APPENDIX 1

METHODOLOGY FOR COMPREHENSIVE, PRE-INVESTMENT STUDIES OF THE MARINE ENVIRONMENT CARRIED OUT BY THE INVESTOR

Timetable for comprehensive studies of the marine environment

No	Scope of monitoring	Quarterly reports (time range)	Methodology used	Spatial scope of the survey
1	Hydrological, meteorological and hydrochemical monitoring	December 2020 - August 2021	The methodology of physico-chemical examination of waters is compliant with the Regulation of the Minister of Infrastructure of 13 July 2021 on forms and methods of conducting monitoring of surface water bodies and groundwater bodies. Hydrological monitoring is carried out at two measuring stations, at the central point of the study area and at the shallowest point of the sea area. Meteorological conditions are measured at both measuring stations. Within the framework of hydrological and meteorological monitoring, the following parameters are measured: air temperature, water temperature, atmospheric pressure, flow in the water-depth, wave movement on the sea surface, water salinity, electrical conductivity of water, wind at the height of approx. 5 m above sea level (direction and speed) and water pressure. Methodology follows the guidelines of the World Meteorological Organization (WMO No. 8 Guide to Meteorological Instruments and Methods of Observations). Hydrochemical monitoring samples are collected from 38 research stations. Research profiles at the selected five stations follow the guidelines of the HELCOME COMBINE programme. Sampling of seawater for analyses of physicochemical indicators is performed in accordance with the recommendations in the Regulation [70]. Measurements and analyses include the following indicators: oxygen conditions, total organic carbon (TOC), acidification (pH) and alkalinity, nutrients (ammonium nitrogen, nitrate nitrogen, total nitrogen, mineral nitrogen (DIN), phosphates, total phosphorus), total suspended solids, as well as analyses of the content of substances particularly harmful to the environment, such as: mercury, nickel, lead, cadmium, arsenic, total chromium, chromium (VI), phenols, cyanides, mineral oils, polycyclic aromatic hydrocarbons (16 PAHs), polychlorinated biphenyls (7 PCB congeners) and measurements of radioactivity of caesium (^{137}Cs) and strontium (^{90}Sr) isotopes. <u>The following standards and references are used during hydrological and meteorological monitoring and in data analyses:</u> • Fofonoff N.P., Millard R.C. Jr, *Algorithms for computation of fundamental properties of seawater*, UNESCO Technical Papers in Marine Science 44, UNESCO/SCOR/ICES/IAPSO Joint Panel on Oceanographic Tables and Standards and SCOR Working Group 51, 1983; • Massel S.R, Ocean Surface Waves. Their Physics and Prediction, Advanced Series on Ocean Engineering, Volume 36, 2nd ndedition, World Scientific 1984;	MFW BI development area with the impact zone of the width of at least 1 nautical mile

			• Nortek AS, AWAC. *Acoustic wave and current meter. User manual.* Doc. No. N3100-126, 2005; • Nortek AS, *Installation guidelines*, 2012. • Nortek AS, *Principles of operation. Current and wave measurement,* 2013; • EN ISO 18365:2014-02E: Hydrometry - Selection, set-up and operation of a measuring station. • World Meteorological Organization, *Guide to Instruments and Methods of Observation. Volume I - Measurement of Meteorological Variables.* WMO-No. 8, Geneva 2018; • World Meteorological Organization, *Guide to meteorological services*, WMO-No. 481, Geneva 2001. <u>The following reference documents are used for sampling and analysis:</u> • Manual for Marine Monitoring in the COMBINE Programme of HELCOM, 2002; HELCOM, Environment of The Baltic Sea area 1994-1998, Baltic Sea Environment Proceedings No. 82B, Helsinki Commission - water monitoring results; • HELCOM, Annex B-15, 2012 Technical note on the measurement of total alkalinity in seawater. § Guidelines for monitoring waterborne pollution loads to the Baltic - salinity measurement; • *Regulation of the Minister of Infrastructure [70].* • *Regulation of the* Minister of Infrastructure of 25 June 2021 on the classification of ecological status, ecological potential, chemical status and the method for classifying the status of surface water bodies and environmental quality standards for priority substances (Journal of Laws 2021, item 1475).	
2	Seabed surveys	March to August 2021.	Seabed surveys are carried out in accordance with the methodology developed by MEWO S.A. and include the following activities: geophysical surveys, bathymetry, side scan sonar, shallow seismic and seismoacoustic surveys, magnetometry, and shallow core sampling. <u>They are conducted in accordance with the following standards and guidelines:</u> • ASTM, D7128-05, Standard Guide for Using the Seismic-Reflection Method for Shallow Subsurface Investigation, 2010. • BS 1377-2 Methods of test for soils for civil engineering purposes. Classification tests. • IHO SP-44, Standards for Hydrographic Surveys, Special Publication No. 44 published by the International Hydrographic Bureau, 5th edition, 2008. • IMO, ISM Code and Guidelines on Implementation of the ISM Code, 1998. International Convention for the Safety of Life at Sea (SOLAS), the latest version. • International Convention for the Prevention of Pollution from Ships (MARPOL) 1973, signed in London on the 17th of February 1973, the latest version. • ISO 9000: Standards on quality management and quality assurance. • PN-B-04481:1988: Construction soils. Soil sample testing.	

			• Przezdziecki P., Seismostratigraphy of Quaternary Sediments in the Polish Part of the Baltic Sea, Bulletin of Polish Geological Institute 2004, 413: 8-126. • The UNESCO Convention 2001 - Convention on the Protection of Underwater Cultural Heritage, adopted by the General Conference of UNESCO at its 31st session in Paris on the 2nd of November, 2001. • UKOOA, Guidelines for the use of differential GPS in offshore surveying, September 1994. Guidelines for the use of differential GPS - procedures and statistics, 1996, 2005. • EN ISO 14688-1:2018-05 Geotechnical investigation and testing - Determination and classification of soils - Part 1: Determination and description. • PN-EN ISO 17892-4:2017-01 Geotechnical investigation and research - Laboratory testing of soils - Part 4: Testing of soil grain size distribution.	
3	Studies on physicochemical parameters of sediments	Winter campaign (February to May 2021) Summer campaign (July to August 2021) (growing season)	Sampling points of surface sediments for examination of physicochemical conditions were delineated in a uniformly distributed measurement grid with a density of 1 sample per 1 km^2. A total of 305 sampling sites were delineated. Surface sediment samples for chemical analyses were collected in two study campaigns. During the winter campaign, surface sediment samples were collected for sieve and/or aerometric analysis and analysis of moisture, loss on ignition, total organic carbon, content of heavy metals and their labile forms (Pb, Cu, Zn, Ni, Cd, Cr, As, Hg), polycyclic aromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), total nitrogen and total phosphorus. In addition, analyses of mineral oils, butyltin (BT) compounds and ^{137}Cs radioactivity were performed on selected samples. During the summer campaign, surface sediment samples were collected for analysis of total nitrogen and total phosphorus due to seasonal variations. <u>The following principles were applied when sampling and analysing seabed surface sediments:</u> • OIMO, Guidelines for the sampling and analysis of dredged material intended for disposal at Sea, Chapter 5, "Building a sampling plan - detailed considerations", Point 5.5. Sample number and location, 2005; • HELCOM Baltic Sea Action Plan, HELCOM Ministerial Meeting Kraków, 15.11.2007 - document "Indicators and targets for monitoring and evaluation of the implementation of the Baltic Sea Action Plan"; • HELCOM Guidelines for the Management of Dredged Material at Sea, March 2015 - Point 7. sampling of dredged material; • Convention on the Protection of the Marine Environment of the Baltic Sea Area, done at Helsinki on April 9, 1992. (Journal of Laws of 2000, No. 28, item. 346) - Annex 1 Harmful substances; • PN-EN ISO 5667-19:2006 Water quality. Sampling. Part 19: Guidelines for sampling in marine sediments; • PN-EN ISO 5667_1:2008 Water quality. Sampling. Part 1: Guidelines for the design of sampling programmes and sampling techniques;	

			• Regulation of the Minister of the Environment of 11 May 2015 on the recovery of waste outside installations and equipment (Journal of Laws 2015, item 796); • PN-EN ISO 14688-1:2018/Ap1:2012P Geotechnical investigation and testing - Soil identification and classification - Part 1: Identification and description; • PKN-CEN ISO/TS 17892-4:2017 Geotechnical investigation and testing - Laboratory testing of soil - Part 4: Determination of particle size distribution.	
4	Marine aggregate research	March to August 2021.	The exploration of the resources began with the analysis of data collected from seabed surveys and the physical and chemical properties of the sediments. Available bathymetric, sonar, seismic-acoustic data, shallow core sample data, grab sample data and literature review were used to identify the presence of mineral resources. <u>The following standards and guidelines were applied in the sampling and analysis of seabed surface sediments:</u> • ASTM, D7128-05. standard guide for the use of the seismic-reflection method in shallow ground investigation, 2010. • Dadlez R., Przekroje geologiczne, utworów przedkenozoiczne, [w:] Mojski J.E. (red.), Atlas geologiczny południowego Bałtyku, Tabl. X, PIG, Sopot-Warszawa 1995 . • Gudelis W.K., Yemelyanov J.M., Geology of the Baltic Sea, Wydawnictwa Geologiczne, Warsaw 1982. • Jurys L., Przeździecki P., Methodology of documenting Baltic natural aggregate deposits. Górnictwo Odkrywkowe 2006, 1-2: 166-173. • Kramarska R., Jegliński W., Jurys L., Przeździecki P, Uścinowicz S., Zachowicz J., Atlas parametrów lithologicznych osadów powierzchniowych południowego Bałtyku ze szczególnym uwzględaniem geologiczno-górniczych warunków występowania surowców okruchowych, Złoża i obszary perspektywiczne surowców okruchowych, Tab. 17, PIG, Gdańsk2005 . • Kramarska R., Krzywiec P., Dadlez R., Mapa geologiczna dna Bałtyku bez utworów czwartorzędowych, 1 : 500 000, PIG, Gdańsk-Warszawa 1999. • Kramarska R., Osady na głębokości 1 m poniżej powierzchni dna, [w:] Mojski J.E. (red.), Atlas geologiczny Południowego Bałtyku, Tab. XXI, Państwowy Instytut Geologiczny, Sopot-Warszawa 1995 a. • Kramarska R., Osady powierzchni dna, [w:] Mojski J.E. (red.), Atlas geologiczny Południowego Bałtyku, Tab. XXV, Państwowy Instytut Geologiczny, Sopot-Warszawa 1995 b. • Kramarska R., Przezdziecki P., Uścinowicz S., Zachowicz J., Przekroje geologiczne (I), [w:] Mojski J.E. (red.), Atlas geologiczny Południowego Bałtyku, Tab. XXIV, Państwowy Instytut Geologiczny, Sopot-Warszawa 1995. • Mojski J.E. (ed.), Atlas Geologiczny Południowego Bałtyku, Państwowy Instytut Geologiczny, Sopot-Warszawa 1995.	

			• Nieć M., Lamberger M., Radwanek-Bąk B., Górecki P., Methodology of documenting solid mineral deposits. Part I. Exploration and prospecting of deposits. Planning and organisation of geological works. Publishing House of the Institute of Geology and Earth Sciences, Cracow 2012. • Pikies R., Morfogeneza dna, [in:] Mojski J.E. (ed.), Atlas geologiczny Południowego Bałtyku. Tab. XXIV, PIG, Sopot-Warszawa 1995. • Przeździecki P., Sejsmostratygrafia osadów czwartorzędowych w polskiej części Morza Bałtyckiego, "Biuletyn Państwowego Instytut Geologicznego" 2004, 413: 8-126. • Regulation of the Minister of the Environment of 1 July 2015 on geological documentation of a mineral deposit, excluding hydrocarbon deposits (Journal of Laws 2015, item 987). • UNESCO 2001 Convention - Convention on the Protection of the Underwater Cultural Heritage, adopted by the General Conference of UNESCO at its 31st session in Paris on 2 November 2001. • Uścinowicz S., Miąższość czwartorzędu, [w:] Mojski J.E. (red.), Atlas geologiczny południowego Bałtyku, Tabl. XIII, PIG, Sopot-Warszawa 1995. • Uścinowicz S., Zachowicz J., Mapa geologiczna dna Bałtyku w skali 1:200 000, sheet Łeba, Słupsk, PIG-PIB, Warszawa 1988. • Uścinowicz S., Zachowicz J., Explanations to the geological map of the Baltic Sea bottom in the scale 1:200 000, sheet Łeba, Słupsk, PIG-PIB, Warsaw 1991. • Act of 9 June 2011. Prawo geologiczne i górnicze (Dz.U. 2011 Nr 163, poz. 981).	
5	Benthic surveys	March to August 2021.	Phytobenthos video surveys are conducted along transects. Their location was determined by sediment mapping and seabed bathymetry. Transects weree located in areas potentially covered by phytobenthos, i.e. on rocky seabed (up to approx. 30 m depth), which is a substrate suitable for macroalgae development. The strategy for the macrozoobenthos surveys was to designate a representative number of sampling stations taking into account seabed habitat delimitation and sediment type as determined by bathymetry and sediment mapping and ROV video documentation (also collected during the phytobenthos surveys). Sampling methods are in accordance with *the Manual for Marine Monitoring in the COMBINE Program of HELCOM. Annex C-8 Soft bottom macrozoobenthos* (HELCOM 2017) and the *Guide for monitoring biological elements and classifying the ecological status of surface waters. Methods update. Macrozoobenthos in transitional and coastal waters* (*Guidelines to the monitoring of the biological elements and the classification of the ecological status of the surface waters. Updated methods. Macrozoobenthos in transitional and coastal waters,* Osowiecki and Błeńska 2020). One macrozoobenthos sample will be collected at each site. <u>The following standards and recommendations were applied in the sampling and analysis of benthic organisms:</u> • Barańska A., Michałek M., Kruk-Dowgiałło L., Brzeska-Roszczyk P., Osowiecki A., Methodology for monitoring and assessing conservation status, 1170 Rocky and stony seabed, reefs, 12 pp. (http://morskiesiedliska.gios.gov.pl/pl/do-pobrania/przewodniki-metodyczne), 2018.	

			• Brzeska-Roszczyk P., Opioła R., Macroalgae and angiosperms in transitional and coastal waters, [in:] Handbook for monitoring biological elements and classification of ecological status of surface waters. Methods update. A. Kolada (ed.), Library of Environmental Monitoring, Warsaw 2020, 331-344, 2020. • Błeńska M. , Osowiecki A., Brzeska P., Kruk-Dowgiałło L., Dziaduch D., Barańska A., Badania bentosu na obszarze MFW Bałtyk Środkowy II. Final report with research results, [in:] Morska Farma wiatrowa Bałtyk Środkowy II, Raport o oddziaływaniu na środowisko. Volume III, section 6. SMDI Doradztwo Inwestycyjne Sp. z o.o. , Warsaw 2015 (a). • Błeńska M., Osowiecki A., Brzeska P., Barańska A., Dziaduch D., Badania bentosu na obszarze MFW Bałtyk Środkowy III. Final report with research results, [in:] Morska Farma wiatrowa Bałtyk Środkowy III, Raport o oddziaływaniu na środowisko. Volume III, Chapter 6. SMDI Doradztwo Inwestycyjne Sp. z o.o., Warsaw 2015 (b). • HELCOM- Manual for Marine Monitoring in the COMBINE Program of HELCOM. Annex C-8 Soft-bottom Macrozoobenthos, 2017. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiNm7b8xb7tAhUEAxAIHWv7BNEQFjAAegQIAxAC&url=https%3A%2F%2Fhelcom.fi%2Fmedia%2Fpublications%2FManual-for-Marine-Monitoring-in-the-COMBINE-Programme-of-HELCOM.pdf&usg=AOvVaw06Te5deG9klea3r4TPL6hS. • Nowak J., Design and construction of an operational device for collection of biological samples from solid objects deposited on the seabed. Research supported by the Ministry of Science and Higher Education under statutory funds, WW IM 7140A, 9 p., 2017. • Odum E., Fundamentals of ecology. Edition III. Państwowe Wydawnictwo Rolnicze i Leśne, Warszawa, 661 p., 1982. • Osowiecki A., Błeńska M., Makrozoobentos w wodach przejściowych i przybrzeżnych, [in:] Przewodnik do monitorowania elementów biologicznych i klasyfikacji stanu ekologicznego wód powierzchniowych. Methods update, A. Kolada (ed.), Environmental Monitoring Library, Warsaw, 331-344, 2020 • Osowiecki A., Łysiak-Pastuszak E., Kruk-Dowgiałło L., Błeńska M., Brzeska P., Kraśniewski W., Lewandowski Ł., Krzymiński W., Opracowanie narzędzi do oceny jakości ekologicznej na polskich obszarach morskich zgodnie z Ramową dyrektywy Wodną. Part IV - Preliminary assessment. Studia Oceanologiczne i Hydrobiologiczne, 41 (3), 1-10, 2012. • Trojan P., General ecology. Edition IV. PWN, Warsaw, 419 p., 1980.	
7	Research on ichthyofauna	Winter campaign (December	Ichthyoplankton surveys were conducted at 7 stations from r/v BALTICA. In the winter season, hydroacoustic surveys were conducted from the r/v BALTICA vessel using complementary methods of hydroacoustic sounding and pelagic survey hauls. Demersal fish were caught using set nets from a fishing vessel and included two net exposures at 7 stations. Analysis of the density and characteristics of the pelagic fish assemblage was carried out	

		2020 to February 2021) Spring campaign (March to May 2021) Summer campaign (June to August 2021) Autumn campaign (September to November 2021)	using complementary methods of hydroacoustic sounding and pelagic control hauls. Groundfish fisheries were conducted using set gillnets. Set gillnets were placed in 20 locations distributed evenly throughout the OWF area. The following standards and recommendations were applied in the sampling and analysis of ichthyofauna: • HELCOM 2015., Guidelines for COASTAL FISH monitoring sampling methods of HELCOM. • Horbowa K., Fey D.P., *Atlas of early life stages of fish. 34 species of fish of the southern Baltic Sea and its lagoons* [in Polish: Atlas of early fish life stages. 34 species of fish of the southern Baltic and its lagoons], Polish Sea Fisheries Institute, Gdynia 2013. • ICES 2014, Manual for the International Baltic Trawl Survey (BITS). Series of ICES Survey Protocols SISP 7 - BITS. 71 pp. • ICES. 2017, Manual for the International Baltic Acoustic Surveys (IBAS). Series of ICES Survey Protocols SISP 8 - IBAS. 47 pp. http://doi.org/10.17895/ices.pub.3368 • ICES SGSIPS Report 2010, Report of the Study Group on Standards in Ichthyoplankton Surveys (SGSIPS). ICES CM 2010/SSGESST:21. • ICES SGSIPS Report 2012, Report of the Study Group on Standards in Ichthyoplankton Surveys (SGSIPS). ICES CM 2012/SSGESST:10. • Munk P., Nielsen J.G., *Eggs and larvae of North Sea fishes*, Biofolia, Denmark 2005. • *Zooplankton fixation and conservation*, ed. by F.H. Steedman, UNESCO, Paris 1976, Monographs on Oceanographic Methodology, 4.	
8	Cultural heritage surveys including archaeological investigations	From December 2020 November 2021.	Heritage research consisted of analysis of archival material, analysis of data collected during seabed surveys (shallow core sampling data, bathymetric, sonar, seismic and magnetic anomaly data) and inspection of selected sites by ROV. The following standards and recommendations apply during heritage surveys together with archaeological investigations: • The Act of 23 July 2003 on the protection and care of historical monuments (Dz. U. of 2021, item 710, as amended) and the provisions of its implementing acts (Regulation of the Minister of Culture and National Heritage of 2 ndAugust 2018 *on conducting conservation works, restoration works and conservation research on a monument entered in the register of monuments or on the Heritage Treasures List, as well as construction works, architectural research and other activities on a monument entered in the register of monuments, and archaeological research and search for monuments* (Journal of Laws, item 1609, as amended). • UNESCO Convention on the Protection of the Underwater Cultural Heritage, adopted on 2 November 2001 in Paris, translated into Polish by Dorota Bartz.	

			• United Nations Convention on the Law of the Sea, signed on 10 December 1982 in Montego Bay. Journal of Laws 2002, No. 59, item 543. • European Convention for the Protection of the Archaeological Heritage (Revised), signed at Valletta on 16 January 1992, OJ 1996. No. 120, pos. and 564565.	
9	Monitoring of acoustic background	From December 2020 to November 2021.	Monitoring of the acoustic background within OZ BI (2 Mm), was conducted using stand-alone SM4M Submersible *Wildlife Acoustics* sound recorders equipped with an HTI-96 omnidirectional ultrasonic hydrophone recording ambient noise in the frequency range of 2 Hz to 192 kHz. Monitoring was carried out in accordance with international standards. <u>The following standards and recommendations apply when monitoring the acoustic background:</u> • Ainslie M., Dekeling R.P.A., Proposals for the TG Noise 2019 update, TG-Noise meeting, Brussels, Belgium, 6 November. 2018. • Betke K., Folegot T., Matuschek R. *et al.* , BIAS Standards for Signal Processing. Aims, Processes and Recommendations. Verfuss U.K., Sigray P. (eds.), Revised version, 2015. • Bundesamt für Seeschifffahrt und Hydrographie (BSH), Offshore-windparks. Messvorschrift für unterwasserschallmessungen. Aktuelle vorgehensweise mit anmerkungen. Anwendungshinweise. Hamburg 2011. • Dekeling R.P.A., Tasker M.L., Van der Graaf A.J. *et al.* , Guidelines for monitoring underwater noise in European seas. Part I: Executive Summary. JRC Scientific and Policy Report EUR 26557 EN, Publications Office of the European Union, Luxembourg 2014. • Dekeling R.P.A., Tasker M.L., Van der Graaf A.J. *et al.* Monitoring Guidance for Underwater Noise in European Seas. Part II: Monitoring Guidance Specifications, JRC Scientific and Policy Report EUR 26555 EN, Publications Office of the European Union, Luxembourg. 2014. • Dekeling R.P.A., Tasker M.L., Van der Graaf A.J. *et al.* Monitoring Guidance for Underwater Noise in European Seas. Part III: Background Information and Annexes, JRC Scientific and Policy Report EUR 26556 EN, Publications Office of the European Union, Luxembourg. 2014. • Johansson T.A., Andersson M.H., Ambient underwater noise levels at Norra Midsjöbanken during the construction of the Nord Stream pipeline, Nord Stream AG and Naturvårsverket, Stockholm. 2012. • OSPAR, Overview of the impacts of anthropogenic underwater sound in the marine environment, Vol. OSPAR, Convention for the Protection of the Marine Environment of the North-East Atlantic, 2009. • Van der Graaf A.J., Ainslie M.A., André M. *et al.* , European Marine Strategy Framework Directive - Good Environmental Status (MSFD GES). Report of the technical subgroup on underwater noise and other forms of energy, 2012.	MFW BI development area with the impact zone of the width of at least 2 nautical miles

10	Seabird surveys	From December 2020 to November 2021.	Seabird surveys were conducted along designated transects in the MFW BI area and the reference area. The reference area is partly designated in the Natura 2000 area "Hoburgs bank och Midsjöbankarna" (SE0330308), as this is an area where no wind energy projects are planned in the long term, and also due to its close proximity to MFW BI. In addition, the designated reference area is similar to the MFW BI area in terms of area and has similar depth classes. Observations were conducted on an annual cycle covering four phenological periods, i.e. winter, spring migration, summer migration and autumn migration, and will begin in March 2021. Two observation campaigns are conducted each month covering the BI DA area (2 NM) and the reference area. Birds are counted from the shipboard in accordance with the methodology described in the methodological manual published by the General Directorate for Environmental Protection (Meissner 2011). During cruises along the designated transects, all birds sitting on the water and flying over are counted, including separate identification of birds occurring within a 600 m wide strip (300 m from each side of the ship). Counting is done simultaneously by two persons standing close together, each counting birds on one side of the ship (port/starboard). A third person from the counting team controls the position and speed of the vessel using a GPS device and records the depth of the sea area according to sonar readings and weather conditions. Due to the expected modelling of bird densities in the study area, the survey methodology described in the CIEP methodological manual was modified (Meissner 2011). This modification allows for better estimation of abundance of individual species. The correction consists in division of transect strip into 4 zones (according to the distance from the ship) on each side of the ship: • up to 50 m; • 50-100 m; • 100-200 m; • 200-300 m. This partitioning allows corrections for decreasing bird detectability as distance from the ship's side increases to be included in the final analyses. This is standard procedure in studies of bird abundance in marine areas (Ronconi & Burger 2009). In addition, birds in flight will be counted using the "snap-shot" technique (taking snap-shots of birds in flight within the transect belt at a given time). In accordance with the methodology used (Komdeur *et al.* 1992, Meissner 2011), birds accompanying the ship are not be counted as this would overestimate their numbers by counting the same individuals multiple times.	

The results of the bird counts are presented separately for birds present in the surveyed sea area and for birds flying over it. The obtained results are presented in the form of tables containing abundances of all taxa found during the consecutive survey campaigns divided into three groups of species:

1) seabirds, which during the non-breeding season tend to be at sea, reaching their highest numbers in the coastal zone more than 1 km offshore. Exceptions are gulls that accompany fishing boats on their fishing grounds as their occurrence in the open sea is strongly influenced by human activities. Among seagulls the black-headed gull, the common gull and the Mediterranean gull are excluded from the seabird group as they are rarely found in the open sea;
2) waterbirds, which are mainly associated with inland reservoirs and occur in large numbers at sea only close to shore, mainly in estuaries, and in coastal bays and lagoons;
3) birds associated exclusively with terrestrial environments that only fly over the area and are not able to stay on the water.

The results obtained are compared with publicly available literature on the occurrence and density of seabirds wintering in the Baltic Sea (Durinck et *al.* 1994, Meissner 2010, Skov *et al.* 2011, Chodkiewicz et al. 2018).

<u>The following standards and recommendations were used during seabird monitoring:</u>

- BSH 2013. standard "Studies of the impacts of offshore wind turbines on the marine environment". (StUK).
- Burnham K.P., Anderson D.R., *Model selection and multimodel inference: a practical information-theoretic approach*, Springer, New York 2002.
- Chodkiewicz T., Meissner W., Chylarecki P., Neubauer G., Sikora A., Pietrasz K., Cenian Z., Betleja J., Kajtoch Ł., Lenkiewicz W., Ławicki Ł., Rohde Z., Rubacha S., Smyk B., Wieloch M., Wylegała P., Zielińska M., Zieliński P., *Monitoring Ptaków Polski w latach 2015-2016,* Biuletyn Monitoringu Przyrody 2016, 15, 1-86.
- Garthe S., Markones N., Hüppop O., Adler S., *Effects of hydrographic and meteorological factors on seasonal seabird abundance in the southern North Sea*, Mar. Ecol. Prog. Ser. 2009, 391: 243-255.
- Heinemann D., *A range finder for pelagic bird censusing*, Journal of Wildlife Management 1981, 45: 489-493.
- Hoekman S.T., Moynahan B.J., Lindberg M.S., Sharman L.C., Johnson W.F., *Line transect surveys for murrelets: accounting for incomplete detection and identification*, Marine Ornithology 2011, 39: 35-44.
- Komdeur J., Bertelsen J., Cracnell G., *Manual for Aeroplane and Ship Surveys of waterfowl and Seabirds*, IWRB Special Publication No. 19, Slimbridge, 1992.
- Meissner W., *Sea birds*, [in:] Sikora A., Chylarecki P., Meissner W., Neubauer G. (eds.), *Monitoring of wetland birds during migration. Poradnik metodyczny*, GDEP, Warsaw 2011: 93-102.

			• Meissner W., Chodkiewicz T., *Monitoring of Wintering Sea Birds*, [in:] Chodkiewicz T., Moczarska J., Bobrek R. *Monitoring of birds with consideration of special bird protection areas Natura 2000 years 2015-2018*, OTOP, Marki *2018:* 195-210. • Ronconi R.A., Burger A.E., *Estimating seabird densities from vessel transects: distance sampling and implications for strip transects*, Aquatic Biology 2009, 4: 297-309. • Spurr E.B., Borkin K.M., Drew K.W., *Line-transect distance sampling compared with fixed-width strip-transect counts for assessing tomtit (Petroica macrocephala) population trends*, New Zealand Journal of Ecology 2012, 36.	
11	Migratory bird surveys	A spring period (minimum 22 survey days between March and May 2021) and one autumn period (minimum 22 survey days between August and November 2021).	Key objectives of migratory bird monitoring include recording and identifying migratory bird species, estimating relative migration intensity and describing phenology. In addition, important details such as migration directions, flight altitude and migration trajectories are recorded, which will allow generalisations to be made about the main routes and altitudes of bird migration. Data are collected from ships and include the following observation procedures: • Visual observations, during the day; • Horizontal radar flight tracking, including species identification, during the day; • Registration of flight altitude by vertical radar, both day and night; • Acoustic recordings, both day and night. Research cruises were planned to cover the spring and autumn bird migration periods in a representative way and provide a minimum of 44 days of observation. The number of research cruises and observation days is planned taking into account known bird migration schedules. The monitoring programme includes several methods, each with a different sensitivity to weather conditions (visual observations, rangefinder height measurements, horizontal radar tracking, vertical radar records, acoustic recordings). In this way, the methods used complement each other and even if weather conditions prevent the application of all methods, some of them still lead to effective data collection. Each observation method serves its purpose, but the application of some methods may be limited by lack of daylight, weather conditions and sea state. Even under suitable environmental conditions, none of the devices will be used continuously, but at regular intervals, which means that sampling of bird migration data will be carried out. <u>The following standards and recommendations apply when monitoring migratory birds:</u> • BSH 2013 Standard "Studies of the impacts of offshore wind turbines on the marine environment". (STUK). • Ohrt H., Method recommendations for future EIA bird surveys. SEACON Report 1011-1-1L002 rev.8. Commissioned by DONG Energy, 2011.	

			• Ronconi R.A., Burger A.E., Estimating seabird densities from vessel transects distance sampling and implications for strip transects. Aquat. Biol. 2009, 4: 297-309. • Stryjecki M., Mielniczuk K., Wytyczne w zakresie prognozowania oddziaływań na środowisko gospodarstw wiatrowych. General Directorate for Environmental Protection, Warszawa 2011.	
12	Monitoring of marine mammals	January 2021 - January 2022	Acoustic monitoring was conducted using C-POD detectors (Chelonia Limited). 10 basic stations were selected in order to evenly cover the whole area of the MFW Bałtyk I. Additionally, to avoid the risk of not obtaining the expected coverage, 2 additional devices are placed in the water. C-PODs were previously used in the SAMBAH (Static Acoustic Monitoring of the Harbour Porpoise in the Baltic Sea) project (SAMBAH 2016) and the methodology of this study is similar to that presented in the SAMBAH study. The C-POD detection range for porpoise clicks is approximately 400 m (Thomsen *et al.* 2004, Gauger et *al.* 2012). <u>The following standards and recommendations apply when monitoring marine mammals:</u> • Chelonia Limited, CPOD user guide, available online: www.chelonia.co.uk/downloads/CPOD.pdf. • SAMBAH 2016. final report for LIFE+ SAMBAH project LIFE08 NAT/S/000261 covering project activities from 01/01/2010 to 30/09/2015. report date 29/02/2016: 1-77. • Gauger M., Jansen C., Hagedorn B., Culik B., Testing POD detection coverage under optimal field conditions, [in:] 26thth European Cetacean Society Conference. Galway ECS, vol. 2012. 1. Thomsen F., Laczny M., Piper W., Methodik zur Erfassung von Schweinswalen (Phocoena phocoena) und anderen marinen Säugern mittels Flugtransekt-Zählungen, SEEVÖGEL 2004, 25 (1): 3-12. 2. BSH 2013 Standard - Study of the impact of offshore wind turbines on the marine environment (StUK 4), Hamburg Bundesamt fuer Seeschifffahrt und Hydrographie, 2013. 3. Hammond P.S., Berggren P., Benke H., Borchers D.L., Collet A., Heide-Jorgensen M.P., Heimlich S., Hiby A.R., Leopold M.F., Oien N., Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters, Journal of Applied Ecology 2002, 39: 361-376. 4. SCANS 2006. small cetaceans in the European Atlantic and North Sea (SCANS II). Final project report, 2006. 5. Thomsen F., Laczny M., Piper W., Methodik zur Erfassung von Schweinswalen (Phocoena phocoena) und anderen marinen Säugern mittels Flugtransekt-Zählungen, SEEVÖGEL 2004, 25 (1): 3-12.	
13	Bat monitoring surveys	Spring migration (1 April - 31 May 2021) Autumn migration (1	Surveys were performed according to the direct survey method (Kepel *et al.* 2011, 2013). Acoustic signals were recorded during cruises along a designated transect route with a total length of approximately 49 km and at one monitoring station located on a survey buoy. All recorded data were reviewed, assigned to a monitoring station or transect route and prepared for further analysis. All recorded files were selected automatically and then the selected files were analysed manually. The ecoObs software (bcAdmin, bcAnalyzePro and batIdent, http://www.ecoobs.com/cnt-software.html) was used in this process. Recordings that occurred at the same time	

		August - 30 September)	(maximum five seconds deviation between two call sequences) and contained calls of the same species were be counted only once to avoid overestimation. Conversely, recordings that did not occur at the same time (with a deviation of more than five seconds between two call sequences) and contain calls of the same species were counted, as two calls according to Kepel *et al*. (2011, 2013). Call sequences within the Nyctaloid group that cannot be assigned to a specific species were classified into a genus group (e.g. *Nyctalus* spp. or *Nyctalus* + *Eptesicus* + *Vespertilio spp.*). In Poland, there are no binding legal regulations concerning bat monitoring methodology. In order to monitor and analyse the bat population in the study area, the research methodology was adopted based on the draft "Guidelines for assessing the impact of wind farms on bats" prepared by Polish specialists and practitioners commissioned by the General Directorate for Environmental Protection in 2011 and updated in 2013 (Kepel *et al.* 2011, 2013) and on the Annex to Resolution No. 7.5 of "The Agreement on the Conservation of Populations of European Bats EUROBATS" (Rodrigues *et al.* 2015). <u>The following standards and recommendations apply when monitoring bats:</u> • BSH, Study on the impact of offshore wind turbines on the marine environment (StUK 4), Germany 2013. • Kepel A., Ciechanowski M., Jaros R., Projekt: Wytyczne dotyczące oceny oddziaływania elektrowni wiatrowych na nietoperze, GDEP, Warszawa 2011. • Kepel A., Ciechanowski M., Jaros R., Guidelines for assessing the impact of wind power plants on bats, Draft - November 2013 version, GDEP, Poznań 2013. • Rodrigues L., Bach L., Doubourg-Savage M.J., Karapandza B., Kovac D., Kervyn T., Dekker J., Kepel A., Bach P., Colling J., Harbusch C., Park K., Micevski B., Minderman J., Guidelines for consideration of bats in wind farm projects - revision 2014, EUROBATS Publication Series no. 6 (English version), UNEP/EUROBATS Office, Bonn 2015.	