (Probable Boulder)	-
C196	41.5563200	-81.6971195	441866.7	4600751.3	2188239.5	689469.7	-	172.7	2.5	0.7	0.2	Linear Contact	-
C197	41.5564578	-81.6964873	441919.6	4600766.3	2188412.1	689521.5	13.2	133.9	2.1	1.4	0.6	Point Source (Probable Boulder)	M143
C198	41.5583034	-81.6961844	441938.2	4600971.1	2188461.4	690194.5	13.5	53.9	1.0	0.9	0.6	Point Source (Probable Boulder)	-

Sidescan Sonar Contacts													
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)							
C199	41.5579418	-81.6960717	441955.6	4600930.8	2188520.8	690063.2	13.4	27.2	1.2	0.6	0.6	Point Source (Probable Boulder)	-
C200	41.5586616	-81.6959293	441968.1	4601010.6	2188557.4	690325.9	13.5	103.0	3.6	0.7	0.7	Linear Contact	-
C201	41.5586658	-81.6958023	441978.7	4601011.0	2188592.1	690327.7	13.5	108.5	3.4	0.6	0.4	Linear Contact	-
C202	41.5568203	-81.6949755	442046.0	4600805.6	2188834.6	689657.4	13.1	37.9	7.2	1.7	0.2	Low Reflectivity Patch (Possible Slag)	-
C203	41.5570360	-81.6947107	442068.2	4600829.3	2188896.4	689736.6	13.2	6.2	4.6	0.4	-	Linear Contact	-
C204	41.5558011	-81.6946811	442069.6	4600682.2	2188908.6	689286.8	13.2	125.2	1.0	0.7	0.5	Point Source (Probable Boulder)	-
C205	41.5562501	-81.6945018	442085.0	4600741.9	2188956.2	689450.8	13.1	74.3	6.6	0.4	0.2	Linear Contact	-
C206	41.5578692	-81.6925614	442248.0	4600898.2	2189482.4	689972.8	13.5	141.7	4.1	0.4	0.1	Linear Contact	-
C207	41.5555337	-81.6921853	442277.5	4600660.8	2189592.6	689195.7	13.1	50.9	1.1	0.6	0.5	Point Source (Probable Boulder)	-
C208	41.5571151	-81.6921246	442284.0	4600896.4	2189609.9	689772.0	13.3	105.3	3.9	0.3	-	Linear Contact	-
C209	41.5565012	-81.6919940	442294.3	4600768.1	2189641.7	689548.7	13.2	50.9	4.6	0.4	-	Linear Contact	-
C210	41.5569952	-81.6919808	442295.9	4600823.0	2189643.6	689728.7	13.2	99.5	4.1	0.5	-	Linear Contact	-
C211	41.5572323	-81.6919185	442301.3	4600849.3	2189659.9	689815.2	13.2	125.0	3.2	0.2	-	Linear Contact	-
C212	41.5562346	-81.6919059	442301.4	4600738.5	2189666.7	689451.7	13.2	28.5	4.1	0.5	0.2	Linear Contact	-
C213	41.5570168	-81.6918770	442304.5	4600825.3	2189672.0	689736.8	13.2	105.7	2.6	0.5	0.3	Linear Contact	-
C214	41.5572423	-81.6917529	442315.1	4600850.3	2189705.2	689819.3	13.2	132.7	4.1	0.5	0.1	Linear Contact	-
C215	41.5555306	-81.6899398	442464.8	4600659.0	2190207.2	689200.2	12.9	39.0	2.3	1.8	0.3	Linear Contact	-
C216	41.5555181	-81.6898221	442474.6	4600657.5	2190238.4	689196.0	12.9	42.5	13.5	9.4	-	Linear Contact	-
C217	41.5552677	-81.6897696	442478.7	4600629.7	2190254.6	689104.9	12.9	20.2	14.5	7.4	0.7	Low Reflectivity Patch (Possible Slag)	-
C218	41.5536396	-81.6895995	442491.5	4600448.8	2190306.7	688512.1	12.8	131.3	1.1	0.5	0.5	Point Source (Probable Boulder)	-
C219	41.5562301	-81.6895567	442497.3	4600736.4	2190309.6	689456.1	12.9	122.4	7.3	0.3	0.1	Linear Contact	-
C220	41.5543942	-81.6890621	442536.9	4600532.3	2190451.2	688788.4	12.8	36.3	2.6	0.4	-	Linear Contact	-
C221	41.5563882	-81.6887626	442563.7	4600753.4	2190536.4	689515.7	-	169.7	4.5	0.4	0.3	Linear Contact	-
C222	41.5532781	-81.6885019	442599.4	4600407.8	2190663.1	688383.7	12.6	114.4	1.0	0.7	0.6	Point Source (Probable Boulder)	-
C223	41.5526391	-81.6867105	442731.5	4600335.8	2191100.8	688154.9	12.6	112.6	8.9	0.7	0.2	Linear Contact	-
C224	41.5541710	-81.6866219	442740.2	4600505.9	2191119.8	688713.5	12.7	40.0	7.4	0.4	0.1	Linear Contact	-
C225	41.5534069	-81.6864698	442752.6	4600420.9	2191165.1	688435.3	12.6	28.1	1.1	0.7	0.5	Point Source (Probable Boulder)	-
C226	41.5555586	-81.6865724	442762.1	4600687.5	2191184.1	689146.6	12.7	165.6	19.6	0.9	0.2	Linear Contact	M75
C227	41.5517372	-81.6859713	442792.4	4600235.2	2191306.2	687828.2	-	170.6	1.8	0.9	0.5	Point Source (Probable Boulder)	-
C228	41.5541670	-81.6859333	442797.7	4600505.0	2191308.3	688713.6	12.7	67.3	1.5	1.7	0.6	Point Source (Probable Boulder)	-
C229	41.5541516	-81.6858827	442801.9	4600503.2	2191322.2	688708.1	12.7	67.8	1.5	1.5	0.6	Point Source (Probable Boulder)	-
C230	41.5527375	-81.6858030	442807.3	4600346.2	2191348.8	688193.1	12.6	66.5	6.0	0.3	-	Linear Contact	-
C231	41.5539001	-81.6857192	442815.3	4600475.2	2191367.8	688616.9	12.7	49.9	2.1	0.8	0.7	Point Source (Probable Boulder)	-
C232	41.5538888	-81.6856907	442817.7	4600473.9	2191375.6	688612.9	12.7	50.0	1.5	0.8	0.6	Point Source (Probable Boulder)	-
C233	41.5540599	-81.6855265	442831.5	4600492.8	2191420.0	688675.6	12.7	75.2	5.6	0.2	0.1	Linear Contact	-
C234	41.5540713	-81.6854649	442836.6	4600494.0	2191436.8	688679.9	12.7	76.8	2.4	0.5	0.1	Linear Contact	-
C235	41.5549087	-81.6850973	442868.0	4600586.7	2191534.6	688986.0	-	178.0	4.8	0.5	0.2	Linear Contact	-
C236	41.5537789	-81.6848326	442889.1	4600461.1	2191610.9	688575.0	12.6	73.8	2.6	0.5	0.1	Linear Contact	-
C237	41.5533787	-81.6846558	442903.5	4600416.6	2191660.6	688429.6	12.6	41.9	2.9	0.5	0.1	Linear Contact	-
C238	41.5532757	-81.6845677	442910.8	4600405.1	2191685.1	688392.3	12.5	35.4	4.5	0.5	0.2	Linear Contact	-
C239	41.5539154	-81.6845295	442914.5	4600478.3	2191690.3	688632.8	12.6	101.2	2.3	0.6	0.1	Linear Contact	-
C240	41.5545156	-81.6843472	442930.3	4600544.8	2191741.1	688852.0	-	166.9	2.5	0.5	0.1	Linear Contact	-
C241	41.5540052	-81.6843075	442933.1	4600485.9	2191753.8	688658.8	12.6	116.9	4.8	0.4	-	Linear Contact	-
C242	41.5539578	-81.6841979	442942.2	4600480.6	2191784.0	688641.8	12.6	116.7	2.3	0.5	0.0	Linear Contact	-
C243	41.5508531	-81.6838111	442971.7	4600135.6	2191900.4	687511.6	-	169.8	13.2	11.9	1.3	Circular Contact (Probable Dredge Spoil)	M102
C244	41.5521890	-81.6837990	442973.9	4600284.0	2191896.2	687998.4	12.4	39.4	2.4	0.9	0.5	Point Source (Probable Boulder)	-
C245	41.5564578	-81.6964873	441919.6	4600766.3	2188412.1	689521.5	13.2	133.9	16.7	-	-	Circular Contact (Probable Dredge Spoil)	-
C246	41.5531969	-81.6835536	442995.3	4600385.7	2191963.9	688366.2	12.4	68.5	2.4	0.5	0.3	Linear Contact	-
C247	41.5536321	-81.6834705	443002.6	4600443.9	2191984.2	688525.0	12.5	114.2	4.5	0.8	0.2	Linear Contact	-
C248	41.5539318	-81.6833425	443013.5	4600477.1	2192018.2	688634.5	12.5	140.5	2.0	0.4	0.1	Linear Contact	-
C249	41.5541702	-81.6855227	443015.4	4600503.6	2192022.8	688721.4	-	172.5	1.5	1.1	0.5	Point Source (Probable Boulder)	-
C250	41.5524949	-81.6832299	443021.6	4600317.5	2192058.9	688111.3	12.4	13.2	6.0	0.2	-	Linear Contact	-
C251	41.5538304	-81.6831028	443033.4	4600465.7	2192084.1	688598.2	12.4	147.3	3.0	0.5	-	Linear Contact	-
C252	41.5514445	-81.6829157	443046.9	4600200.7	2192143.5	687729.4	12.2	76.3	5.6	5.3	0.5	Circular Contact (Probable Dredge Spoil)	M12
C253	41.5514725	-81.6828723	443050.6	4600203.8	2192155.3	687739.7	12.3	71.8	4.6	5.1	0.5	Circular Contact (Probable Dredge Spoil)	-
C254	41.5504814	-81.6827315	443061.4	4600093.7	2192197.2	687378.9	12.5	162.6	14.5	15.8	1.0	Circular Contact (Probable Dredge Spoil)	-
C255	41.5539160	-81.6826490	443071.3	4600474.9	2192206.0	688630.5	-	174.8	1.8	0.9	0.5	Point Source (Probable Boulder)	-
C256	41.5507157	-81.6825446	443077.2	4600119.6	2192247.5	687464.8	12.4	132.3	17.1	14.3	1.1	Circular Contact (Probable Dredge Spoil)	M140
C257	41.5510998	-81.6823615	443092.8	4600157.6	2192296.5	687590.6	12.3	91.5	15.9	14.6	0.8	Circular Contact (Probable Dredge Spoil)	M13
C258	41.5511747	-81.6823186	443096.5	4600170.4	2192307.8	687632.6	12.4	78.6	14.0	13.7	0.8	Circular Contact (Probable Dredge Spoil)	-
C259	41.5524078	-81.6822663	443101.9	4600307.2	2192317.9	688082.0	12.4	43.5	1.5	1.5	0.2	Circular Contact (Probable Tire)	-
C260	41.5501032	-81.6818880	443131.5	4600051.1	2192439.4	687243.3	-	164.9	3.8	1.6	0.3	Linear Contact	-
C261	41.5521021	-81.6818519	443136.2	4600273.0	2192432.4	687971.7	12.5	30.4	1.9	0.7	0.6	Point Source (Probable Boulder)	-
C262	41.5535624	-81.6814695	443169.4	4600434.9	2192532.1	688504.7	-	187.8	8.5	0.7	0.0	Linear Contact	-
C263	41.5499504	-81.6811669	443183.1	4600033.7	2192599.9	687189.2	12.4	155.4	7.7	0.4	0.1	Linear Contact	M103
C264	41.5516304	-81.6809926	443207.5	4600220.1	2192665.2	687802.0	12.5	19.0	1.4	0.7	0.8	Point Source (Probable Boulder)	-
C265	41.5516517	-81.6805545	443244.0	4600222.2	2192789.0	687810.9	12.6	38.7	3.7	0.5	0.1	Linear Contact	-
C266	41.5524888	-81.6799997	443291.0	4600314.5	2192938.0	688116.6	12.5	142.3	3.5	0.5	0.4	Linear Contact	-
C267	41.5493883	-81.6798299	443302.5	4599970.4	2192995.1	686988.1	12.4	152.3	2.0	1.5	-	Rectangular Contact	-
C268	41.5509326	-81.6796207	443321.3	4600141.7	2193047.1	687551.3	12.4	6.3	1.6	0.7	0.8	Point Source (Probable Boulder)	-
C269	41.5516782	-81.6795035	443331.7	4600224.6	2193076.6	687823.3	12.4	83.5	3.2	0.3	0.1	Linear Contact	-
C270	41.5521862	-81.6794338	443338.0	4600280.8	2193093.9	688008.5	12.5	135.8	1.2	1.2	0.7	Point Source (Probable Boulder)	-

Sidescan Sonar Contacts													
	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North								
ID	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)	Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
C271	41.5510600	-81.6787136	443397.0	4600155.3	2193294.9	687600.1	12.6	35.1	1.7	0.6	0.6	Point Source (Probable Boulder)	-
C272	41.5515349	-81.6782774	443433.8	4600207.7	2193412.7	687774.2	12.5	110.9	1.7	0.6	0.6	Point Source (Probable Boulder)	-
C273	41.5510539	-81.6781159	443446.9	4600154.2	2193458.5	687599.4	12.6	78.6	12.2	0.9	0.2	Linear Contact	-
C274	41.5500291	-81.6779915	443456.4	4600040.3	2193496.1	687226.3	12.4	16.1	4.1	0.7	0.6	Linear Contact	-
C275	41.5511725	-81.6779343	443462.1	4600167.2	2193507.8	687643.0	12.6	97.4	1.0	0.7	0.6	Point Source (Probable Boulder)	-
C276	41.5518635	-81.6776264	443488.4	4600243.8	2193589.7	687895.6	-	177.0	1.3	1.0	0.7	Point Source (Probable Boulder)	-
C277	41.5519197	-81.6775816	443492.2	4600250.0	2193601.8	687916.2	-	184.3	1.4	1.2	0.6	Point Source (Probable Boulder)	-
C278	41.5507812	-81.6770972	443531.6	4600123.2	2193738.3	687502.6	12.5	93.0	3.3	0.2	0.1	Linear Contact	-
C279	41.5510166	-81.6769181	443546.7	4600149.3	2193786.2	687588.9	12.6	123.0	7.4	0.2	-	Linear Contact	-
C280	41.5510285	-81.6768499	443552.8	4600150.5	2193806.2	687593.4	12.6	127.1	3.3	0.7	0.5	Linear Contact	-
C281	41.5482126	-81.6766111	443569.9	4599837.8	2193880.2	686568.0	11.9	137.6	16.4	15.9	0.8	Circular Contact (Probable Dredge Spoil)	-
C331	41.5482126	-81.6766111	443569.9	4599837.8	2193880.2	686568.0	12.3	100.7	5.6	1.8	-	Linear Contact	-
C282	41.5484896	-81.6765690	443590.5	4599868.4	2193945.5	686669.6	11.8	98.9	13.0	15.1	0.4	Circular Contact (Probable Dredge Spoil)	-
C283	41.5484909	-81.6765290	443593.7	4599868.5	2193956.4	686670.1	12.5	107.0	19.6	17.3	1.5	Circular Contact (Probable Dredge Spoil)	-
C284	41.5508066	-81.6765271	443595.7	4600103.4	2193945.7	687441.0	12.3	91.8	4.2	0.5	0.2	Linear Contact	-
C285	41.5485524	-81.6762871	443597.2	4599875.3	2193967.7	686692.7	12.5	136.0	11.9	15.9	0.6	Circular Contact (Probable Dredge Spoil)	M14, M19
C286	41.5508125	-81.6760986	443634.9	4600126.1	2194011.5	687516.6	11.9	70.4	5.7	0.3	-	Linear Contact	-
C287	41.5486795	-81.6760747	443615.1	4599889.2	2194025.4	686738.5	11.5	60.5	14.6	16.9	0.7	Circular Contact (Probable Dredge Spoil)	M165
C288	41.5487472	-81.6759931	443621.9	4599896.7	2194047.5	686764.4	11.6	43.6	17.3	18.4	1.3	Circular Contact (Probable Dredge Spoil)	M200
C289	41.5488684	-81.6758657	443632.6	4599910.1	2194081.9	686808.9	12.0	245.8	14.7	10.8	0.7	Circular Contact (Probable Dredge Spoil)	-
C290	41.5465369	-81.6747615	443722.5	4599628.3	2194392.9	685889.4	12.4	155.2	0.9	0.7	0.7	Point Source (Probable Boulder)	-
C291	41.5504215	-81.6746781	443733.0	4600081.7	2194401.7	687377.8	11.9	216.3	4.4	0.3	-	Linear Contact	-
C292	41.5465075	-81.6744406	443749.5	4599647.0	2194480.2	685932.4	12.1	229.3	15.3	1.1	0.4	Linear Contact	-
C293	41.5461016	-81.6737736	443804.7	4599601.5	2194664.1	685806.1	12.4	132.8	1.3	0.8	0.5	Point Source (Probable Boulder)	-
C294	41.5497806	-81.6736843	443815.4	4600009.9	2194675.9	687146.8	-	544.0	1.0	0.8	0.6	Point Source (Probable Boulder)	-
C295	41.5425973	-81.6735217	443822.7	4599212.3	2194745.2	684530.0	12.2	208.7	1.1	0.6	1.9	Point Source	-
C296	41.5462036	-81.6735082	443827.0	4599612.7	2194736.4	685844.0	12.0	224.8	1.8	1.3	0.9	Point Source (Probable Boulder)	-
C297	41.5456141	-81.6724721	443912.9	4599546.6	2195022.1	685631.9	12.0	226.7	3.5	0.9	0.2	Linear Contact	-
C298	41.5455854	-81.6724516	443914.5	4599543.4	2195017.8	685621.5	12.2	111.3	5.0	0.6	0.2	Linear Contact	-
C299	41.5466707	-81.6722098	443935.7	4599663.7	2195090.2	686017.6	12.2	10.8	3.4	0.3	0.4	Linear Contact	-
C300	41.5478349	-81.6719941	443954.6	4599792.8	2195145.2	686442.4	12.2	128.5	1.3	0.8	0.6	Point Source (Probable Boulder)	-
C301	41.5490411	-81.6719892	443956.1	4599926.7	2195142.4	686881.9	12.2	59.0	2.9	1.0	0.5	Linear Contact	-
C302	41.5469226	-81.6715162	443993.7	4599691.2	2195279.2	686111.2	12.1	69.1	3.9	0.3	0.1	Linear Contact	-
C303	41.5466584	-81.6711226	444026.3	4599661.6	2195387.9	686016.0	11.2	533.2	1.8	0.9	0.5	Point Source (Probable Boulder)	-
C304	41.5403643	-81.6710955	444023.1	4598962.8	2195417.1	683722.7	11.3	385.6	2.6	4.1	0.9	Point Source	-
C305	41.5421899	-81.6707211	444056.0	4599165.3	2195513.2	684388.9	12.1	32.3	3.5	1.9	-	Linear Contact	-
C306	41.5475275	-81.6707047	444061.9	4599757.9	2195490.2	686335.7	12.1	25.5	1.1	0.9	0.7	Point Source (Probable Boulder)	-
C307	41.5469167	-81.6706619	444065.0	4599690.0	2195515.1	686111.3	-	711.7	1.9	0.6	0.6	Point Source (Probable Boulder)	-
C308	41.5331604	-81.6702272	444089.4	4598162.5	2195679.7	681100.2	12.0	25.9	12.7	0.5	0.2	Linear Contact	-
C309	41.5467378	-81.6701896	444104.5	4599669.9	2195644.0	686047.3	11.5	435.5	2.5	0.4	0.2	Linear Contact	-
C310	41.5408811	-81.6701475	444102.7	4599019.6	2195674.8	683915.5	11.7	184.0	2.7	0.7	0.7	Linear Contact	-
C311	41.5445263	-81.6700519	444113.8	4599424.2	2195688.3	685241.9	12.1	71.7	21.8	14.2	-	Low Reflectivity Patch (Possible Slag)	-
C312	41.5461150	-81.6699685	444122.1	4599600.6	2195705.6	685821.0	10.6	541.6	2.6	0.3	-	Linear Contact	-
C313	41.5380676	-81.6698780	444122.7	4598707.1	2195750.3	682889.1	12.0	85.1	5.0	3.2	-	Low Reflectivity Patch (Possible Slag)	-
C314	41.5477103	-81.6698294	444135.1	4599777.6	2195738.2	686402.6	12.1	32.7	10.4	0.4	0.2	Linear Contact	-
C315	41.5464878	-81.6697967	444136.8	4599641.8	2195751.4	685957.2	12.1	33.1	4.5	0.7	0.1	Linear Contact	-
C316	41.5464516	-81.6697280	444142.5	4599637.8	2195770.3	685944.2	10.3	569.0	3.1	0.3	0.1	Linear Contact	-
C317	41.5368635	-81.6697192	444134.9	4598573.3	2195806.0	682450.8	10.6	528.1	33.1	14.8	-	Low Reflectivity Patch (Possible Slag)	-
C318	41.5380069	-81.6696852	444138.8	4598700.2	2195811.3	682867.5	10.0	854.7	3.0	1.8	-	Circular Contact	M71
C319	41.5334407	-81.6695453	444146.5	4598193.2	2195865.4	681204.1	10.5	532.9	0.7	0.6	0.2	Circular Contact	-
C320	41.5375060	-81.6695359	444150.8	4598644.5	2195853.9	682685.3	11.5	414.2	10.8	2.1	-	Linear Contact	-
C321	41.5405298	-81.6694702	444158.9	4598980.2	2195861.4	683787.3	11.5	415.4	2.8	0.5	0.3	Linear Contact	M139
C322	41.5404999	-81.6694588	444159.8	4598976.8	2195864.6	683776.4	11.0	473.0	2.9	0.8	0.3	Linear Contact	-
C323	41.5388177	-81.6693340	444168.7	4598790.0	2195904.6	683163.8	12.0	17.0	4.9	0.8	0.1	Linear Contact	-
C324	41.5462797	-81.6693122	444177.0	4599618.4	2195884.7	685882.7	9.8	634.5	11.9	3.9	-	Linear Contact	-
C325	41.5336581	-81.6693049	444166.7	4598217.2	2195930.5	681283.9	12.0	133.0	1.0	0.8	-	Circular Contact	-
C326	41.5479867	-81.6693047	444179.1	4599807.9	2195880.8	686504.7	11.5	306.6	1.1	0.7	0.6	Point Source (Probable Boulder)	-
C327	41.5416987	-81.6690645	444193.7	4599109.7	2195968.4	684214.2	11.9	129.0	7.6	1.2	-	Linear Contact	-
C328	41.5477931	-81.6689345	444209.8	4599786.2	2195982.8	686435.1	12.0	16.3	3.3	0.9	0.7	Linear Contact	-
C329	41.5459050	-81.6689218	444209.2	4599576.6	2195992.9	685747.2	11.9	127.1	9.7	0.3	-	Linear Contact	-
C330	41.5477580	-81.6688946	444213.1	4599782.3	2195993.9	686422.4	11.9	137.4	1.5	1.0	0.8	Point Source (Probable Boulder)	-
C332	41.5343228	-81.6683087	444250.4	4598290.3	2196200.9	681528.7	9.9	541.8	3.2	0.3	0.1	Linear Contact	-
C333	41.5397880	-81.6681239	444270.5	4598896.9	2196232.5	683520.5	11.4	344.3	3.4	1.5	0.8	Point Source (Probable Boulder)	-
C334	41.5391443	-81.6680857	444273.2	4598825.5	2196245.2	683286.0	11.1	362.8	1.6	1.2	0.6	Point Source (Probable Boulder)	-
C336	41.5368898	-81.6680146	444277.2	4598575.1	2196272.5	682464.8	10.0	432.5	5.8	0.7	-	Linear Contact	-
C337	41.5394141	-81.6679282	444286.5	4598855.3	2196287.4	683384.8	11.2	341.3	12.9	0.5	0.2	Linear Contact	-
C338	41.5352453	-81.6678937	444285.8	4598392.5	2196311.3	681865.9	9.7	477.9	7.1	0.5	-	Linear Contact	-
C339	41.5465260	-81.6678419	444299.7	4599622.6	2196287.0	685903.4	11.9	83.7	3.1	0.4	0.1	Linear Contact	-
C340	41.5343460	-81.6676473	444305.6	4598292.5	2196381.9	681538.9	9.7	488.4	1.7	1.9	1.4	Point Source (Probable Boulder)	-
C341	41.5388709	-81.6676224	444311.6	4598795.5	2196373.0	683189.8	11.1	334.9	1.5	0.9	0.5	Point Source (Probable Boulder)	-
C342	41.5464206	-81.6674368	444333.5	4599632.9	2196397.5	685938.9	11.9	116.9	5.8	0.5	0.3	Linear Contact	-
C343	41.5434978	-81.6673347	444339.5	4599308.3	2196435.7	684874.2	11.5	72.8	3.5	0.8	0.5	Linear Contact	-

Sidescan Sonar Contacts													
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)							
C344	41.5433712	-81.6673183	444340.8	4599284.2	2196440.6	684828.2	11.5	80.3	2.2	1.3	0.6	Point Source (Probable Boulder)	-
C345	41.5428351	-81.6672239	444348.2	4599234.7	2196468.3	684633.1	11.4	110.0	2.0	1.5	0.6	Point Source (Probable Boulder)	-
C346	41.5390607	-81.6670194	444362.0	4598815.5	2196537.4	683258.4	11.1	280.8	6.9	0.8	-	Linear Contact	-
C347	41.5400398	-81.6668459	444377.3	4598924.1	2196581.5	683615.6	11.3	234.2	4.6	1.1	-	Circular Contact	-
C348	41.5448288	-81.6667617	444388.5	4599455.7	2196587.9	685360.7	11.6	54.7	1.4	0.6	0.6	Point Source (Probable Boulder)	-
C349	41.5564345	-81.6666675	444389.1	4598523.7	2196642.9	682302.3	10.0	340.6	4.8	0.5	0.1	Linear Contact	-
C350	41.5377070	-81.6664678	444406.9	4598664.8	2196693.1	682766.6	10.3	282.2	3.9	0.6	0.1	Linear Contact	-
C351	41.5559820	-81.6664224	444408.9	4598430.0	2196712.9	681996.1	10.1	349.3	3.2	2.6	-	Circular Contact	-
C353	41.5557122	-81.6664035	444410.5	4598443.3	2196717.7	682039.9	10.1	348.1	3.1	2.4	0.4	Rectangular Contact	-
C352	41.5555430	-81.6663866	444411.8	4598424.5	2196722.9	681978.3	10.1	343.8	2.7	2.1	0.5	Circular Contact	M84
C354	41.5554592	-81.6661312	444433.0	4598415.1	2196799.1	681948.5	10.1	330.5	6.9	0.4	-	Linear Contact	-
C355	41.5559835	-81.6660122	444443.4	4598479.2	2196823.9	682139.8	10.0	308.6	2.0	2.0	0.4	Rectangular Contact	-
C356	41.5404358	-81.6659966	444448.5	4598967.5	2196812.6	683762.1	11.3	153.5	1.7	1.0	0.5	Point Source (Probable Boulder)	-
C357	41.5448531	-81.6659766	444458.0	4599457.9	2196800.8	685371.6	11.5	108.4	2.2	0.4	0.2	Linear Contact	-
C358	41.5394163	-81.6659338	444452.9	4598854.3	2196833.4	683390.8	11.1	182.5	3.2	0.5	0.2	Linear Contact	-
C359	41.5393806	-81.6659024	444455.5	4598850.3	2196842.1	683377.9	11.1	181.2	3.8	0.4	0.1	Linear Contact	-
C360	41.5355404	-81.6658774	444454.3	4598423.9	2196862.3	681978.7	10.1	307.6	10.6	1.2	-	Linear Contact	-
C362	41.5393153	-81.6657848	444465.2	4598843.0	2196874.5	683354.4	11.0	174.1	2.6	0.5	0.1	Linear Contact	-
C363	41.5394764	-81.6655826	444482.2	4598860.7	2196929.3	683413.6	11.0	152.6	9.1	0.5	-	Linear Contact	M164
C364	41.5405681	-81.6655921	444499.1	4598981.8	2196977.6	683811.9	11.3	100.9	1.7	0.9	0.8	Point Source (Probable Boulder)	-
C365	41.5383879	-81.6653599	444499.9	4598738.7	2196994.1	683017.6	10.4	171.3	3.8	0.4	-	Linear Contact	M166
C366	41.5413167	-81.6653200	444505.7	4599064.9	2196994.8	684084.8	11.4	70.2	6.1	0.5	-	Linear Contact	-
C367	41.5366680	-81.6652979	444503.6	4598548.7	2197017.0	682391.1	10.0	223.8	10.7	2.8	-	Point Source (Probable Boulder)	-
C368	41.5412080	-81.6652677	444510.0	4599052.8	2197009.5	684045.3	11.4	69.7	6.0	0.3	0.1	Linear Contact	-
C369	41.5406385	-81.6652522	444510.8	4598989.5	2197015.7	683837.9	11.3	87.5	11.5	0.7	0.2	Linear Contact	-
C370	41.5436988	-81.6651532	444521.7	4599329.2	2197052.1	684933.2	11.5	85.5	3.4	2.4	-	Circular Contact	-
C371	41.5429487	-81.6649808	444535.4	4599245.8	2197081.9	684680.3	11.3	46.5	2.8	0.9	-	Linear Contact	-
C372	41.5366556	-81.6648749	444538.8	4598544.9	2197152.9	682380.4	10.0	191.3	2.7	2.2	-	Rectangular Contact	-
C373	41.5404384	-81.6646158	444563.7	4598966.9	2197190.6	683766.6	11.2	43.5	6.7	0.5	0.1	Linear Contact	-
C374	41.5441247	-81.6643217	444591.4	4599376.0	2197258.2	685110.5	11.5	169.3	5.5	0.5	-	Linear Contact	-
C375	41.5398762	-81.6642473	444593.9	4598904.2	2197299.4	683562.8	10.9	33.0	5.0	0.4	0.1	Linear Contact	-
C376	41.5402326	-81.6642375	444595.1	4598943.8	2197294.9	683692.7	11.0	20.3	5.8	0.4	-	Linear Contact	-
C377	41.5439576	-81.6642185	444599.8	4599357.3	2197287.1	685049.9	11.5	164.9	10.4	3.2	-	Low Reflectivity Patch (Possible Slag)	-
C378	41.5398078	-81.6642158	444596.5	4598896.6	2197300.3	683537.9	10.9	32.8	9.5	0.6	-	Linear Contact	-
C379	41.5415479	-81.6639784	444617.6	4599067.5	2197361.9	684099.7	11.3	37.6	1.2	1.0	0.6	Point Source (Probable Boulder)	-
C380	41.5419327	-81.6639251	444622.7	4599132.4	2197375.0	684312.9	11.3	61.5	5.8	0.7	0.3	Linear Contact	-
C381	41.5416010	-81.6637215	444639.3	4599095.4	2197431.3	684192.6	11.2	66.5	2.9	2.7	0.6	Point Source (Probable Boulder)	-
C382	41.5407071	-81.6635943	444649.1	4598996.1	2197469.5	683867.2	11.1	46.7	3.3	0.5	0.1	Linear Contact	-
C383	41.5367471	-81.6635790	444647.5	4598556.4	2197489.0	682424.4	9.8	84.0	4.5	2.5	-	Rectangular Contact	-
C384	41.5376005	-81.6634348	444659.8	4598651.1	2197523.8	682735.7	10.1	44.5	3.1	2.1	-	Rectangular Contact	-
C385	41.5411380	-81.6634188	444664.1	4599043.8	2197515.8	684024.7	11.2	75.1	11.0	0.5	0.1	Linear Contact	M29
C386	41.5402331	-81.6633790	444667.0	4598943.3	2197531.0	683695.1	10.9	48.3	10.9	0.4	0.2	Linear Contact	-
C387	41.5412524	-81.6633317	444671.5	4599056.4	2197538.3	684066.6	11.2	85.8	6.9	0.4	0.1	Linear Contact	-
C388	41.5426937	-81.6631525	444687.7	4599216.3	2197583.3	684592.2	11.3	151.9	19.3	0.6	0.4	Linear Contact	-
C389	41.5409948	-81.6631281	444688.3	4599027.7	2197595.9	683973.3	11.2	93.4	1.2	0.7	0.6	Point Source (Probable Boulder)	-
C390	41.5572015	-81.6629816	444697.2	4598606.5	2197649.3	682591.5	10.0	21.8	1.7	1.0	1.4	Point Source (Probable Boulder)	-
C391	41.5412620	-81.6629308	444704.9	4599057.3	2197649.0	684071.2	11.1	118.0	16.5	0.5	0.2	Linear Contact	-
C392	41.5412085	-81.6629304	444704.9	4599051.3	2197649.5	684051.7	11.1	116.3	5.1	0.7	0.0	Linear Contact	-
C393	41.5412250	-81.6627034	444723.9	4599053.0	2197711.4	684058.3	11.0	134.9	6.9	0.4	0.1	Linear Contact	-
C394	41.5401107	-81.6625952	444732.0	4598929.2	2197744.9	683652.5	10.5	106.2	5.0	0.4	-	Linear Contact	-
C395	41.5401331	-81.6625766	444733.5	4598931.7	2197749.9	683660.8	10.6	108.5	5.0	0.8	-	Linear Contact	-
C396	41.5410908	-81.6625411	444737.3	4599038.0	2197756.3	684009.8	11.0	143.3	6.0	0.6	-	Linear Contact	-
C397	41.5402982	-81.6624951	444740.5	4598950.0	2197771.6	683721.1	10.6	120.5	4.4	0.3	-	Linear Contact	-
C398	41.5421296	-81.6622073	444766.0	4599152.5	2197844.0	684387.0	11.1	204.4	7.0	0.5	-	Linear Contact	-
C399	41.5378287	-81.6621331	444768.6	4598675.6	2197879.4	682822.3	10.2	66.7	2.5	3.7	1.1	Point Source (Probable Boulder)	-
C400	41.5378276	-81.6621031	444771.1	4598675.4	2197887.6	682822.0	10.2	69.1	1.8	1.2	0.6	Point Source (Probable Boulder)	-
C401	41.5413157	-81.6620963	444774.6	4599062.7	2197877.2	684092.9	11.0	186.2	13.8	0.3	-	Linear Contact	-
C402	41.5379908	-81.6620264	444777.5	4598686.8	2197908.2	682859.8	10.2	78.6	2.0	1.5	1.2	Point Source (Probable Boulder)	-
C403	41.5418485	-81.6620173	444781.6	4599121.8	2197897.0	684287.2	11.1	210.3	1.2	0.7	0.5	Point Source (Probable Boulder)	-
C404	41.5409520	-81.6619165	444789.3	4599022.2	2197927.7	683960.9	10.8	188.3	4.0	0.3	0.1	Linear Contact	-
C405	41.5411253	-81.6618759	444792.8	4599041.4	2197938.2	684024.1	10.9	197.4	9.2	0.4	-	Linear Contact	-
C406	41.5419096	-81.6618484	444795.8	4599128.5	2197943.0	684310.0	11.1	225.8	1.5	0.8	0.6	Point Source (Probable Boulder)	-
C407	41.5409961	-81.6616859	444808.6	4599026.9	2197990.7	683977.5	10.8	208.2	5.6	0.5	0.1	Linear Contact	-
C408	41.5580126	-81.6616176	444811.7	4598865.7	2198019.8	682890.7	10.1	115.9	1.9	0.5	0.6	Point Source (Probable Boulder)	-
C409	41.5412277	-81.6614278	444830.3	4599052.5	2198060.5	684062.6	10.8	236.4	5.7	0.4	0.1	Linear Contact	-
C410	41.5383226	-81.6611910	444839.2	4598729.9	2198108.2	683004.5	10.2	150.2	2.7	1.6	0.7	Point Source (Probable Boulder)	-
C411	41.5383523	-81.6611642	444849.8	4598733.1	2198142.8	683015.6	10.1	161.3	1.5	1.0	0.5	Point Source (Probable Boulder)	-
C412	41.5383756	-81.6611077	444854.6	4598735.6	2198158.2	683024.3	10.2	166.6	3.1	1.2	0.9	Point Source (Probable Boulder)	-
C413	41.5384757	-81.6610147	444862.4	4598746.7	2198183.3	683061.0	10.3	177.3	3.2	0.7	0.4	Point Source (Probable Boulder)	-
C414	41.5585865	-81.6606008	444897.0	4598758.7	2198296.2	683102.4	10.5	215.9	3.1	1.0	1.0	Point Source (Probable Boulder)	-
C415	41.5586604	-81.6605811	444898.7	4598766.9	2198301.3	683129.4	10.5	218.0	2.2	1.5	0.7	Point Source (Probable Boulder)	-
C416	41.5587020	-81.6605765	444899.1	4598771.5	2198302.4	683144.6	10.5	218.7	2.5	1.2	0.7	Point Source (Probable Boulder)	-
C417	41.5586709	-81.6605402	444902.1	4598768.1	2198312.5	683133.4	10.6	221.6	2.5	0.7	0.7	Point Source (Probable Boulder)	-
C418	41.5591259	-81.6604032	444914.0	4598818.5	2198348.4	683299.5	10.5	247.7	3.4	1.8	0.6	Rectangular Contact	M106
C419	41.5587776	-81.6604102	444913.1	4598779.8	2198347.7	683172.6	10.5	235.5	2.6	1.3	0.7	Point Source (Probable Boulder)	-

Sidescan Sonar Contacts													
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed Route (m)	Length (m)	Width (m)	Height (m)	Description	Associated Mag Anomaly ID
	Latitude	Longitude	East (m)	North (m)	East (US survey feet)	North (US survey feet)							
C420	41.5585383	-81.6603481	444918.1	4598753.2	2198365.5	683085.5	10.5	232.4	1.7	0.7	0.5	Point Source (Probable Boulder)	-
C421	41.5587309	-81.6602889	444923.2	4598774.6	2198381.1	683155.9	10.7	243.6	4.0	2.2	0.7	Point Source (Probable Boulder)	-
C422	41.5588188	-81.6602872	444923.4	4598784.3	2198381.2	683187.9	10.5	246.6	1.9	2.2	0.8	Point Source (Probable Boulder)	-
C423	41.5599666	-81.6601601	444934.9	4598911.7	2198412.0	683606.5	10.4	295.1	6.0	0.7	0.2	Linear Contact	-
C424	41.5586927	-81.6601584	444934.0	4598770.2	2198416.9	683142.5	10.6	252.7	2.5	1.1	0.8	Point Source (Probable Boulder)	-
C425	41.5589034	-81.6601138	444937.9	4598793.6	2198428.4	683219.2	10.5	263.3	1.9	1.0	0.7	Point Source (Probable Boulder)	-
C426	41.5607736	-81.6600747	444942.8	4599001.2	2198432.5	683900.7	10.5	328.9	2.1	1.7	0.6	Circular Contact	M26
C427	41.5589287	-81.6600659	444941.9	4598796.4	2198441.4	683228.5	10.5	267.9	1.6	1.0	0.9	Point Source (Probable Boulder)	-
C428	41.5596366	-81.6599435	444952.7	4598874.9	2198472.4	683486.8	10.5	301.3	2.2	2.0	0.6	Rectangular Contact	-
C429	41.5589773	-81.6599406	444952.4	4598801.7	2198475.5	683246.6	10.6	279.5	2.9	1.2	0.4	Point Source (Probable Boulder)	-
C430	41.5590395	-81.6599005	444955.8	4598808.6	2198486.5	683269.3	10.5	284.8	3.8	1.2	0.7	Linear Contact	-
C431	41.5591901	-81.6595928	444981.6	4598825.1	2198570.0	683325.0	10.4	314.3	2.2	2.3	0.7	Point Source (Probable Boulder)	M62
C432	41.5595059	-81.6594679	444992.3	4598860.1	2198609.1	683440.4	10.6	334.8	2.1	1.6	-	Rectangular Contact	M96
C434	41.5412463	-81.6591813	445017.7	4599053.1	2198675.4	684075.3	0.0	415.7	2.2	1.6	1.2	Point Source (Probable Boulder)	-
C435	41.5593486	-81.6591395	445019.6	4598842.4	2198693.5	683384.0	10.6	355.6	2.2	1.0	1.3	Point Source (Probable Boulder)	-
C436	41.5594388	-81.6590536	445026.8	4598849.0	2198716.8	683406.1	10.6	364.5	2.3	1.4	0.7	Point Source (Probable Boulder)	-
C437	41.5594521	-81.6590459	445027.5	4598853.8	2198718.8	683421.9	10.6	366.5	2.7	1.0	0.9	Point Source (Probable Boulder)	-
C438	41.5597920	-81.6590282	445029.2	4598891.6	2198722.5	683545.8	10.7	379.3	3.2	2.3	0.5	Rectangular Contact	-
C439	41.5594321	-81.6590259	445029.1	4598851.6	2198734.3	683414.7	10.6	367.5	2.2	0.9	0.6	Point Source (Probable Boulder)	-
C440	41.5594747	-81.6589939	445031.8	4598856.3	2198733.0	683430.3	10.6	371.4	2.7	1.2	1.2	Point Source (Probable Boulder)	-
C441	41.5598344	-81.6590029	445031.3	4598892.9	2198729.3	683550.4	-	383.2	2.9	2.4	-	Rectangular Contact	-
C442	41.5595829	-81.6589084	445039.0	4598868.3	2198756.0	683470.0	10.7	381.8	1.3	0.5	1.0	Point Source (Probable Boulder)	-
C443	41.5594361	-81.6587317	445053.6	4598848.5	2198805.0	683406.0	10.7	390.0	1.5	1.4	0.7	Point Source (Probable Boulder)	-
C444	41.5598521	-81.6586279	445062.7	4598898.0	2198831.8	683568.8	-	413.2	3.5	1.8	0.6	Rectangular Contact	-
C445	41.5595078	-81.6586090	445064.3	4598859.7	2198839.3	683443.4	-	403.5	2.5	0.8	0.6	Point Source (Probable Boulder)	-
C446	41.5596563	-81.6585672	445067.5	4598876.2	2198849.1	683497.6	-	411.4	1.4	1.0	0.5	Point Source (Probable Boulder)	-
C447	41.5598272	-81.6584060	445081.1	4598895.1	2198892.7	683560.3	-	430.0	1.6	0.8	1.0	Point Source (Probable Boulder)	-
C448	41.5597886	-81.6583821	445083.1	4598890.8	2198890.3	683546.3	-	430.6	2.3	1.0	0.6	Point Source (Probable Boulder)	-
C449	41.5599823	-81.6582954	445090.5	4598913.3	2198922.4	683620.7	-	444.3	2.5	2.6	0.7	Point Source (Probable Boulder)	-
C450	41.5598630	-81.6582472	445094.4	4598898.9	2198936.0	683573.8	-	443.8	2.4	2.2	0.8	Point Source (Probable Boulder)	-
C451	41.5599502	-81.6582051	445098.0	4598908.6	2198947.2	683605.6	-	450.1	1.3	0.7	0.9	Point Source (Probable Boulder)	-
C452	41.5600100	-81.6581874	445099.5	4598915.2	2198951.9	683627.5	-	453.5	2.1	1.0	1.0	Point Source (Probable Boulder)	-
C453	41.5602440	-81.6577455	445136.6	4598940.9	2199072.0	683713.9	-	496.5	2.1	1.7	0.9	Point Source (Probable Boulder)	-
C454	41.5402700	-81.6575067	445156.5	4598943.7	2199137.3	683724.0	-	516.3	1.7	0.8	0.6	Point Source (Probable Boulder)	-
C455	41.5402653	-81.6572468	445178.2	4598943.0	2199208.4	683723.0	-	536.8	3.2	1.4	-	Circular Contact	-

5.2 Magnetometer Results

A review of 271 line km of magnetometer data showed no historic structures (such as shipwrecks) present within the turbine and export cable survey areas.

A total of 178 magnetic anomalies were identified and mapped from the magnetometer data acquired over the Icebreaker Wind survey area. The anomaly location, type, magnitude and observations from the sidescan sonar in the area of each anomaly are listed in Table 3. Profiles of the magnetic anomalies within a 150 m (495 feet) corridor centered on the proposed route. Profiles of those outside the corridor can be found in Appendix A.

Table 3 Magnetic Anomalies Contact List

Marine Magnetometer Anomalies										
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed	Polarity	Amplitude (nT)	Associated Sidescan Contact ID
	Latitude	Longitude	Easting (m)	Northing (m)	East (US survey feet)	North (US survey feet)					
M1	41.5960349	-81.7914838	434038.0	4605228.5	2162296.1	703716.7	16.9	93.1	Monopole	66.9	
M2	41.5727049	-81.7348227	438738.1	4602596.6	2177868.5	695347.0	15.4	92.1	Dipole	63.9	
M3	41.5707487	-81.7299932	439138.9	4602376.0	2179196.2	694645.8	15.3	88.6	Monopole	43.4	
M4	41.5684997	-81.7245598	439589.8	4602122.5	2180690.2	693839.5	15.0	89.4	Monopole	78.5	
M5	41.5649288	-81.7160083	440299.5	4601720.1	2183041.8	692559.4	14.3	93.6	Dipole	37.0	
M6	41.5629714	-81.7112339	440695.8	4601499.5	2184354.8	691857.9	14.5	92.4	Dipole	23.3	
M7	41.5621961	-81.7094409	440844.6	4601412.2	2184848.0	691579.9	14.4	95.8	Dipole	76.8	
M8	41.5568402	-81.6963557	441930.9	4600808.7	2188446.8	689661.1	13.2	91.4	Monopole	68.6	
M9	41.5567475	-81.6961940	441944.3	4600798.3	2188491.4	689627.8	13.2	93.9	Dipole	26.7	
M10	41.5540823	-81.6897585	442478.6	4600498.1	2190261.7	688673.0	12.8	94.6	Monopole	59.6	
M11	41.5522990	-81.6853676	442843.2	4600297.2	2191469.5	688034.4	12.5	91.7	Monopole	30.7	
M12	41.5513733	-81.6830568	443035.1	4600192.9	2192105.1	687703.0	12.4	88.9	Dipole	21.3	C252
M13	41.5510943	-81.6824088	443088.9	4600161.5	2192283.4	687603.1	12.4	90.0	Dipole	52.6	C257
M14	41.5485383	-81.6762752	443598.2	4599873.7	2193971.0	686687.5	11.9	92.2	Monopole	187.5	C285
M15	41.5397510	-81.6714626	443992.0	4598895.0	2195318.7	683498.3	11.1	598.8	Monopole	10.8	
M18	41.5438464	-81.6725876	443901.7	4599350.4	2194996.6	684987.6	11.6	398.0	Monopole	15.6	
M19	41.5486196	-81.6762341	443601.7	4599882.7	2193982.0	686717.3	12.3	82.6	Dipole	107.7	C285
M20	41.5404086	-81.6720712	443941.8	4598968.4	2195149.8	683736.3	11.3	594.9	Dipole	29.2	
M24	41.5369037	-81.6676089	444311.0	4598576.4	2196383.5	682470.9	10.1	399.8	Monopole	26.3	
M25	41.5315404	-81.6747700	443709.0	4597985.6	2194441.6	680498.1	0.0	1091.5	Dipole	145.1	
M26	41.5407863	-81.6600479	444945.0	4599002.6	2198439.8	683905.4	10.5	331.4	Dipole	108.9	C426
M27	41.5389450	-81.6635191	444653.9	4598800.4	2197496.0	683225.4	10.3	6.2	Monopole	32.5	
M28	41.5348691	-81.6682138	444258.8	4598350.9	2196225.0	681728.0	9.7	515.9	Monopole	54.7	
M29	41.5376216	-81.6634084	444662.0	4598653.4	2197531.0	682743.5	10.1	41.7	Dipole	27.6	C384
M30	41.5394153	-81.6600664	444942.3	4598850.4	2198439.6	683405.8	10.4	284.1	Monopole	23.8	
M32	41.5410904	-81.6590152	445031.4	4599035.7	2198721.5	684018.9	0.0	423.7	Monopole	57.5	
M33	41.5408670	-81.6593186	445005.9	4599011.1	2198639.2	683936.7	0.0	392.1	Dipole	136.6	
M34	41.5355832	-81.6663726	444413.0	4598429.0	2196726.6	681993.0	10.1	345.6	Monopole	22.3	C352
M35	41.5362778	-81.6651042	444519.4	4598505.3	2197071.4	682249.4	10.0	221.5	Dipole	68.7	
M36	41.5395686	-81.6594086	444997.3	4598867.0	2198619.1	683463.4	10.6	341.6	Monopole	38.6	C432
M40	41.5394539	-81.6602418	444927.7	4598854.8	2198391.4	683419.4	10.4	271.5	Monopole	42.6	
M41	41.5604476	-81.6996252	441661.5	4601211.4	2187540.0	690967.3	13.1	128.3	Monopole	15.0	
M42	41.5631635	-81.7063681	441101.7	4601517.5	2185685.7	691940.0	14.2	121.7	Dipole	23.9	
M43	41.5660867	-81.7134617	440512.9	4601846.9	2183734.9	692987.5	14.3	121.3	Dipole	18.4	
M44	41.5676671	-81.7172859	440195.5	4602025.0	2182683.3	693554.0	14.9	121.6	Dipole	69.5	
M45	41.5682266	-81.7187086	440077.4	4602088.1	2182292.1	693754.3	14.9	118.9	Dipole	24.7	
M46	41.5690275	-81.7205561	439924.1	4602178.3	2181784.0	694041.6	14.9	122.7	Monopole	88.5	
M47	41.5713855	-81.7263001	439447.4	4602444.1	2180204.6	694886.8	15.3	121.6	Monopole	122.2	
M48	41.6028184	-81.8026381	433115.4	4605990.2	2159225.4	706163.8	17.2	1.5	Monopole	10.1	
M49	41.6008315	-81.8006887	433275.8	4605768.1	2159764.4	705444.1	17.1	1.9	Monopole	61.0	C8
M50	41.6007495	-81.8008125	433265.4	4605759.1	2159730.8	705413.9	17.1	15.6	Monopole	49.1	C8
M51	41.6001685	-81.7991386	433404.3	4605693.3	2160190.3	705205.9	17.1	2.7	Monopole	17.0	
M52	41.5984615	-81.7950101	433746.6	4605500.6	2161324.5	704591.0	17.0	1.8	Monopole	30.2	
M53	41.5733222	-81.7339397	438812.3	4602664.5	2178108.1	695574.0	15.5	3.5	Monopole	98.0	
M54	41.5710419	-81.7284984	439263.8	4602407.5	2179604.2	694756.3	15.3	0.1	Monopole	16.4	
M55	41.5705945	-81.7274535	439350.5	4602357.1	2179891.6	694595.8	15.2	1.7	Dipole	28.8	
M56	41.5679312	-81.7210021	439885.9	4602056.9	2181665.5	693641.1	14.7	1.9	Dipole	16.6	
M57	41.5661370	-81.7166729	440245.2	4601854.7	2182856.0	692998.0	14.8	2.7	Dipole	155.3	
M58	41.5658378	-81.7159728	440303.3	4601821.0	2183048.6	692890.7	14.6	3.7	Dipole	84.8	
M59	41.5656580	-81.7154803	440344.2	4601800.7	2183183.9	692826.4	14.4	1.4	Monopole	134.0	
M60	41.5576602	-81.6960083	441960.6	4600899.5	2188539.1	689960.8	13.3	2.4	Monopole	9.6	
M61	41.5512867	-81.6806541	443235.4	4600181.7	2192763.0	687677.7	12.6	0.8	Monopole	9.7	
M62	41.5391598	-81.6595351	444986.4	4598821.7	2198585.9	683314.1	10.4	317.9	Monopole	41.5	C431
M65	41.5410308	-81.6583996	445082.7	4599028.7	2198890.2	683998.8	0.0	470.7	Monopole	125.3	
M66	41.5409427	-81.6585305	445071.7	4599019.0	2198854.7	683966.4	0.0	457.4	Monopole	233.1	
M67	41.5335442	-81.6689649	444195.0	4598204.3	2196024.0	681243.3	9.6	606.2	Monopole	25.0	
M69	41.5479070	-81.6751860	443688.5	4599802.9	2194271.3	686460.3	12.1	109.8	Monopole	29.1	
M70	41.5407007	-81.6714029	443997.8	4599000.4	2195331.7	683844.5	11.3	530.9	Dipole	60.0	
M71	41.5378505	-81.6696039	444145.4	4598682.8	2195834.1	682810.7	10.5	526.8	Monopole	31.2	C318
M74	41.5531703	-81.6813766	443176.8	4600391.3	2192558.8	688362.1	12.4	153.4	Dipole	23.2	
M75	41.5551699	-81.6862229	442774.4	4600616.5	2191225.6	689078.3	12.7	153.2	Monopole	29.0	C226
M76	41.5629892	-81.7051321	441204.6	4601497.3	2186024.5	691879.6	14.1	154.4	Monopole	16.4	
M77	41.5634985	-81.7063778	441101.2	4601554.7	2185681.9	692062.1	14.2	153.9	Monopole	47.1	
M78	41.5649951	-81.7102511	440779.6	4601723.5	2184617.0	692597.7	14.5	144.0	Monopole	15.9	
M79	41.5671708	-81.7152571	440364.2	4601968.5	2183240.0	693378.1	14.7	154.7	Monopole	13.3	
M80	41.5675736	-81.7162534	440281.5	4602013.9	2182966.1	693522.4	14.8	153.9	Monopole	18.0	
M81	41.5695702	-81.7210491	439883.5	4602238.9	2181647.3	694238.2	15.0	155.7	Monopole	27.9	
M82	41.5717140	-81.7261910	439456.8	4602480.5	2180233.4	695006.8	15.3	157.9	monopole	19.3	C83
M83	41.5797575	-81.7457494	437833.9	4603387.4	2174856.6	697890.6	16.0	155.9	Monopole	13.3	
M84	41.6044681	-81.8025638	433123.3	4606173.3	2159241.0	706765.0	17.2	116.9	Monopole	123.9	C6
M86	41.6028804	-81.8045865	432953.1	4605998.6	2158692.4	706182.1	17.2	123.9	Monopole	130.4	
M87	41.6081027	-81.8084546	432636.2	4606581.4	2157619.4	708076.5	17.4	31.5	Monopole	20.7	
M89	41.6010727	-81.8019985	433166.9	4605795.9	2159405.5	705529.1	17.1	72.8	Dipole	50.2	
M90	41.5994800	-81.8012672	433226.2	4605618.5	2159610.1	704950.4	17.1	149.6	Monopole	26.3	
M91	41.5723577	-81.7353154	438696.7	4602558.4	2177734.8	695219.3	15.4	145.6	Monopole	142.0	
M92	41.5694135	-81.7283386	439275.6	4602226.6	2179653.2	694163.3	15.2	152.1	Dipole	79.6	C63
M93	41.5681926	-81.7252617	439531.0	4602088.9	2180499.1	693725.9	15.0	147.4	Dipole	17.1	
M94	41.5677188	-81.7242741	439612.9	4602035.6	2180770.9	693555.7	15.1	153.9	Dipole	16.7	
M95	41.5658153	-81.7197241	439990.5	4601821.1	2182022.1	692873.3	14.6	156.5	Dipole	33.5	
M96	41.5654690	-81.7187908	440068.0	4601782.0	2182278.6	692749.4	14.8	152.7	Dipole	18.6	
M97	41.5649433	-81.7177223	440156.6	4601722.9	2182572.7	692560.4	14.7	161.0	Monopole	44.1	
M98	41.5646618	-81.7170716	440210.6	4601691.2	2182751.7	692459.5	14.5	162.3	Dipole	20.2	
M99	41.5644116	-81.7160350	440296.8	4601662.7	2183036.2	692370.9	14.3	145.0	Monopole	79.4	
M100	41.5598377	-81.7048125	441228.4	4601147.2	2186122.4	690732.1	13.9	139.4	Monopole	22.4	
M101	41.5589784	-81.7028964	441387.4	4601050.5	2186649.6	690423.8	13.4	146.0	Monopole	48.4	
M102	41.5510265	-81.6836647	442984.1	4600154.8	2191939.9	687575.1	12.4	147.1	Dipole	71.5	C243

Marine Magnetometer Anomalies											
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed	Polarity	Amplitude (nT)	Associated Sidescan Contact ID
	Latitude	Longitude	Easting (m)	Northing (m)	East (US survey feet)	North (US survey feet)					
M103	41.5500740	-81.6813081	443179.8	4600047.5	2192588.2	687234.1	12.5	145.0	Dipole	65.3	C263
M106	41.5391328	-81.6603260	444920.4	4598819.2	2198369.5	683302.2	10.5	254.0	Monopole	17.8	C418
M107	41.5540152	-81.6850092	442874.6	4600487.5	2191561.7	688660.6	12.6	89.7	Dipole	10.2	
M108	41.5676584	-81.7179539	440139.8	4602024.5	2182500.5	693549.1	14.9	93.9	Dipole	75.2	
M109	41.5691766	-81.7217620	439823.7	4602195.7	2181453.5	694093.0	15.0	88.8	monopole	85.5	
M111	41.5700593	-81.7239224	439644.4	4602295.2	2180859.5	694409.4	14.9	88.0	Dipole	20.9	
M112	41.5708789	-81.7259358	439477.3	4602387.6	2180306.0	694703.1	15.2	86.9	Dipole	20.4	C87
M113	41.5710823	-81.7263759	439440.8	4602410.5	2180184.9	694776.1	15.3	89.0	Dipole	25.6	C82
M115	41.5739316	-81.7332821	438867.7	4602731.7	2178286.1	695797.6	15.6	89.2	Monopole	23.9	
M116	41.5744240	-81.7344668	438769.4	4602787.2	2177960.4	695974.2	15.6	89.5	Dipole	14.8	
M117	41.5872063	-81.7656452	436182.7	4604228.9	2169390.5	700558.3	15.7	83.0	Monopole	11.8	
M118	41.5960000	-81.7867306	434434.1	4605221.0	2163596.3	703714.5	16.9	93.9	Monopole	21.9	
M120	41.6024963	-81.8010345	433248.7	4605953.2	2159665.0	706049.9	17.1	86.5	Monopole	20.2	
M121	41.6053231	-81.8038296	433018.7	4606269.2	2158892.3	707073.8	17.3	89.9	Monopole	22.3	
M122	41.5736267	-81.7333638	438860.6	4602697.9	2178264.7	695686.3	15.5	56.2	Monopole	74.9	
M123	41.5669524	-81.7170705	440212.8	4601945.5	2182744.5	693294.1	14.9	60.7	Dipole	26.2	
M124	41.5657431	-81.7141164	440458.0	4601809.2	2183556.9	692860.7	14.3	61.6	Monopole	38.1	
M127	41.5364138	-81.6669817	444362.9	4598521.6	2196556.9	682294.1	10.0	366.3	Monopole	20.1	
M128	41.5354060	-81.6674209	444325.4	4598410.0	2196440.2	681925.7	9.8	434.9	Dipole	35.6	
M129	41.5360893	-81.6679494	444281.9	4598486.2	2196293.2	682173.3	9.9	454.1	Monopole	37.5	
M131	41.5373226	-81.6685387	444233.8	4598623.5	2196127.5	682621.1	10.3	459.8	monopole	39.7	
M133	41.5400208	-81.6699860	444115.4	4598924.0	2195722.0	683600.5	11.4	482.6	Monopole	21.6	
M134	41.5408592	-81.6687921	444215.7	4599016.3	2196045.9	683909.0	11.5	347.0	Monopole	31.6	
M135	41.5374646	-81.6670369	444359.2	4598638.3	2196538.2	682676.8	10.2	335.5	Monopole	21.6	
M138	41.5389967	-81.6686015	444230.0	4598809.4	2196104.5	683230.9	11.0	408.8	Monopole	20.2	
M139	41.5405997	-81.6694249	444162.7	4598987.9	2195873.6	683812.8	11.5	406.4	Dipole	5.8	C321
M140	41.5508761	-81.6824508	443085.2	4600137.3	2192272.7	687523.4	12.5	112.9	Monopole	15.3	C256
M141	41.5512989	-81.6836088	442989.0	4600185.0	2191954.3	687674.5	12.4	118.3	Monopole	14.3	
M142	41.5524452	-81.6863740	442759.4	4600314.1	2191193.5	688085.1	12.6	117.9	Dipole	72.3	
M143	41.5565323	-81.6963428	441931.7	4600774.5	2188451.4	689549.0	13.2	120.8	Monopole	17.2	C197
M144	41.5620845	-81.7098618	440809.4	4601400.1	2184733.2	691538.2	14.4	123.5	Monopole	10.6	C167
M147	41.5653679	-81.7178134	440149.4	4601770.1	2182546.4	692714.9	14.8	123.3	Dipole	128.2	
M148	41.5725375	-81.7352346	438703.6	4602578.3	2177756.3	695285.0	15.4	124.9	Dipole	256.8	
M149	41.5990424	-81.7993035	433389.4	4605568.4	2160148.5	704795.2	17.1	113.6	Monopole	19.0	
M150	41.5999644	-81.8015504	433203.1	4605672.5	2159531.2	705126.2	17.1	118.5	Monopole	30.2	
M151	41.6010881	-81.8005671	433286.2	4605796.5	2159796.9	705537.8	17.1	23.4	Monopole	23.5	
M153	41.6006404	-81.7995452	433370.9	4605746.0	2160077.7	705377.0	17.1	32.3	Monopole	18.5	
M154	41.5735256	-81.7336781	438834.3	4602686.9	2178179.0	695648.7	15.5	33.7	Monopole	101.9	
M155	41.5693697	-81.7237252	439660.2	4602218.5	2180915.7	694158.6	14.9	28.8	Monopole	13.7	C102
M156	41.5686945	-81.7219413	439808.3	4602142.3	2181406.0	693916.9	14.9	34.7	Dipole	36.7	C121
M157	41.5683751	-81.7213093	439860.7	4602106.4	2181580.0	693802.1	14.8	29.0	Monopole	11.5	C129
M158	41.5675903	-81.7194811	440012.4	4602018.0	2182082.8	693520.6	14.8	26.0	Monopole	25.1	C138
M159	41.5663746	-81.7165652	440254.4	4601881.0	2182884.7	693084.8	14.8	24.7	Dipole	58.7	
M161	41.5653242	-81.7139834	440468.7	4601762.6	2183594.6	692708.4	14.2	26.2	Dipole	28.0	
M163	41.5652091	-81.7135192	440507.3	4601749.5	2183722.0	692667.6	14.2	33.6	Dipole	91.4	
M164	41.5396470	-81.6654948	444489.7	4598879.6	2196952.7	683476.0	11.0	139.9	Dipole	8.9	C363
M165	41.5487229	-81.6761189	443611.4	4599894.1	2194013.1	686755.2	12.3	67.9	Dipole	108.8	C287
M166	41.5382546	-81.6654769	444490.0	4598725.0	2196962.5	682968.7	10.4	185.0	Dipole	25.8	C365
M167	41.5384707	-81.6661133	444437.1	4598749.4	2196787.5	683045.8	10.6	228.4	Dipole	144.4	
M169	41.5526855	-81.6847601	442894.2	4600339.7	2191634.4	688176.8	12.5	29.7	Monopole	11.0	
M170	41.5529418	-81.6852665	442852.2	4600368.5	2191495.0	688268.9	12.6	25.1	Dipole	26.6	
M171	41.5569863	-81.6951401	442032.4	4600824.1	2188779.0	689717.4	13.1	28.3	Monopole	52.0	
M172	41.5572905	-81.6960727	441954.9	4600858.5	2188522.8	689825.9	13.2	36.2	Monopole	21.4	
M173	41.5573735	-81.6962019	441944.2	4600867.8	2188487.1	689855.8	13.3	33.3	Monopole	7.4	
M174	41.5572903	-81.6959600	441964.3	4600858.4	2188553.6	689826.1	13.2	31.7	Dipole	75.1	
M175	41.5573982	-81.6961362	441949.7	4600870.5	2188505.0	689865.0	13.2	28.3	Monopole	12.3	
M176	41.5582030	-81.6981451	441782.9	4600961.2	2187952.5	690153.2	13.5	30.7	Monopole	17.5	
M177	41.5647373	-81.7140549	440462.2	4601697.5	2183577.0	692494.4	14.2	33.8	Dipole	58.7	
M179	41.5718504	-81.7312471	439035.4	4602499.2	2178849.6	695044.2	15.2	31.7	Dipole	32.0	C50
M181	41.5758412	-81.7415576	438179.6	4602949.6	2176015.8	696473.6	15.7	57.1	Monopole	9.3	
M182	41.5920046	-81.7800926	434983.3	4604772.4	2165423.9	702273.7	16.8	29.0	Monopole	11.3	
M184	41.6004022	-81.8011538	433236.6	4605720.8	2159638.4	705286.6	17.1	61.6	Monopole	15.8	
M185	41.5992251	-81.7985377	433453.4	4605588.1	2160357.4	704863.5	17.0	65.1	Monopole	19.8	
M186	41.5772457	-81.7451496	437881.5	4603108.1	2175028.6	696976.8	15.6	64.5	Monopole	11.1	
M187	41.5729492	-81.7345112	438764.3	4602623.5	2177952.9	695436.7	15.4	55.8	Monopole	11.6	
M188	41.5716811	-81.7313903	439023.3	4602480.5	2178810.9	694982.2	15.2	53.9	Dipole	9.7	
M189	41.5703497	-81.7282867	439280.8	4602330.5	2179664.4	694504.6	15.2	59.0	Dipole	11.2	
M190	41.5685808	-81.7239886	439637.5	4602131.1	2180846.2	693870.5	15.0	58.6	Monopole	8.7	
M191	41.5679971	-81.7225513	439756.8	4602065.3	2181241.4	693661.3	14.9	57.7	Dipole	9.5	
M192	41.5668192	-81.7197856	439986.3	4601932.6	2182002.0	693238.9	14.6	61.3	Dipole	24.8	C137
M193	41.5594978	-81.7020637	441457.3	4601107.6	2186875.8	690615.1	13.3	62.1	Dipole	20.6	
M194	41.5594349	-81.7018892	441471.8	4601100.5	2186923.8	690592.6	13.3	61.2	Monopole	13.9	
M195	41.5579714	-81.6983177	441768.3	4600935.6	2187906.1	690068.4	13.5	60.1	Monopole	8.2	
M196	41.5571836	-81.6964709	441921.6	4600846.9	2188414.1	689786.0	13.3	62.6	Monopole	6.7	
M197	41.5566534	-81.6950753	442037.5	4600787.1	2188797.9	689596.3	13.1	58.1	Monopole	16.8	
M198	41.5526142	-81.6852246	442855.4	4600332.1	2191507.6	688149.6	12.5	55.3	Dipole	50.7	
M199	41.5506155	-81.6805272	443245.4	4600107.1	2192800.1	687433.4	12.5	61.0	Dipole	85.2	
M200	41.5487343	-81.6760171	443619.9	4599895.3	2194041.0	686759.6	11.9	62.7	Dipole	163.8	C288
M201	41.5516852	-81.6790551	443369.1	4600224.9	2193199.3	687827.0	12.4	102.2	Dipole	27.6	
M202	41.5518646	-81.6788879	443383.2	4600244.7	2193244.5	687892.8	12.4	126.4	Monopole	7.9	
M203	41.5599115	-81.7003941	441596.9	4601152.4	2187331.3	690770.0	13.1	45.2	Monopole	8.4	
M204	41.5604475	-81.7068566	441058.5	4601216.3	2185561.0	690949.2	14.1	162.2	Monopole	4.8	
M205	41.5654662	-81.7100979	440792.8	4601775.7	2184657.4	692769.8	0.0	196.0	Dipole	61.2	
M206	41.5649531	-81.7103442	440771.8	4601718.9	2184591.7	692582.2	14.5	136.2	Dipole	20.4	
M208	41.5663045	-81.7162442	440281.1	4601873.0	2182972.8	693060.0	14.7	30.8	Monopole	68.6	
M209	41.5700883	-81.7203077	439945.8	4602295.9	2181848.5	694428.7	0.0	235.9	Monopole	71.7	

Marine Magnetometer Anomalies											
ID	NAD83 Geographic		NAD83 UTM Zone 17		NAD83 Ohio State Plane North		Bathymetry (m)	Distance from Proposed	Polarity	Amplitude (nT)	Associated Sidescan Contact ID
	Latitude	Longitude	Easting (m)	Northing (m)	East (US survey feet)	North (US survey feet)					
M211	41.5683874	-81.7216561	439831.8	4602108.0	2181485.1	693805.7	14.8	16.2	Monopole	22.7	C125
M214	41.5711257	-81.7263560	439442.5	4602415.3	2180190.2	694792.0	15.3	94.1	Monopole	14.1	C82
M215	41.5713403	-81.7261749	439457.8	4602439.0	2180239.0	694870.6	15.3	122.2	Monopole	61.7	C85
M216	41.5715103	-81.7260724	439466.5	4602457.8	2180266.5	694932.8	15.3	142.9	Monopole	14.0	C86
M217	41.6001150	-81.8016471	433195.2	4605689.3	2159504.4	705180.9	17.1	113.6	Monopole	32.9	
M218	41.6028241	-81.8045222	432958.4	4605992.3	2158710.1	706161.7	17.2	123.4	Dipole	79.7	

Some of the magnetic anomalies were correlated to known sidescan contacts (targets). The remaining magnetic anomalies were not correlated to a sidescan contact or known lakebed installation such as a pipe or cable. There are a number of anomalies mapped on adjacent survey lines that may indicate the presence of a linear ferrous feature perpendicular to the proposed route at EKP 6.3 (Figure 18). This feature could not be identified from the sidescan or sub-bottom profiler data acquired over this area. An analysis of the magnetic data shows that the feature is most likely a buried steel or iron buoy block or anchor at the southwest contact with associated cable running to the northeast.

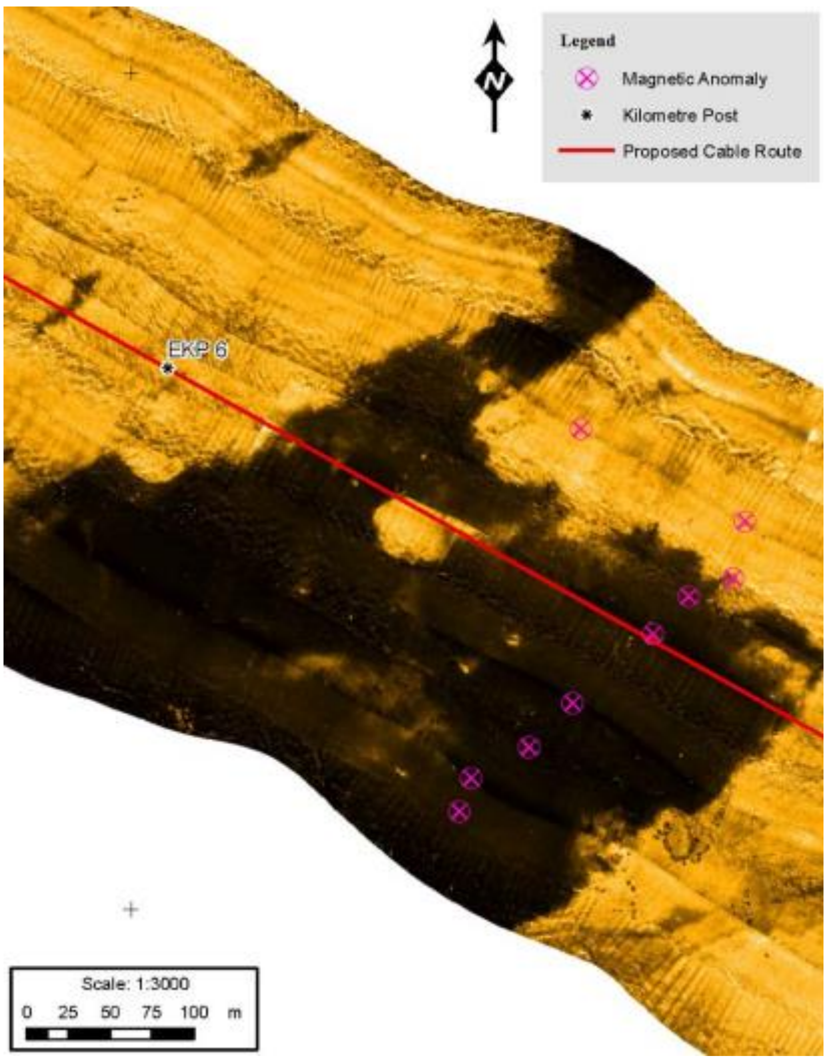

Figure 18 Location of linearly-aligned magnetic anomalies between EKP 6 and EKP 6.5. (CSR)

Past magnetic surveys in this area of the lake have also shown no correlation between the magnetic data and sidescan sonar imagery, with most of the magnetic hits having very small pole-to-pole distances indicating small or thin objects (Alpine, 2010)(VanZandt, 2015). This is primarily due to the proximity of the area being close to shore and used as a dumping ground for the past 200 years. Even today there are 5 dumping grounds identified on the latest Moss Point to Vermilion NOAA chart 14826 (Figure 19).

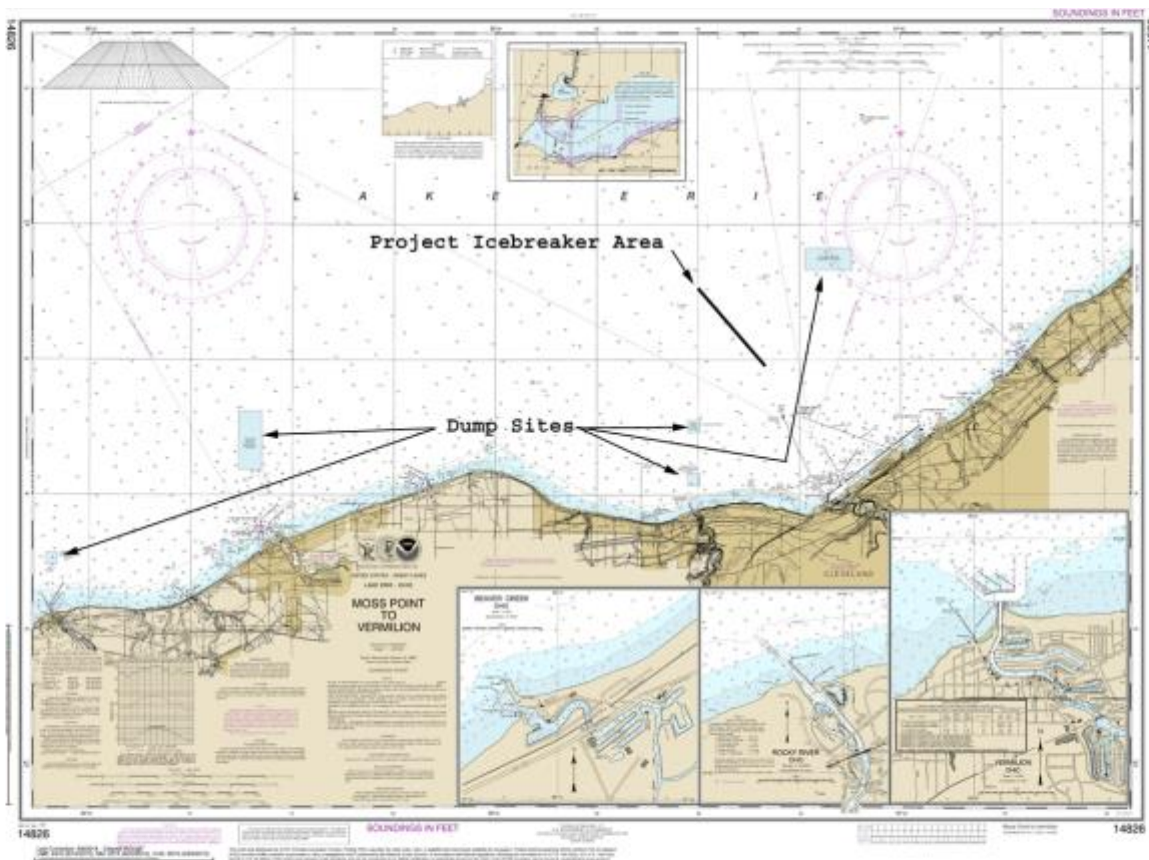

Figure 19 Current Dump Sites in Survey Areas (NOAA, VanZandt Engineering)

It is possible that some of the more magnetically intense anomalies are manmade but have no archaeological context, thus do not represent potentially significant resources. The less magnetically intense objects are most likely a function of geology, perhaps representing small pockets of glacial till or other magnetic rocks/sediment near the surface. In both cases, the Sidescan sonar imagery did not show any objects that would correlate with the anomalies. The lack of correlation is likely due to the magnetic objects being masked by overlying sediment.

5.3 Sub-bottom Data Analysis

A review of 271 line km of sub-bottom data showed no historic structures (such as shipwrecks) or artifacts were present within the turbine, export cable, and inner harbor areas.

The presence of gas charged sediments within the Icebreaker survey area was interpreted from chirp sub-bottom profiler and boomer seismic data. The presence of gas charged sediments can accentuate sub-bottom reflectors causing “bright spots” as well as prevent the penetration of the acoustic energy from the profiling system, thereby masking the acoustic signal.

The origin of the near surface gas in the survey area cannot be determined from the data collected from this survey. This gas may originate from shallow decomposed organic material (biogenic) or from deep underlying bedrock formations (petrogenic). In this area the biogenic source is plausible since vegetation has been buried during the numerous lake transgressions. This burial and subsequent decomposition could account for the presence of sub-surface gas.

Small localized erosional depressions or channels have been identified near the proposed WTG ICE1 turbine location (Figure 20) and over the near shore survey area. These features are infilled and were likely formed by glacial fluvial processes.

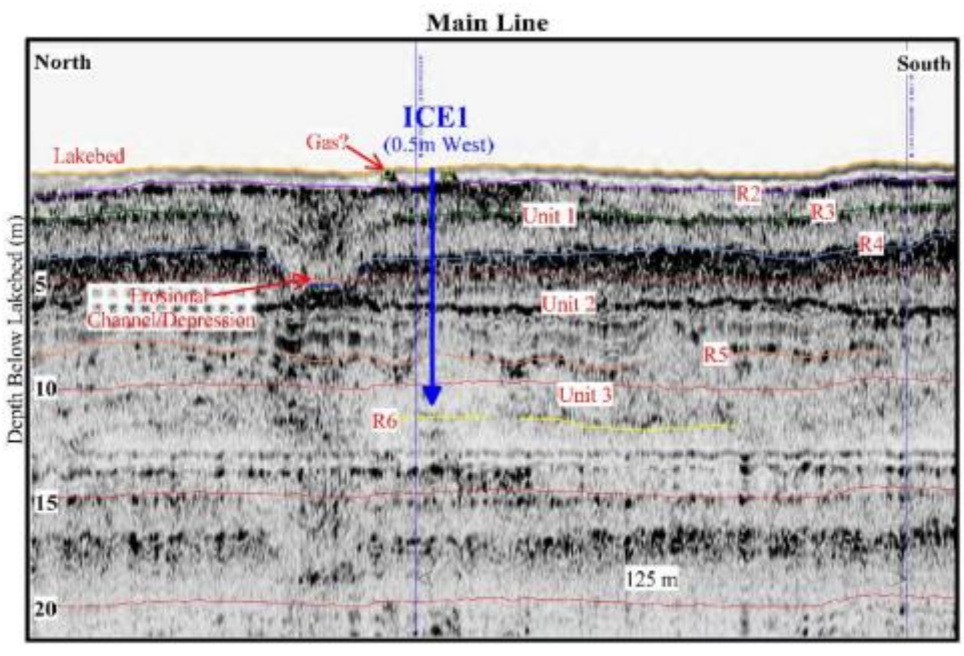

Figure 20 ICE 1 Erosional Depression or Channel (CSR)

6.0 SECTION 106 REVIEW RESULTS

The purpose of this review was to determine if any prehistoric/historically significant artifacts, such as shipwrecks or human occupation sites, might be present in the three APEs in the construction area of the Icebreaker Wind project.

6.1 Prehistoric Results

During the period from ~12,000 YBP to ~5,400 YBP the lake level was below the survey site so the possibility of prehistoric occupation sites does exist. A review of the Dames & Moore and Alpine geological data does not indicate the existence of any potential river systems or water sources that may have provided occupation sites for Paleoindians. A further literature review did not identify any past or ongoing research for the identification of prehistoric Lake Erie river systems.

Several small localized erosional depressions or channels were identified near the proposed ICE1 turbine location and over the nearshore survey area. These features are infilled and were likely formed by glacial fluvial processes. It is highly unlikely that these features contain prehistoric artifacts because erosional and sedimentation processes would have affected any prehistoric sites. This erosion would have mixed -- and destroyed -- the context of any site (Gray & Pape, 2014).

The impact of the project's construction to any prehistoric archaeological sites in the area would be negligible due to the small footprint that the foundation will occupy. Even though the mono bucket will be approximately 17.5 m (57 feet) in diameter and penetrate a maximum of 10 m (33 feet) deep into the lake bed and also into the glacial till layer, the disturbance area is small. This is due to the fact that the portion penetrating the lake bottom is only a cylindrical shell, like a biscuit cutter, not a solid object. The skirt thickness of the mono bucket is 3.175 cm (1.25 inches). The estimated surface area of disturbance for each WTG site is only 3.5 square meters (38 square feet). This coupled with the fact that the sub-bottom geology does not indicate any riverine structures leads to the conclusion that it is very unlikely that any prehistoric sites existed in the turbine APE or that its installation would impact such a site if it were to penetrate one at a thickness of 3.175 cm (1.25 inches.)

The interconnect cables in the turbine APE are buried at a depth of 1.5 m (4.5 feet) which is above these glacial till deposits. Their installation would not impact any potential prehistoric site.

The export cable, running to shore, is buried at a depth of 1.5 m (4.5 feet) and disturbance width of 1.5 m (4.5 feet). Several possible paleo-depressions/channels have been interpreted from the sub-bottom geology data and these are below the burial depth of the export cable. Any disturbance to any possible prehistoric site due to the small disturbance area seem unlikely.

The borehole for the HDD export cable will be well below any potential prehistoric site. The 0.6 m (18 inch) borehole will run from the breakwater, through the inner harbor, and exit at the CPP substation at a total depth of 18 – 27 m (60 – 90 feet) bottom level and a minimum of 4 m (12 feet) below the foundation of the breakwater.

6.2 Historic Results

No properties of historical significance were identified by the survey at the Icebreaker Wind APEs.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Results from the Section 106 review have confirmed that there were no artifacts or properties of historical significance identified within the Icebreaker Wind APEs. Moreover, the literature search produced no evidence of the existence of any artifacts or properties within the project's proposed APEs.

Based on this review, VanZandt Engineering concludes that the Icebreaker Wind project will have no impact on historic properties. VanZandt Engineering believes that no further archaeological investigation is required for this project and that project construction be approved. However, while the research and survey work for this project were thorough, no survey technique is completely adequate to identify all cultural resources in a given area. In the unlikely event any historic or prehistoric remains are discovered during project construction, the SHPO and/or VanZandt Engineering should be contacted to investigate and evaluate the significance of any such finds.

8.0 REFERENCES

Alpine Ocean Seismic Survey, Inc.

2010 Final Report, Expert Lakebed Studies for the Lake Erie Wind Power Project Offshore Cleveland, Ohio. Prepared for the Cuyahoga County Department of Development, Cleveland, Ohio.

Brose, David F.

1994 Archaeological investigations at the Paleo Crossing Site, a Paleoindian occupation in Medina, Ohio, The First Discovery of America: Archaeological Evidence of the Early Inhabitants of The Ohio Area, edited by: Dancey, William S., Ohio Archaeological Council, 1994

CSR (Canadian Seabed Research Ltd.)

2016 ICEBREAKER OFFSHORE WIND DEMONSTRATION PROJECT 2016 Marine Geophysical Survey Results, Cleveland, Ohio, CSR Project Number: 1604, Canadian Seabed Research Ltd. and TDI Brooks, Submission Date: November 25, 2016

Carter, Williams, Fueller, Meisburger

1982 Regional Geology of the Southern Lake Erie (Ohio) Bottom: A Seismic Reflection and Vibracore Study, Miscellaneous Report No. 82-15. U.S. Army Corp of Engineers, Coastal Engineering Research Center, Ft. Belvoir, Virginia.

Dames & Moore

1974 Airport Feasibility Study for the Lake Erie Regional Transportation Authority, Phase I, Report No. 5-1 and 5-2, Dames & Moore Inc., Los Angeles, California.

Frew, David

2014 Shipwrecks of Lake Erie, P. 18, The History Press, Charleston, South Caroloina.

Gray & Pape, Inc.

2014 Literature Review and Recommendations for Area of Potential Effects and Historic Properties Identification Efforts for Icebreaker Windpower Inc's Project Icebreaker, Cuyahoga County, Ohio, Gray & Pape Project No.13-63601.001, January 14, 2014.

Herdendorf, Charles E.

2013 Research overview: Holocene development of Lake Erie, The Ohio Journal of Science, v112, n2 (2013), 24-36.

Herdendorf, Charles E., Klarer, David M., Herdendorf, Ricki C.

2006 The ecology of Old Woman Creek, Ohio: An estuarine and watershed profile, second edition, Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

Mansfield, J. B.

1899 History of the Great Lakes, Vol. 1, J. H. Beers & Co., Chicago, Illinois.

Michigan Sea Grant

2014 Michigan Sea Grant http://www.miseagrant.umich.edu/explore/about-the-great-lakes/. Accessed 8 May 2014

NOAA

2014a Great Lakes Environmental Research Laboratory http://www.glerl.noaa.gov/pr/ourlakes/lakes.html. Accessed 8 May 2014

2014b Great Lakes Environmental Research Laboratory http://www.glerl.noaa.gov/pubs/brochures/foodweb/LEfoodweb.pdf. Accessed 8 May 2014

2014c National Geophysical Data Center http://www.ngdc.noaa.gov/mgg/greatlakes/erie.html. Accessed 8 May 2014

2014d National Geophysical Data Center

http://www.ngdc.noaa.gov/mgg/greatlakes/lakeerie_cdrom/html/e_gmorph.htm. Accessed 8 May 2014

ODNR

2009 Wind Turbine Placement Favorability Analysis Map Methodology Narratives, Ohio Department of Natural Resources, Office of Coastal Management, Sandusky, Ohio

Stothers, David M., Abel, Timothy J.

2001 Vanished Beneath the Waves: The Lost History and Prehistory of Southwestern Lake Erie Coastal Marshes, Archaeology of Eastern North America, 29:19-46

Stothers, David M. and G. Michael Pratt

1980 The Culture History of the Southwestern Lake Erie Drainage Basin. Paper presented at the 7th Annual Archaeological Symposium of the Ontario Archaeological Society. London, Ontario.

VanZandt Engineering

2015 VanZandt Engineering

Final Report, Lake Erie Geophysical Sidescan Sonar Survey II for Project Icebreaker, Prepared for Lake Erie Energy Development Corporation, 1938 Euclid Avenue, Suite 200, Cleveland, Ohio 44115

Waterkeeper

2014 Lake Erie Waterkeeper

http://www.lakeeriewaterkeeper.org/lake-erie/facts/. Accessed 8 May 2014

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]