

Intended for:

C-WIND POLSKA Sp. z o.o.
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ENVIRONMENTAL IMPACT ASSESSMENT
REPORT

FOR THE PROJECT ENTITLED:

CONSTRUCTION OF THE POWER
TRANSMISSION INFRASTRUCTURE FROM
THE BC-WIND OFFSHORE WIND FARM TO
THE NATIONAL POWER SYSTEM

Gdańsk, August 2023

The Environmental Impact Assessment Report has been prepared under the MEWO S.A. Integrated Management System certified by the DNV-GL group to comply with:

ISO 9001:2015 (Quality Management Systems)

ISO 14001:2015 (Environmental Management Systems)

ISO 45001:2018 (Occupational Health and Safety Management Systems)



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TABLE OF CONTENTS

TABLE OF CONTENTS.....	5
LIST OF APPENDICES	9
DEFINITIONS AND ABBREVIATIONS.....	10
1 INTRODUCTION	12
1.1 AIM AND SUBJECT OF THE STUDY	12
1.2 PROJECT CLASSIFICATION	16
1.3 REPORT BASIS.....	18
1.4 FINDINGS OF STRATEGIC AND PLANNING DOCUMENTS	19
1.4.1 <i>International and EU documents</i>	19
1.4.2 <i>Documents at national and regional levels</i>	24
1.4.3 <i>Summary of findings of strategic and planning documents</i>	31
2 METHODOLOGY OF THE ENVIRONMENTAL IMPACT ASSESSMENT CONDUCTED.....	32
2.1 METHODOLOGY OF DEVELOPING THE EIA REPORT.....	32
2.2 METHODOLOGY OF MARINE ENVIRONMENT SURVEYS	34
2.3 MODELLING METHODOLOGIES.....	36
2.4 METHODOLOGY OF THE ENVIRONMENTAL IMPACT ASSESSMENT	38
3 DESCRIPTION OF THE PROPOSED PROJECT	42
3.1 GENERAL CHARACTERISTICS OF THE PROPOSED PROJECT	42
3.1.1 <i>Subject and scope of the Project</i>	42
3.1.2 <i>Project location and the sea and land area occupied by the project</i>	43
3.1.3 <i>Stages of the project implementation</i>	69
3.2 DESCRIPTION OF TECHNOLOGICAL SOLUTIONS FOR INDIVIDUAL ELEMENTS OF THE PROJECT	70
3.2.1 <i>Description of the production process</i>	70
3.2.2 <i>Cable lines within the offshore area</i>	70
3.2.3 <i>Cable line landfalls</i>	78
3.2.4 <i>Cable lines in the onshore area</i>	81
3.2.5 <i>Onshore Substation</i>	91
3.2.6 <i>400 kV power line running to the NPS</i>	92
3.2.7 <i>Access roads</i>	92
3.3 PROJECT VARIANTS CONSIDERED	95
3.3.1 <i>Approach to designating project variants</i>	95
3.3.2 <i>Variants of the project considered along with the justification for their selection</i>	96
3.4 DESCRIPTION OF INDIVIDUAL PHASES OF THE PROJECT	101
3.4.1 <i>General information relating to all phases of the project</i>	101
3.4.2 <i>Construction phase</i>	101
3.4.3 <i>Operation phase</i>	112
3.4.4 <i>Decommissioning phase</i>	120
3.5 RISK OF MAJOR ACCIDENTS OR NATURAL AND CONSTRUCTION DISASTERS	120
3.5.1 <i>Types of accidents resulting in environmental contamination</i>	120
3.5.2 <i>Other types of releases</i>	123
3.5.3 <i>Environmental threats</i>	125
3.5.4 <i>Failure prevention</i>	127
3.5.5 <i>Potential causes of accidents including extreme situations and the risk of natural and construction disasters</i>	129
3.5.6 <i>Risk of major accidents and natural or construction disasters, taking into account the substances and technologies applied, including the risk related to climate change</i>	129
3.6 RELATIONS BETWEEN THE PARAMETERS OF THE PROJECT AND ITS IMPACTS	131

4	COMPARISON OF THE TECHNOLOGICAL SOLUTIONS PROPOSED WITH THE TECHNOLOGICAL SOLUTIONS MEETING THE REQUIREMENTS REFERRED TO IN ARTICLE 143 OF THE ENVIRONMENTAL PROTECTION LAW	132
4.1	USE OF SUBSTANCES WITH A LOW HAZARD POTENTIAL	132
4.2	EFFICIENT GENERATION AND USE OF ENERGY	132
4.3	ENSURING RATIONAL USE OF WATER AND OTHER RESOURCES AS WELL AS MATERIALS AND FUELS	133
4.4	USE OF WASTE-FREE AND LOW-WASTE TECHNOLOGIES AND POSSIBILITY OF WASTE RECOVERY	133
4.5	TYPE, RANGE AND VOLUME OF EMISSIONS.....	133
4.6	USE OF COMPARABLE PROCESSES AND METHODS WHICH HAVE BEEN EFFECTIVELY APPLIED ON AN INDUSTRIAL SCALE 133	
4.7	SCIENTIFIC AND TECHNICAL PROGRESS	134
5	ENVIRONMENTAL CONDITIONS	135
	OFFSHORE AREA.....	135
5.1	LOCATION, SEABED TOPOGRAPHY	135
5.2	GEOLOGICAL STRUCTURE, SEABED SEDIMENTS, RAW MATERIALS AND DEPOSITS	138
5.2.1	<i>Geological structure, geotechnical conditions</i>	<i>138</i>
5.2.2	<i>Seabed sediments and their quality.....</i>	<i>139</i>
5.2.3	<i>Raw materials and deposits.....</i>	<i>144</i>
5.3	SEAWATER QUALITY.....	144
5.4	WATER DYNAMICS AND HYDROPHYSICAL SURVEYS	146
5.5	CLIMATIC CONDITIONS AND AIR QUALITY	146
5.5.1	<i>Climate and the risk related to climate change</i>	<i>146</i>
5.5.2	<i>Meteorological conditions</i>	<i>148</i>
5.5.3	<i>Air quality</i>	<i>149</i>
5.6	AMBIENT NOISE	150
5.7	ELECTROMAGNETIC FIELD	150
5.8	DESCRIPTION OF NATURAL ELEMENTS AND PROTECTED AREAS	151
5.8.1	<i>Biotic components in the sea area</i>	<i>151</i>
5.8.2	<i>Protected areas, including Natura 2000 sites.....</i>	<i>157</i>
5.8.3	<i>Wildlife corridors</i>	<i>159</i>
5.8.4	<i>Biodiversity</i>	<i>160</i>
5.8.5	<i>Environmental evaluation of the sea area.....</i>	<i>162</i>
5.9	CULTURAL VALUES, MONUMENTS AND ARCHAEOLOGICAL SITES AND OBJECTS.....	163
5.10	OTHER ANTHROPOGENIC OBJECTS	163
5.11	USE AND MANAGEMENT OF THE SEA AREA AND TANGIBLE PROPERTY	164
5.11.1	<i>Maritime transport</i>	<i>170</i>
5.11.2	<i>Fisheries</i>	<i>174</i>
5.11.3	<i>National defence.....</i>	<i>183</i>
5.11.4	<i>Natural resource deposits, extraction license areas</i>	<i>184</i>
5.12	LANDSCAPE, INCLUDING CULTURAL LANDSCAPE	184
5.13	POPULATION AND LIVING CONDITIONS OF PEOPLE.....	184
	ONSHORE AREA.....	184
5.14	LOCATION, TOPOGRAPHY OF THE AREA	184
5.15	GEOLOGICAL STRUCTURE, COASTAL ZONE, SOILS, MARINE AGGREGATES AND DEPOSITS	187
5.15.1	<i>Geological structure, geotechnical conditions</i>	<i>187</i>
5.15.2	<i>Topography and dynamics of the coastal zone</i>	<i>190</i>
5.15.3	<i>Soils.....</i>	<i>194</i>
5.15.4	<i>Raw materials and deposits.....</i>	<i>198</i>
5.16	SURFACE WATERS AND THEIR QUALITY	199
5.17	HYDROGEOLOGICAL CONDITIONS AND GROUNDWATER	202
5.18	CLIMATIC CONDITIONS AND AIR QUALITY	205
5.18.1	<i>Climate and the risk related to climate change</i>	<i>205</i>
5.18.2	<i>Meteorological conditions</i>	<i>212</i>
5.18.3	<i>Air quality</i>	<i>214</i>

5.19	AMBIENT NOISE	215
5.20	ELECTROMAGNETIC FIELD (EMF) EMISSION.....	216
5.21	DESCRIPTION OF NATURAL ELEMENTS AND PROTECTED AREAS	217
5.21.1	<i>Biotic components in the onshore area</i>	<i>217</i>
5.21.2	<i>Conservation areas including Natura 2000 sites</i>	<i>250</i>
5.21.3	<i>Wildlife corridors</i>	<i>263</i>
5.21.4	<i>Biodiversity</i>	<i>267</i>
5.21.5	<i>Environmental valorisation of the area</i>	<i>267</i>
5.22	CULTURAL VALUES, MONUMENTS AND ARCHAEOLOGICAL SITES AND OBJECTS.....	276
5.23	USE AND MANAGEMENT OF LAND AND TANGIBLE PROPERTY	284
5.24	LANDSCAPE, INCLUDING THE CULTURAL LANDSCAPE	285
5.24.1	<i>Słowińskie Coast</i>	<i>286</i>
5.24.2	<i>Choczewo Upland</i>	<i>286</i>
5.25	POPULATION AND LIVING CONDITIONS OF PEOPLE.....	287
6	MODELLING AND ANALYSES PERFORMED FOR THE PURPOSES OF THE PROJECT IMPACT ASSESSMENT	289
6.1	ACOUSTIC ANALYSIS.....	289
6.2	ELECTROMAGNETIC FIELD MODELLING	290
6.3	MODELLING OF THERMAL IMPACT OF CABLE LINES	290
6.4	NAVIGATION ANALYSIS FOR THE EXC BC-Wind OWF	291
6.5	MODELLING OF SUSPENDED SOLIDS DISPERSION	291
7	DESCRIPTION OF THE ENVIRONMENTAL IMPACTS PREDICTED IN THE CASE THE PROJECT IS NOT IMPLEMENTED, TAKING INTO ACCOUNT THE AVAILABLE INFORMATION ON THE ENVIRONMENT AND SCIENTIFIC KNOWLEDGE	293
8	PROJECT IMPACT IDENTIFICATION AND ASSESSMENT	295
8.1	APPLICANT PROPOSED VARIANT (APV)	295
8.1.1	<i>Construction phase in the offshore part</i>	<i>295</i>
8.1.2	<i>Operation phase in the offshore part.....</i>	<i>327</i>
8.1.3	<i>Decommissioning phase in the offshore part</i>	<i>343</i>
8.1.4	<i>Construction phase in the onshore part.....</i>	<i>348</i>
8.1.5	<i>Operation phase in the onshore part.....</i>	<i>375</i>
8.1.6	<i>Decommissioning phase in the onshore part.....</i>	<i>388</i>
8.2	REASONABLE ALTERNATIVE VARIANT (RAV)	399
8.2.1	<i>Construction phase for the offshore part.....</i>	<i>401</i>
8.2.2	<i>Operation phase in the offshore part.....</i>	<i>413</i>
8.2.3	<i>Decommissioning phase of the offshore part</i>	<i>421</i>
8.2.4	<i>Summary of the RAV of the EXC BC-Wind OWF.....</i>	<i>425</i>
9	CUMULATIVE IMPACTS OF THE PROPOSED PROJECT (TAKING INTO ACCOUNT THE EXISTING, BEING IMPLEMENTED AND PLANNED PROJECTS AND ACTIVITIES)	426
9.1	EXISTING, IMPLEMENTED, AND PLANNED PROJECTS FUNCTIONALLY UNRELATED TO THE PROPOSED PROJECT FOR WHICH DECISIONS ON ENVIRONMENTAL CONDITIONS HAVE BEEN ISSUED	426
9.2	INFRASTRUCTURE-RELATED PLANNED PROJECTS.....	429
9.2.1	<i>Formal conditions</i>	<i>429</i>
9.2.2	<i>Connection infrastructure for OWFs</i>	<i>431</i>
9.2.3	<i>Choczewo substation</i>	<i>435</i>
9.3	IDENTIFICATION OF POTENTIAL CUMULATIVE IMPACTS	436
9.4	ASSESSMENT OF CUMULATIVE IMPACTS	436
9.4.1	<i>Assessment of cumulative impacts for the offshore part of the EXC BC-Wind OWF area</i>	<i>436</i>
9.4.2	<i>Assessment of cumulative impacts for the onshore part of the EXC BC-Wind OWF area.....</i>	<i>437</i>
10	TRANSBOUNDARY IMPACT.....	441

11	ANALYSIS AND COMPARISON OF THE VARIANTS CONSIDERED AND THE VARIANT MOST BENEFICIAL FOR THE ENVIRONMENT	442
12	COMPARISON OF THE TECHNOLOGICAL SOLUTIONS PROPOSED WITH THE TECHNOLOGICAL SOLUTIONS MEETING THE REQUIREMENTS REFERRED TO IN ARTICLE 143 OF THE ENVIRONMENTAL PROTECTION LAW	446
12.1	USE OF SUBSTANCES WITH A LOW HAZARD POTENTIAL	446
12.2	EFFICIENT GENERATION AND USE OF ENERGY	446
12.3	ENSURING RATIONAL CONSUMPTION OF WATER AND OTHER RAW MATERIALS AS WELL AS CONSUMABLES AND FUELS	447
12.4	USE OF WASTE-FREE AND LOW-WASTE TECHNOLOGIES AND POSSIBILITY OF WASTE RECOVERY	447
12.5	TYPE, RANGE AND VOLUME OF EMISSIONS.....	447
12.6	USE OF COMPARABLE PROCESSES AND METHODS WHICH HAVE BEEN EFFECTIVELY APPLIED ON AN INDUSTRIAL SCALE	447
12.7	SCIENTIFIC AND TECHNICAL PROGRESS	448
13	DESCRIPTION OF THE PROSPECTIVE ACTIONS TO AVOID, PREVENT AND REDUCE NEGATIVE IMPACTS ON THE ENVIRONMENT	449
13.1	OFFSHORE AREA.....	449
13.2	ONSHORE AREA.....	449
14	PROPOSAL FOR THE MONITORING OF THE PLANNED PROJECT IMPACT AND INFORMATION ON THE AVAILABLE RESULTS OF OTHER MONITORING, WHICH MAY BE IMPORTANT FOR ESTABLISHING RESPONSIBILITIES IN THIS AREA.....	461
14.1	OFFSHORE AREA.....	461
14.1.1	<i>Proposal for the monitoring of the planned project impact</i>	<i>461</i>
14.1.2	<i>Information on the available results of other monitoring, which may be important for establishing responsibilities in this area</i>	<i>462</i>
14.2	ONSHORE AREA.....	462
14.2.1	<i>Proposal for the monitoring of the planned project impact</i>	<i>462</i>
14.2.2	<i>Information on the available results of other monitoring, which may be important for establishing responsibilities in this area</i>	<i>463</i>
15	LIMITED USE AREA	464
16	ANALYSIS OF POSSIBLE SOCIAL CONFLICTS RELATED TO THE PLANNED PROJECT, INCLUDING THE ANALYSIS OF IMPACTS ON THE LOCAL COMMUNITY	465
17	INDICATION OF DIFFICULTIES RESULTING FROM TECHNICAL SHORTCOMINGS OR GAPS IN THE CURRENT KNOWLEDGE ENCOUNTERED DURING THE PREPARATION OF THE REPORT	476
18	THE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE CONSTRUCTION, OPERATION AND DECOMMISSIONING PHASES OF THE PLANNED PROJECT ARE WELL RECOGNISED FOR THIS TYPE OF PROJECT, THEREFORE THE FORMULATION OF POTENTIAL ENVIRONMENTAL IMPACTS AND THE FORMULATION OF MITIGATION MEASURES WAS RATHER STRAIGHTFORWARD.SUMMARY OF INFORMATION ON THE PROJECT.....	477
19	SOURCES OF INFORMATION AND MATERIALS USED	481
	LIST OF FIGURES.....	512
	LIST OF TABLES.....	517

List of appendices

- Appendix 1. Report on inventory surveys of abiotic and biotic resources in the survey area of the Export Cable of the BC-Wind OWF
- Appendix 2. Preliminary Report on pre-emptive archaeological surveys in Kierzkowo, Plot 105/4, Lublewo precinct, Choczewo commune
- Appendix 3. Acoustic analysis for the project entitled: "BC-Wind 400/220 kV substation, plot no. 105/4, registration precinct Lublewo, Pomorskie voivodeship, Wejherowo district, Choczewo commune"
- Appendix 4. Modelling of the electromagnetic field in the area of busbar systems connecting the planned ONS of the BC-Wind with Choczewo Substation as well as the onshore cable bed area evacuating power from the BC-Wind OWF
- Appendix 5. Thermal impact of HV cable lines
- Appendix 6. Navigation analysis for the Export Cable of the BC-Wind OWF area
- Appendix 7. The results of the model calculations of suspended solids dispersion in the Export Cable of the BC-Wind OWF area

Definitions and abbreviations

AC	alternating current
BOD ₅	5-day biochemical oxygen demand
CLV	cable laying vessel
C-POD	continuous porpoise detector
CSR	corporate social responsibility
DP	dynamic positioning system
DEC	Decision on Environmental Conditions
HDD	Horizontal Directional Drilling – trenchless method
EXC BC-Wind OWF	Export Cable of the BC-Wind Offshore Wind
SWB	surface water body
GWB	groundwater body
JTU	Jackson turbidity unit
NPS	National Power System
ONS	Onshore Substation
MARPOL	International Convention for the Prevention of Pollution from Ships
MFE	mass flow excavator
OWF	offshore wind farm
BC-Wind OWF	BC-Wind Offshore Wind Farm
MTI	marine transmission infrastructure
OSS	Offshore Substation
EHV	extra-high voltage (EHV) grid – transmission power grid in which the potential difference between phase conductors is equal to or greater than 200 kV
EXC BC-Wind OWF area	in offshore part: area, for which the Applicant obtained a permit for laying and maintenance of cables from the competent authorities; in onshore part: area of the planned cable corridor route, area of the onshore transformer substation, area of the 400 kV line route
EIA	Environmental Impact Assessment
RES	renewable energy sources
PEHD	high-density polyethylene
SEM	State Environmental Monitoring
PSA	Polish Sea Areas

PSE S.A.	Polskie Sieci Elektroenergetyczne Spółka Akcyjna
PWKZ	Pomorskie Voivodeship Heritage Conservation Officer
PZH	National Institute of Public Health – National Research Institute
PVSDP	Pomorskie Voivodeship Spatial Development Plan
EXC OWF	Export cable of the offshore wind farm
NPS	National Power System
MSPPSA	Maritime Spatial Plan for the Internal Marine Waters, the Territorial Sea and the Exclusive Economic Zone at a scale of 1:200 000
RDEP	Regional Directorate for Environmental Protection
RDSF	Regional Directorate of State Forests
MSFD	Marine Strategy Framework Directive
RAV	Reasonable Alternative Variant
Choczewo Substation	Choczewo substation
SIPAM	Spatial Information System of the Maritime Administration
MO	Maritime Office
XLPE	cross-linked polyethylene
Applicant / Investor	C-Wind Sp. z o.o.
APV	Applicant Proposed Variant

1 INTRODUCTION

1.1 Aim and Subject of the Study

This study is the Environmental Impact Assessment Report for the Export Cable of the BC-Wind Offshore Wind Farm (EXC BC-Wind OWF or the Project). The Applicant proposing the implementation of the project is C-Wind Polska Sp. z o.o. The purpose of this study is to present to the competent authority the data and information required to issue a decision on environmental conditions for the planned project entitled "*Budowa infrastruktury przesyłowej energii elektrycznej z Morskiej Farmy Wiatrowej BC-Wind do Krajowego Systemu Elektroenergetycznego*" [literally: Construction of the Power Transmission Infrastructure from the BC-Wind Offshore Wind Farm to the National Power System].

The project will be located in the offshore area, including the exclusive economic zone, the territorial sea and internal sea waters, as well as onshore – in the Choczewo commune, Pomorskie Voivodeship. The location of the BC OWF CI in the offshore and onshore areas is presented in Figure 1.1.

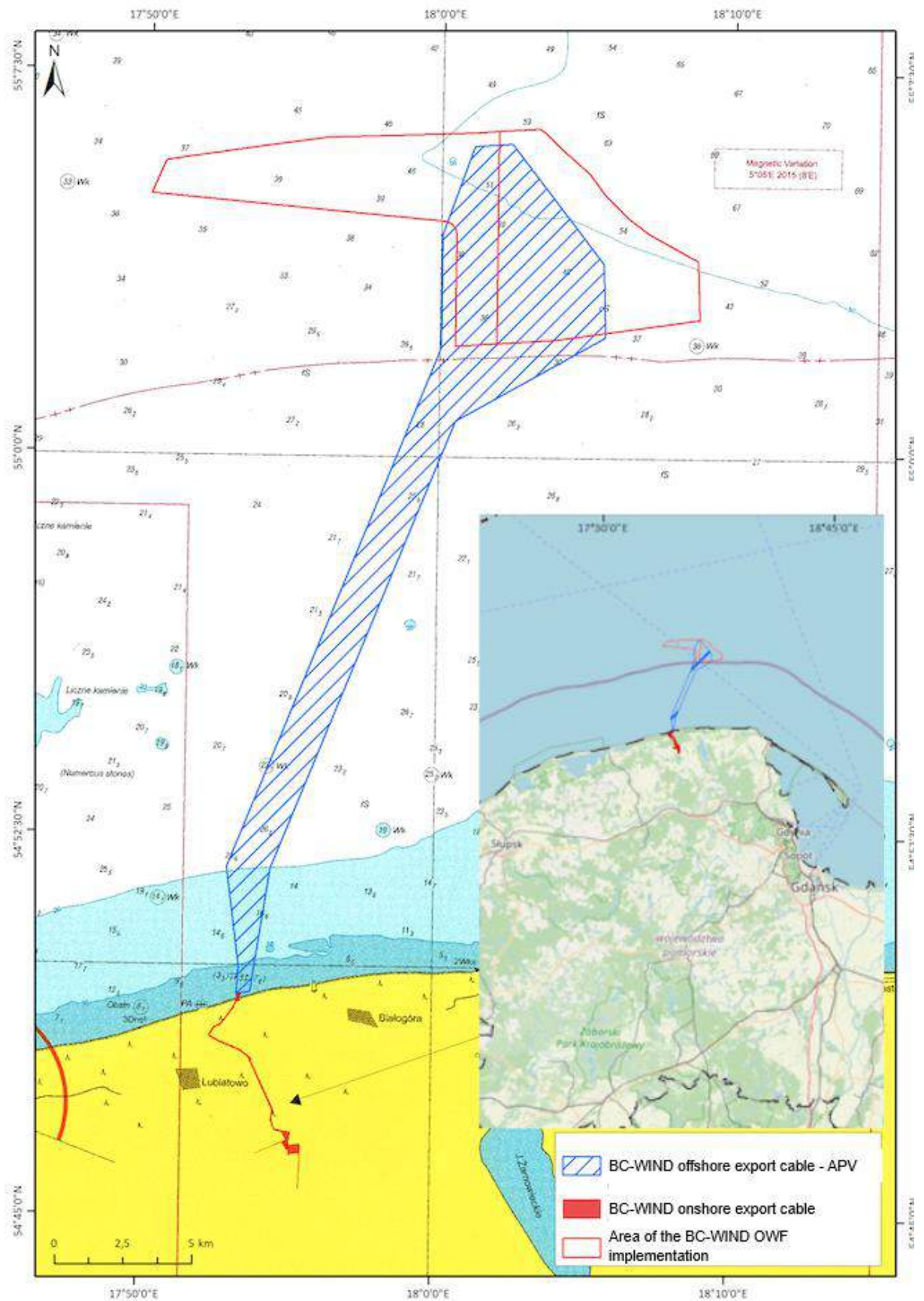


Figure 1.1 Location of the EXC BC-Wind OWF [source: internal materials]

Information on location decisions obtained for the EXC BC-Wind OWF in the offshore area is provided in Section 1.3.

The proposed project involves the construction and operation of transmission power lines together with an Onshore Substation (hereinafter: ONS) and associated infrastructure. Table 1.1 summarises the basic parameters of the planned project in the Applicant Proposed Variant (hereinafter referred to as: APV).

Table 1.1. Basic parameters of the EXC BC-Wind OWF in the Applicant Proposed Variant (APV) [source: internal materials]

Parameter	Parameter value	
	Offshore part	Onshore part
Maximum voltage range (AC) [kV]	220 or 275	220 or 275
Maximum number of cables [items]	2	6
Maximum cable line length [km]	33	8

The purpose of the proposed Project is the transmission of electricity generated within the BC-Wind Offshore Wind Farm (BC-Wind OWF) to the National Power System (NPS).

The Environmental Impact Assessment Report for the EXC BC-Wind OWF was prepared by MEWO S.A. in cooperation with GEOMOR Sp. z o.o. and MAREA Sp. z o.o.

The scope of this Report is compliant with the provisions of Art. 66 of the Act of 3 October 2008 *on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments* (consolidated text: Journal of Laws of 2023, item 1094). According to Article 75 section 1 point 1(c), a Regional Director for Environmental Protection is the authority competent to issue the DEC for the planned project. Taking into account the location of the Baltica OWF CI, the competent authority is the Regional Director for Environmental Protection in Gdańsk. The requirements of Article 66 of the EIA Act are included in the individual sections of this report, as indicated in the table below [Table 1.2].

Table 1.2. Contents of the EXC BC-Wind OWF EIA Report in relation to the requirements of Article 66 of the EIA Act [source: internal materials]

Elements of the Environmental Impact Assessment Report, in accordance with the provisions of Art. 66 of the Act of 3 October 2008 <i>on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments</i> (consolidated text: Journal of Laws of 2023, item 1094).	EIA Report Section number or an indication of the appendix to the EIA Report
1) description of the planned project, including in particular:	3
a) characteristics of the entire project and conditions for the land use during the implementation and operation or use phases, also in relation to flood risk areas within the meaning of Article 16 <i>Definitions</i> point 34 of the Act of 20 July 2017 – the Water Law,	3.1
b) main characteristics of the production processes,	3.2
c) types and quantities of emissions expected, including waste, resulting from the implementation and operation or use phases of the planned project,	3.4
d) information on biodiversity, the use of natural resources, including the use of soil, water and earth surface,	
e) information on energy demand and consumption,	
f) information on demolition works concerning projects likely to have a significant impact on the environment,	
g) the risk assessed on the basis of scientific knowledge regarding major failures, natural or construction disasters, taking into account the substances and technologies used, including those related to climate change,	3.5

Elements of the Environmental Impact Assessment Report, in accordance with the provisions of Art. 66 of the Act of 3 October 2008 on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments (consolidated text: Journal of Laws of 2023, item 1094).	EIA Report Section number or an indication of the appendix to the EIA Report
2) description of natural elements of the environment covered by the scope of the anticipated impact of the planned project on the environment, including:	5
a) description of environmental elements under protection pursuant to the Act of 16 April 2004 on nature protection and wildlife corridors within the meaning of this Act,	5.8.2; 5.21.2
b) description of hydromorphological, physico-chemical, biological as well as chemical properties of waters;	5.3
2a) results of environmental inventory surveys understood as a set of field surveys carried out in order to characterise elements of the natural environment, if such surveys were carried out, along with the description of the methodology applied; results of environmental inventory surveys together with the description of methodology are attached as an appendix to the Report;	Appendix 1
2b) other data on which the description of the natural elements is based;	5
3) description of the monuments protected under the regulations concerning monument protection and care for monuments, located within the impact range of the planned project and its immediate neighbourhood;	5.9
3a) description of the landscape within which the project is to be located;	5.12
3b) information on relations to other projects, in particular on the accumulation of impacts of the implemented, completed or planned projects, for which a decision on environmental conditions has been issued, located in the area where the project is planned to be implemented and in the area of the project impact or the impacts of which fall within the area of the planned project – to the extent to which their impacts may lead to the accumulation of impacts with the planned project;	9
4) description of the environmental impacts predicted in the case the project is not implemented, taking into account the available information on the environment and scientific knowledge;	7
5) description of the variants taking into account the specific characteristics of the project or its impacts, including: a) the Applicant Proposed Variant and a Reasonable Alternative Variant, b) rational variant which is the most beneficial for the environment – together with the justification for their selection;	3.3
6) determination of the environmental impact foreseen for the variants analysed, including in the case of a serious industrial accident or natural or construction disaster, on the climate, including greenhouse gas emissions and impacts important in terms of adaptation to climatic changes, and a possible transboundary environmental impact, and in the case of the road referred to in Article 24ga <i>Application of the provisions on road safety management</i> Section 1 of the Act of 21 March 1985 on public roads, as well as the impact of the planned road on road safety;	8
6a) comparison of the impacts of the analysed variants on: a) people, plants, animals, fungi and natural habitats, water and air, b) ground surface, including mass movements of the earth, and landscape, c) tangible property, d) historical monuments and cultural landscape, covered by the existing documentation, in particular a register or inventory of monuments, e) forms of nature conservation referred to in Article 6 <i>Exemption from the requirement to agree or consult</i> Section 1 of the Nature Conservation Act of 16 April 2004, including the purposes and subjects of protection of Natura 2000 sites, and the continuity of wildlife corridors connecting them, f) elements listed in Article 68 <i>Determination of the scope of the report</i> , Section 2, Point 2(b), if they were taken into account in the environmental impact assessment report or if they are required by the competent authority, g) interactions between the elements referred to in items a-f;	11
7) justification for the Applicant-proposed variant, accounting for the information referred to in points 6 and 6a;	3.3.2.1

Elements of the Environmental Impact Assessment Report, in accordance with the provisions of Art. 66 of the Act of 3 October 2008 on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments (consolidated text: Journal of Laws of 2023, item 1094).	EIA Report Section number or an indication of the appendix to the EIA Report
8) description of forecasting methods applied by the Applicant and the description of the expected significant impacts of the planned project on the environment including direct, indirect, secondary, cumulated, short term, medium term and long term environmental impacts, resulting from: a) the existence of the project, b) the use of natural resources, c) emissions;	2; 8
9) description of the actions planned with an aim to avoid, prevent, limit or environmentally compensate for the adverse impacts on the environment, in particular on the forms of nature conservation referred to in Article 6 <i>Forms of nature conservation</i> Section 1 of the Nature Conservation Act of 16 April 2004, including the impact on the objects and subjects of protection of Natura 2000 sites, and on the continuity of wildlife corridors connecting them, along with assessing their effectiveness during the project implementation, operation, use or decommissioning, respectively;	13
11) if the proposed project is related to the use of installations, the comparison of the proposed technology with the technology complying with all the requirements stated in Article 143 <i>Technology and installation requirements</i> of the Nature Conservation Act of 27 April 2001;	0
11a) reference to environmental objectives resulting from strategic documents important for the implementation of the project;	1.4
13) graphical presentation of the issues;	Maps in the Report and Appendices
14) of the issues in the cartographic form in the scale corresponding to the subject and the detailed scope of issues analysed in the report, also enabling a comprehensive presentation of the analyses conducted regarding the environmental impact of the project;	
15) analysis of potential social conflicts related to the planned project;	16
16) presentation of proposals for monitoring the impact of the planned project at the stage of its implementation and operation or use, in particular on the forms of nature conservation referred to in Article 6 <i>Forms of nature conservation</i> Section 1 of the Nature Conservation Act of 16 April 2004, including the impact on the objects and subjects of protection of the Natura 2000 sites, and the continuity of wildlife corridors connecting them, as well as the information on other monitoring results available which may be relevant for the determination of responsibilities in this respect;	14
17) indication of difficulties resulting from technical shortcomings or gaps in the current knowledge encountered during the preparation of the report;	17
18) non-specialist abstract of the information included in the report related to each component of the report;	Non-specialist abstract
20) sources of information constituting the basis for report preparation.	19

1.2 Project classification

The classification of the Export Cable of the BC-Wind Offshore Wind Farm (**EXC BC-Wind OWF**) in terms of possible environmental impacts was adopted with reference to the provisions of the Regulation of the Council of Ministers of 10 September 2019 on projects that may potentially have a significant impact on the environment (Journal of Laws of 2019, item 1839, as amended), including on the basis of:

- a) Article 3(1)(54)(b), i.e.: **“industrial development, including photovoltaic system or warehouse development, together with the accompanying infrastructure, with a development surface area not smaller than 1 ha in the areas other than those referred to in (a).”** The area expected to be occupied by an onshore substation, which is part of the planned project, will be

approximately 5 ha. Considering the above and the character of the station structure, the EXC BC-Wind OWF can be classified as a project that can potentially have a significant impact on the environment.

- b) Article 3(1)(62), i.e. ***“roads with hard surface with a total length of the project exceeding 1 km other than those listed in Article 2(1)(31 and 32) or bridge structures in the course of road with hard surface, excluding reconstruction of roads or bridge structures, used for the maintenance of power substations and located outside the areas under forms of nature protection, discussed in Article 6(1)(1–5, 8 and 9) of the Act of 16 April 2004 – Nature Conservation Act.”***
The EXC BC-Wind OWF implementation shall involve the construction of paved service roads within the cable bed area, with a total length of approximately 8 km, and an access road to the onshore substation with a length of approx. 1.7 km.
- c) Article 3(1)(88), i.e. ***“the modification of a forest, other soil with a contiguous surface area of at least 0.10 ha covered with forest vegetation – trees and shrubs as well as forest litter – or a wasteland into an agricultural use or deforestation intended to change the manner of land use: [...], including letter: (c), i.e. “in areas covered by forms of nature protection, referred to in Article 6(1)(1–5, 8 and 9) of the Nature Conservation Act of 16 April 2004, or in the buffer zones of the forms of nature protection referred to in Article 6(1)(1–3) of this Act” and point (e), i.e. “with an area of not less than 1 ha, other than those specified in points (a)–(d).”*** In the part of the area in which the Project is to be implemented, with a maximum surface of 10.5 ha, the tree stand will be felled. The project implementation procedure adopted by the Project Owner in accordance with the provisions of the Act of 24 July 2015 *on the preparation and implementation of strategic transmission network projects* (consolidated text: Journal of Laws of 2022, item 273), results in the exclusion of the application of the Act of 3 February 1995 *on the protection of agricultural and forest land* (consolidated text: Journal of Laws of 2022, item 2409). Consequently, this area will not be excluded from forest production. The production will only have a different character. However, in the event of conducting the project on the basis of general principles and the need to include the investment projects in the local spatial development plan or to obtain a site selection decision for a public purpose investment, this area could be deforested and excluded from forest management. In accordance with the wording, the planned deforestation for the construction of the cable bed can be classified as a project that can potentially have a significant impact on the environment;
- d) Article 3(1)(37)(c), i.e. ***“installations for the above-ground storage of substances or mixtures within the meaning of respectively Article 3(1) and (2) of Regulation 1907/2006, which are not food”***. In view of the possibility of implementing a fire extinguishing system using CO₂, nitrogen or other gas, the project will also qualify under the above-mentioned Regulation. At this stage of the project planning, a fire extinguishing system using water or CO₂ or nitrogen or other extinguishing gas is being considered. This will be serviced and, if necessary, supplemented by an external company.

Pursuant to the Act of 3 October 2008 *on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments* (consolidated text: Journal of Laws of 2022, item 1029, as amended), the implementation of a planned project that can have a significant impact on the environment is allowed only after obtaining a decision on environmental conditions.

The EXC BC-Wind OWF is a public purpose investment within the meaning of Article 6 of the Act of 21 August 1997 *on real estate management* (consolidated text: Journal of Laws of 2021, item 1889) and Article 2(5) of the Act of 27 March 2003 *on spatial planning and development* (consolidated text: Journal of Laws of 2022, item 503).

Pursuant to Article 6 (4)(a) of the Act *on real estate management*, the public purpose is the construction and maintenance of an OWF within the meaning of the Act of 17 December 2020 *on*

promoting energy production in offshore wind farms (consolidated text: Journal of Laws of 2022, item 1050) together with a set of devices designed to transport power within the meaning of this Act.

Article 2(5) of the Act of 27 March 2003 *on spatial planning and development* (consolidated text: Journal of Laws of 2022, item 503) defines public purpose investment as: “[...] activities of local (municipality) and supra-local (district, voivodeship and national), as well as national (also including international and supra-regional investments) and metropolitan (including the metropolitan area) importance, regardless of the status of the entity undertaking those activities and the sources of their financing, constituting the implementation of the objectives referred to in Article 6 of the Act of 21 August 1997 *on real estate management* (consolidated text: Journal of Laws of 2021, item 1889)”.

In accordance with Article 3(a) of the Act of 24 July 2015 *on the preparation and implementation of strategic transmission network projects* (consolidated text: Journal of Laws of 2022, item 273), EXC BC-Wind OWF is a strategic project concerning transmission networks. Such projects, pursuant to the provisions of Article 80, section 2 of the Act of 3 October 2008 *on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessment* (consolidated text: Journal of Laws of 2022, item 1029, as amended), are not subject to the requirement that the authority issuing DEC confirms the compliance of the project location with the provisions of the local development plan, if the plan has been adopted.

The planned project will enable the transmission and transformation of electric power generated in the offshore wind farm. It will enable achieving the objectives that are mainly aimed at avoiding harmful gas emissions in various ways, increasing the share of energy from renewable energy sources (RES) in electric energy production and increasing the level of energy security. The objectives referenced were established in the above-mentioned strategic documents, adopted on a regional, national as well as international scales.

1.3 Report basis

The basis for the preparation of this EIA Report were:

1) the Applicant's Documentation:

- decision of the Minister of Infrastructure of 27 October 2021 No. 5/K/21 approving the location and methods of cable maintenance in the exclusive economic zone;
- decision of the Minister of Infrastructure of 27 October 2021 No. 6/K/21 approving the location and methods of cable maintenance in the exclusive economic zone;
- decision of the Minister of Infrastructure of 3 November 2021 on the *ex officio* correction of the decision of the Minister of Infrastructure No. 5/K/21;
- decision of the Minister of Infrastructure of 3 November 2021 on the *ex officio* correction of the decision of the Minister of Infrastructure No. 6/K/21;
- decision of the Director of the Maritime Office in Gdynia of 30 November 2021 No. 6/21 – permit for the laying and maintenance of cables within internal sea waters and territorial sea, establishing the location and conditions for their maintenance;
- decision of the Director of the Maritime Office in Gdynia of 30 November 2021 No. 7/21 – permit for the laying and maintenance of cables within internal sea waters and territorial sea, establishing the location and conditions for their maintenance;
- declaration from the Director of the Maritime Office in Gdynia of 18 January 2022 informing that the decision of the Director of the Maritime Office in Gdynia No. 6/21 of 30 November 2021 entered into force as of 18 January 2022;

- declaration from the Director of the Maritime Office in Gdynia of 18 January 2022 informing that the decision of the Director of the Maritime Office in Gdynia No. 7/21 of 30 November 2021 entered into force as of 18 January 2022;
 - decision of the Minister of Infrastructure of 28 June 2022 – assignment of rights, resulting from the decision of the Minister of Infrastructure of 27 October 2021 No. 5/K/21, from B-Wind Sp. z o.o. to C-Wind Sp. z o.o.;
 - decision of the Director of the Maritime Office in Gdynia of 29 July 2022 No. 5/22 – assignment of all rights, under the decision of the Director of the Maritime Office in Gdynia No. 6/21 of 30 November 2021, from B-Wind Sp. z o.o. to C-Wind Sp. z o.o.;
 - decision of the Minister of Infrastructure No. 3/K/2022 of 16 January 2023, approving the location and methods of cable maintenance in the exclusive economic zone;
 - documentation containing the results of environmental surveys and inventory carried out in the period from 2019 to 2023 for the purpose of this EIA Report (Appendix 1 to the EIA Report);
- 2) moreover, when preparing this EIA Report, sources of information specified in section 17 were used, in particular, reports on environmental impact assessment or other documentation for the projects existing, implemented or planned, located closest to the planned project, such as:
- Environmental Impact Assessment Report for the Baltica Offshore Wind Farm [24];
 - Environmental Impact Assessment Report for the BC-Wind Offshore Wind Farm [125];
 - Environmental Impact Assessment Report for the Baltic Power Offshore Wind Farm [303];
 - Environmental Impact Assessment Report for the Connection Infrastructure of the Baltica B-2 and B-3 Offshore Wind Farms [304];
 - Environmental Impact Assessment Report for the Baltic Power Offshore Wind Farm Connection Infrastructure [305];
- 3) strategic documents, programming and planning documents at the international, national, regional and local levels [Section 1.4];
- 4) applicable legal regulations, including:
- Act of 3 October 2008 on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments (consolidated text: Journal of Laws of 2022, item 1029, as amended);
 - Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 *on the assessment of the effects of certain public and private projects on the environment* (amended by the Directive of 16 April 2014);
 - other international, EU and national regulations.

1.4 Findings of strategic and planning documents

1.4.1 International and EU documents

The Baltic region is characterised by a long-standing international cooperation in areas such as development and spatial planning (VASAB), marine environment protection (HELCOM) and energy (BASREC). In 2009, the European Union Strategy for the Baltic Sea Region (EUSBSR) was adopted, being the first EU macro-regional intra-EU strategy.

VASAB (Vision and Strategies Around the Baltic Sea)

Intergovernmental cooperation between the Baltic Sea Region states responsible for development and spatial planning. In its strategic document VASAB sets out the directions of the development until 2030. One of them is to strengthen internal and external availability, and the development of

offshore wind energy is indicated as a way to achieve the energy independence of the Baltic region. Measure 18 of the LTP directly indicates the need to exploit potential in Polish Sea Areas (PSA) in the short term. The planned project is part of the development directions for the Baltic Sea region suggested by VASAB.

Directive 2014/89/EU of the European Parliament and of the Council establishing a framework for maritime spatial planning

A document that specifies the framework for planning in the Baltic Sea area, which was adopted on 23 July 2014, due to, among others, the high and rapidly increasing demand for the maritime space for different purposes, such as installations for the production of energy from renewable sources, oil and gas exploration and exploitation, maritime shipping and fishing activities, ecosystem and biodiversity conservation, tourism, aquaculture installations and underwater cultural heritage, as well as the multiple pressures on coastal resources, requiring an integrated planning and management approach.

Pursuant to the Directive 2014/89/EU, the main purpose of maritime spatial planning is "to promote sustainable development and to identify the utilisation of maritime space for different sea uses as well as to manage spatial uses and conflicts in marine areas" ((19) and Article 1(1)). The directive in question sets out the framework for maritime spatial planning aimed at propagating sustainable development in the maritime economy, sustainable development of the sea areas as well as sustainable use of the marine resources.

The result of the maritime planning should be a "comprehensive plan, presenting various methods of using maritime space that takes into consideration the long-term changes caused by climate change," which specifies "the spatial and temporal arrangement of significant, already implemented or future actions as well as methods of use of marine waters."

Marine Strategy Framework Directive (MSFD)

The principles of conservation and objectives for the marine waters have been specified in the Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy – the so-called Marine Strategy Framework Directive (MSFD).

The objective of the directive is for the Member States to take the necessary measures to achieve or maintain good environmental status in the marine environment until 2020 at the latest. MSFD is the first comprehensive legal act of the EU with an objective to especially protect the marine environment and natural resources as well as to create framework for the sustainable use of marine waters.

The MSFD provisions have been implemented into the Polish legal system primarily through the Water Law Act of 20 July 2017 (consolidated text: Journal of Laws of 2021, item 624, as amended, and Journal of Laws of 2022, item 1549). Pursuant to Article 145 of this Act, the environmental targets for the marine waters are achieved by taking actions specified in the National Marine Waters Protection Programme (NMWPP) adopted by the Council of Ministers by the Resolution of 11 December 2017 (Journal of Laws of 2017, item 2469). NMWPP is a strategic document, the development of which is imposed on the Member States under MSFD. The objective of NMWPP is to specify the optimal set of measures, which will lead to the achievement of good environmental status of marine waters within a given period of time.

Within the NMWPP framework, the basic measures will include the following categories: legal, administrative, economic, educational, and control measures.

Pursuant to Article 144 of the Water Law Act of 20 July 2017 (consolidated text: Journal of Laws of 2021, item 624, as amended, and Journal of Laws of 2022, item 1549), in order to protect the marine

water environment, a maritime strategy is developed and implemented, which includes the following measures:

- development of the preliminary environmental assessment of the marine water status;
- development of a set of properties typical of good environmental status of marine waters;
- development of a set of environmental targets for marine waters and the related indicators;
- development and implementation of the marine waters monitoring programme;
- development and implementation of the National Marine Waters Protection Programme

The set of environmental targets for marine waters is specified in the Regulation of the Minister of the Environment of 25 February 2021 on the adoption of the update of the set of environmental targets for marine waters (Journal of Laws of 2021, item 569), issued under Article 157 section 8 of the Water Law Act of 20 July 2017 (consolidated text: Journal of Laws of 2021, item 624, as amended, and Journal of Laws of 2022, item 1549). This act specifies the environmental objectives for 11 categories of characteristics – descriptive indicators, which pursuant to the provisions of MSFD constitute the assessment criteria of the marine environment good status (Annex I to MSFD). The Act also contains the provisions of the Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive).

In accordance with the requirements of MSDF, member states were obliged to carry out the preliminary environmental assessment of marine waters until 2012. The preliminary environmental assessment of marine waters was prepared in 2013 by the Chief Inspectorate for Environmental Protection and adopted by the Council of Ministers on 10 November 2014. This assessment is used for obtaining information on the current status of the marine environment, and thus, is the starting point for the determination of the direction of actions which must be implemented for the targets set out in the MSDF to be achieved. The methodological criteria and standards for the measurement of the achievement of good environmental status of marine waters are set out in the European Commission Decision 2017/848/EU.

1992 Convention for the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)

Convention on the Protection of the Marine Environment of the Baltic Sea Area, signed in Helsinki on 9 April 1992 (Journal of Laws of 2000, No. 28, item 346). Under the Helsinki Convention, actions for the conservation of the Baltic Sea focus on the implementation of the Baltic Action Plan (BAP), adopted at the HELCOM Ministerial Meeting in 2007. The Baltic Action Plan assumes that good ecological status of the Baltic Sea will be achieved by 2021 and sets out the areas of action to achieve this. The paramount strategic objective of segment IV “Maritime activities” is that maritime transport and economic activities are carried out in the Baltic Sea in an environmentally friendly manner. One of the priorities is the minimum risk from offshore constructions. The countries have agreed within the BSAP that they will follow appropriate procedures and make efforts to eliminate, reduce or redress the potential negative environmental impacts that may be caused by offshore constructions. The 2013 Ministerial Conference in Copenhagen adopted **Recommendation 34E/1** for safeguarding important bird habitats and migration routes in the Baltic Sea from negative effects of wind and wave energy production at sea. This document emphasises a positive aspect of the development of wind energy in the context of climate change, recommending specific steps that may help to reduce the negative impact of the project on the environment. It should be emphasised that the planned project will be implemented in accordance with the Recommendation 34E/1 of HELCOM. The provisions of this recommendation refer mainly to the activities of the States Parties to the Helsinki Convention and as such do not concern the planned project, but the Applicant assumes that the project will be conducted so as to avoid or minimise the impact of the project on the environment, including, in particular, on important bird habitats and their migration routes.

The Convention on the Protection of Migratory Species of Wild Animals – CMS Convention

The international treaty concluded as part of the UN environmental programme – the Convention on the Protection of Migratory Species of Wild Animals (Journal of Laws of 2003, No. 2, item 17) (Bonn Convention), was drawn up in Bonn on 23 June 1979. Poland has been a party to the convention since 1 May 1996, a member of the Standing Committee and party to the agreements on the protection of bats (EUROBATS) and small cetaceans (ASCOBANS).

The objective of the convention is the protection of wild migratory animals, which constitute an irreplaceable element of the natural environment. Migratory species (or lower taxonomic groups) are considered those, a large number of which crosses state borders in various life cycles in a cyclical and foreseeable manner. A series of agreements concerning migratory species were included in the convention.

The only species of cetacean living in the Baltic Sea is the harbour porpoise (*Phocoena phocoena*). The harbour porpoise is included in Annex II, listing migratory species with inadequate conservation status, for which international agreements on protection and management should be concluded. In 1997, the parties to ASCOBANS adopted a Resolution on the by-catch of small cetaceans, in which the parties to the agreement and the states from the agreement impact area were invited to develop a plan of the harbour porpoise restitution in the Baltic Sea, one element of which should be to identify the types of human activity that pose a potential danger to the restoration of the population of this species in the Baltic Sea. The final plan, the so-called “Jastarnia Plan,” was adopted by the parties to ASCOBANS in 2009. Poland, which is a party to the ASCOBANS agreement since 1995, actively participating in its development, has also approved this plan for implementation.

A temporary objective specified by ASCOBANS is to restore the harbour porpoise population in the Baltic Sea up to at least 80% of the environment capacity level.

1992 United Nations Framework Convention on Climate Change (UNFCCC)

Specifying the assumptions of the international cooperation on the reduction of greenhouse gas emissions responsible for the global warming phenomenon. The most important, legally binding instrument of the Convention is the Kyoto Protocol signed on 11 December 1997 and entered into force in February 2005. Under the Protocol, the developed countries, including the countries undergoing transition to a market economy, undertook to reduce greenhouse gas emissions by at least 5% in comparison to year 1990. The developing countries were not obliged to reduce their emissions. This division is reflected in the annexes to the Climate Convention. In 2015, the Paris Agreement was developed, the long-term goal of which was to maintain the rise in mean global temperature to well below 2°C by the end of the 21st century. The Agreement was adopted in October 2016.

The Act on the ratification of the Kyoto Protocol

to the United Nations Framework Convention on Climate Change of 26 July 2002 (Journal of Laws of 2002, No. 144, item 1207). The provisions of the Kyoto Protocol mandate countries to reduce their own emissions by the negotiated values compiled in the annex to the treaty by 2022 (at least 5% of the emission level from 1990 – Article 3(1)); emissions include carbon dioxide, methane and nitrogen oxides as well as HFC, PFC and SF6 – the gases responsible for the greenhouse effect.

Act of 6 October 2016 on the ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change

drafted in New York on 19 May 1992, adopted in Paris on 12 December 2015 (Journal of Laws of 2016, item 1631). The Paris Agreement pointed to the objective of enhancing the implementation of the Climate Convention and striving to intensify the global response to the danger of climate change, in the context of sustainable development and efforts to eradicate poverty.

European Green Deal

The European Green Deal constitutes a set of political initiatives of the European Commission, the main objective of which is to achieve climate neutrality in Europe by 2050. Specific actions have been taken for each area, for example, for climate the new, more ambitious objective concerning the net emission of greenhouse gases has been set out – a reduction by at least 55% until 2030 in comparison to the levels from 1990. The European Green Deal focuses on three main principles of a clean energy transition that will help reduce greenhouse gas emissions and the quality of life. These are:

1. ensuring a secure and affordable EU energy supply;
2. developing a fully integrated, interconnected and digitalised EU energy market;
3. prioritising energy efficiency, improving the energy performance of our buildings and developing a power sector based largely on renewable sources.

To achieve this, the Commission has set out the following main objectives:

- building interconnected energy systems and better integrated grids to support renewable energy sources (RES);
- promoting innovative technologies and modern infrastructure;
- boosting energy efficiency and eco-design of products;
- decarbonising the gas sector and promoting smart integration across sectors;
- empowering consumers and helping EU countries to tackle energy poverty;
- promoting EU energy standards and technologies at global level;
- developing the full potential of Europe's offshore wind energy.

The planned project – EXC BC-Wind OWF – is in line with the above-mentioned objectives.

EU strategy on adaptation to climate change

The objective of the EU strategy on adaptation is making Europe more resilient to climate change. This means increasing preparedness and response to the impacts of climate change at a local, national and EU level, preparing a coherent approach and improving coordination of actions through the implementation of the following environmental targets: integrating climate change adaptation into regional and other development projects and ensuring resilient infrastructure. The planned project is in line with the objective of the EU strategy.

The main legal acts concerning environmental protection in the maritime transport sector, divided into hazard groups at an international and EU level are:

- International Convention for the Prevention of Pollution from Ships, 1973, adopted in London on 2 November 1973, together with Annexes I, II, III, IV, and V as well as the 1978 Protocol relating thereto, together with Annex I adopted in London on 17 February 1978 (Journal of Laws of 1987, No. 17, item 101, as amended), (MARPOL Convention);
- Convention on the Protection of the Marine Environment of the Baltic Sea Area, signed in Helsinki on 9 April 1992 (consolidated text: Journal of Laws of 2000, No. 28, item 246) (Helsinki Convention).

In the scope of air emissions in maritime areas, the following legal acts are in force at an international and EU level:

- Directive 2012/33/EU of the European Parliament and of the Council of 21 November 2012 amending Council Directive 1999/32/EC *as regards the sulphur content of marine fuels* (OJ L 327, 27.11.2012, p. 1);
- Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending Directive 2003/87/EC *to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814*.
- Regulation of the European Parliament and the Council (EU) 2015/757 of 29 April 2015 *on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC* (OJ L 123, 19.05.2015, p. 55);
- Commission Implementing Regulation (EU) 2016/1927 of 4 November 2016 *on templates for monitoring plans, emissions reports and documents of compliance pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on monitoring, reporting and verification of carbon dioxide emissions from maritime transport* (OJ L 299, 05.11.2016, p. 1);
- Commission Implementing Regulation (EU) 2016/1928 of 4 November 2016 *on determination of cargo carried for categories of ships other than passenger, ro-ro and container ships pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport* (OJ L 299, 05.11.2016, p.22);
- Commission Delegated Regulation (EU) 2016/2071 of 22 September 2016 amending Regulation (EU) 2015/757 of the European Parliament and of the Council *as regards the methods for monitoring carbon dioxide emissions and the rules for monitoring other relevant information* (OJ L 320, 26.11.2016, p. 1)
- Commission Delegated Regulation (EU) 2016/2072 of 22 September 2016 *on the verification activities and accreditation of verifiers pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport* (OJ L 320, 26.11.2016, p. 5).

Combating hazards and pollution at sea is regulated by the *International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC Convention)* adopted in London on 30 November 1990 (Journal of Laws of 2004, No. 36, item 323) together with the *Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol)* adopted in London on 15 March 2000 (Journal of Laws of 2007, No. 167, item 1173).

1.4.2 Documents at national and regional levels

The planned project directly pursues the objectives described in the national and regional documents listed below. These objectives relate mainly to avoiding the emission of harmful gases, increasing the share of energy from RES in energy production and increasing the level of energy security.

1.4.2.1 National documents

Maritime Policy of the Republic of Poland until 2020 (with an outlook to 2030)

The document was adopted by the Resolution of the Council of Ministers No. 33/2015 of 17 March 2015 *on the Maritime Policy of the Republic of Poland until 2020 (with an outlook to 2030)*.

The planned project is in line with objective 8 *Strengthening the country's energy security*, according to which the following measures were adopted to achieve the objective:

1. creating conditions for the use of renewable energy sources at sea, i.e. wind, sea currents and wave energy;
2. construction and improvement of offshore transmission infrastructure [...].

The Maritime Policy of the Republic of Poland until 2020 (with an outlook to 2030), specifies that the real potential of development of offshore wind energy in Poland, which may bring the greatest benefits for the Polish energy balance and the Polish economy, amounts to 6 GW of power installed in the OWF until 2030. Creating conditions for the construction of offshore wind farms has been identified as an action to improve energy security.

Coastline protection programme

The document adopted by the Act of 28 March 2003 *on the establishment of the long-term programme "Sea Coast Protection Programme"* (consolidated text: Journal of Laws of 2003, item 678) contains the list of projects aimed at protecting the sea shore. The planned project will be implemented in the area of 162.5–162.8 km of the coastline (according to the shoreline chainage of the Maritime Office), for which no tasks have been foreseen for implementation until 2023.

National Spatial Development Concept 2030

The National Spatial Development Concept 2030 (NSDC) was adopted by Resolution no. 239 of the Council of Ministers of 13 December 2011 (M.P.2012.252). It is the main document on spatial development in the long term, defining the objectives and directions of the spatial development policy of the country. It takes into account the need to develop offshore wind farms (OWF) together with connection infrastructure in order to solve the problem of underinvestment in energy infrastructure and to improve the energy security of the country. The development of offshore wind energy will contribute to the reduction of CO₂ emission in accordance with the arrangements of the European Union (EU). The Concept specifies that the wind energy will constitute 45% of the energy obtained from RES. The need to build new transmission lines with accompanying infrastructure, the need to take into account air corridors of bird migration and landscape protection as well as weather variability were considered as barriers to RES development in Poland. According to the arrangements of the Concept, the proposed project is located in the development zone of distributed renewable wind energy. The NSDC sets 6 objectives pursuing the strategic objective. The planned project is part of objective 5: "Increasing the resilience of the spatial structure to natural hazards and loss of energy security and shaping spatial structures supporting the country's defensive capabilities." One of the directions of the actions implementing this objective is "increasing the use of renewable energy sources by building new capacities that will reduce losses related to energy transmission and improve energy security at the national, regional and local level." "One of the elements of support for the diversification of energy sources, which also has positive effects on reducing CO₂ emissions, is increasing the production of energy from renewable sources. In Polish conditions, this type of sources with the greatest economic potential should include wind energy (...)." "It is planned that by 2020 at least 15% of final gross energy consumption will come from renewable energy sources."

Maritime Spatial Plan of Polish Sea Areas

On 14 April 2021, the Maritime Spatial Plan of Polish Sea Areas (MSPPSA) was adopted by the Regulation of the Council of Ministers of 14 April 2021 (Journal of Laws of 2021, item 935). The document covers the necessity to provide sea space for the construction and maintenance of the OWF connection infrastructure. Its location is possible in those sea areas, the main function of which is the “technical infrastructure” (sea areas with letter designation I) and in the sea area with a different main function, but in which the technical infrastructure has been indicated as an acceptable function. In some sea areas with the main function other than “technical infrastructure”, sea subareas have been determined for the laying of this type of infrastructure. The location and construction method of the technical infrastructure, including the connection infrastructure, in the sea areas and subareas, is subject to bans and restrictions indicated in the detailed arrangements of the Plan.

The detailed characteristics of the subareas and the location of the planned project against MSPPSA is presented in Section 5.11.

Energy Policy of Poland until 2040

In the Energy Policy of Poland until 2040 adopted by the Council of Ministers on 2 February 2021, it has been indicated that the implementation of offshore wind energy, together with the implementation of nuclear energy and increasing the role of distributed and civic energy, will be the primary way to decarbonise the energy sector. In accordance with the provisions of the Policy, OWFs will play a special role in achieving at least 23% share of RES in gross final energy consumption in 2030. The incorporation and transmission of the power generated by OWFs will be achieved through the expansion of the transmission grid in northern and north-western Poland. Energy Policy of Poland until 2040 also establishes the framework for energy transformation in Poland. It is based on three pillars. These are: a just transition, zero-emission energy system, and good air quality. The low-emission energy transition is to facilitate the modernisation of the Polish economy, guaranteeing energy security, ensuring fair division of costs and protection of the most vulnerable social groups. The document constitutes a contribution to the implementation of the Paris Agreement concluded in 2015 during the twenty-first session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (COP21), taking into account the objectives of carrying out this transition fairly and with solidarity. The Energy Policy of Poland until 2040 also takes into consideration the challenges related to the adjustment of the economy to, for example, the EU conditions concerning the climate and energy targets for 2030 and the European Green Deal.

Long-term National Development Strategy Third Wave of Modernity

This document was adopted by the Resolution of the Council of Ministers no. 16 of 5 February 2013 (M.P. 2013, item 121). Pursuant to the provisions of the Act of 6 December 2006 *on the principles governing the conduct of development policy* (Article 9(1) – of the current revision, consolidated text: Journal of Laws of 2021, item 1057, article repealed) it is a document specifying the main trends, challenges and scenarios of the socio-economic development of the country and the directions of the spatial development of the country, taking into account the principle of sustainable development, covering a period of at least 15 years. It constitutes the broadest and most general element of the new system of the country's development management, the assumptions of which have been specified in the Act on the principles of conducting development policy and in the document Assumptions of the Development Management System of Poland adopted by the Council of Ministers on 27 April 2009.

The Strategy sets out 11 strategic objectives and directions of intervention in the area of competitiveness and innovativeness of the economy. One of them is ensuring energy security and the protection and improvement of the environment. The intervention direction adopted is the

modernisation of infrastructure and energy security, as part of which the projects modernising the electricity, oil and gas infrastructure should be implemented and financed.

The planned project – EXC BC-Wind OWF – is in line with the above-mentioned objective and is consistent with the Long-term National Development Strategy 2030.

Strategy for Responsible Development for the period up to 2020 (including the perspective up to 2030);

The Strategy specifies that the modernisation of generation sources and innovative solutions in the economy, along with the development of capacities available from renewable sources, will contribute to the reduction of greenhouse gas emissions. The Strategy states that RES sources are mostly non-controllable sources. Continuous subsidisation of RES causes serious disturbances in the functioning of energy markets, resulting in an increase in energy prices. Therefore, the Strategy identified the following as necessary:

- ensuring the possibility of balancing and interaction of RES sources with other sources (not subject to limitations by forces of nature);
- evolutionary process of changes.

National Energy and Climate Plan for the years 2021–2030 (NECP PL)

On 30 December 2019, the Minister of State Assets submitted to the European Commission the National Energy and Climate Plan for the years 2021–2030, thus fulfilling the obligation imposed on Poland under the provisions of Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 *on the Governance of the Energy Union and Climate Action*, amending Regulations (EC) No. 663/2009 and (EC) No. 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No. 525/2013 of the European Parliament and of the Council (OJ of the European Union L 328/1 of 21 December 2018).

The National Energy and Climate Plan for the years 2021–2030 (NECP PL) was adopted by the Committee for European Affairs at a sitting on 18 December 2019.

NECP PL presents the assumptions and objectives as well as policies and measures intended to implement 5 dimensions of the Energy Union, i.e.:

1. energy security;
2. internal energy market;
3. energy efficiency;
4. decarbonisation of the economy;
5. research, innovation and competitiveness.

The National Energy and Climate Plan for the years 2021–2030 sets out the following climate and energy targets for 2030:

- 7% reduction of greenhouse gas emissions in the sectors not covered by the ETS system in comparison to the level from 2005;
- 21–23% share of RES in the gross final consumption of energy (target 23% will be possible to achieve when Poland is awarded additional EU funds, including those intended for equitable transformation), taking into consideration:
 - 14% share of RES in transport,
 - annual increase in the share of RES in heating and cooling by 1.1 percentage points on average per year;

- increase in energy efficiency by 23% compared to the PRIMES2007 projections;
- reduction of the share of coal in electricity production to 56–60%.

The planned project is in line with the main objective of the energy policy, which is energy security while ensuring the competitiveness of the economy, energy efficiency and reducing the environmental impact of the energy sector and the optimum use of own energy resources.

PRSP 2018–2027 Development Plan for meeting the current and future electricity demand for 2018–2027

The part concerning the potential directions of transmission network extension ensuring the reliability of the power system indicates the performance of analytical works in the scope of offshore transmission network construction and indicates that among the expected system effects of the development of the extra high voltage networks (EHV) is the preparation of the capability for connection and evacuation of the installed power on wind farms at the level allowing to meet the RES proportion in the energy balance of the country. The document also presents various OWF connection scenarios.

National Program for Low-Emission Economy Development

The document determines the need for greater diversification of the energy mix. As the location of wind farms mainly coastal areas have been identified. It has also been specified that modernisation and extension of the NPS is required to meet the requirements of the RES market. It was stated in the document that the maximum productivity of the OWF in the PSA is estimated at 12 GW of installed capacity and 48–56 TWh of energy per year. The real investment plans until 2030 amount to 6 GW. The document specifies that for the development of offshore wind energy in Poland, it is necessary, among others:

- to conduct analyses regarding the grounds for the OWF development in Poland;
- to develop offshore power networks.

The Study of Conditions for the Maritime Spatial Plan of Polish Sea Areas

On commission from the Directors of the Maritime Offices in Szczecin and Gdynia, the Study of Conditions for the Maritime Spatial Plan of Polish Sea Areas including spatial analyses was developed in 2015. The study has a different character than the study of conditions and directions for commune spatial development, specified in the Act of 27 March 2003 *on spatial planning and development* (consolidated text: Journal of Laws of 2022, item 503).

Its aim was to collect and analyse information for the purposes of preparing spatial development plans for the PSA. The Study compiled information on the state of the marine ecosystem and the use of sea areas.

Vistula River Basin Management Plan

The Plan was adopted by the Resolution of the Council of Ministers of 18 October 2016 (Journal of Laws of 2016, item 1911). River basin management plans are used as the basic planning document for achieving environmental objectives. The river basin water resources include: inland surface and groundwater, marine inland waters as well as transitional and coastal waters located in the river basin area, divided into surface water bodies (SWB).

1.4.2.2 Regional documents

2030 Pomorskie Voivodeship Development Strategy

The Strategy adopted by the Pomorskie Regional Assembly in Resolution no. 376/XXXI/21 of 12 April 2021 is the main strategic document setting out the directions of development of the Pomorskie

Voivodeship. The Strategy sets three key objectives: Sustainable Security, Open Regional Community and Resilient Economy. These are detailed in 12 operational objectives. The planned project contributes to the achievement of operational objective 1.2. "Energy security" through the development of the offshore wind energy. In the strategy, it was indicated that "Pomorskie, due to its good conditions for the development of renewable energy sources, including the offshore wind energy, can significantly contribute to the achievement of that objective." Among the commitments, the strategy lists: "Starting a network of dialogue and developing a partner cooperation between all stakeholders (in particular: investors constructing offshore wind farms, a nuclear power plant and the transmission system operator with the local governments of the communes, districts and voivodeships) in the scope of locations of new elements of the power system in the region." The strategy also sets expectations for central authorities which include "Development of the electricity distribution and transmission system and the construction of electricity storage systems in connection with the development of renewable energy sources, in particular offshore wind farms as well as prosumer and distributed energy." The document implementing the Pomorskie Voivodeship Development Strategy 2020 is the *Regionalny Program Strategiczny w zakresie energetyki i środowiska Ekoefektywne Pomorze* [literally: Regional Strategic Programme for Energy and Environment Eco-efficient Pomerania] (2018) which identifies the development of low-emission energy sources as one of the priorities.

2030 Pomorskie Voivodeship Spatial Development Plan

The Plan was adopted by Resolution no. 318/XXX/16 of the Pomorskie Regional Assembly of 29 December 2016. In terms of spatial policy, the focus is, among others, on the growth of electricity production and the transformation of the region into the national leader in renewable energy generation. The spatial policy activities and projects included in the Pomeranian Voivodeship Spatial Development Plan 2030 (PVSDP) include, among others: "[...] *the construction of transmission and distribution networks as well as substations for power evacuation from the new, systemic and renewable energy sources (wind farms, including offshore...)* [...] *the extension of 400/110 kV Żarnowiec substation for the possibility of connecting the offshore wind farms to the National Power System (NPS)* [...]" The 2030 Pomorskie Voivodeship Spatial Development Plan (PVSDP) outlines the vision of spatial transformations of the region. One of the elements of the vision is the thesis that as a result of installation of large power capacities within the voivodeship, in the form of a nuclear power plant, coal-fired power plant and an offshore wind turbine (OWT), as well as due to the development of distributed power sector, the security of energy supply of Northern Poland will be improved and the voivodeship will become energetically self-sufficient.

Program for energy development including renewable sources in the Pomorskie Voivodeship until 2025

The program was adopted with Resolution no. 1155/350/10 of the Pomorskie Voivodeship Government of 31 October 2010. The following objectives were set out in the document regarding offshore wind energy: a reduction in the dependence on the traditional energy sources by increasing the proportion of energy produced from renewable resources to at least 19% in 2025. Since wind energy can give a significant boost to the development of the Pomorskie region, the program assumes the possibility of erecting wind turbines at sea with a power of 1200–1500 MW in 2025 (in the sea areas adjacent to the Pomorskie Voivodeship).

Pomorskie Voivodeship Environmental Protection Plan for the years 2018–2021 with an outlook to 2025

The Plan was adopted by Resolution no. 461/XLIII/18 of the Pomorskie Regional Assembly of 26 February 2018. One of the objectives is the "Improvement of air quality" and the adopted direction of intervention is the development of renewable energy. The tasks implemented as part of this

direction, are, for example, the generation of energy from renewable sources and promoting renewable energy sources.

Study of Conditions and Directions of Spatial Development of the Choczewo Commune

The Study adopted by Resolution no. VI/58/2003 of the Choczewo Commune Council of 9 June 2003 (as amended) mentions the favourable climatic conditions within the coastal strip, which have contributed to the establishment of several onshore wind turbines in the Pomorskie Voivodeship, including also in the Choczewo commune area. The study contains information on the search for the location of energy parks on land. Resolution no. XXVIII/220/2021 of the Choczewo Commune Council of 26 January 2021 introduced changes to the current Study in order to enable the development of energy infrastructure related to the operation of renewable energy production.

Local Spatial Development Plan of the Choczewo commune

The southern section of the cable route (with a length of approximately 350 m), the area of the Onshore Substation and the area intended for the construction of the 400 kV power cable from the ONS to the NPS are located in the area covered by the provisions of the local spatial development plan "Wiatraki w Lubiewie" [Wind turbines in Lubiewo], Choczewo commune (Resolution no. XIV/144/2008 of the Choczewo Commune Council of 19 March 2008, Journal of the Pomeranian Voivodeship no. 58 of 24 June 2008, item 1658). There are agricultural areas and areas for the location of electrical power equipment there.

Pursuant to Article 3(a) of the Act of 24 July 2015 *on the preparation and implementation of strategic transmission network projects* (consolidated text: Journal of Laws of 2022, item 273), the proposed Project is a strategic project regarding transmission networks. Such projects, pursuant to the provisions of Article 80(2) of the Act of 3 October 2008 *on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessment* (consolidated text: Journal of Laws of 2022, item 1029, as amended), are not subject to the requirement that the authority issuing DEC confirms the compliance of the project location with the provisions of the local development plan, if the plan has been adopted.

Choczewo Commune Development Strategy

The Strategy was adopted by Resolution no. VIII-62/1999 of the Choczewo Commune Council on 15 October 1999. The project is in line with strategic objective 3: Maintaining a clean environment through the development of sewage infrastructure and the use of clean energy sources, subsection 1. "Construction of wind power turbines". In the SWOT analysis, one of the development opportunities for the commune is the trend towards new energy sources – wind.

Draft Assumptions for the Heat, Electrical Energy and Fuel Gas Supply Plan for the Choczewo Commune

The document published in August 2015 by the "Fundacja Poszanowanie Energii" [literally: Respect Energy Foundation] assumes measures and tasks of the commune energy policy that involve: enhancing local energy security through the use of renewable energy resources and the development of renewable energy sources, reducing the environmental impact of energy and reducing energy costs, in particular improving air quality.

Low-emission Economy Plan for the Choczewo Commune

The plan was adopted by way of Resolution No. XIX/102/15 of the Choczewo Commune Council of 13 November 2015 *on the adoption for implementation of the "Low-emission Economy Plan for the Choczewo Commune"*, amended by Resolution No. XXVI/150/16 of the Choczewo Commune Council of 23 March 2016 *on amending the resolution of the Choczewo Commune Council of 13 November*

2015 on the adoption for implementation of the "Low-Emission Economy Plan for the Choczewo Commune". One of the additional strategic objectives of the plan is to increase energy production from renewable sources by a minimum of 80% compared to 2014, i.e. to a level of approximately 1170 GJ (without taking into account electricity production from the system wind turbines, i.e. producing electricity for the NPS). The proposed project is in line with Specific Objective no. 3 "Improvement of RES use in individual households and enterprises". The document mentions issues of promoting and supporting the use of renewable energy.

Environmental Protection Plan for the Choczewo Commune for the years 2019–2022 with an outlook to 2025.

The Plan underlines that the most important issues for the Choczewo commune, resulting from the analysis of the status and threats to the environment, are the investments and the administrative and organisational activities concerning, among others, change of heating sources, introduction of renewable energy, modernisation of the communication system to improve air quality and the environmental status within the entire zone. Strategic objective: "Improving air quality to the levels required by law, meeting emission standards from installations" is included in the specific objective no. 3, which talks about "Increasing the use of unconventional energy sources," which the planned project is in line with.

1.4.3 Summary of findings of strategic and planning documents

The planned project – EXC BC-Wind OWF – remains in line with the arrangements of many policies and strategies, in particular, the ones concerning environmental protection (reduction of pollution emissions), sustainable development (use of RES) and energy security (independence from external energy sources). The connection infrastructure will enable power evacuation from the BC-Wind OWF and its integration into the NPS. For that reason, **the planned project is in line with the environmental objectives of the mandatory strategic and planning documents analysed which have been developed and are applicable at international, national and regional levels.**

2 METHODOLOGY OF THE ENVIRONMENTAL IMPACT ASSESSMENT CONDUCTED

2.1 Methodology of developing the EIA Report

The primary aim of the EIA Report preparation is the assessment of the impact on the environment of the project entitled: „ Export Cable of the BC-Wind OWF” as well as the identification of the ways for the elimination or reduction of its negative impacts. The assessment is a desk study performed by a team of specialists.

The work was carried out in accordance with an outline of environmental impact assessment report development [Figure 2.1], including:

- the provisions of programme and planning documents at the international, national and regional level, as well as the results of environmental impact forecasts of these documents, which may have an impact on the proposed project;
- the concept of the project, including the activities in the following phases: construction, operation and decommissioning, including the determination of threats to the environment and their potential effects;
- the use of environmental survey and inventory survey results;
- the results of the modelling of changes in the environment resulting from the project implementation;
- information on the projects existing, being implemented and planned;
- the results of information meetings.

The preparation of the EIA Report was based primarily on the results of a comprehensive environmental inventory surveys carried out between 2019 and 2023, along with guidelines, manuals and other materials on the subject of its development, as well as the experience of the team of authors and good practices in the area of the work.

Figure 2.1 presents a diagram of the methods of preparation of the EIA Report in relation to the data concerning the planned project and the environmental surveys conducted. The term "Environmental surveys" used in the figure means that the report on the impact of the planned project on the environment uses both the results of environmental surveys and inventory surveys carried out for the purpose of this study, as well as the results of other studies available to the public or in literature, e.g. for the projects closest to the proposed project, or related to the development of such documents as protection plans or protective task plans for protected areas.

While developing the EIA Report, the analysis of descriptive and cartographic materials was carried out, the results of the surveys, inventories and modelling conducted were interpreted, and the original methodology for assessing the project impact on individual components of the environment was used.

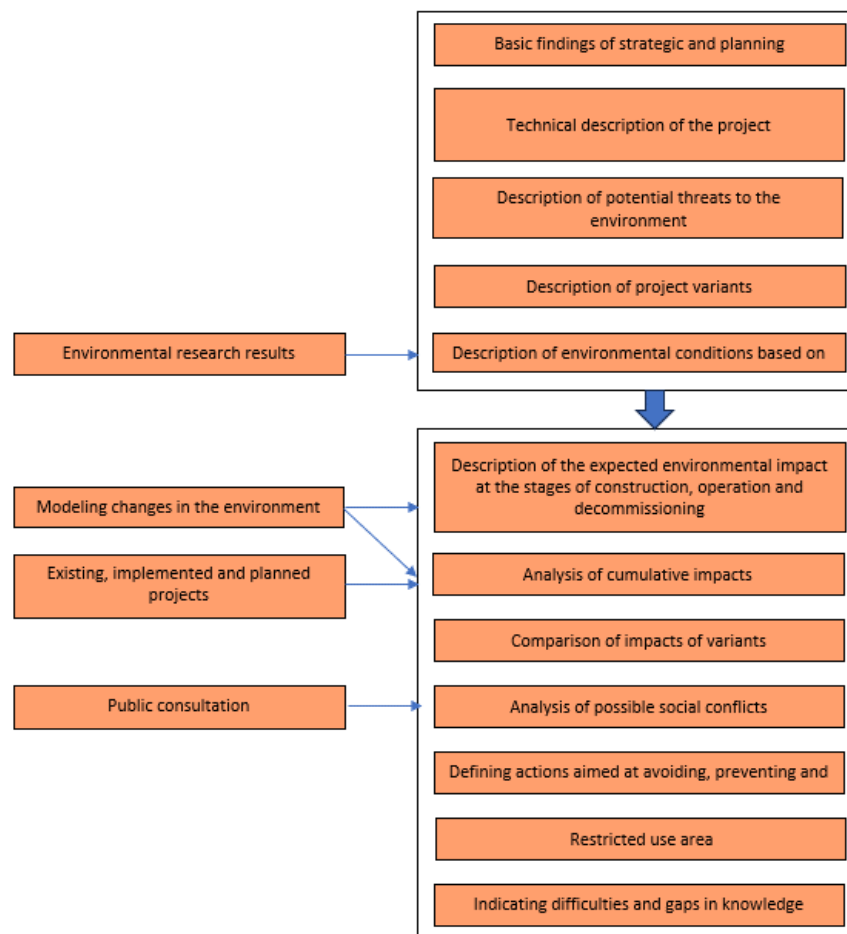


Figure 2.1. Outline of the Environmental Impact Assessment Report preparation [source: internal materials]

When preparing the EIA Report, the following was primarily analysed:

- technical and technological aspects of the planned project affecting the type and size of the impact on individual environmental components at the stage of construction, operation and decommissioning;
- environmental, spatial and social conditions of the proposed project;
- possibility of preparing different project variants (regarding location, as well as technical and technological solutions);
- type, size and significance of potential environmental impacts;
- possibility of avoiding and reducing adverse environmental impacts;
- need to record possible future environmental changes as a result of the project implementation (scope of post-implementation monitoring).

The EIA Report contains an analysis of the planned project in terms of techniques and technologies applied as well as operating conditions. Among others, the information contained in the documentation of the proposed project was used and the potential impact of similar activities that may accumulate was analysed.

When developing this EIA Report, the following environmental survey results were used:

1. carried out by MEWO S.A. in the offshore part of the EXC BC-Wind OWF, between February 2019 and September 2021;

2. carried out by MEWO S.A. to confirm the earlier inventory surveys in the onshore part of the EXC BC-Wind OWF, between March 2022 and November 2023;
3. the results of environmental surveys and inventory surveys carried out for projects located alongside the EXC BC-Wind OWF, the potential impact of which might cover the area of the planned project:
 - "Infrastruktura Przyłączeniowa MFW Baltica B-2 i B-3" [literally: Connection Infrastructure of the Baltica B-2 and B-3 OWFs] – a decision on environmental conditions dated 11 August 2022;
 - "Infrastruktura Przyłączeniowa Morskiej Farmy Wiatrowej Baltic Power" [literally: Baltic Power Offshore Wind Farm Connection Infrastructure] – a decision on environmental conditions dated 6 September 2022

The study also takes into account the results of the information meetings, which were used to clarify the issues of public interest and to develop the part of the report dedicated to the analysis of possible social conflicts (including meetings with representatives of the commune and fishing communities¹). Moreover, the work was based on the arrangements made by the Applicant with the Choczewo Forest Inspectorate regarding the onshore route of the connection infrastructure as well as on the information submitted to PSE S.A. regarding the location of the connection point.

On the basis of the available data, the results of environmental surveys and the environmental inventories, significant environmental, spatial and social conditions were determined. On this basis, potential impacts and risks related to the planned project were identified. The scope and reach of the expected environmental impact were also determined. Comparisons were made with analogous cases in terms of environmental conditions and the size and nature of impacts.

The approach used to assess the scale and significance of impacts results from the authors' experience gained during the environmental impact assessments of projects planned to be implemented in offshore areas, including cable and pipeline projects.

The approach adopted allowed identifying comprehensive actions aimed at avoiding, preventing and limiting negative impacts related to the proposed project.

2.2 Methodology of marine environment surveys

Table 2.1 presents the characteristics of the marine and terrestrial environment surveys carried out for the purpose of the EIA Report preparation. Detailed survey methodologies for individual components of the environment are presented in the Report on inventory surveys constituting Appendix 1 to this Report.

Table 2.1. Characteristics of the surveys on abiotic and biotic components of the marine and terrestrial environment conducted within the EXC BC-Wind OWF area and within its impact range [source: internal materials]

Type of surveys	Date of surveys [mm.yyyy]	Scope of surveys
Marine environment		
Abiotic elements		
Geophysical surveys	04.2020-06.2020 07.2021-09.2021	Surveys along the profiles: bathymetric profiling was carried out using a multibeam echosounder;

¹ Public consultation on the planned construction of B-Wind and C-Wind Poland offshore wind farms in Polish maritime areas, link to video coverage of the meeting <https://youtu.be/yKKnwzD9cbc>

Type of surveys	Date of surveys [mm.yyyy]	Scope of surveys
		sonar surveys were carried out with a side-scan sonar; digital data was recorded in the Coda GeoSurvey data acquisition and processing system; magnetometer surveys (measurements of magnetic anomalies) were carried out using a caesium magnetometer; seismo-acoustic and seismic surveys were carried out using two sediment profilers operating at different frequencies (high and low). Analysis of the data collected and visual inspections (conducted using an ROV) of selected objects.
Geochemical surveys	01.2020-02.2020 07.2020-08.2020 08.2021 01.2022	Collecting 78 samples of surface sediments (during winter campaigns) and 76 samples of surface sediments (during summer campaigns) in an even grid with an average density of 1 sample per 1 km². Laboratory tests based on PN-EN-ISO standards or, in the absence thereof, in accordance with test procedures prepared by an accredited laboratory or applicable test methods.
Hydrochemical surveys	11.2019 02.2020 03.2020 05.2020 07.2020 09.2020	Collecting 84 samples of seawater each from near-surface and near-seabed water layers. Additionally, at 1 station, collecting samples of seawater supplementing the vertical profile (in total, 30 samples during each campaign) Laboratory tests based on PN-EN-ISO standards or, in the absence thereof, in accordance with test procedures prepared by an accredited laboratory or applicable test methods.
Biotic elements		
Phytobenthos	06.2020 06.2021	Filming along 16 transects.
Macrozoobenthos	06.2020 06.2021	Sampling at 72 stations on the soft bottom and 8 stations at the hard (stony) bottom. Sample analysis according to the applicable methodologies
Ichthyofauna	10.2019 01.2020 03.2020 07.2020	Pelagic fish: Acoustic surveys according to the methodology recommended by ICES; acquisition of quantitative data on marine organisms; control catches with a pelagic trawl; ichthyological analysis. Demersal fish: catches with a set of scientific nets; ichthyological analysis. Ichthyoplankton: sample collection using a Bongo net; sample analysis according to the applicable methodology
Marine mammals	10.2019-01.2021	Acoustic recording using C-POD detectors in 7 locations.
	02.2020 03.2020 04.2020 06.2020 08.2020 09.2020	Aerial visual observations along designated transects.
	09.2019-11.2020	Visual observation from aboard vessels.
Seabirds	09.2019-08.2020	Bird counts from aboard vessels.
Terrestrial environment		
Abiotic elements		
Geology, soils, surface and	12.2022-03.2023	Study of published and unpublished data and analysis of cartographic studies

Type of surveys	Date of surveys [mm.yyyy]	Scope of surveys
groundwater bodies, climate, acoustic climate, air quality and waste		
Biotic elements		
Fungi	04.2022-07.2023	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Lichens	05.2022-07.2023	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Mosses and liverworts	05-09.2022	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Vascular plants and natural habitats	03-11.2022	Inventory of natural habitats, the sites of protected and endangered species and assessment of the condition of their habitats
Invertebrates	04-10.2022	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Ichthyofauna	03.2022-03.2023	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Herpetofauna	03-10.2022	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Avifauna	03.2022-03.2023	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats
Mammals and bats	03.2022-02.2023	Inventory of the sites of protected and endangered species and assessment of the condition of their habitats

2.3 Modelling methodologies

Table 2.2 presents the methodologies of the modelling and analyses performed for the purposes of the environmental impact assessment of the EXC BC-Wind OWF.

Table 2.2. Compilation of the methodologies of the modelling and analyses conducted for the purposes of the assessment of the EXC BC-Wind OWF impact on the environment in the onshore section [source: internal materials]

Parameter	Methodology
Thermal conditions	The computational model for the EXC BC-Wind OWF onshore section was developed on the basis of the so-called mirror image method using the Kennelly formula assuming the existence of two linear heat sources, i.e. the actual source representing the power loss due to phase conductor resistance and dielectric losses in the primary insulation of a power line, and its symmetrical representation with regard to the Earth's surface, with identical power value as the actual source adopted with a negative sign.
Electromagnetic field	High-voltage power cables, due to the presence of a cable operating wire screening sheaths, are not a source of magnetic field, since its normal (radial) component disappears completely as a result of the presence of a semiconductive screen surrounding the operating wire, copper or aluminium as well as the presence of a conductive screen surrounding the electrical insulating sheath. Therefore, estimating the levels of the electric field component outside the cable is unjustified. For the cable bed area, the calculations of the maximum values of the magnetic field intensity (H) that can be expected above the cable line were conducted using the PoE-M computer software. The calculations were performed by determining the value of magnetic field intensity at a height of 0.2; 1.0 and 2.0 MAGL in accordance with the recommendation indicated in the Regulation of the Minister of Climate of 17 February 2020 on the methods of checking compliance with permissible levels of electromagnetic fields in the environment (Journal of Laws of 2020, item 258). For busbar systems, the calculations of the distribution of electric and magnetic field intensities were performed for the cross-section in which the distance between the conductors forming the busbar system and the ground is the smallest (the place of occurrence of the maximum intensity of electric and magnetic fields). The electromagnetic field distribution in the ONS area was not calculated. Due to the fact that the station devices are located at a considerable distance from the ONS fence, the field generated by them is not taken into account in the EMF modelling. The measurements taken outside the area of operating substations show that the levels of individual components of the electromagnetic field are negligible, except for the areas of electrical power connections entering the station.
Noise	The calculations include installation noise emissions. The noise analysis was carried out in two variants: the primary variant covering emissions from the C-Wind transformer station, and a cumulative variant additionally covering emissions from the other transformer stations located in the immediate vicinity. Noise sources in the project area were modelled as point sources, in accordance with the ISO 9613-2 standard referred to in Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. The environmental noise level was calculated in a grid of 2 m x 2 m points in IMMI 2020 software, at ordinates of +4 m and at calculation points situated at the most noise-exposed locations of the protected areas.
Dispersion of suspended solids	Numerical calculations were made using MIKE 21 Coupled Model FM software. It is a computational package intended for the calculation of flows, wave motion and sediment transport within the coastal zone as well as in the open sea. The Coupled version allows the dynamic simulation of hydraulic aspects with the reciprocal interaction of all the modules used. A numerical model was created to reflect the transport of suspended solids in the dynamic marine environment during underwater works in the EXC BC-Wind OWFI area.

2.4 Methodology of the environmental impact assessment

The assessment of the impact on individual receptors was carried out according to the diagram presented [Figure 2.2].

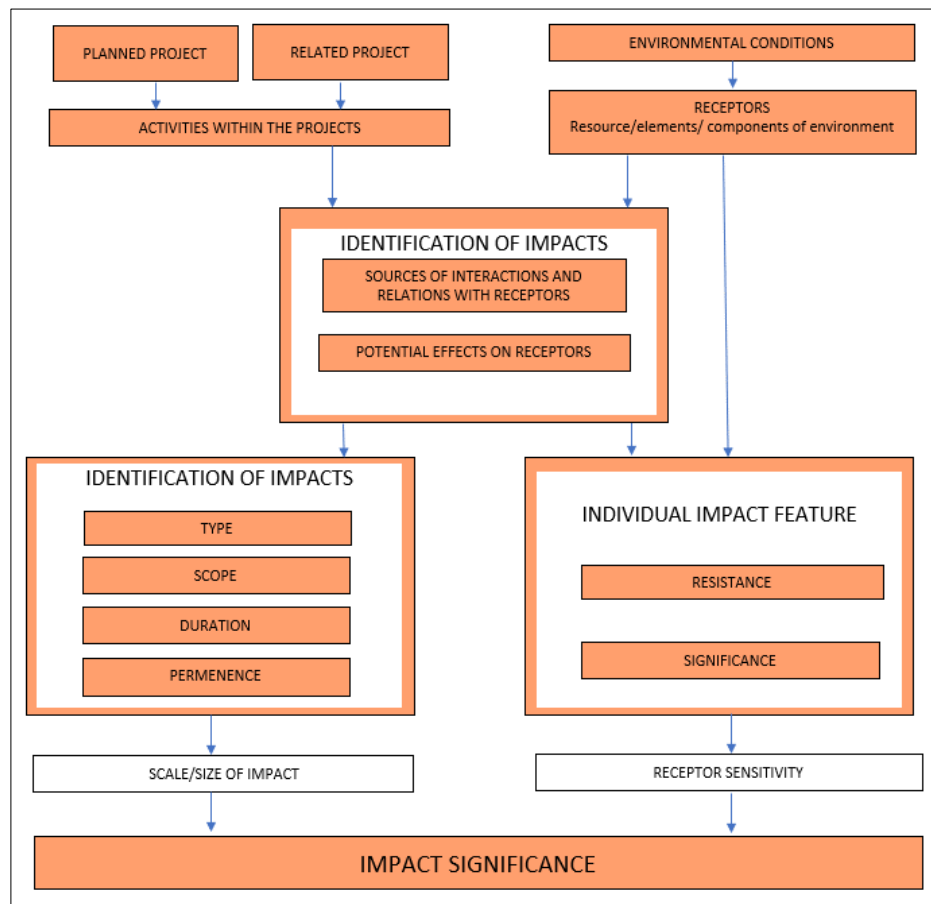


Figure 2.2. Outline of environmental impact identification and impact assessment, including the determination of impact significance [source: internal materials based on ESPOO REPORT (2017)].

An actual impact occurs only when a specific sensitive receptor is present within the impact range. A receptor is considered to be an individual component of the environment (e.g. species of plants and animals, natural habitats, abiotic components, and landscape), but also humans.

At the first stage of the assessment, impacts that may affect individual receptors resulting from the construction, operation and decommissioning stages of the planned project were identified. Based on the environmental and inventory surveys, carried out for the purposes of the EIA Report, the receptors on which these activities may have an impact were also specified. At the second stage of the assessment, the correlations between the sources of potential impacts and individual receptors were identified on the basis of literature and experts' experience.

The impacts identified were assigned features in four categories [Table 2.3]:

- type (direct, indirect, secondary);
- scope (transboundary, regional, local);
- duration (permanent, long-term, medium-term, short-term, momentary);
- permanence (irreversible, reversible).

Table 2.3. Characteristics of the project impacts on receptors [source: internal materials]

Category	Feature	Characteristics
Type	Direct	Impact resulting from a direct interaction between the activities related to the planned project implementation and the elements of the environment
	Indirect	Impact resulting from an indirect interaction between the activities related to the planned project implementation and the elements of the environment
	Secondary	Impact resulting from the interaction between the planned project implementation and the elements of the environment, postponed in time, which may occur as a result of direct or indirect impact
Range	Transboundary	Impact the effects of which are felt outside Poland on the territory of other countries
	Regional	Impact, whose effects exceed the direct vicinity of the activity related to the planned project, but does not reach outside the Polish Maritime Areas or the commune's area
	Local	Impact that takes place in the close proximity of the activities related to the planned project
Duration	Constant	Impact, which do not subside along with the conclusion of the activities related to the planned project
	Long-term	Impact which is limited in time and its effects are noticeable (measurable) either constantly or cyclically for 3 years or 3 vegetation periods from the beginning of the activity related to the planned project
	Medium-term	Impact which is limited in time and its effects are noticeable (measurable) either constantly or cyclically for 1 to 3 years or 1 to 3 vegetation periods from the beginning of the activity related to the planned project
	Short-term	Impact which is limited in time and its effects are noticeable (measurable) for a relatively short period but no longer than 1 year or 1 vegetation period from the beginning of the activity related to the planned project
	Temporary	Impact which is limited to the duration of the activity related to the planned project
Permanence	Irreversible	Impact, the effects of which will not disappear after the cessation of activities related to the planned project, and the resources will not return to the initial state
	Reversible	Impact the effects of which cease to be noticeable (measurable) after the activities related to the planned project are completed

Due to the overall characteristics of the individual impact features, in some cases, during the detailed assessments, individual concepts were clarified further, taking into account the specificity of impacts. If good practices or generally accepted and applied methodologies indicated the need for other assessment and/or definition methodologies, these were quoted directly in the place of their use.

As a result, each impact was characterised and assessed in accordance with the number of points presented in Table 2.4.

Table 2.4. Method of assessing individual impacts on receptors [source: internal materials]

Impact	Impact characteristics													Joint assessment t
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Constant	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Impact 1.														
Impact 2.														
Impact n														

As a result of the ratings assigned to the impact characteristics, the size (scale) of the impact was described according to a five-point scale:

1. 4–5 points – irrelevant;
2. 6–7 points – low;
3. 8–9 points – moderate;
4. 10–12 points – high;
5. 13 points – very high.

In the cases of possible interaction between the impact and the receptor, the resistance of the receptors to individual impacts as well as their significance and role in the environment, including the protective status in relation to environmental components, were determined. As a result, the resistance and significance of the receptors contributed to the determination of a receptor sensitivity, which was also determined, using the expert method, according to a five-point scale: (1) irrelevant, (2) low, (3) moderate, (4) high and (5) very high.

At the next stage of the assessment, taking into account the assigned size (scale) of the impact and the receptor sensitivity, the significance of a given impact on the receptor was also determined on a five-point scale [Table 2.5]:

- negligible impact;
- low impact;
- moderate impact;
- important impact;
- significant impact.

The relationships between the scale of the impact and the receptor sensitivity indicating the significance of the impact are shown in Table 2.5.

Table 2.5. Matrix defining the significance of the impact in relation to the impact scale and receptor sensitivity [source: internal materials]

Impact significance		Receptor sensitivity				
		Irrelevant	Low	Moderate	High	Very high
Scale (size) of impact	Irrelevant	Negligible	Negligible	Negligible	Negligible	Low
	Low	Negligible	Negligible	Low	Low	Moderate
	Moderate	Negligible	Low	Low	Moderate	Moderate
	High	Negligible	Low	Moderate	Important	Significant
	Very high	Low	Moderate	Moderate	Significant	Significant

In accordance with the EIA methodology described above, a significant impact may occur if a “very high” scale of impact is determined and at the same time at least a “high” sensitivity of the receptor as well as in the case when a “high” scale of impact is determined with a “very high” sensitivity of the receptor.

The methodology described above was developed to standardise the environmental impact assessment for different types of activities, emissions and different types of receptors. This approach enables an effective comparative assessment of all impacts of the project and the assessment of the project as a whole. Due to the algorithm of the methodology adopted, it is necessary to quantify both the scale of impact and the sensitivity of the receptors (assigning the number of points from the pool available for individual evaluation criteria). Therefore, for each of the issues assessed in the tables in Section 8, one should refer directly to the text preceding the tables with regard to the detailed assessment of the impact conditions.

Correct use of standardised assessment methods requires also the correct interpretation of the phrases corresponding to the number of points awarded in each category. They should not be interpreted in the colloquial sense, but as a replacement phrase specifying the sum of the points awarded, e.g. the phrase “low” used to determine the impact scale means the value of the parameter A (impact scale) within the range of 6 to 7 points, from the set of quantified results of four criteria: type (1–3 points), range (1–3), duration (1–5), and permanence (1–2). The same is true for the quantified evaluation of receptor sensitivity (parameter B values). When interpreting the results of the assessment of the emission scale, the sensitivity of receptors and the resultant assessment – the significance of the impact, the replacement phrases for the sum of points presented in the tables in Section 8 should be interpreted together with the detailed descriptions of the impacts that precede the tables of the standardised method.

Where significant environmental impacts have been identified, mitigation measures have been proposed (Section 13). The effectiveness of the proposed mitigation measures was assessed and presented in Section 8.

A separate category, not subject to assessment with regard to impact characteristics, are cumulative impacts occurring in combination with the impacts resulting from other current and/or planned projects, concerning the same subjects of impact. They were identified regardless of their characteristics and assessment.

3 DESCRIPTION OF THE PROPOSED PROJECT

3.1 General characteristics of the proposed project

3.1.1 Subject and scope of the Project

The proposed project involves the construction and operation of the EXC BC-Wind OWF within the offshore and onshore areas of the Republic of Poland [Figure 3.1]. The planned EXC BC-Wind OWF will allow the integration of the electricity generated by the BC-Wind OWF into the NPS.

The project will comprise the following elements:

- EHV power cable lines, located in the offshore area, within the boundaries of the exclusive economic zone, the territorial sea and internal sea waters (crossing the shoreline in the vicinity of 160.2–160.5 km of the seashore (according to the Maritime Office chainage) using a trenchless method (HDD);
- transition joint bays located on land, where subsea and underground cable lines are to be connected;
- EHV power cable lines, located within the onshore area in the Choczewo commune (Wejherowo district, Pomorskie voivodeship);
- 220/400 kV or 275/400 kV onshore substation;
- EHV power cable line connecting the onshore substation with the PSE substation;
- access roads, optical fibres and cable joints as well as other necessary associated infrastructure.

The scope of the proposed project includes three main phases of implementation: construction, operation, and decommissioning, which in the case of the project in question will involve the discontinuation of operation of the EXC BC-Wind OWF.

The starting point (km 0+0) of the proposed project will be the cable terminations of EHV power line cables connected to the GIS 66/220 kV or 66/275 kV switchgears situated at the offshore substation (OSS) located at a maximum distance of 33 km from the coastline.

The land-sea interface of the offshore and onshore parts, i.e. the landfall of EHV power cable lines (transition joint bays), lies in plots no. 290, 3/6, 3/7, Kierzkowo cadastral district, Choczewo commune (Wejherowo district, Pomorskie voivodeship). The corridor through which the EXC BC-Wind OWF will switch from the offshore onto the onshore section will be located in the vicinity of 160.2–160.5 km of the seashore (according to the shoreline chainage of the Maritime Office). Pursuant to the Act of 21 March 1991 on the maritime areas of the Republic of Poland and maritime administration (consolidated text: Journal of Laws of 2023, item 960), the proposed project will be implemented within the boundaries of the coastal strip [Figure 5.21., Section 5.14]. The route of the underground cable line will run through the forests administered by the Regional Directorate of State Forests (RDSF) in Gdańsk, within the boundaries of the Choczewo Forest District and the plots owned by the Applicant.

Another element of the EXC BC-Wind OWF will involve connecting it to the ONS with an input voltage of 220 kV or 275 kV and an output voltage of 400 kV. The planned station is located in plot no. 105/4, Lublewo cadastral district, Choczewo commune. The ONS will be connected with the PSE S.A. substation with a 400 kV underground power cable line.

The end point of the proposed project is marked by the disconnect terminals in the 400 kV feeder bay dedicated to the BC-Wind OWF at the PSE S.A. substation.

Table 3.1 presents basic parameters characterising the proposed project. A detailed description of the technologies to be used in the project implementation is included in Subsection 2.2 3.2.

Table 3.1. List of key parameters of the proposed project [source: internal materials]

Parameter	Value/description
Length of the grid connection line within the offshore area	approximately 33 km
Length of the HDD or HDD Intersect trenchless technology landfall section between the offshore and onshore power cable route (including the offshore and onshore sections)	approximately 600–1700 m
Length of the grid connection line within the onshore area	approximately 8 km
Type of power cables within the offshore area	Three-core AC subsea cables with an integrated fibre-optic cable
Type of power cables within the onshore area	Single-core AC earth cables
Fibre-optic line	approximately 8 km of the onshore section
Rated voltage of power cables	220 or 275 kV
Maximum number of cables within the offshore area	2 single (three-core) cable lines in a single cable corridor
Maximum number of cable lines within the onshore area	2 single cable lines, consisting of 3 single-core cables each
Cable landfall method	Trenchless method – Horizontal Directional Drilling (HDD)
Method of power cable laying within the offshore area	Buried in the seabed or laid on the seabed, mechanically secured
Method of power cable laying in the onshore area	Open-trench technology / burying directly in the ground or in casing pipes
Method of connecting the ONS with the PSE S.A. substation.	Open-trench technology, 400kV cable (3 single-core cables), laid directly in the ground or in casing pipes
Maximum length of the ONS connection line with the PSE S.A. substation	1000 m

The concept for the proposed project was developed on the basis of information on the commonly used technological and technical solutions for the implementation of such projects. The information and data collected on the environment allowed verifying the assumptions made in order to minimise the impact on the natural environment and other users of the area in which the construction of the EXC BC-Wind OWF is planned.

The technological and technical solutions adopted will maintain their state-of-the-art status at least for several years after the project commencement. It is unlikely that power line construction technologies that would significantly differ from those used today will emerge within the next few years.

The information and data characterising this project and included in this section are as accurate and precise as is reasonably possible. A precautionary approach was applied, i.e. all possible implementation methods of a particular project component were described. In the impact analysis, the worst-case scenario of the implementation method was adopted in terms of environmental impact, assuming that the adoption of the implementation method less oppressive to the environment would not result in different impacts, but would only mitigate or reduce their negative effect. Such an approach guarantees that the worst-case scenario of the project implementation regarding the environment has been adopted in the EIA Report.

3.1.2 Project location and the sea and land area occupied by the project

The EXC BC-Wind OWF development area is located within the maritime area of the Republic of Poland – in the exclusive economic zone, in the area of the territorial sea and internal sea waters, as well as onshore, in the Choczewo commune area (Wejherowo district, Pomorskie voivodeship).

Within the offshore area, the EXC BC-Wind OWF development area is described using the coordinates given in Table 3.2. Within the area stretching from the southern boundary, the OWF does not reach beyond the coordinates laid down in Decisions No. 5/K/21 and No. 6/K/21 of the Minister of Infrastructure of 27 October 2021 and in Decision No. 6/21 of the Director of the Maritime Office in Gdynia of 30 November 2021, whereas within the BC-Wind OWF Area – in Decision No. 3/K/2022 of 16 January 2023.

Within the onshore area, the EXC BC-Wind OWF development area was described using the coordinates given in Table 3.2 and the cadastral plots in which the project will be implemented [Table 3.3]. Table 3.4 contains a list of plots situated within the range of the project potential impact.

The location of the proposed project within the Choczewo Forest Division has been a subject of discussions and agreements with the Forest Inspectorate authorities. On the basis of the comments and recommendations of the Choczewo Forest Inspectorate, a design of the EXC BC-Wind OWF route has been prepared which is to mitigate the negative environmental impacts, by:

- minimising the tree felling area by routing the connection infrastructure for various project owners within a single, common cable bed area;
- bypassing the environmentally valuable areas indicated by the Choczewo Forest Inspectorate at the stage of approvals;
- using the cable technology and horizontal directional drilling as mitigating the pressure on the environment, including cultural objects and areas of high nature conservation value.

Figure 3.1 and Figure 3.2 show the location of the EXC BC-Wind OWF development area, the boundaries of which are defined by the coordinates provided in Table 3.2. The scope of the figures and coordinates in the table covers the above-mentioned planned changes of the project location in the offshore area.

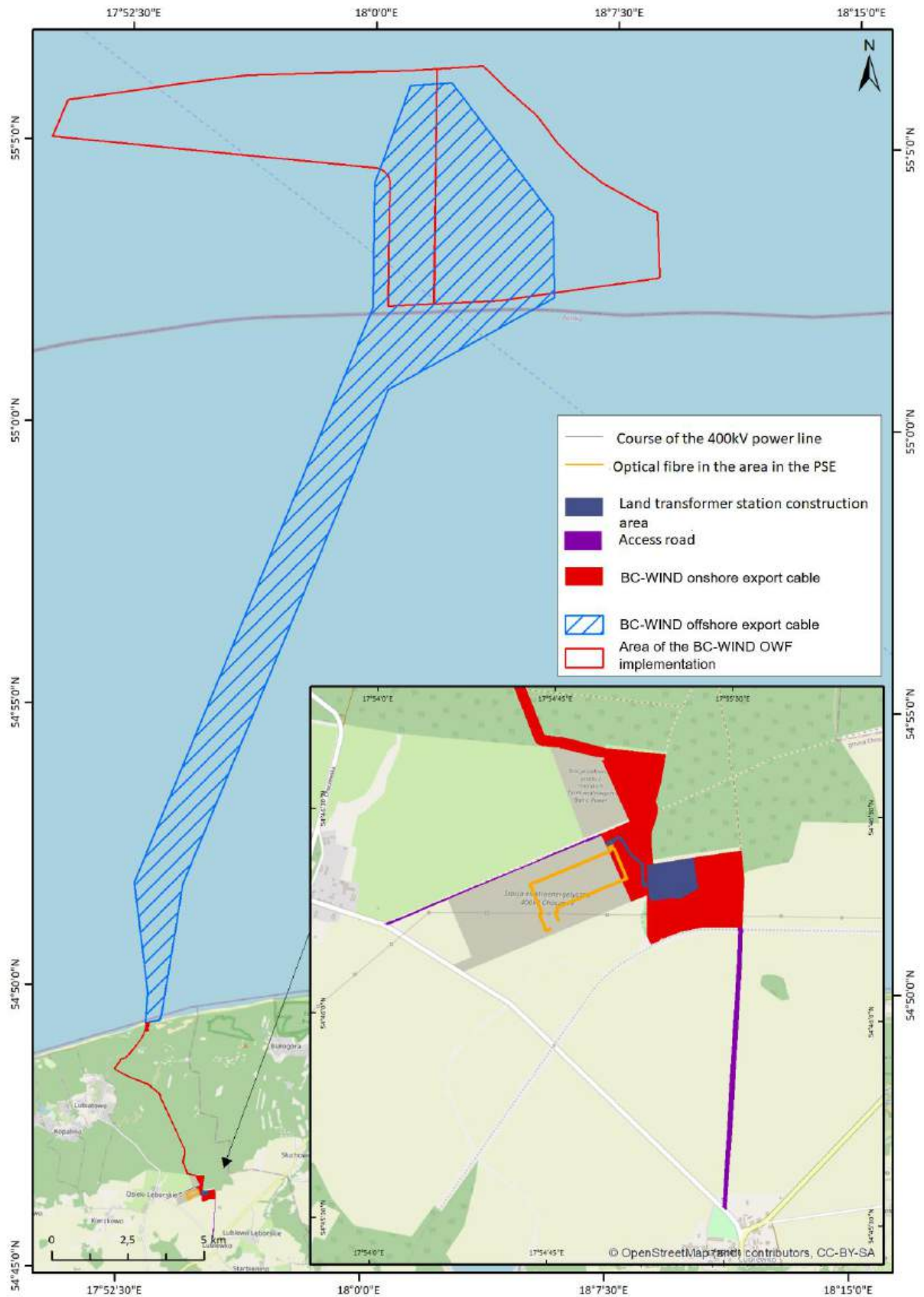


Figure 3.1. Location of the proposed project – the EXC BC-Wind OWF [source: internal materials]

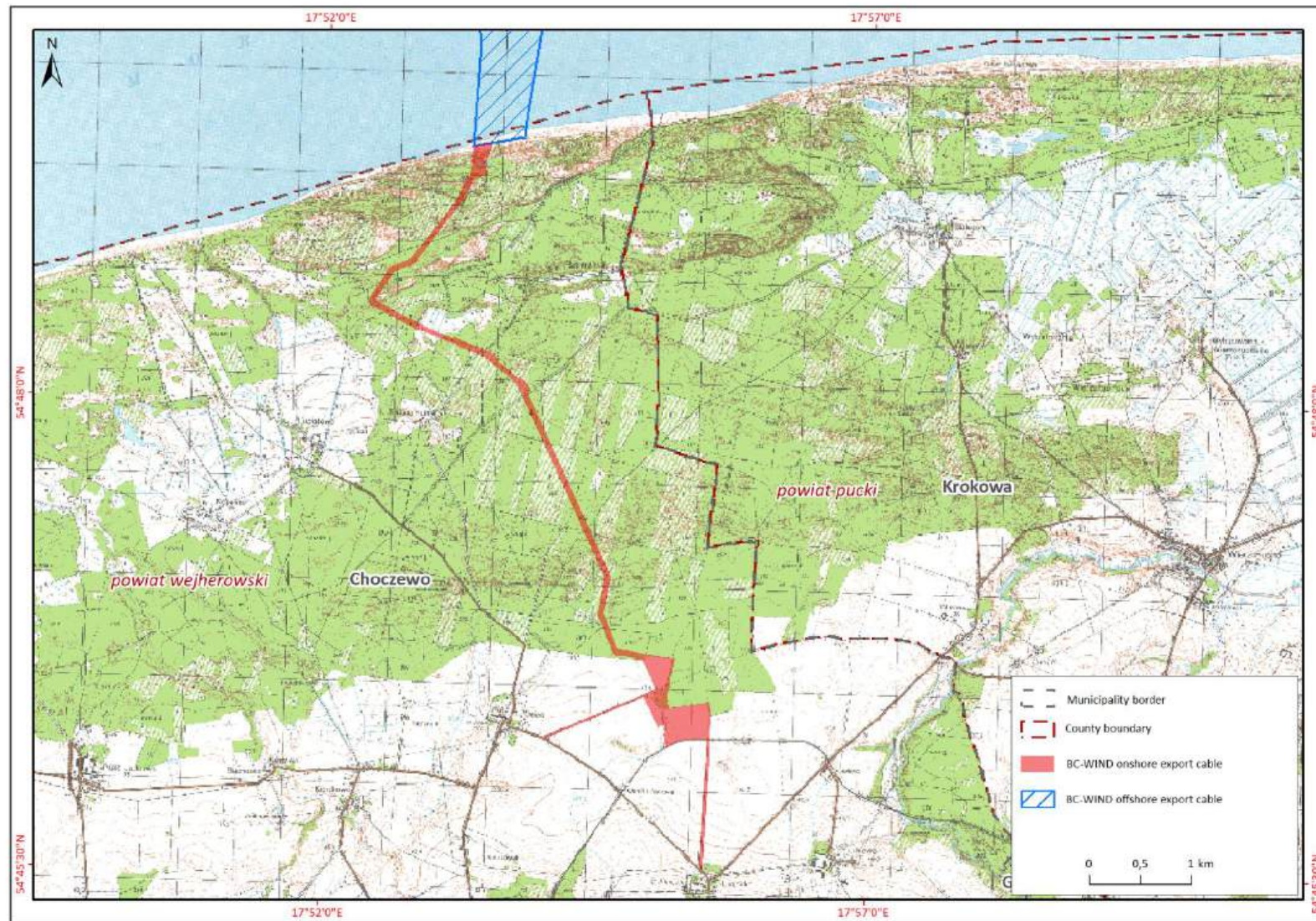


Figure 3.2. Location of the proposed project –the EXC BC-Wind OWF – in the onshore part [source: internal materials]

Table 3.2. Geographical coordinates of the EXC BC-Wind OWF development area boundaries in the offshore and onshore areas [source: internal materials]

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
OFFSHORE AREA				
1	804602.85	437358.97	55° 06' 02.448" N	18° 01' 04.733" E
2	804686.74	438720.48	55° 06' 05.775" N	18° 02' 21.495" E
3	800299.66	442043.90	55° 03' 45.264" N	18° 05' 32.252" E
4	797630.21	442084.47	55° 02' 18.907" N	18° 05' 36.491" E
5	797224.71	441349.36	55° 02' 05.476" N	18° 04' 55.374" E
6	794614.65	436617.82	55° 00' 38.934" N	18° 00' 30.907" E
7	778347.15	429864.01	54° 51' 49.332" N	17° 54' 24.972" E
8	774176.85	429169.98	54° 49' 34.047" N	17° 53' 49.723" E
9	773854.30	429116.27	54° 49' 23.583" N	17° 53' 46.997" E
10	773799.99	428794.73	54° 49' 21.662" N	17° 53' 29.027" E
11	773788.17	428719.59	54° 49' 21.241" N	17° 53' 24.827" E
12	773784.66	428697.30	54° 49' 21.116" N	17° 53' 23.581" E
13	773778.95	428669.84	54° 49' 20.917" N	17° 53' 22.047" E
14	773768.38	428618.92	54° 49' 20.549" N	17° 53' 19.203" E
15	774784.92	428701.01	54° 49' 53.482" N	17° 53' 22.901" E
16	778389.38	428257.40	54° 51' 49.878" N	17° 52' 54.813" E
17	797086.83	436020.06	55° 01' 58.648" N	17° 59' 55.259" E
18	797312.72	436113.85	55° 02' 06.000" N	18° 00' 00.360" E
19	800172.47	436154.75	55° 03' 38.548" N	18° 00' 00.360" E
20	801402.14	436172.33	55° 04' 18.343" N	18° 00' 00.359" E
ONSHORE AREA				
CONSTRUCTION AREA OF THE TRANSITION JOINT BAYS AND CABLE LINE				
1b_1	773547.6	428732.7	54° 49' 13.465" N	17° 53' 25.777" E
1b_2	773571.4	428692.1	54° 49' 14.212" N	17° 53' 23.479" E
1b_3	773566.4	428664.8	54° 49' 14.036" N	17° 53' 21.952" E
1b_4	773574.5	428648.5	54° 49' 14.291" N	17° 53' 21.035" E
1b_5	773589.8	428618.0	54° 49' 14.771" N	17° 53' 19.310" E
1b_6	773589.8	428616.6	54° 49' 14.771" N	17° 53' 19.233" E
1b_7	773592.0	428617.2	54° 49' 14.839" N	17° 53' 19.262" E
1b_8	773603.7	428635.4	54° 49' 15.228" N	17° 53' 20.275" E
1b_9	773614.6	428650.3	54° 49' 15.589" N	17° 53' 21.099" E
1b_10	773615.7	428655.3	54° 49' 15.627" N	17° 53' 21.377" E
1b_11	773616.1	428662.1	54° 49' 15.645" N	17° 53' 21.760" E
1b_12	773615.6	428667.0	54° 49' 15.631" N	17° 53' 22.031" E
1b_13	773616.9	428676.4	54° 49' 15.679" N	17° 53' 22.560" E
1b_14	773620.5	428693.9	54° 49' 15.803" N	17° 53' 23.539" E
1b_15	773622.1	428702.6	54° 49' 15.858" N	17° 53' 24.021" E
1b_16	773625.1	428712.3	54° 49' 15.961" N	17° 53' 24.562" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
1b_17	773612.5	428719.6	54° 49' 15.557" N	17° 53' 24.983" E
1b_18	773600.9	428725.1	54° 49' 15.185" N	17° 53' 25.304" E
1b_19	773586.8	428730.6	54° 49' 14.730" N	17° 53' 25.623" E
1a_1	773800.4	428797.6	54° 49' 21.678" N	17° 53' 29.185" E
1a_2	773605.6	428729.6	54° 49' 15.338" N	17° 53' 25.548" E
1a_3	773605.9	428729.4	54° 49' 15.348" N	17° 53' 25.540" E
1a_4	773615.2	428724.9	54° 49' 15.647" N	17° 53' 25.280" E
1a_5	773630.7	428715.9	54° 49' 16.145" N	17° 53' 24.759" E
1a_6	773631.4	428715.1	54° 49' 16.165" N	17° 53' 24.712" E
1a_7	773631.7	428714.1	54° 49' 16.174" N	17° 53' 24.656" E
1a_8	773631.6	428713.0	54° 49' 16.172" N	17° 53' 24.598" E
1a_9	773627.9	428701.3	54° 49' 16.047" N	17° 53' 23.946" E
1a_10	773622.9	428675.5	54° 49' 15.870" N	17° 53' 22.504" E
1a_11	773621.7	428666.9	54° 49' 15.826" N	17° 53' 22.019" E
1a_12	773622.1	428662.2	54° 49' 15.839" N	17° 53' 21.755" E
1a_13	773621.6	428654.5	54° 49' 15.819" N	17° 53' 21.325" E
1a_14	773620.4	428648.7	54° 49' 15.775" N	17° 53' 21.003" E
1a_15	773614.6	428635.9	54° 49' 15.581" N	17° 53' 20.292" E
1a_16	773607.9	428616.1	54° 49' 15.355" N	17° 53' 19.185" E
1a_17	773605.3	428604.5	54° 49' 15.265" N	17° 53' 18.539" E
1a_18	773624.5	428607.6	54° 49' 15.889" N	17° 53' 18.697" E
1a_19	773768.4	428618.9	54° 49' 20.549" N	17° 53' 19.203" E
1a_20	773779.0	428669.8	54° 49' 20.917" N	17° 53' 22.047" E
1a_21	773784.7	428697.3	54° 49' 21.116" N	17° 53' 23.581" E
1a_22	773788.2	428719.6	54° 49' 21.241" N	17° 53' 24.827" E
2_1	773547.6	428732.7	54° 49' 13.465" N	17° 53' 25.777" E
2_2	773571.4	428692.1	54° 49' 14.212" N	17° 53' 23.479" E
2_3	773566.4	428664.8	54° 49' 14.036" N	17° 53' 21.952" E
2_4	773574.5	428648.5	54° 49' 14.291" N	17° 53' 21.035" E
2_5	773589.8	428618.0	54° 49' 14.771" N	17° 53' 19.310" E
2_6	773589.8	428616.6	54° 49' 14.771" N	17° 53' 19.233" E
2_7	773590.0	428602.0	54° 49' 14.770" N	17° 53' 18.414" E
2_8	773538.0	428593.6	54° 49' 13.083" N	17° 53' 17.987" E
2_9	773524.8	428591.4	54° 49' 12.652" N	17° 53' 17.878" E
2_10	773507.2	428588.6	54° 49' 12.083" N	17° 53' 17.733" E
2_11	773486.7	428584.3	54° 49' 11.416" N	17° 53' 17.514" E
2_12	773468.8	428575.3	54° 49' 10.833" N	17° 53' 17.027" E
2_13	773448.3	428616.5	54° 49' 10.190" N	17° 53' 19.351" E
2_14	773453.7	428619.2	54° 49' 10.367" N	17° 53' 19.499" E
2_15	773453.7	428619.2	54° 49' 10.368" N	17° 53' 19.500" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
2_16	773492.5	428733.3	54° 49' 11.680" N	17° 53' 25.856" E
2_17	773493.8	428749.6	54° 49' 11.733" N	17° 53' 26.771" E
2_18	773494.1	428753.9	54° 49' 11.744" N	17° 53' 27.008" E
2_19	773514.0	428751.9	54° 49' 12.388" N	17° 53' 26.882" E
2_20	773527.8	428750.1	54° 49' 12.833" N	17° 53' 26.765" E
2_21	773538.9	428748.2	54° 49' 13.189" N	17° 53' 26.651" E
2_22	773542.8	428741.5	54° 49' 13.314" N	17° 53' 26.269" E
3_1	773448.3	428616.5	54° 49' 10.190" N	17° 53' 19.351" E
3_2	773287.0	428535.5	54° 49' 4.930" N	17° 53' 14.959" E
3_3	773273.1	428555.1	54° 49' 4.490" N	17° 53' 16.068" E
3_4	773270.4	428551.7	54° 49' 4.401" N	17° 53' 15.881" E
3_5	773270.3	428551.7	54° 49' 4.398" N	17° 53' 15.877" E
3_6	773269.8	428551.2	54° 49' 4.382" N	17° 53' 15.851" E
3_7	773257.6	428542.3	54° 49' 3.982" N	17° 53' 15.364" E
3_8	773231.8	428523.6	54° 49' 3.140" N	17° 53' 14.339" E
3_9	773232.9	428521.8	54° 49' 3.173" N	17° 53' 14.239" E
3_10	773242.1	428506.2	54° 49' 3.464" N	17° 53' 13.354" E
3_11	772834.4	428198.4	54° 48' 50.114" N	17° 52' 56.471" E
3_12	772804.1	428112.9	54° 48' 49.088" N	17° 52' 51.709" E
3_13	772832.7	428134.5	54° 48' 50.023" N	17° 52' 52.894" E
3_14	772848.9	428152.5	54° 48' 50.558" N	17° 52' 53.890" E
3_15	772856.1	428160.5	54° 48' 50.794" N	17° 52' 54.331" E
3_16	773266.8	428471.0	54° 49' 4.244" N	17° 53' 11.359" E
3_17	773272.5	428475.3	54° 49' 4.430" N	17° 53' 11.595" E
3_18	773276.8	428478.5	54° 49' 4.571" N	17° 53' 11.773" E
3_19	773286.2	428484.3	54° 49' 4.878" N	17° 53' 12.086" E
3_20	773293.4	428487.6	54° 49' 5.114" N	17° 53' 12.268" E
3_21	773304.3	428492.8	54° 49' 5.469" N	17° 53' 12.548" E
3_22	773306.6	428493.9	54° 49' 5.543" N	17° 53' 12.610" E
3_23	773309.1	428495.2	54° 49' 5.626" N	17° 53' 12.679" E
3_24	773468.8	428575.3	54° 49' 10.833" N	17° 53' 17.027" E
4_1	772834.4	428198.4	54° 48' 50.114" N	17° 52' 56.471" E
4_2	772731.8	428120.8	54° 48' 46.752" N	17° 52' 52.219" E
4_3	772677.7	428080.0	54° 48' 44.983" N	17° 52' 49.982" E
4_4	772671.9	428075.5	54° 48' 44.790" N	17° 52' 49.731" E
4_5	772666.2	428070.7	54° 48' 44.603" N	17° 52' 49.470" E
4_6	772660.6	428065.8	54° 48' 44.421" N	17° 52' 49.198" E
4_7	772655.2	428060.7	54° 48' 44.244" N	17° 52' 48.916" E
4_8	772650.0	428055.4	54° 48' 44.073" N	17° 52' 48.624" E
4_9	772645.0	428049.9	54° 48' 43.908" N	17° 52' 48.322" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
4_10	772640.1	428044.3	54° 48' 43.748" N	17° 52' 48.011" E
4_11	772635.5	428038.5	54° 48' 43.594" N	17° 52' 47.690" E
4_12	772631.0	428032.5	54° 48' 43.447" N	17° 52' 47.362" E
4_13	772626.8	428026.4	54° 48' 43.306" N	17° 52' 47.024" E
4_14	772622.7	428020.2	54° 48' 43.171" N	17° 52' 46.679" E
4_15	772618.9	428013.9	54° 48' 43.043" N	17° 52' 46.327" E
4_16	772615.2	428007.4	54° 48' 42.922" N	17° 52' 45.967" E
4_17	772611.8	428000.8	54° 48' 42.808" N	17° 52' 45.601" E
4_18	772608.6	427994.1	54° 48' 42.701" N	17° 52' 45.228" E
4_19	772605.6	427987.3	54° 48' 42.602" N	17° 52' 44.849" E
4_20	772602.9	427980.4	54° 48' 42.509" N	17° 52' 44.465" E
4_21	772557.6	427861.1	54° 48' 40.981" N	17° 52' 37.826" E
4_22	772556.6	427858.8	54° 48' 40.949" N	17° 52' 37.694" E
4_23	772555.6	427856.4	54° 48' 40.915" N	17° 52' 37.565" E
4_24	772554.5	427854.1	54° 48' 40.878" N	17° 52' 37.437" E
4_25	772553.3	427851.9	54° 48' 40.838" N	17° 52' 37.311" E
4_26	772552.0	427849.7	54° 48' 40.796" N	17° 52' 37.188" E
4_27	772550.7	427847.5	54° 48' 40.752" N	17° 52' 37.067" E
4_28	772549.3	427845.3	54° 48' 40.705" N	17° 52' 36.949" E
4_29	772547.8	427843.3	54° 48' 40.656" N	17° 52' 36.834" E
4_30	772546.3	427841.2	54° 48' 40.605" N	17° 52' 36.722" E
4_31	772544.6	427839.3	54° 48' 40.552" N	17° 52' 36.613" E
4_32	772543.0	427837.3	54° 48' 40.496" N	17° 52' 36.507" E
4_33	772541.2	427835.5	54° 48' 40.439" N	17° 52' 36.404" E
4_34	772539.4	427833.7	54° 48' 40.379" N	17° 52' 36.305" E
4_35	772537.5	427831.9	54° 48' 40.318" N	17° 52' 36.209" E
4_36	772535.6	427830.3	54° 48' 40.255" N	17° 52' 36.117" E
4_37	772533.6	427828.7	54° 48' 40.190" N	17° 52' 36.029" E
4_38	772531.6	427827.1	54° 48' 40.123" N	17° 52' 35.944" E
4_39	772529.5	427825.7	54° 48' 40.055" N	17° 52' 35.864" E
4_40	772280.0	427657.8	54° 48' 31.894" N	17° 52' 26.682" E
4_41	772279.3	427657.3	54° 48' 31.873" N	17° 52' 26.660" E
4_42	772278.7	427656.9	54° 48' 31.852" N	17° 52' 26.638" E
4_43	772278.0	427656.6	54° 48' 31.830" N	17° 52' 26.618" E
4_44	772277.3	427656.2	54° 48' 31.808" N	17° 52' 26.599" E
4_45	772276.6	427655.9	54° 48' 31.785" N	17° 52' 26.582" E
4_46	772275.9	427655.6	54° 48' 31.762" N	17° 52' 26.566" E
4_47	772275.2	427655.3	54° 48' 31.739" N	17° 52' 26.551" E
4_48	772274.5	427655.1	54° 48' 31.715" N	17° 52' 26.538" E
4_49	772273.7	427654.9	54° 48' 31.691" N	17° 52' 26.526" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
4_50	772273.0	427654.7	54° 48' 31.667" N	17° 52' 26.515" E
4_51	772272.3	427654.5	54° 48' 31.643" N	17° 52' 26.507" E
4_52	772271.5	427654.3	54° 48' 31.618" N	17° 52' 26.499" E
4_53	772270.7	427654.2	54° 48' 31.594" N	17° 52' 26.493" E
4_54	772270.0	427654.1	54° 48' 31.569" N	17° 52' 26.488" E
4_55	772269.2	427654.1	54° 48' 31.544" N	17° 52' 26.485" E
4_56	772268.5	427654.0	54° 48' 31.519" N	17° 52' 26.484" E
4_57	772267.7	427654.0	54° 48' 31.495" N	17° 52' 26.484" E
4_58	772266.9	427654.0	54° 48' 31.470" N	17° 52' 26.485" E
4_59	772266.2	427654.1	54° 48' 31.445" N	17° 52' 26.488" E
4_60	772265.4	427654.1	54° 48' 31.420" N	17° 52' 26.492" E
4_61	772264.6	427654.2	54° 48' 31.396" N	17° 52' 26.498" E
4_62	772263.9	427654.3	54° 48' 31.371" N	17° 52' 26.505" E
4_63	772263.1	427654.5	54° 48' 31.347" N	17° 52' 26.514" E
4_64	772262.4	427654.7	54° 48' 31.323" N	17° 52' 26.525" E
4_65	772261.6	427654.8	54° 48' 31.299" N	17° 52' 26.536" E
4_66	772260.9	427655.1	54° 48' 31.276" N	17° 52' 26.549" E
4_67	772260.2	427655.3	54° 48' 31.252" N	17° 52' 26.564" E
4_68	772259.5	427655.6	54° 48' 31.229" N	17° 52' 26.580" E
4_69	772258.7	427655.9	54° 48' 31.206" N	17° 52' 26.597" E
4_70	772258.1	427656.2	54° 48' 31.184" N	17° 52' 26.616" E
4_71	772257.4	427656.6	54° 48' 31.162" N	17° 52' 26.636" E
4_72	772256.7	427656.9	54° 48' 31.141" N	17° 52' 26.657" E
4_73	772256.0	427657.3	54° 48' 31.119" N	17° 52' 26.680" E
4_74	772255.4	427657.7	54° 48' 31.099" N	17° 52' 26.703" E
4_75	772254.8	427658.2	54° 48' 31.079" N	17° 52' 26.728" E
4_76	772254.1	427658.6	54° 48' 31.059" N	17° 52' 26.755" E
4_77	772253.5	427659.1	54° 48' 31.040" N	17° 52' 26.782" E
4_78	772253.0	427659.6	54° 48' 31.021" N	17° 52' 26.811" E
4_79	772252.4	427660.1	54° 48' 31.003" N	17° 52' 26.840" E
4_80	772251.9	427660.7	54° 48' 30.986" N	17° 52' 26.871" E
4_81	772251.3	427661.2	54° 48' 30.969" N	17° 52' 26.903" E
4_82	772250.8	427661.8	54° 48' 30.953" N	17° 52' 26.935" E
4_83	772250.3	427662.4	54° 48' 30.938" N	17° 52' 26.969" E
4_84	772249.9	427663.0	54° 48' 30.923" N	17° 52' 27.004" E
4_85	772249.4	427663.6	54° 48' 30.909" N	17° 52' 27.039" E
4_86	772249.0	427664.3	54° 48' 30.896" N	17° 52' 27.075" E
4_87	772248.6	427664.9	54° 48' 30.883" N	17° 52' 27.112" E
4_88	772248.2	427665.6	54° 48' 30.871" N	17° 52' 27.150" E
4_89	772052.9	428024.8	54° 48' 24.737" N	17° 52' 47.448" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
4_90	772059.6	428040.5	54° 48' 24.961" N	17° 52' 48.322" E
4_91	772020.0	428120.9	54° 48' 23.723" N	17° 52' 52.860" E
4_92	771971.9	428090.8	54° 48' 22.150" N	17° 52' 51.213" E
4_93	771973.1	428087.8	54° 48' 22.188" N	17° 52' 51.048" E
4_94	771972.4	428068.3	54° 48' 22.154" N	17° 52' 49.954" E
4_95	771978.1	428057.7	54° 48' 22.335" N	17° 52' 49.357" E
4_96	772204.4	427641.6	54° 48' 29.440" N	17° 52' 25.845" E
4_97	772206.8	427637.5	54° 48' 29.517" N	17° 52' 25.611" E
4_98	772209.5	427633.5	54° 48' 29.602" N	17° 52' 25.387" E
4_99	772212.5	427629.7	54° 48' 29.695" N	17° 52' 25.173" E
4_100	772215.7	427626.2	54° 48' 29.797" N	17° 52' 24.970" E
4_101	772219.1	427622.8	54° 48' 29.907" N	17° 52' 24.779" E
4_102	772222.7	427619.7	54° 48' 30.023" N	17° 52' 24.602" E
4_103	772226.6	427616.8	54° 48' 30.146" N	17° 52' 24.438" E
4_104	772230.6	427614.2	54° 48' 30.275" N	17° 52' 24.289" E
4_105	772234.8	427611.9	54° 48' 30.409" N	17° 52' 24.155" E
4_106	772239.2	427609.9	54° 48' 30.549" N	17° 52' 24.036" E
4_107	772243.6	427608.1	54° 48' 30.692" N	17° 52' 23.934" E
4_108	772248.2	427606.7	54° 48' 30.839" N	17° 52' 23.849" E
4_109	772252.8	427605.5	54° 48' 30.989" N	17° 52' 23.781" E
4_110	772257.6	427604.7	54° 48' 31.142" N	17° 52' 23.730" E
4_111	772262.3	427604.2	54° 48' 31.296" N	17° 52' 23.697" E
4_112	772267.1	427604.0	54° 48' 31.451" N	17° 52' 23.682" E
4_113	772271.9	427604.1	54° 48' 31.606" N	17° 52' 23.685" E
4_114	772276.7	427604.6	54° 48' 31.760" N	17° 52' 23.706" E
4_115	772281.4	427605.3	54° 48' 31.914" N	17° 52' 23.744" E
4_116	772286.1	427606.4	54° 48' 32.066" N	17° 52' 23.800" E
4_117	772290.7	427607.8	54° 48' 32.215" N	17° 52' 23.873" E
4_118	772295.2	427609.5	54° 48' 32.361" N	17° 52' 23.964" E
4_119	772299.5	427611.4	54° 48' 32.503" N	17° 52' 24.071" E
4_120	772303.8	427613.7	54° 48' 32.641" N	17° 52' 24.194" E
4_121	772307.8	427616.3	54° 48' 32.774" N	17° 52' 24.333" E
4_122	772557.3	427784.1	54° 48' 40.934" N	17° 52' 33.514" E
4_123	772564.2	427789.1	54° 48' 41.160" N	17° 52' 33.787" E
4_124	772570.8	427794.6	54° 48' 41.374" N	17° 52' 34.086" E
4_125	772576.9	427800.5	54° 48' 41.576" N	17° 52' 34.410" E
4_126	772582.7	427806.8	54° 48' 41.765" N	17° 52' 34.757" E
4_127	772588.0	427813.4	54° 48' 41.940" N	17° 52' 35.126" E
4_128	772592.8	427820.4	54° 48' 42.099" N	17° 52' 35.515" E
4_129	772597.1	427827.8	54° 48' 42.243" N	17° 52' 35.921" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
4_130	772600.9	427835.4	54° 48' 42.371" N	17° 52' 36.343" E
4_131	772604.2	427843.2	54° 48' 42.482" N	17° 52' 36.780" E
4_132	772649.5	427962.4	54° 48' 44.010" N	17° 52' 43.419" E
4_133	772653.7	427972.5	54° 48' 44.151" N	17° 52' 43.980" E
4_134	772658.5	427982.3	54° 48' 44.312" N	17° 52' 44.525" E
4_135	772664.0	427991.8	54° 48' 44.492" N	17° 52' 45.051" E
4_136	772670.0	428000.9	54° 48' 44.691" N	17° 52' 45.558" E
4_137	772676.5	428009.7	54° 48' 44.907" N	17° 52' 46.041" E
4_138	772683.6	428018.0	54° 48' 45.141" N	17° 52' 46.501" E
4_139	772691.2	428025.9	54° 48' 45.390" N	17° 52' 46.934" E
4_140	772699.3	428033.2	54° 48' 45.655" N	17° 52' 47.340" E
4_141	772707.8	428040.1	54° 48' 45.934" N	17° 52' 47.717" E
4_142	772759.6	428079.2	54° 48' 47.630" N	17° 52' 49.865" E
4_143	772788.1	428100.8	54° 48' 48.563" N	17° 52' 51.045" E
4_144	772804.1	428112.9	54° 48' 49.088" N	17° 52' 51.709" E
5_1	771887.3	428446.2	54° 48' 19.596" N	17° 53' 11.196" E
5_2	771834.8	428424.0	54° 48' 17.885" N	17° 53' 10.000" E
5_3	771971.9	428090.8	54° 48' 22.150" N	17° 52' 51.213" E
5_4	772020.0	428120.9	54° 48' 23.723" N	17° 52' 52.860" E
5_5	772001.8	428126.2	54° 48' 23.135" N	17° 52' 53.174" E
5_6	771885.0	428409.9	54° 48' 19.504" N	17° 53' 9.168" E
5_7	771893.1	428430.4	54° 48' 19.777" N	17° 53' 10.306" E
6_1	771657.9	428859.4	54° 48' 12.385" N	17° 53' 34.545" E
6_2	771621.2	428824.6	54° 48' 11.182" N	17° 53' 32.630" E
6_3	771649.0	428790.6	54° 48' 12.061" N	17° 53' 30.703" E
6_4	771662.7	428773.8	54° 48' 12.497" N	17° 53' 29.747" E
6_5	771707.8	428718.5	54° 48' 13.928" N	17° 53' 26.612" E
6_6	771713.0	428711.8	54° 48' 14.094" N	17° 53' 26.228" E
6_7	771718.0	428704.7	54° 48' 14.250" N	17° 53' 25.830" E
6_8	771722.6	428697.5	54° 48' 14.395" N	17° 53' 25.420" E
6_9	771726.8	428690.0	54° 48' 14.528" N	17° 53' 24.998" E
6_10	771730.6	428682.4	54° 48' 14.649" N	17° 53' 24.566" E
6_11	771734.1	428674.5	54° 48' 14.758" N	17° 53' 24.124" E
6_12	771737.3	428666.5	54° 48' 14.855" N	17° 53' 23.673" E
6_13	771743.9	428648.2	54° 48' 15.059" N	17° 53' 22.641" E
6_14	771812.4	428458.6	54° 48' 17.180" N	17° 53' 11.960" E
6_15	771814.2	428457.0	54° 48' 17.238" N	17° 53' 11.866" E
6_16	771825.3	428446.9	54° 48' 17.591" N	17° 53' 11.295" E
6_17	771834.8	428424.0	54° 48' 17.885" N	17° 53' 10.000" E
6_18	771887.3	428446.2	54° 48' 19.596" N	17° 53' 11.196" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
6_19	771853.6	428537.5	54° 48' 18.552" N	17° 53' 16.340" E
6_20	771834.1	428545.6	54° 48' 17.926" N	17° 53' 16.814" E
6_21	771790.9	428665.2	54° 48' 16.589" N	17° 53' 23.550" E
6_22	771787.8	428674.3	54° 48' 16.493" N	17° 53' 24.061" E
6_23	771784.3	428683.2	54° 48' 16.387" N	17° 53' 24.567" E
6_24	771780.6	428692.1	54° 48' 16.271" N	17° 53' 25.067" E
6_25	771776.6	428700.8	54° 48' 16.146" N	17° 53' 25.560" E
6_26	771772.3	428709.4	54° 48' 16.011" N	17° 53' 26.045" E
6_27	771767.7	428717.9	54° 48' 15.867" N	17° 53' 26.522" E
6_28	771762.8	428726.2	54° 48' 15.713" N	17° 53' 26.990" E
6_29	771757.7	428734.3	54° 48' 15.551" N	17° 53' 27.450" E
6_30	771752.3	428742.2	54° 48' 15.380" N	17° 53' 27.900" E
6_31	771753.5	428764.2	54° 48' 15.429" N	17° 53' 29.130" E
6_32	771681.8	428853.1	54° 48' 13.156" N	17° 53' 34.171" E
6_33	771661.8	428854.6	54° 48' 12.508" N	17° 53' 34.275" E
7_1	771498.7	429055.6	54° 48' 7.336" N	17° 53' 45.676" E
7_2	771461.2	429022.6	54° 48' 6.103" N	17° 53' 43.864" E
7_3	771467.7	429014.9	54° 48' 6.310" N	17° 53' 43.424" E
7_4	771513.7	428956.4	54° 48' 7.769" N	17° 53' 40.110" E
7_5	771621.2	428824.6	54° 48' 11.182" N	17° 53' 32.630" E
7_6	771657.9	428859.4	54° 48' 12.385" N	17° 53' 34.545" E
8_1	771328.9	429157.6	54° 48' 1.892" N	17° 53' 51.540" E
8_2	771382.3	429167.0	54° 48' 3.624" N	17° 53' 52.018" E
8_3	771436.6	429141.7	54° 48' 5.371" N	17° 53' 50.551" E
8_4	771479.4	429093.5	54° 48' 6.730" N	17° 53' 47.814" E
8_5	771498.7	429055.6	54° 48' 7.336" N	17° 53' 45.676" E
8_6	771461.2	429022.6	54° 48' 6.103" N	17° 53' 43.864" E
8_7	771460.9	429022.9	54° 48' 6.096" N	17° 53' 43.876" E
8_8	771454.1	429029.9	54° 48' 5.880" N	17° 53' 44.278" E
8_9	771446.6	429036.7	54° 48' 5.640" N	17° 53' 44.664" E
8_10	771439.5	429042.3	54° 48' 5.412" N	17° 53' 44.985" E
8_11	771438.7	429043.0	54° 48' 5.386" N	17° 53' 45.021" E
8_12	771430.3	429048.7	54° 48' 5.119" N	17° 53' 45.348" E
8_13	771421.6	429053.8	54° 48' 4.839" N	17° 53' 45.642" E
8_14	771412.5	429058.3	54° 48' 4.548" N	17° 53' 45.902" E
8_15	771400.4	429063.8	54° 48' 4.158" N	17° 53' 46.222" E
8_16	771305.6	429106.9	54° 48' 1.114" N	17° 53' 48.722" E
9_1	771328.9	429157.6	54° 48' 1.892" N	17° 53' 51.540" E
9_2	771319.0	429155.9	54° 48' 1.573" N	17° 53' 51.452" E
9_3	771296.5	429166.0	54° 48' 0.850" N	17° 53' 52.038" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_4	769610.7	429933.5	54° 47' 6.692" N	17° 54' 36.490" E
9_5	769604.6	429936.2	54° 47' 6.494" N	17° 54' 36.645" E
9_6	769598.3	429938.6	54° 47' 6.293" N	17° 54' 36.789" E
9_7	769592.0	429940.9	54° 47' 6.089" N	17° 54' 36.921" E
9_8	769585.6	429942.9	54° 47' 5.882" N	17° 54' 37.040" E
9_9	769579.1	429944.8	54° 47' 5.674" N	17° 54' 37.148" E
9_10	769572.6	429946.4	54° 47' 5.463" N	17° 54' 37.243" E
9_11	769566.0	429947.7	54° 47' 5.251" N	17° 54' 37.326" E
9_12	769559.3	429948.9	54° 47' 5.037" N	17° 54' 37.396" E
9_13	769552.7	429949.8	54° 47' 4.822" N	17° 54' 37.453" E
9_14	769546.0	429950.5	54° 47' 4.606" N	17° 54' 37.498" E
9_15	769539.3	429951.0	54° 47' 4.389" N	17° 54' 37.530" E
9_16	769532.6	429951.2	54° 47' 4.172" N	17° 54' 37.550" E
9_17	769525.8	429951.2	54° 47' 3.954" N	17° 54' 37.556" E
9_18	769519.1	429951.0	54° 47' 3.737" N	17° 54' 37.550" E
9_19	769512.4	429950.6	54° 47' 3.519" N	17° 54' 37.531" E
9_20	769505.7	429949.9	54° 47' 3.303" N	17° 54' 37.499" E
9_21	769499.1	429949.0	54° 47' 3.087" N	17° 54' 37.455" E
9_22	769492.4	429947.9	54° 47' 2.871" N	17° 54' 37.397" E
9_23	769225.5	429898.2	54° 46' 54.209" N	17° 54' 34.847" E
9_24	769180.0	429889.5	54° 46' 52.733" N	17° 54' 34.401" E
9_25	769179.9	429889.5	54° 46' 52.730" N	17° 54' 34.400" E
9_26	769179.8	429889.4	54° 46' 52.727" N	17° 54' 34.399" E
9_27	769179.7	429889.4	54° 46' 52.724" N	17° 54' 34.398" E
9_28	769179.6	429889.4	54° 46' 52.720" N	17° 54' 34.398" E
9_29	769179.5	429889.4	54° 46' 52.717" N	17° 54' 34.398" E
9_30	769179.4	429889.4	54° 46' 52.714" N	17° 54' 34.398" E
9_31	769179.3	429889.4	54° 46' 52.711" N	17° 54' 34.398" E
9_32	769179.2	429889.4	54° 46' 52.708" N	17° 54' 34.399" E
9_33	769179.1	429889.4	54° 46' 52.704" N	17° 54' 34.399" E
9_34	769179.0	429889.5	54° 46' 52.701" N	17° 54' 34.400" E
9_35	769178.9	429889.5	54° 46' 52.698" N	17° 54' 34.401" E
9_36	769178.8	429889.5	54° 46' 52.695" N	17° 54' 34.402" E
9_37	769178.7	429889.5	54° 46' 52.692" N	17° 54' 34.404" E
9_38	769178.6	429889.5	54° 46' 52.689" N	17° 54' 34.405" E
9_39	769178.5	429889.6	54° 46' 52.686" N	17° 54' 34.407" E
9_40	769178.4	429889.6	54° 46' 52.683" N	17° 54' 34.409" E
9_41	769178.3	429889.6	54° 46' 52.680" N	17° 54' 34.411" E
9_42	769107.6	429917.5	54° 46' 50.406" N	17° 54' 36.030" E
9_43	768975.3	429969.6	54° 46' 46.151" N	17° 54' 39.061" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_44	768828.5	430027.4	54° 46' 41.429" N	17° 54' 42.425" E
9_45	768828.4	430027.4	54° 46' 41.426" N	17° 54' 42.427" E
9_46	768828.3	430027.5	54° 46' 41.423" N	17° 54' 42.430" E
9_47	768828.2	430027.5	54° 46' 41.420" N	17° 54' 42.432" E
9_48	768828.1	430027.5	54° 46' 41.417" N	17° 54' 42.435" E
9_49	768828.0	430027.6	54° 46' 41.414" N	17° 54' 42.438" E
9_50	768827.9	430027.7	54° 46' 41.411" N	17° 54' 42.442" E
9_51	768827.9	430027.7	54° 46' 41.409" N	17° 54' 42.445" E
9_52	768827.8	430027.8	54° 46' 41.406" N	17° 54' 42.449" E
9_53	768827.7	430027.8	54° 46' 41.403" N	17° 54' 42.452" E
9_54	768827.6	430027.9	54° 46' 41.401" N	17° 54' 42.456" E
9_55	768827.5	430028.0	54° 46' 41.398" N	17° 54' 42.460" E
9_56	768827.5	430028.1	54° 46' 41.396" N	17° 54' 42.464" E
9_57	768827.4	430028.1	54° 46' 41.394" N	17° 54' 42.469" E
9_58	768827.3	430028.2	54° 46' 41.391" N	17° 54' 42.473" E
9_59	768827.3	430028.3	54° 46' 41.389" N	17° 54' 42.478" E
9_60	768827.2	430028.4	54° 46' 41.387" N	17° 54' 42.483" E
9_61	768827.1	430028.5	54° 46' 41.385" N	17° 54' 42.487" E
9_62	768827.1	430028.5	54° 46' 41.384" N	17° 54' 42.492" E
9_63	768827.0	430028.6	54° 46' 41.382" N	17° 54' 42.497" E
9_64	768827.0	430028.7	54° 46' 41.380" N	17° 54' 42.503" E
9_65	768826.9	430028.8	54° 46' 41.379" N	17° 54' 42.508" E
9_66	768826.9	430028.9	54° 46' 41.377" N	17° 54' 42.513" E
9_67	768826.8	430029.0	54° 46' 41.376" N	17° 54' 42.519" E
9_68	768826.8	430029.1	54° 46' 41.375" N	17° 54' 42.524" E
9_69	768826.8	430029.2	54° 46' 41.374" N	17° 54' 42.530" E
9_70	768826.7	430029.3	54° 46' 41.373" N	17° 54' 42.535" E
9_71	768826.7	430029.4	54° 46' 41.372" N	17° 54' 42.541" E
9_72	768826.7	430029.5	54° 46' 41.371" N	17° 54' 42.547" E
9_73	768826.7	430029.6	54° 46' 41.371" N	17° 54' 42.552" E
9_74	768826.6	430029.7	54° 46' 41.370" N	17° 54' 42.558" E
9_75	768826.6	430029.8	54° 46' 41.370" N	17° 54' 42.564" E
9_76	768825.7	430037.8	54° 46' 41.345" N	17° 54' 43.010" E
9_77	768818.5	430100.7	54° 46' 41.144" N	17° 54' 46.539" E
9_78	768818.0	430104.4	54° 46' 41.128" N	17° 54' 46.747" E
9_79	768817.3	430108.1	54° 46' 41.109" N	17° 54' 46.954" E
9_80	768816.6	430111.8	54° 46' 41.085" N	17° 54' 47.159" E
9_81	768778.0	430268.5	54° 46' 39.916" N	17° 54' 55.964" E
9_82	768767.6	430311.1	54° 46' 39.602" N	17° 54' 58.358" E
9_83	768738.3	430580.9	54° 46' 38.787" N	17° 55' 13.488" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_84	768679.6	430572.2	54° 46' 36.884" N	17° 55' 13.050" E
9_85	768677.8	430571.8	54° 46' 36.826" N	17° 55' 13.029" E
9_86	768673.0	430570.7	54° 46' 36.670" N	17° 55' 12.973" E
9_87	768633.7	430561.9	54° 46' 35.395" N	17° 55' 12.514" E
9_88	768607.1	430555.9	54° 46' 34.530" N	17° 55' 12.203" E
9_89	768542.9	430539.8	54° 46' 32.444" N	17° 55' 11.354" E
9_90	768541.0	430539.3	54° 46' 32.382" N	17° 55' 11.326" E
9_91	768539.1	430538.8	54° 46' 32.321" N	17° 55' 11.302" E
9_92	768537.2	430538.4	54° 46' 32.258" N	17° 55' 11.281" E
9_93	768535.2	430538.1	54° 46' 32.196" N	17° 55' 11.265" E
9_94	768533.3	430537.8	54° 46' 32.133" N	17° 55' 11.252" E
9_95	768531.3	430537.6	54° 46' 32.070" N	17° 55' 11.242" E
9_96	768529.4	430537.5	54° 46' 32.006" N	17° 55' 11.237" E
9_97	768527.4	430537.4	54° 46' 31.943" N	17° 55' 11.236" E
9_98	768525.5	430537.4	54° 46' 31.880" N	17° 55' 11.238" E
9_99	768523.5	430537.5	54° 46' 31.817" N	17° 55' 11.244" E
9_100	768521.6	430537.7	54° 46' 31.753" N	17° 55' 11.254" E
9_101	768519.6	430537.9	54° 46' 31.691" N	17° 55' 11.268" E
9_102	768517.7	430538.2	54° 46' 31.628" N	17° 55' 11.285" E
9_103	768515.8	430538.5	54° 46' 31.566" N	17° 55' 11.307" E
9_104	768513.8	430538.9	54° 46' 31.504" N	17° 55' 11.332" E
9_105	768512.0	430539.4	54° 46' 31.443" N	17° 55' 11.361" E
9_106	768502.5	430542.1	54° 46' 31.138" N	17° 55' 11.517" E
9_107	768499.7	430542.6	54° 46' 31.049" N	17° 55' 11.550" E
9_108	768496.9	430543.1	54° 46' 30.959" N	17° 55' 11.577" E
9_109	768494.1	430543.4	54° 46' 30.869" N	17° 55' 11.600" E
9_110	768491.3	430543.7	54° 46' 30.778" N	17° 55' 11.616" E
9_111	768488.5	430543.8	54° 46' 30.687" N	17° 55' 11.627" E
9_112	768485.7	430543.9	54° 46' 30.596" N	17° 55' 11.633" E
9_113	768482.9	430543.8	54° 46' 30.505" N	17° 55' 11.634" E
9_114	768480.1	430543.7	54° 46' 30.413" N	17° 55' 11.628" E
9_115	768477.2	430543.5	54° 46' 30.322" N	17° 55' 11.618" E
9_116	768474.4	430543.2	54° 46' 30.232" N	17° 55' 11.602" E
9_117	768471.7	430542.7	54° 46' 30.141" N	17° 55' 11.581" E
9_118	768468.9	430542.2	54° 46' 30.051" N	17° 55' 11.554" E
9_119	768466.1	430541.6	54° 46' 29.962" N	17° 55' 11.522" E
9_120	768463.4	430540.9	54° 46' 29.873" N	17° 55' 11.485" E
9_121	768460.7	430540.1	54° 46' 29.785" N	17° 55' 11.442" E
9_122	768458.0	430539.2	54° 46' 29.698" N	17° 55' 11.394" E
9_123	768393.0	430519.0	54° 46' 27.583" N	17° 55' 10.320" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_124	768391.4	430518.6	54° 46' 27.533" N	17° 55' 10.296" E
9_125	768389.9	430518.2	54° 46' 27.483" N	17° 55' 10.276" E
9_126	768388.3	430517.8	54° 46' 27.432" N	17° 55' 10.258" E
9_127	768386.7	430517.5	54° 46' 27.381" N	17° 55' 10.244" E
9_128	768385.1	430517.3	54° 46' 27.329" N	17° 55' 10.232" E
9_129	768383.6	430517.1	54° 46' 27.278" N	17° 55' 10.224" E
9_130	768338.0	430513.1	54° 46' 25.801" N	17° 55' 10.039" E
9_131	768337.8	430513.1	54° 46' 25.796" N	17° 55' 10.039" E
9_132	768337.7	430513.1	54° 46' 25.791" N	17° 55' 10.039" E
9_133	768337.5	430513.1	54° 46' 25.785" N	17° 55' 10.039" E
9_134	768337.3	430513.1	54° 46' 25.780" N	17° 55' 10.039" E
9_135	768337.2	430513.1	54° 46' 25.774" N	17° 55' 10.040" E
9_136	768337.0	430513.1	54° 46' 25.769" N	17° 55' 10.041" E
9_137	768242.4	430524.3	54° 46' 22.713" N	17° 55' 10.748" E
9_138	768268.7	430697.9	54° 46' 23.652" N	17° 55' 20.439" E
9_139	768302.2	430923.2	54° 46' 24.848" N	17° 55' 33.022" E
9_140	768182.5	430935.6	54° 46' 20.980" N	17° 55' 33.816" E
9_141	768183.2	430938.6	54° 46' 21.004" N	17° 55' 33.984" E
9_142	767968.9	430929.0	54° 46' 14.064" N	17° 55' 33.629" E
9_143	767951.8	430928.4	54° 46' 13.512" N	17° 55' 33.613" E
9_144	767951.0	430908.8	54° 46' 13.477" N	17° 55' 32.516" E
9_145	767951.1	430742.8	54° 46' 13.398" N	17° 55' 23.224" E
9_146	767943.2	430698.0	54° 46' 13.118" N	17° 55' 20.727" E
9_147	767933.2	430648.9	54° 46' 12.772" N	17° 55' 17.989" E
9_148	767917.5	430606.8	54° 46' 12.242" N	17° 55' 15.644" E
9_149	767900.8	430564.5	54° 46' 11.682" N	17° 55' 13.291" E
9_150	767905.0	430561.1	54° 46' 11.815" N	17° 55' 13.096" E
9_151	767898.9	430555.1	54° 46' 11.616" N	17° 55' 12.769" E
9_152	767896.2	430556.5	54° 46' 11.529" N	17° 55' 12.846" E
9_153	767876.9	430519.6	54° 46' 10.885" N	17° 55' 10.797" E
9_154	767872.9	430512.7	54° 46' 10.752" N	17° 55' 10.415" E
9_155	767916.8	430492.9	54° 46' 12.163" N	17° 55' 9.269" E
9_156	768100.0	430493.5	54° 46' 18.092" N	17° 55' 9.148" E
9_157	768070.7	430423.4	54° 46' 17.109" N	17° 55' 5.249" E
9_158	768370.5	430288.2	54° 46' 26.741" N	17° 54' 57.420" E
9_159	768378.7	430284.3	54° 46' 27.005" N	17° 54' 57.196" E
9_160	768413.9	430368.7	54° 46' 28.187" N	17° 55' 1.888" E
9_161	768428.8	430404.3	54° 46' 28.685" N	17° 55' 3.867" E
9_162	768433.7	430415.9	54° 46' 28.849" N	17° 55' 4.514" E
9_163	768434.9	430415.3	54° 46' 28.889" N	17° 55' 4.481" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_164	768711.7	430291.4	54° 46' 37.782" N	17° 54' 57.308" E
9_165	768710.9	430298.2	54° 46' 37.760" N	17° 54' 57.687" E
9_166	768722.6	430300.9	54° 46' 38.140" N	17° 54' 57.828" E
9_167	768728.9	430258.9	54° 46' 38.323" N	17° 54' 55.473" E
9_168	768767.8	430100.9	54° 46' 39.501" N	17° 54' 46.591" E
9_169	768768.0	430100.1	54° 46' 39.507" N	17° 54' 46.550" E
9_170	768768.1	430099.4	54° 46' 39.512" N	17° 54' 46.508" E
9_171	768768.3	430098.6	54° 46' 39.517" N	17° 54' 46.466" E
9_172	768768.4	430097.9	54° 46' 39.521" N	17° 54' 46.424" E
9_173	768768.6	430097.1	54° 46' 39.525" N	17° 54' 46.381" E
9_174	768768.7	430096.4	54° 46' 39.529" N	17° 54' 46.339" E
9_175	768768.8	430095.6	54° 46' 39.532" N	17° 54' 46.297" E
9_176	768768.9	430094.9	54° 46' 39.535" N	17° 54' 46.254" E
9_177	768772.2	430066.9	54° 46' 39.626" N	17° 54' 44.687" E
9_178	768777.8	430016.5	54° 46' 39.784" N	17° 54' 41.862" E
9_179	768777.9	430015.8	54° 46' 39.786" N	17° 54' 41.824" E
9_180	768778.0	430015.2	54° 46' 39.789" N	17° 54' 41.786" E
9_181	768778.1	430014.5	54° 46' 39.792" N	17° 54' 41.748" E
9_182	768778.2	430013.8	54° 46' 39.795" N	17° 54' 41.710" E
9_183	768778.3	430013.1	54° 46' 39.799" N	17° 54' 41.672" E
9_184	768778.5	430012.5	54° 46' 39.803" N	17° 54' 41.635" E
9_185	768778.6	430011.8	54° 46' 39.807" N	17° 54' 41.597" E
9_186	768778.8	430011.1	54° 46' 39.812" N	17° 54' 41.560" E
9_187	768778.9	430010.5	54° 46' 39.817" N	17° 54' 41.522" E
9_188	768779.1	430009.8	54° 46' 39.823" N	17° 54' 41.485" E
9_189	768779.3	430009.2	54° 46' 39.829" N	17° 54' 41.449" E
9_190	768779.5	430008.5	54° 46' 39.835" N	17° 54' 41.412" E
9_191	768779.8	430007.9	54° 46' 39.842" N	17° 54' 41.375" E
9_192	768780.0	430007.2	54° 46' 39.849" N	17° 54' 41.339" E
9_193	768780.2	430006.6	54° 46' 39.857" N	17° 54' 41.303" E
9_194	768780.5	430005.9	54° 46' 39.864" N	17° 54' 41.267" E
9_195	768780.7	430005.3	54° 46' 39.873" N	17° 54' 41.232" E
9_196	768781.0	430004.7	54° 46' 39.881" N	17° 54' 41.196" E
9_197	768781.3	430004.1	54° 46' 39.890" N	17° 54' 41.161" E
9_198	768781.6	430003.4	54° 46' 39.899" N	17° 54' 41.126" E
9_199	768781.9	430002.8	54° 46' 39.909" N	17° 54' 41.092" E
9_200	768782.2	430002.2	54° 46' 39.919" N	17° 54' 41.057" E
9_201	768782.5	430001.6	54° 46' 39.929" N	17° 54' 41.024" E
9_202	768782.9	430001.0	54° 46' 39.940" N	17° 54' 40.990" E
9_203	768783.2	430000.4	54° 46' 39.950" N	17° 54' 40.957" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_204	768783.6	429999.8	54° 46' 39.962" N	17° 54' 40.924" E
9_205	768783.9	429999.3	54° 46' 39.973" N	17° 54' 40.891" E
9_206	768784.3	429998.7	54° 46' 39.985" N	17° 54' 40.859" E
9_207	768784.7	429998.1	54° 46' 39.997" N	17° 54' 40.827" E
9_208	768785.1	429997.6	54° 46' 40.010" N	17° 54' 40.795" E
9_209	768785.5	429997.0	54° 46' 40.023" N	17° 54' 40.764" E
9_210	768785.9	429996.5	54° 46' 40.036" N	17° 54' 40.733" E
9_211	768786.3	429995.9	54° 46' 40.049" N	17° 54' 40.703" E
9_212	768786.8	429995.4	54° 46' 40.063" N	17° 54' 40.673" E
9_213	768787.2	429994.9	54° 46' 40.077" N	17° 54' 40.643" E
9_214	768787.7	429994.4	54° 46' 40.092" N	17° 54' 40.614" E
9_215	768788.1	429993.9	54° 46' 40.106" N	17° 54' 40.585" E
9_216	768788.6	429993.4	54° 46' 40.121" N	17° 54' 40.557" E
9_217	768789.1	429992.9	54° 46' 40.136" N	17° 54' 40.529" E
9_218	768789.6	429992.4	54° 46' 40.152" N	17° 54' 40.502" E
9_219	768790.1	429991.9	54° 46' 40.168" N	17° 54' 40.475" E
9_220	768790.6	429991.5	54° 46' 40.184" N	17° 54' 40.448" E
9_221	768791.1	429991.0	54° 46' 40.200" N	17° 54' 40.422" E
9_222	768791.6	429990.6	54° 46' 40.216" N	17° 54' 40.397" E
9_223	768792.1	429990.1	54° 46' 40.233" N	17° 54' 40.372" E
9_224	768792.6	429989.7	54° 46' 40.250" N	17° 54' 40.348" E
9_225	768793.2	429989.3	54° 46' 40.268" N	17° 54' 40.324" E
9_226	768793.7	429988.9	54° 46' 40.285" N	17° 54' 40.300" E
9_227	768794.3	429988.5	54° 46' 40.303" N	17° 54' 40.277" E
9_228	768794.9	429988.1	54° 46' 40.321" N	17° 54' 40.255" E
9_229	768795.4	429987.7	54° 46' 40.339" N	17° 54' 40.233" E
9_230	768796.0	429987.3	54° 46' 40.357" N	17° 54' 40.212" E
9_231	768796.6	429987.0	54° 46' 40.376" N	17° 54' 40.191" E
9_232	768797.2	429986.6	54° 46' 40.395" N	17° 54' 40.171" E
9_233	768797.8	429986.3	54° 46' 40.414" N	17° 54' 40.151" E
9_234	768798.4	429985.9	54° 46' 40.433" N	17° 54' 40.132" E
9_235	768799.0	429985.6	54° 46' 40.453" N	17° 54' 40.114" E
9_236	768799.6	429985.3	54° 46' 40.472" N	17° 54' 40.096" E
9_237	768800.2	429985.0	54° 46' 40.492" N	17° 54' 40.079" E
9_238	768800.8	429984.7	54° 46' 40.512" N	17° 54' 40.062" E
9_239	768801.4	429984.4	54° 46' 40.532" N	17° 54' 40.046" E
9_240	768802.1	429984.2	54° 46' 40.552" N	17° 54' 40.030" E
9_241	768802.7	429983.9	54° 46' 40.573" N	17° 54' 40.016" E
9_242	768883.2	429952.1	54° 46' 43.162" N	17° 54' 38.165" E
9_243	768956.5	429923.2	54° 46' 45.520" N	17° 54' 36.485" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_244	769089.6	429870.8	54° 46' 49.799" N	17° 54' 33.436" E
9_245	769162.3	429842.3	54° 46' 52.135" N	17° 54' 31.772" E
9_246	769163.0	429842.0	54° 46' 52.158" N	17° 54' 31.757" E
9_247	769163.7	429841.7	54° 46' 52.181" N	17° 54' 31.742" E
9_248	769164.4	429841.5	54° 46' 52.203" N	17° 54' 31.727" E
9_249	769165.1	429841.2	54° 46' 52.227" N	17° 54' 31.714" E
9_250	769165.8	429841.0	54° 46' 52.250" N	17° 54' 31.701" E
9_251	769166.5	429840.8	54° 46' 52.273" N	17° 54' 31.688" E
9_252	769167.3	429840.6	54° 46' 52.297" N	17° 54' 31.677" E
9_253	769168.0	429840.4	54° 46' 52.320" N	17° 54' 31.666" E
9_254	769168.7	429840.3	54° 46' 52.344" N	17° 54' 31.656" E
9_255	769169.5	429840.1	54° 46' 52.368" N	17° 54' 31.646" E
9_256	769170.0	429840.0	54° 46' 52.385" N	17° 54' 31.640" E
9_257	769170.2	429840.0	54° 46' 52.391" N	17° 54' 31.638" E
9_258	769171.0	429839.8	54° 46' 52.415" N	17° 54' 31.630" E
9_259	769171.7	429839.7	54° 46' 52.439" N	17° 54' 31.622" E
9_260	769172.4	429839.6	54° 46' 52.464" N	17° 54' 31.616" E
9_261	769173.2	429839.5	54° 46' 52.488" N	17° 54' 31.610" E
9_262	769173.9	429839.4	54° 46' 52.512" N	17° 54' 31.604" E
9_263	769174.7	429839.4	54° 46' 52.536" N	17° 54' 31.600" E
9_264	769175.4	429839.3	54° 46' 52.560" N	17° 54' 31.596" E
9_265	769176.2	429839.3	54° 46' 52.585" N	17° 54' 31.593" E
9_266	769176.9	429839.2	54° 46' 52.609" N	17° 54' 31.591" E
9_267	769177.7	429839.2	54° 46' 52.633" N	17° 54' 31.589" E
9_268	769178.5	429839.2	54° 46' 52.658" N	17° 54' 31.588" E
9_269	769179.2	429839.2	54° 46' 52.682" N	17° 54' 31.588" E
9_270	769180.0	429839.3	54° 46' 52.707" N	17° 54' 31.589" E
9_271	769180.7	429839.3	54° 46' 52.731" N	17° 54' 31.590" E
9_272	769181.5	429839.3	54° 46' 52.755" N	17° 54' 31.592" E
9_273	769182.2	429839.4	54° 46' 52.780" N	17° 54' 31.595" E
9_274	769183.0	429839.5	54° 46' 52.804" N	17° 54' 31.598" E
9_275	769183.7	429839.6	54° 46' 52.828" N	17° 54' 31.603" E
9_276	769188.8	429840.5	54° 46' 52.994" N	17° 54' 31.651" E
9_277	769233.1	429848.7	54° 46' 54.429" N	17° 54' 32.074" E
9_278	769501.7	429898.8	54° 47' 3.147" N	17° 54' 34.640" E
9_279	769511.7	429900.3	54° 47' 3.470" N	17° 54' 34.716" E
9_280	769521.7	429901.1	54° 47' 3.794" N	17° 54' 34.753" E
9_281	769531.7	429901.2	54° 47' 4.120" N	17° 54' 34.753" E
9_282	769541.8	429900.7	54° 47' 4.444" N	17° 54' 34.714" E
9_283	769551.7	429899.5	54° 47' 4.766" N	17° 54' 34.637" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETTIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
9_284	769561.6	429897.6	54° 47' 5.085" N	17° 54' 34.523" E
9_285	769571.3	429895.0	54° 47' 5.398" N	17° 54' 34.371" E
9_286	769580.9	429891.8	54° 47' 5.705" N	17° 54' 34.182" E
9_287	769590.1	429888.0	54° 47' 6.003" N	17° 54' 33.958" E
9_288	771305.6	429106.9	54° 48' 1.114" N	17° 53' 48.722" E
CONSTRUCTION AREA OF THE ONSHORE SUBSTATION				
1	768237.21	430493.16	54° 46' 22.531" N	17° 55' 09.008" E
2	768268.86	430705.54	54° 46' 23.661" N	17° 55' 20.868" E
3	768128.65	430726.45	54° 46' 19.134" N	17° 55' 22.159" E
4	768095.68	430668.62	54° 46' 18.039" N	17° 55' 18.951" E
5	768094.37	430659.82	54° 46' 17.992" N	17° 55' 18.460" E
6	768086.44	430661.01	54° 46' 17.736" N	17° 55' 18.532" E
7	768080.94	430624.06	54° 46' 17.539" N	17° 55' 16.469" E
8	768088.92	430622.88	54° 46' 17.797" N	17° 55' 16.396" E
9	768072.59	430512.78	54° 46' 17.214" N	17° 55' 10.248" E
10	768079.79	430510.36	54° 46' 17.446" N	17° 55' 10.107" E
11	768088.87	430506.15	54° 46' 17.737" N	17° 55' 09.864" E
12	768134.99	430499.28	54° 46' 19.226" N	17° 55' 09.439" E
13	768138.41	430499.06	54° 46' 19.337" N	17° 55' 09.424" E
14	768138.37	430494.72	54° 46' 19.333" N	17° 55' 09.181" E
15	768138.97	430494.69	54° 46' 19.353" N	17° 55' 09.179" E
16	768143.79	430494.62	54° 46' 19.509" N	17° 55' 09.171" E
17	768144.96	430494.61	54° 46' 19.546" N	17° 55' 09.169" E
18	768145.01	430498.67	54° 46' 19.550" N	17° 55' 09.397" E
CONSTRUCTION AREA OF THE FIBRE-OPTIC CABLE TO THE CHOCZEWO SUBSTATION				
1	768337.22	430328.65	54° 46' 25.684" N	17° 54' 59.715" E
2	768306.47	430341.31	54° 46' 24.696" N	17° 55' 00.450" E
3	768308.50	430346.15	54° 46' 24.764" N	17° 55' 00.719" E
4	768175.98	430401.76	54° 46' 20.504" N	17° 55' 03.946" E
5	768043.21	430083.84	54° 46' 16.049" N	17° 54' 46.268" E
6	768027.07	430090.59	54° 46' 15.530" N	17° 54' 46.659" E
7	768021.52	430077.32	54° 46' 15.344" N	17° 54' 45.922" E
8	767985.32	430092.38	54° 46' 14.180" N	17° 54' 46.796" E
9	768332.76	430316.28	54° 46' 25.534" N	17° 54' 59.026" E
10	768332.04	430314.58	54° 46' 25.510" N	17° 54' 58.932" E
11	768300.76	430327.66	54° 46' 24.504" N	17° 54' 59.691" E
12	768173.40	430023.09	54° 46' 20.231" N	17° 54' 42.754" E
13	768148.72	429963.81	54° 46' 19.402" N	17° 54' 39.459" E
14	768017.25	430018.21	54° 46' 15.176" N	17° 54' 42.617" E
15	768011.89	430004.87	54° 46' 14.996" N	17° 54' 41.875" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
16	767937.40	430037.06	54° 46' 12.602" N	17° 54' 43.741" E
17	767945.61	430056.09	54° 46' 12.877" N	17° 54' 44.799" E
18	767949.54	430054.50	54° 46' 13.003" N	17° 54' 44.707" E
CONSTRUCTION AREA OF THE SOUTHERN ACCESS ROAD				
1_1	766670.8	430855.1	54° 45' 32.026" N	17° 55' 30.609" E
1_2	766666.4	430856.1	54° 45' 31.884" N	17° 55' 30.671" E
1_3	766685.4	430835.3	54° 45' 32.491" N	17° 55' 29.490" E
1_4	766686.6	430837.3	54° 45' 32.530" N	17° 55' 29.599" E
1_5	767330.7	430873.9	54° 45' 53.388" N	17° 55' 31.095" E
1_6	767784.3	430903.5	54° 46' 8.081" N	17° 55' 32.362" E
1_7	767924.1	430908.5	54° 46' 12.605" N	17° 55' 32.524" E
1_8	767936.1	430909.2	54° 46' 12.994" N	17° 55' 32.551" E
1_9	767936.1	430908.3	54° 46' 12.994" N	17° 55' 32.502" E
1_10	767937.8	430908.3	54° 46' 13.049" N	17° 55' 32.499" E
1_11	767951.0	430908.8	54° 46' 13.477" N	17° 55' 32.516" E
1_12	767951.8	430928.4	54° 46' 13.512" N	17° 55' 33.613" E
1_13	767951.8	430928.4	54° 46' 13.512" N	17° 55' 33.615" E
1_14	767936.9	430932.9	54° 46' 13.034" N	17° 55' 33.877" E
1_15	767922.9	430928.6	54° 46' 12.577" N	17° 55' 33.648" E
1_16	767758.1	430921.5	54° 46' 7.240" N	17° 55' 33.393" E
1_17	767307.5	430897.6	54° 45' 52.650" N	17° 55' 32.442" E
1_18	767076.6	430885.6	54° 45' 45.171" N	17° 55' 31.966" E
CONSTRUCTION AREA OF THE WESTERN ACCESS ROAD				
2_1	768370.5	430288.2	54° 46' 26.741" N	17° 54' 57.420" E
2_2	768341.0	430218.1	54° 46' 25.751" N	17° 54' 53.524" E
2_3	768342.6	430217.3	54° 46' 25.804" N	17° 54' 53.480" E
2_4	768090.7	429614.4	54° 46' 17.348" N	17° 54' 19.953" E
2_5	767964.5	429320.6	54° 46' 13.118" N	17° 54' 3.618" E
2_6	767964.3	429320.5	54° 46' 13.110" N	17° 54' 3.618" E
2_7	767961.0	429320.5	54° 46' 13.002" N	17° 54' 3.618" E
2_8	767968.8	429303.1	54° 46' 13.249" N	17° 54' 2.637" E
2_9	767969.4	429304.6	54° 46' 13.268" N	17° 54' 2.724" E
2_10	767969.5	429304.4	54° 46' 13.272" N	17° 54' 2.708" E
2_11	767978.3	429325.3	54° 46' 13.565" N	17° 54' 3.873" E
2_12	767998.1	429372.7	54° 46' 14.229" N	17° 54' 6.507" E
2_13	768018.1	429420.6	54° 46' 14.900" N	17° 54' 9.169" E
2_14	768024.0	429434.7	54° 46' 15.099" N	17° 54' 9.954" E
2_15	768062.4	429526.9	54° 46' 16.390" N	17° 54' 15.079" E
2_16	768078.0	429564.1	54° 46' 16.912" N	17° 54' 17.151" E
2_17	768101.0	429619.2	54° 46' 17.684" N	17° 54' 20.210" E

POINT NO.	COORDINATE SYSTEM			
	TWO-DIMENSIONAL CARTESIAN PL-1992 [M]		GEODETIC GRS80H [DD°MM'SS.SSS"]	
	X	Y	Φ	Λ
2_18	768139.5	429711.4	54° 46' 18.976" N	17° 54' 25.337" E
2_19	768162.4	429766.2	54° 46' 19.745" N	17° 54' 28.387" E
2_20	768178.0	429803.6	54° 46' 20.269" N	17° 54' 30.466" E
2_21	768216.5	429895.8	54° 46' 21.561" N	17° 54' 35.594" E
2_22	768255.0	429988.0	54° 46' 22.853" N	17° 54' 40.722" E
2_23	768293.5	430080.3	54° 46' 24.146" N	17° 54' 45.850" E
2_24	768332.0	430172.5	54° 46' 25.438" N	17° 54' 50.979" E
2_25	768349.4	430214.0	54° 46' 26.020" N	17° 54' 53.286" E
2_26	768370.5	430264.7	54° 46' 26.731" N	17° 54' 56.107" E
2_27	768378.7	430284.3	54° 46' 27.005" N	17° 54' 57.196" E

Table 3.3. List of the cadastral plots in which the proposed project, the EXC BC-Wind OWF, is to be implemented [source: internal materials]

NO.	COMMUNE NAME	CADASTRAL DISTRICT NAME	PLOT ID	PLOT NUMBER
1	Choczewo	Lublewo	221504_2.0012.104	104
2	Choczewo	Lublewo	221504_2.0012.105/1	105/1
3	Choczewo	Lublewo	221504_2.0012.105/2	105/2
4	Choczewo	Lublewo	221504_2.0012.105/4	105/4
5	Choczewo	Lublewo	221504_2.0012.105/5	105/5
6	Choczewo	Lublewo	221504_2.0012.105/6	105/6
7	Choczewo	Lublewo	221504_2.0012.107/2	107/2
8	Choczewo	Lublewo	221504_2.0012.110/1	110/1
9	Choczewo	Kierzkowo	221504_2.0016.17/135	17/135
10	Choczewo	Kierzkowo	221504_2.0016.17/136	17/136
11	Choczewo	Kierzkowo	221504_2.0016.17/71	17/71
12	Choczewo	Kierzkowo	221504_2.0016.19	19
13	Choczewo	Kierzkowo	221504_2.0016.21	21
14	Choczewo	Kierzkowo	221504_2.0016.25/5	25/5
15	Choczewo	Kierzkowo	221504_2.0016.288/2	288/2
16	Choczewo	Kierzkowo	221504_2.0016.290	290
17	Choczewo	Kierzkowo	221504_2.0016.3/6	3/6
18	Choczewo	Kierzkowo	221504_2.0016.3/7	3/7
19	Choczewo	Kierzkowo	221504_2.0016.303/3	303/3
20	Choczewo	Kierzkowo	221504_2.0016.309	309
21	Choczewo	Kierzkowo	221504_2.0016.310	310
22	Choczewo	Kierzkowo	221504_2.0016.311	311
23	Choczewo	Kierzkowo	221504_2.0016.312	312
24	Choczewo	Kierzkowo	221504_2.0016.318	318
25	Choczewo	Kierzkowo	221504_2.0016.319	319
26	Choczewo	Kierzkowo	221504_2.0016.320	320
27	Choczewo	Kierzkowo	221504_2.0016.321	321
28	Choczewo	Kierzkowo	221504_2.0016.328	328
29	Choczewo	Kierzkowo	221504_2.0016.329	329
30	Choczewo	Kierzkowo	221504_2.0016.337	337
31	Choczewo	Kierzkowo	221504_2.0016.338	338
32	Choczewo	Kierzkowo	221504_2.0016.348	348
33	Choczewo	Kierzkowo	221504_2.0016.349	349
34	Choczewo	Kierzkowo	221504_2.0016.350	350
35	Choczewo	Kierzkowo	221504_2.0016.375	375

Table 3.4. List of the cadastral plots within the range of the EXC BC-Wind OWF project potential impact [source: internal materials]

NO.	COMMUNE NAME	CADASTRAL DISTRICT NAME	PLOT ID	PLOT NUMBER
1	Choczewo	Kierzkowo	221504_2.0016.17/75	17/75
2	Choczewo	Kierzkowo	221504_2.0016.17/71	17/71
3	Choczewo	Kierzkowo	221504_2.0016.17/74	17/74
4	Choczewo	Kierzkowo	221504_2.0016.17/95	17/95
5	Choczewo	Kierzkowo	221504_2.0016.33/73	33/73
6	Choczewo	Lubiatowo	221504_2.0013.81/1	81/1
7	Choczewo	Lublewo	221504_2.0012.100/52	100/52
8	Choczewo	Lublewo	221504_2.0012.101	101
9	Choczewo	Lublewo	221504_2.0012.102/3	102/3
10	Choczewo	Lublewo	221504_2.0012.102/4	102/4
11	Choczewo	Lublewo	221504_2.0012.102/5	102/5
12	Choczewo	Lublewo	221504_2.0012.103	103
13	Choczewo	Lublewo	221504_2.0012.104	104
14	Choczewo	Lublewo	221504_2.0012.105/1	105/1
15	Choczewo	Lublewo	221504_2.0012.105/2	105/2
16	Choczewo	Lublewo	221504_2.0012.105/4	105/4
17	Choczewo	Lublewo	221504_2.0012.105/5	105/5
18	Choczewo	Lublewo	221504_2.0012.105/6	105/6
19	Choczewo	Lublewo	221504_2.0012.107/2	107/2
20	Choczewo	Lublewo	221504_2.0012.109	109
21	Choczewo	Lublewo	221504_2.0012.110/1	110/1
22	Choczewo	Lublewo	221504_2.0012.111/2	111/2
23	Choczewo	Lublewo	221504_2.0012.111/26	111/26
24	Choczewo	Lublewo	221504_2.0012.111/27	111/27
25	Choczewo	Lublewo	221504_2.0012.111/28	111/28
26	Choczewo	Lublewo	221504_2.0012.111/29	111/29
27	Choczewo	Lublewo	221504_2.0012.111/3	111/3
28	Choczewo	Lublewo	221504_2.0012.111/30	111/30
29	Choczewo	Lublewo	221504_2.0012.111/33	111/33
30	Choczewo	Lublewo	221504_2.0012.111/34	111/34
31	Choczewo	Lublewo	221504_2.0012.111/35	111/35
32	Choczewo	Lublewo	221504_2.0012.111/4	111/4
33	Choczewo	Lublewo	221504_2.0012.111/40	111/40
34	Choczewo	Lublewo	221504_2.0012.111/5	111/5
35	Choczewo	Lublewo	221504_2.0012.111/6	111/6
36	Choczewo	Lublewo	221504_2.0012.111/7	111/7
37	Choczewo	Lublewo	221504_2.0012.111/8	111/8
38	Choczewo	Lublewo	221504_2.0012.94	94
39	Choczewo	Lublewo	221504_2.0012.99	99
40	Choczewo	Lublewo	221504_2.0012.100/52	100/52
41	Choczewo	Lublewo	221504_2.0012.101	101
42	Choczewo	Lublewo	221504_2.0012.102/3	102/3

NO.	COMMUNE NAME	CADASTRAL DISTRICT NAME	PLOT ID	PLOT NUMBER
43	Choczewo	Lublewo	221504_2.0012.102/4	102/4
44	Choczewo	Lublewo	221504_2.0012.102/5	102/5
45	Choczewo	Lublewo	221504_2.0012.103	103
46	Choczewo	Lubiatowo	221504_2.0013.27	27
47	Choczewo	Kierzkowo	221504_2.0016.16/2	16/2
48	Choczewo	Kierzkowo	221504_2.0016.17/113	17/113
49	Choczewo	Kierzkowo	221504_2.0016.17/114	17/114
50	Choczewo	Kierzkowo	221504_2.0016.17/115	17/115
51	Choczewo	Kierzkowo	221504_2.0016.17/116	17/116
52	Choczewo	Kierzkowo	221504_2.0016.17/117	17/117
53	Choczewo	Kierzkowo	221504_2.0016.17/118	17/118
54	Choczewo	Kierzkowo	221504_2.0016.17/119	17/119
55	Choczewo	Kierzkowo	221504_2.0016.17/120	17/120
56	Choczewo	Kierzkowo	221504_2.0016.17/128	17/128
57	Choczewo	Kierzkowo	221504_2.0016.17/130	17/130
58	Choczewo	Kierzkowo	221504_2.0016.17/131	17/131
59	Choczewo	Kierzkowo	221504_2.0016.17/132	17/132
60	Choczewo	Kierzkowo	221504_2.0016.17/133	17/133
61	Choczewo	Kierzkowo	221504_2.0016.17/134	17/134
62	Choczewo	Kierzkowo	221504_2.0016.17/135	17/135
63	Choczewo	Kierzkowo	221504_2.0016.17/136	17/136
64	Choczewo	Kierzkowo	221504_2.0016.18	18
65	Choczewo	Kierzkowo	221504_2.0016.188/5	188/5
66	Choczewo	Kierzkowo	221504_2.0016.189/3	189/3/
67	Choczewo	Kierzkowo	221504_2.0016.19	19
68	Choczewo	Kierzkowo	221504_2.0016.21	21
69	Choczewo	Kierzkowo	221504_2.0016.24	24
70	Choczewo	Kierzkowo	221504_2.0016.288/1	288/1
71	Choczewo	Kierzkowo	221504_2.0016.288/2	288/2
72	Choczewo	Kierzkowo	221504_2.0016.29	29
73	Choczewo	Kierzkowo	221504_2.0016.290	290
74	Choczewo	Kierzkowo	221504_2.0016.282	282
75	Choczewo	Kierzkowo	221504_2.0016.292	292
76	Choczewo	Kierzkowo	221504_2.0016.294	294
77	Choczewo	Kierzkowo	221504_2.0016.301	301
78	Choczewo	Kierzkowo	221504_2.0016.303/2	303/2
79	Choczewo	Kierzkowo	221504_2.0016.303/3	303/3
81	Choczewo	Kierzkowo	221504_2.0016.302/1	302/1
82	Choczewo	Kierzkowo	221504_2.0016.302/2	302/2
83	Choczewo	Kierzkowo	221504_2.0016.303/1	303/1
84	Choczewo	Kierzkowo	221504_2.0016.308	308
85	Choczewo	Kierzkowo	221504_2.0016.309	309
86	Choczewo	Kierzkowo	221504_2.0016.310	310
87	Choczewo	Kierzkowo	221504_2.0016.311	311

NO.	COMMUNE NAME	CADASTRAL DISTRICT NAME	PLOT ID	PLOT NUMBER
88	Choczewo	Kierzkowo	221504_2.0016.312	312
89	Choczewo	Kierzkowo	221504_2.0016.313	313
90	Choczewo	Kierzkowo	221504_2.0016.317	317
91	Choczewo	Kierzkowo	221504_2.0016.318	318
92	Choczewo	Kierzkowo	221504_2.0016.319	319
93	Choczewo	Kierzkowo	221504_2.0016.320	320
94	Choczewo	Kierzkowo	221504_2.0016.321	321
95	Choczewo	Kierzkowo	221504_2.0016.322	322
96	Choczewo	Kierzkowo	221504_2.0016.323	323
97	Choczewo	Kierzkowo	221504_2.0016.327	327
98	Choczewo	Kierzkowo	221504_2.0016.328	328
99	Choczewo	Kierzkowo	221504_2.0016.329	329
100	Choczewo	Kierzkowo	221504_2.0016.330	330
101	Choczewo	Kierzkowo	221504_2.0016.331	331
102	Choczewo	Kierzkowo	221504_2.0016.332/2	332/2
103	Choczewo	Kierzkowo	221504_2.0016.333	333
104	Choczewo	Kierzkowo	221504_2.0016.339	339
105	Choczewo	Kierzkowo	221504_2.0016.336	336
106	Choczewo	Kierzkowo	221504_2.0016.337	337
107	Choczewo	Kierzkowo	221504_2.0016.338	338
108	Choczewo	Kierzkowo	221504_2.0016.340	340
109	Choczewo	Kierzkowo	221504_2.0016.341	341
110	Choczewo	Kierzkowo	221504_2.0016.343	343
111	Choczewo	Kierzkowo	221504_2.0016.345	345
112	Choczewo	Kierzkowo	221504_2.0016.347	347
113	Choczewo	Kierzkowo	221504_2.0016.348	348
114	Choczewo	Kierzkowo	221504_2.0016.349	349
115	Choczewo	Kierzkowo	221504_2.0016.350	350
116	Choczewo	Kierzkowo	221504_2.0016.351	351
117	Choczewo	Kierzkowo	221504_2.0016.352	352
118	Choczewo	Kierzkowo	221504_2.0016.354	354
119	Choczewo	Kierzkowo	221504_2.0016.375	375
120	Choczewo	Kierzkowo	221504_2.0016.25/2	25/2
121	Choczewo	Kierzkowo	221504_2.0016.25/4	25/4
122	Choczewo	Kierzkowo	221504_2.0016.25/5	25/5
123	Choczewo	Kierzkowo	221504_2.0016.3/6	3/6
124	Choczewo	Kierzkowo	221504_2.0016.25/6	25/6
125	Choczewo	Kierzkowo	221504_2.0016.3/7	3/7

The surface area of the EXC BC-Wind OWF development area in the offshore area is 74.30 km² (including: 34.70 km² in the exclusive economic zone, 39.55 km² in the territorial sea and 0.05 km² in the internal sea waters), while in the onshore area – 0.674 km² (including: 0.638 km² of the cable route construction area, and 0.036 km² of the ONS construction area). The surface area of the construction site of the access road to the ONS will be 0.0097 km².

The area of the construction works will be limited to the necessary minimum within the development area boundaries. It is planned that in the offshore area, for each of a maximum of 2 cable lines, the construction belt will be up to 25 m wide, thus, the largest actual seabed surface area covered by the construction works (for all 2 cable lines) will be up to 1.65 km², representing up to approx. 2.22% of the project area.

Within the onshore area, the width of the technical belt for the entire multi-circuit cable line will differ depending on the location and construction technology of its individual sections [Table 3.9]. The actual surface area of the site covered by the construction work will be approximately 0.137 km². The areas located above the HDD drilling sites, with a total surface area of 0.036 km², will not be subject to any surface alteration.

Within the onshore construction area, a site with a surface area of approx. 1.6 ha will be designated, at which horizontal directional drilling will be conducted. A construction site and a storage site for machinery and materials necessary for the drillings will be organised within that area. The subsea cables landed will be connected to the onshore cables in transition joint bays. After the construction site is closed down, a small area around the transition joint bays will be fenced off to ensure their protection. The fenced-off area around the transition joint bays will have a maximum of 750 m².

For the purposes of the planned project implementation, the permanent and temporary technical belts have been delimited. As presented in Table 3.5, in the permanent technical belt, the ground surface layer will be permanently destroyed. It is estimated that the area permanently occupied by the proposed project will be up to 14.5 ha. In the temporary technical belt used for the purposes of the construction works conducted, felling of trees and shrubs will be carried out only if necessary.

Table 3.5. Characteristics of the permanent and temporary technical belts of the EXC BC-Wind OWF [source: internal materials]

Technical belt	Width [m]	Characteristics
Permanent	22 m – Varied depending on the cable line location and construction technology (more details in Table 3.9)	Area directly connected to the construction works, covers the places, in which the surface layer of the ground and groundcover will be destroyed, and the trees and shrubs will be removed. The removal of trees and shrubs will be permanent. Along the sections with HDD boreholes, there will be no alteration to the ground surface.
Temporary	Up to 70 m – Varied depending on the cable line location and construction technology (more details in Table 3.9)	Constitutes the so-called “auxiliary belt,” in which environmental impact is possible during the construction phase, due to construction works, storage sites for excavated soil, vehicle parking areas and access roads.

For the purposes of this report, for the EXC BC-Wind OWF route, a working chainage of the project route was adopted, measured from KP 00.0 at the northernmost point in the offshore area, KP 33.3 at the level of the coastline, KP 40.7 for the Onshore Substation.

3.1.3 Stages of the project implementation

The Applicant allows for the implementation of the project in a continuous process as well as in stages, with a view to:

- mitigate the risk of failure to meet the time frames indicated in the Act of 21 March 1991 *on maritime areas of the Republic of Poland and maritime administration* (consolidated text: Journal of Laws of 2023, item 960) to uphold Decisions no. 5/K/21 and 6/K/21 of the Minister of Infrastructure of 27 October 2021 and Decision no. 3/K/2022 of 16 January 2023 and Decision no. 6/21 and 7/21 of the Director of the Maritime Office in Gdynia of 30 November 2021;
- economically optimise the entire project;

- enable the comprehensive contracting of the necessary services and supplies;
- consider limitations in the access to essential services and supplies (including: power cables, specialist vessels, port infrastructure and other components in the supply chain) related to the possible simultaneous implementation of similar investment plans in the sector of wind-generated electricity transmission by other entities.

3.2 Description of technological solutions for individual elements of the project

The following sections describe the commonly used technological and technical solutions for transmitting electricity from the OWF to onshore power grids which are planned to be used in the implementation of this project.

3.2.1 Description of the production process

The planned EXC BC-Wind OWF will enable the transmission of electricity generated by the BC-Wind OWF to the NPS. The electric power transmission will be carried out via a double-circuit alternating current EHV power cable line with a nominal voltage of 220 kV or 275 kV. The 220 kV or 275 kV EHV power line cables will connect the OSS with the Onshore Substation (ONS), which, in turn, will be connected to the PSE S.A. substation using a 400 kV underground power cable line. The demand for raw materials and energy, as in the case of other power installations, will be related to the construction process of individual EXC BC-Wind OWF components. The operation of the transmission infrastructure will not require providing energy from the combustion of fuels and the use of other raw materials for its proper functioning. It is anticipated that during normal operation, the consumption of fuels and other raw materials will result only from the necessity to conduct inspections or possible repairs, which, in the case of the offshore part of the EXC BC-Wind OWF, will be carried out at least once every 5 years, and for the onshore part – on *ad hoc* basis, in the event of suspected cable damage. After the termination of the EXC BC-Wind OWF operation, the Project Owner allows for two scenarios: 1) leaving the export cables buried in the seabed or ground or 2) partial or complete retrieval of the export cables from the seabed or ground as well as their removal from the environment.

3.2.2 Cable lines within the offshore area

Electricity will be exported from the BC-Wind OWF using a maximum of 2 EHV AC subsea cables with an operating voltage of 220 kV or 275 kV. Three-core power cables with a circular cross-section will be used including a necessary telecommunication infrastructure, which will enable communication with the BC-Wind OWF infrastructure. Precise technical parameters of the subsea cables will be specified at a later stage of the project implementation.

As part of the BC-Wind OWF construction (project covered by the decision on environmental conditions issued on 16 September 2022), an Offshore Transformer Station will be erected within the BC-Wind OWF Area, from which a cable line will be routed, which will consist of two, three-core power cables. Along the route of the offshore export cable line, it is planned to install cables at a distance of no more than 500 m. To protect the cables from mechanical damage, burial in the seabed up to a depth of 4 m is planned. The exceptions may be the areas of the seabed characterised by dense sediment structure or covered by numerous boulders, which would make it impossible to reach the planned depth. In such a situation, the cables will be additionally covered with a suitable protective measure (concrete mattresses, slabs, stones, etc.).

The technologies of cable route construction commonly applied within the offshore area, which are planned to be applied in this project, are described below.

It should be underlined that before the commencement of the construction of the two-circuit cable line, a Geological-Engineering Documentation will be prepared on the basis of the results of

geotechnical surveys conducted in accordance with the approved Geological Works Plan the preparation of which is necessary pursuant to the Act of 9 June 2011 – *Geological and Mining Law* (Journal of Laws of 2011, No. 163, item 981, as amended). The Geological-Engineering Documentation will provide a basis for specifying the more detailed construction solutions.

Table 3.6 contains a compilation of the technical assumptions behind the cable line construction within the offshore area, for which the environmental impacts are to be specified.

Table 3.6. Technical assumptions behind the construction of the EXC BC-Wind OWF within the offshore area [source: internal materials]

Technical assumptions behind the construction of cable lines within the offshore area	Value/description
Power cable type	Extra high voltage (EHV) alternating current power cables with an operating voltage of 220 kV or 275 kV in XLPE insulation (cross-linked polyethylene) including the necessary telecommunication infrastructure. The maximum temperature of the phase conductor will be up to 90°C.
Cable line routing	Cable line routes are presented in Figure 3.6. Along the route of the offshore export cable line, it is planned to install cables at a distance of no more than 500 m. To bypass the near-shore dynamic zone, the cable landfall will be constructed using a trenchless method. The underground cables will converge towards one another up to the depth of approx. 20 m in the location of cable landfall.
Maximum number of cable lines	2
Cable line construction technology	The cables will be installed using one of the following methods: SLB (simultaneous lay and burial), PLB (post lay burial), PLT (pre-lay trenching) or mass flow excavation. In case it is impossible to bury the cable in the seabed, it is acceptable to lay its sections on the seabed with the cable appropriately protected using, for example, concrete mattresses or rip-raps. It is recommended that the cable laying should be carried out in accordance with applicable standards and the manufacturer's recommendations as well as under ongoing supervision
Maximum depth of cable burial in the seabed sediment	4 m
Volume of sediment disturbed during the cable-laying works	A maximum of 20 m ³ of sediment per 1 cable running metre with an assumed trench depth of 4 m and a maximum slope gradient of 43 degrees.
Maximum width of the seabed strip covered by the construction works of a single cable line	25 m
Date of cable line construction works	The Applicant's intention is to conduct construction works in any period of the year selected.
Cable line construction rate	It is assumed that a single cable installation rate will be a minimum of 1 km per day. The installation rate will depend on the type of substratum, installation method applied, installation depth, weather conditions and others.
Types of vessels involved in the construction of cable lines	For example: Cable-Laying Vessel (CLV), Offshore Service Vessel (OSV), cable barge or barge towboat.
Size of vessels involved in the construction of cable lines	The largest vessels that can be involved in the construction works are Cable-Laying Vessels (CLV) with a length of up to 180 m. Cable barges and OSVs do not exceed the length of 100 m, whereas the barge towboats do not exceed the length of approximately 50 m.
Export cable landfalls	Trenchless method, e.g. horizontal directional drilling (HDD or HDD Intersect). Drillings will be made from land or from both sides (land and sea). The exits of drillings will be located beyond the dynamic zone of the nearshore waters.

3.2.2.1 Subsea power cables

A typical subsea EHV power cable consists of three one-core cables, appropriately insulated and screened, armed with steel wires and synthetic materials, covered with a durable plastic sheath. There is a fibre optic bundle inside the cable, which enables the measurements of the cable temperature and the communication with the wind farm ICT infrastructure. The insulation material most commonly used in EHV (up to 500 kV) current-transmitting power cables is the cross-linked polyethylene (XLPE), which is characterised by very high operating temperature of the phase conductor reaching up to 90°C. An example of a three-core EHV cable design is illustrated in Figure 3.3.

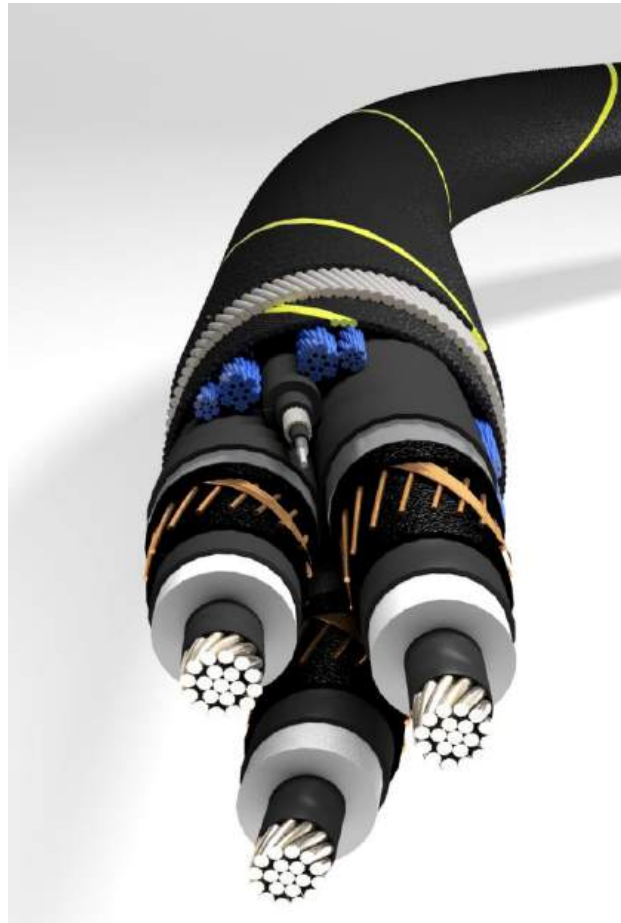


Figure 3.3. Example of an extra high voltage subsea power cable construction [Source: JDR CABLE SYSTEMS LTD]

3.2.2.2 Technologies of cable line laying within the offshore area

A power cable can be buried in the seabed using the following technologies:

- SLB – simultaneous laying and burial of the cable in the seabed sediment;
- PLB – post-lay burial of the cable;
- PLT – pre-lay trenching;
- MFE – mass flow excavation.

In the case of the SLB technology, usually only a single vessel is used for cable laying – a cable-laying vessel (CLV). A device (most commonly a cable plough) dragged by the vessel buries the cable in the seabed without the necessity to first prepare an excavation and then bury the cable in it. The cable-laying rate depends mainly on the weather conditions and the characteristics of the seabed. It is approx. 1 km to maximally 9 km per day. The drawback of the SLB technology is that an appropriately

long period of favourable weather conditions must occur, which would allow constructing the entire cable line without interruptions which are not recommended in the case of this technology.

The PLB technology requires using at least two vessels for cable laying. One of them is a cable-laying vessel or a towed cable barge which lays the cable on the seabed. The second one is most commonly a service vessel or other multi-purpose vessel equipped with a device for burying the cable, laid previously on the seabed, in the seabed sediment. Although the PLB method does not usually allow constructing the cable line as quickly as in the case of the SLB method, its advantage is the possibility to divide the cable line construction process, which is useful in the case of short-term periods with favourable weather conditions.

In the case of PLT, the first vessel constructs a cable trench in which the subsea cable is laid by the next vessel.

In addition, other vessels, which do not participate directly in the process related to power cable laying, such as: patrol vessels, service operation vessels (SOV), walk-to-work vessels (W2W) and flotels, where people involved in the construction phase may be accommodated, may participate in maritime operations.

3.2.2.3 Devices used for cable line laying within the offshore areas

The selection of the cable line construction technology, resulting from the seabed type, determines the types of devices that are used for cable laying on the seabed. In the case of the SLB technology, the most commonly used device is a cable plough, which allows simultaneous cable laying and burying in the seabed sediment [Figure 3.4]. The plough with the cable placed in the guide is deployed from the cable laying vessel to the seabed. The vessel sails away to a predetermined distance uncoiling the cable at the same time. The vessel is anchored or remains in a set position, which is maintained using the vessel dynamic positioning (DP) system, and the plough tow-line recovery begins. The towed plough buries the cable in the seabed sediment at a predetermined depth. After the plough approaches the vessel at a particular distance, the operation of swimming away to another position and line recovery is repeated. At the end of the planned cable-laying section, the cable is released from the guide and the plough is recovered back onto the vessel deck. Plough cable-laying is the most common method of export cable laying, due to the cost-effectiveness of this method (single operating vessel, relatively short time of cable laying) and the possibility of applying it in a wide variety of seabed sediment types – from sands to loose tills. Some ploughs are equipped with additional accessories designed to loosen the structure of the substratum, and thus, facilitate the cable-laying process.



Figure 3.4. Example of a subsea cable plough [source: royalihc.com]

Other devices often used in the construction of subsea cable lines are the vehicles travelling on the seabed, equipped with accessories that enable injecting seawater under pressure into the sediment to a desired depth, i.e. water jetting. These vehicles can be divided into devices with simpler structure equipped with skids which move passively when pulled by a vessel or the ones used more often and with more advanced structures – self-propelled crawler vehicles controlled by an operator from aboard a vessel (ROV jet trencher) [Figure 3.5].



Figure 3.5. Examples of plough (1, 2) and crawler (3, 4) vehicles used for the construction as part of the water jetting and mechanical trenching technologies [Source: eta-ltd.com, ctoffshore.dgweb.dk, pharosoffshoregroup.com]

Use of cable line laying equipment in the offshore area depending on the type of sediment:

- The water injected into the sediment under pressure results in a short-term fluidisation of the cohesive sediments, such as fine-grain sands and tills. The cable laying on the surface of the fluidised sediment sinks into it under its own weight and becomes automatically buried. As a result, the devices are most often used for burying the cable laid on the seabed, and not for constructing a trench in which the cable is to be laid later on.
- Constructing a trench in soft sediments beforehand is done very rarely using high-capacity submersible water pumps (MFE, mass flow excavators). Such pumps are deployed from a vessel deck onto the seabed and after activation eject a stream of seawater under pressure towards it, which flushes away the seabed sediment to the depth of several meters along the vessel movement route. The use of MFE devices causes the stirring and lifting of large amounts of the seabed sediment into the water depth, which leads to a temporary, high water turbidity and sediment re-sedimentation over a large seabed area.
- If the seabed is composed of compact tills or rocks, the self-propelled devices equipped with, for example, wheels or cutting chains are used for constructing cable trenches (e.g. ROV mechanical trencher). This device is used most often for constructing trenches before laying the cable, less often during its laying, due to a high risk of cable damage.

Some devices are equipped with complementary systems that take advantage of both of the technologies described above.

All the devices described above can be applied as part of the SLB and PLB technologies, however, in the case of the SLB technology, cable ploughs are used most commonly, and in the case of the PLB technology, the self-propelled, remotely controlled vehicles operating as part of the water jetting or mechanical trenching technologies are applied.

The selection of the appropriate cable line construction technology and devices depends mainly on the:

- technical parameters of the cable laid;
- complexity of the cable line route;
- type and depth of the seabed;
- cable burial depth;
- natural or man-made obstacles located along the cable line route;
- availability of vessels appropriate for the construction of a cable line;
- other logistic conditions;
- economic conditions.

In the case of the proposed project, at the current stage of the work progress, it is impossible to precisely indicate the technologies and devices that will be used in the EXC BC-Wind OWF construction phase within the offshore area. Hence, it has been assumed that the construction works in the offshore area can be carried out using any of the technologies described above, and the environmental impacts were assessed in the context of the application of the technology which is the most unfavourable for the environment, i.e. the PLB technology, and the use of self-propelled remotely controlled devices operating in the water jetting and mechanical trenching technologies.

At the current stage of the project progress, the Applicant cannot exclude that some sections of cable lines will not be buried but laid on the seabed instead. This will result, for example, from the unfavourable environmental conditions that will preclude the cable from being buried. In such a case, the cable section will be laid on the seabed and secured against damage or destruction using protective measures standard in such situations:

- concrete mattresses;
- sandbags;

- rip-rap;
- PVC pipe sheaths;
- concrete protective structures.

3.2.2.4 Spatial scope of the cable line construction within the offshore area

Figure 3.6 shows the spatial scope of the EXC BC-Wind OWF development area in its offshore part, the boundaries of which are defined by the coordinates provided in Table 3.7.

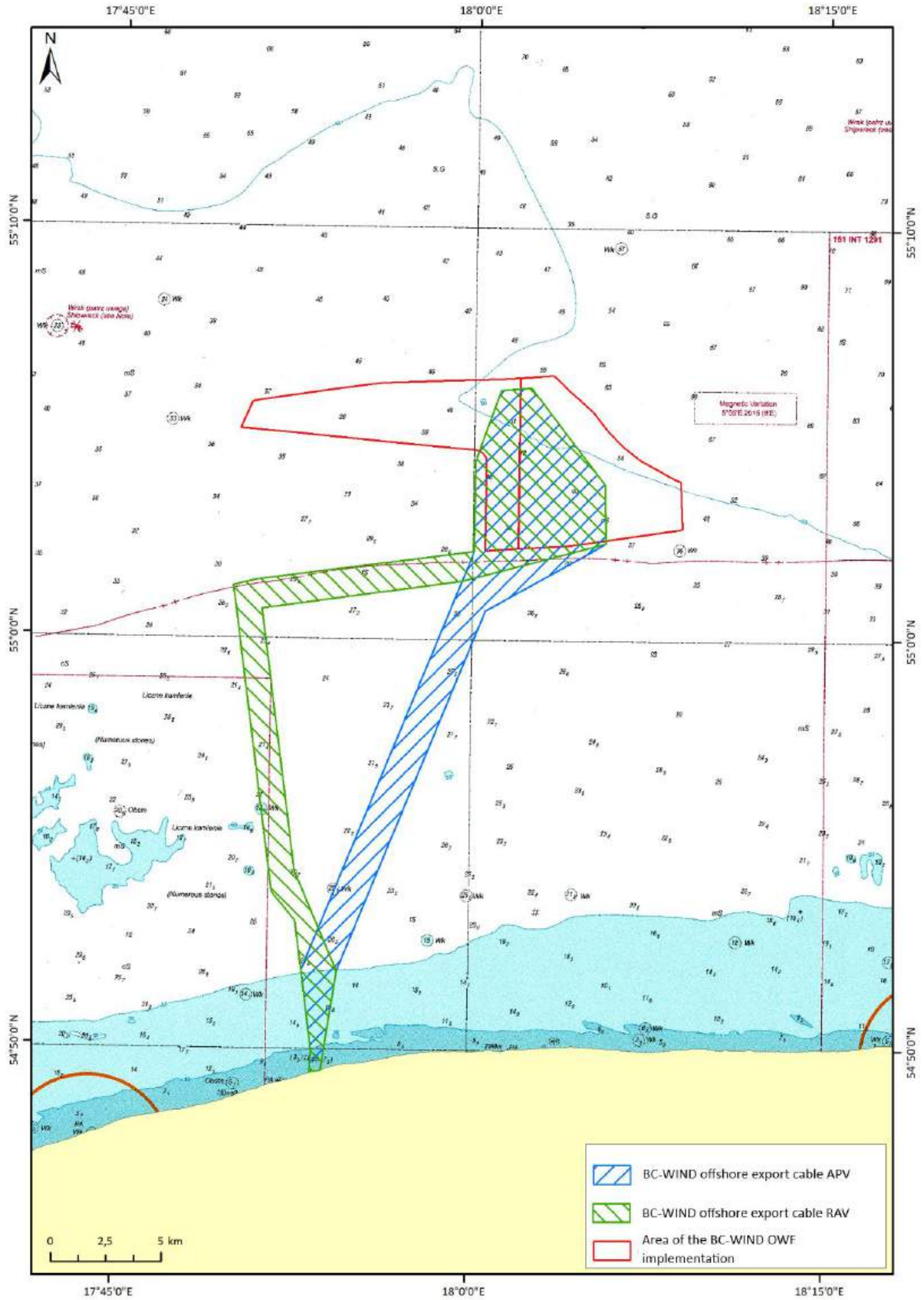


Figure 3.6. Spatial scope of the EXC BC-Wind OWF cable line construction in the APV and RAV in the offshore part [source: internal materials]

Table 3.7. Geographical coordinates of the EXC BC-Wind OWF development area boundaries in the offshore part [source: internal materials]

Point no.	Coordinate system			
	two-dimensional Cartesian PL-1992 [m]		geodetic GRS80H [DD°MM'SS.SSS"]	
	X	Y	φ	λ
Offshore area				
1	804602.85	437358.97	55° 6' 2.448" N	18° 1' 4.733" E
2	804686.74	438720.48	55° 6' 5.775" N	18° 2' 21.495" E
3	800299.66	442043.9	55° 3' 45.264" N	18° 5' 32.252" E
4	797630.21	442084.47	55° 2' 18.907" N	18° 5' 36.491" E
5	797224.71	441349.36	55° 2' 5.476" N	18° 4' 55.374" E
6	794614.65	436617.82	55° 0' 38.934" N	18° 0' 30.907" E
7	778347.15	429864.01	54° 51' 49.332" N	17° 54' 24.972" E
8	774176.85	429169.98	54° 49' 34.047" N	17° 53' 49.723" E
9	773854.3	429116.27	54° 49' 23.583" N	17° 53' 46.997" E
10	773799.99	428794.73	54° 49' 21.662" N	17° 53' 29.027" E
11	773788.17	428719.59	54° 49' 21.241" N	17° 53' 24.827" E
12	773784.66	428697.3	54° 49' 21.116" N	17° 53' 23.581" E
13	773778.95	428669.84	54° 49' 20.917" N	17° 53' 22.047" E
14	773768.38	428618.92	54° 49' 20.549" N	17° 53' 19.203" E
15	774784.92	428701.01	54° 49' 53.482" N	17° 53' 22.901" E
16	778389.38	428257.4	54° 51' 49.878" N	17° 52' 54.813" E
17	797086.83	436020.06	55° 1' 58.648" N	17° 59' 55.259" E
18	797312.72	436113.85	55° 2' 6.000" N	18° 0' 0.360" E
19	800172.47	436154.75	55° 3' 38.548" N	18° 0' 0.360" E
20	801402.14	436172.33	55° 4' 18.343" N	18° 0' 0.359" E

3.2.2.5 Rate of the cable laying within the offshore area

It is assumed that a single cable installation rate will be a minimum of 1 km per day. The installation rate will depend on the type of substratum, installation method applied, installation depth, weather conditions and others.

3.2.3 Cable line landfalls

3.2.3.1 Connection of power cables in the coastal zone

The connection of three-core subsea cables with one-core land cable and the fibre optic cable will be executed inside cable joints located in transition joint bays. The connection of the offshore section with the onshore section of the cable line will be executed in a manner that ensures proper working conditions for the cables and cable accessories.

Transition joint bays are rectangular structures with a side length of up to a few metres, located at a depth of approximately 2 m [Figure 3.7].



Figure 3.7. Examples of transition joint bays [source: dunmain.com.au, sl-engineers.asia.com]

The use of transition joint bays is the result of the necessity to adjust the subsea cable construction parameters to the conditions onshore. Subsea cables are characterised by more robust armour due to more demanding environmental conditions and higher damage risk. The transition joint bays will be designed in such a way as to ensure safe access to the devices inside them.

3.2.3.2 Technologies of cable line laying within the coastal area

Cable landfalls will be constructed using a trenchless HDD method described in detail in Subsection 3.2.4.2.

3.2.3.3 Spatial scope of the cable line construction in the coastal zone

Each of a maximum of two offshore cable lines will be landed in a separate drilling made from the land side or from the land and sea side. Boreholes on land will be located at a distance of approximately 300 m from the shoreline and at a distance of approximately 20 m from one another. Each of the two boreholes will have a maximum length of 1.7 km. Additionally, the Project Owner is considering the possibility of constructing one back-up borehole. The cable landfalls in the offshore area will be located outside the nearshore zone at a depth from 8 to 12 m measured from the water table to the seabed. The distance between the borehole outlets in the seabed will be approximately 50 m. The maximum depth of the borehole will be 50 MBSB/MBGL. The drilling trajectory accounts for the need to protect the dune system and the environment of the nearshore dynamic zone (sandbanks zone). The routing of cables below the seabed in the sandbanks zone will protect them against the negative impact of intensive hydrodynamic processes of this zone, which could result in the exposure of the cables buried in the seabed sediment and their damage. The detailed drilling parameters will be known after the planned geotechnical surveys have been conducted. After the boreholes are made and secured, the subsea cables will be landed and connected to the onshore cable lines and optical fibres in transition joint bays.

Figure 3.8 presents the location of the EXC BC-Wind OWF horizontal drilling exits in the offshore and onshore areas.

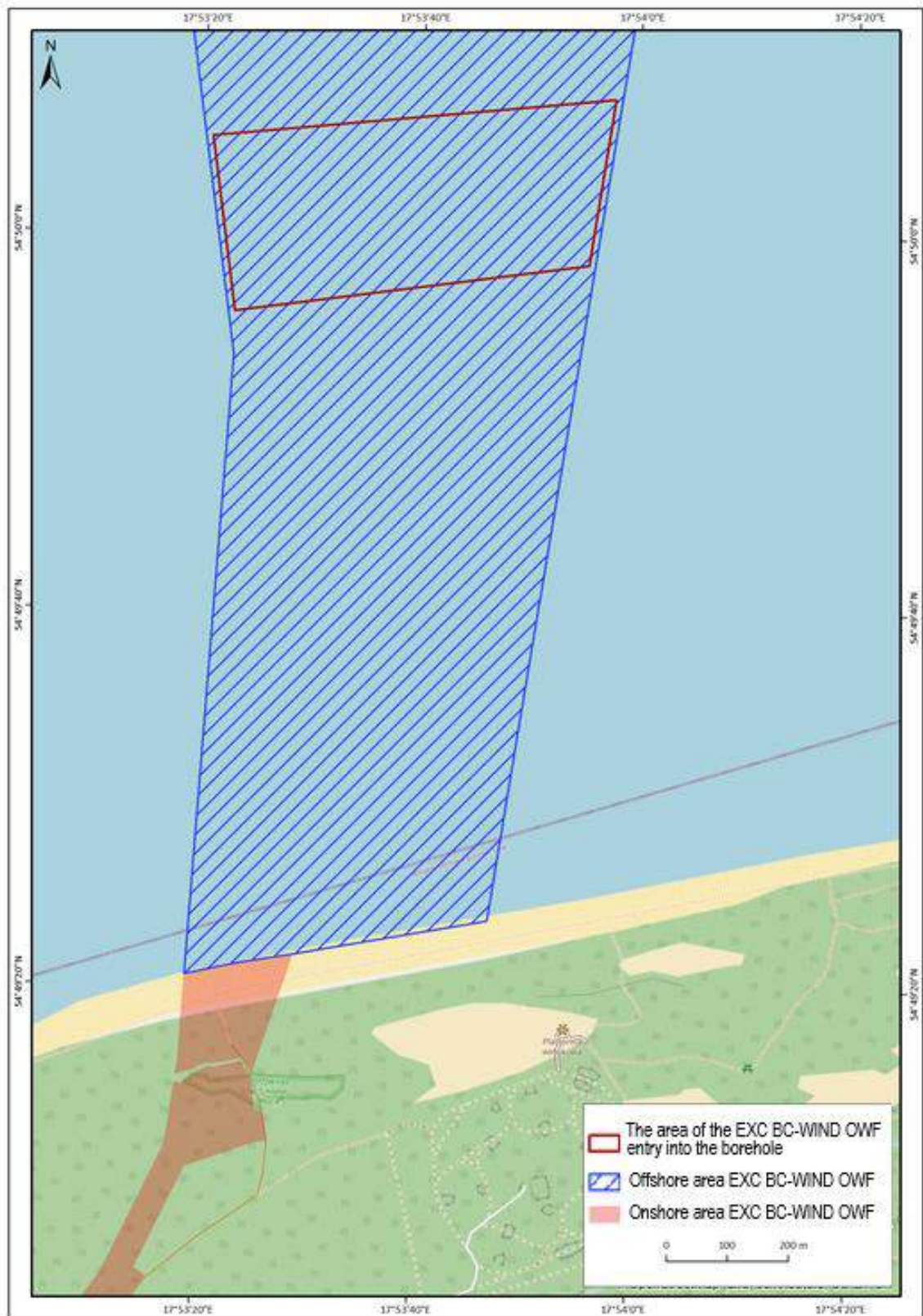


Figure 3.8. Location of the area of the EXC BC-Wind OWF cable entry into the borehole in the coastal part [source: internal materials]

3.2.4 Cable lines in the onshore area

3.2.4.1 Underground power cables

In the onshore part, electric power will be transferred via underground single-core alternating current (AC) cables with an operating voltage of 220 kV or 275 kV. Cables will be insulated with a cross-linked polyethylene (XLPE). Precise technical parameters of the subsea cables will be specified at a later stage of the project implementation. Table 3.8 presents the EXC BC-WIND OWF technical assumptions within the onshore area.

Table 3.8. Technical assumptions behind the construction of the EXC BC-Wind OWF in the onshore area from the cable landfall to the ONS [source: internal materials]

Technical assumptions behind the construction of cable lines within the onshore area	Value/description
Power cable type	EHV alternating current power cables with an operating voltage of 220 kV or 275 kV in XLPE insulation (cross-linked polyethylene). The maximum temperature of the phase conductor will be up to 90°C. Fibre optic cables are to be used for communication.
Number and route of cable lines	2 single cable lines, consisting of 3 single-core cables each, in a flat or trefoil formation.
Maximum number of cable lines constructed concurrently	2
Cable laying technique	Cables will be inserted into the cable trough located in a trench directly from a cable drum. Within the naturally valuable areas that are difficult to cross with an open pit, and also due to the presence of watercourses and other natural obstacles, trenchless construction forms are planned such as horizontal directional drills or molings.
Depth of the trenches	approx. 2 m
Maximum depth of HDD boreholes	50 m
Width of the trenches	approx. 5 m
Technical belt width	Varied depending on the cable line location and construction technology (more details in Table 3.7)
Start date of the cable line construction	The Project Owner's intention is to conduct construction works without limitation to a specific period of the year
Cable line construction rate	It is assumed that the time required to excavate the trench, insert the cable into the trench, execute the cable joints connecting the sections, prepare the bentonite, cover with plastic sheeting, arrange the concrete slabs and marking bands and backfill a trench with a length of approximately 1.0 km will be approximately 2–4 weeks.
Type of equipment used in the construction phase	Construction vehicles and machinery, lifts, cranes, hoists, specialised machinery for cable/conductor tensioning (cable trailer vehicle, cable winches, cable rollers, cable guides, cable grips/terminators, pulling heads, rotary connectors), drilling, moling, pumping, wellpoints, personnel transport vehicles
Insertion of power cables into the ONS	The power cables at the ONS will be routed to the overhead support structures and terminated with overhead heads.

3.2.4.2 Technologies of underground cable line laying

There are four methods for laying EHV underground cable lines available [Figure 3.9], which are described below.

3.2.4.2.1 Cable lines laid in the ground

The cables are laid in a trench in a wavy line on a layer of compacted bedding material with a minimum thickness of 0.2 m. The minimum horizontal distance between the ducts will be established on the basis of calculations concerning the mutual thermal interaction between the lines. After laying, cables are covered with a filling layer with a minimum height of 0.2 m above the level of the upper surface of the power cable placed the highest in the line route trench. Bentonite, which is a mix of sand and cement, is used as the bedding material. The structure of the filling material and the bedding material cannot cause the cable sheath damage. Protection covers are placed on the filling layer over the cable line. A signalling cable tape is placed over the cable. The remaining part of the trench is filled with virgin soil cleared of debris and stones, which must be compacted to prevent soil sinking.

3.2.4.2.2 Cable lines laid in pipes

Pipes act as an element reinforcing the section of the cable being run, reducing the possibility of mechanical damage and protecting the insulation of the cable. They are most commonly used in the locations of cable line crossings with other objects, such as roads, rail tracks, other underground infrastructure elements, buildings, etc. Pipes can be erected using the open-pit, hydraulic moling or horizontal directional drilling (HDD) methods. Smoothwall casing pipes made of high-density plastic with a diametral stiffness of the pipe appropriate to the location are used for the construction of the cable pipes. A single cable is laid in a single pipe. When pulling the cable in, care should be taken not to drag the virgin soil and contaminations inside the pipe together with the cable. It is acceptable to fill the pipes with a material of appropriate resistivity and thermal conductivity, e.g. bentonite. It is acceptable to leave one auxiliary pipe in the pipes for each section of the cable line track.

3.2.4.2.3 Cable lines laid in cable ducts

This technology is mainly used in the areas of power substations. The sizes of cable ducts are selected individually for specific cable lines, taking into consideration the possibility of heat dissipation. Cables belonging to a single line circuit are laid in a single cable duct. Laying a greater number of cables is permissible provided that there is no interaction between the individual current circuits. Cables are fastened using dedicated brackets to ensure their longitudinal movement under the influence of the temperature changes. Cable ducts have natural ventilation which ensures appropriate cable cooling conditions. A cable duct located above the groundwater level should have an absorbent bottom, whereas, a duct located below the groundwater level or in the area with unfavourable soil conditions (impermeable soils) should be equipped with a drainage system. Cables laid in ducts should have a flame-retardant sheath.

3.2.4.2.4 Cable lines laid in cable trough/culvert

The requirements concerning the sizes of cable troughs and culverts, their structure, cable laying and fixing methods, specification of the forced cooling conditions and the accessibility for personnel carrying out maintenance services, are determined individually for each cable line solution. Cable culverts should be equipped with precipitation and groundwater drainage systems, and the cable inlets and outlets should have systemic protections, for example, against water as well as natural ventilation ensuring appropriate cable cooling conditions, in accordance with the assumptions adopted for the calculations of the long-term line current-carrying capacity.

Regardless of the selected cable line laying technology including the installation of the cable accessories, it should be compliant with the recommendations of the cable and accessories manufacturer and should be done under their supervision.



Figure 3.9. Methods of laying underground cable lines: cable lines in the ground (1), cable lines in pipes (2), cable lines in a cable duct (3), cable culvert (4) [source: dreamstime.com, dunmain.com.au, e-cigre.org, nationalgrid.com]

If a cable line and an optical fibre intersect with the existing underground infrastructure, it is a common practice to route the cable line below the underground facility or to conduct a reconstruction of the existing infrastructure. Where technically reasonable (e.g. in cases of deeply buried waterworks, sewage systems), it is acceptable to locate the cable line above the object intersected.

As part of the proposed project, the 220 kV or 275 kV power cables, including a fibre optic line, will be laid in 2 cable circuits, 3 one-core cables per circuit.

In practice, two variants of underground cable line arrangement are used:

- trefoil formation;
- flat formation.

As part of the proposed project, it is envisaged to arrange the cables in a flat formation, which is characterised by more favourable conditions of heat dissipation to the soil, which enables the use of smaller cables with the same amount of current transmitted compared to the trefoil formation. As part of the planned project implementation, there will be a total of two export cable lines, each consisting of three single-core power cables. Cable lines will be laid in parallel, mainly using the open-trench technology, at a depth of approximately 1.4 m, and, if conditions require, a horizontal directional drilling will be performed (upon agreement with competent authorities). Due to the differences in topography, the depth of cable burial may exceed 2 m in some locations, while in the case of boreholes, their depth will not exceed 50 m.

The width of the cable corridor (permanent technical belt) in which permanent deforestation will take place will vary depending on the cable line construction location and technology [Table 3.9]. Along the sections, in which cables will be routed using trenchless methods, there will be no need for the removal of phanerophytes.

Cables will be delivered to the construction site on drums, in sections up to approximately 1.5 km long. Cable drums [Figure 3.10] will be delivered to the laying location on cable trailers.



Figure 3.10. Examples of 220 kV cable drums (1), vehicles with a cable trailer (2), EHV cable winching operation (3), example of a cable winch (4) [source: okorder.com, lancier-cable.de, rampionoffshore.com, watucab.pl]

Cables will be laid in the cable trough located in the trench directly from the drum placed at one of the ends of the line section, and will be pulled on cable rolls placed along the entire length of the cable section being laid. The trenches will have a length of approximately 1.5 km. The cable installation time along this section will be approximately 2–4 weeks. It is possible to construct a few sections concurrently. Rolls and guides are to prevent the cable from friction against the drum discs and the ground. The cables will be pulled mechanically using a cable winch located at the end of the line route [Figure 3.10]; the line of the winch will be connected to the end of the cable laid using a rotary connector (swivel) and pulling head or a cable grip mounted at the cable end. Moreover, it is acceptable to use additional motorised rolls that facilitate cable pulling. After the planned cable section is laid, both its ends will be secured against moisture. Individual cable sections with a length of up to 1.5 km will be linked together inside cable joints [Figure 3.11].

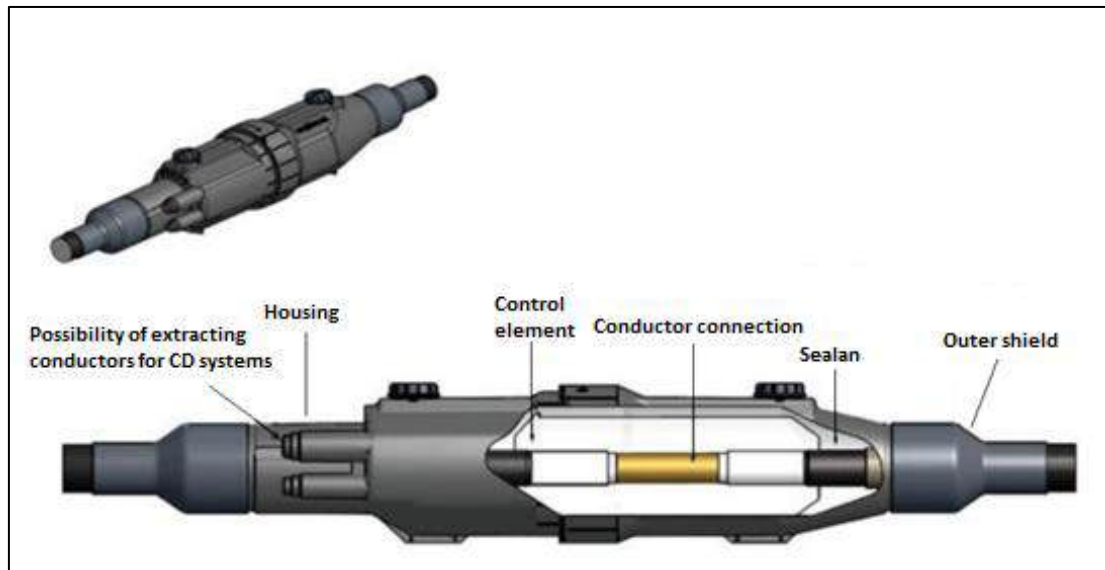


Figure 3.11. Example of a cable joint cross-section [source: Technical standard for the conditions of construction of HV power cable lines including cables and accessories, TAURON, 2018]

Cable laying will be done in a way preventing their excessive bending. The cable will be inserted in such a way as to prevent its coating or sheath from rubbing against the trough openings and the dirt from the outside being dragged inside the pipe. If decreasing the force of friction of the cable against the internal pipe surface becomes necessary, a lubricating material should be inserted inside the trough, which has no adverse impact on the cable coating or sheath. In accordance with the relevant literature, it is recommended to use paraffin oil as the lubricating material for cables with polyethylene coatings or sheaths or other special substances.

It will be allowed to use bentonite (liquid substance) in pipes and drillings. Bentonite will be delivered to the construction site in the form of a dry mixture and after fluidisation with water, pumped into the pipes with the cable inserted beforehand. Bentonite (a mixture of sand and cement), which stabilises the thermal resistance in the immediate vicinity of cables laid in troughs and constitutes an additional mechanical protection will be used in locations with protective slabs and cable foils (in open trenches). Afterwards, protection covers will be placed on the upper layer of bentonite. Perforated foil or plastic mesh will be placed above the covers. The remaining part of the trench will be backfilled with virgin soil [Figure 3.12].

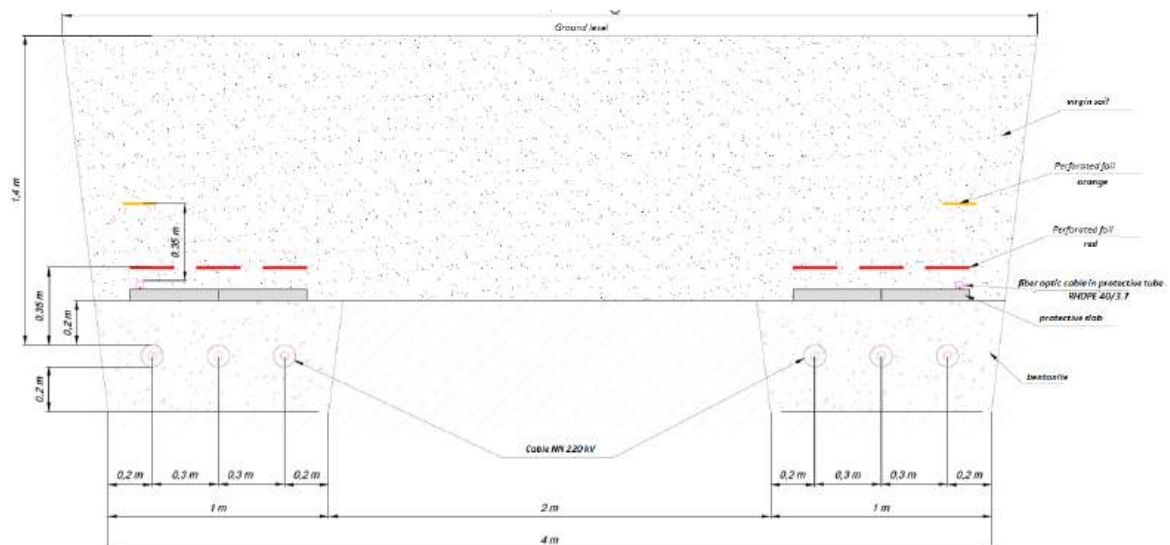


Figure 3.12. Arrangement of cables in a trench [source: internal materials]

3.2.4.2.4.1 Trenchless methods

Within the naturally valuable areas that are difficult to cross with an open pit, and also due to the presence of watercourses and other natural obstacles, trenchless construction forms, such as horizontal directional drilling or molings (jacking) are planned. In the remaining area, mainly an open trench is to be constructed, and, if conditions require, a horizontal directional drilling will be performed (upon agreement with competent authorities).

3.2.4.2.4.2 Horizontal Directional Drilling (HDD or HDD Intersect)

Horizontal Directional Drilling (HDD) is a trenchless method for the construction of underground utilities that involves directional drilling along a defined trajectory using drilling mud and a drill pipe. This is a multi-stage method that uses a closed loop drilling mud circuit. The objective of the project is the installation of a gas pipeline or a bundle of pipelines inside a borehole. The abbreviation HDD is used commonly for the Horizontal Directional Drilling method.

The curved HDD trajectory enables routing the cable line under field obstacles over long distances using a trenchless method. The specifics of the technique make it possible to start drilling from ground level, so that it is not necessary to prepare deep start shafts (or pits) as is the case when using moling techniques (microtunneling or Direct Pipe). In the HDD technology, a separate borehole (borehole with defined geometry) will be drilled for each cable trough.

The main stages of drilling include:

- 1) pilot drilling;
- 2) borehole reaming to the technologically required diameter;
- 3) borehole calibration;
- 4) installation of a PEHD casing pipe inside the borehole;
- 5) pulling the power cables inside the casing pipe.

Pilot drilling involves the construction of a borehole along the trajectory (designed curve) assumed by the Design Engineer. Before drilling, the feasibility of the borehole route is analysed and verified in the context of the actual geological conditions, the logistic and technical possibilities and the chosen method of operation. The execution of a correct trajectory is crucial for the carrying out of directional drilling procedure. At the mobilisation stage, all the necessary elements of the drilling system, including the HDD drill rig, drilling mud pump, drilling mud preparation, conditioning and treatment system, are installed at site. Guided trajectories are made possible through the use of a professional navigation system. The use of GST gyroscope, ParaTrack magnetic or ParaTrack-Gyro hybrid systems is acceptable.

In case the magnetic or hybrid navigation system (Paratrack 2 or Paratrack Gyro) is used in the borehole, it is recommended to arrange a measuring loop from the entry point to the seashore line. The measuring loop is a cable stretched between posts driven into the ground. The width of the loop depends on the current depth. One side of the loop is stretched over the axis of the drilled borehole. The loop is temporary and will be removed once the pilot drilling is completed.

The change in the drilling direction is possible thanks to the orientation of the drill pipe bottom set, which has a curved connector (bend sub) that allows drilling along a curve. With the advance in drilling, further sections of drill pipe (mud circuit) are added at the side of the drilling rig. The drilling process is possible thanks to the drilling mud pumped into the drill bit (drill rig) through the drilling mud pipes. The drilling mud is a bentonite suspension created on a freshwater basis. The drilling mud has several technologically critical functions, including: hydraulic enhancement of the formation excavation process and transport of excavated material (drill cuttings) in the annular space of the borehole to the ground surface. The solid phase generated during the drilling process

undergoes separation in mechanical devices for the drilling mud treatment. The drilling mud circulates in a closed loop circuit.

The objective of the second stage of work is to ream the pilot hole to the required target diameter. Reaming is performed in one, two or a maximum of three steps. The number of reaming marches depends on the parameters of the geological formation, type of the tools used and the parameters of the drilling system: pull/push force, torque, and drilling mud flow rate. The final diameter of the borehole is 30 to 50% larger than the envelope diameter of the casing pipes to be installed. The tool used for pilot drilling is replaced with a set of reamers and centralizers. Throughout the reaming process, the drill pipe remains inside the borehole, drilling mud is pumped into the tool through the drill pipe and the excavated material is transported through the annular space from the bottom of the hole to the surface. The drilling mud has the same functions as during the pilot drilling phase: hydraulic excavation of the borehole bottom, tool cooling and friction reduction, maintaining the solid phase in suspension, hydraulic transport to the surface, and keeping the borehole wall integrated. Drill pipe right-side rotation is applicable during drilling operations.

The third stage of the drilling process is the calibration of the reamed borehole. During this phase of work, a calibrator with a diameter close to that of the borehole drilled is pulled through the borehole with rotation. The loads recorded enable confirming the borehole readiness for conducting an effective installation. At that stage, the borehole is filled with a drilling slurry (a mixture of the drilling mud with residuals of the solid phase from the drilling process).

The fourth stage of the process involves the installation of a pipeline or pipe bundle inside a stable borehole. The prepared pipeline is connected with the drill pipe using a set consisting of a reamer and a swivel. Swivel is a special tool that prevents the transfer of rotation from the drill pipe to the pipeline being installed. The swivel load capacity should exceed the expected installation loads. During installation, the drill pipe is removed from the borehole and is replaced by the pipeline prepared. To reduce the installation forces, the pipeline will be ballasted with a fluid (e.g. seawater).

3.2.4.2.4.3 Direct Pipe Method (DP)

The Direct Pipe Method is a hybrid technique that involves drilling of the borehole along a defined trajectory with simultaneous installation of a steel pipeline. This is a single-stage method that uses a closed loop drilling mud circuit. The pipeline is installed between the shallow entry pit and the ground surface or seabed.

In this technique, the soil excavation is done using a standard micro-tunnel head. The trajectory of the tunnel drilled is controlled using a navigation system that uses a gyroscope. The drilling mud is supplied to the bottom of the borehole (mixing chamber) using pipelines laid inside the jacked steel pipe. Similarly, the excavated material is discharged through parallel drilling mud manifolds. The drilling mud is circulated in a closed loop. The drilling slurry is subject to phase separation in mechanical drilling mud separation systems located at the ground surface. A control cabin is located on the ground surface and in the shallow launch pit, a jacking station is mounted which is responsible for overcoming the resistance of the jacking operation and for transmitting axial forces through the pipeline to the microtunnel head.

The steel pipeline installed is prepared beforehand – welded in one or several sections at the machinery side and tested according to the industry requirements. The tunnel work ends in a shallow reception pit. The accessories inside the jacked pipeline are removed and the pipeline is handed over for further operation. The insertion of cable lines into the pipeline is done after the completion of drilling operations, using the previously prepared pits (launch and reception, e.g. steel sheet pile), which after the work is finished are removed and the area is brought back to the original condition.

3.2.4.2.4.4 Horizontal moling

Horizontal moling can be divided into pneumatic and hydraulic moling. Pneumatic moling involves driving pipes into the ground using a pneumatic punch. The pneumatic punch is positioned in the initial trench. When the diameters of the pipes driven are larger and therefore when heavy-duty punchers are used, the positioning of a puncher is often supported using pneumatic cushions. The impact force is translated to the pipes driven via special intermediate rings, also called reduction cones. Individual pipe sections are joined by welding. After the pipes are driven into the ground along the entire section length, the separated soil core that is inside them is removed using compressed air, pressurised water, auger drill or other methods.

The hydraulic moling technique involves pressing of steel casing pipes into the ground using hydraulic actuators. Such pipes may be left in the soil as the so-called “lost pipes”, inside which the conduit pipes in the form of regular pipes are inserted, as used in the traditional trenching methods. The recovery of casing pipes enables the application of a more advanced method, in which after the hydraulic moling of steel casing pipes, the hydraulic moling of conduit pipes takes place. The casing pipes are then pushed out to the target trench.

3.2.4.2.4.5 HDD Intersect

The HDD Intersect variant assumes the pilot hole is made from both ends of the obstacle to be crossed. Two drill rigs are necessary to apply this variant. At the onshore side, the drill is positioned on the ground surface, and at the offshore side, on a suitably prepared station, e.g. a jack-up platform. At the offshore side, between the jack-up platform and the seabed, a casing pipe is installed through which the pilot borehole will be made. To install a casing pipe a crane located on a platform or a support vessel is used. After a pilot borehole is made at the land side, a device for the borehole reaming is installed. Following that, the technology continues according to the traditional variant (pilot drilling from one side). During the works related to the borehole, constant assistance of other vessels apart from the jack-up vessel is not necessary. Such a vessel will be necessary for transporting materials or exchanging the crew on the platform. Inserting the casing pipe into the borehole can be conducted both from the seashore side or from the land side.

3.2.4.3 Devices used for cable line laying within the onshore areas

During the cable line construction phase, depending on the environmental conditions and the stage of work progress, various types of vehicles, construction machinery and equipment, including lifts, cranes, hoists, specialised machinery used for cable tensioning (vehicles with a cable trailer, cable winches, cable rollers, cable guides, cable grips/terminations, pulling heads, rotary connectors), drilling and jacking, will be used. Moreover, depending on the needs, pump and wellpoint sets will be used. Vehicles designed for passenger transport will be used for personnel transportation to the site.

3.2.4.4 Spatial scope of the cable line construction within the onshore area

Figure 3.6 shows the location of the EXC BC-Wind OWF development area, the boundaries of which are defined by the coordinates provided in Table 3.7.

The maximum width of individual sections of the EXC BC-Wind OWF cable corridor are presented in Table 3.9. Within the area of section No. 3, the Applicant allows for optional construction of two shorter HDD boreholes. The implementation of this variant is due to the geotechnical conditions present in the work area.

Table 3.9. Length and maximum widths of individual BC-Wind cable corridor sections in the onshore part [source: internal materials]

Section number	Section length [m]	Proportion of the section length in the total length of the cable bed [%]	Maximum section width [m]	Description
1	169	2.26	103	Sea-land HDD area in the onshore part; no alteration to the ground surface
2	160	2.14	69	Transition joint bay area
3	754	10.07	18	HDD area beneath the dune zone; no alteration to the ground surface
4	1393	18.60	22	Open trench site
5	359	4.79	13	HDD area beneath the wetland zone; no alteration to the ground surface
6	463	6.18	22	Open trench site
7	254	3.39	22	HDD area beneath the archaeological site zone; no alteration to the ground surface
8	191	2.55	59	Open trench site
9	3746	50.02	26.5	Open trench site



Figure 3.13. Location of the EXC BC-Wind OWF in the onshore part divided into sections [source: internal materials]

3.2.4.5 Rate of the cable laying within the onshore area

It is assumed that the duration of inserting a cable into a cable trough in a trench of a length of approximately 1.5 km will be from 2 to 4 weeks. Cable laying in the trench, constructing joints linking the sections together, executing the bentonite, covering with foil, laying concrete covers and marking bands – up to 1 month. Preparation of the site for trenching, together with excavating a trench for the purpose of one section (approx. 1.5 km), may vary from a few to several weeks, depending on the topographic conditions.

3.2.5 Onshore Substation

As part of the proposed project, an Offshore Transformer Station with an input voltage of 220 kV or 275 kV and output voltage of 400 kV will be erected. Onshore Substation(ONS) will comprise of:

- 400/220/SN kV or 400/275/SN kV autotransformers or transformers;
- reactors compensating for reactive power;
- a 400 kV switchgear;
- a 220 kV or 275 kV switchgear.

The switchgears will comprise of:

- support structures and foundations for the equipment;
- switches;
- disconnectors;
- transformers;
- surge arresters.

Auxiliary systems and equipment will include:

- a medium-voltage switchgear;
- MV/0.4 kV transformers;
- devices for enhancing the quality of electricity (e.g. harmonic filters);
- reactive power control equipment;
- power generator.

The switchgears will be equipped with standard switching, metering and protection equipment, fulfilling the appropriate technical, environmental and the Transmission System Operator's requirements. The ONS auxiliary elements will include:

- infrastructure buildings;
- underground conduit system;
- internal circulation system;
- site lighting;
- lightning protection;
- rainwater drainage system;
- water service and water intake, if any;
- parking space;
- site fencing;
- access road;
- fire-fighting water storage tank accompanied by appropriate infrastructure and facilities – if necessary.

Water will be supplied from the nearest water supply system or local water intake located in the ONS premises. Sewage will be disposed to an external sewage system or to a leakproof sewage tank. A drainage system for the ONS within the surface-paved areas of the station is planned to be

constructed. Rainwater from the sealed transformer pits, on the other hand, will be managed within the plot by means of an infiltration system after being treated in the petroleum separator.

3.2.6 400 kV power line running to the NPS

The Onshore Substation will be connected to the PSE S.A. power substation with a cable section of the 400 kV power line with a length of up to 1000 m. In this case, the technology commonly used in these types of projects is to be applied. Table 3.10 presents the basic technical assumptions behind the EXC BC-Wind OWF in the onshore part partially including the connection of the ONS with the Choczewo Substation.

Table 3.10. Technical assumptions behind the EXC BC-Wind OWF in the onshore part covering the connection of the OnST with the Choczewo Substation [source: internal materials]

Technical assumptions behind the construction of cable lines within the onshore area	Value/description
Power cable type	Extra high voltage (EHV) alternating current power cables with an operating voltage of 400 kV in XLPE insulation (cross-linked polyethylene). The maximum temperature of the phase conductor will be up to 90°C. Two fibre optic cables are to be used for communication between stations.
Number and route of cable lines	1 cable line, 1 cable per each of 3 phases, in a flat or trefoil formation is to be constructed.
Maximum number of cable lines constructed concurrently	1
Cable laying technique	Cables will be inserted into the cable trough located in a trench directly from a cable drum. Within the naturally valuable areas that are difficult to cross with an open pit, and also due to the presence of watercourses and other natural obstacles, trenchless construction forms are planned such as horizontal directional drills or molings.
Depth of the trenches	approx. 2 m
Width of the trenches	approx. 1.5 m
Buffer zone width – permanent deforestation of the area	Agricultural land with single woodlots
Start date of the cable line construction	The Project Owner's intention is to conduct construction works without limitation to a specific period of the year
Cable line construction rate	It is assumed that the duration of inserting a cable into a cable trough in a trench of a length of approximately 0.5 km shall be approximately 5 days. Cable laying in the trench, pouring of bentonite, covering with foil, laying of concrete covers and marking bands – approximately 1–2 weeks.
Type of equipment used in the construction phase	Construction vehicles and machinery, lifts, cranes, hoists, specialised machinery for cable/conductor tensioning (cable trailer vehicle, cable winches, cable rollers, cable guides, cable grips/terminators, pulling heads, rotary connectors), drilling, moling, pumping, wellpoints, personnel transport vehicles
Insertion of power cables into the ONS	Wall cable ducts
Insertion of power cables into the PSE substation.	Cable termination on support structures with a height of up to 4 m (including apparatus up to 10 m high)

3.2.7 Access roads

At the construction stage, the implementation of the proposed project will require using the existing public roads and forest roads by the Project Owner. At the same time, due to the fact that investment projects identical to the one in question are planned in the immediate vicinity of the Project, at the stage of the Project implementation, it will be possible for the Project Owner to make use of the previously prepared and already existing access roads. As a result, in terms of the access

roads, only minor preparatory or adaptation works such as aggregate lining or local minor tree and shrub felling are assumed.

Access to the public road (district road no. 1432G) will be ensured via the designed internal road on cadastral plot no. 105/4 (approximately 0.2 km) and next the reconstructed internal road on cadastral plots no. 110/1 and 107/2 (approximately 1.5 km), which are owned by the Choczewo commune, and the designed exit to the above-mentioned public road. In the path of the aforementioned internal road, there is a railway crossing on plot no. 104 - railway line no. 230 Wejherowo-Garczegorze.

Access to the station will be possible also via the designed service road along the cable line in plot no. 348. Figure 3.14 presents the access roads that can be used for accessing the EXC BC-Wind OWF onshore station.

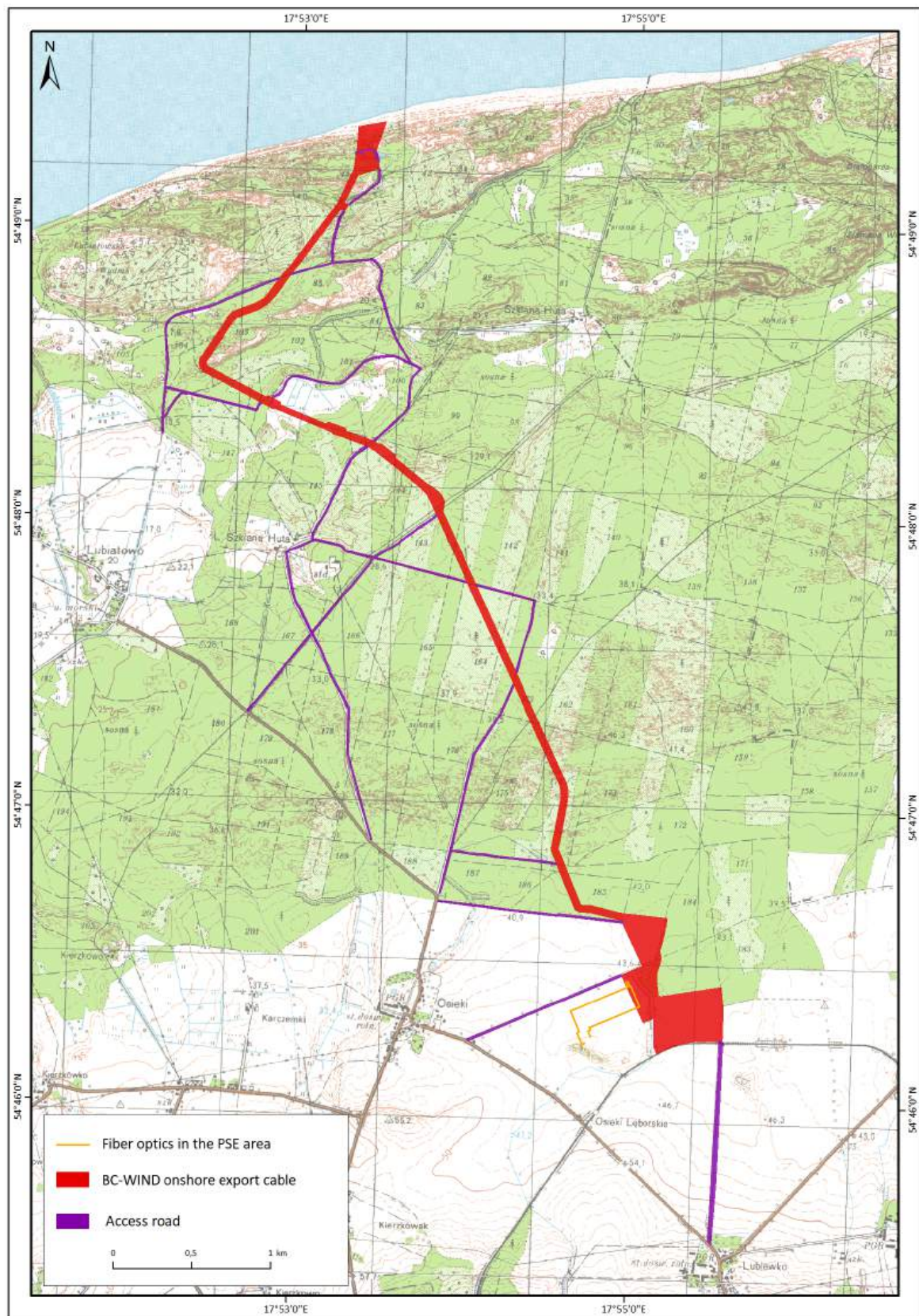


Figure 3.14. Access roads considered for the EXC BC-Wind OWF Onshore Substation and cable line development area [source: internal materials]

3.3 Project variants considered

3.3.1 Approach to designating project variants

Analysis of alternative solutions of the proposed project is conducted at the level of:

- determination of the project location;
- method of implementation of the project objective;
- determination of technological solutions of the project necessary to be included in the construction design, significant from the point of view of environmental protection;
- determination of project functioning methods that are essential from the point of view of environmental protection.

The key assumption in the design process is to determine the route of the EXC BC-Wind OWF, taking into account environmental aspects, technical capabilities, minimisation of the risk of potential failures and social conflicts, as well as ensuring economic optimisation. As part of the proposed project, options were developed for the offshore and onshore sections. An analysis of potential conflicts and impacts as well as costs and risks were also taken into account. During the planning process, the project was consulted with relevant administrative authorities, institutions and stakeholders.

The option analysis accounted for the following decisions of the competent authorities:

- Decision No. 5/K/21 of the Minister of Infrastructure of 27 October 2021 – approving the location and methods of cable maintenance in the exclusive economic zone for the project;
- Decision No. 6/K/21 of the Minister of Infrastructure of 27 October 2021 – approving the location and methods of cable maintenance in the exclusive economic zone for the project;
- Decision of the Minister of Infrastructure of 3 November 2021 on the *ex officio* correction of the decision of the Minister of Infrastructure No. 5/K/21;
- Decision of the Minister of Infrastructure of 3 November 2021 on the *ex officio* correction of the decision of the Minister of Infrastructure No. 6/K/21;
- Decision of the Director of the Maritime Office in Gdynia of 30 November 2021 No. 6/21 – permit for the laying and maintenance of cables within internal sea waters and territorial sea, establishing the location and conditions for their maintenance for the project
- Decision of the Director of the Maritime Office in Gdynia of 30 November 2021 No. 7/21 – permit for the laying and maintenance of cables within internal sea waters and territorial sea, establishing the location and conditions for their maintenance for the project;
- Declaration from the Director of the Maritime Office in Gdynia of 18 January 2022 informing that the decision of the Director of the Maritime Office in Gdynia No. 6/21 of 30 November 2021 entered into force as of 18 January 2022;
- Declaration from the Director of the Maritime Office in Gdynia of 18 January 2022 informing that the decision of the Director of the Maritime Office in Gdynia No. 7/21 of 30 November 2021 entered into force as of 18 January 2022;
- Decision of the Minister of Infrastructure of 28 June 2022 – assignment of rights, resulting from the decision of the Minister of Infrastructure of 27 October 2021 No. 5/K/21, from B-Wind Sp. z o.o. to C-Wind Sp. z o.o.;
- Decision of the Director of the Maritime Office in Gdynia of 29 July 2022 No. 5/22 – assignment of all rights, under the decision of the Director of the Maritime Office in Gdynia No. 6/21 of 30 November 2021, from B-Wind Sp. z o.o. to C-Wind Sp. z o.o.;
- Decision No. 3/K/2022 of the Minister of Infrastructure of 16 January 2023 approving the location and methods of cable maintenance for the project in the exclusive economic zone.

The agreements between the Applicant and the Choczewo Forest Inspectorate authorities on the onshore part of the proposed project route within forest areas were also preliminary taken into consideration in the analysis (see: Section 3.1.2).

The basic criterion considered during the option preparation was the comparison of viable location and technical and technological alternatives.

At an earlier stage of the Project implementation, the Applicant analysed the possibility of implementing an option different from the APV in the onshore part, which involves laying cable lines in an open trench at the level of the peat bog within the area of the backwater of the *Bezimienna* river as well as at the level of the ecological area *Torfowisko w Szklanej Hucie* [Peat bog in Szklana Huta]. During the conceptual work on that option, which primarily focused on the environmental, as well as technological, organisational and technical conditions, it was indicated that its implementation could significantly affect the environment, including, in particular, directly the existing water relations in these areas, and indirectly many biotic components of the ecosystem of those areas, in particular during the EXC BC-Wind OWF construction and operation phases. Significant risks, and therefore unacceptable by the Applicant, connected to the acceptance of that option, were decisive for its rejection and consequent failure to consider it as an Reasonable Alternative Variant.

3.3.2 Variants of the project considered along with the justification for their selection

Both variants adopted for assessment are reasonable, i.e. feasible given the current legal status, technical and technological conditions as well as the current state of knowledge about environmental conditions. As regards the onshore part of the EXC BC-Wind OWF, the design of variants was also guided by the necessity to ensure spatial continuity and to reduce spatial collisions with other stakeholders. When it comes to the offshore part of the EXC BC-Wind OWF, the change with respect to the APV is the re-routing of the cable lines and thus extension of the route.

3.3.2.1 Applicant Proposed Variant

In the Applicant Proposed Variant [Figure 3.15], the starting point of the proposed project is the exit of the export cables from the Onshore Substation that constitutes a part of the BC-Wind OWF infrastructure. Electricity will be exported from the BC-Wind OWF using a maximum of 2 EHV AC three-core subsea cables with an operating voltage of 220 kV or 275 kV. The length of the grid connection line in the offshore area is approximately 33 km. The cable landfalls will be constructed using a trenchless HDD method in the area of 160.2–160.5 km of the sea shore (according to the Maritime Office shoreline chainage). At the onshore section of the route, in a maximum of 2 transition joint bays, the subsea cable construction parameters will be adjusted to the conditions onshore. Next, in the onshore part, electric power will be routed via underground single-core alternating current cables with an operating voltage of 220 kV or 275 kV. The cables will be laid in 2 cable circuits, 3 one-core cables per circuit. The route of the underground cable line will lead through the forests administered by the Regional Directorate of State Forests (RDSF) in Gdańsk, within the boundaries of the Choczewo Forest Division. The EXC BC-Wind OWF will enter the Onshore Substation with an input voltage of 220 kV or 275 kV and an output voltage of 400 kV. The ONS will be connected with the Choczewo Substation with a 400 kV line with a maximum length of 1000 m. The end point of the proposed project are the linear disconnect terminals of the 400 kV feeder bay at the Choczewo Substation. The length of the grid connection line within the onshore area is approximately 8 km and the width of the cable corridor varies depending on the location and cable laying technology [Table 3.9].

The Applicant Proposed Variant assumes the project implementation in accordance with the state-of-the-art and commonly applied technologies for the construction of EHV power lines. As regards the offshore area outside the BC-Wind OWF Area, the route of the project does not reach beyond the area indicated in the location decisions issued by the Minister of Maritime Economy and Inland Navigation and the Director of the Maritime Office in Gdynia [Section 1.3]. The option accounts for all environmental protection requirements as well as optimisation between planning, environmental, technical and economic conditions for energy transmission. This option provides for the burial of the power cables in the seabed sediment and in the ground. A description of the technology and techniques of construction of the power connection in the APV can be found in Section 3.2.

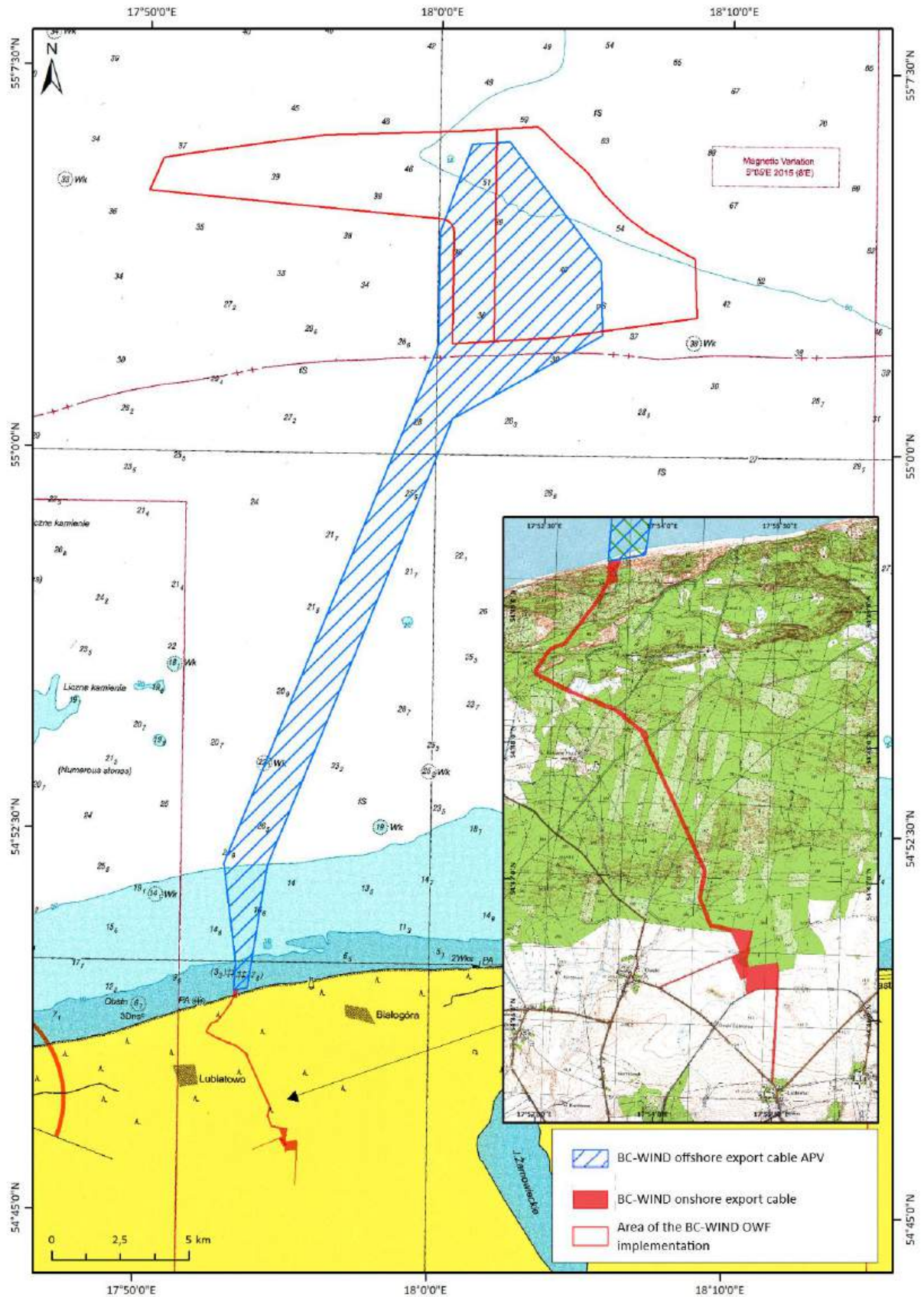


Figure 3.15. Location of the proposed project – Applicant Proposed Variant [source: internal materials]

3.3.2.2 Rational Alternative Variant

The Rational Alternative Variant compared to the APV assumes extension of the two-circuit cable line route in the offshore area [Figure 3.16]. In the RAV, the way of routing the EXC BC-Wind OWF assumes evacuating electric power from the BC-Wind OWF using a maximum of two subsea three-core EHV cables with an operating voltage of 220 kV or 275 kV to the substations that constitute a part of the BC-Wind OWF – as in the case of the APV. The length of the grid connection line in the offshore area is approximately 39.3 km. Next, cable landfalls will be constructed using a trenchless HDD or HDD Intersect method in the area of 160.2–160.5 km of the sea shore (according to the Maritime Office shoreline chainage). At the onshore section of the route, in a maximum of 2 transition joint bays, the subsea cable construction parameters will be adjusted to the conditions onshore. Next, in the onshore part, electric power will be routed via underground single-core alternating current cables with an operating voltage of 220 kV or 275 kV. The cables will be laid in 2 cable circuits, 3 one-core cables per circuit. The route of the underground cable line will lead through the forests administered by the Regional Directorate of State Forests (RDSF) in Gdańsk, within the boundaries of the Choczewo Forest Division. The EXC BC-Wind OWF will enter the ONS with an input voltage of 220 kV or 275 kV and an output voltage of 400 kV. The current terminals of the PSE substation constitute the endpoint of the proposed project.

The length of the grid connection line within the onshore area is approximately 8 km, while the width of the technical belt varies depending on the section and cable laying technology [Figure 3.16].

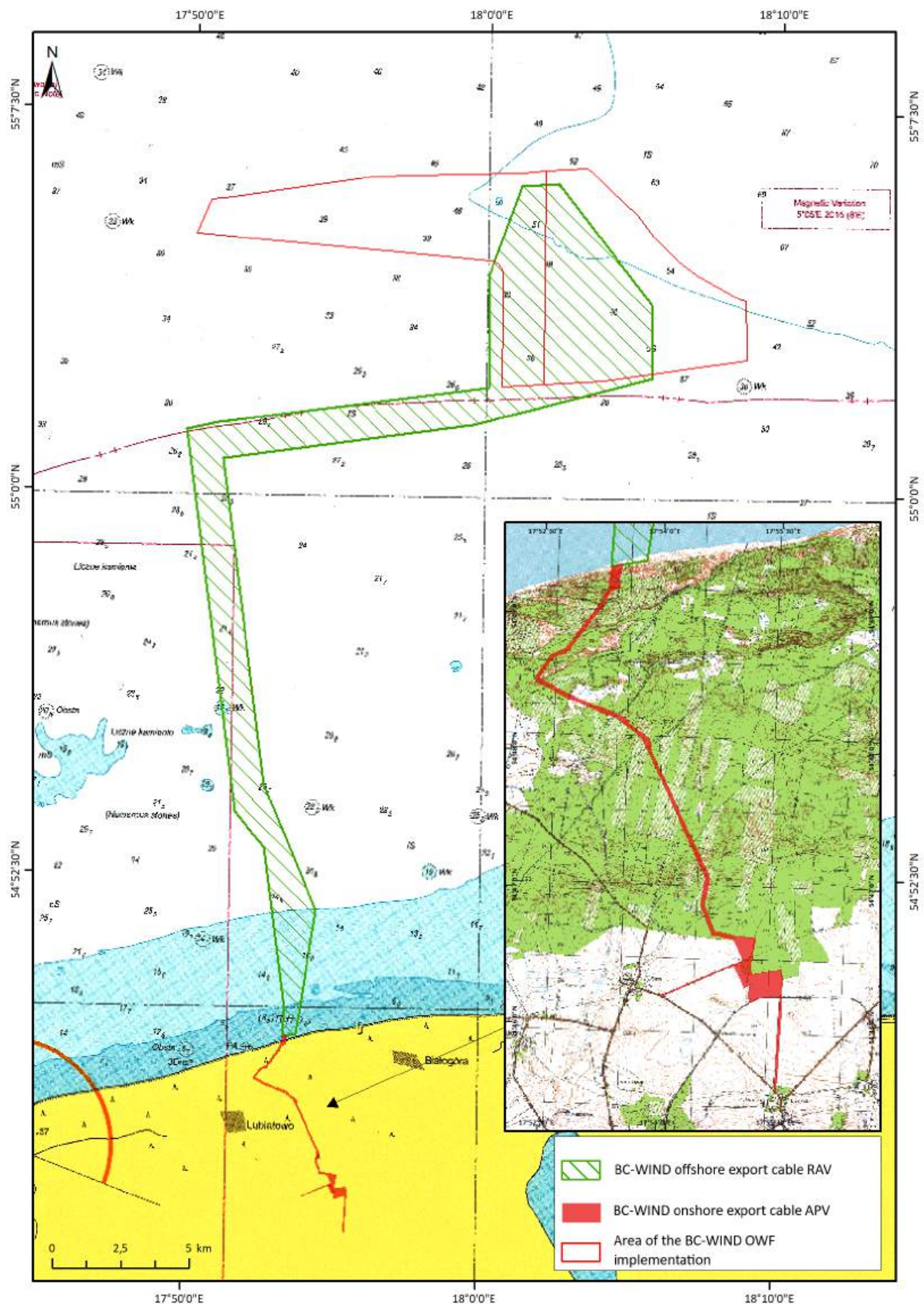


Figure 3.16. Location of the proposed project – Rational Alternative Variant (RAV) [source: internal materials]

3.3.2.3 Compilation of the technical parameters of the project options considered

Table 3.11 presents a summary of the technological and technical parameters of the proposed project that differentiate the APV and the RAV.

Table 3.11. Technological and technical parameters differentiating the Applicant Proposed Variant (APV) and the Rational Alternative Variant (RAV) [source: internal materials]

Technical parameters	Applicant Proposed Variant (APV)	Rational Alternative Variant (RAV)
Offshore area		
Length of the multi-circuit cable line (assuming that the export cables are led from each of a maximum of two BC-Wind OWF substations)	approximately 33 km	approximately 39.3 km
Onshore area		
Length of the cable line	approximately 8 km	
Technical belt width	Varied depending on the location and technology of cable laying [Table 3.9].	
Depth and width of the trenches	Depth – approximately 1.4 m, width – a maximum of 5 m for 2 cable circuits. Due to differences in topography (e.g. dunes), the depth of cable burial may exceed 2 m at some points, whereas for a borehole, it may exceed 30 m. In the area of cable joints, the width of trenches may be up to 10 m.	
Technical characteristics of the cables	Alternating current single-wire cables. Cross-linked polyethylene (XLPE) insulation	
Number of power lines	A maximum of 2 circuits, 3 cables each	

3.4 Description of individual phases of the project

3.4.1 General information relating to all phases of the project

The proposed project will consist of three main phases: construction, operation, and decommissioning, which in the case of this project, will involve the termination of the EXC BC-Wind OWF operation or possible removal of part or all of the infrastructure from the environment. It will be implemented within the offshore and onshore areas, which will involve significant technological and technical differences in the implementation of each of these phases. The description of the planned activities for every phase takes into consideration the technological and technical differences, which differentiate the APV from the RAV. Due to a significant difference in the implementation of activities for each phase, their description was divided into an offshore and onshore part.

3.4.2 Construction phase

3.4.2.1 OFFSHORE AREA

The construction phase will consist of the following three main stages:

1. transport and laying of export cables on the seabed;
2. burying of export cables in the seabed sediment;
3. export cable landing.

These works will be carried out sequentially. A detailed work schedule will be prepared before the commencement of the construction. This results from the necessity to use specialist vessels and equipment, which due to their availability must be booked well in advance.

3.4.2.1.1 Construction works facilities

Construction works will be carried out by specialist vessels, for example, cable-laying vessels, service vessels, cable barges, and barge towboats. In addition, other vessels, not directly involved in the process related to power cable laying, such as: patrol vessels, walk-to-work vessels (W2W) and flotels, in which the people involved in the construction phase may be accommodated, are allowed to participate in maritime operations. Most probably, the power cable will be loaded onto a cable-laying vessel or a cable barge in a harbour near the production location and transported by them to the laying location. To optimise the costs, it is not planned for a vessel to call at another port under normal operating conditions before the completion of construction works. Secondly, the Applicant plans to transport the cables from the place of production to a different port situated close to the proposed project and to store them there until their installation. At the moment of the construction commencement, the cables stored on the premises of the port will be loaded onto a vessel and transported to the location of laying. Ensuring the proper functionality of the port will be the responsibility of the port manager. The preliminary analysis has shown that the ports best suited to be an installation port are the ports of Rønne, Sassnitz-Murkan, Rostock, and Aalborg, however, the ports in Gdynia, Gdańsk, Karlskrona, Świnoujście, Klaipėda, and Szczecin are also taken into consideration.

It is assumed that the construction phase (the laying of up to 33 km cable lines and cable landing) will be implemented in the shortest possible time, in accordance with applicable standards and the manufacturer's instructions as well as under ongoing supervision. The cable line laying will be highly dependent on weather conditions. If weather conditions are favourable, it will be completed within a maximum of 6 months from its commencement. The Project Owner's intention is to be able to start the construction works irrespective of the season.

In the location of the HDD borehole exit in the offshore part, it may be necessary to level the area with a maximum surface of 13 600 m². In the event that underwater dunes are encountered along the route of the offshore export cable line, there is the possibility of preparatory work, which involve the removal/levelling of the dune ridges located along the cable line route, which is called sweeping.

3.4.2.1.2 Noise emissions

Vessels and underwater vehicles involved in the construction of the cable lines will generate underwater noise. In the case of vessels, the noise will be generated by the engine running, the sound of the propeller and the operation of the steering engines. Large vessels equipped with DP systems, e.g. cable laying vessels, generate low frequency noise ranging from 30 Hz to 3 kHz, and sound pressure from 100 to 197 dB re 1 µPa at a distance of 1 m from the source [294]. The sound levels do not depend on the vessel speed but on the operating intensity of the DP systems that keep the vessel in a set position. Therefore, higher levels of the noise emitted by vessels will occur during unfavourable weather conditions, i.e. strong wave motion and wind. Smaller vessels not equipped with DP systems generate underwater noise with a frequency between 50 Hz and 2 kHz and a sound pressure from 170 to 180 dB re 1 µPa at a distance of 1 m from the source [294]. In contrast to the vessels equipped with DP systems, the level of noise depends in this case on the travel speed of such vessels.

The operation of underwater devices involved in the construction of the cable lines also entails the generation of noise into the environment. The highest noise levels will be generated by single underwater vessels operating in the mechanical trenching technology, which emit sounds with sound pressure ranging from 172 to 185 dB re 1 µPa, at a distance of 1 m from the source.

3.4.2.1.3 Waste and waste management

During the EXC BC-Wind OWF construction phase, various types of waste will be generated as a result of the operation of vessels and equipment used for laying the cable lines. The types and quantities of waste expected to be generated are provided in

Table 3.12. The waste names and codes are compliant with the Regulation of the Minister of Climate of 2 January 2020 *on the waste catalogue* (Journal of Laws of 2020, item 10). At this stage of the project development, it is impossible to determine precisely the types of waste to be generated, nor their quantities; therefore, the table includes all theoretically possible types of waste and the estimates regarding their maximum quantities anticipated on the basis of the information on the assumed technology and the longest assumed duration of works in the offshore area. In the case of the RAV, the same types of wastes will be generated, however, their quantities will be greater due to the longer route of cable lines in this route option.

Table 3.12. Compilation of the maximum quantities of waste estimated to be generated in the construction phase of the offshore part throughout a single year [source: internal materials]

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
08	Wastes from manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks	
08 01	Wastes from the manufacture, formulation, supply and use (MFSU) and removal of paint and varnish	
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances	5
08 01 12	Waste paint and varnish other than those mentioned in 08 01 11	12
08 01 13*	Sludges from paint or varnish containing organic solvents or other hazardous substances	11
08 01 14	Sludges from paint or varnish other than those listed in 08 01 13	23
08 01 99	Wastes not otherwise specified	7
08 04	Wastes from MFSU of adhesives and sealants (including waterproofing products)	
08 04 09*	Waste adhesives and sealants containing organic solvents or other hazardous substances	5
08 04 10	Waste adhesives and sealants other than those mentioned in 08 04 09	9
08 04 99	Wastes not otherwise specified	7
13	Oil wastes and wastes of liquid fuels (except edible oils, and those included in groups 05, 12 and 19)	
13 01	Waste hydraulic oils	
13 01 09*	Mineral-based chlorinated hydraulic oils	23
13 01 10*	Mineral based non-chlorinated hydraulic oils	141
13 01 11*	Synthetic hydraulic oils	94
13 02	Waste engine, gear and lubricating oils	
13 02 04*	Mineral-based chlorinated engine, gear and lubricating oils	468
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	468
13 02 06*	Synthetic engine, gear and lubricating oils	351
13 02 07*	Readily biodegradable engine, gear and lubricating oils	35
13 02 08*	Other engine, gear and lubricating oils	35
13 04	Bilge oils	
13 04 03*	Bilge oils from other navigation	141
13 05	Oil/water separator contents	
13 05 02*	Sludges from oil/water separators	47
13 05 06*	Oil from oil/water separators	47
13 05 07*	Oily water from oil/water separators	35
13 07	Wastes of liquid fuels	
13 07 01*	Fuel oil and diesel	20
13 07 02*	Petrol	20
13 08	Oil wastes not otherwise specified	
13 08 80	Oily solid waste from ships	12
14	Waste organic solvents, refrigerants and propellants (except 07 and 08)	
14 06	Waste organic solvents, refrigerants and foam/aerosol propellants	
14 06 02*	Other halogenated solvents and solvent mixtures	20
14 06 03*	Other solvents and solvent mixtures	20

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 01	Paper and cardboard packaging	82
15 01 02	Plastic packaging	82
15 01 03	Wooden packaging	82
15 01 04	Metallic packaging	82
15 01 05	Composite packaging	82
15 01 06	Mixed packaging waste	82
15 01 07	Glass packaging	40
15 01 09	Textile packaging	40
15 02	Absorbents, filter materials, wiping cloths and protective clothing	
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths (e.g. rags, wipes), protective clothing contaminated by hazardous substances (e.g. PCBs)	40
15 02 03*	Absorbents, filter materials, wiping cloths (e.g. rags, wipes) and protective clothing other than those mentioned in 15 02 02	40
16	Wastes not otherwise specified	
16 06	Batteries and accumulators	
16 06 01*	Lead batteries	40
16 06 02*	Ni-Cd batteries	40
16 06 04	Alkaline batteries (except 16 06 03)	40
16 06 05	Other batteries and accumulators	40
16 81	Waste resulting from accidents and unplanned events	
16 81 01*	Wastes exhibiting hazardous properties	2
16 81 02	Wastes other than those mentioned in 16 81 01	2
17	Wastes from construction, renovation and demolition of construction works and road infrastructure (including excavated soil from contaminated sites)	
17 09	Other construction and demolition wastes	
17 09 04	Mixed construction, renovation and dismantling waste other than those listed in 17 09 01, 17 09 02 and 17 09 03	4
20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
20 01	Separately collected fractions (except 15 01)	
20 01 01	Paper and cardboard	40
20 01 02	Glass	164
20 01 08	Biodegradable kitchen and canteen waste	82
20 01 29*	Detergents containing hazardous substances	40
20 01 30	Detergents other than those mentioned in 20 01 29	82
20 01 33*	Batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries	40
20 01 34	Batteries and accumulators other than those mentioned in 20 01 33	40
20 01 35*	Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components	20

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
20 01 36	Discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	20
20 03	Other municipal wastes	
20 03 01	Mixed municipal waste	40

The waste and sewage generated during the construction phase will be properly stored and secured on vessels, in accordance with a pollution prevention plan in force on each vessel, drawn up in accordance with the requirements of the Act of 16 March 1995 *on the prevention of sea pollution from ships* (Journal of Laws of 1995, No. 47, item 243, as amended). In ports, waste and sewage will be transferred to port reception facilities and handled in accordance with the applicable ship-generated waste and cargo residues management plan [Regulation of the Minister of Infrastructure of 21 December 2002 *on waste and cargo residues management plans for ports* (Journal of Laws of 2002, No. 236, item 1989, as amended)].

3.4.2.1.4 Power, raw materials and water demand

The vessels and equipment involved in offshore work will consume electricity produced by the combustion of fuel – low sulphur diesel oil (<0.1%). The amount of fuel consumed will be influenced by many factors, among which the most important are the type and intensity of works, as well as weather conditions while carrying them out – the intensity of wave motion as well as the strength and direction of the wind, which to a large extent shape the way a vessel is manoeuvred as well as the load of the propulsion engines (including by DP systems). Since at this stage, the vessels which will be involved in the project implementation and the weather conditions of the construction phase are not known, it is also impossible to estimate the amount of fuel which will be consumed by the vessels in the construction phase. Table 3.13 contains the average values of fuel consumption per hour for vessels of various sizes, which gives a certain idea about the amount of fuel consumed during the construction works.

Table 3.13. Average fuel consumption for different types of vessels [source: internal materials based on [44]]

Vessel size	Purpose	Average fuel consumption (diesel) [kg·h ⁻¹]	Nominal daily working time [h]
Small vessels	Small supplies, personnel transport, one-day service, emergency operations – for each phase	50–200	8–10
Medium vessels	Supplies, construction works and support for construction works, towing operations, multi-day stationary service – for each phase	500–2000	12–18
Large vessels	Construction works, storage – construction phase	2500–5000	12–24

The application of the jet trenching technology for burying export cables will involve the use of seawater. Specialist devices will collect the water from the environment and inject it under pressure into the surface layer of the seabed sediment in order to loosen its structure, which will enable cable laying. During this process, neither the chemical composition of the water nor its temperature will be changed. The entire water collected will be returned to the environment. Depending on the device used, it is expected that the water flow may reach from approximately 800 to approximately 5000 m³/h [13]. The water will also be used for the everyday needs of the crews of vessels involved in the

construction works. The drinking water tanks will be refilled during port stopovers. After use, the water is stored in waste water tanks and handed over for treatment during the next port call.

3.4.2.2 ONSHORE AREA

For the purposes of the project implementation, the performance of the following work is envisaged:

- felling of trees in the area planned for the location of the multi-circuit cable line and/or Onshore Substation;
- construction of access roads for the project needs;
- construction of trenches for the multi-circuit cable line;
- conducting horizontal directional drilling in the locations where the open trench will not be excavated;
- laying of the cable line and fibre optic line in trenches;
- execution of the cable line connections – cable joints, cable heads, feeding services to the ONS;
- finishing works – backfilling, cable line marking, completion of communication system, ground levelling and reclamation.

The construction phase will require occupation of a cable corridor for earthworks and installation works, which will vary in width depending on the cable line construction location and technology [Table 3.9].

In the case it is necessary to carry out excavation drainage, pumps, wellpoints or additional drainage trenches will be used.

Construction works in the forest areas will be preceded by the felling of trees and bushes. The work related to the removal of tress will include the felling and grubbing of shrubs and trees, the removal of tree stumps, the removal of the material excavated out of the construction site, as well as the backfilling of holes created by the removal of tree stumps. The work and activities related to tree felling will be performed using harvesters, power saws, wood choppers for crushing branches and boughs as well as small cutting tools, such as axes, pruning shears, hand files, etc.

Construction vehicles and machinery normally used for this type of work will be utilised during the construction phase: cranes, lifts, jib cranes, backhoe loaders, rolls, felling devices, crawler bulldozers, and specialist machinery for cable tensioning, boreholes, pumps, wellpoints, as well as vehicles for staff transportation.

Table 3.14 presents a compilation of specialist equipment types used for cable burying that can be used during the construction phase and their characteristics.

Table 3.14. Type of equipment used for cable laying in the onshore area [source: internal materials]

Equipment	Description
Cable winch	Used for laying and winching power cables along cable routes. It is equipped with systems protecting the cable during winching as well as an electronic measuring system which monitors all cable winching parameters
Cable rolls	Used for cable shifting. Made of hard aluminium or galvanised steel. Roll axes should be mounted on rolling bearings, protected against water and contamination, especially soil
Cable guides	Made from two sections of metal pipes, mounted pivotally on rolling bearings on a common metal frame
Cable grips/terminators	Used for cable protection against breaking. Made of galvanized steel wire twisted lines braided in such a way that when a pulling force is applied the cable grip will clamp the surface of the cable or its protective tube covering
Pulling heads	Made of metal, enable clamping of the ends of the cable phase wires and are adjusted to transmitting the pulling force

Equipment	Description
Rotary joints	Made of metal, equipped with a u-bracket at both ends. Both joint parts are pivotally connected with each other using a rolling bearing, adjusted to transmitting the rotary movement from one part of the joint to another
Equipment for cleaning and inspecting the pipes	Brushes intended for removing possible debris, e.g. soil, from the inside of a pipe should be made of plastic, cylindrical in shape, equipped with u-brackets for rope fastening
Pipe greasers	Intended for distributing the lubricant inside the protective pipe. Made of at least two polishing pads from cotton threads, mounted on a metal axle, on both sides equipped with a u-bracket

The construction phase is expected to last up to 24 months.

3.4.2.2.1 Construction works facilities

During the project implementation, the construction site facilities will be organised, which will constitute a set of elements of material and technical resources necessary for the task implementation. As part of the proposed project, the following is envisaged:

- site facilities in the vicinity of the Onshore Substation (ONS);
- temporary construction site facilities in the vicinity of the transition joint bays.

In the case it is necessary to use another location for the purpose of the construction site (after ground survey results are obtained and in the course of further design work), the Project Owner will use anthropogenic areas near the existing access roads.

The elements of the construction site facilities include, for example: construction machinery, transport and construction equipment, construction material stockyard, temporary facilities with office and administrative and/or welfare facilities, fire protection and OHS equipment. The construction site facilities will be equipped with airtight and portable sanitary facilities.

3.4.2.2.2 Noise emissions

The operation of the heavy construction equipment used during construction will be the source of noise emission, the level of which will vary depending on the project implementation phase and the type of equipment used. Moreover, the noise resulting from the transport of construction materials, equipment and personnel will cover both the area of direct construction works, as well as the areas surrounding the access roads.

Due to a linear character of the project and the specificity of the work implementation in an open space, the noise will be present only at the section at which the work is carried out and will cease with the progress of the construction works.

The examples of noise levels (at a distance of 7 m from the operating device) emitted by the construction equipment and machinery are the following [167]:

- caterpillar excavator – 85 dB;
- bulldozer – 87 dB;
- power generator – 80 dB.

As part of the proposed project, trenchless methods will be applied which introduce an additional source of noise. In this case, there are more machines at the construction site than in the case of the section erected using the open trench method. Additionally, the machinery involves pumps with a sound power level of approx. 93 dB, drilling fluid recycling and recovery device with a sound power level of approx. 99 dB, drilling fluid preparatory mixer with a sound power level of 89 dB and a drilling rig with a sound power level of approx. 108 dB.

The construction works will be conducted using equipment that guarantees the possibly effective protection against noise, which meets the requirements of the applicable legal regulations. In accordance with the guidelines included in the Regulation of the Minister of the Environment of 21 December 2005 *on essential requirements for outdoor-use equipment regarding noise emissions into the environment* (Journal of Laws of 2005, No. 263, item 2202, as amended), the sound power level of the equipment used in construction industry is subject to restrictions depending on the type of equipment and the power installed.

3.4.2.2.3 Waste and waste management

The implementation of the proposed project will be the source of waste generation from typical construction works related to the excavation of trenches, construction of the ONS and 220 kV or 275 kV and 400 kV cable lines. The types and quantities of waste expected during the construction phase are included in Table 3.15. The waste names and codes are compliant with the Regulation of the Minister of Climate of 2 January 2020 *on the waste catalogue* (Journal of Laws of 2020, item 10). At this stage of the work progress, it is impossible to determine precisely the types of waste to be generated nor their quantities; therefore, the table includes all theoretically possible types of waste and estimates regarding their maximum quantities anticipated, based on the information on the assumed technology as well as the longest assumed duration of works within the onshore area.

Table 3.15. Compilation of the maximum quantities of waste estimated to be generated in the construction phase of the onshore part throughout a single year [source: internal materials]

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
08	Wastes from manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks	
08 01	Wastes from the manufacture, formulation, supply and use (MFSU) and removal of paint and varnish	
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances	410
10	Waste from thermal processes	
10 12	Wastes from manufacture of ceramic goods, bricks, tiles and construction products	
10 12 08	Waste ceramics, bricks, tiles and construction products (after thermal processing)	55
13	Oil wastes and wastes of liquid fuels (except edible oils, and those included in groups 05, 12 and 19)	
13 02	Waste engine, gear and lubricating oils	
13 02 07*	Readily biodegradable engine, gear and lubricating oils	23
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 01	Paper and cardboard packaging	164
15 01 02	Plastic packaging	164
15 01 03	Wooden packaging	246
15 01 06	Mixed packaging waste	137
15 01 10*	Packaging containing residues of or contaminated by hazardous substances	1366
15 02	Absorbents, filter materials, wiping cloths and protective clothing	
15 02 02	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths (e.g. rags, wipes), protective clothing contaminated by hazardous substances (e.g. PCB)	137
15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	137
16	Wastes not otherwise specified	
16 10	Aqueous liquid wastes intended for off-site treatment	

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
16 10 02	Aqueous liquid wastes other than those mentioned in 16 10 01	13 400 m ³ for the entire implementation period
17	Wastes from construction, renovation and demolition of construction works and road infrastructure (including excavated soil from contaminated sites)	
17 01	Waste materials and building elements as well as road infrastructure (e.g. concrete, bricks, tiles and ceramics)	
17 01 81	Wastes from road renovations and reconstructions	1639
17 02	Wood, glass and plastic	
17 02 01	Wood	437
17 03	Bituminous mixtures, tar and tar products	
17 03 01*	Bituminous mixtures containing coal tar	410
17 04	Waste and scrap metal and metal alloys	
17 04 01	Copper, bronze, brass	273
17 04 02	Aluminium	14
17 04 05	Iron and steel	464
17 04 11	Cables other than those mentioned in 17 04 10	232
17 05	Soil and earth (including soil and earth from polluted areas and excavated material)	
17 05 04	Soil and stones other than those mentioned in 17 05 03	3005
17 09	Other construction and demolition wastes	
17 09 03*	Other construction and demolition wastes (including mixed wastes) containing hazardous substances	82
17 09 04	Mixed construction, renovation and dismantling waste other than those listed in 17 09 01, 17 09 02 and 17 09 03	273
20	Municipal wastes	
20 01	Separately collected fractions (except 15 01)	
20 01 21*	Fluorescent tubes and other mercury-containing waste	14
20 03	Other municipal wastes	
20 03 01	Mixed municipal waste	546

During the construction phase, earth masses will be managed under the conditions and in the manner specified in the decision on the construction permit. Pursuant to Article 2(3) of the Act of 14 December 2012 – *Waste Act* (Journal of Laws of 2013, item 21 as amended), uncontaminated soil and other naturally occurring material excavated in the course of construction activities, providing it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated, is not treated as waste. The trenches made in connection with the implementation of the proposed project will be backfilled with the excavated soil. Small quantities of excess soil, if any, will be handed over to specialist companies in accordance with the applicable regulations.

The drilling fluid used in the HDD technology will be used multiple times during the drilling process (see Section 3.2.4.2.4.2). Once this process is complete, it will be recycled to recover bentonite. The rest will be treated as waste with a code 16 10 02, i.e. “aqueous liquid wastes other than those mentioned in 16 10 01”, collected by a specialist company and treated off-site.

Pursuant to the Act of 14 December 2012 – *Waste Act* (Journal of Laws of 2013, item 21, as amended), the contractor of works is regarded as the producer of waste generated during construction works. The contractor will be responsible for managing the waste in accordance with the provisions of the above-mentioned Act, i.e. in the first place for preventing waste generation, and in the event of

generation – for selective collection and transfer of such waste to entities holding permits for waste transport or collection.

3.4.2.2.4 Power, raw materials and water demand

Due to its specificity, the proposed project will be implemented using ready-made devices, elements, and construction materials.

A total of eight HDD drillings are envisaged for the laying of the cable lines in the coastal area and on land. Drilling operations will require the use of both seawater and freshwater. Table 3.16 presents the balance of process water used in the HDD process. The presented balance does not include the planned use of seawater in the drilling in the coastal zone in the amount of 950 m³.

Table 3.16. Balance of the process water used for HDD as part of the EXC BC-Wind OWF construction [source: C-Wind Sp. z o.o.]

Type of water	Minimum amount of water [m ³]	Maximum amount of water [m ³]
Freshwater used for drilling fluid	8450	13 950
Freshwater used for filling the pipelines on land	450	450
Water recovered from the drilling slurry displaced from the boreholes via pipelines	-1500	-1000
BALANCE	7400	13 400

Total volume of the drilling slurry displaced will be 2100 m³.

Water will also be used for the everyday needs of the staff in an expected quantity of approximately 0.05 m³/day. During the construction phase, diesel oil will be used by the equipment operating at the construction site in an expected amount of approximately 100 l/day.

3.4.3 Operation phase

3.4.3.1 OFFSHORE AREA

In the EXC BC-Wind OWF operation phase, cyclical inspections of particularly sensitive places (e.g. crossings with the existing infrastructure), as well as of the entire length of the cable lines, are expected to take place at least once every 5 years. Inspections of subsea cables require the use of small vessels, which can cause their periodic presence within the EXC BC-Wind OWF area. The inspections can be carried out using unmanned ROVs or by divers. Currently, due to the human safety reasons as well as the advancement of technology, unmanned vehicle inspections are preferred.

In the case of a cable line failure, a cable repair may be necessary. This will result in a periodical, increased traffic of vessels in the location of failure. The framework schedule of actions undertaken in the case of a broken subsea cable involves:

- tracking the damaged cable section and determining the type of damage;
- loading the cable that will replace the damaged section of the cable onto a cable laying vessel;
- cable transport to the location of the repairs;
- recovery of the damaged cable section – operation time depends on the type and size of damage, as well as the conditions of cable burying in the seabed (depth of burial), usually the recovery operation lasts 1–2 weeks; the cable is excavated using mass flow excavators, the recovery and loading of the cable onto a repair vessel is carried out by divers;
- cable repair, including cable jointing and laying on the seabed;
- cable burying in the seabed;
- return of the cable-laying vessel to the port.

To minimise the risk of cable damage, and thus, the repair works, effective methods of cable protection will be developed and implemented during the construction phase, the most important of which will be the burying of the entirety of cable lines in the seabed sediment or protecting them with permanent protective structures, if there is a need to lay line sections on the seabed surface and use the trenchless methods of construction of the cable landfall. The application of the commonly used and proven solutions protecting the subsea cable lines against damage significantly reduces this risk and makes its occurrence during the operation phase unlikely, not included in the normal scope of the project functioning.

Small service vessels will use the port located nearest to the investment project site, which is the Port of Władysławowo.

3.4.3.1.1 Waste and waste management

Table 3.17 contains the predicted maximum quantities and types of waste generated by service vessels. The waste names and codes are compliant with the Regulation of the Minister of Climate of 2 January 2020 *on the waste catalogue* (Journal of Laws of 2020, item 10). In the case of the RAV, the same types of wastes will be generated, however, their quantities will be greater due to the longer route of cable lines in this route option.

Table 3.17. Compilation of the maximum quantities of waste estimated to be generated in the operation phase of the offshore part throughout a single year [source: internal materials]

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
13	Oil wastes and wastes of liquid fuels (except edible oils, and those included in groups 05, 12 and 19)	
13 01	Waste hydraulic oils	
13 01 09*	Mineral-based chlorinated hydraulic oils	5
13 01 10*	Mineral based non-chlorinated hydraulic oils	5
13 01 11*	Synthetic hydraulic oils	5
13 02	Waste engine, gear and lubricating oils	
13 02 04*	Mineral-based chlorinated engine, gear and lubricating oils	5
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	5
13 02 06*	Synthetic engine, gear and lubricating oils	5
13 02 07*	Readily biodegradable engine, gear and lubricating oils	5
13 02 08*	Other engine, gear and lubricating oils	5
13 04	Bilge oils	
13 04 03*	Bilge oils from other navigation	11
13 05	Oil/water separator contents	
13 05 02*	Sludges from oil/water separators	5
13 05 06*	Oil from oil/water separators	5
13 05 07*	Oily water from oil/water separators	5
13 07	Wastes of liquid fuels	
13 07 01*	Fuel oil and diesel	20
13 07 02*	Petrol	20
13 08	Oil wastes not otherwise specified	
13 08 80	Oily solid waste from ships	12
14	Waste organic solvents, refrigerants and propellants (except 07 and 08)	
14 06	Waste organic solvents, refrigerants and foam/aerosol propellants	

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
14 06 02*	Other halogenated solvents and solvent mixtures	5
14 06 03*	Other solvents and solvent mixtures	5
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 01	Paper and cardboard packaging	21
15 01 02	Plastic packaging	21
15 01 03	Wooden packaging	21
15 01 04	Metallic packaging	21
15 01 05	Composite packaging	21
15 01 06	Mixed packaging waste	21
15 01 07	Glass packaging	9
15 01 09	Textile packaging	9
15 02	Absorbents, filter materials, wiping cloths and protective clothing	
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths (e.g. rags, wipes), protective clothing contaminated by hazardous substances (e.g. PCB)	9
15 02 03	Absorbents, filter materials, wiping cloths (e.g. rags, wipes) and protective clothing other than those mentioned in 15 02 02	9
16	Wastes not otherwise specified	
16 81	Waste resulting from accidents and unplanned events	
16 81 01*	Wastes exhibiting hazardous properties	0.5
16 81 02	Wastes other than those mentioned in 16 81 01	0.5
17	Wastes from construction, renovation and demolition of construction works and road infrastructure (including excavated soil from contaminated sites)	
17 04	Waste and scrap metal and metal alloys	
17 04 01	Copper, bronze, brass	23
17 04 11	Cables other than those mentioned in 17 04 10	23
20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
20 01	Separately collected fractions (except 15 01)	
20 01 01	Paper and cardboard	4
20 01 02	Glass	4
20 01 08	Biodegradable kitchen and canteen waste	8
20 01 29*	Detergents containing hazardous substances	2
20 01 30	Detergents other than those mentioned in 20 01 29	4
20 01 33*	Batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing these batteries	4
20 01 34	Batteries and accumulators other than those mentioned in 20 01 33	4
20 01 35*	Discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components	20
20 01 36	Discarded electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	20
20 03	Other municipal wastes	
20 03 01	Mixed municipal waste	4

The waste and sewage generated during the operation phase will be properly stored and secured on vessels, in accordance with a pollution prevention plan in force on each of them, drawn up in accordance with the requirements of the Act of 16 March 1995 *on the prevention of sea pollution from ships* (Journal of Laws of 1995, No. 47, item 243 as amended). In ports, waste and sewage will be transferred to port reception facilities and handled in accordance with the applicable ship-generated waste and cargo residues management plan [Regulation of the Minister of Infrastructure of 21 December 2002 *on waste and cargo residues management plans for ports* (Journal of Laws of 2002, No. 236, item 1989, as amended)].

3.4.3.1.2 Power, raw materials and water demand

In the operation phase, the demand for power will result exclusively from the planned maintenance works for the EXC BC-Wind OWF offshore part. As in the construction phase, the consumption of fuel will be mainly determined by the type and intensity of the work carried out, the size of wave motion as well as the strength and direction of wind, which affect the method of vessel manoeuvring as well as the load of power engines. Since at this stage, the vessels that will take part in the project implementation as well as the weather conditions in which the servicing work will be carried out are not yet known, it is also impossible to estimate the quantity of fuel which will be consumed by the vessels in the operation phase. Table 3.13 contains the average fuel consumption values for vessels of various sizes per operation hours, which gives a certain idea about the amount of fuel consumption during the servicing works.

In the operation phase, water will be used for the everyday needs of the service vessel crews. The drinking water tanks will be refilled during port stopovers. After use, the water is stored in waste water tanks and handed over for treatment during the next port call.

3.4.3.1.3 Electromagnetic field (EMF)

The operation of the power cables will involve the generation of an electromagnetic field. Cable structure – steel wire reinforcement significantly reduces the range and power of the EMF, however, does not eliminate it completely. Eddy currents induced by an AC magnetic field in highly conductive protective materials will create an opposite magnetic field vector and will further increase the partial elimination of the magnetic field from the cable. In order to significantly reduce the impact of EMF on the marine environment, it is planned to bury the cable in the seabed sediment along its entire route up to a maximum depth of 4 m. The EMF intensity decreases with the distance from the conductor. As the analyses have shown, in the case of AC EHV export cables, already at a distance of approx. 1.5 m from the cable, the EMF intensity levels are negligible in the context of the impact on the marine environment. The burying of a cable at this depth or greater will neutralise the impact of EMF on the benthic and pelagic marine organisms sensitive to EMF.

3.4.3.1.4 Heat dissipation of power cables

According to Joule's law, electric current flowing through a cable causes it to heat up as a result of power losses on the resistance. As the temperature of the cable increases above the ambient temperature, the transfer of heat from the cable to the surrounding environment commences. An accurate quantification of the heat emitted is difficult because of the following phenomena: heat radiation, conduction and convection, subject to different physical laws. The heating of sediments may lead to a change in the taxonomic composition of the benthos living on and in the seabed in the immediate vicinity of the cables. The minimum burial depth should be determined on the basis of the sediment type (their thermal conductivity) and the type of power grid (size and type of loads, thermal characteristics).

3.4.3.2 ONSHORE AREA

The operation phase of the underground cable line is a maintenance-free process. Due to the necessity to ensure access to the underground cable infrastructure, a permanent exclusion from forestry use in a strip of land with a width of approximately 22 m along a predominant section of the cable line as well as in a 70 m radius within the transition joint bay area and the exit of the directional drilling borehole within the archaeological area. This necessity is due to the risk of cables being damaged by the root systems and their possible failure. In this context, the access to transition joint bays as well as joint stations will be ensured.

The surface area of land occupied by the underground cable line during operation will be around 14.5 ha.

During the power connection operation phase, the servicing work will be carried out, which will be detailed at a later stage of the project.

The visual inspections of cable lines constitute a part of the periodic technical condition assessment conducted for the purposes of meeting the requirements of the power grid maintenance standard and are conducted visually. During the visual inspections of cable lines, special attention will be paid in particular to:

- the presence and condition of cable line markings and warning signs;
- the condition of the line routes and their surroundings;
- the condition of cable circuits;
- the condition of systems inside the cable circuits;
- the condition of transition joint bays (concrete slabs, flooding, backfilling with soil, storage of materials on manholes and the condition of bulkheads and firewalls);
- the technical condition and corrosion protection of the supporting structures of the cable lines in the circuits and external areas;
- the condition of the visible cable protection sheaths, including corrosion protection sheaths;
- the condition of cable sheaths protecting against mechanical damage and protections against the water infiltration;
- the condition of cable heads (fractures, leakages of the cable compound or oil, impregnant or oil level);
- the condition of earthing wire connections and cable terminals at heads;
- the condition of the overvoltage and shock protections by assessing the condition of the earthing conductors and terminal connections;
- whether there are no excavations near the cable line routes and whether large and heavy elements are not stored along the cable line routes, which could inhibit the access to the cable or induce its damage as a result of pressure of the elements possibly stored on the ground;
- the condition of the information and warning messages and markings, as well as their compliance with the technical documentation of the cable line.

The cable line inspections constitute activities included in the scope of the operation activities that are a set of technical procedures resulting from the assessment of the technical condition, aimed at maintaining the cable lines and associated facilities in a proper technical condition. The dates and scopes of inspections of individual cable lines of the distribution grid should result from the conducted technical condition assessment of the line preceded with a visual inspection. On the basis of the technical condition assessment, the maintenance and overhauls of the cable network are carried out.

In the case of an underground cable line failure, the framework schedule of activities involves the following:

- tracking the damaged cable section and determining the type of damage;

- removing the damaged cable section (if the repair on site is impossible, e.g. insulation breakdown);
- cable repair, including cable jointing and laying underground.

In the case of minor mechanical damage, it is possible to repair the cable with no need to replace the entire section thereof. The work site for repairing the cable line will be prepared in such a way that the adopted repair technology is protected against the impact of harmful external factors, such as dirt, dust, vapours, and precipitation.

To reduce the failure frequency of the cable line, the cables will be buried in the soil at a depth of approximately 1.4 m (excluding the areas, in which the cable will be laid in casing pipes at greater depths), covered with protective slabs and labelled with marking bands.

The ONS will be operated by the technical personnel 24/7 on a shift basis. The standard time of the presence of the same people on the premises of the ONS should not exceed 4 hours per day, whereas in emergency situations, this time may be extended in accordance with the relevant provisions. Regular inspections and maintenance are envisaged as part of the ONS operation.

3.4.3.2.1 Waste and waste management

Table 3.18 contains the predicted maximum quantities and types of waste generated as a result of the ONS operation. The waste names and codes are compliant with the Regulation of the Minister of Climate of 2 January 2020 *on the waste catalogue* (Journal of Laws of 2020, item 10). During the operation phase of the proposed project, minor amounts of waste will be generated as a result of the operation of the substation. The operation of cable lines will not involve the generation of waste.

Table 3.18. Compilation of the maximum quantities of waste estimated to be generated within one year of operation during the operation phase in the onshore part [source: internal materials]

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
08	Wastes from manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks	
08 01	Wastes from the manufacture, formulation, supply and use (MFSU) and removal of paint and varnish	
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances	<0.04
08 01 17*	Wastes from paint or varnish removal containing organic solvents or other hazardous substances	<0.04
13	Oil wastes and wastes of liquid fuels (except edible oils, and those included in groups 05, 12 and 19)	
13 02	Waste engine, gear and lubricating oils	
13 02 05*	Mineral-based non-chlorinated engine, gear and lubricating oils	0.02
13 02 07*	Readily biodegradable engine, gear and lubricating oils	<0.04
13 05	Oil/water separator contents	
13 05 02*	Sludges from oil/water separators	0.02
13 05 06*	Oil from oil/water separators	0.01
13 05 07*	Oily water from oil/water separators	<0.46
15	Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified	
15 01	Packaging (including separately collected municipal packaging waste)	
15 01 10*	Packaging containing residues of or contaminated by hazardous substances	0.03
15 02	Absorbents, filter materials, wiping cloths and protective clothing	

Waste code (*hazardous waste)	Waste type	Maximum quantity estimated [kg/year]
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths (e.g. rags, wipes), protective clothing contaminated by hazardous substances (e.g. PCB)	<0.05
15 02 03	Absorbents, filter materials, wiping cloths (e.g. rags, wipes) and protective clothing other than those mentioned in 15 02 02	0.10
17	Wastes from construction, renovation and demolition of construction works and road infrastructure (including excavated soil from contaminated sites)	
17 01	Waste materials and building elements as well as road infrastructure (e.g. concrete, bricks, tiles and ceramics)	
17 01 01	Waste concrete and concrete rubble from demolitions and renovations	0.03
17 01 07	Mixed waste from concrete, brick rubble, ceramic materials and elements of equipment other than those listed in 17 01 06	0.01
17 02	Wood, glass and plastic	
17 02 01	Wood	0.02
17 04	Waste and scrap metal and metal alloys	
17 04 01	Copper, bronze, brass	0.02
17 04 05	Iron and steel	0.02
17 04 11	Cables other than those mentioned in 17 04 10	0.02
17 09	Other construction and demolition wastes	
17 09 03*	Other construction and demolition wastes (including mixed wastes) containing hazardous substances	<0.02
20	Municipal wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions	
20 01	Separately collected fractions (except 15 01)	
20 01 36	Fluorescent tubes and other mercury-containing waste	0.03
20 03	Other municipal wastes	
20 03 01	Mixed municipal waste	0.03

During the Onshore Substation operation, typical process waste is not generated, however, the station is the source of a small amount of waste generated only during its operation. This means that small quantities of both hazardous and non-hazardous waste will be generated during the operation phase of the substation. This will include waste generated from normal operation of the facility as well as waste generated from periodic maintenance and repair work. The amount of waste generated during the operation phase will be significantly smaller than during the construction phase. All waste generated at the operation stage will be stored selectively. Hazardous waste will be collected in tightly closed and specially labelled containers, in a designated place, protected from access by unauthorised persons. Such waste will be transferred to specialist companies dealing with waste management, disposal or recycling.

3.4.3.2.2 Power, raw materials and water demand

During the underground cable line operation phase, there will be no need for water, raw materials, other materials, fuels, nor energy. As a result of the Onshore Substation operation, the power demand will be satisfied internally by means of MV/0.4 kV transformers, external back-up supply by means of MV lines, emergency supply internally by means of a power generator. Heat supply will be satisfied by means of electric heaters powered from the station auxiliary system.

Water will be supplied from the nearest water supply system or local water intake located in the ONS premises. The station will be equipped with a holding tank or connected to a sewage system. A

maximum of 4 people are assumed to stay on the ONS at any one time, hence the water demand for the everyday needs will be up to approx. 240 dm³ per day.

3.4.3.2.3 Electromagnetic field (EMF)

The underground cable line is a source of an EMF, which in certain situations, at significant values of the intensity of individual field components, may unfavourably affect the environment and the health of people. An optical fibre line which is not a source of electromagnetic radiation will be laid together with the cables. Electric fields with significant intensities are mainly generated by high-voltage system elements, whereas, the magnetic field component reaches relatively high values in the vicinity of high-current circuits. High-voltage power cables, due to the presence of the screening sheaths of a cable phase wire, are not a source of magnetic field, since the electromagnetic field normal (radial) component – the only one present in the cable – disappears completely as a result of the presence of a semiconductive screen surrounding the phase wire, copper or aluminium as well as the presence of a conductive screen surrounding the electrical insulating sheath. As a result, estimations of the electric field component outside the cable are not based on any theoretical grounds. On the other hand, the electricity flowing through the cable core is the source of electromagnetic field of relatively high values. The value of this field, usually designated above the cable line, is greatly influenced by the depth of the cable line burial underground as well as the distances between individual cores (phases) constituting a common electrical circuit (cable supply circuit).

Similarly, as for the offshore part, in order to significantly reduce the impact of the EMF on the terrestrial environment, it is planned to install the cable line in trenches with a depth of approximately 1.4 m. Due to differences in topography (e.g. dunes), the depth of cable burial may exceed 2 m at some points, whereas for a HDD borehole, it may reach a maximum of 50 m.

The cable lines will meet the requirements specified in the Regulation of the Minister of Health of 17 December 2019 *on permissible levels of electromagnetic fields in the environment* (Journal of Laws of 2019, item 2448).

During the operation phase, the Onshore Substation will also be a source of the EMF, since electric and magnetic fields are generated inside it by the high-voltage systems and current circuits.

When analysing the electromagnetic hazards, the impact of the 400 kV power line section that connects the customer substation with the PSE substation was taken into consideration.

3.4.3.2.4 Heat dissipation from power cables

The thermal capacity of the conductors and the related rules for protecting the conductors against overloads and short circuits are related to the temperature increases permissible under the specified conditions of use, and these, in turn, are related to the values of the initial and final temperatures, characterising the process of conductor heating. The size of thermal emission that is generated by the cable lines depends on their arrangement method as well as the soil thermal resistivity and the cable backfill material used. The flat formation, which will be used as part of the proposed project, is characterised by more favourable conditions of heat dissipation to the soil, which enables the individual circuits to be arranged closer to one another, and as a result, a narrower strip of land to be occupied.

To ensure the best conditions for cable heat dissipation into the environment, the cable lines will be arranged along their entire length in the immediate vicinity of the bentonite.

3.4.3.2.5 Noise emission by the ONS

The operating HV power substation is characterised by an increased level of noise generated mainly by autotransformers as well as, to a smaller extent, by the corona effect from the busbar systems. The

level and propagation conditions of the noise generated are affected by the condition of the environment, and in the case of a corona effect, the atmospheric conditions.

Numerous results of the noise measurements conducted on the 400 kV upper voltage power substations indicate that the level of the noise emitted from the substations is constant; whereas, the noise of low-level, originating at the substation bus bar systems depends, to a large extent, on the atmospheric conditions.

For the purposes of the impact assessment, an analysis of the environmental sound level emitted by the ONS was carried out. Its results are included in Appendix 3 to this EIA Report.

3.4.3.2.6 Fire-fighting

In view of the possibility of implementing a fire extinguishing system using CO₂, nitrogen or other gas, the project will also qualify under the above-mentioned Regulation. At this stage of the project planning, a fire extinguishing system using water or CO₂ or nitrogen or other extinguishing gas is being considered. This will be serviced and, if necessary, supplemented by an external company.

3.4.4 Decommissioning phase

The operation of the EXC BC-Wind OWF will be terminated as a result of the BC-Wind OWF decommissioning. In the context of transmission infrastructure, two scenarios are possible after the termination of operation:

- deactivation and non-removal of power cables from the environment – in this scenario, the buried power cables will remain in the seabed sediment or in the soil. This is a common practice of handling decommissioned power and telecommunication cables. It is aimed at preventing the occurrence of negative environmental impacts, the scope and strength of which could exceed the impacts generated during the construction phase, for example, due to the necessity to use mass flow excavators (MFE) in order to uncover the cable lines in the offshore area, which causes high water turbidity as well as re-sedimentation [173].
- deactivation and removal of power cables from the environment – in this scenario, power cables will be recovered from the seabed or soil in whole or in part, and recycled in accordance with current legislation.

In the case of the Onshore Substation, two scenarios are also possible:

- dismantling;
- further functioning within the NPS, including after its possible modernisation.

The final decisions concerning the implementation of the scenarios will be made at the end of the assumed operation phase and will involve the legislation and other industry regulations in place at that time as well as agreements with the Transmission System Operator. They will also be preceded by analyses the objective of which will be to assess the economic and environmental impact in the context of possible investment expenditures.

3.5 Risk of major accidents or natural and construction disasters

3.5.1 Types of accidents resulting in environmental contamination

Pursuant to Article 3(3) of the Act of 27 April 2001 *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), a major accident is “an event, in particular an emission, fire or explosion happening during industrial process, storage or transportation, in which one or more dangerous substances are involved, resulting in an immediate threat to human life or health, or threat to the environment, or a delayed occurrence of such a threat.”

The proposed project will not be a place of storage of substances determining the project classification as a plant with an increased or high risk of a serious industrial accident pursuant to the Regulation of the Minister of Development of 29 January 2016 *on the types and quantities of hazardous substances present in the industrial plants, which determine the plant classification as a plant with an increased or high risk of a serious industrial accident* (Journal of Laws of 2016, item 138).

The main environmental hazards that can be encountered during the EXC BC-Wind OWF construction are spills of petroleum products, mainly diesel and hydraulic oil as well as greases from vessels, and diesel, transformer oil from systems of the power substation. To a lesser extent, the marine environment may incidentally be threatened by other materials containing hazardous substances, e.g. sulphur hexafluoride (SF₆) used in gas-insulated switchgears as well as ethylene glycol used in cooling equipment of power transmission loss reduction systems. An example of the content of hazardous substances used in a modern power substation with a capacity of approx. 400 MW is shown in Table 3.19.

Table 3.19. Example of the content of oil substances and other hazardous substances in the offshore substation [source: internal materials]

Types of hazardous substances	Working volume (t)	Lifespan [years]	Volume of substance to be replenished – annually [m ³]	Volume of substance – life cycle [m ³]
Transformer oil	80 000–100 000	25–35	3200–4000	volume (mass) remains unchanged
Diesel oil for supplying the emergency generators of the power substation	30 000	25–35	replenishment, if necessary	
Sulphur hexafluoride (SF ₆) for gas-insulated switchgears	800–1000 kg	25–35	replenishment up to 1%	
Ethylene glycol used in cooling equipment of power transmission loss reduction systems	40 000–50 000	25–35	not replenished	

During the operation phase, the main cause of marine pollution can be the oil spills originating from service vessels; however, it should be remembered that the scope of service work associated with the connection infrastructure is minimal. Vessel traffic associated with cable line inspections both within open sea waters and close to the shore can be considered negligible. Contrary to this, in the event of a failure resulting in the need for major cable repair or replacement, any offshore operations involving more than one vessel should be treated in the same way as for the construction phase.

In order to mitigate this risk, all vessels involved throughout the project will meet the requirements and will comply with the regulations resulting from the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), including in particular the procedures contained in the Shipboard Oil Pollution Emergency Plans or, in the case of other substances, in the Shipboard Marine Pollution Emergency Plans for Oil and/or Noxious Liquid Substances. It should be mentioned here that in compliance with the Maritime Safety Act, the Project Owner is obliged to have a Plan for Combating Risk and Pollution for the offshore wind farm and the complex of facilities understood in the act as connection infrastructure. This plan applies to all phases of the Project life cycle, is subject to regular update and must be approved by the territorially competent director of the maritime office before the building permit is obtained.

The extent of oil pollution can be classified as follows:

- **Tier I** – small spills of petroleum products that do not require the intervention of external forces and resources and are possible to be removed with own resources. These spills are of local character, their removal does not pose particular technical difficulties and they do not pose a significant threat to the marine environment. A typical example of Tier I pollution emission is a diesel oil spill from a small service vessel in a maximum amount of 1 m³;

- **Tier II** – spill of petroleum products, the scale of which requires coordinated counteractions involving the participation of external forces and measures. The decision to mobilise external force is taken by the Project Owner/Contractor/Manufacturer in accordance with their plan for combating risk and pollution or by the Director of the Maritime Office in Gdynia, who makes the decision on the scale of counteraction required. A typical example of Tier II pollution emission is a diesel oil spill from a large installation vessel in a maximum amount of 200 m³;
- **Tier III** – spills of petroleum products that are extremely dangerous to the environment, the combating of which requires forces and measures available within the National Plan for Combating Risk and Pollution of the Marine Environment. Tier III case requires the use of a second vessel, not related to the execution of the EXC BC-Wind OWF installation work, which transports significant amounts of oil as cargo (tankers) or bunkering oil (large commercial vessel).

3.5.1.1 Spill of petroleum products during normal operation of vessels and in an emergency situation

Normal operation of vessels does not cause emissions of petroleum substances (grease and diesel oils).

During the construction and operation of the EXC BC-Wind OWF (the decommissioning phase does not involve any activities), a spill of petroleum product may occur, the consequence of which will be water, seabed sediment, and coast contamination. A spill can occur as a result of a failure or collision of vessels, their sinking, fire or grounding. In the worst-case scenario, during the construction stage, Tier III spills will occur. Information on the probability of navigational incidents will be obtained from the navigational expertise required under the Maritime Safety Act.

Currently, there is no detailed data on the probability of collision along the EXC BC-Wind OWF route. The calculations conducted for the transmission infrastructure of the Baltica 2 and Baltica 3 OWFs, for which the connection location is in part parallel to the EXC BC-Wind OWF, indicated that the recurrence period of vessel collisions is:

- for the nearshore zone – 496 483 years
- for the zone with the maximum traffic intensity – 216 232 years

We are therefore dealing with a frequency of events described as extremely rare.

From the environmental point of view, the most sensitive areas in the case of possible spills will be the coastal area approximately between Łeba in the west and Góra in the east. Considering the prevailing westerly wind direction and the occurrence of coastal currents, the areas at risk are the coastal strip with tourist resorts (Lubiatowo, Białogóra, Dębki and Karwia) and the harbours in Dębki and Karwia.

The areas particularly vulnerable to the potential pollution are the conservation areas including the areas belonging to the NATURA 2000 network of protected areas [355].

It should be highlighted that it is not so much the size of the spill that is crucial here, but also the type of oil substance, the environmental conditions and the location where it originated. There are known cases of high bird mortality due to small oil spills into the sea. Extensive oil spills drifting away from the coasts, on waters with very low numbers of birds, do not cause as much loss in populations as smaller spills in areas of high concentration of seabirds. The area of the planned EXC BC-Wind OWF runs through the Natura 2000 site *Przybrzeżne wody Bałtyku* PLB990002, where large concentrations of wintering birds occur periodically. It should be emphasised, however, that in case of diesel oil spills, the dispersal of oil derivative substances threatening the protected areas and the objects of protection in those areas is very unlikely, providing that planned organisation of prevention and counteraction is ensured.

The determination of the actual extent of spillage is possible only during the event, on the basis of the current meteorological data and the data on the type and potential quantity of the contaminant, appropriate modelling of the movement of the substance and determination of the extent and spill is carried out. Therefore, at this stage of the project implementation it is not possible to make a more detailed assessment of the spread of contamination, particularly in the nearshore zone. It is also not possible to assess the impact on organisms that are most vulnerable to the effects of oil spills, as such studies are carried out in relation to actual pollution incidents, and there have been none in the survey area.

Assuming the worst-case scenario and the release of 200 m³ of diesel fuel into the marine environment as a result of a failure, as well as taking into account its type, behaviour in seawater, the time of oil dispersion and drift, it is estimated that the extent of pollution will not exceed 5 to 20 km from the EXC BC-Wind OWF development area, however, the level of contamination with a maximum extent will be minimal. On the basis of the Plan for Combating Risk and Pollution for the Offshore Wind Farm and the BC-Wind OWF complex of facilities, "The contamination level of the surface of sea areas is specified by determining the concentration of hydrocarbons in a given volume of water. Quick spreading of the oil slick and other phenomena that reduce its mass (evaporation and dispersion) cause the concentration of the contaminant to decrease significantly. For a 200 m³ MGO spill, the hydrocarbon concentration calculations are:

- first day: 4–8 ppm;
- second day: 2–6 ppm;
- third day: 1–3 ppm."

3.5.2 Other types of releases

3.5.2.1 Release of municipal waste or domestic sewage

During the construction of cable lines, waste will be generated aboard vessels – mostly municipal and other waste, not related to the construction process directly – as well as domestic sewage [Sections 3.4.2.1.3, 3.4.3.1.1]. Waste and sewage can be accidentally released into the sea, e.g. during collection by another vessel and in the case of failure, causing local increase of nutrient concentration and the deterioration of water and sediment quality.

It is estimated that the possible occurrence of the above-mentioned releases will not affect the structure and functioning of groups of marine organisms in the area of the project, nor will it contribute to their increased mortality.

3.5.2.2 Gas emissions to the atmosphere

A failure of the Onshore Substation may result in emissions of gases used as refrigerants in air conditioning systems. Some of the 400 kV and 220 kV or 275 kV switchgear devices can be insulated with SF₆ gas, which is used as an insulating medium in the MV and HV apparatus, and as a result, there is a potential risk that gas could be released into the atmosphere in an emergency situation. Moreover, there may be exhaust emissions from power generators used at the substation.

With regard to the prevention of failure effects, the following measures are envisaged:

- in the case of transformers, autotransformers, and reactors – the use of leakproof oil pits connected to a runoff treatment system (oil separation);
- in the case of batteries – the use of trays or pans to contain the electrolyte in the event of spillage.

The release of insulating gases to the atmosphere will be prevented thanks to automatic gas density monitoring. If the sensors detect a drop in the gas density below a permissible level, the control system of the switchgear is locked.

The station will be equipped with a portable kit of sorbents and agents designed to handle the hazardous substances spilled and leaking – appropriate to the size of the facility and the number of devices containing such substances.

3.5.2.3 Contamination of water and seabed sediments with antifouling agents

In order to protect ship hulls against fouling, biocides are used, the composition of which may include for example: copper, mercury and tributyltin compounds (TBT). These substances can transfer into water and eventually be retained in the sediments. It should be assumed that emissions of these compounds will be insignificant. Among the substances listed, organotin compounds are the most harmful (toxic) to aquatic organisms. Currently, the usage of tributyltin (TBT) (the most harmful substance) in antifouling paints is prohibited. However, the presence of these compounds cannot be excluded in the protective coatings of older vessels. This impact can be reduced by controlling the type of protective coats applied on vessels that will be used to perform activities during the construction and operation phases.

It is estimated that the possible occurrence of the above-mentioned releases will not affect the structure and functioning of groups of marine organisms in the area of the project, nor will it contribute to their increased mortality.

3.5.2.4 Release of contaminants from anthropogenic objects on the seabed

It cannot be excluded that during the preparatory work for the EXC BC-Wind OWF construction process, and especially during the seabed surveys on the occurrence of UXOs and chemical weapons, man-made objects can be discovered, the disturbance of which could result in the release of contaminants contained therein (e.g. containers with chemicals or unexploded ordnance). During the geophysical surveys conducted in the years 2020–2021, the EXC BC-Wind OWF development area was inspected for the presence of man-made objects on the seabed, including packaging and containers that could contain hazardous chemical substances, and no such objects were found within the area. Before the commencement of the construction, the Project Owner will conduct detailed surveys on the presence of unexploded ordnances (UXO) on the seabed. In case any chemical warfare agents/UXOs are found during these surveys, the Project Owner will notify the relevant authorities and institutions of that, and will comply with their instructions. In order to determine the way of dealing with such finds, the Project Owner will prepare a plan for handling dangerous objects, both from the point of view of operational work at sea (for example, rules for conducting work in the vicinity of potentially hazardous objects) and from the point of view of possible removal or avoidance of the locations of such objects. The basic assumption of the plan for dealing with dangerous objects is to avoid threats to human life and health and to avoid the spread of contaminants from such objects.

The Project Owner has already carried out a preliminary study of the UXO documentation on the basis of historical data together with a preliminary inventory and assessment of the risks posed by UXO – ORDTEK company. A UXO risk management plan is being developed, which each contractor will be required to implement.

3.5.2.5 Release of drilling fluid to the sediments or soil

During HDD drillings, both in the coastal zone and in the onshore area, drilling fluid can penetrate the seabed sediments or the soil. In most cases, the drilling fluid is a mixture of water and bentonite along

with drilling fluid additives. The selection of suitable additives will depend primarily on the geological structure at the drilling sites. Bentonite and suitable drilling fluid additives used should have the relevant attestation, so there can be no question of toxicity or environmental risk. However, it should be remembered that the exact environmental impact of high-performance bentonites (with polymer additives) has not been thoroughly investigated [278]. To prevent the drilling fluid release into the environment, it is necessary to carefully select the geological parameters depending on the geological conditions at the work site. An important element in minimising the risk of drilling fluid escaping from the borehole is to maintain a high technological level during drilling, by cleaning the borehole, controlling fluid pressure and controlling the friction phenomenon in the borehole [197].

3.5.3 Environmental threats

3.5.3.1 Construction phase

On the basis of the data obtained from other projects implemented in offshore areas and similar undertakings, as well as the authors' knowledge and experience, the following potential environmental threats, which may become a source of negative impact on the environment, have been identified for the construction phase:

- spill of petroleum products as a result of collision of ships in an emergency situation;
- accidental release of municipal waste or domestic sewage;
- accidental release of chemicals;
- contamination of water and seabed sediments with antifouling agents;
- accidental release of drilling fluid into the environment.

As a direct result of emergency situations and incidents, the abiotic environment, especially seawater and to a lesser extent, seabed sediments can become contaminated. On the other hand, these events can also indirectly affect living organisms, those inhabiting or otherwise using the seabed, water depth and the surface of the sea. The contamination of water or seabed sediments with municipal waste or domestic sewage is a direct negative impact, temporary or short-term, reversible and of local range. The scale of the impact is negligible.

The collision of ships (as a result of an emergency situation) and the resulting release of hazardous substances into the environment (especially petroleum product) is a factor which can cause increased mortality and diseases of marine organisms, including those that are subject to protection in such areas. The likelihood of such events can be considered small.

In the onshore part, during the construction phase of the proposed project, the potential accidents may be related to the incidental pollution of soil caused by hazardous substances originating from the spills from vehicles and equipment involved in the construction works, which may lead to local soil contamination. When analysing potential hazards consisting in contamination of soil by petroleum products from damaged machines and vehicles, it should be noted that the impact of this kind may only be of short-term character (even momentary) and actually one-off in terms of occurrence frequency. In such cases only small quantities of pollutants may be released to the environment and the spatial range of such impacts should be considered spot-like.

3.5.3.2 Operation phase

During the operation of the EXC BC-Wind OWF, threats to the marine environment may result from the contamination of water and, to a lesser extent, sediments with:

- oil derivatives;
- antifouling agents;
- accidentally released municipal waste and domestic sewage;

- accidentally released chemicals.

Waste and sewage may be generated by people on service vessels, periodically performing inspections of the EXC BC-Wind OWF.

The impacts caused by the occurrence of emergency situations during the operation phase are partially identical to those which may occur during the EXC BC-Wind OWF construction phase. Only the aspect regarding the accidental release of chemicals and waste is slightly different. Periodic inspection of the cable lines will be carried out during the operation of the EXC BC-Wind OWF. The possibility of small quantities of waste or operating fluids being accidentally released into the sea cannot be excluded. It is estimated that the possible occurrence of the above unexpected random incidents will not affect the structure and functioning of marine organisms in the project area, nor will it cause their mortality.

During the operation, harmful chemical substances may leak into the environment as a result of breakdowns of vessels involved in the project service, i.e. mainly fuels, motor oils or hydraulic fluids. Their impact on marine organisms can be an important pathogenic factor and result in increased mortality. However, the likelihood of such events can be considered low. The implementation of a proper plan of action in case of collisions and spills aims to limit the impact of such events. The threat from this event can be considered negligible.

Cable lines buried in the seabed sediment and soil – as opposed to those laid on the seabed without protection as well as overhead lines – are less exposed to adverse environmental factors, but their potential damage is usually permanent and their repair is more expensive and time-consuming. It should be noted, however, that the failure rate of underground cable lines is extremely low, considerably lower than that of overhead lines. The following cable line failures can be distinguished:

- simple: single-, two- and three-phase earth faults; one-, two- or three-phase interruptions and transient short circuits;
- complex: including two or more simple failures e.g. a single-phase short circuit with a simultaneous phase break.

Two types of causes of cable line damage are distinguished:

- external: all damages that arise as a result of other human activities (e.g. earthwork on land, and anchoring of vessels at sea as well as the use of active bottom-set fishing gear in the location of the cable line laying) and random incidents (sinkholes, ground settlement, damage caused by animals, etc.);
- internal:
 - design errors and technological defects not found upon acceptance,
 - incorrect installation and assembly errors,
 - electrical, including partial discharge,
 - ageing, material fatigue,
 - inadequate protection of lines against atmospheric overvoltage and switching electromagnetic pulses,
 - inadequate protection of lines against overcurrents (increase of electric current in the circuit above the permissible value),
 - inadequate protection of lines against corrosion.

Most often, damage to cable lines occurs as a result of a process consisting of many aspects occurring in succession. According to literature, electrical causes account for the largest proportion of failures (approx. 40%). These usually include switching electromagnetic pulses and overcurrents. Non-selective operation of the protection automation during a short circuit can cause thermal damage to the cable in many places [Figure 3.17], making fault location difficult and increasing the failure repair time.

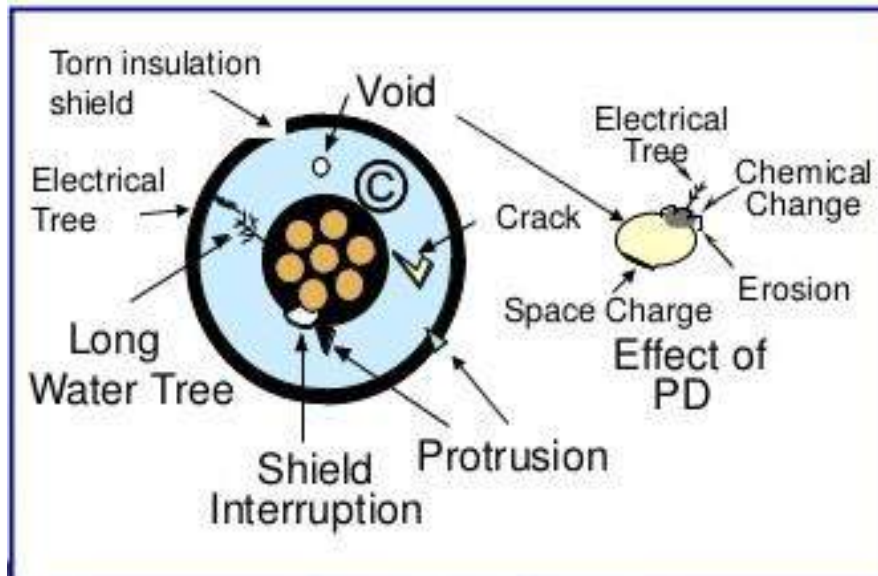


Figure 3.17. Examples of power cable defects [source: http://www.kee.agh.edu.pl/EUI/pdf/2007/EUI2007_49.pdf]

During the operation phase, the substation will emit an EMF and the noise resulting from the operation of the (auto)transformers and high-power reactors and, to a much lesser extent, the corona discharge. As a result of a failure, an additional emission of gasses to the atmosphere may occur (flue gases from the power generator activated in emergency situations, leaks of cooling agent from the cooling system or leaks of SF6 insulating gas). There is also a risk of electrolyte leakage, fire extinguishing agents and the power generator fuel. Additionally, as a result of a double failure – a leak in the transformer or reactor tank and a leak in the oil sump – a leakage of oil to the soil may occur, as a result of which the soil and surface waters may become contaminated.

3.5.3.3 Decommissioning phase

During the EXC BC-Wind OWF decommissioning phase, two scenarios are possible. The first one involves deactivation of the transmission infrastructure and leaving the cables in the environment. There are also no plans to disassembly the 400 kV cable line Onshore Substation. The implementation of this scenario will not involve environmental hazards.

In the case of the second scenario, which involves partial or total removal of cables from the environment, hazards similar to the hazards identified for the construction phase can occur, which result mainly from the involvement of vessels or vehicles and devices in that phase.

3.5.4 Failure prevention

Failure prevention covers a comprehensive range of activities related to the protection of human life and health, the natural environment and property, as well as the reputation of all participants in the processes related to the construction, operation and decommissioning of the EXC BC-Wind OWF. Due to the nature of the EXC BC-Wind OWF installation works, the greatest potential environmental impacts and risks from failures are associated with works carried out in the sea area. In order to eliminate or minimise such risks various actions will be taken, including among others:

- developing plans for the safe construction, operation and decommissioning of the EXC BC-Wind OWF in accordance with the applicable legal regulations for the duration of the project implementation;
- developing rescue plans and training of crews and personnel, including the principles of updating and verification by conducting regular exercises, in particular determining the procedures for the use of own vessels and external vessels, including helicopters;

- developing a plan for counteracting hazards and pollution arising from the construction and operation of the OWF which covers part of the EXC BC-Wind OWF;
- selecting suppliers as well as certified parts and components for the purpose of the EXC BC-Wind OWF;
- accurate marking of the EXC BC-Wind OWF area, its facilities and vessels moving within the area;
- planning offshore operations;
- applying the standards and guidelines of the International Maritime Organization (IMO), recognised classification societies and maritime administration recommendations;
- developing plans of safe navigation in the construction phase;
- providing adequate navigational support in the form of maps and navigational warnings;
- providing direct or indirect navigational supervision using a surveillance vessel or remote radar surveillance and Automatic Identification System (AIS);
- continuous monitoring of vessel traffic regarding the vessels involved in the construction and operation phase;
- establishing a coordination centre supervising the respective phases of project implementation;
- maintaining regular communication lines between the EXC BC-Wind OWF coordination centre and the coordinator of works at sea and other coordination centres (Maritime Rescue Coordination Centre in Gdynia and maritime administration).

The likelihood of a major accident in the onshore part of the EXC BC-Wind OWF is lower than in the offshore section. In the event of a need to remove an accidental oil spill from vehicles and equipment involved in construction works, construction and maintenance crews will be equipped with sorbents to absorb oil-derived substances and construction workers will be required to permanently remove any small spills they notice. The used sorbents will be collected and handed over for recovery or neutralisation by specialised companies. Such companies must have appropriate permits in accordance with the provisions of the Waste Act.

During the operation phase of the substation, in order to reduce system failure rates if transformers, autotransformers, and reactors are used, the substation will be equipped with oil pits connected to a runoff treatment system. Regular maintenance and servicing are intended to prevent failures.

Such situations involving equipment failures in substations are extremely rare, of low scale and are local in terms of impact. In the event of a failure, procedures are in place to limit the consequences by locating the site of the failure and controlling it as quickly as possible in order to secure the uninterrupted operation of the substation.

During the substation operation, a periodic inspection of the technical condition of equipment will be carried out to detect irregularities and prevent technical failures that could cause adverse environmental impacts.

To prevent possible emissions of gas to the atmosphere from the SF6 gas-insulated switchgear, automatic gas density control will be used. If the sensors detect a drop in the gas density below a permissible level, the control system of the switchgear is locked.

Design, technological and organisational security mainly relies on carrying out navigational risk assessments and developing prevention plans against:

- threats to human life – evacuation plans, search and rescue plans;
- fire risks on ships involved in the construction and operation phases;
- environmental pollution risks – action plan for counteracting hazards and contamination from oil spills by ships involved in the construction and operation phases.

3.5.5 Potential causes of accidents including extreme situations and the risk of natural and construction disasters

In the case of the offshore area, the greatest potential risks will occur during the construction phase; however, the risk of a disaster is minimal due to the fact that the planning of offshore operations always takes into account weather conditions and the possibility of their change. Every offshore operation has its limitations in terms of visibility, wind speed, sea state or ambient temperatures. Adverse weather conditions such as too strong wind or too high waves can only result in the extension of the construction cycle and an increased demand for energy – fuel consumption. The nature of the project – after the laying of cable lines – also excludes the possibility of a construction disaster in the sea area.

In the operation phase, damage to the underground cable line may be caused by seismic shocks and landslides, i.e. as a result of a natural disaster within the meaning of the Act of 18 April 2002 *on the state of natural disaster* (Journal of Laws of 2002, No.62, item 558 as amended). However, these events are unlikely in the proposed project location. As regards seismic phenomena, the territory of Poland is classified as aseismic (no tremors) and penseismic (rare and weak tremors), where earthquakes occur rarely and are not strong.

According to the Landslide Counteracting System SOPO (<http://geoportal.pgi.gov.pl/portal/page/portal/SOPO/>), the area of the proposed project is situated beyond landslides and areas prone to mass movements. There is no flood hazard in the prevailing part of the proposed project area (<https://wody.isok.gov.pl>).

Pursuant to Article 73 of the *Construction Law* of 7 July 1994 (Journal of Laws of 1994, No. 89, item 414 as amended), a construction disaster is understood as an unintentional, sudden destruction of a civil structure or its part, as well as structural elements of scaffolding, elements of forming devices, sheet piling and excavation lining. In this context, the proposed project, due to its specificity, the location of implementation and the construction of greatest part of the power line route in the form of cable lines buried at a shallow depth, to a very small extent will be a potential source of construction disasters and hazard to the immediate surroundings, including people present there.

3.5.6 Risk of major accidents and natural or construction disasters, taking into account the substances and technologies applied, including the risk related to climate change

The risk of a major accident, natural and construction disasters is minimal. The Applicant intends to use the state-of-the-art technologies to ensure high reliability of electricity transmission and to comply with the relevant environmental and economic standards and requirements. The implementation of these tasks will be achieved through:

- the use of conductive, insulating and structural materials characterised by high operating parameters;
- selecting the most reliable and safest methods of power line construction;
- conducting maintenance operations.

The most significant risk may be related to the spills of petroleum products at sea, which can adversely affect the marine and coastal environment. With the standard preventive measures applied and the ones developed for the proposed project, the risk of such a spill will be minimal. The probability of such events as vessel collisions belongs to the category of extremely rare events (probability of occurrence 1/100 000 years) (Appendix 6 Navigation analysis for the EXC BC-Wind OWF). Taking into account the effects in the form of 200 m³ of diesel oil emission, the risk level is within an acceptable range [376]. Emission of 200 m³ of diesel oil will cause insignificant damage to the natural environment because it will disperse within a few dozen hours.

The effects of climate change observed in recent decades are manifested in particular by an increase in temperature as well as in the frequency and severity of extreme events. Under the United Nations Framework Convention on Climate Change of 9 May 1992 (422), in order to avoid the most serious threats from climate change, measures were agreed to reduce greenhouse gas emissions, which have a significant impact on the global energy balance of the climate system. In the foreseeable future, greenhouse gas emissions will not be reduced sufficiently to contain climate change. In this situation, one of the priorities, apart from mitigating the effects of climate change, is a possible adaptation to it, also in the scope of the planned undertakings.

The climate change scenarios for Poland developed for the KLIMADA project (Polish National Strategy for Adaptation to Climate Change by 2020 with the perspective by 2030 [274]) are descriptions of probable future climate conditions up to 2030. They are based on the results of hydrodynamic simulations of atmosphere and ocean models. Due to a significant level of uncertainty, they cannot be regarded as certain climate projections, but they represent the best available approximation of future change.

- Extreme events (heavy rainfall, floods, deluges, landslides, heat waves, droughts, storms, landslides, etc.) resulting from climate change are projected to increase in frequency and intensity in the future. These phenomena will occur with increasing frequency and intensity and will affect larger areas of the country [274, 405].
- Climate change is associated with adverse changes in hydrological conditions. Although the annual sums of precipitation do not change significantly, their character becomes more random and uneven, resulting in longer periods without rainfall, interrupted by sudden and heavy rainfalls.
- Impacts of climate change in the coastal zone primarily include an increase in the frequency, intensity and duration of storms. This can be accompanied by an increased irregularity of these events, i.e. long periods of relative calm can be followed by repeated storms preventing coastal regeneration.
- An additional factor accelerating the process of coastal erosion is an increase in average winter temperatures, as a result of which a reduction in the ice cover protecting the beaches from storm surges, and thereby safeguarding them against coastal erosion, should be expected. The scenarios of sea level changes demonstrate that in the period 2011–2030 the average annual sea level along the entire coast will be approximately 5 cm higher compared to the values from the reference period, i.e. 1971–1990.
- An increase in the frequency of storm floods and more frequent flooding of low-lying areas, as well as the degradation of the coastal cliffs and sea shore, which will entail a strong pressure on the infrastructure located in these areas, are very important effects of the climate change.

The power sector has been listed as one of the climate-sensitive sectors, due to the predominance of overhead lines in the Polish power system, which are highly vulnerable to failures caused by strong winds and excessive icing, as opposed to cable networks.

The planned power connection, by being buried and secured underground, will be resistant to these factors. It will also be planned in such a way so as to prevent the ingress of water and mud inside the casing pipes. The points of cable entry into protective tubes will be sealed and the cables will be protected against damage.

3.6 Relations between the parameters of the project and its impacts

The matrix of connections between the proposed project parameters and the impacts for the offshore and onshore part is presented in Table 3.20 and Table 3.19.

Table 3.20. Matrix of connections between the project parameters and impacts – offshore part [Source: internal materials]

Parameter	Type of emission or disturbance													
	Heat	EMF	Above-water noise	Underwater noise	Waste	Light effects	Seabed disturbances	Suspended solids	Resuspension of contaminants	Redeposition	Creation of an “artificial reef”	Water contamination	Air pollutions	Increased traffic and collision risk
Length and type of cables	X	X												
Method of cable line construction, construction belt width and depth of cable burying	X	X		X			X	X	X	X				
Cable laying on the seabed and their protection against damage and destruction											X			
Traffic of construction, inspection and service vessels			X	X	X	X						X	X	X
Horizontal drilling				X			X	X	X	X		X	X	

Table 3.21. Matrix of connections between the project parameters and impacts – onshore part [Source: internal materials]

Parameter	Type of emission or disturbance							
	Destruction of the ground surface – tree felling	New buildings	Noise	Waste	Sewage	EMF	Heat	Air pollutions
Cable length and number	X					X	X	
Voltage range						X	X	
Method of cable line construction, width of the permanent and temporary belts, depth of cable burying	X		X	X	X			x
ONS components		X	X	X	X	X		X
Horizontal drilling			X	X	X			X

4 COMPARISON OF THE TECHNOLOGICAL SOLUTIONS PROPOSED WITH THE TECHNOLOGICAL SOLUTIONS MEETING THE REQUIREMENTS REFERRED TO IN ARTICLE 143 OF THE ENVIRONMENTAL PROTECTION LAW

Pursuant to Article 143 of the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), the technologies used in newly commissioned systems should meet the requirements which consider, in particular:

- use of substances with a low hazard potential;
- effective generation and use of energy;
- ensuring rational consumption of water and other raw materials as well as consumables and fuels;
- use of waste-free and low-waste technologies and possibility of waste recovery;
- indication of the type, range and volume of emissions;
- use of comparable processes and methods which have been effectively applied on an industrial scale;
- scientific and technical progress.

According to Article 3(6) of the *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), "installation" shall mean:

- a stationary technical unit;
- a group of stationary technical units which are technologically linked together, being under the management of the same entity, and located on the premises of the same plant;
- structures which are not technical units nor groups thereof, the operation of which may cause emission.

4.1 Use of substances with a low hazard potential

During the project construction and operation phases, hazardous waste described in sections 3.4.2 and 3.4.3 may be produced. Such waste will be stored at designated sites in a manner which is selective and safe for people and the environment; subsequently, it will be transferred to authorised waste collectors, thus limiting the potential hazards. The Onshore Substation operation involves a risk of a leakage of electrical insulating oils and the release of SF₆ insulating gas or refrigerants from the air-conditioning system into the atmosphere. To minimise the leakage risk, the ONS will be equipped with sealed oil pits connected to a rainwater pre-treatment system. The SF₆ insulating gas will be prevented from release to the atmosphere thanks to automatic gas density monitoring. The station will not generate process wastewater. The Project Owner will take all necessary measures resulting from the legal provisions and good practices to reduce the risks.

4.2 Efficient generation and use of energy

The proposed project will not involve power generation but its transmission by means of an underground cable line as well as its processing and transformation. It will be ensured that the power required for the proposed project is used rationally. With reference to the ONS, the electricity demand will be satisfied as follows: 1) the primary power demand will be satisfied internally by means of MV/0.4 kV transformers, 2) external back-up supply by means of MV lines and 3) emergency supply – internally by means of a power generator are also considered. Heat supply will be satisfied by means of electric heaters powered from the ONS auxiliary system. During the construction phase, electricity required to power construction equipment will come from power generators, while during the

operation phase, due to the use of modern technological solutions, including the use of a new type of phase conductors, electrical transmission losses will be reduced.

4.3 Ensuring rational use of water and other resources as well as materials and fuels

The use of water, raw materials, consumables and fuels will be mostly related to the construction phase and maintenance works. During the operation of the proposed project, there will be no need to use these resources. The ONS will not be intended for permanent staff presence. The occupancy time of the same persons per day should not exceed 4 hours. Consequently, the amount of water used and sanitary sewage generated will be less than in a small household. It confirms the rationality of the proposed project in terms of resource use.

4.4 Use of waste-free and low-waste technologies and possibility of waste recovery

During the construction phase, the waste will be collected selectively at locations specially designated and adapted for this purpose, under conditions preventing the release of harmful substances into the environment. It will be ensured that they are collected by eligible entities responsible for waste management or reuse. The waste management will comply with the applicable Act of 14 December 2012 *on waste* (Journal of Laws of 2013, item 21, as amended). The underground power line operation will not produce any waste with the exception of minor amounts of waste related to maintenance works or removal of possible failures.

4.5 Type, range and volume of emissions

During the operation phase, the proposed project in the form of an underground cable line will be a source of heat and EMF emission, which have been described in detail in this EIA Report. The Onshore substation will be the source of excessive noise, EMF, heat and gas emissions into the atmosphere only in the event of a failure. During the ONS operation, the impacts in the form of electromagnetic fields and noise will not cause an exceedance of the limit values outside the project site. The construction phase will involve noise emissions and the release of pollutants from fuels burnt in vehicle engines into the atmosphere as well as waste and waste water generation. These emissions will be short-term and local.

4.6 Use of comparable processes and methods which have been effectively applied on an industrial scale

The dynamic development of the cable networks has been observed worldwide. The primary objectives of the cable line development are ensuring high reliability of transmission and compliance with the relevant standards as well as economic and environmental requirements. These objectives are achieved through:

- introduction of conductive, insulating and structural materials characterised by enhanced operating parameters;
- modernisation and improvement of the technological parameters of production lines;
- conducting tests within the optimal range during the production and post-production cycles, as well as after the cable line installation and during its operation;
- providing quality and reliability analyses of the cables on the basis of the statistical data and failure rates as well as the development of databases.

The selected technologies and materials which will be used for the construction of the underground power lines and the ONS conform to the current EU standards and can be considered optimal for a project of this type – these technologies have been widely used in Poland, EU countries and in other parts of the world.

4.7 Scientific and technical progress

The solutions used during the project implementation will be best available techniques and technologies that are currently in use globally and are characterised by safety and high efficiency. All the work associated with the project implementation will be supervised by site managers experienced in construction of similar facilities, environmental specialists, expert construction and engineering supervision in accordance with the applicable provisions.

In view of the above, as part of the proposed project, best available techniques (BAT) are to be applied as provided for in the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556).

This catalogue of requirements refers to the newly launched industrial installations and equipment that are the source of environmental hazards. The OWF connection infrastructure, due to the technological characteristics of the construction, operation and decommissioning phases as well as the special conditions of operation in the marine and land environment, requires verification of these requirements at an early stage of project planning.

The structural elements of the OWF connection infrastructure are to be made of materials which are neutral to seawater and ground substrate (seabed) as well as to the soils in which the power cables will be buried onshore. Resistance to erosion, corrosion or chemical compounds present in seawater, seabed sediment and soil is an essential prerequisite for failure-free operation of power cables.

The efficiency and safety of power transmission from the BC-Wind OWF to the NPS will be among the basic criteria used when selecting cable types and their offshore and onshore routing. The overriding criterion of energy efficiency is ensuring that energy waste in transmission installations is kept at the lowest possible level.

The consumption of water, consumables, raw materials and fuels will take place during the process of laying submarine cables. During 20–30 years of operation, the cables will require the use of consumables and fuels for maintenance service activities.

Emissions and their range will mainly relate to the impacts resulting from the process of laying cables on the seabed and in the ground during the construction phase. These impacts will not affect significantly either the marine or land environment. No significant electromagnetic interactions or thermal actions are expected to occur during the operational phase.

The experiences related to the construction and operation of power cables offshore and onshore enable the selection and implementation of the most efficient and proven solutions for power transmission from the BC-Wind OWF to the NPS, meeting the requirements of the most advanced technologies, resistant to the conditions of operation in the marine and land environments, while keeping the energy waste at the lowest possible level, and affecting the environment to the smallest extent.

5 ENVIRONMENTAL CONDITIONS

OFFSHORE AREA

5.1 Location, seabed topography

The EXC BC-Wind OWF area, in its offshore part, lies within the BC-Wind OWF area and between the southern boundary of the BC-Wind OWF area and the land in the area of 160.5 km of the seashore (according to the Maritime Office shoreline chainage). It covers a part of the seabed with a depth from approximately 57.7 to 0.0 MASL [Figure 5.1].

The seabed relief was identified on the basis of bathymetric data analysis. The analysis of sonar data enabled the interpretation of seabed features. On the basis of seismo-acoustic data analysis and using literature data on the area surveyed [77, 78, 151, 232, 233, 234, 231, 275, 328, 326, 327, 429, 430, 431, 433, 434] the characteristics of the seabed and the main types of sediments forming the seabed were identified.

In the northern part of the EXC BC-Wind OWF area and over a small area located in the southern part of the EXC BC-Wind OWF area, a seabed with the features of an abrasive-accumulative plain was identified [Figure 5.1, Figure 5.2]. The plain covers the seabed with a depth from approx. 23.5 to approx. 52.0 MBSL. Within its boundaries, the seabed is relatively level with small height differences (1–2 m) associated with the presence of sand accumulations on the surface of tills and till outcrops. Boulder clusters are present on the seabed. Accumulations of gravel are also visible. Seabed slope within the accumulation plain is up to 2–3°.

In the northern, north-eastern and central part of the EXC BC-Wind OWF area, the seabed with the characteristics of an accumulation plain was identified. The seabed is relatively level with small areas of slight height differences reaching up to 2.0 m. In the north-eastern part of the EXC BC-Wind OWF area, within the accumulation plain, sand waves were identified [Figure 5.1, Figure 5.2]. In the area of sandy waves, the height differences of the seabed reach up to 5 m. The proximal slopes of the waves are directed to the west, and the distal slopes to the east. The ridges of sandy waves have a N–S orientation. The sandy waves reach up to 2–3 m in height, up to 5 m in some places. The length of waves is 40–60 m, 80–100 m in some places, and 150 m at maximum. Seabed slope within the abrasive-accumulative plain is approximately 2°. However, on the distal slopes, the seabed slope exceeds 15° in some places.

In the southern part of the area analysed, there is a foreshore slope. It encompasses the seabed with a depth of approximately 8.0 to approximately 24.0 m, immediately adjacent to the sandbank zone, gently inclined towards the open sea [Figure 5.1, Figure 5.2]. The seabed slope is approximately 1–2°. The seabed surface is level and sandy.

The shallowest part of the seabed in the EXC BC-Wind OWF route variants analysed is the sandbank zone. It covers a strip of sandy seabed stretching from the shore into the sea, with a depth up to approximately 8.0 m. It has a width of 600–700 m [Figure 5.1, Figure 5.2]. Within this zone, three sandbanks have developed – sand embankments parallel to the shore. Their height is up to 1 m above the surface of the surrounding seabed. They are intensively transformed and restructured during storms, but their position remains stable, with only slight changes.

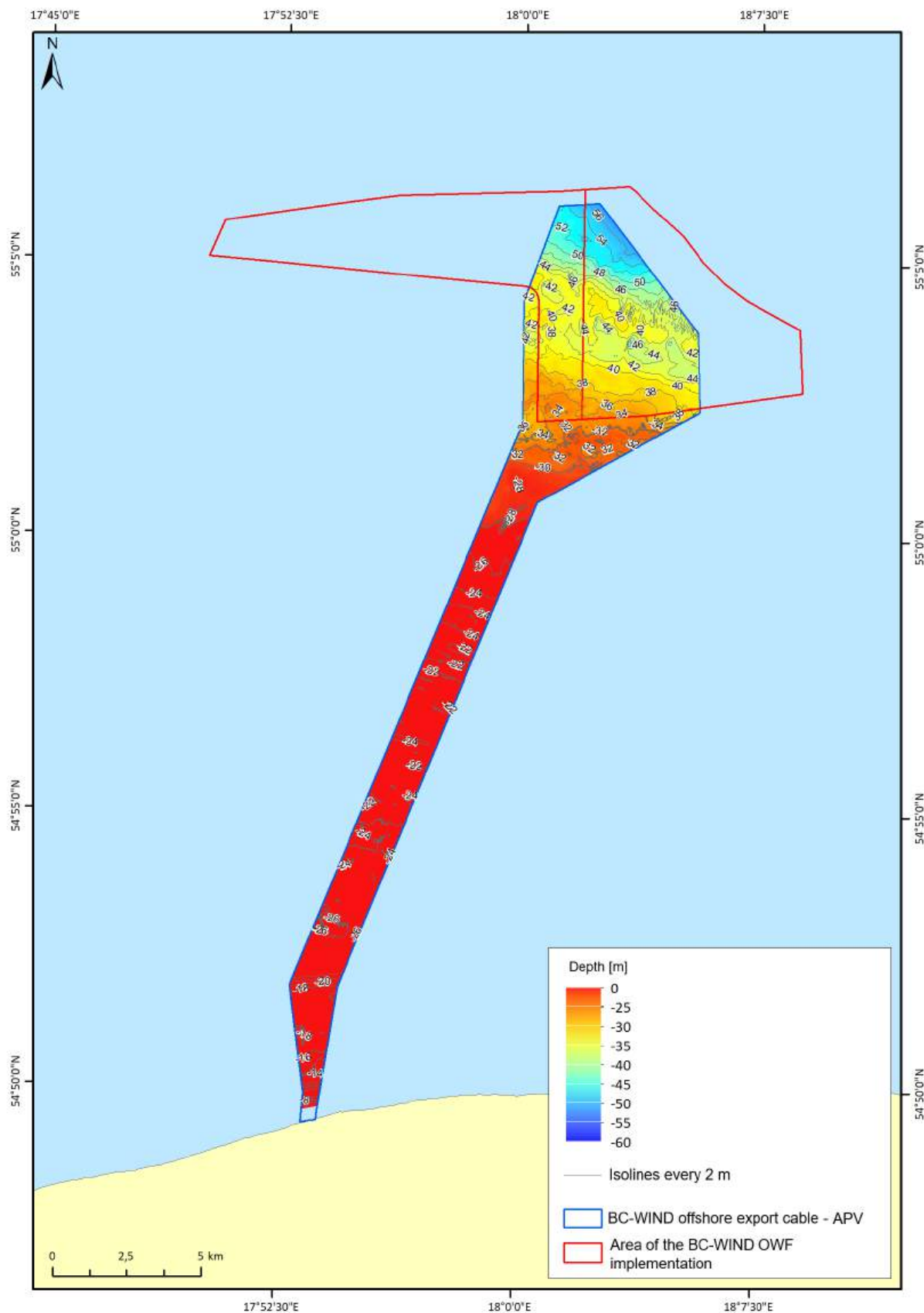


Figure 5.1. Bathymetric map of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

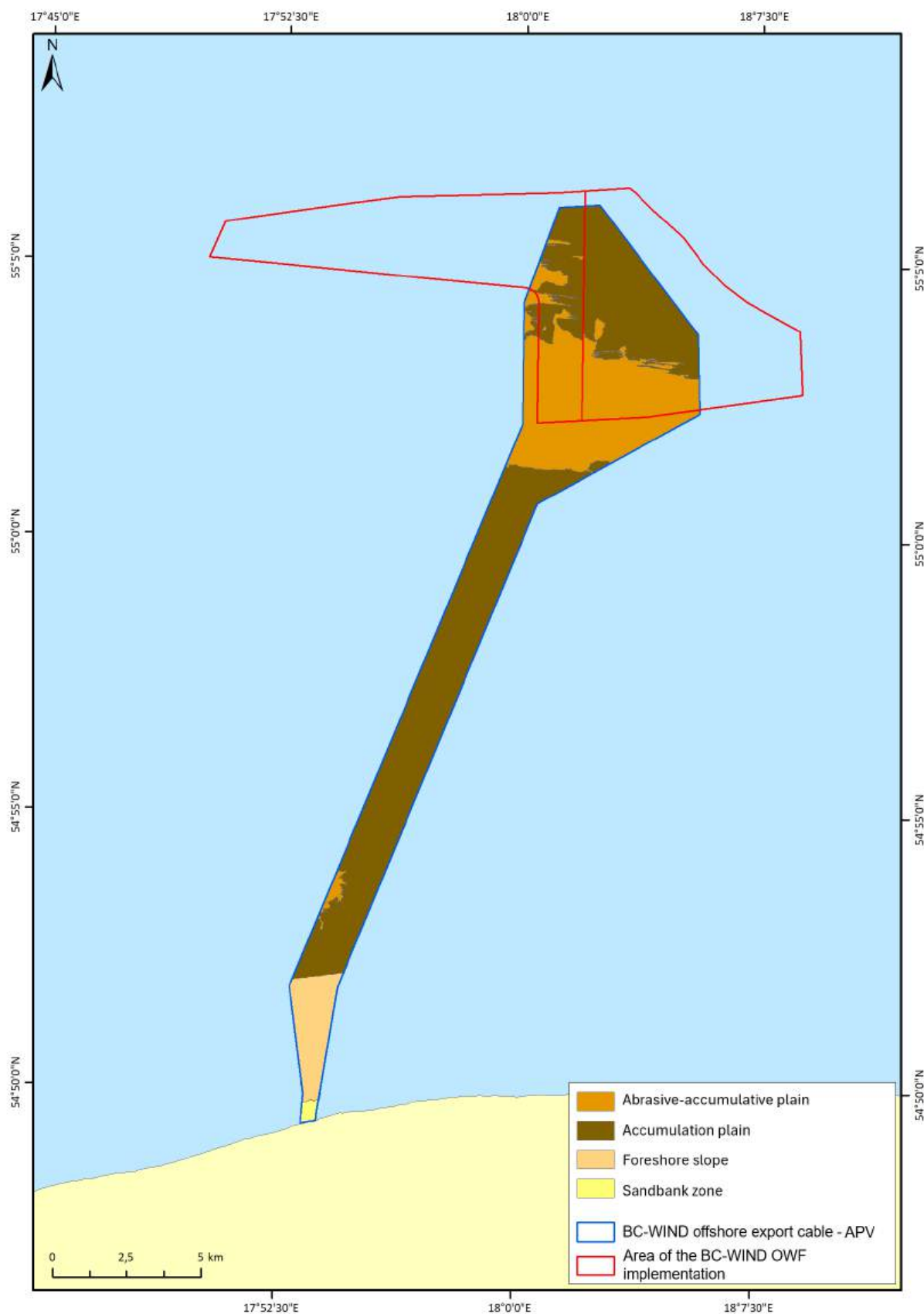


Figure 5.2. Map of seabed types in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

5.2 Geological structure, seabed sediments, raw materials and deposits

5.2.1 Geological structure, geotechnical conditions

Within the area analysed, the crystalline basement is located at a depth of approximately 3000 m. In the crystalline basement, in the western part of the area discussed, there is the *Białogóra* fault, renewed only in the Palaeozoic sediments (Cambrian-Silurian). The sedimentary cover is made up of Cambrian, Ordovician, Silurian, and Permian formations. These are mainly Cambrian sandstones and silt-clay sediments, Silurian clays and Zechstein dolomites, anhydrites, and rock salts. Mesozoic is represented by the Triassic and Cretaceous sediments. These are mainly Triassic claystones, siltstones and sandstones as well as Cretaceous quartz-glaucinite sands and sands with phosphorites. Quaternary formations lie directly on the Paleogene and Neogene sediments represented by sands and silty clays often mixed with carbonaceous substances [368, 385, 386, 479, 480, 131, 181].

The thickness of the Quaternary formations in the survey area is between 20–30 m on average. These are mainly glacial till and sandy-till sediments, fluvio-glacial sandy and sand and gravel sediments, as well as local accumulations of clays, silts and fine-grained sands of glaciolacustrine origin covered with modern marine sands [368, 385, 386, 479, 480, 131, 181].

5.2.1.1 Sub-Quaternary formations

Pre-Quaternary sediments, in the top part, are represented by the Paleogene and Neogene sediments. Above these sediments, the seabed is made up of Quaternary sediments. The thickness of the Quaternary formations is estimated to reach up to approximately 30 m. These formations are mainly glacial and fluvio-glacial sediments (tills, sands and gravels). Locally, they are covered by a thin, discontinuous series of glaciolacustrine deposits (clays, silts, fine sands) covered by a series of fluvio-glacial sands and modern marine sands.

5.2.1.2 Quaternary formations

The till top forms a discontinuous, uneven and varied surface in the northern and southern parts of the EXC BC-Wind OWF area. It is deposited shallowly below the seabed surface, under a thin, discontinuous layer of abrasive pavement and a sand cover. Till top forms depressions of various types and shapes that are, in places, filled with sands, silts and clays of ice-marginal origin and covered with a thin layer of sands, or in some places, also with multi-grained sediments (sand and gravel). The tills forming the seabed within the survey area are mainly the tills of Vistulian glaciation.

Silt and clay sediments fill depressions in the till top in two locations – one in the northern part of the EXC BC-Wind OWF area and the other in the central part of the area, forming two small accumulations. They were formed in places where glaciolacustrine water bodies existed from the end of the Pleistocene to the beginning of the Holocene. Some of these water bodies might have functioned as lakes till the Littorina transgression, when the area was eventually flooded by the waters of the Littorina Sea. These are sediments formed in calm sedimentation conditions, mainly silts, clays, fine- and very fine-grained sands.

Almost entire seabed surface of the area analysed is covered with a discontinuous changing layer of fine- and medium-grained sands. In places, multi-grained sediments (sand and gravel) and clusters of boulders (so-called boulder areas) are accumulated on the seabed surface. Two types of seabed-forming sediments predominate: (1) fine-grained and medium-grained sands as well as (2) cohesive sediments with a stone and gravel abrasive pavement and sand cover.

The fine- and medium-grained sands form mainly compact covers with level surfaces. Within their area, the sand layer thickness reaches up to several metres.

Cohesive sediments with stone and gravel abrasive pavement and a sandy cover form areas of diverse relief with ripple mark fields moving over the surface of tills and abrasive pavement. Locally, the seabed surface consists solely of abrasive pavement on till.

5.2.2 Seabed sediments and their quality

The results of sonar surveys carried out within the EXC BC-Wind OWF area enabled the interpretation of seabed features. Based on these, maps of the seabed sediments [Figure 5.3] and maps of the distribution of boulders over 0.4 m in diameter within the survey area [Figure 5.4] were prepared.

Almost the entire seabed surface of the area analysed is covered with a discontinuous layer of fine- and medium-grained sands. In several places on the seabed, there are accumulations of multi-grained sediments (sand and gravel), boulder clusters and cohesive sediment outcrops. The cohesive sediments identified on the seabed are mainly Pleistocene glacial tills, with accumulations of ice-marginal and lacustrine deposits (Pleistocene/Holocene) in some places (in the till top depressions).

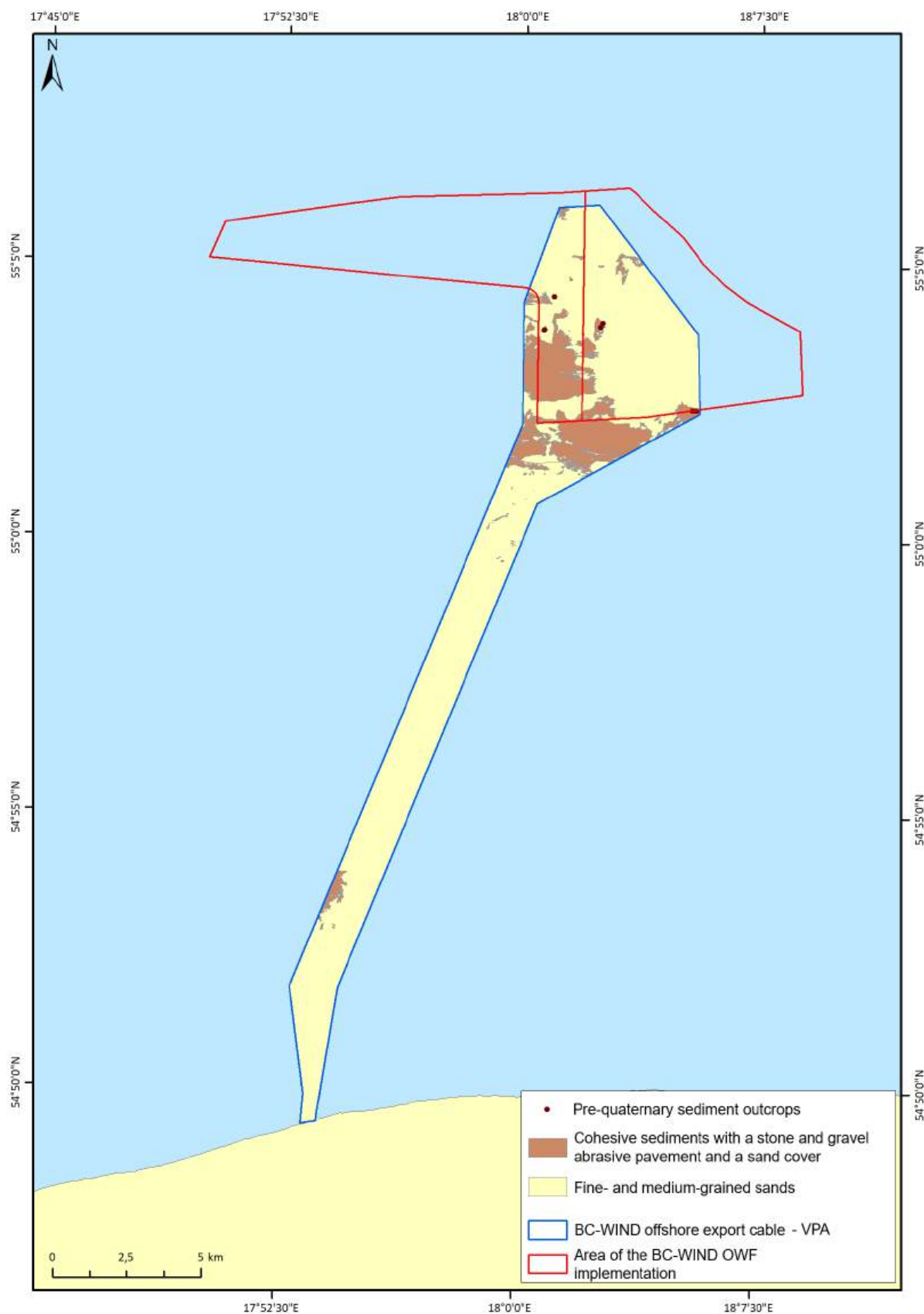


Figure 5.3. Map of seabed sediments in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

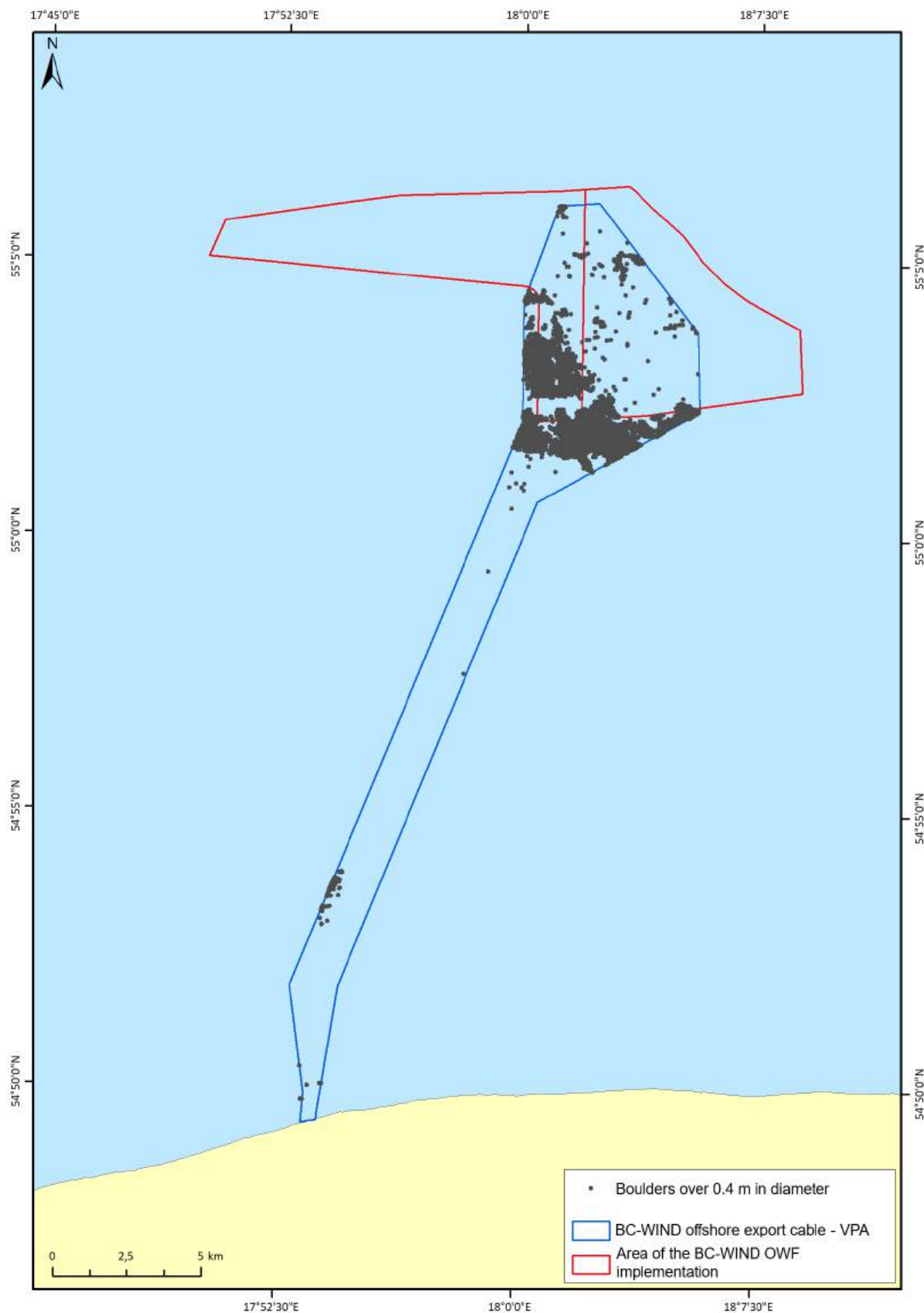


Figure 5.4. Map of boulder distribution in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

The seabed surface within the EXC BC-Wind OWF area is mainly composed of sand. A broader diversity of surface sediment types is noticeable only within the abrasive-accumulative plain. The abrasive-

accumulative plain is mainly composed of a thin, discontinuous layer of sands with a thickness of up to approximately 0.5 m, locally sand and gravel, as well as tills in the form of outcrops and hillocks, often with a stony cover in the till top of an erosion pavement character. Below the sandy and sand and gravel sediments, the seabed is made of cohesive sediments, mainly tills. The till top is uneven, with height differences reaching several metres. In some places, the depressions in the till top are filled with silt and clay (ice-marginal) material, and locally with sand.

In the EXC BC-Wind OWF area, two types of sediments forming the seabed surface were distinguished: fine- to medium-grained sands, and cohesive sediments with a stone and gravel abrasive pavement and a sand cover.

The fine-grained and medium-grained sands within the EXC BC-Wind OWF area form mainly compact covers with flat surfaces (with the exception of those seabed parts on which sand waves are present). Cohesive sediments with a stone and gravel abrasive pavement and a sand cover form areas of diverse relief with fields of ripple marks and mega-ripples (up to 10–15 m in height and up to 2.5 m in length) moving over the till surface and abrasive pavement. Locally, the seabed surface consists solely of abrasive pavement on till and boulders.

Seabed sediments constitute a very important element of the aquatic ecosystem of the Baltic Sea, which is a shallow sea, with limited water exchange and a surface area approximately four times smaller than its catchment area. Such conditions mean that every interference in the marine environment, including the exploitation and development of the seabed, affects the delicate ecological balance of the marine ecosystem.

The transfer of contaminants from the sediment into the water (and hence the change of water quality) depends on the type of sediment. The most contaminants and nutrients will be transferred into the water from a sediment with an increased amount of organic matter (e.g. silty, clayey sediments, characterised by higher concentrations of metals and persistent organic pollutants). In the case of sandy deposits with low organic matter content (e.g. coarse-grained sandy sediments), the processes described will be less intense. These sediments are generally characterised by a small number of fine fractions and low concentrations of metals and persistent organic pollutants.

The surface seabed sediments from the EXC BC-Wind OWF area which were analysed belong to inorganic sediments, with the organic matter content expressed as loss on ignition (LOI) of less than 7%.

The seabed sediment samples collected during the environmental surveys were analysed in terms of the content of nutrients, ¹³⁷Cs, persistent organic pollutants (POPs) (i.e. PAHs, PCBs, TBT and mineral oils) and metals.

Primary processes influencing the nutrient content in the sea are the geophysical and geochemical processes, which control not only the supply of such elements to seawater but are also responsible for the dispersion and removal of such compounds.

Nitrogen compounds present in the seabed sediments undergo cyclical changes as a result of biogeochemical processes. Oxidation of ammonia and its compounds by nitrifying bacteria leads to formation of nitrogen oxides, and later nitrates. Too intense nitrification, however, is not desirable, as nitrates are more easily eluted from sediments than ammonium ions. Under anoxic conditions, denitrification processes take place, involving the conversion of nitrates into molecular nitrogen [296, 420].

In the Baltic Sea sediments, nitrogen occurs mainly in an organic form and its regional variability is analogous to the variability of carbon [57]. Usually, inorganic forms of nitrogen constitute no more than 10% of the total nitrogen (TN) in the sediments [58]. An increase in the proportion of inorganic nitrogen forms is possible in the area of erosion and transport of fine particle dispersion sediments [428].

Due to the fact that the circulation of nitrogen in the environment is a very complex process, and its intensity depends on numerous factors (e.g. oxygenation, temperature, season, primary production, etc.) as well as on the volume of nutrient supply from isolated spots, diffused sources and the deposition from the atmosphere [48, 119], the calculation of the nitrogen load that would enter the water column from the sediment during construction works is a rough approximation. According to the data from literature, nitrogen content in the Southern Baltic sediments ranges between 98–2604 mg N·kg⁻¹ DW in sandy sediments, 1106–3094 mg N·kg⁻¹ DW in sand and clay sediments, 1904–9506 mg N·kg⁻¹ DW in clays and 1694–4606 mg N·kg⁻¹ DW in tills [322].

In the seabed sediments within the EXC BC-Wind OWF area, the content of total nitrogen both in summer and winter, in most samples, was below the limit of quantification of the method applied, i.e. 200 mg·kg⁻¹ DW. In the summer season of 2021, this value was higher in only two samples, with a maximum of 546 mg·kg⁻¹ DW, whereas in the winter season of 2022, one sample had a higher value of 292 mg·kg⁻¹ DW.

Phosphorus (P) in the seabed sediments is conventionally divided into labile (mobile, reactive) and refractive. Refractive forms are a combination of phosphorus with calcium, aluminium and clay minerals, as well as degradation-resistant organic forms of this element. Refractive phosphorus is subject to deposition, and thus, is removed from the circulation in the water depth. Labile phosphorus is the phosphorus contained in fresh organic matter, phosphates present in the interstitial waters, the combinations of phosphorus with Fe³⁺ and phosphates loosely bound by adsorption with different elements of the sediment. Such forms easily re-enter the circulation in the water depth, mainly due to the mineralisation of organic matter and the dissolution of combinations of phosphorus with Fe³⁺ as a result of the decrease in the value of the redox potential [4, 428]. Phosphorus can act as a productivity-limiting factor for marine ecosystems [444]. In aquatic environment, when primary production is limited by the quantity of phosphorus, the introduction of 1 mg of phosphorus means a 100 mg growth of algae DW per single biological cycle [95].

The content of total phosphorus in the EXC BC-Wind OWF area did not exceed the values typical of the sediments of the Southern Baltic. The amount of phosphorus that may be released into the water (the so-called available phosphorus) is estimated at 10–20 % of the total amount of phosphorus contained in the sediments [457]. The mean concentration of phosphorus in the seabed sediments surveyed was 206 mg·kg⁻¹ DW in the winter and 241 mg·kg⁻¹ DW in the summer.

None of the seabed sediment samples tested exceeded the limit values specified for the concentration of metals, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), according to the Regulation of the Minister of the Environment of 11 May 2015 *on the recovery of waste outside installations and facilities* (Journal of Laws of 2015, item 796), which allows the classification of a sediment as clean in the context of practical applications, and although it does not apply to a sediment transferred within water, they may form the basis for assessing the seabed sediment contamination with chemical compounds. On this basis, it can be concluded that the concentration values obtained for the tested sediments collected in the EXC BC-Wind OWF area are low, and the sediments are not contaminated with the compounds of these groups. Moreover, the concentrations of persistent organic pollutants (PAHs, PCBs) and harmful substances, such as metals or mineral oils, in the area surveyed did not exceed the values typical for the sandy sediments of the Southern Baltic.

Pyrogenic PAHs as well as PCBs exhibit exceptionally high persistence in seabed sediments, which is caused by the occlusion of these chemical compounds in very fine sediment particles [42]. Therefore, the phenomenon of desorption of these substances from the sediments into the water is limited. Usually, it is at most 0.5% for PCB congeners, and up to 5% for the analytes from the PAH group [129, 128]. Assuming that such amounts of these substances will transfer to the water, it can be concluded that the risk of water contamination related to the remobilisation of PAHs and PCBs in the area surveyed is insignificant.

PCB concentrations (LOQ <0.0001 mg·kg⁻¹ DW) in the sediment analysed were below the lower limit of quantification. Consequently, the risk of water contamination related to the remobilisation of such chemical compounds from the seabed sediment during the construction phase of the EXC BC-Wind OWF was acknowledged as negligible and no further analyses were conducted.

Metal concentrations in the sediments analysed within the EXC BC-Wind OWF were low. Additionally, their availability (i.e. the ability to permeate into the water depth), which depends on their physico-chemical form, should be taken into consideration [379]. Metals permanently bound in the crystalline structure of minerals are immobilised and will not transfer into the water in natural conditions. On the other hand, metals in the mobile (labile) form are prone to permeating into the water from the sediment [379, 90, 91]. The labile form of metals may constitute (depending on the type of sediment for individual metals) from 30 to 80% [319, 379, 427, 90, 83]. The results of the analysis of the labile form of metals in the sediments analysed showed that in unfavourable conditions approximately 70% of lead, 46% of copper and 43% of zinc can transfer from the sediment into the water. In the case of nickel and chromium, which are more permanently bound with the sediment, this can occur in approx. 38% and 24%, respectively. Concentrations of cadmium, mercury and arsenic as well as TBT in the sediment examined were at trace level, generally below the lower limit of quantification. Consequently, the risk of water contamination related to the remobilisation of such chemical compounds from the seabed sediment during the construction of the Baltica OWF CI was acknowledged as negligible and no further analyses were conducted.

The sediments surveyed were also characterised by a low activity of the radioactive isotope of caesium ¹³⁷Cs, typical for sandy sediments.

5.2.3 Raw materials and deposits

In order to identify potential areas of the presence of raw materials useful for the extraction in the EXC BC-Wind OWF area, the seismo-acoustic data, bathymetric data and sonar data were analysed.

On the basis of the analyses conducted, no accumulations of fine and medium sands and gravels which could constitute a mineral deposit [within the meaning of the Act of 9 June 2011 – *Geological and Mining Law* (consolidated text: Journal of Laws of 2021, item 1420) and the Regulation of the Minister of the Environment of 1 July 2015 *on the geological documentation of mineral deposits, excluding hydrocarbon deposits* (Journal of Laws of 2015, item 987)] were identified. Within the entire area under analysis, the seabed sediments are mainly fine- and medium-grained sands, silty in places. They form a discontinuous layer with a thickness of up to around a dozen metres. The largest sand accumulations were identified in the area of sand waves (northern part of the survey area) as well as in the sandbank zone and the southern part of the foreshore slope (southern part of the survey area).

According to the Regulation of the Minister of the Environment of 1 July 2015 *on the geological documentation of the mineral deposit, excluding hydrocarbons* (Journal of Laws of 2015, item 987), a deposit should have an least 2 m thickness (limit values for the parameters defining a deposit and its boundaries for individual minerals – gravel deposits, gravel and sand as well as sand and gravel with a sand point below 75%).

In the area of the Polish exclusive economic zone of the Baltic Sea, three concessions for oil and gas prospecting, exploration and production are in force (Gotland 36/2001/Ł, Łeba 37/2001/Ł, Rozewie 38/2001/Ł). The EXC BC-Wind OWF area neither borders on nor is situated within the area covered by these concessions.

5.3 Seawater quality

The results of analyses of individual chemical parameters of water in the EXC BC-Wind OWF area, such as pH level, 5-day biochemical oxygen demand (BOD₅), total organic carbon (TOC), nutrients, PCBs,

PAHs, mineral oil, cyanides, metals, phenols, caesium, and strontium, did not essentially deviate from the values typical for the waters of the Southern Baltic.

These waters were characterised by an alkaline pH (approx. 8.0), alkalinity of approx. $1.75 \text{ mmol} \cdot \text{dm}^{-3}$ and relatively good oxygenation, with a seasonal variability characteristic of the Southern Baltic waters. The assessment of the water quality index for the EXC BC-Wind OWF area on the basis of the oxygen content in the near-seabed layer in summer indicates a good water status (no oxygen deficit). The average contents of dissolved oxygen during this period were above the threshold value of $6.0 \text{ mg} \cdot \text{dm}^{-3}$ [240].

In the entire survey period, the average biochemical oxygen demand (BOD_5) in the water samples collected from the EXC BC-Wind OWF area in individual measurement periods mostly remained below the limit of quantification. Only during the winter-spring period did the maximum recorded BOD_5 values slightly exceed this limit. Also the content of suspended solids in the individual measurement periods was typical of the Southern Baltic waters. Average concentrations in the individual measurement periods were at $1.17\text{--}5.41 \text{ mg} \cdot \text{dm}^{-3}$. Values above $8 \text{ mg} \cdot \text{dm}^{-3}$ were also recorded.

The concentrations of nutrients, such as total nitrogen, mineral nitrogen (total nitrates, nitrites and ammonia), phosphates and total phosphorus in the waters surveyed were characterised by seasonal variability typical for the waters of the Southern Baltic. The lowest concentrations of the substances surveyed were recorded in the spring-summer period, whereas in the winter months their significant increase was observed, in accordance with the seasonal trend of nutrient pool recovery [8].

The waters of the region surveyed were characterised by low concentrations of particularly harmful substances. Mean concentrations of PCBs, mineral oils (mineral oil index), free and bound cyanides, metals (Pb, Cd, Cr, Cr(VI), As, Ni, Hg) and phenols were at trace levels.

The waters tested were also characterised by low values of caesium ^{137}Cs and strontium ^{90}Sr activity, typical for the waters of the Southern Baltic, which confirms a slow downward trend of ^{90}Sr and ^{137}Cs concentrations in the Baltic Sea area [475].

In the EXC BC-Wind OWF area, marginally higher PAH concentrations were observed, compared to the ones specified by the data from literature [160, 458], which may have resulted from the differences at the stage of sample preparation for analyses (PAHs were determined in water without the separation of suspended solids).

Comparing the indicator results obtained from the water surveys with the threshold values specified in the Regulation of the Minister of Maritime Economy and Inland Navigation of 25 June 2021 *on the classification of ecological status, ecological potential, chemical status and the method of classifying the status of surface water bodies as well as environmental quality standards for priority substances* (Journal of Laws, item 1475), the area surveyed can be classified as water class 1 (very good status) due to the concentrations of nitrate nitrogen, DIN and total nitrogen. The average concentrations of the total phosphorus place the area surveyed in water quality class 2. On the other hand, due to the phosphate phosphorus content (the average concentration in the water column was $0.029 \text{ mg} \cdot \text{dm}^{-3}$), the waters tested did not reach a good quality level. The remaining parameters tested, i.e. metals, phenols, cyanides, PAHs and PCBs, did not exceed the limit values for class 2 specified in the regulations cited.

The values recorded for the physical parameters of the water are characteristic for individual seasons of the year. Temperature and the related specific electrical conductivity of water indicated distinct seasonality. Salinity was characterised by a seasonal influx of more saline water, probably from the deeper layers of the sea.

5.4 Water dynamics and hydrophysical surveys

From October 2019 to January 2021, continuous recording of the dynamic parameters of the sea surface (wave motion) and in the water depths (water flows) as well as the hydrophysical parameters of the water across the water depth was carried out in the EXC BC-Wind OWF area. The results obtained do not deviate from the ones that should be expected for the individual seasons of the year in this sea area.

For the entire period of the measurements conducted, a significant variability of water flow dynamics was recorded, and it intensified during the increase of wind speed (especially during the occurrence of storm conditions at sea). Periods of a significant calming of the water flows also occurred. For the entire period, flows along the west-east axis prevailed, while flows in the eastern directions, from NE to ENE, were particularly significant. In the period analysed, the highest average velocities of water flows ($0.16 \text{ m}\cdot\text{s}^{-1}$) were recorded in the near-surface water layers, while the average velocities of water flows in the remaining layers were lower (up to $0.11 \text{ m}\cdot\text{s}^{-1}$ at the seabed).

Considering the directional distribution of the water mass movements at different depths in the water column, flows along the WNW–ESE axis clearly dominate in the near-surface layer. In the deeper, middle water depth layers, the bidirectional flow along the W–E axis is clearly visible. Such a distribution of flow directions is maintained practically throughout the entire water profile. In the near-seabed layer, the flows in the NE and E directions dominate, with a significant decrease in their velocity. Wave motion on the free sea surface depended on the season of the year and ranged from calm in summer to very intensive in winter.

The water temperature values at all levels fell between 4.83 and 20.92°C . The data measured cover an observational cycle lasting more than one year, thanks to which the thermocline formation periods, as well as the periods of water mass mixing, as a result of more intensive weather conditions, can be recorded.

The values of water salinity ranged from 6.93 to 11.08 PSU. The highest average value was recorded in the near-seabed layer. Water salinity was stable at all depths, with the exception of the near-seabed layer, which was episodically reached by the more saline water masses from the distant parts of the Baltic Sea.

Turbidity above the seabed (depth of approx. 42 m) was recorded during the entire survey period. For the entire reporting period, the maximum turbidity value equalled 55.18 FTU, while the minimum value was 0.59 FTU. Higher average values in the autumn season, caused by intensive water mixing conditions, are visible.

5.5 Climatic conditions and air quality

5.5.1 Climate and the risk related to climate change

The area of the Southern Baltic is located in the humid temperate climate zone with the influence of the Atlantic climate due to prevailing oceanic winds. The vicinity of the Atlantic Ocean, due to the large air masses inflow, largely determines the climate of the Baltic Sea. As a result, the winters are mild and warmer, while the summers are cooler. In addition, it is characterised by predominantly westerly and south-westerly winds and, during storms, strong winds from northerly sectors and a large variation in air humidity.

Within the Polish sea areas, including the coastal zone, long-term recordings of near-ground (near-water) atmospheric parameters (air pressure, temperature and humidity, wind conditions and insolation as well as precipitation intensity and type) and water parameters (sea level, water temperature and salinity and dynamic conditions – flows within the water depth and wave motion) are carried out both at onshore stations, as well as on the high seas. This includes, in particular, the

comprehensive measurements performed operationally for several decades by the Institute of Meteorology and Water Management – National Research Institute (IMWM-NRI) at monitoring stations and points, and for several years also on buoys anchored at sea. In addition, IMWM-NRI performs monitoring surveys in the Southern Baltic area several times a year, recording the hydro-physical and physico-chemical parameters of the sea within a designated grid of points. Hydrological and meteorological surveys are also carried out by other scientific and research units. Wind parameters, air temperature and humidity as well as the mean sea level are measured at the Coastal Research Station (CRS) in Lubiato, owned by the Institute of Hydro-Engineering of the Polish Academy of Science (IHE PAS), while the Institute of Oceanology of the Polish Academy of Sciences with a monitoring station located at the Sopot Pier monitors air temperature, pressure and humidity, insolation, as well as seawater temperature and salinity. As part of the SatBałtyk project carried out in 2010–2015, satellite measurements were conducted enabling the determination of the characteristics of the sea and atmosphere in the form of maps presenting, for example, temperature distributions, ice covers, momentary water flow velocity, water mixing and turbidity. At the Maritime Institute of the Gdynia Maritime University, in various research projects and at the request of clients, the recordings of the parameters of the near-water atmospheric layer as well as hydrophysical and dynamic values for the entire water column have been conducted in the last dozen years, at various locations within the Polish exclusive economic zone of the Baltic Sea.

The surveys presented, which are associated with similar recordings conducted by the neighbouring Baltic countries, allow determining the current trends and the anticipated directions of changes in the basic climatic parameters of the Southern Baltic. Additionally, the information from simulation calculations of the climatological numerical models of the Global Atmospheric Circulation Model available, for example, from the research conducted as part of the BALTEX Assessment of Climate Change for the Baltic Sea Basin are used for the above-mentioned determinations [180].

The climate specific for the coast and the adjacent sea areas can be classified as a coastal strip climate with small air temperature amplitudes, high humidity, mild winters, cooler summers and strong winds. Winds from the west and south-west directions prevail. In the open sea areas, climatic conditions are characterised by smaller air temperature amplitudes and mean wind velocities higher than in the adjacent land areas.

On the basis of the data and analyses available, it is possible to present the most important forecasts regarding changes of particular elements of the atmosphere and water in the Baltic Sea region:

- the increase in air temperature is faster here than the average global increase, this trend is expected to continue;
- the increase in surface water temperature is greater than in its deeper layers, this may result in stronger thermal stratification and the stabilisation of the thermocline throughout the year;
- the predicted salinity changes are not clearly defined and depend, on the one hand, on the changes in the air circulation conditions and the volume of water exchange with the North Sea and, on the other hand, on the volume of river water inflow; a decrease in salinity level is predicted;
- an increase in atmospheric precipitation is forecast for the entire Baltic Sea basin in winter, while in summer only in the northern part; the prevalence of extreme precipitation will increase;
- in terms of forecasting the changes in sea level, the effects of its global increase will not be felt to a significant extent. This is due to the fact that the Baltic Sea, which is a relatively small and shallow shelf sea, is connected with the North Sea by the rather narrow Danish straits, through which an exchange of oceanic waters (the so-called inflows) takes place only incidentally. Moreover, most of its area (in the northern part) is located within the Scandinavian plate,

which is characterised by visible uplift processes (so-called isostatic rebound), which result in a decrease of the mean sea level. In the southern part, the impact of these processes is practically negligible, and the water level is determined mainly by the atmospheric circulation conditions;

- forecasts regarding changes in wind climate are subject to considerable uncertainty, mainly due to the formation of atmospheric circulation conditions. It is assumed that an increase in the mean surface water temperature will be accompanied by an increase in the mean wind speed over sea areas;
- changes in wave climate are mainly related to the development of wind conditions over the sea surface as well as to the frequency and intensity of storms – an increase in extreme events is anticipated;
- model calculations indicate that there will be an increase in the extent of low oxygen area in the water and anaerobic areas near the seabed.

Forecasts of climate change for Poland, including the coastal zone and sea areas under the jurisdiction of the Polish state, as well as scenarios of adaptation activities aimed at mitigating and counteracting the effects of changes have been the subject of intensive work carried out by the Ministry of the Environment and the Institute of Environmental Protection, as part of the "Polish National Strategy for Adaptation to Climate Change by 2020 with forecasts until 2030" [274] and the KLIMADA project [347].

Taking into account the conclusions and recommendations related to the coast and the adjacent areas of the Baltic Sea, it was concluded that the observed and projected climate changes will have a negative impact on the functioning of coastal zones. An adverse influence of the periodic sea level rises is predicted, resulting mainly from the increase in frequency and intensity of heavy storms. In the case of the Baltic Sea, this refers to a possible increase in the number, intensity and duration of storms, with an increase in the irregularity of their occurrence, i.e. after long periods of relative calm, series of rapidly succeeding storms of considerable force may occur.

An additional factor that accelerates the process of coastal erosion is the warming of winters, the expected result of which will be a reduction in the ice cover protecting the beaches from storm surges, and thereby safeguarding them against coastal erosion. The scenarios of sea level changes demonstrate that in the years 2011–2030 the mean annual sea level along the entire coast will be by approximately 5 cm higher in comparison to the values from the reference period, i.e. 1971–1990. An increase in the frequency of storm floods and more frequent flooding of low-lying areas, as well as the degradation of the coastal cliffs and seashore, which will entail a strong pressure on the infrastructure located in these areas, will be very important effects of the climate change.

Due to the increase in the average water temperature and an increased inflow of biogenic pollutants into the sea (nitrogen and phosphorus compounds), a negative phenomenon that will occur will be the progressive eutrophication, especially on the water surface (algae blooms).

The activities undertaken as part of the near-shore zone adaptation to the climate change concern the areas situated along the Baltic Sea coastline. However, there are no detailed guidelines and recommendations relating to the open sea areas, including the installations and structures located there, which present the scope of activities aimed at counteracting the effects of the climatic condition changes forecast.

5.5.2 Meteorological conditions

The environmental surveys in the EXC BC-Wind OWF area included the recording of meteorological parameters of the near-water layer of the atmosphere: pressure, temperature, air humidity and wind parameters. The recording was conducted over a period of more than one year: from October 2019 to January 2021. The values recorded demonstrated variability typical of each season of the year.

5.5.3 Air quality

Due to the lack of measurement data regarding the parameters of air purity over the sea areas, the air quality assessment of the atmosphere layer near the water surface is compared with the information obtained as part of the measurements carried out by the Inspection for Environmental Protection under the State Environmental Monitoring for the nearest coastal research station (Łeba). However, it should be noted that due to the lack of significant pollution emission sources over the sea area under analysis, the parameters of air purity should not be inferior to those measured at the shore.

The evaluation of air quality in Poland, including coastal stations, was carried out on the basis of the Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 *on ambient air quality and cleaner air for Europe*. In Poland, the tasks related to conducting surveys and assessments of the state of the environment, including air quality monitoring, are carried out by the Inspection for Environmental Protection under the State Environmental Monitoring, whose programme is developed by the Chief Inspector for Environmental Protection and approved by the Minister of the Environment. As part of this program, the tasks related to the fulfilment of the requirements contained in EU regulations and in Polish law as well as in international conventions signed and ratified by Poland are implemented.

Due to the fact that the monitoring of air quality is conducted only in onshore areas, the results obtained from the measurements for the Pomorskie Voivodeship, and in particular for the coastal zone, have been taken as the reference level for the offshore areas. For most substances measured by the State Inspection of Environmental Protection in 2021, the criteria for concentrations corresponding to purity class A were obtained. This status has not changed significantly in relation to the measurements conducted in previous years. Detailed values from the last decade are presented in Table 5.1. In sea areas covering the territory of the planned connection, no measurements have been made to assess the air quality in terms of greenhouse gas presence, dust concentrations and other hazardous volatile substances. The closest location within the coastal zone in which air pollution monitoring is conducted is the coastal research station in Łeba, distant from land emission sources, where concentrations of sulphur dioxide, nitrogen dioxide and ozone are recorded. On the basis of the measurement data made available by the Chief Inspectorate for Environmental Protection (CIEP) and the Voivodeship Inspectorate for Environmental Protection (VIEP) in Gdańsk, the following concentrations of the above-mentioned gases were identified for the year 2021:

- sulphur dioxide (SO₂) – the mean 24-hour concentration in 2021 amounted to 1.18 µg·m⁻³ with a permissible value of 125 µg·m⁻³; this is the lowest value recorded in the Pomorskie Voivodeship;
- nitrogen dioxide (NO₂) – the mean annual content measured in 2021 was 4.67 µg·m⁻³ with a permissible value of 40 µg·m⁻³; this is the lowest value recorded in the Pomorskie Voivodeship;
- ozone (O₃) – the mean annual content measured in 2021 was 63.13 µg·m⁻³, while the maximum 8-hour running mean was 171.10 µg·m⁻³, with the assumed target value of 120 µg·m⁻³ – this is one of the highest values recorded in the Pomorskie Voivodeship; however, according to the assessment included in the VIEP report, the mandatory criteria regarding the target level for the protection of human health and plant protection are met in the Pomorskie Voivodeship.

These values were compared with the values from the last decade 2011–2020 [Table 5.1].

Table 5.1. Air pollution values in Łeba [source: CIEP data; available at: <http://powietrze.gios.gov.pl/pjp/archives>]

Component measured	Period covered	Annual values [$\mu\text{g}\cdot\text{m}^{-3}$]		
		mean	minimum	maximum
Sulphur dioxide SO_2	2021	1.18	0.20	5.80
	2011–2020	1.39	0.20	14.20
Nitrogen dioxide NO_2	2021	4.67	0.70	24.0
	2011–2020	4.62	0.30	24.90
Ozone O_3	2021	63.13	0.10	171.10
	2011–2020	60.94	0.00	169.61

Such level of the parameters recorded means that the onshore area in the coastal zone near Łeba has air quality class A. Moreover, a slight decrease in the concentration of sulphur dioxide in the air in 2021 can be seen, compared with the values recorded in the 2011–2020 decade. In the case of nitrogen dioxide and ozone, a slight increase in concentrations was recorded in 2021, compared to the 2011–2020 average value.

Similar values for the concentrations of these pollutants are to be expected for nearshore sea areas, especially as these sea areas are at a considerable distance from onshore sources of SO_2 and NO_2 emissions. Those substances are emitted only by vessels, the traffic intensity of which is relatively low. The offshore areas surveyed are free from any terrain obstacles impeding the spread of these substances. Therefore, the average concentrations of the above-mentioned compounds in the air should have lower values.

5.6 Ambient noise

To determine the baseline ambient noise level, noise monitoring was conducted in the northern part of the EXC BC-Wind OWF area, using an SM4M Wildlife Acoustics autonomous sound recorder.

The results of ambient noise surveys conducted in the period from December 2019 to January 2021 show that the levels of underwater noise and their variability ranges indicate values characteristic for the Southern Baltic area [222, 280].

The comparison of the results obtained with the model data acquired using the BIAS platform Soundscape Planning Tool [123, 437] for the survey area, indicated that the ambient noise monitoring results presented in this report are in a certain concordance with the BIAS project results, which also confirm the seasonal variability of the noise level, as well as the occurrence of higher sound pressure (SPL) values in the winter season. The results obtained also indicate a good concordance with the results of the noise level studies conducted to the west of the EXC BC-Wind OWF area, i.e. within the Baltica OWF [24] and Baltic Power OWF [303] areas.

More details are provided in Appendix 1 to the EIA Report.

5.7 Electromagnetic field

Electromagnetic fields in the environment can be divided into natural fields and fields of anthropogenic origin (called artificial fields). From the natural fields, the geomagnetic field of the Earth, the intensity of which ranges from 16 to $56 \text{ A}\cdot\text{m}^{-1}$, is best recognised. On the surface of the Earth, an electric charge is accumulated, which is the source of the natural electric field. The intensity value of the Earth's natural electric field at moderate weather conditions is approximately $120 \text{ V}\cdot\text{m}^{-1}$.

In the marine environment, the above-mentioned values of the electric field and the geomagnetic field are similar. In the vicinity of the EXC BC-Wind OWF, there are no artificial sources of electromagnetic radiation. The existing 450 kV DC Sweden-Poland transmission system is located several dozen kilometres away from the area of the planned project.

Changes in natural electric fields do not have a direct impact on living organisms as well as human well-being. Natural magnetic fields show differences depending on the geographical location. They have a significant impact on some living organisms.

Electromagnetic fields created by the flow of electric current can change the natural migration behaviour of marine mammals, they can also be a source of thermal energy introduced into the sea. However, these factors are difficult to measure and in compliance with the “Update of the preliminary environmental assessment of the marine waters status” [2], are not currently monitored in Poland. It has been known for years that some animals, such as dolphins, birds and certain species of insects are guided by the position of the magnetic poles in their underwater migrations or long-distance flights. These abilities to recognise the direction of the Earth's natural magnetic field can be disturbed as a result of a very strong intensity of a constant magnetic field of 1-50 Tesla.

5.8 Description of natural elements and protected areas

5.8.1 Biotic components in the sea area

5.8.1.1 Phytobenthos

Phytobenthos comprises aquatic plants with a size of at least a few millimetres, which include vascular plants rooted in the seabed (e.g. seagrass), as well as macroalgae, which attach themselves to hard surfaces (stones, boulders, wrecks, underwater structures) or lie freely on the seabed.

The presence of phytobenthos is determined by two factors, namely the type of substrate and the extent of the euphotic zone, i.e. the layer penetrated by sunlight that is necessary for plants to perform photosynthesis. In the Baltic Sea, this zone extends up to a depth of 20 m [213]. None of the environmental surveys conducted to date have recorded vascular plants in the Polish nearshore zone of the Baltic Sea – from Świnoujście to the Hel Peninsula [67, 332, 55, 305]. The phytobenthos inventory surveys carried out in June 2020 and June 2021 showed the absence of phytobenthos in the EXC BC-Wind OWF area. Lack of vascular plants in the nearshore zone and lack or scarce occurrence of macroalgae in deep water areas (>20 m) is typical for Polish sea areas. Consequently, that component will not determine the feasibility of the proposed project and will not affect the environmental impact assessment.

5.8.1.2 Macrozoobenthos

Macrozoobenthos (benthic macrofauna, invertebrate macrofauna, and benthic macroinvertebrates) is a group of invertebrates with dimensions exceeding 1 mm, inhabiting the surface (epifauna) or the interior (infauna) of seabed sediments. These are mostly sessile organisms with a life-cycle of at least one year. The macrozoobenthos composition includes marine brackish water and fresh water species mainly belonging to the Bivalvia, Crustacea, Polychaeta, Oligochaeta and the Gastropoda divisions. Moreover, periphytic organisms such as bryozoans (Bryozoa) or hydrozoans (Hydrozoa) appear often on the hard substrate. Macrozoobenthos plays an important role in the trophic network of marine ecosystems as food for many species of fish and seabirds. The eggs and larvae of bivalves are food for zooplankton and fish larvae. Benthic fauna shapes the living conditions of other organisms and positively affects the state of the environment, e.g. due to bioturbation of burrowing organisms or biofiltration of suspended solids from the water by bivalves [482, 408, 442, 270, 448, 307, 403].

For the purpose of this EIA Report, macrozoobenthos surveys were carried out in June 2020 in the northern part of the EXC BC-Wind OWF area, and in June 2021 in the southern part of the EXC BC-Wind OWF area: on the soft bottom (at a total of 72 stations – designating an average of 1 survey station per 1 km²) and on the hard bottom (at a total of 8 stations – in stony seabed areas).

Field surveys showed that the EXC BC-Wind OWF area is dominated by sandy sediments (72% of all stations). At 20 stations (28% of all stations) sand and gravel sediments were identified. Due to the mosaic nature of the seabed area surveyed (sand sediment, stone pavement, single stones), it was possible to collect samples from 8 stations on the hard bottom, of which 2 were considered qualitative and were not included in the quantitative analysis. The number of samples collected enables the determination of the qualitative and quantitative structure of macrozoobenthos of both the soft- and hard-bottom habitats.

A total of 23 macrozoobenthos taxa were found in the macrozoobenthos samples collected on the soft bottom within the EXC BC-Wind OWF area. The most common (absolutely constant) taxa, found in over 75% of the samples tested, both in the northern and in the southern part of the EXC BC-Wind OWF area, were two taxa of polychaetes – *Pygospio elegans* and *Marenzelleria* sp. – and a species of bivalves *Limecola balthica*. In addition, only in the northern part of the EXC BC-Wind OWF area the absolutely constant species were the crustacean *Diastylis rathkei* and the polychaete *Bylgides sarsi*, whereas in the southern part these were bivalves *Mya arenaria* and *Cerastoderma glaucum* and the polychaete *Hediste diversicolor*.

In terms of abundance, the polychaete *Pygospio elegans* (46.2%) and the bivalve *Limecola balthica* (10.3%) were predominant in the northern part of the EXC BC-Wind OWF area. The proportion of the remaining individual taxa in the total abundance was lower than 6%. Two species of bivalves accounted for the largest proportion of the macrozoobenthos biomass in the area: the Baltic clam *Limecola balthica* (58.4%) and the sand gaper *Mya arenaria* (10.3%). Also polychaetes constituted a significant proportion of the biomass: *Pygospio elegans* (9.2%) and *Marenzelleria* sp. (7.9%).

In terms of abundance, the polychaete *Pygospio elegans* dominated in the southern part of the EXC BC-Wind OWF area, similarly to the northern part (46.2%). Moreover, the most abundant taxa included Hydrobiide snails (16.6%) as well as the bivalve *Mya arenaria* (8.8%) and Oligochaeta (8.7%). The proportion of the remaining individual taxa in the total abundance was lower than 5%. Three species of bivalves accounted for the largest proportion of the macrozoobenthos biomass in this area: the Baltic clam *Limecola balthica* (47.4%), the lagoon cockle *Cerastoderma glaucum* (25.9%), and the sand gaper *Mya arenaria* (14.5%).

A total of 19 taxa were identified on the hard bottom in the EXC BC-Wind OWF area. The absolutely constant taxa in the northern part of the area were *Bylgides sarsi*, *Mytilus trossulus* and *Einhornia crustulenta*. On the hard bottom in the southern part of the EXC BC-Wind OWF area, the absolutely constant taxa were *Bylgides sarsi*, *Pygospio elegans*, Oligochaeta, *Amphibalanus improvisus*, *Jaera albifrons*, *Gammarus* juv., *Gammarus salinus*, *Mytilus trossulus* and *Einhornia crustulenta*. The bay mussel *Mytilus trossulus* prevailed on the hard bottom throughout the survey area, both in terms of abundance and biomass (97.2% of abundance and 99.7% of biomass in the northern part, and 89.4% of abundance and 99.8% of biomass in the southern part).

The results of previous macrozoobenthos surveys within the survey area have not been published in the scientific literature yet. The survey conducted within the EXC BC-Wind OWF area provided the necessary data for a precise determination of the surface distribution of the macrozoobenthos quality status in this area. The comparative material for assessing the taxonomic composition and the constancy of macrozoobenthos occurrence in the EXC BC-Wind OWF area may be the survey results contained in the reports on the macrozoobenthos surveys in the areas of the Baltic Power OWF CI as well as Baltica B-2 and B-3 OWF CI. In the macrozoobenthos surveys for the EIA Report for the Baltic Power OWF Connection Infrastructure, the same number of taxa [305] was recorded for the soft

bottom as in the present survey. A higher number of taxa (31) was identified in the macrozoobenthos surveys for the EIA Report for the Baltica B-2 and B-3 OWF Connection Infrastructure [304]. As for the hard bottom, the number of taxa in the EXC BC-Wind OWF area was higher than in comparable areas.

The two polychaete taxa *Pygospio elegans* and *Marenzelleria* sp. as well as the bivalve species *Limecola balthica* were absolutely constant taxa on the soft bottom within all three survey areas, namely the EXC BC-Wind OWF, Baltic Power OWF CI and Baltica B-2 and B-3 OWF CI areas. This is primarily due to a similar type of the seabed sediment and a similar depth range.

5.8.1.3 Ichthyofauna

The ichthyofauna surveys were conducted in the EXC BC-Wind OWF area to determine the species composition, abundance and distribution of ichthyofauna, the structure and biological characteristics of the species of fish occurring there, including also the species composition and abundance of ichthyoplankton. The surveys were conducted in a one-year-long cycle and included four survey campaigns covering all seasons of the year.

During the ichthyoplankton surveys carried out in the EXC BC-Wind OWF area, the eggs of a single fish species (sprat – maximum quantity of 79.84 pcs per 10 m² in the summer) and larvae belonging to 10 taxa were caught. Similarly, during the ichthyoplankton inventory surveys conducted to the west of the EXC BC-Wind OWF area [304, 305], only sprat eggs were found. The number of larvae taxa in these surveys was higher at 12. No larvae of straightnose pipefish or turbot were recorded in the survey area for the EXC BC-Wind OWF.

A total of 9 fish species were caught during pelagic control catches in the EXC BC-Wind OWF area. The dominant species were sprat and herring. Other species were caught in small quantities: garfish, three-spined stickleback, great sand eel, cod, anchovy, flounder and lesser sand eel. In the pelagic fish surveys carried out in the EXC BC-Wind OWF area [304, 305] the results were very similar. The predominant species were also sprat and herring, while the number of species in the case of surveys for the Baltica B-2 and B-3 OWFs CI was 9, and for the Baltic Power OWF CI it was 8.

A total of 13 species were recorded in the EXC BC-Wind OWF area during demersal fish surveys. Among these, flounder and cod prevailed, as in other surveys conducted in the area [304, 305]. Other species accounted for a small proportion of the catch (great sand eel, plaice, shorthorn sculpin, pogge, mackerel, fourbeard rockling, turbot, sprat, herring, lumpfish and viviparous eelpout).

In the coastal zone of the EXC BC-Wind OWF area, inventory surveys were carried out in 2016–2017 [304] and in 2020–2021 [303]. Between 14 and 18 fish taxa were identified in these surveys. Lesser sand eel and great sand eel prevailed in the catches.

The results obtained indicate that during the survey period, the area of the planned project provided a habitat for herring, being particularly important for the juvenile stages of this species, and also, it was an area through which migration routes leading towards wintering grounds run, as well as spawning and feeding migration routes. The area of the planned project constituted a part of a sea area, in which temporary spawning as well as feeding ground migrations of sprat took place, and the latter migrations intensified in autumn.

Taking into account the information from literature and the results of the surveys conducted, it can be assumed that sprat spawning does not take place within the EXC BC-Wind OWF area [32, 338, 235, 150, 147, 148, 149].

The area of the planned project is the location of the occurrence of cod with a varied seasonal abundance. Moreover, it is situated on the spawning and feeding migration routes of this species.

The area of the EXC BC-Wind OWF is a seasonal habitat for adult flounder. Flounder do not spawn within that area, since the salinity prevailing there is too low to enable successful fertilisation [276,

288, 286, 287]. Shallow waters (up to 1 m in depth) at the very shore are the habitat and feeding area of the flounder fry.

The EXC BC-Wind OWF area is also a habitat for ammodytids and the freshwater species migrating periodically from the inland surface waters such as roach, bream, perch and zander.

The presence of small numbers of the larvae of ammodytids, shorthorn sculpin, longspined bullhead, rock gunnel and turbot in the samples collected within the EXC BC-Wind OWF area and in the surveys carried out in adjacent areas [304, 305], indicates that spawning of these taxa may occur in the nearshore area. This is confirmed by the data from literature pointing to shallow, near-shore areas with the seabed covered with sandy or gravelly sediment as a natural environment conducive to the reproduction of these fish.

Out of all the fish species recorded during the ichthyofauna surveys carried out for the purpose of the planned project, four are of particular economic importance in terms of commercial fishing. These are: sprat, herring, cod, and flounder. They were also found in dominant numbers in surveys conducted in this area of the Southern Baltic [304, 305]. Neither salmon nor eel were recorded during the survey catches (no standardised survey methods, low density), although these two species are found in commercial fishing.

Two taxa of the fish larvae recorded, i.e. gobies and common seasnail, belong to partially protected species pursuant to the Regulation of the Minister of the Environment of 16 December 2016 *on the protection of animal species* (consolidated text: Journal of Laws of 2022, item 2380). Gobies have not been identified to species, but on the basis of the knowledge from literature and random observations, it can be assumed that sand goby was the dominant species in the samples collected.

To assess the significance of the EXC BC-Wind OWF area with respect to ichthyofauna, its following values were considered: taxonomic diversity, occurrence of protected and endangered as well as commercial species, the presence of feeding or spawning grounds, and migration routes. On the basis of the above-mentioned functions, the natural values of this area were assessed as moderate. This evaluation was made on the basis of an expert assessment.

5.8.1.4 Marine mammals

There are four species of marine mammals found in the Baltic Sea: the grey seal (*Halichoerus grypus*), the harbour seal (*Phoca vitulina*), the ringed seal (*Pusa hispida*) and the harbour porpoise (*Phocoena phocoena*). The ringed seal is not recorded in Polish sea areas.

The **grey seal** can be found throughout the Baltic Sea, particularly in its northern and north-western parts where it forms colonies. The total population in the Baltic Sea is estimated to be 40 000 individuals. In the Polish part of the Baltic Sea, grey seals are observed along the entire coastline, with several hundred cases of live or dead animals recorded in recent years. The only place where a group of grey seals can be observed for most of the year is the area of the *Mewia Łacha* Nature Reserve near the Vistula Cut estuary, which is a resting place for over 100 individuals [329]. There are no colonies of this species on the Polish coast, understood as resting, moulting or breeding areas.

Grey seals breed in undisturbed resting places in February and March. They travel up to several hundred kilometres to reach their feeding grounds. They feed on fish. In the Baltic Sea, their main food source is herring, but sprat and Atlantic cod are also important food sources. In recent years, the continued presence of seals in the Vistula Cut estuary has become a cause of increasing conflict with fishing activities [3].

The **harbour seal** is rare in Polish waters, and the Vistula Cut estuary is the only place where this species has been observed in recent years. The population in the Baltic Sea was estimated at 1700 individuals in 2016. Feeding grounds of the harbour seal are usually not very far from the colonies, which are

located in the western Baltic Sea and in the Danish Straits; occasionally, individuals are recorded feeding at greater distances.

The harbour seal mates in May/June and the young are born in August/September. Notably, pups are sensitive to disturbance near the colony in June/July because they need resting areas where they suck their mothers' milk. They feed on fish, squid and crustaceans. Seals' eyes are adapted to see underwater and above water. Their hearing is better adapted to marine than terrestrial environments. The animals can dive to depths reaching 100 m.

Given the shortage of surveys on the impacts of subsea cable construction and operation in offshore areas on individual seal species occurring in the Baltic Sea, further impact assessment was carried out jointly for both species together, i.e. the grey seal and the harbour seal, assuming that animal responses will be similar.

The **harbour porpoise** is the only cetacean species present in the Baltic Sea. Two populations of this species are distinguished: the Baltic Sea (or Baltic Proper) population and the Belts population. The Baltic Sea porpoise population is an endangered population, with an estimated number of animals living in the Baltic Proper being 447 individuals (95% confidence interval: 90–997). In 2012, the abundance of the Belts Sea population was estimated at approximately 18 500 individuals [400], and during SAMBAH survey it was estimated at over 20 000 individuals [371]. The two populations are clearly separated in the summer, with a north-south boundary of occurrence along the eastern coast of Bornholm. In winter, the animals are more dispersed. Areas of particular importance for this species are therefore mainly based on their distribution in the summer. In the SAMBAH project, an aggregation of the harbour porpoise was found to appear in the summer, in the areas of the Middle Bank and Hoburgs Bank in the Baltic Proper. This aggregation coincides with the birthing time and the mating season [371]. Porpoise breeding in the Baltic Sea takes place from mid-June to the end of August, calving – between May and June, and mating – in July and August. Females give birth to one calf that is dependent on the mother during the lactation period, which lasts from 8 to 11 months. The main food source of the harbour porpoise is a variety of fish species, especially cod, herring and sprat. The diving depth generally does not exceed 50 m.

Results of the SAMBAH project show that the area of the proposed project was characterised by low detection rates of the harbour porpoise, indicating the sporadic occurrence of these animals in the area [371] [Figure 5.5].

Marine mammals are negatively affected by anthropogenic activities: by-catch, reduced food supply, noise and toxic pollution.

The seal is not considered to be an animal sensitive to anthropogenic activities [38], except during breeding and moulting periods. In these periods, the animals are sensitive to physical disturbance, especially on land near the colony. The key factor affecting the mortality of seals and porpoises in the Baltic Sea is by-catch. Even minimum by-catch estimates exceed the limits of the small Baltic Proper population of the harbour porpoise, preventing recovery of abundance. The by-catch of all Baltic seal species is estimated to remain significant, exceeding 2% of their population, if the current structure of fishery is not changed. The situation may improve with a replacement of fishing methods with ones that do not pose a by-catch risk. The decreasing food supply associated with overfishing and the destruction of fish habitats is deteriorating the health of seals and porpoises. Animal health is also deteriorating due to the influx of pollutants from land.

As the climate warms and sea-ice cover declines, there is a threat of increased seal mortality from hunting due to the concentration of individuals in less dispersed colonies.

Despite the slow increase of the seal population in the Baltic Sea, its status is unsatisfactory. Achieving a good status for all seal species requires the introduction of protected areas and a reduction of human

impacts. The population of the harbour porpoise in the Baltic Proper has a critically endangered status and, despite the lack of accurate information on its abundance, a further decline is probable [161].

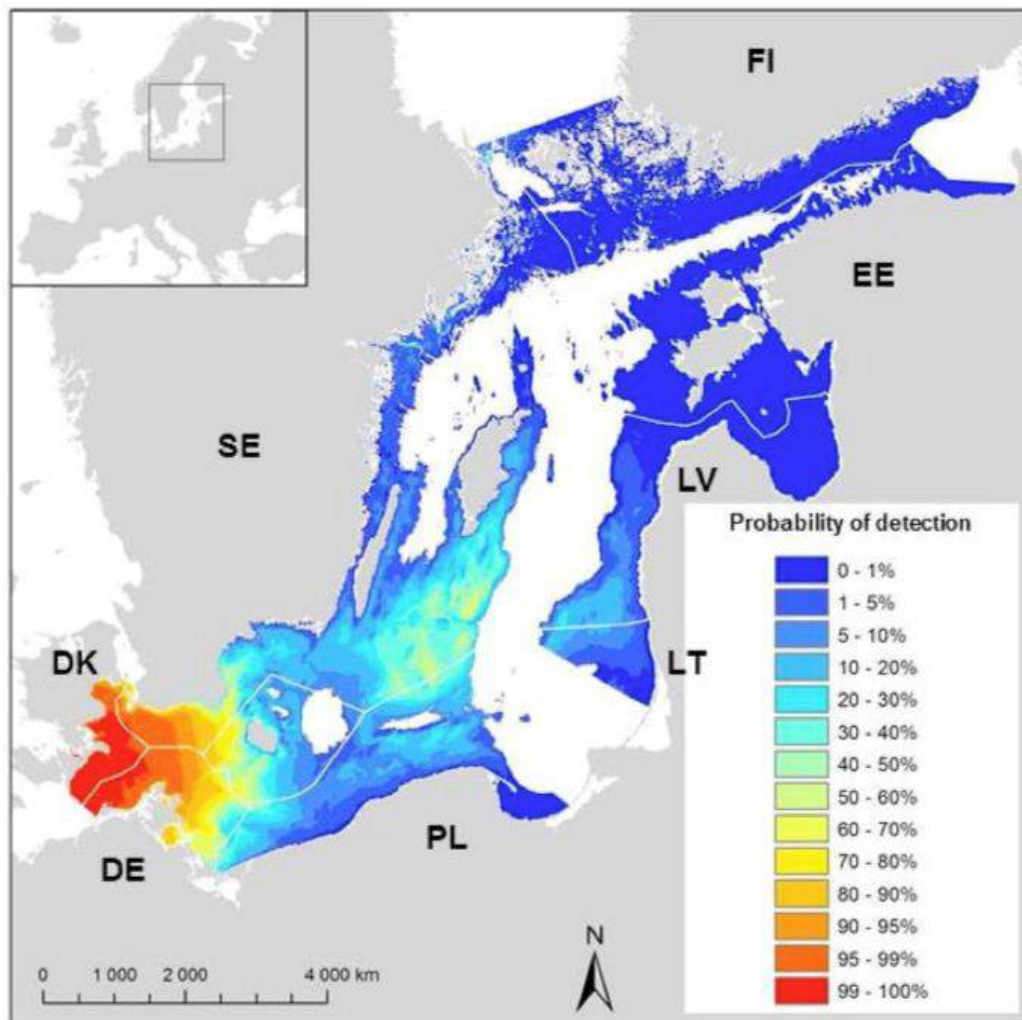


Figure 5.5. Probability of the harbour porpoise detection in the Baltic Sea in August [source: [372]]

Passive acoustic monitoring of harbour porpoises was carried out within the EXC BC-Wind OWF area from October 2019 to January 2021. In addition, during this period observations of marine mammal occurrence were conducted from the air as well as from ships, during seabird surveys. The results of the surveys clearly indicate that the EXC BC-Wind OWF area is used sporadically, both by harbour porpoises (17 days of positive detections) and by seals, of which 21 individuals were recorded during the entire survey period, including 15 grey seals.

The sporadic use of the EXC BC-Wind OWF area by marine mammals is also indicated by the results of other inventory surveys for OWF connection infrastructure projects [304, 305]. In each case, single seal sightings as well as single detections of harbour porpoises were recorded in the area.

5.8.1.5 Seabirds

In order to characterise the EXC BC-Wind OWF area in terms of its use by seabirds, a comprehensive inventory survey was carried out in 2019–2020, covering different phenological periods, i.e. the autumn migration period, the wintering period, the spring migration period and the summer period.

The results of the survey clearly indicated that the vicinity of the EXC BC-Wind OWF area is used by seabirds in a heterogeneous manner. The northern part of the area, located away from the shore, is characterised by lower numbers of seabirds, either sitting on the water or flying over the area, compared to the southern part. The southern part of the EXC BC-Wind OWF area is located in a protected sea basin (part of the Natura 2000 European ecological network – *Przybrzeżne wody Bałtyku* (PLB990002) site).

In the northern part of the EXC BC-Wind OWF area, the dominant species among birds sitting on the water was the European herring gull, with its highest abundance recorded during the autumn migration, wintering and spring migration periods. It was only during the summer period that the common guillemot demonstrated the highest proportion in terms of abundance, although only slightly higher than the European herring gull. The common guillemot was also present in the other periods surveyed, but with a considerably smaller proportion in terms of abundance. During the wintering period, the second most abundant species was the long-tailed duck. This species was also present during the autumn and spring migration periods, but its proportion at that time was much lower (approximately 1%). During the summer season, the long-tailed duck was not recorded in the northern part of the EXC BC-Wind OWF area. The species that was recorded in the survey area during all the periods was the razorbill, with a proportion in the abundance of all birds exceeding 20% during the wintering and spring migration periods. Among the birds with a proportion in abundance exceeding 1%, also the great saddle-backed gull, the little gull, the lesser black-backed gull and the red-throated diver were recorded outside the autumn migration period.

A different pattern of prevalence of birds sitting on the water was identified within the southern part of the EXC BC-Wind OWF area. During the autumn migration period and wintering, the velvet scoter was the clearly dominant species, while during the spring migration period it was the long-tailed duck. Outside the wintering period, also the European herring gull and the razorbill were present in the area in abundances exceeding 1% proportion of all birds.

Among birds flying over the survey areas, similar dominance distributions were recorded as for birds sitting on the water. During the autumn migration period, flights of geese of the *Anser* genus were recorded over both the northern and southern parts of the EXC BC-Wind OWF area – these birds prevailed among the birds flying over the survey areas.

The results of the survey clearly indicate that the southern part of the EXC BC-Wind OWF area is definitely a more important area for birds, compared with its northern part. In each of the phenological periods, more birds used the southern part of the sea area, both sitting on the water and flying over it. During the wintering period (considering the average abundance per survey cruise), more than 20 times more birds were present in the southern part of the EXC BC-Wind OWF area than in its northern part, almost 16 times more during the autumn migration period, and over 26 times more during the spring migration period, respectively. Also, when comparing the numbers of birds flying over the sea areas surveyed, more of them used the space within the southern part of the EXC BC-Wind OWF area.

These survey results largely coincide with the results of the surveys carried out in 2018–2019 for the Baltic Power OWF [303].

5.8.2 Protected areas, including Natura 2000 sites

The southern part of the EXC BC-Wind OWF area, stretching over approximately 12.5 km, crosses the eastern part of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002) along the north-south axis [Figure 5.6].

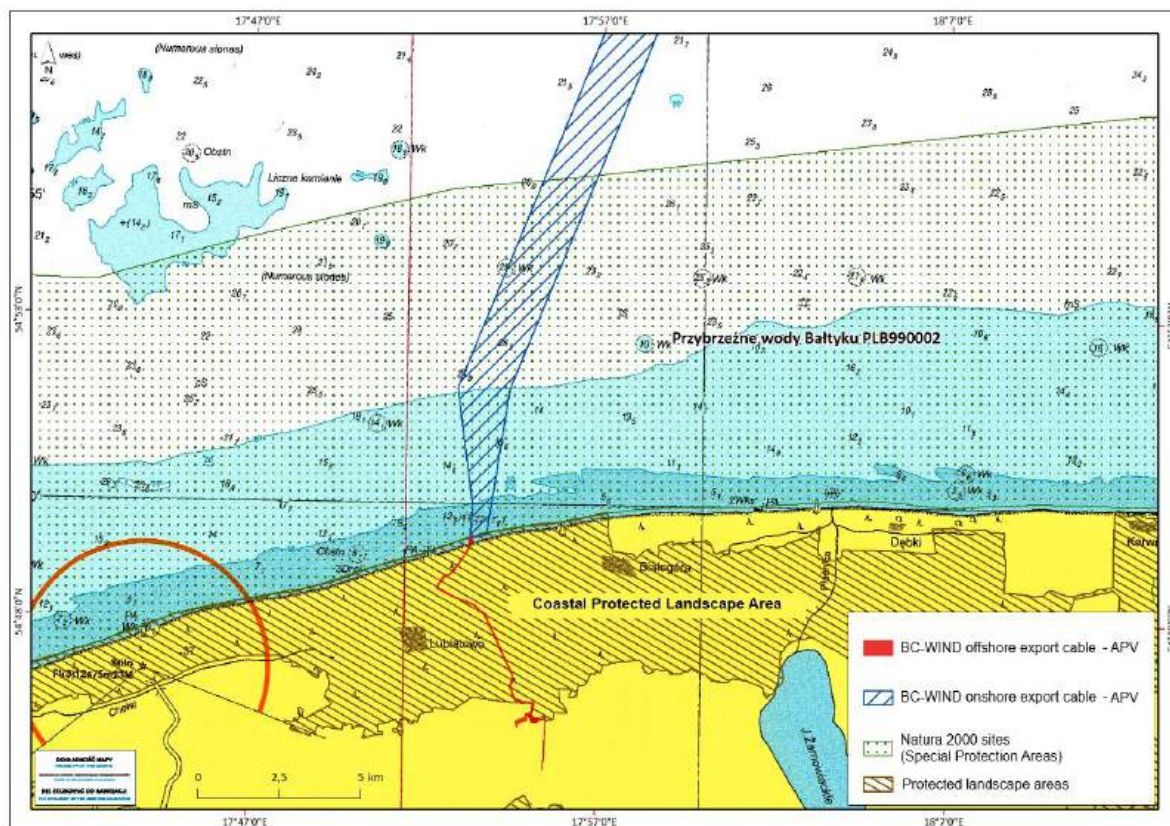


Figure 5.6. Location of the EXC BC-Wind OWF area in relation to the Natura 2000 site Przybrzeżne Wody Bałtyku (PLB990002) [source: internal materials]

The Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002) was established by the Regulation of the Minister of the Environment of 21 July 2004 on the Natura 2000 special protection areas for birds (Journal of Laws of 2004, No. 229, item 2313, as amended). The primary function of the site is to provide protection for birds wintering in the nearshore zone of the Baltic Sea, mainly the long-tailed duck (*Clangula hyemalis*), the velvet scoter (*Melanitta fusca*), the common scoter (*Melanitta nigra*), the black guillemot (*Cepphus grylle*), the razorbill (*Alca torda*) and divers (Gaviiformes) [264]. The surface of the area is 194 626.73 ha, covering coastal waters of the Baltic Sea up to a depth of approximately 20 m, and its boundaries extend for 200 km, from the base of the Hel Peninsula, to the eastern border of the Pomeranian Bay [264, 130].

Approximately 12% of the velvet scoter, 2% of the common scoter and 35% of the long-tailed duck wintering in Polish sea areas gather within the area [264, 130]. Due to its importance for wintering birds, the *Przybrzeżne wody Bałtyku* PLB990002 site is classified as a bird refuge of European significance (refuge code E 80). In the short-term, high abundances of gulls may be recorded in the area, mainly the European herring gull [264, 130]. It is a phenomenon of synanthropic origin – gulls appear in large numbers over the sea area when they accompany fishing boats in search for easily accessible food source [416, 381].

Nine species of birds listed in Annex I to the Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds are subject to protection in the area [Table 5.2]. Most of them are the species wintering in the Polish Baltic Sea area, with the exception of the European herring gull, which may appear over the sea area throughout the year [416, 381].

Table 5.2. Species covered by Article 4 of Directive 2009/147/EC, species listed in Annex II to Directive 92/43/EC, as well as population assessment within the *Przybrzeżne wody Bałtyku* site for these species [source: SDF [130]]

No.	Species	Population type	Population assessment in the area*	Population size in the area [number of individuals]	
				minimum	maximum
1.	Razorbill <i>Alca torda</i>	wintering	C	5 (500)	50 (1000)
2.	Black guillemot <i>Cepphus grylle</i>	wintering	C	1 (200)	7 (1100)
3.	Long-tailed duck <i>Clangula hyemalis</i>	wintering	C	2750 (90 000)	7150 (120 000)
4.	Black-throated diver <i>Gavia arctica</i>	wintering	C	1	12
5.	Red-throated diver <i>Gavia stellata</i>	wintering	C	1	100
6.	European herring gull <i>Larus argentatus</i>	wintering	B	1250	7300
7.	Common gull <i>Larus canus</i>	wintering	C	70	550
8.	Velvet scoter <i>Melanitta fusca</i>	wintering	C	1600	11,700
9.	Common scoter <i>Melanitta nigra</i>	wintering	C	350	3000
		passing	C	3000	3000

*Estimation of the species population size and density in relation to the national population; class ranges: A – $100 \geq p > 15\%$; B – $15 \geq p > 2\%$; C – $2 \geq p > 0\%$;

**values in brackets derived from BirdLife International [31]

In the SDF of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002), two negative impacts on the site were identified [130]. The first one is: "Other urbanisation, industrial and similar activities" (code E06), and the other is: "No threats and pressures" (code X). The impact labelled "No threats and pressures" was also indicated in the SDF of the area as a positive impact. Three impacts are classified as the "medium" level (M), meaning a "moderate direct or immediate influence, predominantly indirect and/or relating to approximately half of the area" [188]. Regarding impact E06, it was indicated that the impact is internal (generated within the site boundary), whereas the sources of impact X are classified as internal and intrinsic [130].

The authority responsible for the management of the area is the Director of the Maritime Office in Gdynia and the Director of the Słowiński National Park in the offshore area of the Słowiński National Park. The planned project is not directly related to or essential for the management of a Natura 2000 site. The *Przybrzeżne wody Bałtyku* (PLB990002) site has no protection plan implemented.

5.8.3 Wildlife corridors

A wildlife corridor, pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended), is an area enabling the migration of plants, animals or fungi. A network of wildlife corridors connecting the European Ecological Network Natura 2000 in Poland was developed in 2011 [199]; however, no wildlife corridors in the Polish sea areas were indicated therein. Krost *et al.* [236] emphasise the necessity to indicate wildlife corridors for benthic organisms. However, this is a relatively poorly recognised issue. There are also no relevant studies on the Southern Baltic in that scope.

According to the general classification of the migration system of aquatic and wetland birds in Eurasia, Poland, including its marine areas, is located within two large flyways: the East Atlantic and the Mediterranean/Black Sea flyways. The migration tactics, as well as the flyways of seabirds in the Baltic

region are very poorly recognised. In summer (July and August), the migration of sea ducks (mainly the common scoter males) is observed, from the Gulf of Finland in the direction of the moulting grounds located in the Danish straits. They are accompanied by common eiders *Somateria mollissima* and velvet scoters *Melanitta fusca*; however, the abundance of both species is much lower than that of the common scoter. These birds make a stop in the sea areas of the Southern Baltic only in exceptional cases. The period of seabird autumn migration is very extended in time. Starting in August, a number of water bird species can be observed within the Polish sea areas. Some of them are only passing and do not winter there (e.g. the terns of the *Sterna* and *Chlidonias* genera), others are observed throughout the entire migration and wintering periods (sea ducks, razorbills, divers, grebes). In spring, large flocks of sea ducks (the long-tailed duck, the velvet scoter and the common scoter) moving towards feeding grounds make a stop in the Polish zone of the Baltic Sea [381].

Also, for the marine mammals occurring in the Southern Baltic, no areas that could meet the criteria for wildlife corridors can be identified. Both seals, as well as porpoises travel in search of food with no preference for specific routes.

5.8.4 Biodiversity

5.8.4.1 Phytobenthos

No phytobenthos was identified within the EXC BC-Wind OWF area.

5.8.4.2 Macrozoobenthos

Within the EXC BC-Wind OWF area, 23 macrozoobenthos taxa were identified on the soft bottom (sand and gravel sediments), belonging to 7 classes: Hydrozoa, Polychaeta, Clitellata, Malacostraca, Gastropoda, Bivalvia and Gymnolaemata, as well as two phyla: Nemertea and Priapulida.

The Malacostraca and Polychaeta were the most abundant. The most common taxa were the two species of psammophilous polychaetes: *Marenzelleria* sp. and *Pygospio elegans*. The quantitative analyses of the soft bottom showed that the taxa typical of the shallow and medium-deep seabed (up to 35 MBSL) of the near-shore and open waters of the Southern Baltic (eastern Gotland Basin) dominated in the survey area. In terms of abundance, the group of polychaetes dominated, including the psammophilous *Pygospio elegans*, which is common in the Southern Baltic, and *Marenzelleria* sp. In terms of biomass, on the other hand, the class of Bivalvia was clearly dominant, with the highest share of *Limecola balthica*, characterised by a wide range of tolerance to environmental factors.

In the samples collected from the hard bottom (stone surface) within the EXC BC-Wind OWF area, the presence of 19 taxa (16 species and 3 higher taxonomic units) belonging to 8 classes: Hydrozoa, Clitellata, Polychaeta, Hexanauplia, Malacostraca, Gastropoda, Bivalvia and Gymnolaemata was recorded. Most taxa were the representatives of Malacostraca. In terms of occurrence, three taxa were constant. They were representatives of the periphytic fauna, such as the bay mussel *Mytilus trossulus*, *Einhornia crustulenta* and the associated fauna – the polychaete *Bylgides sarsi*. However, in the abundance and biomass structures of this community, the definite dominant was the bay mussel *Mytilus trossulus*, which is a component of the diet of benthivorous birds and fish, also playing an important habitat-forming role in the environment.

The number of macrozoobenthos taxa in the EXC BC-Wind OWF area was similar to the numbers of taxa in the other survey areas. The same number of taxa (23) was recorded in the soft bottom area within the Baltic Power OWF CI area [305], whereas a higher number (31) was recorded within the Baltica B-2 and B-3 OWF CI areas [304]. On the other hand, the number of macrozoobenthos taxa on the hard bottom of the EXC BC-Wind OWF area was higher than in the Baltic Power OWF CI area (14) and in the Baltica B-2 and B-3 OWF CI areas (17).

5.8.4.3 Ichthyofauna

The analysis of the catch results and catch efficiency for the fish community inhabiting the EXC BC-Wind OWF area demonstrates that the area is typical for the Southern Baltic in terms of species diversity, with a distinct prevalence of cod and flounder in demersal catches and of herring and sprat in pelagic catches.

In total, 144 fish species, including 97 marine species, 7 migratory species and 40 freshwater species, were recorded in the Baltic Sea [412]. The fish species prevailing in the deeper waters of the western Baltic Sea are cod and flounder in the demersal zone and herring and sprat in the pelagic zone [12, 221, 184]. According to CIEP, a maximum of 44 fish species live in the open sea area, including the species occurring in the coastal and transitional waters.

As regards ichthyoplankton, the eggs of one fish species (sprat) and the larvae of 10 fish taxa (gobies, sprat, flounder, herring, ammodytids, longspined bullhead, rock gunnel, common seasnail, cod and fourbeard rockling) were caught in the EXC BC-Wind OWF area during the entire survey period. In ichthyoplankton surveys for the Baltic Power OWF CI, only sprat eggs and larvae of 12 fish taxa were caught [305]. Similarly, in ichthyoplankton surveys for B-2 and B-3 OWF CI, only sprat eggs and larvae of 13 fish taxa were caught [304].

A total of 17 fish species were observed in the EXC BC-Wind OWF area during the surveys, in pelagic and demersal catches. In the case of the surveys for the Baltic Power OWF CI, there were 18 species caught in total, while in the surveys for the Baltica B-2 and B-3 OWF CI, 22 species were caught.

During pelagic fishing in the EXC BC-Wind OWF area, 9 fish species were caught, with sprat and herring being the clearly dominant species in biomass. The dominance of these species was also recorded in the pelagic fishing for the Baltic Power CI [305], where 8 species were caught, and for the Baltica B-2 and B-3 OWF CI, where 9 species were caught [304].

During demersal fishing in the EXC BC-Wind OWF area, fish belonging to 13 species were caught. These catches were dominated by flounder and cod. The dominance of these species was also recorded in the pelagic fishing for the Baltic Power OWF CI [305], where 15 species were caught, and for the Baltica B-2 and B-3 OWF CI, where 21 species were caught [304].

A total of 23 fish taxa were recorded in catches with beach seine nets in the nearshore zone within the EXC BC-Wind OWF area [304, 305]. The catches were dominated by lesser sand eel, followed by herring, great sand eel, and perch.

5.8.4.4 Marine mammals

The EXC BC-Wind OWF area is not a place of permanent or regular occurrence of marine mammals. During the inventory surveys, occasional presence of the harbour porpoise and the grey seal was recorded – two of the three species found in the Southern Baltic.

5.8.4.5 Seabirds

In terms of seabird occurrence, the northern and southern parts of the EXC BC-Wind OWF area differ from each other. Significantly more birds sitting on the water were recorded in the southern part of the EXC BC-Wind OWF area in each phenological season. The number of species in the southern part was also higher. The greatest difference in the number of species between the sea areas surveyed was found in the autumn migration period, with 10 species recorded in the northern part of the EXC BC-Wind OWF area and 16 species in the southern part. During the wintering period, 8 bird species were found in the northern part, while 13 were recorded in the southern part. The smallest difference was recorded during the spring migration period: 12 species in the northern part and 14 in the southern part.

5.8.5 Environmental evaluation of the sea area

Given the lack of phytobenthos in the EXC BC-Wind OWF area, this environmental component does not affect the evaluation.

Benthic invertebrates can be a sensitive bioindicator of the environment, since the taxonomic diversity, abundance, biomass and sensitivity of individual taxa composing the benthic organism complex indicates the ecological quality of the seabed [307].

Pursuant to the Regulation of the Minister of Infrastructure of 25 June 2021 *on the classification of ecological status, ecological potential and chemical status and the method of classification of the status of surface water bodies and the environmental quality standards for priority substances* (Journal of Laws of 2021, item 1475) as well as the classification used in the Water Framework Directive, soft-bottom macrozoobenthos is one of the elements used in assessing the quality status of the seabed, rated with index B on a 5-degree scale. The quality status of the soft-bottom macrozoobenthos community in the EXC BC-Wind OWF area, both in the northern and southern parts, was assessed as "moderate", which corresponds to class 3 water quality. This was due to a clear prevalence of one species – the polychaete *Pygospio elegans*. For the evaluation of periphytic fauna and the associated fauna of the hard bottom, the methodology used in the assessment of habitat 1170 – Reefs for the purpose of the Habitats Directive (Council Directive 92/43/EEC of 21 May 1992) was adopted [20]. On this basis, the status of the hard-bottom macrozoobenthos communities in the northern part of the EXC BC-Wind OWF area was classified as "good", while in the southern part it was classified as "very good".

The macrozoobenthos taxa identified in the EXC BC-Wind OWF area are the representatives of the invertebrate macrofauna typical and commonly occurring in the open waters of the Southern Baltic to a depth of approx. 30 MBSL. The communities of the soft- and hard-bottom benthic macrofauna did not stand out in terms of taxonomic diversity, abundance, biomass or ecological status assessed as moderate (for the most part of the EXC BC-Wind OWF area, where sandy seabed habitat – the soft-bottom habitat – predominated). Furthermore, no protected macrozoobenthos species were identified in the survey area.

For the purpose of evaluating the EXC BC-Wind OWF area with respect to ichthyofauna, the following characteristics were considered: taxonomic diversity, occurrence of protected and endangered species, the presence of feeding and/or spawning grounds, and migration routes. On the basis of the aforementioned elements, the natural qualities of this area were assessed as medium. This evaluation was based on an expert assessment. The characteristics of the above mentioned natural qualities have been as follows:

- the ichthyoplankton was characterised by medium taxonomic diversity;
- the occurrence of the larvae of fish species under partial protection pursuant to the Regulation of the Minister of the Environment of 16 December 2016 *on the protection of animal species* (consolidated text, Journal of Laws of 2022, item 2380) was recorded; these were the abundant gobies (probably the sand goby) and common seasnail;
- ichthyoplankton surveys indicate the occurrence of sprat spawning, however, the comparison of the numbers of larvae caught during the survey with the average number observed in the Southern Baltic area does not indicate the importance of this area as a spawning ground;
- in the case of gobies, the relatively large numbers of larvae recorded in the summer indicate intensive spawning of this taxon taking place during this period;
- the presence of a few larvae of ammodytids, shorthorn sculpin, long-spined bullhead and rock gunnel in the samples collected indicates that spawning of these taxa may occur in the nearshore area;

- three species of ichthyofauna caught (herring, turbot, sprat) are classified as LC category, i.e. least concern;
- only Atlantic cod has vulnerable status according to the IUCN Red List. Atlantic cod was included in the VU category in 1996; it is a high-risk species endangered with extinction due to a population reduction below 50% in the recent time;
- the area can provide important feeding functions for such species as flatfish, cod, herring, sprat, sand eel, lesser sand eel as well as shorthorn sculpin, three-spined stickleback, lumpfish and viviparous eelpout.

The natural values of the EXC BC-Wind OWF area for marine mammals were assessed as medium. In terms of food supply or the presence of suitable resting and breeding sites for marine mammals, the area of the proposed project is characterised by features typical of the Southern Baltic waters and has a medium value for them. The project area is not located within any conservation areas important for marine mammals, and the survey results showed sporadic occurrence of marine mammals in the area.

In terms of its use by seabirds, the EXC BC-Wind OWF area can be divided into two parts: northern and southern, situated within the boundaries of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002). The southern part is characterised by better environmental conditions for birds, which results in a higher abundance of birds and a higher number of species. Consequently, this area has a higher natural value for seabirds than the northern part of the EXC BC-Wind OWF area.

5.9 Cultural values, monuments and archaeological sites and objects

During geophysical surveys, the remains of one wreck were confirmed within the EXC BC-Wind OWF area – over 46 m long, almost 13 m wide and over 3.6 m tall. According to the Spatial Information System of the Maritime Administration (Polish: SIPAM) [402], the dimensions of this object (WK-0594) are as follows: length 36 m, width 14 m and height 2.6 m. This object is not considered to be a cultural heritage asset.

There is another object described as wreck remains (WK-0472) within the boundaries of the EXC BC-Wind OWF area [402]. It is located directly in the nearshore zone, approximately 650 m from the shoreline. The object is 16 m long and 1 m high. No information on its width is available. According to the SIPAM data, this wreck is a historical object.

To the west of the EXC BC-Wind OWF area, in close proximity to it, there are two wrecks with underwater object numbers WK-0465 and WK-0466 [402]. The former is situated approximately 55 m from the boundary of the EXC BC-Wind OWF area (at a depth of approximately 24 m) and the latter – approximately 63 m (at a depth of approximately 6 m) from the boundary of the EXC BC-Wind OWF area. Both wrecks are classified as historical objects. WK-0466 is the wreck of the Danish steamship *S/S Elie*, discovered in 2014 [473, 334].

No listed monuments or archaeological sites or objects are located within the EXC BC-Wind OWF area.

5.10 Other anthropogenic objects

In 2020–2021, geophysical surveys were carried out in the EXC BC-Wind OWF area in order to detect ferromagnetic objects lying on the seabed or under the sediment layer. As a result, 24 magnetic anomalies were identified. All of these were compared with bathymetric and sonar data to verify the possible presence of objects on the seabed. Selected objects the character of which could not be identified using bathymetric and sonar data were inspected by an ROV. A total of 41 objects were identified on the sonar profiles analysed in the EXC BC-Wind OWF area, including one wreck, 9 linear objects, 9 convex linear objects, 4 bedload deposits, one log, 10 objects of other types (unidentified origin) and 7 objects classified as geological formations. During ROV inspections, a total of 15 objects were surveyed, previously identified on the basis of the analysis of bathymetric and sonar data.

In the EXC BC-Wind OWF area, no conventional warfare agents from the period of either world war have been found so far. However, their presence on the seabed of the analysed area cannot be excluded. A similar approach should be taken to the potential occurrence of containers with chemical weapons, which were dumped after World War II, mainly in the Baltic deeps – the Gotland Deep and the Bornholm Deep – as well as in the Skagerrak, the Little Belt and the Gdańsk Deep [223, 25] [Figure 5.7]. In light of the current analytical results and incidental discoveries, it is known that some chemical warfare agents were dumped from ships into the sea during transfer to their intended deposition sites [223]. Taking a precautionary approach, it should therefore be assumed that conventional and unconventional warfare agents from periods of warfare may also be deposited on the seabed in the EXC BC-Wind OWF area, posing a potential threat to the safety of the project implementation.

Before the commencement of the proposed project, the Project Owner will conduct detailed surveys in the scope of the presence of duds and UXOs on the seabed. If any chemical warfare agents/UXOs are found, the Project Owner shall notify the relevant authorities and institutions, and shall comply with their recommendations.

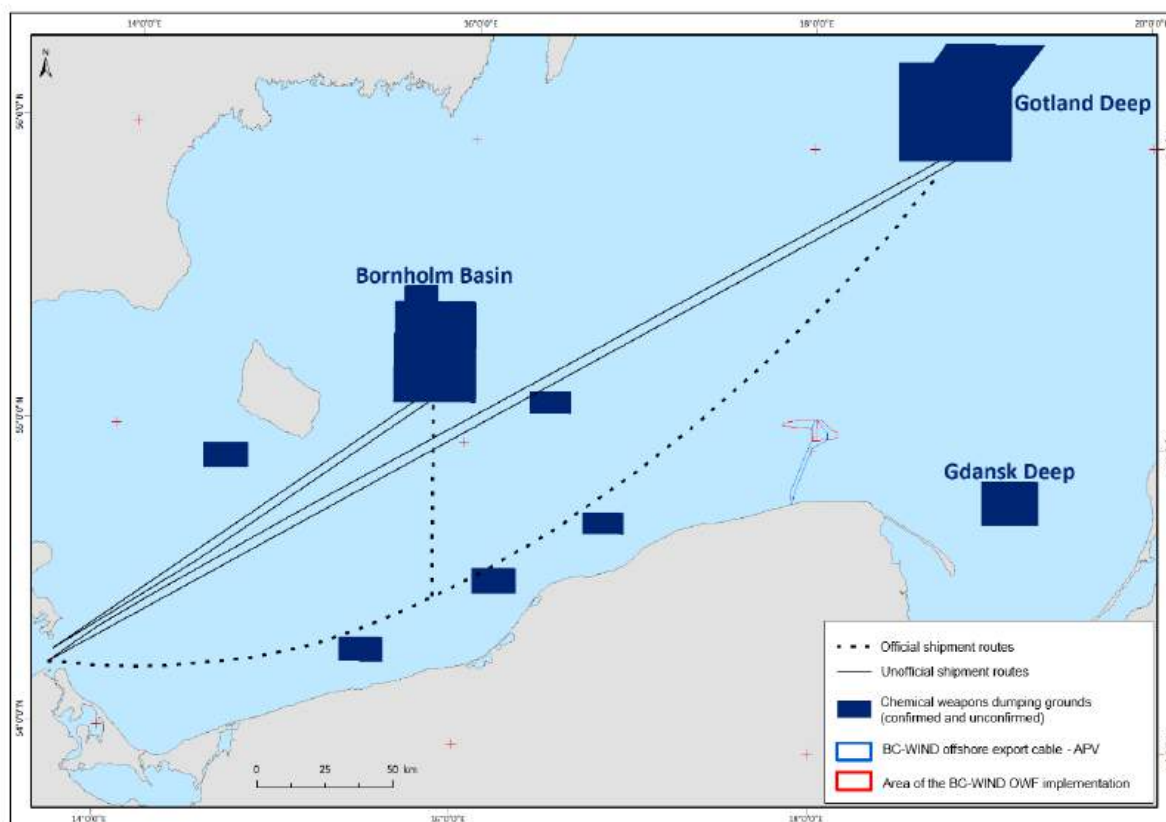


Figure 5.7. Location of the EXC BC-Wind OWF area in relation to the shipment routes and chemical weapons dumping grounds in the Baltic Sea [source: internal materials based on [26]]

5.11 Use and management of the sea area and tangible property

The sea area in which the EXC BC-Wind OWF area is situated plays various functions resulting from the previous human activity and the natural and environmental resources occurring in it. A list of forms of the current and future use of sea space is presented in the MSPPSA approved by the Regulation of the Council of Ministers of 14 April 2021 *on the adoption of the maritime spatial plan for internal sea waters, the territorial sea and the exclusive economic zone at a scale of 1:200 000* (Journal of Laws of 2021, item 935).

According to the division of the Polish sea areas, resulting from the MSPPSA, the offshore part of the EXC BC-Wind OWF is located in the following sea basins and sub-basins [Figure 5.8]:

- sea basin POM.46.E;
- sea basin POM.16.Pw, including sub-basins 16.201.I;
- sea basin POM.54.T, including sub-basins 54.201.I and 54.926.B;
- sea basin POM.41a.P, including sub-basins 41a.201.I and 41a.926.B;
- sea basin POM.40a.C, including sub-basins 40a.201.I, 40a.918.B and 40a.800.S.

Pursuant to the MSPPSA, the EXC BC-Wind OWF is classified as "technical infrastructure". This term denotes, among others, *external connection infrastructure of offshore wind farms*. Table 5.3 provides characteristics of the sea basins and sub-basins in the context of allowing the construction and maintenance of connection infrastructure within their boundaries.

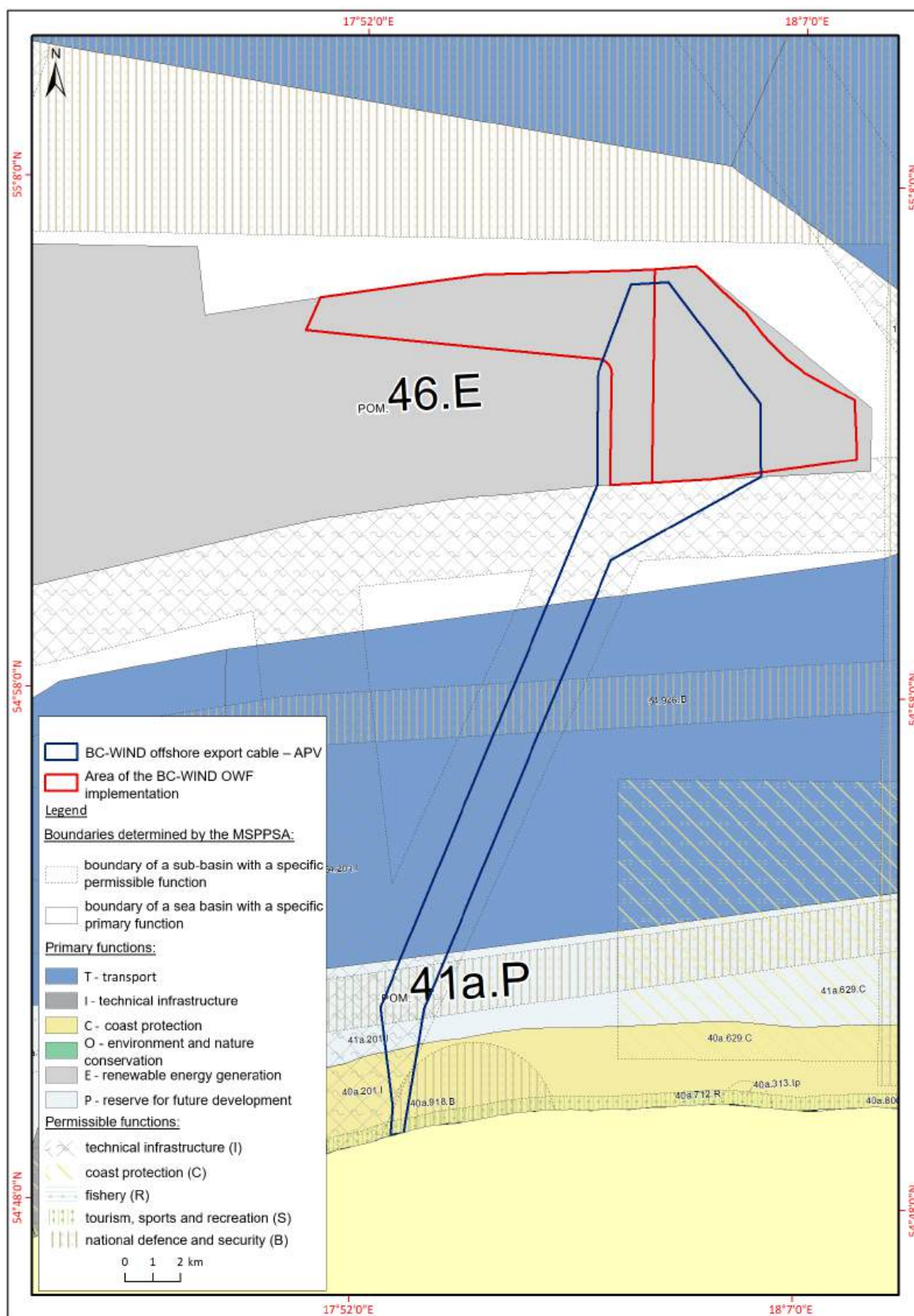


Figure 5.8. Location of the EXC BC-Wind OWF area against the background of the Maritime Spatial Plan of the Polish Sea Areas [source: internal materials based on the MSPPSA drawing].

Table 5.3. Provisions of the Maritime Spatial Plan of the Polish Sea Areas for the sea basins and sub-basins within the boundaries of the EXC BC-Wind OWF area [source: internal materials, based on the MSPPSA]

Sea basin	Primary function	Permissible functions	Provisions pertaining to the location of technical infrastructure within the sea basin	Provisions pertaining to sub-basins within the sea basin
POM.46.E	Renewable energy generation	1) aquaculture; 2) scientific research; 3) cultural heritage; 4) technical infrastructure; 5) exploration and prospecting of mineral resources, as well as extraction of minerals from deposits; 6) fishery; 7) artificial islands and structures; 8) transport; 9) tourism, sports and recreation	– the implementation of the function is restricted to: – the infrastructure essential for the implementation of the function of energy acquisition, – methods which do not endanger the ecological function of spawning grounds and the survival of the early development stages (eggs and larvae) of commercial fish species; – linear elements of the technical infrastructure are required to be laid in a space-efficient manner, below the surface of the seabed, and if this is impossible due to environmental or technological constraints, other permanent safeguards should be applied to allow the safe use of anchored set nets	-
POM.16.Pw	Reserve for future development with permission for extraction	1) aquaculture; 2) scientific research; 3) cultural heritage; 4) technical infrastructure; 5) national defence and security; 6) exploration and prospecting of mineral resources, as well as extraction of minerals from deposits; 7) fishery; 8) artificial islands and structures; 9) transport; 10) tourism, sports and recreation	– the implementation of the function is restricted to methods which do not endanger navigational safety; – the new linear elements of technical infrastructure are required to be laid under the seabed surface, and if this is impossible due to environmental or technological constraints, other permanent safeguards should be used to ensure navigational safety	sub-basin 16.201.I – designated for laying and maintenance of the linear elements of technical infrastructure – external connection infrastructure for offshore wind farms, including the planned DC connection between Poland and Lithuania
POM.54.T	Transport	1) scientific research; 2) cultural heritage; 3) technical infrastructure; 4) national defence and security; 5) protection of the seashore; 6) exploration and prospecting of mineral resources, as well as extraction of minerals from deposits;	– the implementation of the function is restricted to methods which: – do not endanger the ecological function of spawning grounds and the survival of the early development stages (eggs and larvae) of commercial fish species; – the new linear elements of technical infrastructure are required to be laid under the seabed surface, and if it is impossible due to environmental or technological	sub-basin 54.201.I – designated for laying and maintenance of the linear elements of technical infrastructure – including external connection infrastructure for offshore wind farms and the planned DC connection between Poland and Lithuania; sub-basin 54.926.B – designated for fairways of the Polish Navy (0301, 0302, 0303, 0304). The

Sea basin	Primary function	Permissible functions	Provisions pertaining to the location of technical infrastructure within the sea basin	Provisions pertaining to sub-basins within the sea basin
		7) fishery; 8) tourism, sports and recreation	constraints, other permanent safeguards should be used to ensure navigational safety; – it is forbidden to lay the linear elements of technical infrastructure referred to in Annex 1(5)(2), outside the designated sub-basins 54.201.I, 54.202.I and 54.203.I, excluding the DC connection between Poland and Lithuania	change of the existing state of development requires obtaining the opinion of the minister responsible for national defence. During the activities carried out by the Polish Armed Forces, the implementation of other functions in the sub-basin may be precluded;
POM.41a.P	Reserve for future development	1) scientific research; 2) cultural heritage; 3) technical infrastructure; 4) national defence and security; 5) protection of the seashore; 6) exploration and prospecting of mineral resources, as well as extraction of minerals from deposits; 7) fishery; 8) transport; 9) tourism, sports and recreation	– the implementation of the function is restricted to methods which: - do not endanger navigational safety; - do not endanger the ecological function of spawning grounds and the survival of the early development stages (eggs and larvae) of commercial fish species; - do not have a significant negative influence on the welfare of birds wintering and resting during migration or in the period of their numerous occurrence from the beginning of November to the end of April; – the new linear elements of technical infrastructure are required to be laid under the seabed surface, and if it is impossible due to environmental or technological constraints, other permanent safeguards should be used to ensure navigational safety;	sub-basin 41a.201.I – designated for laying and maintenance of the linear elements of technical infrastructure – external connection infrastructure for offshore wind farms and the planned DC connection between Poland and Lithuania; sub- basin 41a.926.B – designated for fairways of the Polish Navy (0205, 0206). The change of its existing development status must be agreed with the minister responsible for national defence. During the activities carried out by the Polish Armed Forces, the implementation of other functions in the sub-basins may be precluded
POM.40a.C	Protection of the seashore	1) scientific research; 2) cultural heritage; 3) port or harbour operation; 4) technical infrastructure; 5) national defence and security; 6) exploration and prospecting of mineral resources, as well as extraction of minerals from deposits; 7) fishery; 8) artificial islands and structures; 9) transport; 10) tourism, sports and recreation	– the implementation of the function is restricted to methods which: - do not endanger the ecological function of spawning grounds and the survival of the early development stages (eggs and larvae) of commercial fish species; - do not have a significant negative influence on the welfare of birds wintering and resting during migration or in the period of their numerous occurrence from the beginning of November to the end of April; – the new linear elements of technical infrastructure are required to be laid: - perpendicularly to the shoreline, if possible; - under the seabed surface, and if it is impossible due to environmental or technological constraints, other	sub- basin 40a.201.I – designated for laying and maintenance of the linear elements of technical infrastructure – external connection infrastructure for offshore wind farms and the planned DC connection between Poland and Lithuania; sub- basin 40a.918.B – protection zone of a restricted area enabling safe use of the military complex K-4121 Białogóra; sub- basin 40a.800.S is designated for the development of tourist functions

Sea basin	Primary function	Permissible functions	Provisions pertaining to the location of technical infrastructure within the sea basin	Provisions pertaining to sub-basins within the sea basin
			permanent safeguards should be used to ensure navigational safety; - minimum 3 m below the mean depth of the bottom of depressions between the sandbanks; - it is forbidden to cross the linear elements of technical infrastructure, unless it is impossible due to technological constraints;	

The provisions of the MSPPSA indicate that the EXC BC-Wind OWF project can be implemented with the technology assumed within the boundaries of the above-described sea basins and sub-basins. The route of the proposed project does not reach beyond the area indicated in the location decisions issued by the Minister of Infrastructure and the Director of the Maritime Office in Gdynia. The decisions were not invalidated by the entry of MSPPSA into force on 22 May 2021.

The most important forms of the use of the maritime space in the EXC BC-Wind OWF area are described below.

5.11.1 Maritime transport

The EXC BC-Wind OWF area is located in an area that is intensively used for shipping. Within the territorial sea, it intersects one of the major customary shipping routes of the Baltic Sea, leading, among others, to the seaports in Gdynia and Gdańsk. The MSPPSA accounts for the importance of this route by designating a category T sea basin for it, in which the primary function is transportation. Part of the EXC BC-Wind OWF area is situated in the sea basin marked as POM.54.T. This part runs to the east of the Traffic Separation Scheme TSS Słupska Bank, effective from 1 June 2021 [Figure 5.9]. Vessel traffic in this area is supervised by the Vessel Traffic Control Service VTS Słupska Bank. In addition to transport vessels travelling to and from seaports, also other vessels such as fishing vessels which conduct catches in this sea basin or sail to other fisheries, and small recreational vessels (e.g. sailing yachts) appear in the EXC BC-Wind OWF area.

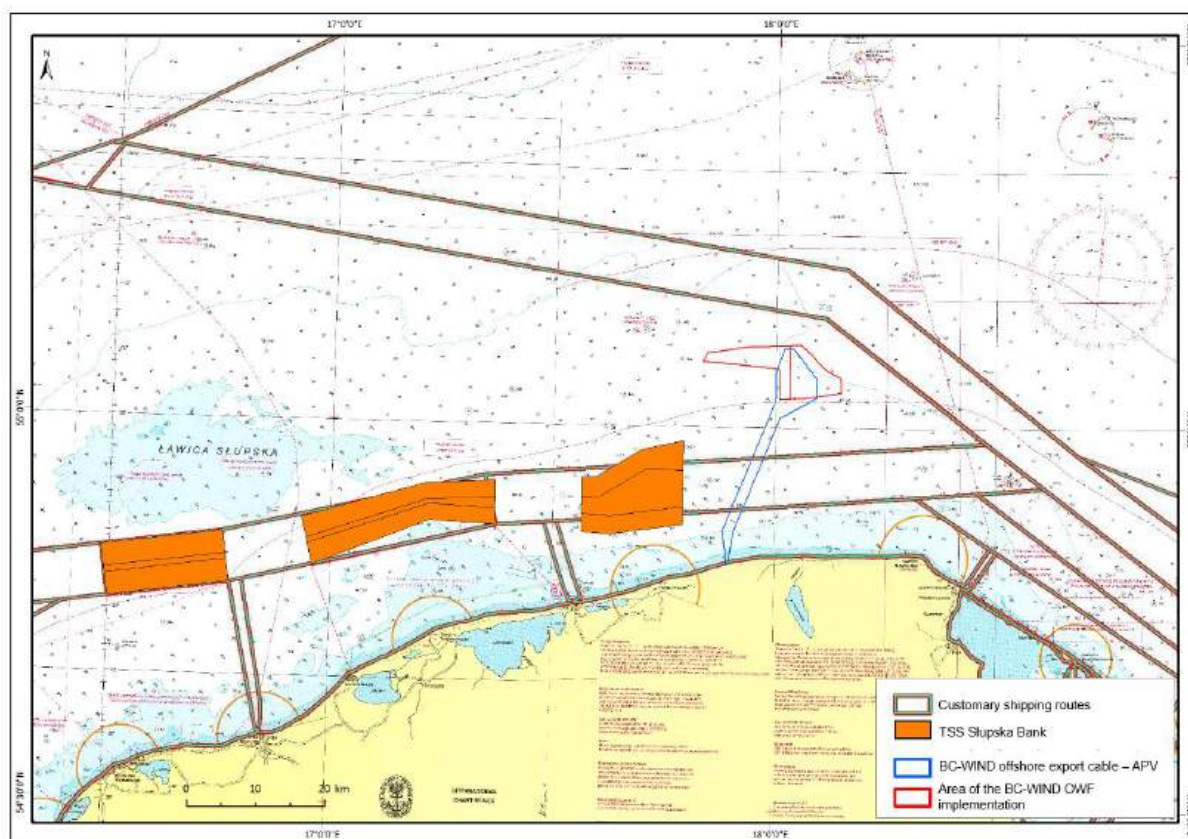


Figure 5.9. Location of the EXC BC-WIND OWF construction area against the background of shipping routes, projected on the navigational chart [source: internal materials based on SIPAM]

The region of the EXC BC-Wind OWF area can also be characterised in terms of its use by vessels against the background of the larger area, on the basis of AIS data recorded by the Polish Maritime Administration in 2018–2019. A graphical representation of vessel traffic intensity is provided in Figure 5.10.

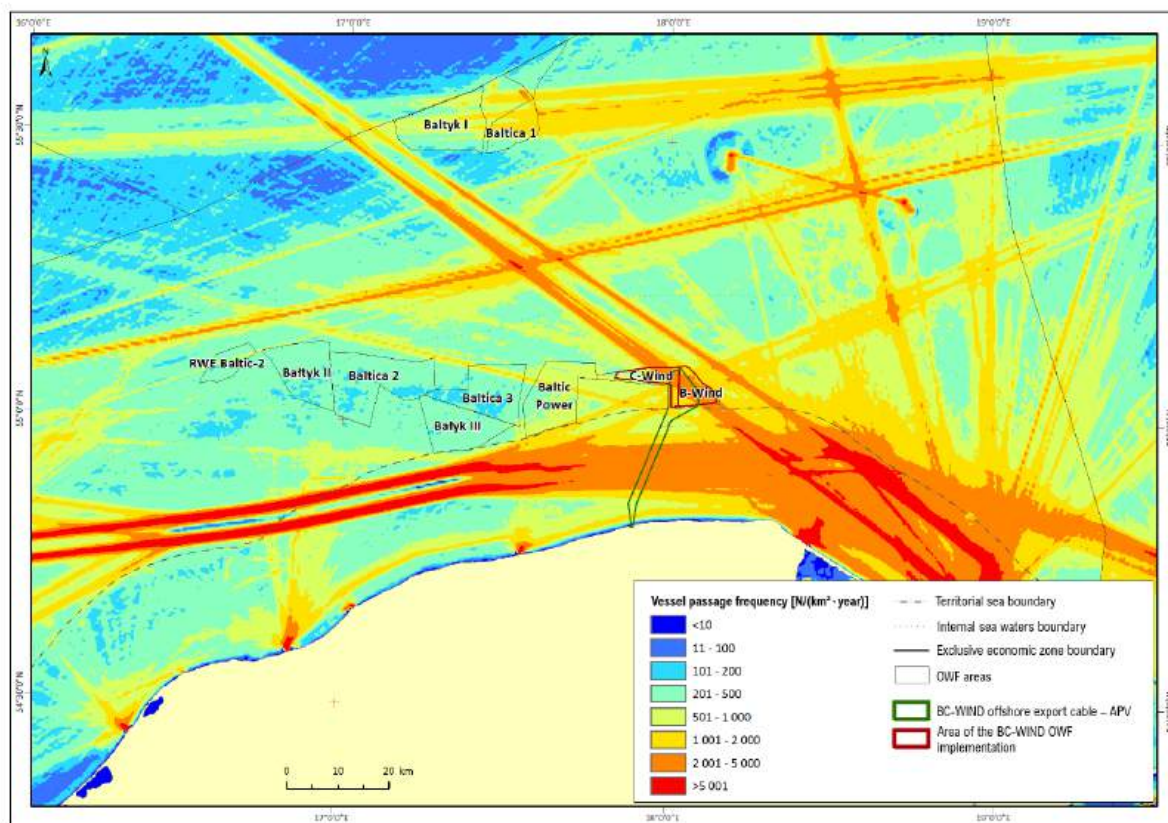


Figure 5.10. Distribution of vessel traffic in the central part of Polish sea areas in 2018–2019 [source: internal materials based on AIS data]

Based on the data illustrated in Figure 5.10, the axes of the main shipping routes were identified. The analysis of these routes enables the identification of conflicts and risks related to the simultaneous functioning of shipping and activities related to the construction and operation of the EXC BC-Wind OWF and, in a broader sense, all activities related to offshore wind energy, in accordance with the MSPPSA.

Figure 5.11 and Figure 5.11 show diagrams of the present and planned main shipping routes. The map includes both the conditions resulting from the MSPPSA and the modified area of the traffic separation scheme TSS Słupska Bank, which covers its eastern part, i.e. the separation zone, traffic lanes and the inshore traffic zone.

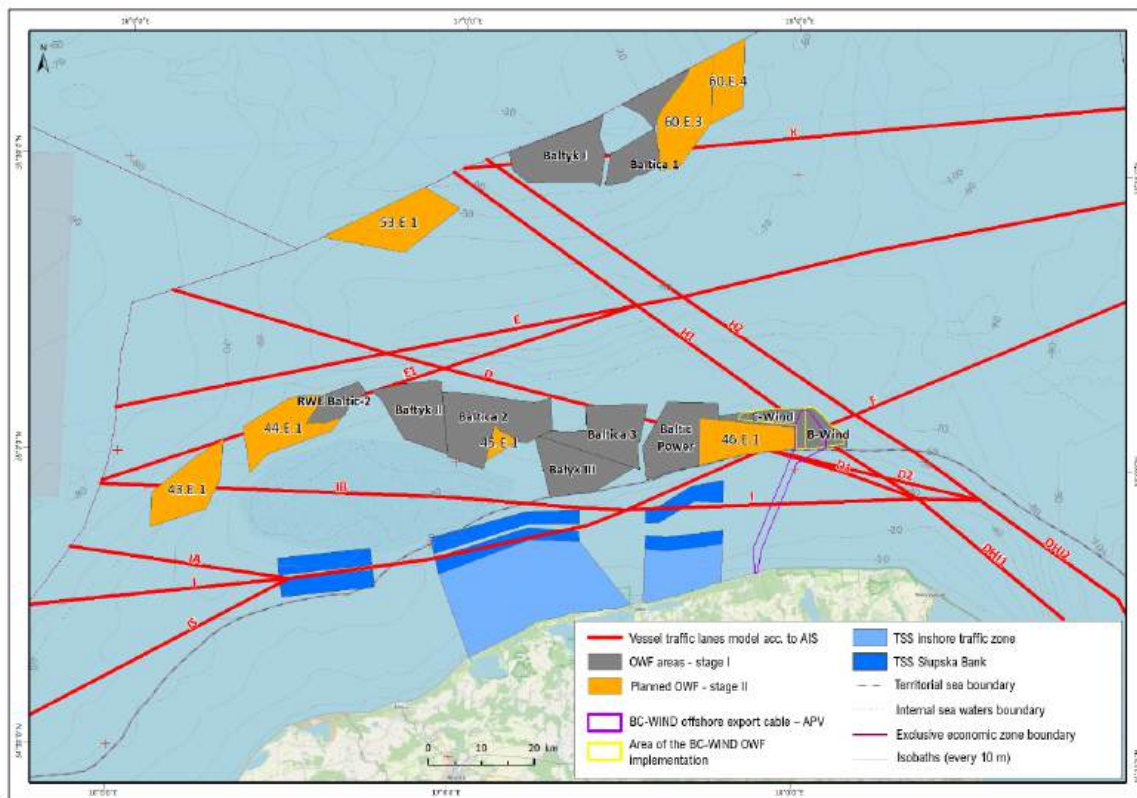


Figure 5.11. Location of the offshore part of the EXC BC-Wind OWF against the background of shipping routes [source: internal materials based on AIS data, 2018–2020]

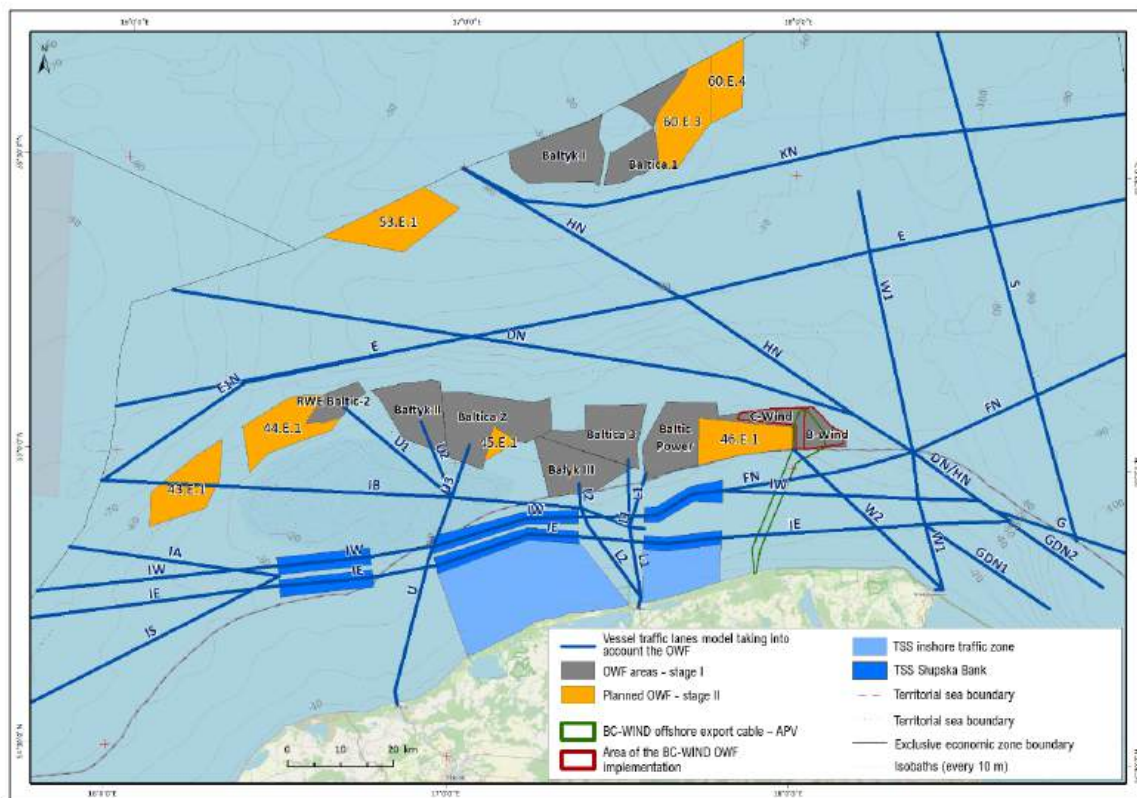


Figure 5.12. Location of the offshore part of the EXC BC-Wind OWF against the background of planned shipping routes [source: internal materials]

A separate group of vessels using sea basins for navigation are fishing vessels. Figure 5.13 illustrates the movement of fishing vessels in the central part of Polish sea areas regardless of their speed, while Figure 5.14 illustrates the movement of vessels at speeds below 5 knots based on the assumption that this is the upper speed limit at which fishing can be carried out. Speeds above 5 knots represent a fishing vessel's transfer to the fishing area or return from the fishing area to port.

The EXC BC-Wind OWF area is not heavily used by fishing vessels navigating to or from the fishing grounds. This activity takes place mainly on the eastern side of the area and is related to the movement of fishing vessels sailing to and from the port in Władysławowo [Figure 5.13].

Also, no intensive fishing activity takes place within the EXC BC-Wind OWF area. Fishing activity is more intensive in the area adjacent to the north-eastern part of the EXC BC-Wind OWF area [Figure 5.14].

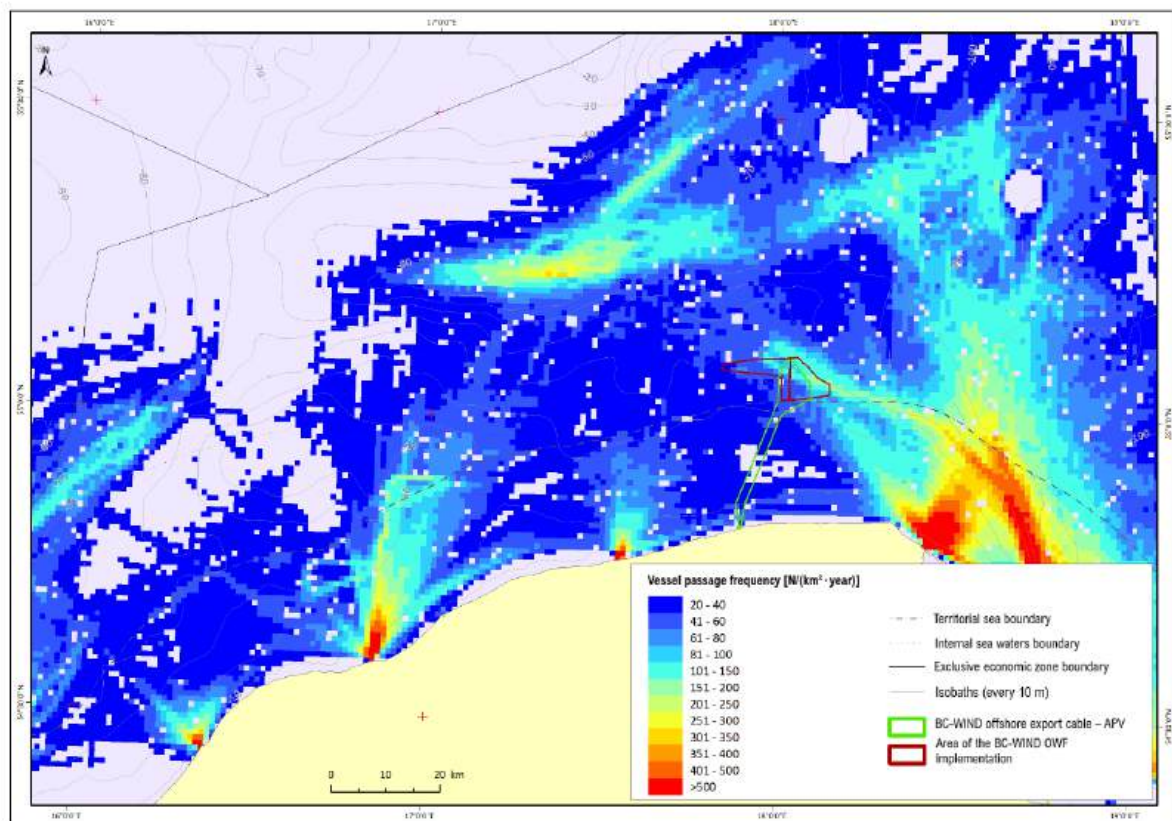


Figure 5.13. Location of the offshore part of the EXC BC-Wind OWF against the background of the fishing vessel traffic in the central part of Polish sea areas [source: internal materials based on AIS data, 2018–2020]

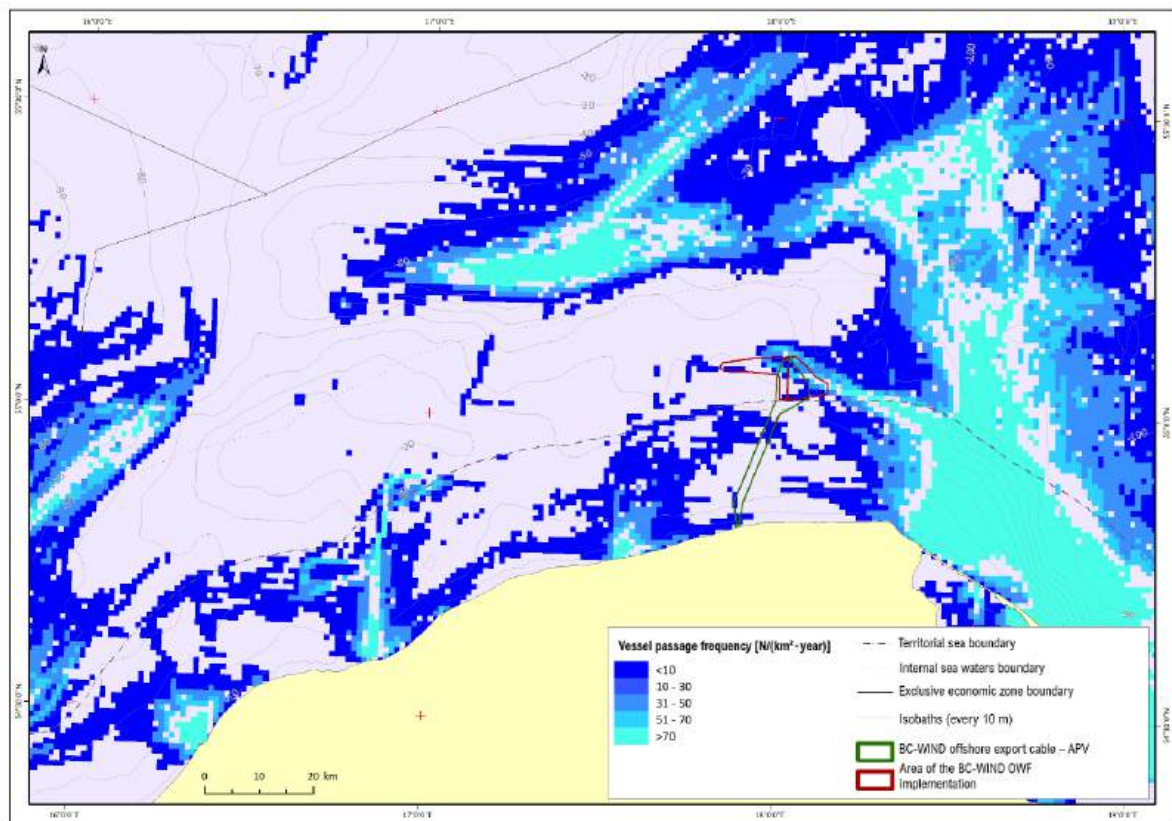


Figure 5.14. Location of the offshore part of the EXC BC-Wind OWF against the background of the fishing vessel traffic at speeds below 5 knots in the central part of Polish sea areas [source: internal materials based on AIS data, 2018–2020]

5.11.2 Fisheries

Surveys of fishing activity were conducted, including the volume and value of catches as well as the amount of fishing effort (number of fishing days and number of fishing vessels) in the area of the four statistical rectangles within which the EXC BC-Wind OWF area is located both in the APV and in the RAV, as well as in the EXC BC-Wind OWF area in the APV and in the RAV [Figure 5.15].

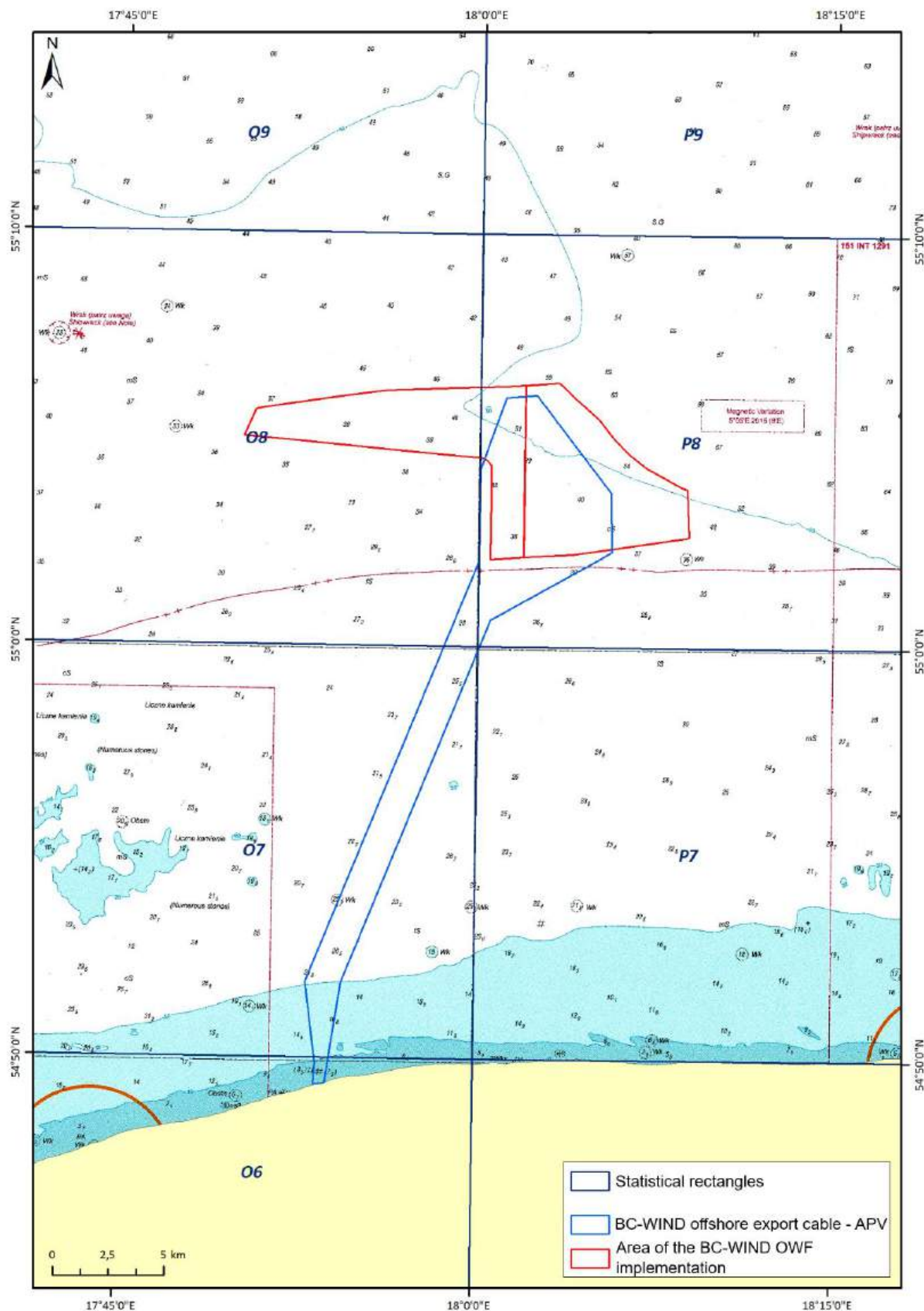


Figure 5.15. Location of the EXC BC-Wind OWF area against the background of statistical rectangles [source: internal materials]

The analysis of the EXC BC-Wind OWF impact on fisheries was conducted using the data on the volume and value of catches as well as fishing effort collected within the National Programme for Fisheries Data Collection [Polish: NPZDR] based on source information from fishing vessel catch reports including: the location of a catch (statistical rectangle or geographical position), fish species, the month of a catch and the vessel type (vessels up to 12 m and over 12 m). The criterion of 12 m was adopted for the purpose of differentiating between the vessels which can be classified as small-scale coastal fishing vessel (<12 m) in accordance with the provisions of the Council Regulation (EC) No. 508/2014, and because of the level of detail of the available fishing location data (available for vessels >12 m from the VMS – Vessel Monitoring System).

The data from the catch reports may differ from the landing (final) data; however, adopting them as a basis was necessary for conducting an analysis on the geographical distribution of fishing activities. Any possible differences are insignificant and do not affect the conclusions reached. The analysis includes a review of the catch data from the years 2017–2021. The value of catches was estimated on the basis of the average annual prices of the first sale of individual species of fish and the volume of catches.

Since more detailed data on the catches of the fishing fleet are available for the statistical rectangle areas (surface area of approx. 400 km²) that do not coincide with the areas analysed, the following was taken into consideration to determine, with the greatest possible accuracy, the impact of the project on the fisheries within the area of the transmission infrastructure itself, in the APV and the RAV:

- for fishing boats exceeding 12 m in length, equipped with a VMS, the daily catch volume was assigned to a particular statistical rectangle or the EXC BC-Wind OWF area on the basis of the proportion of the number of vessel position reports provided within a particular statistical rectangle or in the project area to the general number of the VMS reports within a day;
- for fishing boats below 12 m in length, for which the VMS data are not available, information on the catches in the area of the Baltic rectangle were used, whereas the catch volume in the area restricted to the EXC BC-Wind OWF was estimated on the basis of the relative proportion of the surface area on which the connection is to be located to the total surface area of the statistical rectangle. With this simplification, the possible diversification of the catch volumes within a particular fishing square (for example, due to the differences in depth or type of seabed) is omitted, however, it is the only one possible enabling more precise reference to the location of the fish caught.

The two areas of the EXC BC-Wind OWF under analysis (APV and RAV) are located within four statistical rectangles: O6, O7, O8, P8, occupying different surfaces therein [Table 5.4].

Table 5.4. Area occupied by the EXC BC-Wind OWF area in the APV and in the RAV (the calculations accounted for catch volumes of vessels below 12 m in length operating within the OWF area) [source: internal materials]

Statistical rectangle	Statistical rectangle surface occupied by the EXC BC-Wind OWF [%]	
	APV	RAV
O6	1.12	0.78
O7	7.13	4.47
O8	0.76	3.92
P8	10.76	9.34
Total	6.01	5.70

5.11.2.1 Volume and value of fish catches

The average volume of fish catches in the area of the five rectangles analysed amounted to 780 tonnes in the years 2017–2021 [Table 5.5]. The average value of catches amounted to approximately PLN 1.1

million [Table 5.6]. This represented 0.6% of the total volume in terms of the quantity and value of landings from Polish catches in the Baltic Sea in 2017–2021.

In the years 2017–2021, the estimated volume of catches (calculated on the basis of the surface area covered by the CI in each statistical rectangle – for vessels with a length of <12 m, and on the basis of detailed VMS data – for vessels with a length of ≥12 m) narrowed down to the EXC BC-Wind OWF area averaged 34.3 tonnes with a value of PLN 52.3 thousand in the APV, and 34 tonnes with a value of PLN 53.6 thousand in the RAV [Table 5.5, Table 5.6].

The highest productivity was recorded within rectangle P8 – nearly 1750 kg/km² with a value of approx. PLN 2 thousand. Nevertheless, among the 123 Baltic rectangles situated in the PSA (partially or entirely), the P8 rectangle ranks 58th in terms of catch volume per km² of the surface area.

The average proportion of fish caught in the years 2017–2021 within the EXC BC-Wind OWF area, in relation to the total Polish catches in the Baltic Sea was low and equalled 0.56%.

The following tables [Table 5.5 – Table 5.8] contain data on the relative significance of the area of the statistical rectangles within which the EXC BC-Wind OWF is to be routed for fishing vessels located in various ports. The importance of the proposed project area for fisheries is noticeable only at the level of the statistical rectangles for vessels registered in Władysławowo and Łeba. The proportion of catches in the four rectangles analysed in relation to the average catches by vessels from Władysławowo and Łeba, in the period between 2017 and 2021, was 1.59% and 1.22% for the APV as well as 1.59% and 3.89% for the RAV, respectively. The value of the indicator limited to the surface area of the EXC BC-Wind OWF area alone is only 0.08% and 0.03% for the APV, as well as 0.1% and 0.1% for the RAV.

Table 5.5. Average volume of catches [t] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the volume of catches within the EXC BC-Wind OWF area in the APV and to the total volume of Polish catches in the Baltic Sea, by registration ports [source: internal materials]

Port	Within the statistical rectangles			Within the EXC BC-Wind OWF area (APV)			Baltic Sea total	Within the statistical rectangles [%]	Within the EXC BC-Wind OWF area (APV) [%]
	<12 m	>12m	Total	<12m	>12m	Total			
Władysławowo	0.0	629.4	629.4	0.0	33.0	33.0	39 472.5	1.59	0.08
Ustka	7.3	92.7	99.9	0.1	0.1	0.2	15 758.8	0.63	0.00
Łeba	9.3	23.1	32.4	0.1	0.6	0.7	2659.1	1.22	0.03
Hel	0.6	10.0	10.6	0.0	0.0	0.0	11 875.9	0.09	0.00
Kołobrzeg	2.9	0.0	2.9	0.2	0.0	0.2	40 226.7	0.01	0.00
Jastarnia	0.0	2.1	2.1	0.0	0.0	0.0	6395.0	0.03	0.00
Darłowo	0.0	0.5	0.5	0.0	0.0	0.0	331.7	0.17	0.01
Other	0.9	0.3	1.2	0.1	0.0	0.1	21 627.6	0.01	0.00
Total	21.1	758.1	779.2	0.6	33.7	34.3	138 347.1	0.56	0.02

Table 5.6. Average value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the value of catches within the EXC BC-Wind OWF area in the APV and to the total value of Polish catches in the Baltic Sea, by registration ports [source: internal materials]

Port	Within the statistical rectangles			Within the EXC BC-Wind OWF area (APV)			Baltic Sea total	Within the statistical rectangles [%]	Within the EXC BC-Wind OWF area (APV) [%]
	<12 m	>12 m	Total	<12 m	>12 m	Total			
Władysławowo	0.7	701.9	702.6	0.1	41.7	41.8	39 737.7	1.77	0.11
Ustka	89.7	149.3	239.0	1.8	3.1	4.9	22 338.6	1.07	0.02
Łeba	57.5	91.6	149.1	1.1	2.8	3.9	3830.8	3.89	0.10
Hel	4.6	12.0	16.6	0.3	0.0	0.3	10 914.7	0.15	0.00
Kołobrzeg	7.4	0.0	7.4	0.5	0.0	0.5	48 486.9	0.02	0.00
Jastarnia	1.0	4.2	5.2	0.1	0.2	0.3	6836.0	0.08	0.00

Port	Within the statistical rectangles			Within the EXC BC-Wind OWF area (APV)			Baltic Sea total	Within the statistical rectangles [%]	Within the EXC BC-Wind OWF area (APV) [%]
	<12 m	>12 m	Total	<12 m	>12 m	Total			
Darłowo	0.0	1.9	1.9	0.0	0.0	0.0	1617.9	0.12	0.00
Other	10.1	1.0	11.1	0.6	0.0	0.6	49 427.0	0.02	0.00
Total	171.1	962.0	1133.1	4.5	47.8	52.3	183 189.5	0.62	0.03

Table 5.7. Average volume of catches [t] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the volume of catches within the EXC BC-Wind OWF area in the RAV and to the total volume of Polish catches in the Baltic Sea, by registration ports [source: internal materials]

Port	Within the statistical rectangles			Within the EXC BC-Wind OWF area (RAV)			Baltic Sea total	Within the statistical rectangles [%]	Within the EXC BC-Wind OWF area (RAV) [%]
	<12 m	>12 m	Total	<12 m	>12 m	Total			
Władysławowo	0.0	629.4	629.4	0.0	32.6	32.6	39 472.5	1.59	0.08
Ustka	7.3	92.7	99.9	0.1	0.1	0.2	15 758.8	0.63	0.00
Łeba	9.3	23.1	32.4	0.1	0.7	0.8	2659.1	1.22	0.03
Hel	0.6	10.0	10.6	0.0	0.0	0.0	11 875.9	0.09	0.00
Kołobrzeg	2.9	0.0	2.9	0.2	0.0	0.2	40 226.7	0.01	0.00
Jastarnia	0.0	2.1	2.1	0.0	0.0	0.0	6395.0	0.03	0.00
Darłowo	0.0	0.5	0.5	0.0	0.0	0.0	331.7	0.17	0.01
Other	0.9	0.3	1.2	0.1	0.0	0.1	21 627.6	0.01	0.00
Total	21.1	758.1	779.2	0.6	33.5	34.0	138 347.1	0.56	0.02

Table 5.8. Average value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the value of catches within the EXC BC-Wind OWF area in the RAV and to the total value of Polish catches in the Baltic Sea, by registration ports [source: internal materials]

Port	Within the statistical rectangles			Within the EXC BC-Wind OWF area (RAV)			Baltic Sea total	Within the statistical rectangles [%]	Within the EXC BC-Wind OWF area (RAV) [%]
	<12 m	>12 m	Total	<12 m	>12 m	Total			
Władysławowo	0.7	701.9	702.6	0.1	41.0	41.1	39 737.7	1.77	0.10
Ustka	89.7	149.3	239.0	2.2	5.2	7.4	22 338.6	1.07	0.03
Łeba	57.5	91.6	149.1	0.8	2.9	3.7	3830.8	3.89	0.10
Hel	4.6	12.0	16.6	0.3	0.0	0.3	10 914.7	0.15	0.00
Kołobrzeg	7.4	0.0	7.4	0.4	0.0	0.4	48 486.9	0.02	0.00
Jastarnia	1.0	4.2	5.2	0.1	0.1	0.2	6836.0	0.08	0.00
Darłowo	0.0	1.9	1.9	0.0	0.0	0.0	1617.9	0.12	0.00
Other	10.1	1.0	11.1	0.6	0.0	0.6	49 427.0	0.02	0.00
Total	171.1	962.0	1133.1	4.4	49.2	52.3	183 189.5	0.62	0.03

The volume and value of fish catches in individual statistical rectangles to be crossed by the transmission cables varies but a similar trend of declining catches is evident in all rectangles. The pattern observed was the result of the deteriorating state of cod stocks, particularly evident in the coastal zone. Subsidies from EU funds paid for temporary cessation of fishing activities were an additional factor contributing to the decreasing fishing performance.

The main fish species caught within the five rectangles analysed in the years 2017–2021 were herring and sprat, corresponding to 55% and 39% of the total catch volume, as well as 48% and 20% of the value of fish caught, respectively [Figure 5.16]. The remaining share was constituted by other fish, among which salmonids, turbot and herring prevailed.

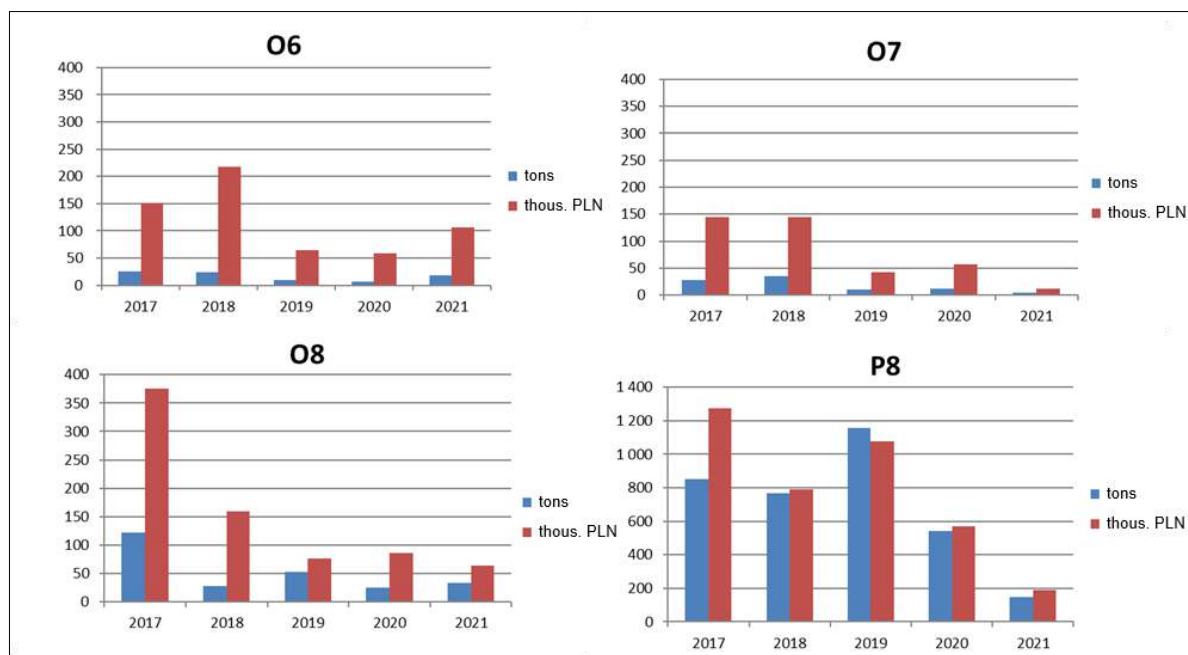


Figure 5.16. Volume [t] and value [PLN thousand] of fish catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021
 [source: internal materials]

Table 5.9. Volume [t] and value [PLN thousand] of fish catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021, by major species [source: internal materials].

Taxon	Catch parameter	Year				
		2017	2018	2019	2020	2021
Herring Clupea harengus	volume [t]	837.4	292.9	586.6	260.9	149.1
	value [in thousands of PLN]	1171.2	325.4	674.6	332.2	206.0
Sprat Sprattus sprattus	volume [t]	102.1	467.7	620.9	293.0	25.5
	value [in thousands of PLN]	81.4	355.8	452.3	246.6	23.1
Flounder Platichthys flesus	volume [t]	24.3	38.7	7.5	19.1	20.0
	value [in thousands of PLN]	39.8	62.8	11.2	25.4	22.7
Other	volume [t]	64.4	54.1	14.5	10.8	6.1
	value [in thousands of PLN]	655.1	570.1	121.4	166.8	121.5
Total: volume [t]		1028.2	853.5	1229.6	583.9	200.7
Total value [in thousands of PLN]		1947.4	1314.1	1259.5	771.0	373.3

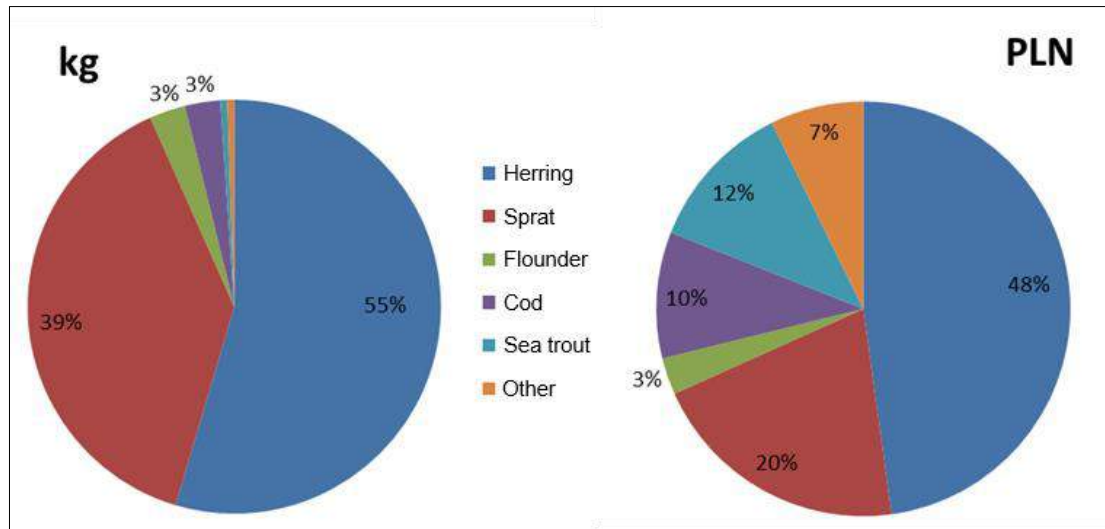


Figure 5.17. Species structure in the catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]

In the period under analysis, the vast majority of catches, both in terms of quantity and value, were made by vessels larger than 12 m in length [Table 5.10]. This was due both to the prevalence of large vessels as well as their higher fishing capacity. An additional factor limiting the number of vessels smaller than 12 m in length is the lack of a harbour in close proximity to the project area. In the years 2017–2021, the average share in the volume and value of catches made by vessels larger than 12 m in length was 97% and 85%, respectively.

Table 5.10. Volume [t] and value [PLN] of catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021, by vessel length [source: internal materials]

Catch parameter	Vessel length [m]	Year				
		2017	2018	2019	2020	2021
Volume [t]	0–11.9	39.6	34.0	11.4	2.6	17.8
	12 and more	988.5	819.5	1218.2	581.3	182.9
Value [PLN]	0–11.9	196.5	425.9	80.9	45.6	106.4
	12 and more	1750.9	888.2	1178.6	725.4	266.9
Total volume [t]		1028.2	853.5	1229.6	583.9	200.7
Total value [PLN]		1947.4	1314.1	1259.5	771.0	373.3

The tables below [Table 5.11 – Table 5.13] provide calculation results for catch volumes in the respective statistical rectangles and the values of catches conducted in the EXC BC-Wind OWF area, in the APV and in the RAV. In 2021, the estimated value of fish narrowed down to the area to be occupied by the EXC BC-Wind OWF in the APV was PLN 8.9 thousand and PLN 11.1 thousand in the EXC BC-Wind OWF Area in the RAV.

Table 5.11. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]

Vessel length [m]	Statistical rectangle	Year				
		2017	2018	2019	2020	2021
<12	O6	133.3	198.5	60.9	43.1	101.4
	O7	7.0	53.0	18.5	1.0	1.7
	O8	34.3	111.3	1.5		0.8
	P8	21.8	63.0		1.6	2.5
<12 total		196.5	425.9	80.9	45.6	106.4
≥12	O6	18.0	18.6	3.9	16.0	5.3
	O7	138.0	91.2	24.1	56.0	10.4
	O8	341.1	48.6	74.9	85.4	62.7
	P8	1253.9	729.8	1075.6	568.0	188.4

Vessel length [m]	Statistical rectangle	Year				
		2017	2018	2019	2020	2021
≥12 total		1750.9	888.2	1178.6	725.4	266.9
Total		1947.4	1314.1	1259.5	771.0	373.3

Table 5.12. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, within the EXC BC-Wind OWF area in the APV [source: internal materials]

Vessel length [m]	Statistical rectangle	Year				
		2017	2018	2019	2020	2021
<12	O6	1.5	2.2	0.7	0.5	1.1
	O7	0.5	3.8	1.3	0.1	0.1
	O8	0.3	0.8	0.0		0.0
	P8	2.4	6.8		0.2	0.3
<12 total		4.6	13.6	2.0	0.7	1.5
≥12	O6	0.0	2.5	0.0	0.0	0.0
	O7	3.9	3.5	0.7	2.8	0.1
	O8	0.1	0.0	0.0	0.3	0.6
	P8	117.0	16.6	56.5	27.8	6.7
≥12 total		121.0	22.6	57.3	30.9	7.4
Total		125.6	36.3	59.3	31.6	8.9

Table 5.13. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, within the EXC BC-Wind OWF Area in the RAV [source: internal materials]

Vessel length [m]	Statistical rectangle	Year				
		2017	2018	2019	2020	2021
<12	O6	1.1	1.6	0.5	0.3	0.8
	O7	0.3	2.4	0.8	0.0	0.1
	O8	1.3	4.3	0.1		0.0
	P8	2.0	5.9		0.1	0.2
<12 total		4.7	14.2	1.4	0.4	1.1
≥12	O6	0.0	0.0	0.0	0.9	0.0
	O7	5.3	0.0	0.9	2.7	2.5
	O8	7.9	0.3	0.7	1.8	0.7
	P8	115.8	16.6	55.7	27.7	6.7
≥12 total		129.0	16.9	57.3	33.1	9.9
Total		133.7	31.1	58.7	33.5	11.0

The analysis of change in monthly catch volumes within the area of the four rectangles analysed does not reveal any evident regularities. The catch volumes could vary considerably from one year to another for the same months. The only noticeable regularity in all the years analysed consists in the relatively lower catches in the summer, which can be related to the cod protection period in force during these months (from 1 July to 31 August) and the restriction of targeted sprat fishing to the period from 11 September to 9 June, in line with the Regulation of the Minister of Maritime Economy and Inland Navigation of 16 September 2016 *on the protected dimensions and protection periods of marine organisms and detailed conditions for commercial fishing* (Journal of Laws of 2016, item 1494) [Figure 5.18].

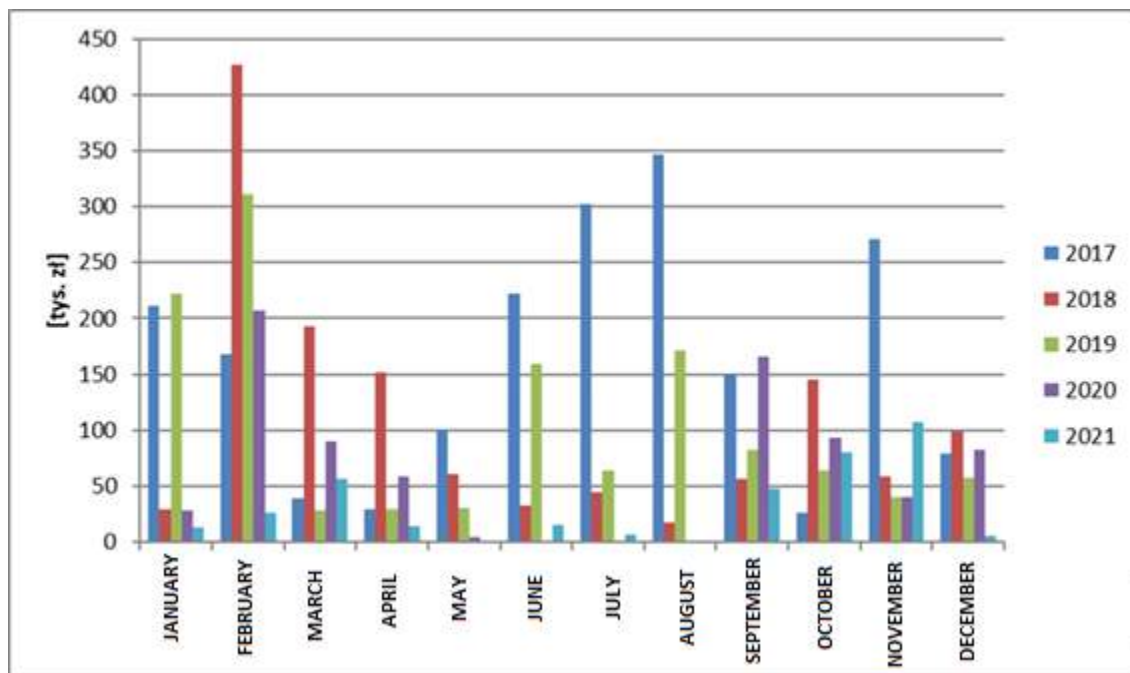


Figure 5.18. Monthly value [PLN thousand] of fish catches within statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]

Pelagic trawls accounted for the dominant share of the catch structure within statistical rectangles O6, O7, O8 and P8. Between 2017 and 2021, approximately 90% of the total catch volume was caught with this type of gear [Figure 5.19].

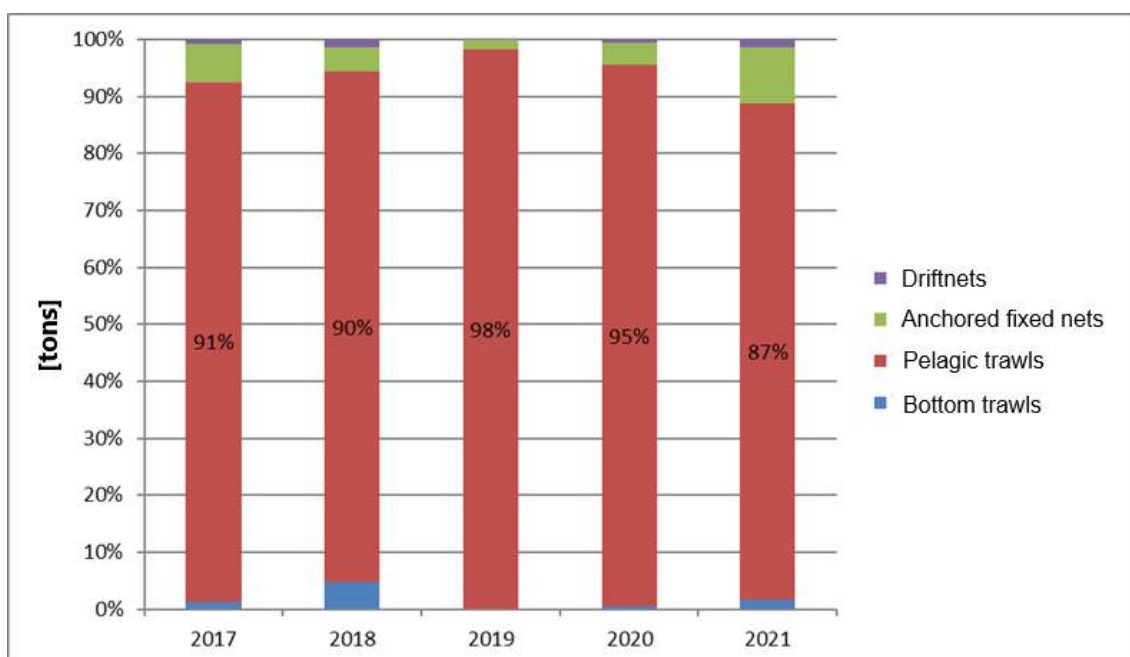


Figure 5.19. The proportion of different types of fishing gear in the catches within statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]

5.11.2.2 Fishing effort

In 2017–2021, fish catches in the area of statistical rectangles O6, O7, O8, O7 and P8 were carried out by 66, 72, 51, 48 and 40 vessels, respectively, compared to a total of : 797, 777, 786, 800 and 805 Polish fishing vessels carrying out catches in the Baltic Sea. Fishing vessels with lengths exceeding 12 m

prevailed, with an average of 80% share in the entire period under analysis: 49, 51, 40, 39 and 32 vessels in the years 2017–2021, respectively.

In the years 2017–2021, the total fishing effort (measured by the number of fishing days) in the area of the four rectangles (O6, O7, O8 and P8) ranged from 203 days (2021) to 643 days (2017) [Figure 5.20].

Fishing effort was mainly concentrated in rectangle P8 (with a total of 970 days in 2017–2021) followed by O8 (395 days) and O6 (367 days).

The relative significance of the area of the four rectangles analysed in the total fishing effort of the Polish fishing fleet conducting catches in 2021 in the Baltic Sea (60 thousand days) was negligible and equalled 0.3%.

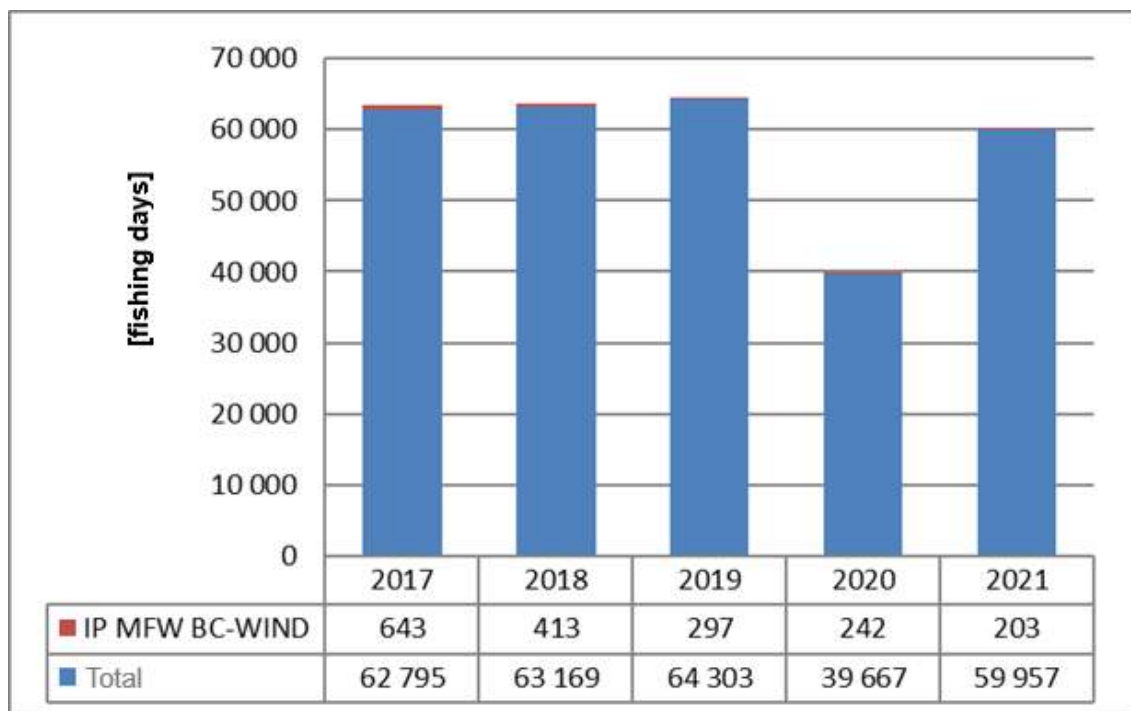


Figure 5.20. Number of fishing days within statistical rectangles O6, O7, O8 and P8, and in the remaining fishing areas of the Baltic Sea, in 2017–2021 [source: internal materials]

5.11.3 National defence

According to the SIPAM [402], the EXC BC-Wind OWF area is partly located in sub-basins:

- 41a.926.B designated for Polish Navy fairways (0205, 0206). The change of its existing development status must be agreed with the minister responsible for national defence. During the activities carried out by the Polish Armed Forces, the implementation of other functions in the sub-basin may be precluded;
- 40a.918.B – designated as a protection zone of a restricted area enabling safe use of the military complex K-4121 Białogóra. Pursuant to the MSPPSA provisions, this sub-basin was made available for the installation of technical infrastructure, including power cables;
- 54.926.B – designated for fairways of the Polish Navy (0301, 0302, 0303, 0304). The change of the existing state of development requires obtaining the opinion of the minister responsible for national defence. During the activities carried out by the Polish Armed Forces, the implementation of other functions in the sub-basin may be precluded.

The EXC BC-Wind OWF area is not located within the zones permanently or periodically closed for navigation and fishing activity, as established by the Minister of National Defence by way of a

regulation, in accordance with the Act of 21 March 1991 *on the marine areas of the Republic of Poland and maritime administration* (consolidated text: Journal of Laws of 2023, item 960).

5.11.4 Natural resource deposits, extraction license areas

The EXC BC-Wind OWF area is situated outside areas with identified raw material deposits and areas for which extraction licences have been issued. At a distance of more than 3.2 km east of the central part of the EXC BC-Wind OWF area, an area of sand accumulation for artificial shore nourishment is located. At a distance of approximately 22 km north-west of the EXC BC-Wind OWF area, there is the B21 natural gas field [402].

5.12 Landscape, including cultural landscape

The EXC BC-Wind OWF area is situated within the exclusive economic zone, the territorial sea and internal sea waters, and stretches from the shore up to the distance of approximately 29 km away from the shore. The marine landscape in this area is currently not disturbed by any above-water or underwater structures. According to the information provided in the SIPAM [402], permits for the erection and use of artificial islands, structures and devices are issued in the area of the northern part of the EXC BC-Wind OWF area in connection with the plans to build and operate offshore wind farms. Their implementation will change the existing landscape.

Various types of vessels moving within the area constitute a permanent element of the landscape of the EXC BC-Wind OWF area.

5.13 Population and living conditions of people

The presence of people in the offshore parts of the EXC BC-Wind OWF area is only temporary, resulting from the existing use of the sea basin (shipping and fishery). The conditions of human presence in the marine environment are governed by separate regulations, which are primarily intended to ensure their safety.

ONSHORE AREA

The analysis of the relief character and contemporary changes within the *Wydmu Lubiatońskie* dunes, as well as of the contemporary shore changes required a wider view of the environmental conditions and was developed within the *Wydmu Lubiatońskie* dune boundaries.

5.14 Location, topography of the area

In administrative terms, the planned project is located in the north-eastern part of the Choczewo commune, Wejherowo district. The project is located in the northern part of the Pomorskie voivodeship [Figure 5.21.].

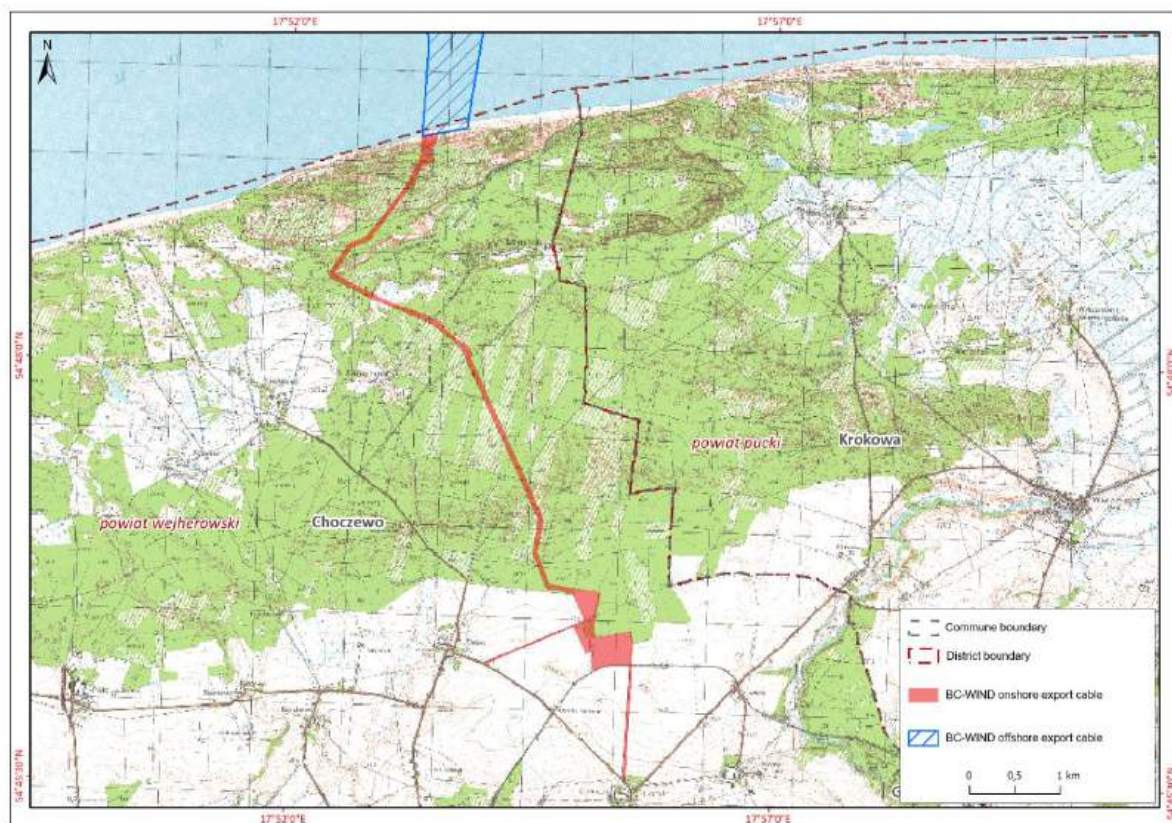


Figure 5.21. Administrative location of the planned project [source: internal materials]

Pursuant to the Act of 21 March 1991 *on the maritime areas of the Republic of Poland and maritime administration* (consolidated text: Journal of Laws of 2023, item 960), the planned project is located within the boundaries of the coastal strip [Figure 5.22], which includes:

- technical belt – which is a zone of direct interaction between the sea and land. This area is intended for maintaining the coast in a condition compliant with the safety and environmental protection requirements;
- protective belt – covering the area where human activity has a direct impact on the condition of the technical belt.

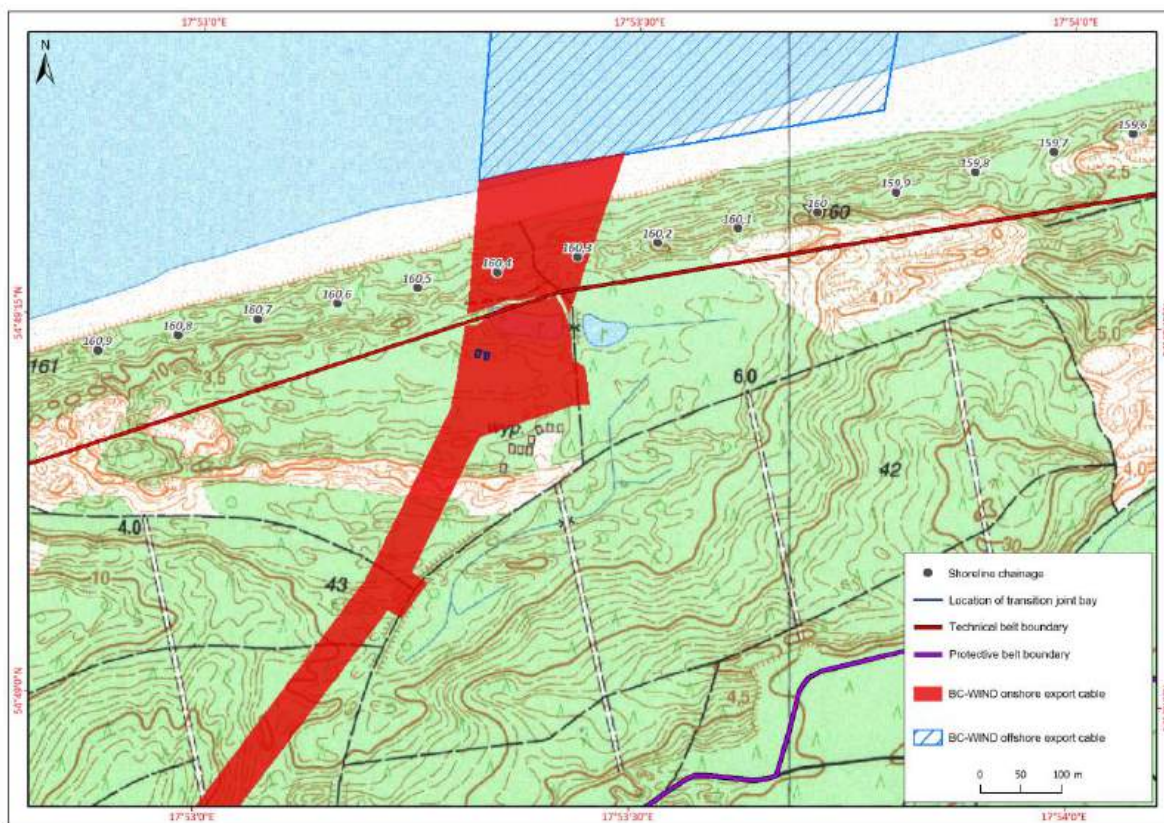


Figure 5.22. Position of the planned project against the coastal strip of the Maritime Office in Gdynia [source: internal materials based on www.umgdy.gov.pl/]

The area of the planned project is located at the boundary between two mesoregions – the Słowińskie Coast and the Żarnowiecka Upland, constituting the Koszalin Coastland in accordance with the physical-geographic regionalisation [Kondracki 2011].

The Słowińskie Coast is a narrow strip of land along the Baltic Sea coast, and its landscape includes: beach, dunes, coastal lakes and swamps as well as elements of post-glacial relief. This is a coastal valley of fluvial origin. It is made up of a series of accumulation and abrasive-accumulative terraces covered with dunes and re-deposited sand plains overgrown with pine forests. The forest complexes are divided by waterlogged meadows and peatlands. A characteristic natural geosystem can be found here, in which the terrestrial environment is affected by the sea (and vice versa), while the atmospheric processes play a major role here. This is manifested by sea and land breezes, warmer winters and cooler summer months than inland, a later spring and longer autumn. The wave motion which is the effect of wind activity, causes rapid shoreline changes, abrasion, bed load transport and accumulation.

The Żarnowiecka Upland constitutes a well-distinguished region, consisting of moraine formations, at an altitude of more than 100 MASL in places. There are several moraine mounds, divided by post-glacial furrows, partially filled with lakes (the biggest of them being Lake Żarnowieckie with a surface area of 14.32 km²). In the upland area, agricultural lands with high quality class soils are dominant. Brown soils formed on till substratum as well as soils of organic origin accumulated mainly in the valleys prevail. Forests are mainly pine forests with admixtures of beech and birch.

The route of the planned project in both variants is characterised by considerable diversity in terms of terrain topography. In the location of cable landfall, between 160.2 km and 160.5 km (according to the shoreline chainage of the Maritime Office), the beach has a width from approx. 80 m. Directly at the back of the beach, there is a wide strip of spit, occupied by four dune forms of *Wydmu Lubiawskie*, with a height from several to 35 MASL. In the area of the planned project impact, there are mainly

dune forms with a maximum height of 25 MASL intersected by numerous lowerings and deflation monadnocks. At the back of the beach there is also a flat area of the upland foreground with a height of up to 10 MASL. The *Bezimienna* stream valley is present there. Slightly further, an undulated moraine upland begins to form, the heights of which reach up to approximately 45 MASL in the area of the ONS and the PSE substation, at the south-western edge of the planned project impact area.

5.15 Geological structure, coastal zone, soils, marine aggregates and deposits

5.15.1 Geological structure, geotechnical conditions

5.15.1.1 Sub-Quaternary formations

The planned project is located entirely within the Precambrian East-European platform within the boundaries of the Peribaltic Syncline [367]. The Paleozoic sediment cover has a thickness of approximately 2500 m. The Mesozoic sediment cover with a thickness of approximately 400 m is deposited on top of it [127]. The Paleogene and Neogene sediments are represented by a series of sandy sediments, silts, tills, clays, mudstones and siltstones [367].

Sub-Quaternary sediments in the area of the planned ONS are represented by Cretaceous formations, the top of which is located at a depth of approximately 160 MBGL. Eocene formations, represented mainly by mudstone and siltstone, are deposited on them. Their top is located at a depth of approximately 150 MBGL [367].

5.15.1.2 Quaternary formations

The characteristics of Quaternary sediments constituting the bedrock of soil were developed on the basis of soil maps obtained from the Institute of Soil Science and Plant Cultivation State Research Institute in Puławy (SSPC SRI) as well as spatial data provided by the State Forests.

The diagram below shows the percentage share of individual types of geological formations in the planned project impact area.

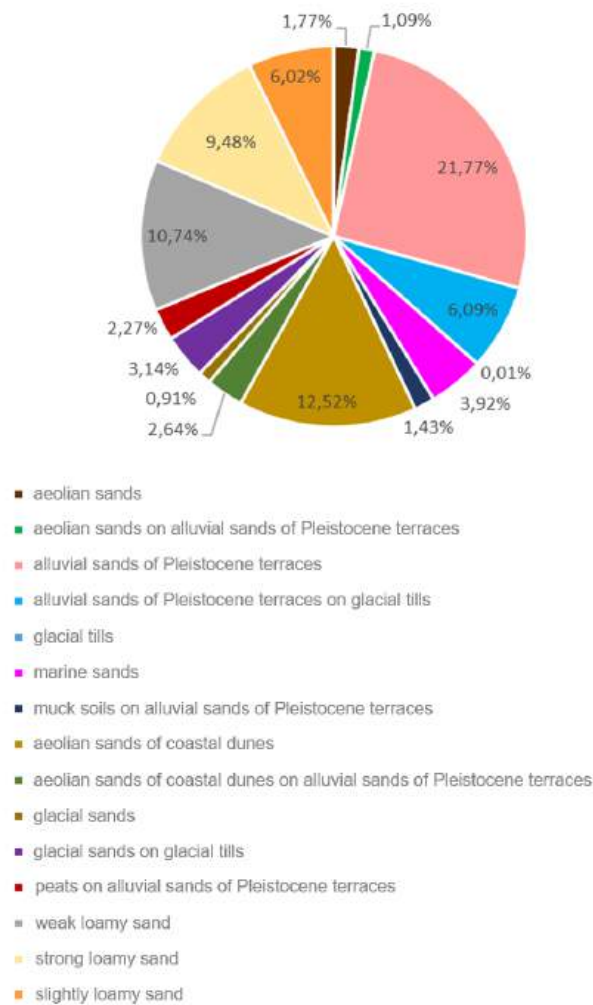


Figure 5.23. Percentage share of individual types of Quaternary geological formations in the planned project impact area
[source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests]

Alluvial sands of Pleistocene terraces have the highest share (21.77%) in the planned project impact area. A significant share (more than 10%) is also recorded for aeolian sands of coastal dunes (12.52%) and light loamy sands (10.74%).

Figure 5.24 presents the distribution of individual types of geological formations in the planned project impact area.

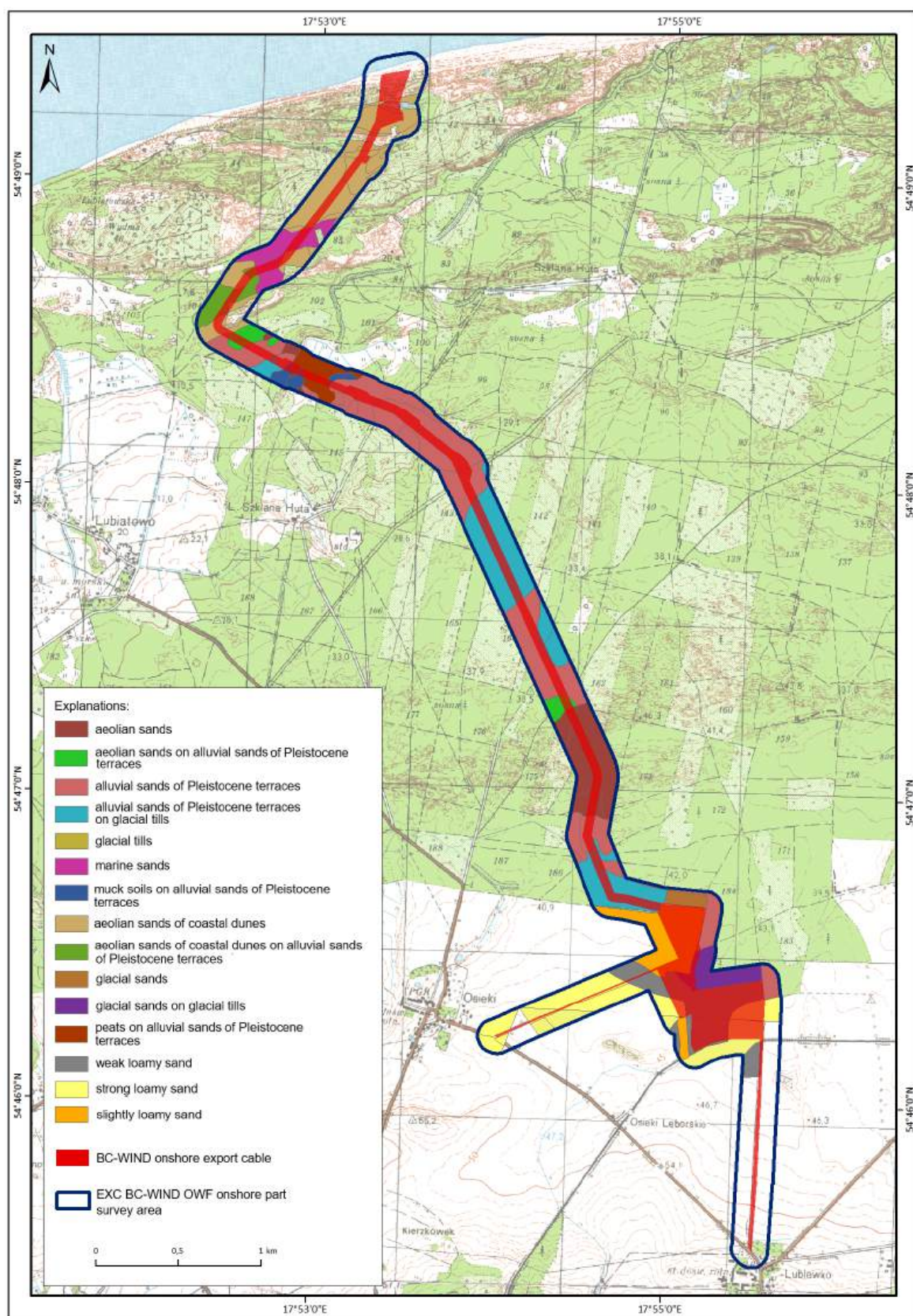


Figure 5.24. Distribution of geological formations constituting the bedrock of soils in the planned project impact area [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests]

The route of the planned project from the landfall to km 35+300, runs across aeolian sands of coastal dunes, with local inserts of marine sands (from km 34+400 to 34+800) and aeolian sands of coastal dunes on alluvial sands of Pleistocene terraces (from km 34+800 to 35+200).

Further on, the route of the planned project runs across alluvial sands of Pleistocene terraces (from km 35+300 to 37+200), in places, intersected by aeolian sands on alluvial sands of Pleistocene terraces (from km 35+320 to km 35+450), alluvial sands of Pleistocene terraces on tills (from km 33+600 to km 35+720), peats on alluvial sands of Pleistocene terraces, muck soils on alluvial sands of Pleistocene terraces (from km 35+750 to km 36+000) as well as muck soils on alluvial sands of Pleistocene terraces (from km 35+750 to km 35+850 and from km 36+000 to 36+100). In the southern section of the planned project, formations of aeolian sands, aeolian sands on alluvial sands of Pleistocene terraces, alluvial sands of Pleistocene terraces and alluvial sands on tills dominate. Next, from km 37+200 to 37+850, the route of the planned project runs across a complex of alluvial sands of Pleistocene terraces on tills; from km 37+850 to km 38+460, it leads across a complex of alluvial sands of Pleistocene terraces. From km 38+460 to km 38+550, formations of aeolian sands on alluvial sands of Pleistocene terraces can be found. From km 38+550 to km 39+220, complexes of aeolian sands are present. Further on, from km 40+700, the route of the planned project runs across formations of alluvial sands of Pleistocene terraces, alluvial sands of Pleistocene terraces on tills and slightly loamy sands.

The area of the ONS and the PSE substation is located on formations of light and heavy loamy sands. The most recent formations are the Holocene dune and beach sands.

5.15.2 Topography and dynamics of the coastal zone

In the area of the planned project, there is a distinct strip-like relief arrangement including the beach, a series of dunes parallel to it and the coastal lowland areas directly at the back of the dune strip. The beach has a width of 30–60 m, periodically up to 100 m. At the back of the beach, there is a strip of dunes with a width of 450–750 m and the maximum height of dune formations of 35 MASL. Directly at the back of the beach there are series of longitudinal dunes parallel to the shore at the back of which, the series of arched and parabolic dunes have developed. These dunes are covered with pine forest and peat accumulations in the dune slacks. The top parts of the dunes reach a height of 20–25 MASL, while the areas of dune slacks are at a height of 3–5 MASL. The back of this spit section is an area of the upland foreland with heights from 8 to 10–15 MASL, slightly rising to the south [Figure 5.25], with relict parabolic dune forms and peat bog areas.

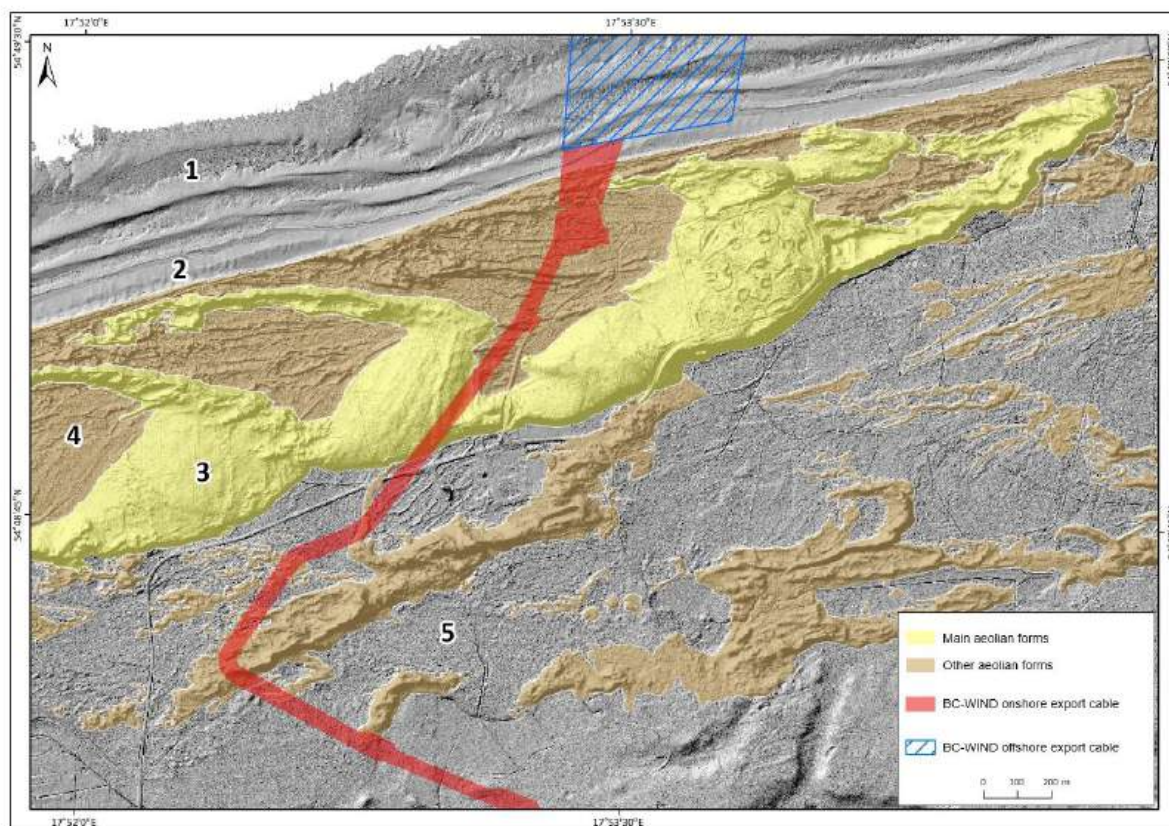


Figure 5.25. Area of the Wydmy Lubiawskie dunes – geomorphological sketch; 1 – nearshore seabed, 2 – beach, 3 – main dune forms, 4 – other aeolian forms (dunes, deflation monadnocks, deflation troughs with local peat deposits), 5 – unseparated adjacent area of the Wydmy Lubiawskie dunes (area of biogenic accumulation, single aeolian forms, in the southern part, glacial, fluvio-glacial and fluvial landforms) [source: internal materials]

The character of the dynamics of the shore section between km 159.5 and 161.5 prepared on the basis of lidar data as well as orthophotomaps from the years 2005, 2008, 2010, 2011, 2015, 2017, 2018, 2019 and 2020 is presented below.

5.15.2.1 Beach

In the area of the cable landfall (159.4–160.5), the beach has a width of approximately 30–40 m. Both, east and west of this location, the beach width increases and equals 50–60 m on average, periodically even approximately 100 m (in the vicinity of km 159.9–160.1 and west of 161.3). On the basis of data from the period between 2005 and 2020, the width of the beach in the area of the cable landfall was from approximately 35 m (2020) to approximately 80 m (2010). Within the period analysed, the beach with the greatest width of approximately 100 m, was located near km 159.9–160.1 and km 161.3 – up to the western boundary of the study area. The smallest beach width, around 40 m, was recorded at km 159.8, approximately 35 m at km 160.5 (2018) and 30 m at km 160.1 (2017 and 2018).

5.15.2.2 Location of dune baseline (2005–2020)

The chainage (km) from 159.5 to 159.9 km of the seashore (according to the shoreline chainage of the Maritime Office) is characterised by multi-directional changes, it is a section with abrasive tendencies; between 2005 and 2008, the dune baseline shifted towards land by approximately 31 m in the area of km 159.5 to approximately 4 m in the area of km 159.5; from 2008 to 2020, the waterline location changed in this section multi-directionally: approximately 10 m in the direction of the sea between 2008 and 2020 at km 159.9, it was stable at km 159.7, and in the area of km 159.5–159.6, between

2008 and 2010, the dune baseline shifted in the direction of the sea by approximately 3–4 m, whereas, between 2018 and 2020, the dune baseline shifted in the direction of land by around 6–7 m.

Km 159.9–160.4 is a stable section with accumulative tendencies. The location of the dune baseline changed gradually, between 2005 and 2020, the dune baseline moved towards the sea maximally by 18–20 m in the central part of the section.

Km 160.4–161.1 is an abrasive section. The construction of transition joint bays is planned within the area of this section. Between 2005 and 2020, the dune baseline location varied unidirectionally landwards. Maximally, the dune baseline changed its position by 23–25 m in the area of km 160.6–160.7. In the area of the cable landfall (km 160.5), this change equalled approximately 15 m.

The average rate (between 2005–2020) of the dune baseline movement towards the land at this section was from 1 to 1.5 m per year. Currently, transition joint bays are located at a distance of approximately 75 m (extreme west chamber) to 90 m (extreme east chamber) from the dune baseline (as at March 2020). With the direction and intensity of the process maintained, transition joint bays will be within the impact zone of the storm waves in approximately 50 to 75 years.

Km 160.1–160.4 is a stable section, of variable, multi-directional features, with no distinct tendency. The change in the position of the dune baseline takes place within a 10–11 m wide strip.

Km 160.4–161.5 is a stable section with accumulative tendencies. The dune baseline changed position within a strip of up to 12 m wide in the direction of the sea (there was an accumulation of sand material and the development of young dune forms, which resulted in the movement of the dune baseline towards the sea).

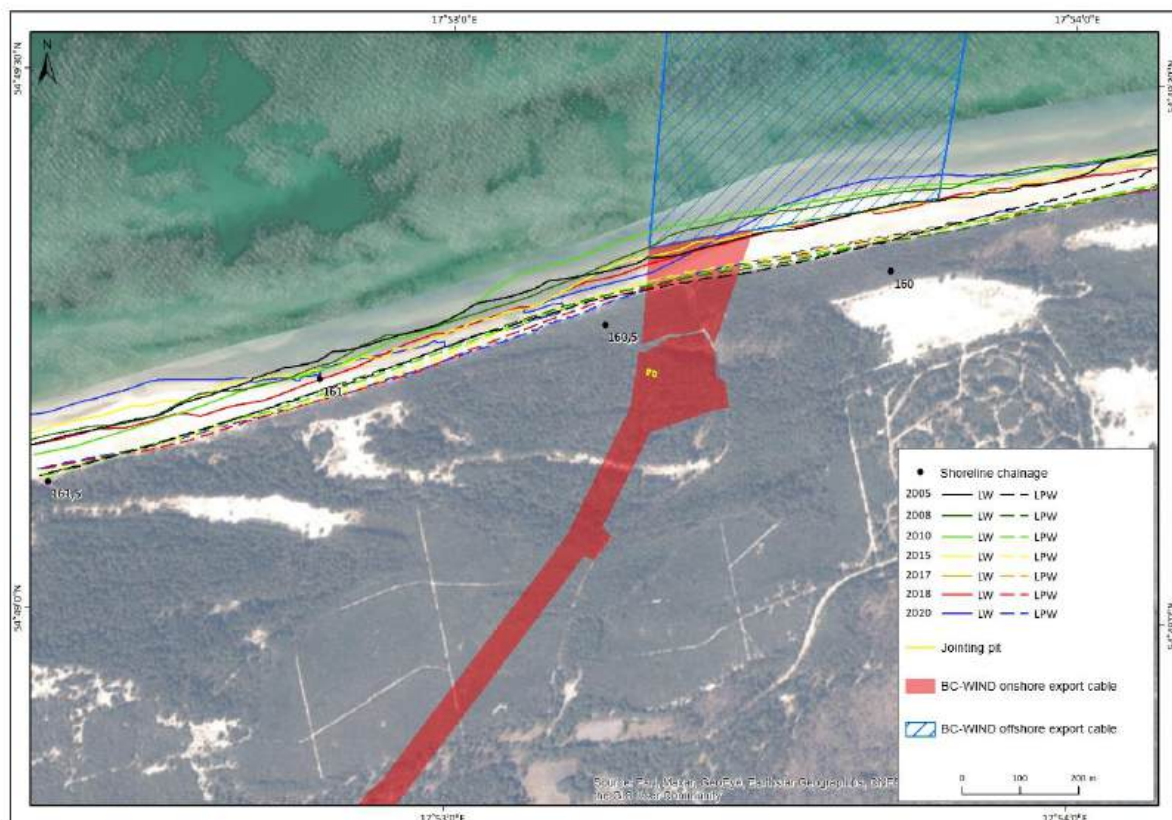


Figure 5.26. Location of selected waterline (LW) and dune (LPW) baselines between 2005 and 2020 against the orthophotomap from 2020; area of km 159.6–161.2 [source: internal materials]

5.15.2.3 Shore dynamics

According to the data from literature [477] this area is located within the shore section described as stable. On the basis of the interpretation of cartographic data for the period 1875–1979, changes in the position of the shoreline were small. For the section between 158.0 and 161.5 km of the shore they were +0.4 m per year on average (movement of the shoreline towards the sea). According to the morphodynamic classification of dune shores based on the rate of a dune baseline movement [477], the section analysed should be classified as balanced, with possible occurrence of minor changes.

5.15.2.4 Areas of active aeolian processes

Near the beach surface, in the area analysed, there are several areas without vegetation or with scarce vegetation, within which the relief character changes as a result of aeolian processes. On the basis of archival data (orthophotomaps) analysis the extent of these type of areas was determined. Orthophotomaps from the years 2005, 2008, 2015, 2016 and 2019 were analysed; the orthophotomap from 2020 was not included due to excessive contrast of the areas with sand cover. On the basis of the analyses conducted, it was found that the area of the *Wydmu Lubiatowskie* dunes uncovered by vegetation has gradually decreased between 2005 and 2019. The dune areas without the vegetation cover or with a scarce plant cover, occupy the minimum surface area of both project variants considered [Figure 5.27].

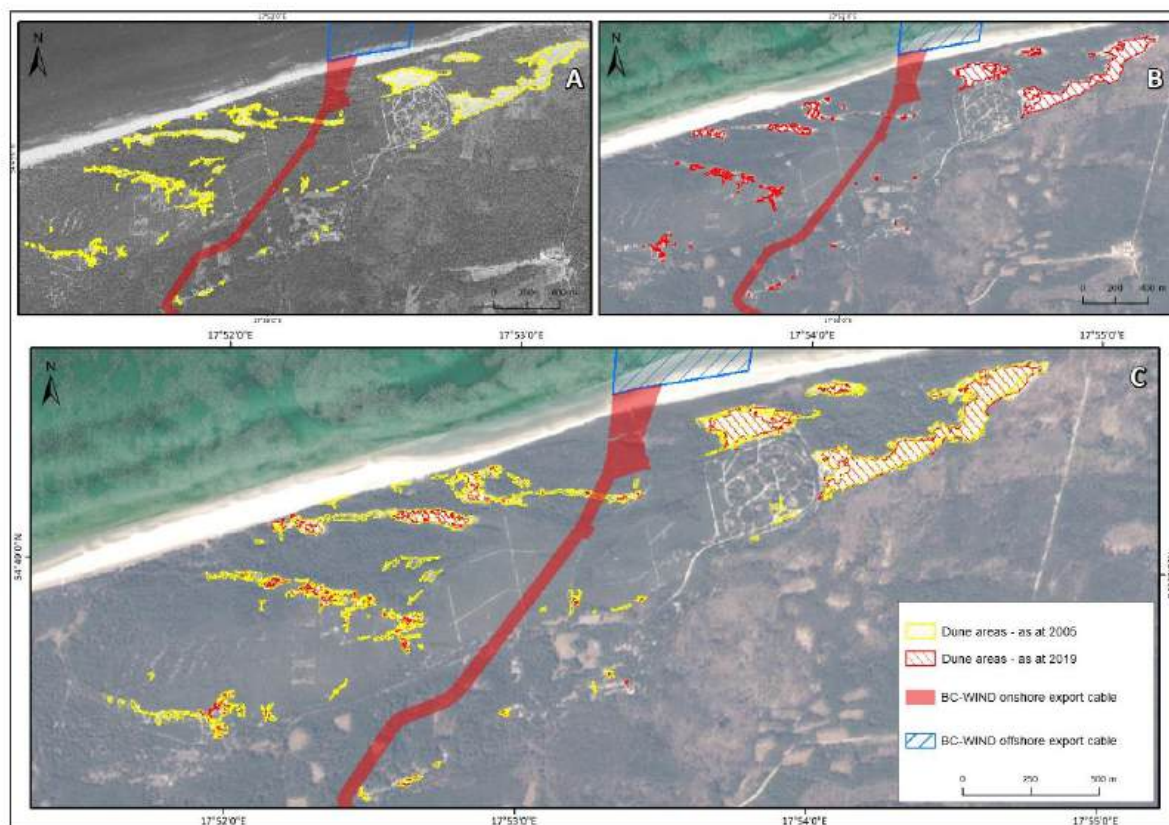


Figure 5.27. Areas without vegetation cover or with scant vegetation cover [source: internal materials]

Orthophotomaps and lidar data (from 2008–2020) were analysed to identify areas in which aeolian processes noticeably contribute to changes in the relief character. These sites are presented on the map [Figure 5.28]. They are beyond the range of the planned project.

In these areas, the maximum average movement of dune slip faces were recorded in the period 2008–2020 and these were 1 m/year. These changes occur within small areas and short sections of the

dune slip faces in the eastern part of the area analysed. At the remaining sites, the average rate of the change in dune location was below 0.5 m/year. These changes largely affected the character of the windward slopes, rather than the movement of the dunes.

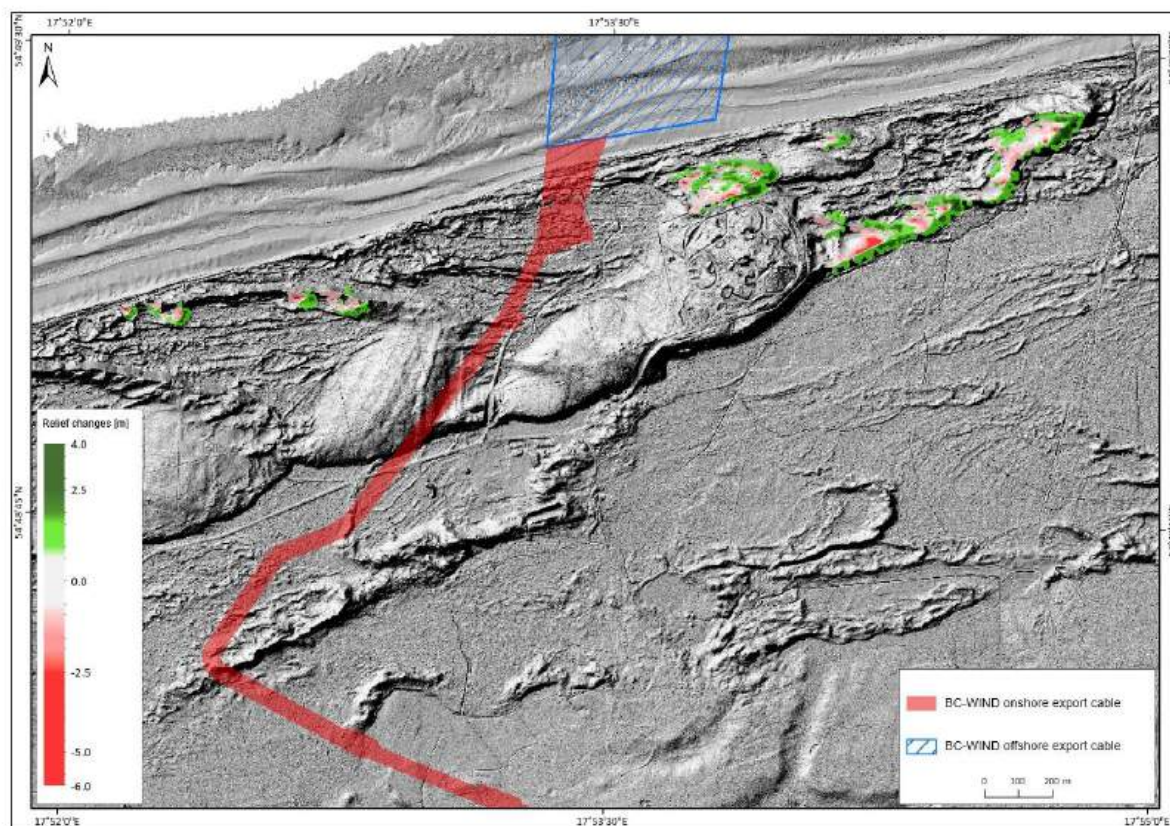


Figure 5.28. Differential map of the relief of the areas with active aeolian processes in the Wydmy Lubińskie dunes, developed by analysing lidar data from 2008 and 2020; against the background of the DTM from 2020 [source: internal materials]

5.15.3 Soils

The soil characteristics was developed on the basis of the soil maps obtained from the Institute of Soil Science and Plant Cultivation State Research Institute in Puławy (SSPC SRI) as well as spatial data provided by the State Forests.

Figure 5.29 presents the distribution of individual soil types within the area of the planned project impact. The dominant soil types are albic podzols (25%) and eutric/epidystric cambisols and dystric cambisols (22%). Albic brunic arenosols (17%), eutric/dystric brunic arenosols (15%) and dystric arenosols (11%) also have a large share (more than 10%). In general, 32% of the planned project impact area is covered by brunic arenosols, 25% by podzols, 22% by cambisols – these three main types of soil cover in total almost 80% of the planned project impact area.

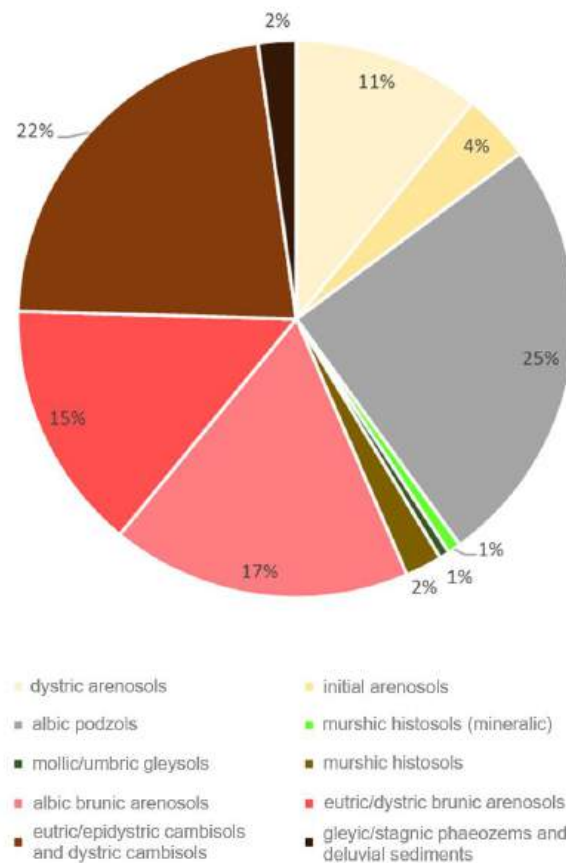


Figure 5.29. Percentage share of individual types of soils in the planned project impact area [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests]

The route of the planned project runs mostly across soils of forest areas, whereas the ONS is located in non-forest areas.

Figure 5.30 presents the planned project area against individual types of soil.

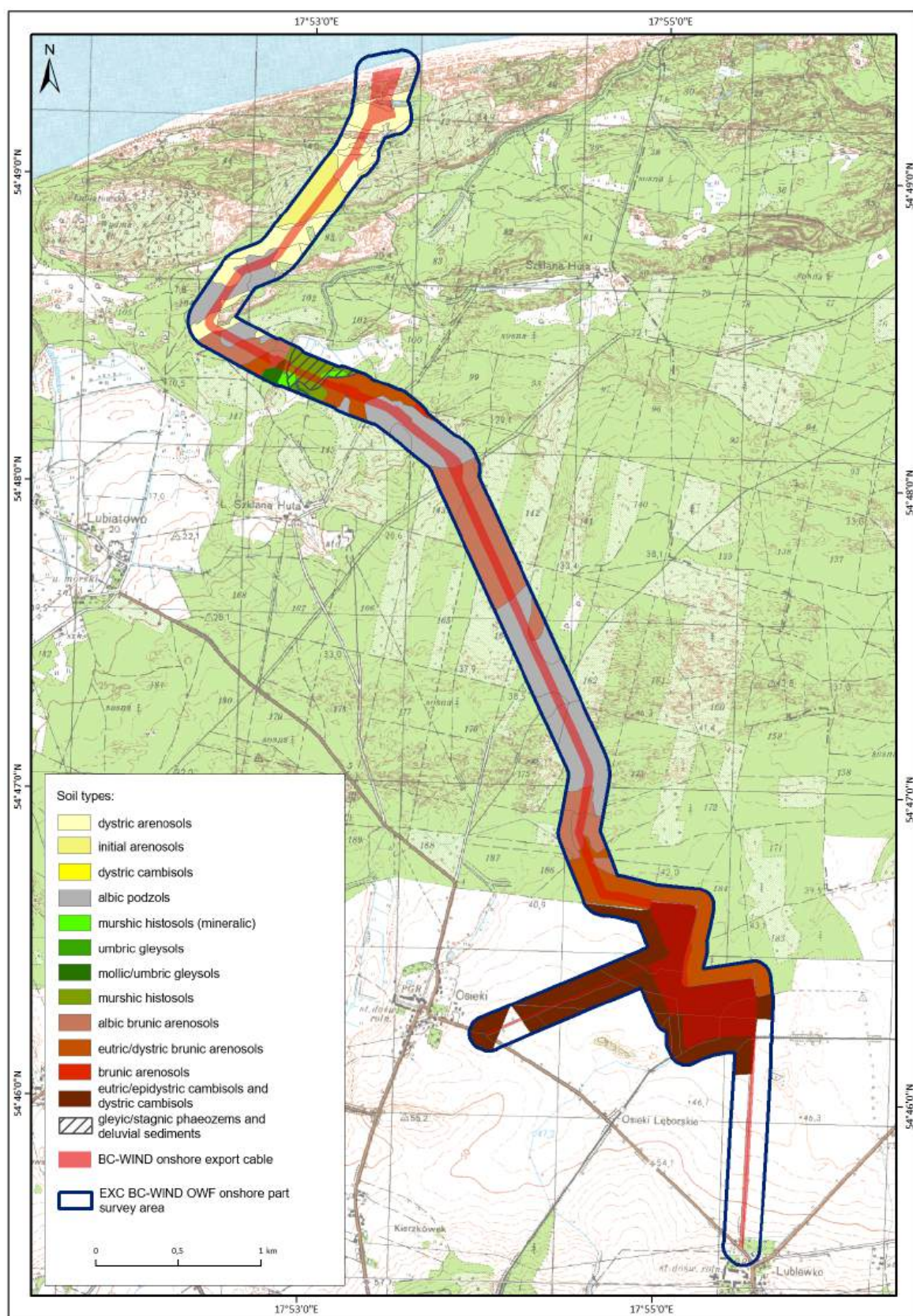


Figure 5.30. Planned project against individual soil types [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests and OSM]

The cable route, after it exits the transition joint bay, runs across an area of arenosols from km 35+300, with an insert of podzols at km 34+600 to km 35+200. Further, along a section from km 35+300 to km 35+700, it leads across a complex of brunic soils, with an insert of podzols along a section from km 35+320 to km 35+450. In the *Bezimienna* stream valley, along a section from km 35+700 to km 36+000, the route of the planned project leads across a complex of murshic histosols with patches of umbric gleysols, murshic and mineralic soils, and phaeozems. After exiting the *Bezimienna* stream valley, the route of the planned project leads across eutric/dystric brunic arenosols along a section from km 36+000 to km 36+300. Next, from km 36+900, it runs across a complex of podzols. Up to km 37+850, it leads across a complex of albic brunic arenosols, next, from km 39+100, across a complex of podzols and further again across albic brunic arenosols (to km 39+470). From km 39+470 to km 40+700, the route of the planned project leads across a complex of eutric/dystric brunic arenosols. The ONS is located on eutric/epidystric cambisols and dystric cambisols.

In the northern part of the potential impact area, within the coastal dunes, poorly developed soils are present, i.e. arenosols. The structure of the soil profile is usually simplified, the humus horizon is in the early stages of development. Initial arenosols are characterised by the most poorly developed humus horizon with a maximum thickness of 10 cm. Dystric/eutric arenosols are characterised by a humus horizon with a thickness of approximately 10–30 cm, under which the parent rock is directly present. Dystric arenosols in contrast to proper arenosols are characterised by the presence of strata showing eluvial and illuvial features beneath the humus horizon [302].

Podzolic soils belong to the poorest soils, in trophic terms, among the mineral ones with a fully-developed profile. Only arenosol-type soils can be less fertile. Podzolic soils occur on sandy soil substrata with a strong precipitation type of water management. Above the mineral soil, acidic ectohumus is formed, and as a result of its decomposition humus acids are produced which stimulate the podzolisation process. Podzols have developed on loose sands without the admixtures of clay and silt fractions in a complex with brunic arenosols [302].

Brunic arenosols form mainly from the poorly sorted sandy formations, they belong to the order of podzols. The basic soil-forming process in such soils is the brunification process. It involves the formation of immobile humus complexes, which together with iron and aluminium oxides do not move deeper, but remain in place and form rusty sheaths around silt and clay grains [302].

Cambisols have developed mainly from tills, deep and very deep loamy sands, and to a lesser extent from silt formations and loamy gravels. Cambisols are characterised by brown colour across the entire profile. The brownification horizon with a thickness of 30–50 cm transforms gradually into parent rock. Cambisols are characterised by a wide range of pH values, from acidic to neutral [302].

In endorheic areas, histosols and murshic histosols are formed. Peatlands develop in the areas with high groundwater table. These can be stagnant or poorly flowing waters. Fens form in the areas with shallow groundwater, such as river valleys, springs, eutrophic water reservoirs and places of inflow and accumulation of surface waters. Murshic histosols are formed both from peat soils and silty soils as a result of dewatering of the organic horizon, whereby they become aerated and the moorshification process begins. The lowering of the groundwater level interrupts the marsh processes and instead of accumulation, which is characteristic for peat soils, the mineralisation and loss of organic matter commences. Degree of the moorshification process advancement depends of the type of peat, depth and period of dewatering. Murshic histosols have developed from bog-peat soils after dewatering which interrupted the peat accumulation process. Moorshification process begins with near-surface layers and covers deeper parts of the soil profile as the groundwater table decreases [302].

Hydrogenic soils, i.e. histosols, murshic histosols, are most sensitive to the potential impact of the planned project (trench opening, excavation drainage). This type of soil is particularly sensitive to changes in water relations. In the area of the planned project impact, hydrogenic soils occur from km

35+720 to km 36+100 – this is a complex of mineral and muck soils, umbrisoils, umbric gleysoils and murshic histosols.

5.15.4 Raw materials and deposits

The planned project is in its entirety located within the area of “Żarnowiec” concession no. 5/2019/Ł for prospecting and exploration of crude oil and natural gas granted to Baltic Shale Sp. z o.o., from the Northam Sp. z o.o. capital group.

No mineral resource deposits nor mining areas are located within the boundaries of the planned project nor the area of its potential impact. Figure 5.31 presents the location of deposits in the area of the onshore part of the planned project.

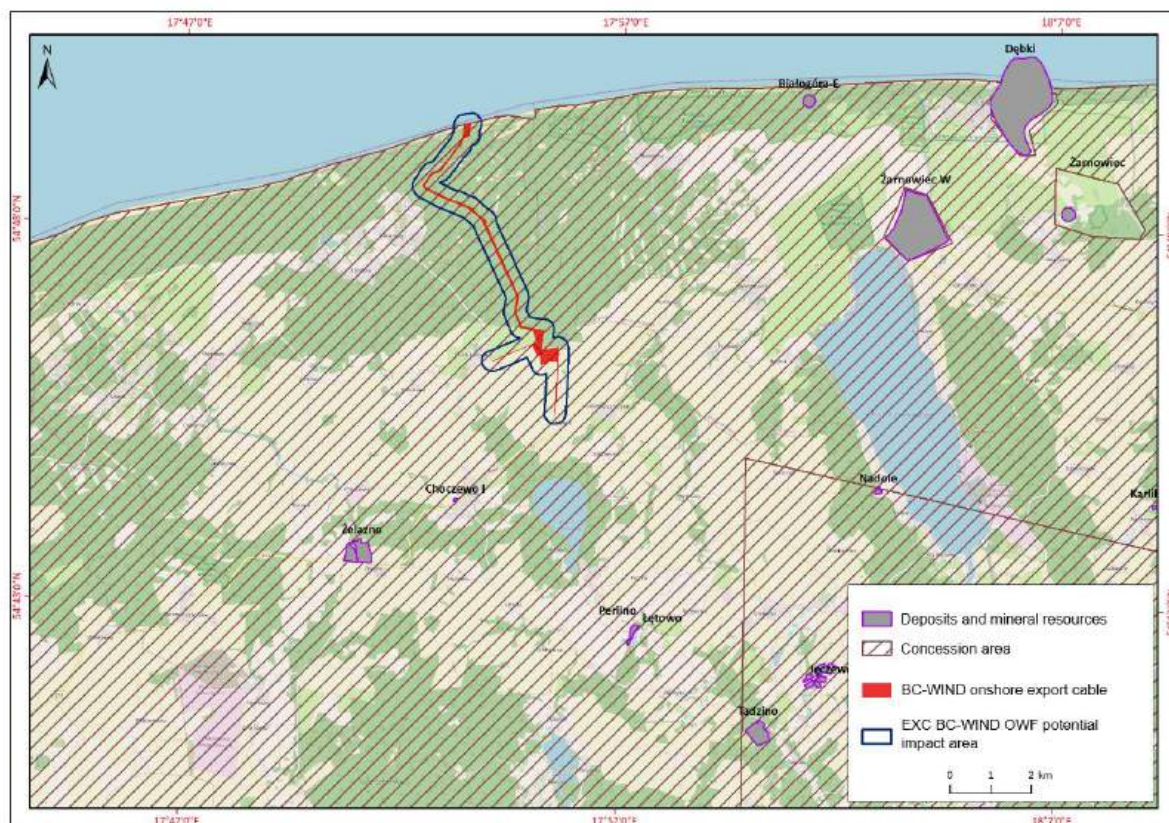


Figure 5.31. Location of the planned project against the occurrence of deposits and mineral resources [source: internal materials on the basis of OSM and MIDAS shp base]

At a distance of up to 10 km from the area of the planned project potential impact, the following resources are deposited (MIDAS base, as of March 2023):

- natural aggregate deposit (sand) Choczewo I located at a distance of 3.6 km south-west of the planned project impact area boundary;
- natural aggregate deposits (sand and gravel) Żelazno and Żelazno I located at a distance of 5.7 km south-west of the planned project impact area boundary;
- lake marl deposit Łętowo II located at a distance of 6.8 km south of the planned project impact area boundary;
- natural aggregate deposits Jęczewo, Jęczewo I and Jęczewo II (sand and gravel) located at a distance of 10 km south of the planned project impact area boundary;
- sand and sand with gravel deposit Nadole located at a distance of 8.4 km south-east of the planned project impact area boundary;

- crude oil and condensate (natural gas) deposit Żarnowiec W located at a distance of 8.4 km east of the planned project impact area boundary;
- crude oil deposit Białogóra E located at a distance of 8.2 km east of the planned project impact area boundary.

5.16 Surface waters and their quality

According to the hydrographic division of Poland, the planned project is situated in the Vistula River basin, in the Lower Vistula water region; in most part, in the direct catchment area of the sea and in the catchment area of the *Łeba* river. Forest-agricultural type of land use is dominant there.

In the surroundings of the planned project in both variants, the hydrographic network comprises of small watercourses: *Lubiatówka*, *Bezimienna*, and the Biebrowski Canal with the tributary from Kierzkowo [Figure 5.32]. The *Bezimienna* watercourse is an approximately 4 km long, mid-forest stream debouching into the Baltic Sea west of the village of Białogóra. It is fragmented due to two impounding structures. The *Bezimienna* watercourse is under a strong influence of a migrating dune affecting the original stream bed and characterised by a significant drop in the water level. The *Lubiatówka* watercourse is a 3.6 km long stream, together with its tributaries forming a drainage system for the adjacent areas of fields and meadows around the village of Lubiatowo, where its waters also debouch into the Baltic Sea. Surrounding the village of Lubiatowo, together with its adjacent tributaries, it serves as a drainage system for the region and a potential discharge area for the sewage from the camping sites located nearby. The Biebrowski Canal with its tributary constitutes a drainage system for Biebrowo and Kopalino, it flows into the *Chełst* river and is characterised by fragmentation which is unfavourable for the fish population preservation.

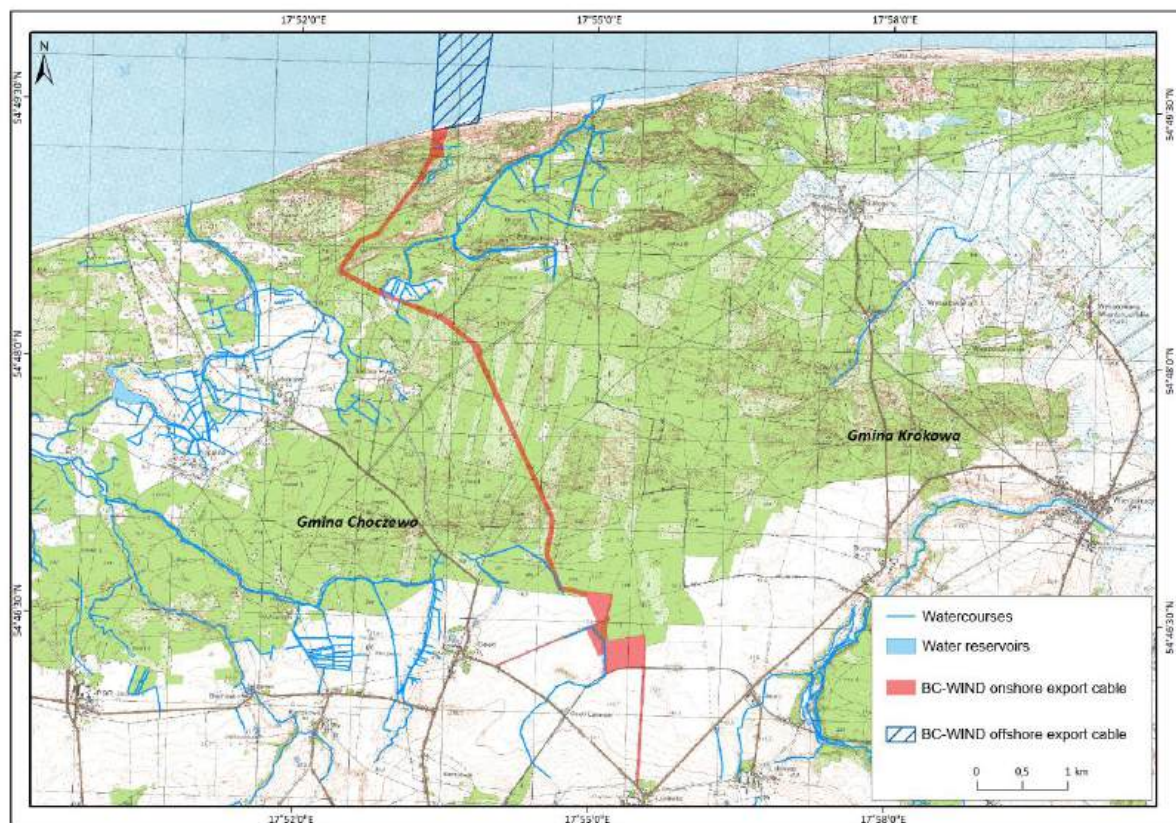


Figure 5.32. Hydrographic network in the onshore part of the EXC BC-Wind OWF [source: internal materials In the area of the planned project potential impact, surface waters are represented by:

- two ponds in the area of the transition joint bay at km 33+500 as well as the associated watercourses; it is planned to locate the transition joint bay at a distance of approximately 30 m south of the western pond;
- waterlogged areas in the vicinity of Spacerowa street, km 34+500;
- a waterlogged valley with a system of watercourses constituting tributaries of the *Bezimienna* stream from km 35+750 to 36+000;
- a tributary from Kierzkowo to the Biebrovski Canal, km 39+600;
- a drainage ditch on the western side of the ONS km 40+900 (planned to be crossed by a 400 kV line), with a pond at the southern edge of the planned project impact area.

The ponds in the vicinity of the planned transition joint bays are small (the “west” pond has approximately 0.25 ha, and the “east” pond – 0.15 ha). They are located in a dune slack at a height of approximately 3.75 MASL. A paved road leading to the beach runs between them. These reservoirs constitute a poor fen, which is protected as an ecological area “Torfowisko” [Peat bog] in Szklana Huta and are supplied mainly by precipitation and waters from the first aquifer.

The *Bezimienna* stream tributaries occupy a small valley depression and constitute a system of connected watercourses. The terrain lowers here to approximately 15 MASL. The waters flow eastwards.

At km 39+600, the planned project intersects a stream which is a tributary to the Biebrovski Canal. At km 40+900, the planned project intersects a drainage ditch with a 400 kV line; the ditch continues to the south. At the southern boundary of the planned project area, the drainage ditch transforms into a wetland forming a waterlogged area of approximately 0.7 ha.

In the area of the planned project, there are no surface water intakes nor protection zones for surface water intakes established under local law.

The planned project is located within the area of two surface water body catchment areas:

- the immediate catchment area of the sea CWDW1801;
 - the RWB Chełst river to its outlet into Lake Sarbsko RW200017476925

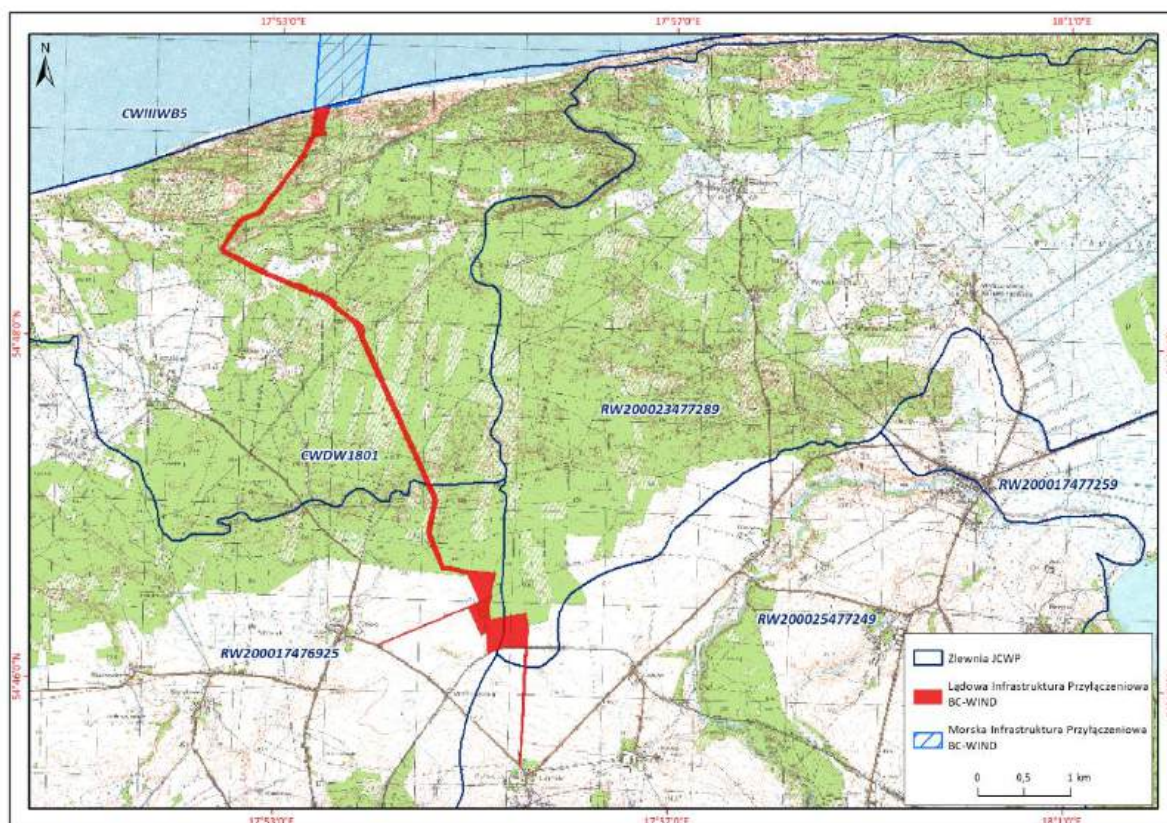


Figure 5.33. Location of the planned project against Surface Water Bodies (SWBs) [source: internal materials] The RWB Chełst river to its outlet into Lake Sarbsko RW200017476925 is a natural water body. Its state of water is bad, there is a risk of the environmental targets not being met. The entire catchment area is sensitive to eutrophication caused by pollutants from municipal sources, understood as enrichment of waters with nutrients, in particular with nitrogen and phosphorus compounds. For the catchment area, an exemption was made consisting in the deferment of the achievement of environmental targets, which is connected to the fact that the environmental targets of the RWB for the following indices have not been met (or are at risk): TOC, mercury(b).

According to the flood hazard map, the planned project is located outside the areas where there is a probability of flooding once in 10 years. The planned project in the area of the small ponds, constituting the ecological area "Torfowisko" [Peat bog] in Szklana Huta, is located in the areas with low probability of flooding of once in 500 years and ($Q=0.2\%$) and once in 100 years ($Q=1\%$) (<https://wody.isok.gov.pl/>).



Figure 5.34. Location of the planned project against areas of low or average probability of flooding once in 500 years and once in 100 years [source: internal materials on the basis of the data from: <https://wody.isok.gov.pl/>]

5.17 Hydrogeological conditions and groundwater

The occurrence of groundwater in the area of the planned project is connected to water-bearing formations in the Quaternary and Tertiary horizons. Within the Quaternary horizon, there are two aquifers: intermoraine and sub-till. The Tertiary formations are also characterised by the presence of two aquifers connected to the Miocene and Oligocene formations. The intermoraine aquifer occurs in fluvio-glacial sediments of the Middle Polish Glaciation and North Polish Glaciation, most often connected into a single water-bearing complex. In places, it is separated by a small layer of glacial till, forming a two-layer horizon, but with a close hydraulic connection. The maximum thicknesses of the saturation zone exceed 40 m, however, most commonly they are 15–30 m thick, and the average value of the filtration coefficient is 32 m/24 h (161.6 m/24 h at maximum). The horizon top is located at a depth of 30–45 m, in the terrain lowerings – less than 15 m, whereas, locally below 50 m [251].

The chemical composition of the Quaternary aquifer is made of local circulation waters type $\text{HCO}_3\text{-Ca}$, moderately hard water ($1\text{--}6 \text{ mval/dm}^3$), poorly mineralised (dry residues does not usually exceed 380 mg/dm^3). The content of 18 chlorides, sulphates as well as nitrogen compounds is slightly increased compared to the natural ambient conditions. This may indicate the influence of anthropogenic factors on the groundwater chemistry. The iron compounds and the related manganese are most commonly within the following range: $0.01\text{--}0.6 \text{ mg/dm}^3$ and $0.01\text{--}0.1 \text{ mg/dm}^3$. No elevated levels of metals or other compounds were observed [251].

The ground waters present in dune areas in the planned project area are poorly-recognised. They are characterised by low mineralisation and increased iron content of up to 0.8 mg/dm^3 [251].

Ground waters present in the direct vicinity of the seashore may be exposed to marine ingress. This situation may take place especially in the case of increased groundwater exploitation at the intake in

Białogóra or Lubiatowo. However, increased contents of nitrogen compounds indicate that some of the pollutants are infiltrating into the groundwater.

The characteristics of hydrological conditions for the planned project were carried out on the basis of the sheet of hydrological map of Poland at a scale of 1:50 000 The First Aquifer – Occurrence and Hydrodynamics (Choczewo sheet 0004) [Figure 5.35]. Moreover, as part of the assessment of the impact on hydrogeological conditions in the area of the ecological area “Torfowisko” [Peat bog] in Szklana Huta, 4 boreholes were made with a core drill to a depth of 2.5 m in the area of the planned transition joint bays [305]. No groundwater was recorded within the 2.5 m boreholes drilled. It was found that a free water table was present there at a depth of approximately 3–5 m in the area of transition joint bays and at approximately 2–5 m in the ecological area. The run-off of the waters of the first aquifer in this region takes place from the south-east in the direction of the seashore.

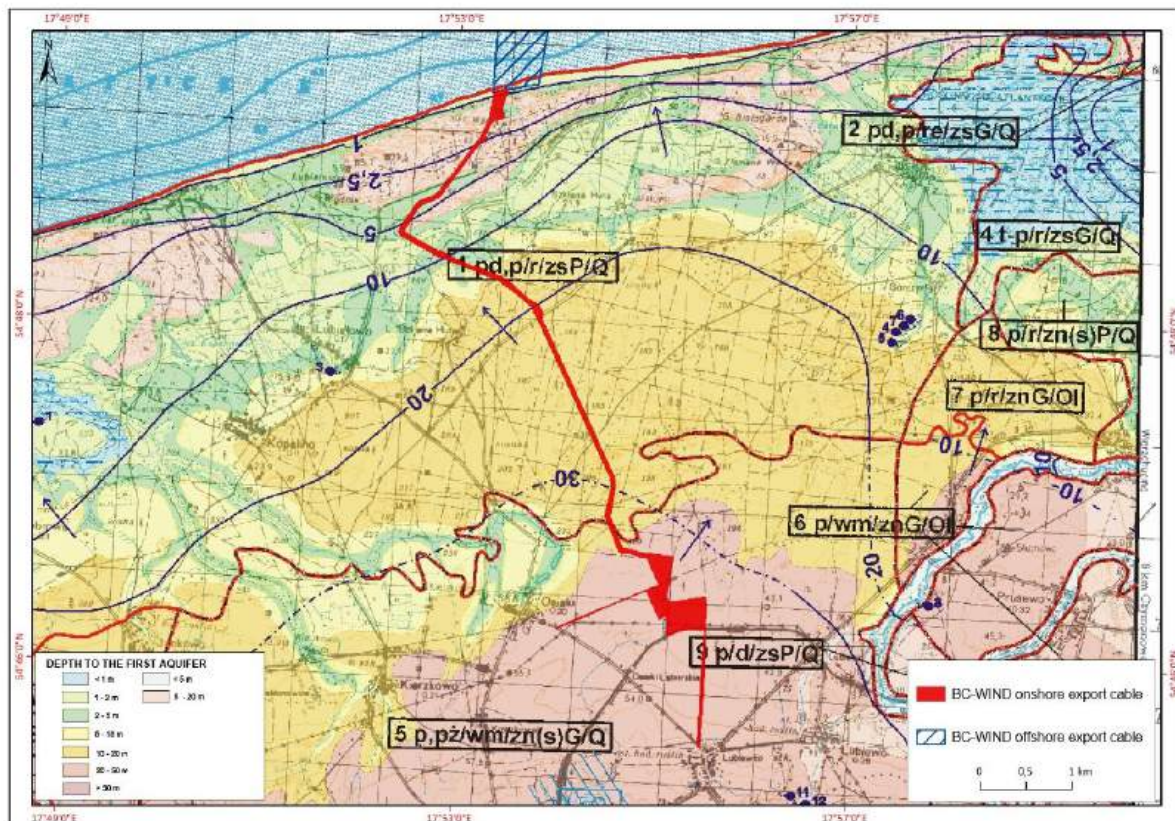


Figure 5.35. Position of the planned project against a hydrological map of Poland at a scale of 1:50 000. The First Aquifer – Occurrence and Hydrodynamics (Choczewo sheet 0004) [source: internal materials on the basis of the hydrological map of Poland at a scale of 1:50 000 [241]]

Table 5.14 presents the depth of groundwater deposition in relation to the chainage of the underground cable line on the basis of the hydrological map of Poland at a scale of 1:50 000 [251].

Table 5.14. Depth to the first aquifer along the route of the planned project [source: internal materials on the basis of the hydrological map of Poland. Choczewo sheet (1:50 000) [251]]

Chainage of the planned project [m]	Depth to the first aquifer [m]
from the transition joint bays to km 34+400	5–20
from 34+400 to 35+300	2–5
from 35+300 to 35+600	1–2
from 35+600 to 36+050	2–5
from 36+050 to 36+400	5–10
from 36+400 to 39+800	10–20
from km 39+800 to the southern boundary of the impact area	20–50

Summing up, along the majority (3.4 km) of the section, the planned project will be located in an area where the depth of the first aquifer is approximately 10–20 MBGL. The deepest (1–2 MBGL) groundwater can be found just below the waterlogged valley of the *Bezimienna* stream, along a section of approximately 300 m. Low water level (2–5 MBGL) can be found in the area of the *Bezimienna* stream. Groundwater flow from south to north is dominant. In the direct vicinity of the cable transition joint bays, to the north, waterlogged areas with a depth up to the first useful aquifer (2–5 m) occur.

The EXC BC-Wind OWF construction area is located within two units of division into groundwater bodies (GWBs):

- 11 (PLGW200011) in the southern part of the project;
- 13 (PLGW200013) in the northern and central part of the project.

The total area of the GWB 11 is 3969 km². This unit includes the catchment areas of the *Śłupia*, *Łupawa* and *Łeba* rivers. Within it, there are three multiaquifer formations: Quaternary, Paleogene–Neogene and Cretaceous, whereby within the boundaries of the planned project, Quaternary and Oligocene aquifers are usable.

The total area of the GWB 13 is 2856 km². This unit includes the catchment areas of the *Kacza*, *Zagórska Struga*, *Reda*, *Czarna Woda* and *Piaśnica* rivers. The aquifer system of the unit consists of three multiaquifer formations: Quaternary, Paleogene–Neogene and Cretaceous.

The groundwater of the coastal lowlands and spits is in direct contact with sea waters. The contact takes place along the coastline and creates a zone from several dozen to 300 metres wide. There is a local flow within the area of the Quaternary aquifer and the associated Miocene aquifer. The age of these waters generally ranges from a few to several decades, although locally they can be several hundred years old. The waters of the local circulation are mainly fed by direct infiltration and shallow aquifers. They are locally supported by infiltrating waters from rivers and lakes located on the surface of the Kashubian Lake District. The surface water system constitutes the drainage base for these waters. The indirect flow is associated with Paleogene multi-aquifer formations and deep Quaternary structures. These waters are fed indirectly by a Quaternary multi-aquifer formation, mainly in the Kashubian Lake District and partly in the Żarnowiecka Upland. They are drained by the waters of shallower aquifers in the area of river valleys, coastal depressions and lower sections of the *Przymorze* rivers.

The results of isotopic surveys indicate that the waters of the Oligocene aquifer can be several thousand years old [181].

The status assessment for 2012 for both GWBs indicated good chemical, quantitative and general statuses. This has been confirmed by the 2015 results of the monitoring activities published by the VIEP in Gdańsk and by the results from the previous years. As part of the operational monitoring activities, in 2015, the VIEP in Gdańsk tested the groundwater at three sites in the GWB 11 and three sites in the GWB 13, including the water intake in the village of Czymanowo in the Gniewino commune. All the tests indicated that the water bodies have a good chemical status (water quality class II standard is not exceeded).

Neither of the GWBs is at risk of the environmental objectives not being met. For both GWBs, “maintaining good chemical status, maintaining good quantitative status” were set as environmental objectives.

The nearest groundwater intake point is the Lubiatowo intake (plot no. 171/15, Lubiatowo precinct), at a distance of approximately 2.3 km south-west of the EXC BC-Wind OWF area boundary. This intake is supplied by Quaternary waters and supplies the following towns: Kopalino, Lubiatowo and Jackowo.

5.18 Climatic conditions and air quality

5.18.1 Climate and the risk related to climate change

The planned project is located in the transitional climate zone in Pomerania region, the specificity of which involves high changeability of weather conditions. A typical maritime climate is present there, characterised by small, annual seasonal and daily amplitude of air temperatures, high humidity and windiness. Short and mild winters, cool summers and significant amount of precipitation are typical there. As a result of its location in the Baltic Sea basin, on the migration route of active Atlantic lows, the lowest atmospheric pressure values in Poland occur there.

The effects of climate change observed in recent decades are manifested in particular by an increase in temperature as well as in the frequency and severity of extreme events. Under the United Nations Framework Convention on Climate Change of 9 May 1992 (the so-called Climate Convention), in order to avoid the most serious threats from climate change, measures were agreed to reduce greenhouse gas emissions, which have a significant impact on the global energy balance of the climate system. The reduction of greenhouse gas emissions on a global scale is a complex issue. In the foreseeable future, greenhouse gas emissions will not be reduced sufficiently to contain climate change. In this situation, one of the priorities, apart from mitigating the effects of climate change, is a possible adaptation to it, also in the scope of the planned project.

The climate change scenarios for Poland developed for the KLIMADA project 2.0 [485], provide descriptions of probable future climate conditions up to 2100. The rate of temperature changes and other climate parameters depends on the quantity of carbon dioxide in the atmosphere, which in the future can differ from the scenario of the economic and socio-economic development. The scenarios, agreed internationally for the purposes of the carbon dioxide quantity estimations, are updated every several years. The scenarios developed for the Fifth Assessment Report have an acronym RCP (*Representative Concentrations Pathways*). The names of individual RCP come from the values of global radiative forcing in the upper atmosphere assigned to them, forecast by the end of the 21st century (currently 3 W/m²). This quantity depends on the greenhouse gases content in the atmosphere (410 ppm CO₂ in 2020). The analyses of the climate change for Poland carried out by the IEP-NRI were focused on two development pathways, RCP4.5 and RCP8.5:

- RCP 4.5 – introduction of new technologies to obtain reduction in greenhouse gas emissions higher than the current one. A distinct reduction in the GHG content in the atmosphere is assumed by the first half of the century as well as the achievement of CO₂ concentrations at a level of approximately 540 ppm and the radiative forcing at 4.5 [W/m²] in the year 2100. The average global temperature will increase by approximately 2.5°C by the end of the 21st century;

- RCP 8.5 – maintaining the current rate of the increase in greenhouse gas emissions, in line with the “business as usual” pathway. It is assumed that by the end of this century, the CO₂ concentration level will reach approximately 940 ppm and the radiative forcing will reach 8.5 [W/m²]. The average global temperature will increase by 4.5°C compared to the pre-industrial era. This scenario entails, with a 95% probability, an irreversible destabilisation of the Earth’s climate.

The analysis of the climate change in the territory of Poland [395], based on an ensemble forecast created with the use of climate model results from the EuroCORDEX repository, points to the existence of systematic trends, especially for scenario RCP8.5 (“business as usual”). On the basis of the climate change forecast results, it can be stated that in the territory of Poland, both the thermal and precipitation conditions, will change in the time horizon of 2100. The analysis of ten climate indices allows formulating several general conclusions with regard to the anticipated changes in temperature and precipitation in the territory of Poland. With reference to the average temperature, an increase is forecast for both scenarios – RCP4.5 and RCP8.5; however, the increase for scenario RCP8.5 is more significant:

- the greatest changes are forecast for the winter (December, January, February) and summer months (June, July, August);
- the highest temperature rises occur in the east and north-east of Poland. The temperature rise until 2060 is from approximately 1°C (RCP4.5) to 1.2°C (RCP8.5);
- the course of the change in the number of days of the vegetation period is concurrent with the increase in the average annual temperature. The distribution and frequency of extreme temperatures will also change both in summer and winter, and the effects will affect most of the country to varying degrees;
- in summer, as far as daily maximum temperatures in successive decades are concerned, the number of hot days (with a daily maximum temperature exceeding 30°C) shows an upward trend, while the greatest changes affect the southern and south-eastern parts of the country (RCP4.5) or the southern and south-western parts (RCP8.5). On average, the number of hot days will increase from 3 (RCP4.5) to 6 days (RCP8.5);
- for both scenarios, a decrease in the frost days is visible, more significant in the northern (RCP4.5) or northern and eastern parts of the country (RCP8.5). In the time horizon of 2060, the number of frost days will decrease by approximately 18 days (RCP4.5) to 25 days (RCP8.5);
- the number of freezing-degree days will decrease throughout the country. The greatest reduction is observed in the north-eastern part of the country. The number of freezing-degree days, in the time horizon of 2060, will decrease by approximately 10 in the case of scenarios RCP4.5 and RCP8.5, compared to the 2011–2020 decade. The increase in the average annual temperature is due to the increase in the number of hot days as well as to the reduction in the number of freezing-degree days. As a result of temperature increase in the cold season of the year, the number of frost days will decrease.

For precipitation, the forecasts are less clear-cut, as both the accumulated precipitation and the distribution of precipitation intensity throughout the year are important for this parameter:

- in the case of both scenarios, the annual precipitation will increase, whereas for RCP8.5 this increase is more significant. This applies mainly to the eastern part of Poland; an increase in precipitation is noticeable also for the mountainous and coastal areas. The lowest increase is forecast for the locations in the central-western part of Poland. By 2060, an increase in annual precipitation by 30 mm (RCP4.5) to 50 mm (RCP8.5) is forecast;
- with reference to the seasonal distribution, the greatest changes in the amount of precipitation across a larger area of Poland apply to the summer season (June, July, August);

- the analysis indicates that the forecast number of days with precipitation and days without precipitation is different for scenario RCP4.5 and scenario RCP8.5 and shows a varying distribution in subsequent decades. The number of days with precipitation increases predominantly in the northern and southern parts of Poland. The difference between scenario RCP4.5 and scenario RCP8.5 is approximately 4 days;
- in the case of scenarios RCP4.5 and RCP8.5, the average number of days without precipitation slightly decreases. In both scenarios, the reduction in the number of days without precipitation is from approximately 4 days (RCP4.5) to 6 days (RCP8.5);
- In the case of extreme precipitation > 20 mm/day, an upward trend occurred for both scenarios. In the case of RCP8.5 scenario, the increase is higher by approximately 1 day in comparison to RCP4.5. The greatest changes in precipitation frequency and quantity occur in the north-western part of Poland. The total number of days with precipitation increases slightly. The increase in annual precipitation results mostly from the increase in the number of days with extreme precipitation. The forecast changes in precipitation are the least significant in the western part of the country.

On the basis of the Klimada 2.0 project data, trends in changes of selected climatic parameters in Wejherowo district were analysed.

The diagrams below show the forecasts for the increase in average monthly temperature in Wejherowo district for both scenarios analysed, in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 compared to the decade 2011–2020.

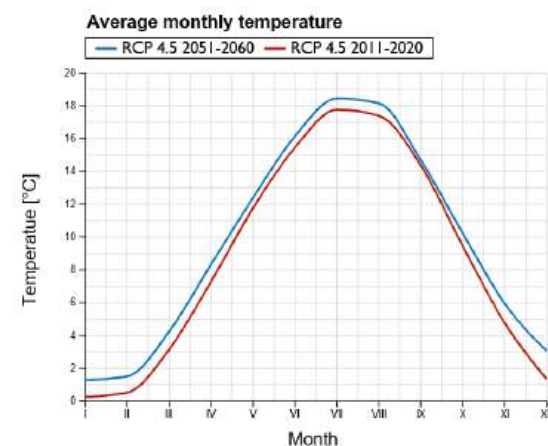
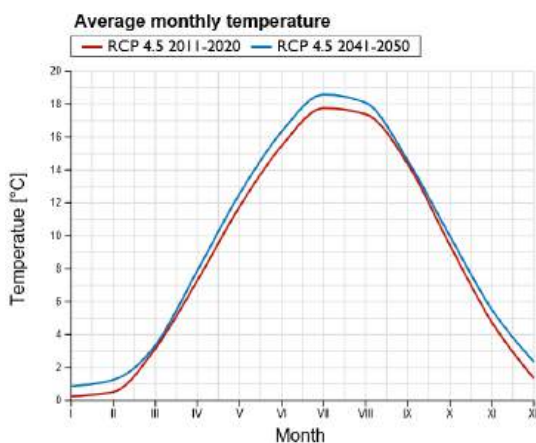
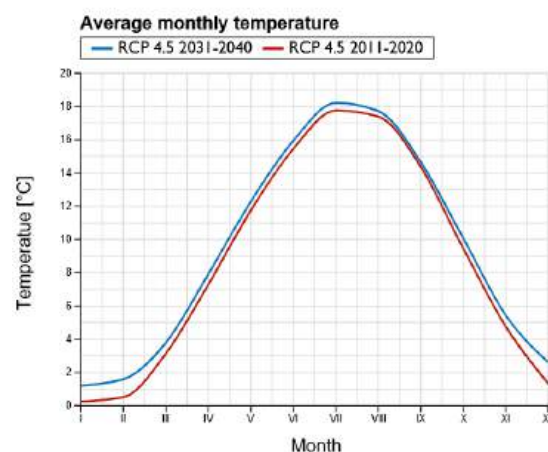
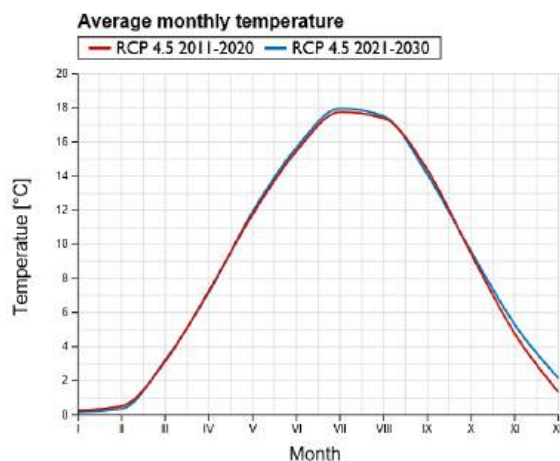


Figure 5.36. Changes in the average monthly temperature in Wejherowo district according to scenario RCP4.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of <https://klimada2.ios.gov.pl/klimat-scenariusze-portal/>]

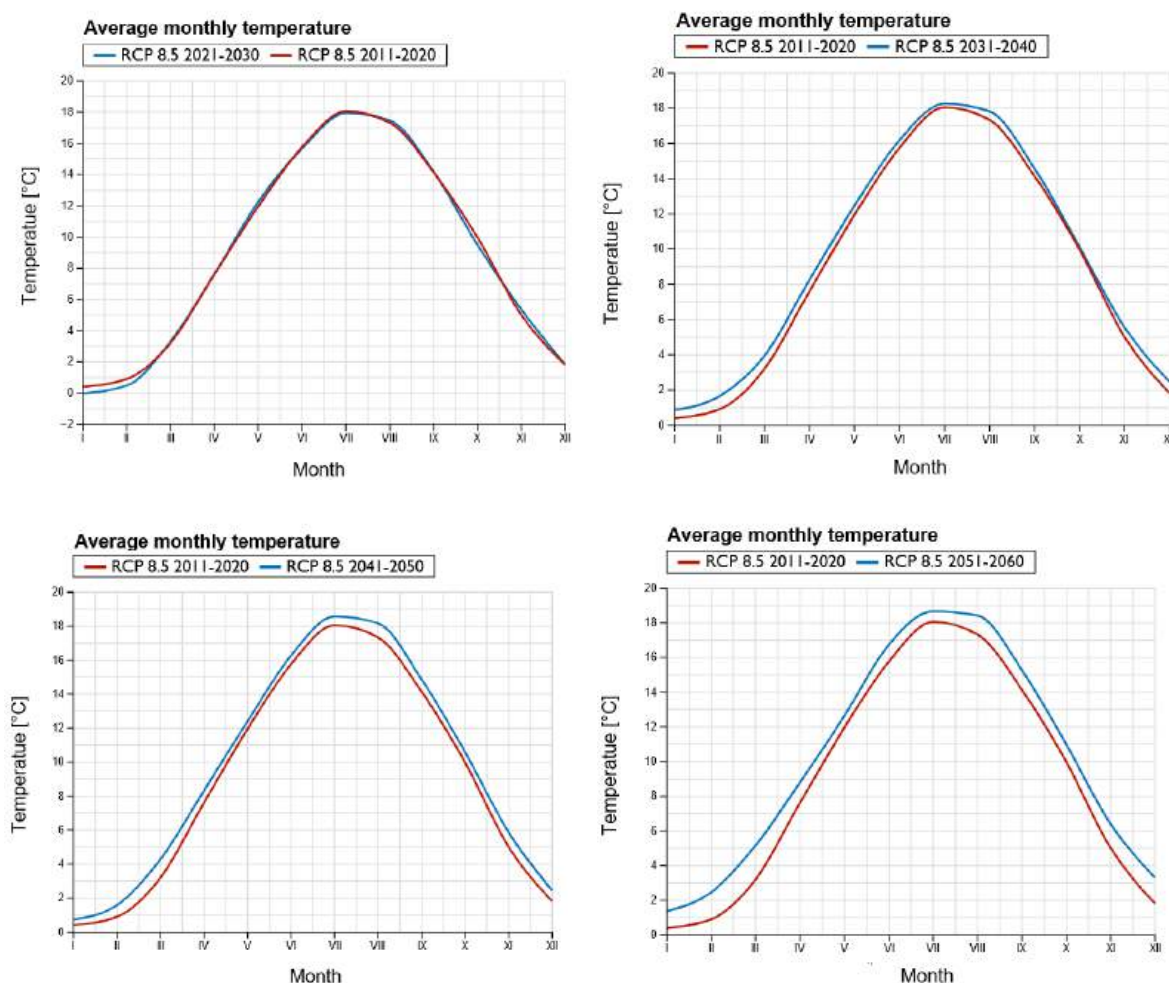


Figure 5.37. Changes in the average monthly temperature in Wejherowo district according to scenario RCP8.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of <https://klimada2.ios.gov.pl/klimat-scenariusze-portal/>]

The diagrams below show the forecasts for the changes in the average monthly precipitation in Wejherowo district for both scenarios analysed, in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 compared to the decade 2011–2020.

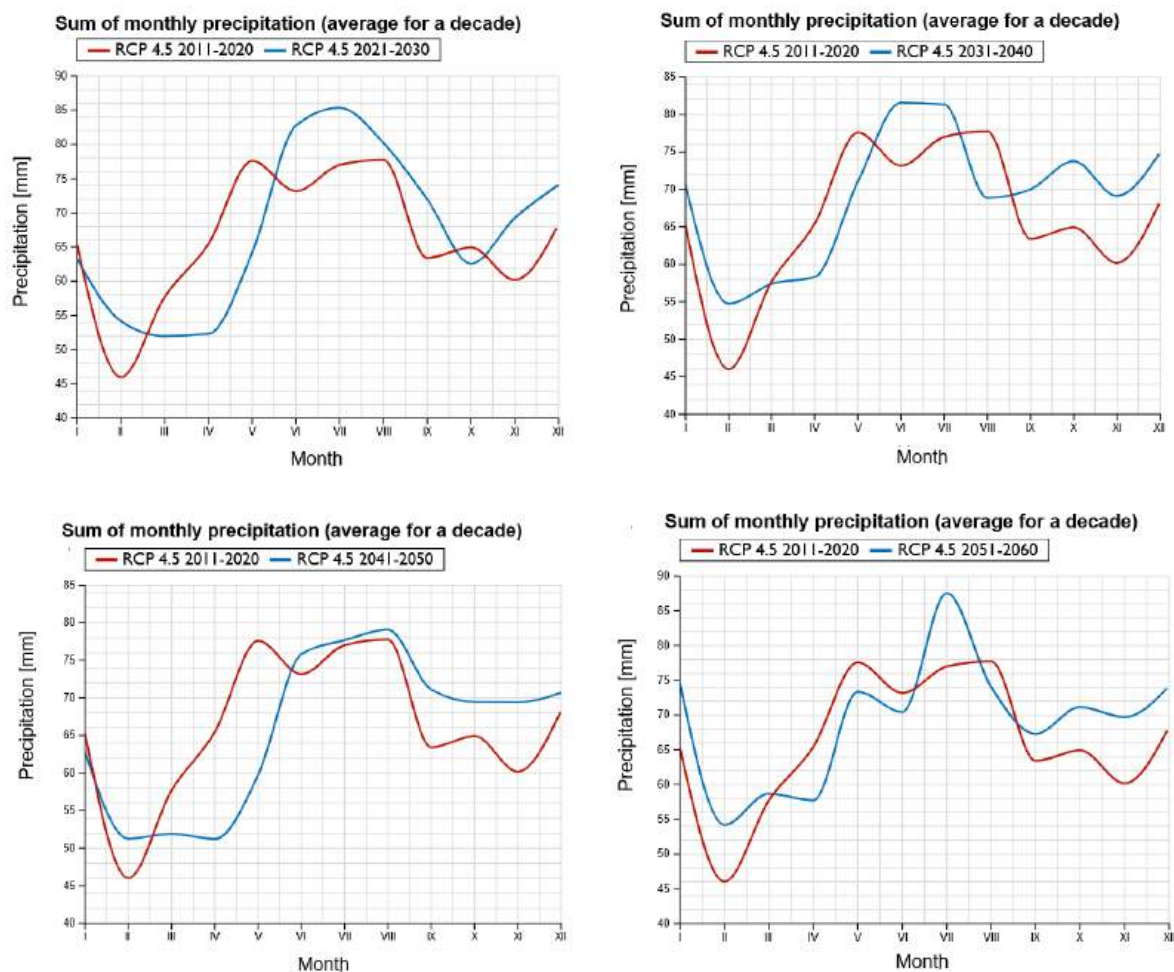
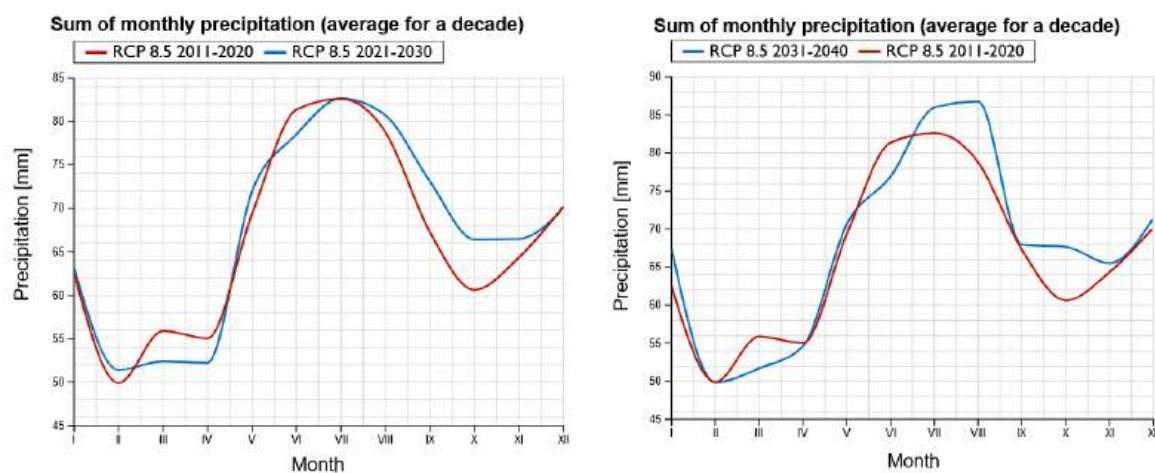


Figure 5.38. Changes in the average monthly precipitation in Wejherowo district according to scenario RCP4.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of <https://klimada2.ios.gov.pl/klimat-scenariusze-portal/>]



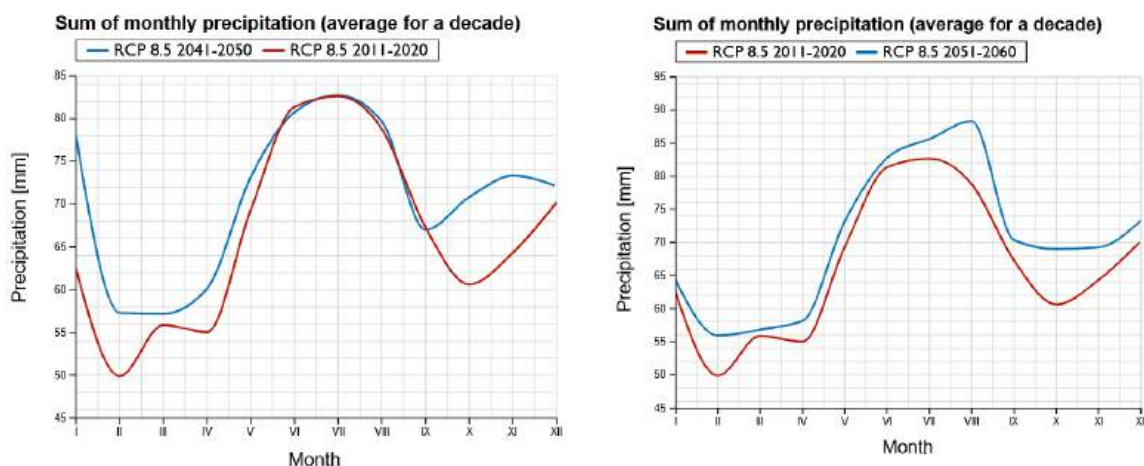


Figure 5.39. Changes in the average monthly precipitation in Wejherowo district according to scenario RCP8.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of <https://klimada2.ios.gov.pl/klimat-scenariusze-portal/>]

Observations and measurements of the climate elements indicate that, in general, the trend of air temperature increases is picking up [485]. Studies show that an increase in the greenhouse gases concentration caused global warming by more than 1.0°C above the level from before the industrial age (IPCC 2018, IPCC 2021). An increase in global air temperature is not distributed evenly in time and space. As in the past, fluctuations in average temperature values between years are and will be observed. The most important effects of the forecast climate changes include [155]:

- an increase in average temperatures per year, season and month (mainly affecting habitat conditions);
- an increase in maximum temperatures (mainly affecting humans and the water balance; increase in fire risk);
- an increase in the frequency and uninterrupted heatwave periods (mainly affecting humans and some sectors of the economy);
- an increase in minimum temperatures; a reduction in the freezing-degree period (affecting humans and the economy);
- an increase in the frequency and intensity of heavy precipitation (storms); an increase in flood risk (river and flash floods);
- an increase in the frequency and duration of droughts (affecting the habitat conditions, water balance and the economy; increase in fire risk in forests);
- an increase in sea level; sea floods and river floods in lower (estuary) valley sections of rivers debouching into the sea.

From the point of view of the planned project, the forecast increase in the frequency, intensity and duration of storms is significant. This can be accompanied by an increased irregularity of these events, i.e. long periods of relative calm can be followed by repeated storms preventing coastal regeneration. An additional factor accelerating the process of coastal erosion is an increase in average winter temperatures, as a result of which a reduction in the ice cover protecting the beaches from storm surges, and thereby safeguarding them against coastal erosion, should be expected. The scenarios of sea level changes demonstrate that in the period 2011–2030, the average annual sea level along the entire coast will be approximately 5 cm higher compared to the values from the reference period, i.e. 1971–1990. An increase in the frequency of storm floods and more frequent flooding of low-lying areas, as well as the degradation of the coastal cliffs and sea shore, which will entail a strong pressure on the infrastructure located in these areas, are very important effects of the climate change. In accordance with Communication 02/2021 of the interdisciplinary Advisory Group on Climate Crisis

affiliated with the President of the Polish Academy of Sciences on climate change and sea-level rise [490]:

- *“The 2019 IPCC Special Report on the Ocean and Cryosphere in a Changing Climate forecasts that the sea level in the two last decades of the 21st century will increase with a probability of 2/3 by 29–59 cm for RCP2.6 and by 61–100 cm for RCP8.5. It should be remembered that the anticipated sea-level rise will not stop in 2100 and by 2300 its continued rise is probable by even a dozen of meters for scenario RCP8.5, however, with high uncertainty related to the dynamics of the Antarctica ice sheet. The expected rate of the sea-level rise will accelerate depending on the emission scenario. The authors of the report write: “The rate of global mean sea level rise is projected to reach 15 mm/year in 2100, and to exceed several centimetres per year in the 22nd century.”*
- *In the case of the Polish coast, the forecasts of the actual sea level rise are also similar to the global forecasts. However, in the case of apparent rise of the sea level (in relation to the local seabed), directly affecting the coastal infrastructure, the effects of vertical movements of the Earth’s crust should be added, which are caused both by the crust adjusting to the decreased ice sheet load after the last ice age (isostasy), as well as the plate tectonics of the Earth’s crust. They are still insufficiently researched for the Polish coast. The initial results show no indication of vertical movements of the seabed for the western edges of the Polish coast and its central part, as well as of a lowering of the coast by approximately 1 mm/year in the Gulf of Gdańsk area and even by 2 mm/year in the area of the Vistula Fens region. This may result, in this area, in an accelerated rise in the relative average sea level by additional approximately 10–20 cm per century, resulting in an increase in threats related to the sea level rise and such threats covering larger and larger areas, including such nationally important locations as the historical part of Gdańsk, the Vistula Fens or the Hel Peninsula.*
- *An additional important factor posing a threat to the coastal zone are storm surges. The authors of the report write: “A rise in the global sea level will, in most locations, result in the increase in the frequency of extreme events. It is anticipated that local sea level values, which historically occurred once per century, will occur in all RCP scenarios, at least once a year, in most locations, by 2100. It is predicted that many low-lying areas and small islands will experience historic centennial events at least once a year, by 2050. The year in which the historical centennial events are expected to recur once per year, falls on RCP8.5 at the earliest and RCP2.6 at the latest. The increasing frequency of high water levels can have serious consequences in many locations.”*
- *The highest values of storm surges recorded on the Polish coast reached a level exceeding the average level by 2 m. The existing literature on the subject suggests an increased future storminess for the Central Europe and the Baltic Sea region, however, the uncertainty of such projections is still high. Nevertheless, the summary of global studies suggests that in the perspective of the next 30 years, surges are likely to occur, which can be several times more frequent than in the past.”*

The issues related to the coastal dynamics of the analysed section of the Southern Baltic coast are crucial from the point of view of the planned project. The shore section corresponding to the location of the transition joint bays has an abrasive character. An analysis of high resolution lidar data and orthophotomaps from 2005–2020 demonstrated that the average rate at which the dune baseline moves towards land is 1.0 to 1.5 m per year. Assuming this rate remains unchanged, the transition joint bay area could be within the storm wave impact range in approximately 50–75 years. With the variable circulation in the Southern Baltic region and with the greater frequency and intensity of the storms forecast that rate may change. This does not mean that the changes forecast might speed up the process, however, it should be remembered that maintaining the current abrasion rate or even the process intensification is more probable than its significant slowdown, which cannot be ruled out either.

One of the climate-sensitive sectors is the power sector, due to the predominance of overhead lines in the Polish power system, which are highly vulnerable to failures caused by strong winds and excessive icing, as opposed to cable networks [Poradnik... 2015].

5.18.2 Meteorological conditions

5.18.2.1 Wind speed and direction

In the area of the planned project, west and north-west winds predominate. In winter, south and south-eastern winds are common. In 2021, winds from the west and south-west directions (W–SW) prevailed. In 2018, the average annual wind speed fluctuated from 4.0 to 4.25 m·s⁻¹ [Figure 5.40]. The average number of days per year with strong wind ($v > 10$ m·s⁻¹) and very strong wind ($v > 15$ m·s⁻¹) may reach up to 70 there. Further inland, the number of days with strong and very strong winds decreases 5–6 times. Breezes as well as frequently passing low pressure areas causing strong winds, storms and heavy rainfall are all characteristic phenomena.

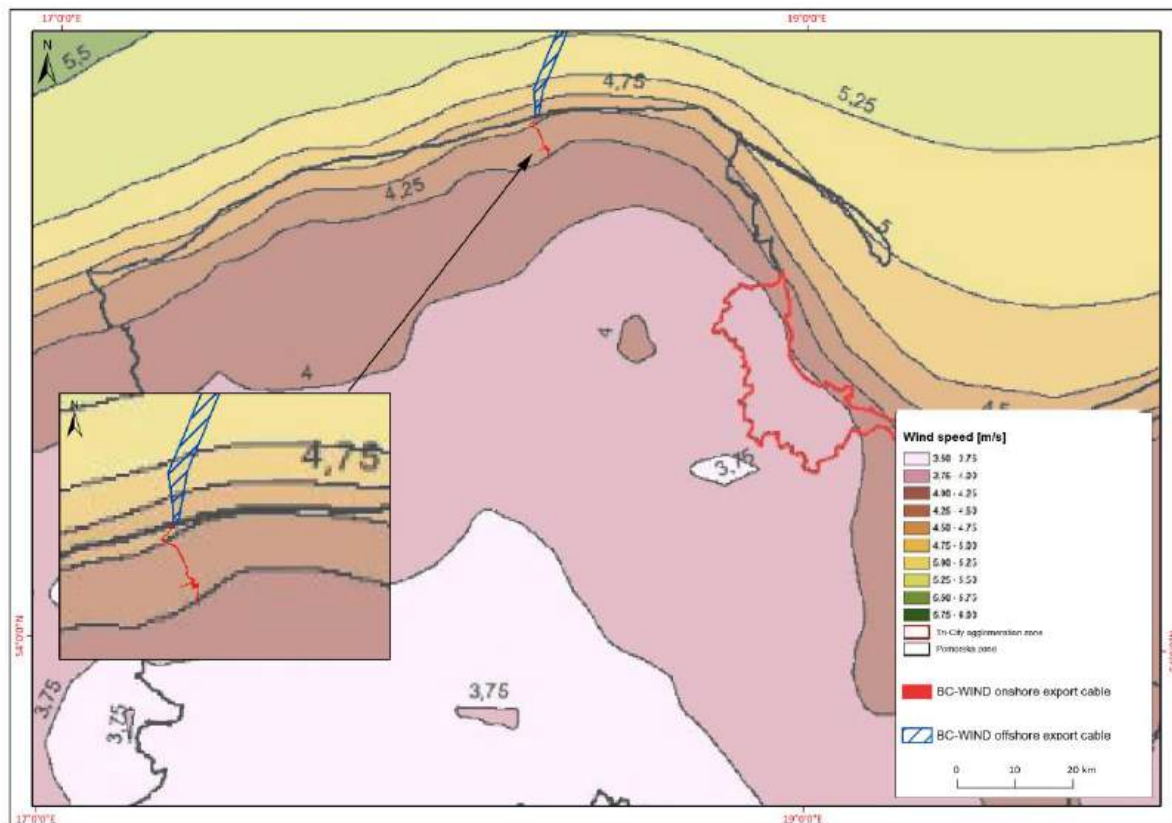


Figure 5.40. Spatial distribution of average annual wind speeds in the Pomorskie Voivodeship in 2018 [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020]

In accordance with the distribution of average monthly wind speeds in all towns within the Pomorska zone, in 2018, the highest speeds were recorded in January, whereas, the lowest in the warm weather period (from May to August).

5.18.2.2 Air temperature

In accordance with the data from the nearest weather station in Łeba in the Choczewo area:

- the average annual air temperature is 7.2°C;
- the average monthly air temperature in the hottest month, i.e. July, is 18°C;
- the average monthly air temperature in the coldest month, i.e. January, is -1°C.

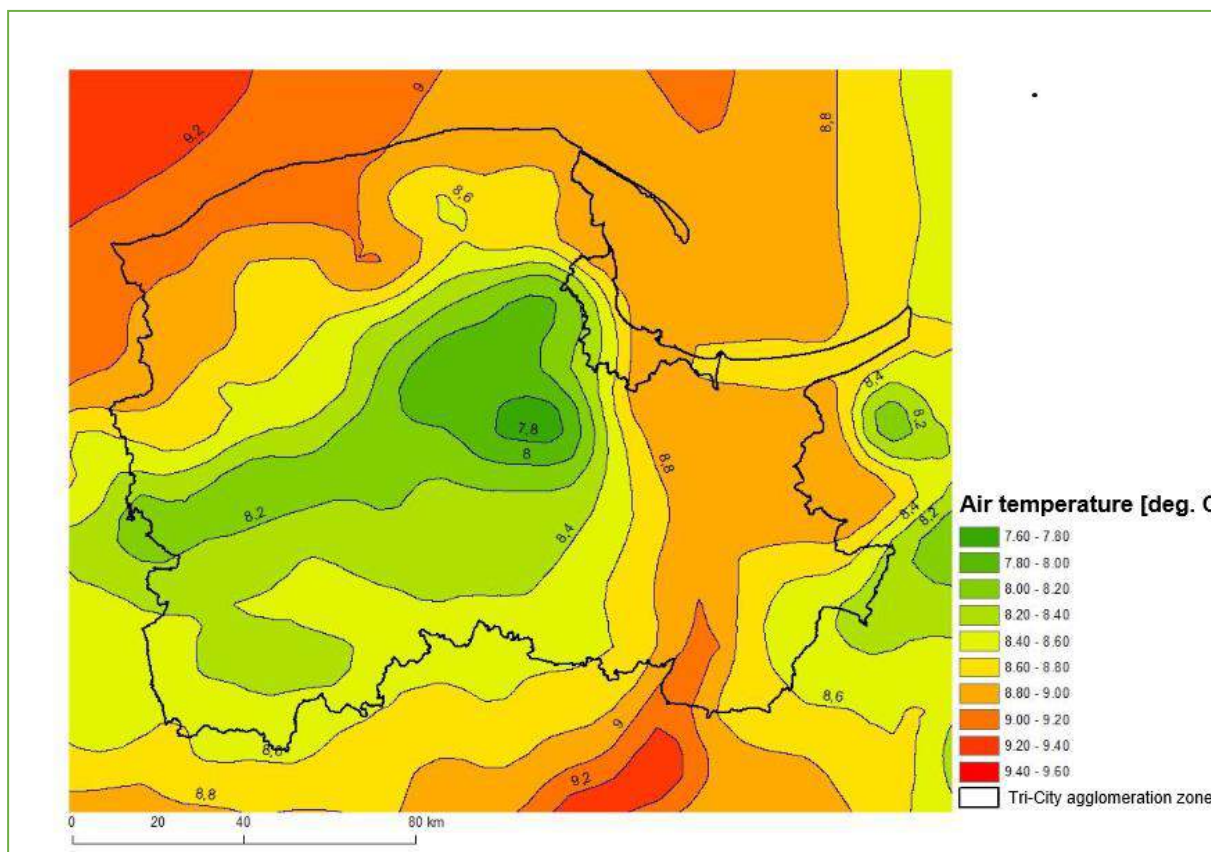


Figure 5.41. Spatial distribution of the average annual air temperature determined by the WRF/CALMET model in the Pomorskie Voivodeship in 2018 [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020]

In the Pomorskie Voivodeship, a drop in the average annual air temperature with the distance from the Baltic Sea coastline is visible. In the area of the planned project, the growing season is approximately 180 days.

5.18.2.3 Precipitation

The average sum of annual precipitation in the area of the planned project is approximately 500 mm, with a predominance of summer precipitation. In 2018, the sum of precipitation was approximately 650–700 mm. The annual sums of precipitation in the Pomorskie Voivodeship show a correlation with the distance from the coastline and terrain relief.

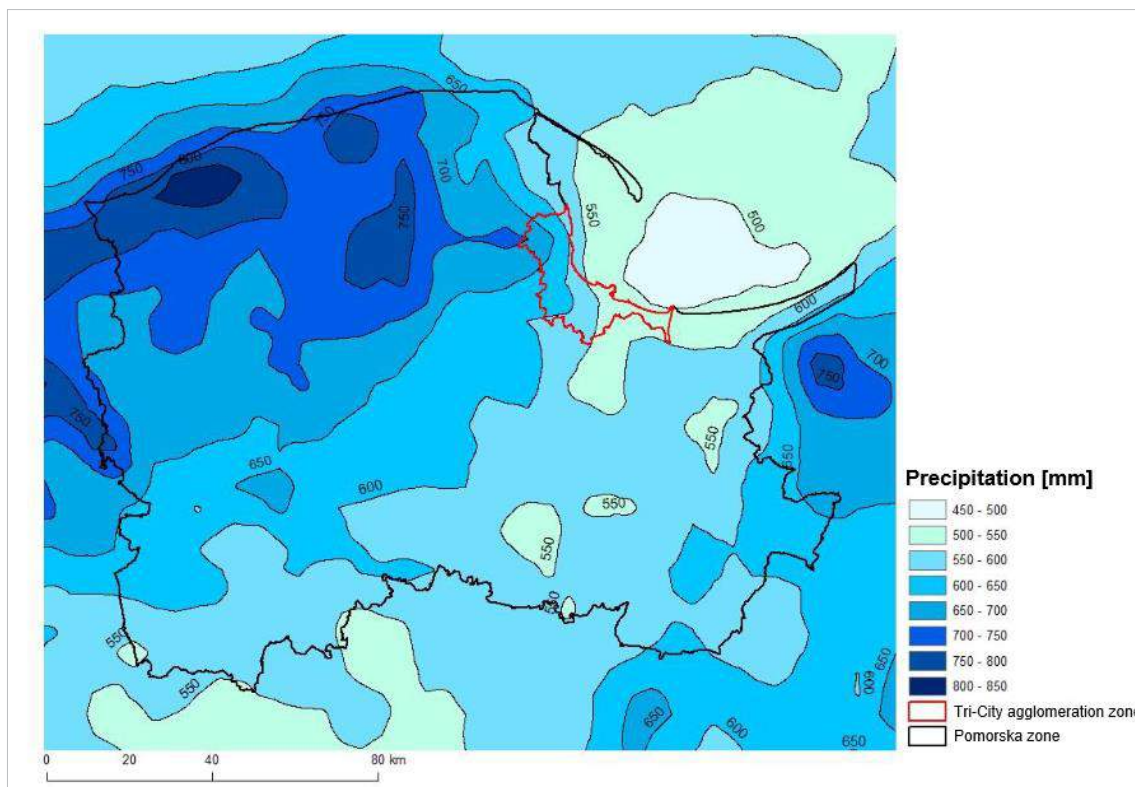


Figure 5.42. Spatial distribution of annual precipitation [mm] determined by the WRF/CALMET model in the Pomorskie Voivodeship in 2018. [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020]

5.18.3 Air quality

In accordance with the Report on the State of Environment in the Pomorskie Voivodeship [Report 2020], a zone classification was made in terms of health protection for 2018, with division into the Tri-City Agglomeration and the Pomorska zone, in which the planned project is located. The measurement station located nearest to the planned project is the station in Łeba at Rąbka 1a street. According to the data from the 2021 Annual Air Quality Assessment in the Pomorskie Voivodeship [387], the target level for benzo(a)pyrene in suspended particulate matter PM₁₀ was exceeded in the Pomorskie zone with regard to health protection. According to the data from Appendix 1, such an exceedance was not recorded for the Choczewo commune. In the Pomorska zone, an exceedance in the long-term target level for ozone was also recorded in the Choczewo commune. No exceedance of the target levels of substances in the air was recorded with regard to plant protection.

According to the Low-emission Economy Plan for Choczewo Commune [331], the main sources of air pollution in the commune are:

- municipal and domestic sources: local heating plants, individual household hearths, emitters from public utility plants;
- transport sources;
- secondary dusting from exposed terrain surfaces;
- allochthonous pollution coming from outside the commune depending on the prevailing wind direction.

The Low-emission Economy Plan for Choczewo Commune [331], includes an action plan with regard to decarbonisation with division into priority action areas. The Pomorskie Voivodeship Regional Council has adopted air protection programmes for all zones of the Pomorskie Voivodeship. The Air Protection Programme for the Pomorska zone of 28 August 2020 indicates the types of remedy actions intended

to improve the air quality and specifies the exceedance areas [1]. The Choczewo commune was not included in any of the areas specified. It should be remembered that the planned project is located far away from any objects that constitute a source of air pollution.

5.19 Ambient noise

The main acoustic nuisance in the Choczewo commune area is communication noise, mainly along the voivodeship road no. 213 Słupsk–Celbowo and along the district and commune roads.

An acoustic map was prepared for the voivodeship roads of the Pomorskie Voivodeship in accordance with the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556) which implemented the provisions of Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise. The Choczewo commune was not included in these surveys.

The noise levels permissible in the environment caused by individual groups of noise sources, expressed with indicators L_{AeqD} and L_{AeqN} , are provided in the Resolution of the Minister of the Environment of 14 June 2007 *on permissible noise levels in the environment* (Journal of Laws of 2007, No. 120 item 826, as amended).

Indicators L_{AeqD} and L_{AeqN} are used to establish and control the conditions for the use of the environment with respect to a single day. For the noise generated by roads, the indicator L_{AeqD} refers to the time interval equal to 16 day-time hours, while the indicator L_{AeqN} refers to the time interval equal to 8 night-time hours, whereas, for the installation noise, the indicator L_{AeqD} refers to the assessment time of 8 most unfavourable hours during the day, and L_{AeqN} refers to a single least favourable hour during the night. Permissible noise levels in the environment are specified in Table 5.15.

Table 5.15. Permissible noise levels in the environment [Source: Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws of 2007, No. 120, item 826 as amended)]

No.	Type of area	Permissible noise level [dB]			
		Roads or railways		Other noise-emitting facilities and activities	
		L_{AeqD} reference time interval equal to 16 hours	L_{AeqN} reference time interval equal to 8 hours	L_{AeqD} reference time interval equal to 8 consecutive least favourable day-time hours	L_{AeqN} reference time interval equal to 1 least favourable night-time hour
1.	a. Health resort protection zone "A" b. Hospital areas outside the city	50	45	45	40
2.	a. Single family housing areas b. Housing areas connected to permanent or temporary residence of children and young people c. Nursing home areas d. Hospital areas in cities	61	56	50	40
3.	Multi-family housing and collective housing areas Homestead housing areas Recreational and leisure areas Residential and commercial areas	65	56	55	45

No.	Type of area	Permissible noise level [dB]			
		Roads or railways		Other noise-emitting facilities and activities	
		L _{Aeq D} reference time interval equal to 16 hours	L _{Aeq N} reference time interval equal to 8 hours	L _{Aeq D} reference time interval equal to 8 consecutive least favourable day-time hours	L _{Aeq N} reference time interval equal to 1 least favourable night-time hour
4.	Inner city zone areas of cities with more than 100 000 inhabitants	68	60	55	45

Pursuant to Article 114, section 1 of the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), the basis for categorisation of areas subject to protection against noise are the provisions of local spatial development plans.

Within the area of the planned project potential impact, there is an acoustically protected area with a single-family residential development function. This is the area of the Rehabilitation and Holiday Centre for disabled people (30 Spacerowa Street, Lubiatowo). Pursuant to Resolution No. IX/76/2007 of the Choczewo Commune Council of 13 September 2007, the local spatial development plan for the Lubiatowo region, the Kierzkowo precinct, and the Choczewo commune is in force there (Official Journal of the Pomorskie Voivodeship No. 3 of 17.01.2008, item 92).

5.20 Electromagnetic field (EMF) emission

EMF comprises the following fields: electric, magnetic, and electromagnetic with frequencies from 0 Hz to 300 GHz, which generate a range of non-ionising electromagnetic radiation. Its main sources are: high-voltage lines, mobile phone transmitting stations, radars, mobile phones, and electric devices, etc. The report “Assessment of Electromagnetic Field levels in the Environment in 2020” [486] concludes that in the recent years, a gradual increase in the electromagnetic radiation in the environment can be observed. This increase is caused, among other things, by the development of mobile phone networks. The highest increase in the EMF concentrations is recorded in cities and districts with more than 50 thousand inhabitants, the lowest increases are recorded in rural areas. The average EMF level obtained from all the measurements for the year 2020 was 0.48 V/m, however, this value was 0.26 V/m for rural areas.

The Choczewo commune area is supplied from the NPS from a transformer station MPS Jackowo 110/15 kV. The MPS transformer station is supplied by two HV overhead power lines 110 kV, i.e.:

- HV 110 kV line Opalino;
- HV 110 kV line Wojciechowo.

The back-up supply for the MV lines is provided by 110/15 kV MPSS Opalino and Bożepole stations.

The commune power supply infrastructure system includes [331]:

- MPS 110/15 kV Jackowo station (main power supply station);
- the transmitted 15 kV power supplying individual settlement units – 8 overhead lines;
- a series of 15/04 kV transformer stations supplying the end customers.

In accordance with the Environmental Protection Plan for Choczewo Commune [346], most 15 kV networks were constructed in the 70s and 80s of the previous century. They have been renovated or replaced and their technical condition is assessed as good. The existing low-voltage network is well-developed and assessed as good. The street lighting network is a 0.4 kV separated network and should be partially modernised. Local customers are supplied from the medium to low-voltage transformer stations, which are the source of power for the low-voltage customer and lighting networks.

Transformer stations are usually erected aboveground as towers with transformers with a power of up to 600 kVa. The number of transformer devices and the MV and LV network lengths satisfy the demand of individual customers, small and medium enterprises.

Mobile phone network base stations are located in the Choczewo commune. They are transmission-receiving devices connecting the mobile phone network with mobile phones. The configuration of the base station antenna system cannot generate a non-ionising electromagnetic radiation with levels exceeding the permissible level (in areas accessible to humans), specified in the provisions of the Environmental Protection Law.

In compliance with the Act of 27 April 2001, *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), since 2005, the Environmental Protection Inspectorate has been carrying out the assessments of the electromagnetic field levels in the environment as part of the State Environmental Monitoring. Monitoring surveys of electromagnetic radiation were carried out in accordance with the regulation of the Minister of Climate and Environment of 15 December 2020 *on periodic tests of electromagnetic field levels in the environment* (Journal of Laws of 2020, item 2311).

In accordance with the Report on the State of the Environment in the Pomorskie Voivodeship, in the Choczewo commune, which was identified as a rural area, the EMF intensity measurements were carried out in 2017 and 2018. For all the rural areas inspected, the average intensity values of the EMF in 2017 were $0.22 \text{ V} \cdot \text{m}^{-1}$ while in 2018 – $0.42 \text{ V} \cdot \text{m}^{-1}$. In 2021, a monitoring of electromagnetic fields in urban areas was carried out, as part of the SEM, which is carried out in the permanent monitoring network in a two-year cycle. Closest to the planned project, the monitoring was carried out in Wejherowo and in Łeba, where the result for a 0.5 h measurement was 1.1 V/m for Wejherowo (with an average of 1.42 V/m for this category), and for Łeba – 0.87 V/m (with an average of 0.55 V/m for this category).

5.21 Description of natural elements and protected areas

5.21.1 Biotic components in the onshore area

5.21.1.1 Spatial range of the biotic element characteristics

The onshore part of the EXC BC-Wind OWF survey area is located in the Choczewo commune, east of the villages of Lubiatowo and Osieki Lęborskie, in the Pomorskie Voivodeship [Figure 5.43].

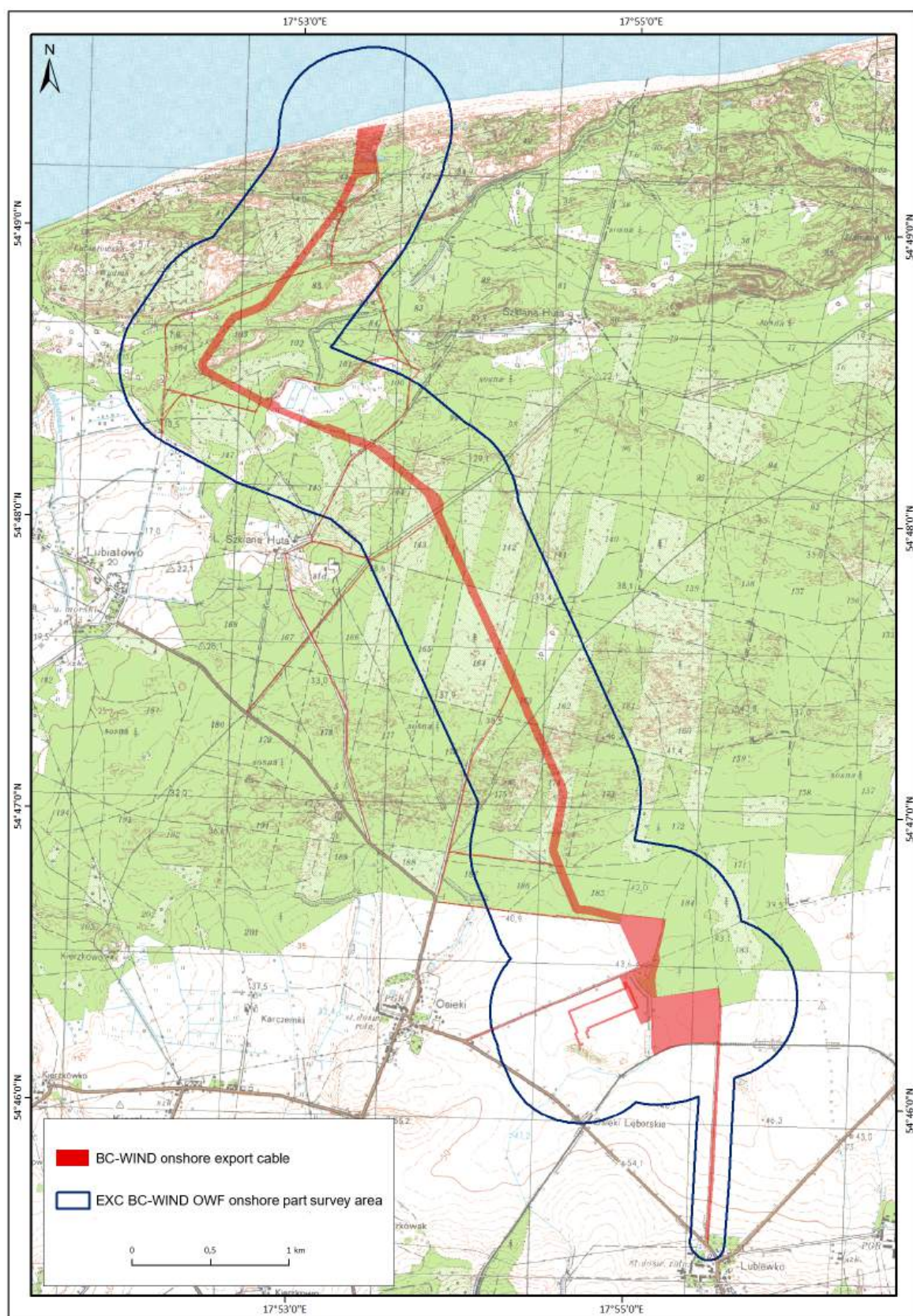


Figure 5.43. Location of the EXC BC-Wind OWF survey area, onshore part [source: C-Wind Sp. z o.o. data]

The area stretches from north-west to south-east and runs from the beach on the northern edge, through the dune zone and coastal forests to agricultural areas in the south.

The inventory surveys covered the immediate area of the proposed project along with a 500 m wide buffer zone around it. In specific cases (e.g. ichthyofauna), some survey sites were located outside the main survey area. The total surface of the survey area was approximately 10 km².

5.21.1.2 Methods of evaluation of the biotic environment resources identified and their habitats

For each of the groups studied, a resource evaluation was carried out, which took into account, on the one hand, the conservation status and threat category on an international, national, and local scale and, on the other hand, the frequency of occurrence countrywide and in the Gdańsk Pomerania region. In the case of some organism groups, due to a lack of detailed information on the occurrence of many taxa, the list of species under legal protection did not include those which are actually rare and/or endangered in Poland. As a result, for the purposes of the impact area evaluation, also rare and/or endangered species were included, regardless of their conservation status.

The evaluation of the macroscopic **fungi** species of high nature conservation value found during the inventory surveys was carried out on the basis of the analysis of the frequency of occurrence of individual taxa in Poland and the region, based on the register of protected and endangered fungi – GREJ (<http://www.grzyby.pl>), the data published on Gdańsk Pomerania, their conservation status and the threat category according to the Red List of Macrofungi in Poland. Due to the fact that all species occur singly in the plots, the number of plots in the survey area was also adopted as the factor differentiating the biota of fungi.

The above-mentioned evaluation of species was taken into account when assessing the plots of **lichen** species of high nature value. The evaluation of the lichen species of particular concern found during the surveys was carried out on the basis of the frequency of occurrence of individual taxa in Poland, in the region and within the survey area itself (based on published and unpublished data) as well as their conservation status and the threat category in Poland and Gdańsk Pomerania. Hence, the most valuable are the plots with the species considered to be of exceptionally high and high nature conservation value.

The evaluation of the **moss** species of high nature conservation value recorded during surveys was based on the analysis of the frequency of occurrence of individual taxa in the country and region, on the basis of the data published on Gdańsk Pomerania region and their conservation status.

The evaluation of the **vascular plant** species of high nature conservation value found during the surveys was carried out on the basis of the analysis of the frequency of individual taxa occurrence countrywide and across the region, from the data published on Gdańsk Pomerania, on their conservation status and the threat category according to the national and regional red lists and red data books for Poland.

The evaluation of **herpetofauna** breeding sites was based on several criteria:

- number of species using the habitat in question;
- conservation status and threat category of individual species;
- seasonal and overall sustainability of a habitat;
- abundance of individual populations.

On this basis, the evaluation was carried out on a three-step scale:

- Class 1 – high value site (numerous species, high abundance, good habitat conditions);
- Class 2 – medium value site (at least two species, medium abundance, average habitat conditions);
- Class 3 – moderate value site (one species, moderate and poor habitat conditions).

The evaluation of **chiropterofauna** was performed taking into account the following parameters: population, nature conservation value of the species, habitat conservation status – structure and function.

Assessment method for the *population* parameter

Determined on the basis of the species activity index (if significant function of the habitat is identified – feeding ground, bat swarming site, daily migration route from roosts to feeding grounds):

- 0 pts – low score – number of echolocation signals recorded below 6 activity units per hour (low activity);
- 1 pt – medium score – number of echolocation signals recorded in the range between 6 and 12 activity units per hour (high activity);
- 2 pts – high score – number of echolocation signals recorded above 12 activity units per hour (very high activity).

To assess the activity scale, the scale currently used for determining the level of bat activity was applied, i.e. the scale developed for wind farm assessment purposes (*Tymczasowe wytyczne dotyczące oceny oddziaływania elektrowni wiatrowych na nietoperze* [literally: Interim guidelines for the assessment of the impact of wind turbines on bats] – Kepel *et al.* 2011).

Assessment method for the *nature conservation value of the species* parameter

- 0 pts – low score – synanthropic species, with low habitat requirements; a species of low value when it meets the following conditions: common species, with broad environmental requirements, not associated with sensitive habitats;
- 1 pt – medium score – a species of medium value when it meets the following conditions: species of medium frequency, fairly abundant nationally;
- 2 pts – high score – a species of high value when it meets the following conditions: occasional indicator species; associated with rare or sensitive habitats; listed in Annex 2 to Directive 92/43/EEC *on the conservation of natural habitats and of wild fauna and flora* (Habitats Directive); endangered species, listed in the Polish Red Data Book of Animals.

Assessment method for the *habitat – structure and function* parameter

Determined on the basis of the following indicators: reproduction of the species, wintering, maintenance of the elements of key importance to bats in a habitat:

- 0 pts – low score – habitat of low quality, lacking some of the elements of key importance to the species, significant threats, low significance of the habitat for the species, no bat breeding sites identified in the vicinity, no potential roosts, no conditions for wintering;
- 1 pt – medium score – habitat well preserved but with distortions present or lacking certain elements of key importance to the species, suboptimal habitat quality, average significance of the habitat for the species, temporary bat roosts identified in the vicinity, wintering of single individuals (1–5);
- 2 pts – habitat/site size sufficient for the long-term survival of the species (optimum); satisfactory habitat quality (presence of feeding grounds and potential roosts suitable for the species, no significant barriers or threats, habitat situated within a large nature conservation area), high significance of the habitat for the species, breeding colony identified in the vicinity, wintering of more than 5 individuals.

The overall assessment of the conservation status of the habitats inventoried comprised the sum of the scores from the three parameters assessed, with the following scale assigned:

- 0–2 points – habitats of low nature conservation value;

- 3–4 points – habitats of medium nature conservation value;
- 5–6 points – habitats of high nature conservation value.

5.21.1.3 Forests

The planned project is located within the area of forests administered by the Regional Directorate for Environmental Protection (RDEP) in Gdańsk, within the boundaries of the Choczewo Forest District, the forest ranges of Szklana Huta and Białogóra [Figure 5.44.]. The Forest District area is dominated by the potential natural vegetation of the complex of communities of the acidophilous oak forest type (*Fago-Quercetum*) as well as lowland acidophilic beech forests (*Luzulo pilosae-Fagetum*). The forest health status for pine and mixed stands with their share is good. The stands are characterised by good quality and health.

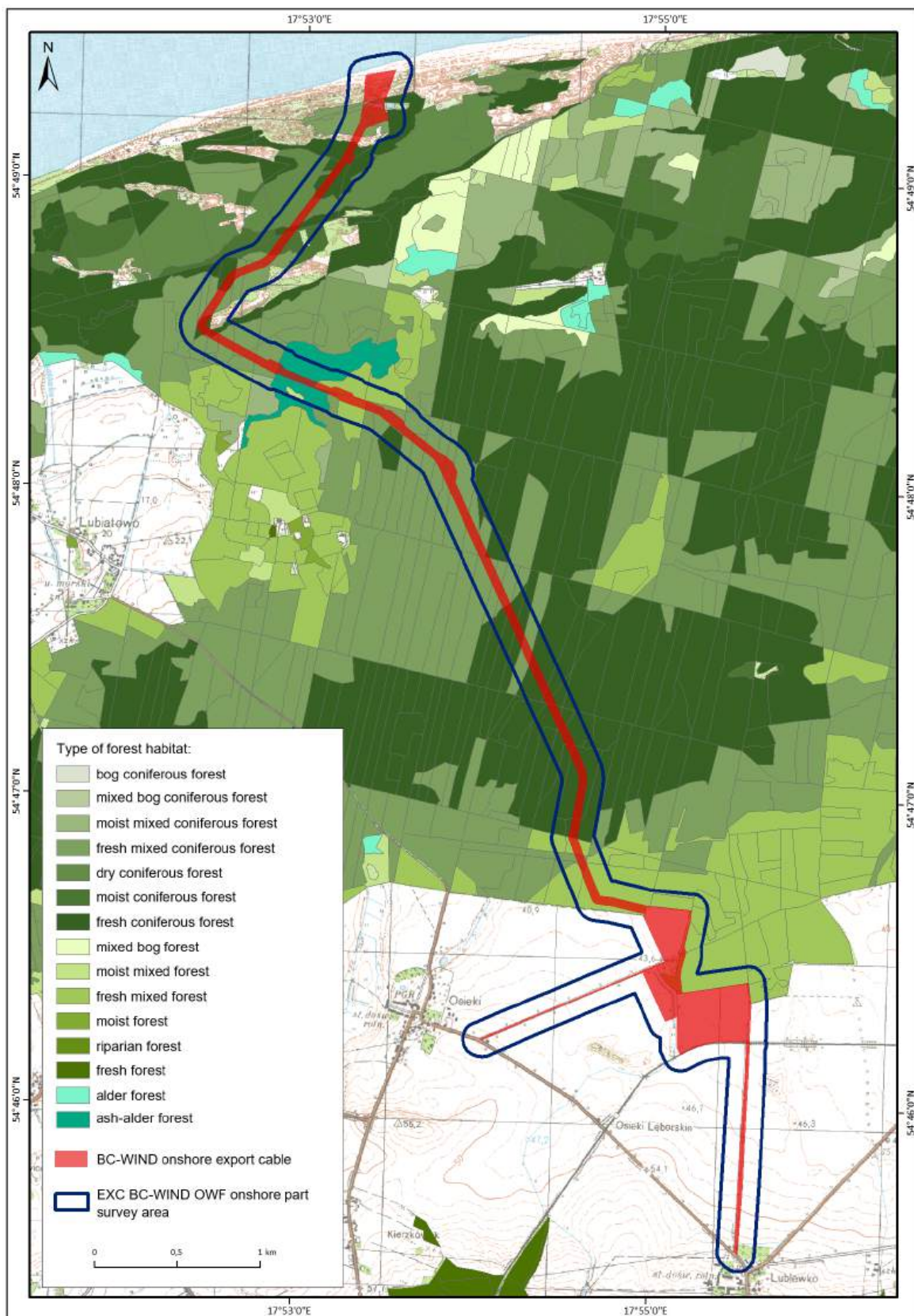


Figure 5.44. Forest habitat types in the onshore part of the EXC BC-Wind OWF area [source: internal materials on the basis of <https://www.bdl.lasy.gov.pl/portals/uslugi-mapowe-ogc> – status as at March 2023]

Due to their physiognomy and direct relationship with the Baltic Sea coast, the forests of the Choczewo Forest District have been studied several times, starting with the studies of Czubiński [72], Wojterski [460, 461] and Piotrowska [330], up to the recent years [246]. They represent typical phytocoenoses of coastal forests located at the back of grey dunes, where habitats are shaped mainly by the influence of the sea, including sandy substrate, strong winds and the reduced annual amplitude of temperature fluctuations. Apart from the natural dynamics associated with coastal processes, the element strongly influencing the local phytocoenoses was the role of man in the formation of forest communities and their changes. Currently, the forest management is compounded by elements of human pressure connected to tourism and leisure, which generates pressure especially on dune ecosystems, but also on the accompanying southern forest ecosystems. Human pressure connected to tourism is observed in the creation of new forest passages and roads, the widening of already existing tracts, as well as the development of widely understood agritourism and recreation centres at the back of forest phytocoenoses.

Communities of coastal coniferous and deciduous forests are diversified both in terms of their dominant component (Scots pine, common beech) and water relations, dividing the main habitat types into dry and moist subtypes, conditioning the biodiversity of species and habitats in individual plots.

The following forest habitat types occur within the potential impact of the proposed project:

- Fresh mixed coniferous forest,
- Moist mixed coniferous forest,
- Dry coniferous forest,
- Fresh coniferous forest,
- Moist coniferous forest,
- Fresh semi-deciduous forest,
- Moist semi-deciduous forest,
- Ash-alder forest.

5.21.1.3.1 Fresh mixed coniferous forest – *Betulo-Quercetum*

The communities of the fresh mixed coniferous forest are characterised by high variability and dynamics of phytocoenoses intensified by forest management activities, although natural and near-natural habitats occupy approximately 65% of all habitats of the fresh mixed coniferous forest. The habitats of the fresh mixed coniferous forest deformed as a result of forest management concern mainly pine stands of younger age classes, devoid of any admixture in the stand composition, devoid of undergrowth, with a deteriorated form of forest humus. The main forest stand species in the fresh mixed coniferous forest habitat is pine (*Pinus sylvestris*) of an average stand quality class II. The admixture species in the second layer are: European beech (*Fagus sylvatica*), common oak (*Quercus robur*), common aspen (*Populus tremula*), silver birch (*Betula pendula*) and European spruce (*Picea abies*). A high variety of shrubs is noticeable in the phytocoenoses. The following species can be found there: purging buckthorn (*Rhamnus cathartica*), alder buckthorn (*Frangula alnus*), rowan (*Sorbus aucuparia*), bird cherry (*Padus avium*) and common hazel (*Corylus avellana*). In the deformed habitats of the fresh coniferous forest, a solid pine tree stand without the undergrowth can be found. In terms of physiognomy and structure, deformed or strongly deformed fresh mixed coniferous forest habitats are similar to pine forests. The only elements indicating that it belongs to fresh mixed coniferous forest are the soil and the high proportion of tufted hair grass (*Deschampsia caespitosa*). The following species are present in the ground cover: common bracken (*Pteridium aquilinum*), bitter vetch (*Lathyrus montanus*), wall hawkweed (*Hieracium murorum*), pill sedge (*Carex pilulifera*), and creeping soft grass (*Holcus mollis*), as for the mosses, the most common is cypress-leaved plait moss (*Hypnum cupressiforme*). From historical data it is known that the coastal area was artificially afforested at the beginning of the last century; naturally formed phytocoenoses are absent.

5.21.1.3.2 Moist mixed coniferous forest

In terms of fertility, these habitats are at the same level in the trophic network as the fresh mixed coniferous forest. The groundwater level facilitates the development of the forest stand and does not pose an obstacle to any activities, as is the case with the marshy habitats. Moist mixed coniferous forests occur mainly in a near-natural state. A small surface area is occupied by habitats deformed as a result of poor management. These are mainly deformed forest stands, with large amount of spruce or forest stands of younger age classes. In the area of the Choczewo Forest District, the moist mixed coniferous forest is overgrown mainly by tree stands of pine, less frequently birch and spruce trees of younger age classes with admixture of common aspen (*Populus tremula*). The habitat of moist mixed coniferous forest is clearly distinguishable from the other habitats of similar trophic nature due to the group of species differentiating it from fresh mixed coniferous forest. The presence of purple moor-grass (*Molinia caerulea*) indicates a high level of mesotrophic groundwater.

5.21.1.3.3 Dry coniferous forest

Extremely dry and poor habitat. Groundwater usually occurs at least (lower than) 4 m below the ground surface. Podzolic soils or albic podzols of dune sands, shifting sands, fluvioglacial sands and gravels with a thin humus layer in the form of dry peat. Typical dry coniferous forest habitats are associated with poorly developed soils formed from loose dune sands (these can be either inland dunes formed from sands of fluvial origin, e.g. in the Gorzów Basin District, or sands originating from outwash plains, e.g. in the Tuchola Forest District or the Kurpiowska Forest District, as well as coastal dunes in the Coastal Belt District) or from loose sands of aeolian origin which do not form dunes. Typical dry coniferous forest habitats are very rare and usually occupy the top parts of dunes (they are highly susceptible to wind erosion). A characteristic feature of the ground cover is the occurrence of shrubby ground lichens (mainly reindeer lichens) and narrow-leaved grasses (grey hair-grass, sheep's fescue), the grey colouring of which gives the habitat a specific colour. **Typical undergrowth species:** *Cladonia* pl. sp. – reindeer lichens, *Dicranum scoparium* – broom forkmoss, *Calluna vulgaris* – common heather, *Festuca ovina* – sheep fescue, *Corynephorus canescens* – grey hair-grass, *Nardus stricta* – matgrass, *Carex ericetorum* – rare spring sedge, *Koeleria glauca* – blue hair grass, *Hieracium pilosella* – mouse-ear hawkweed, *Arctostaphylos uva-ursi* – bearberry, *Cetraria islandica* – true Iceland lichen, *Entodon Schreberi* – red-stemmed feathermoss. The forest stand consists of pine, characterised by very low index of the productive capacity, generally below V. Even the older stands, over 100 years old, reach only 10–13 m in height. The younger stands, 25–40 years old, can reach heights of 1–3 m at most. The trees are thin and often crooked. The ground cover shows an abundance of lichens (reindeer lichens), which are found not only on the ground surface but also on tree trunks. In a typical dry coniferous forest, the ground cover is monotonous and poor, with characteristic colours [487].

5.21.1.3.4 Fresh coniferous forest

Fresh coniferous forest is one of the most widespread forest habitats in the country. These habitats occur in the entire lowland part of the country (areas I–VI) on sands of old, usually steep river terraces, while in northern Poland (areas I–III) they also occur on sands of outwash plains and in the coastal strip – on dunes formed from sands of marine origin. Fresh coniferous forests occupy moderately poor habitats, still poorly humidified but on soils slightly better than dry coniferous forests. The predominant soils are podzolic soils with varying degrees of podzolisation, although there are also fresh coniferous forests with poorly developed podzolic, podzolic-brunic or brunic soils. A characteristic feature of these soils is mor type humus (typical fibrous raw humus). This humus is highly acidic (pH of 3.5–4). Fresh coniferous forest habitats can occur in two humidity variants: without a clear influence of groundwater and with groundwater presence or traces of gleying appearing at depths of 1.5–2.0 m. The ground cover is mostly mossy, especially in young stands (20–60 years old). In older forest stands (or in younger stands with higher insolation), mosses are accompanied by shrubs

– common heather, lingonberry and narrow-leaved tufted grasses (sheep fescue), and in some regions of the country also bent grass. Bushy lichens (reindeer lichens) are also present, but in small numbers. Typical **ground cover species differentiating fresh coniferous forests from dry coniferous forests include:** *Vaccinium myrtillus* – European blueberry, *Hyllocomium splendens* – mountain fern moss, *Melampyrum pratense* – common cow-wheat, *Dicranum undulatum* – waved fork-moss, *Chimaphila umbellata* – umbellate wintergreen, *Danthonia decumbens* – heath grass, *Lycopodium clavatum* – common club moss, *Luzula pilosa* – hairy wood-rush, and *Deschampsia flexuosa* – bent grass in Regions I, III, V and VI), *Empetrum nigrum* – black crowberry (in the Coastal Belt District), *Calamagrostis arundinacea* – reed grass in Region II), *Convallaria majalis* – lily of the valley (in Region II), *Goodyera repens* – creeping lady's-tresses (in Region II), *Molinia caerulea* – purple moor-grass (in the fresh variant, in Regions I–IV). **Frequent species include:** *Entodon schreberi* – red-stemmed feathermoss, *Vaccinium vitis-idaea* – lingonberry, *Calluna vulgaris* – common heather, *Dicranum scoparium* – broom forkmoss. The forest stand is dominated by pine, mostly of quality class III (only in the Region it is class II) with admixture of silver birch. There is a small admixture of spruce (particularly in Region II), and occasionally also fir – in Region V. The shrubby undergrowth is poorly developed. The essential element of the ground cover is European blueberry with a mixture of mosses. Fresh coniferous forests have a wide climatic range and produce a number of subtypes that differ in the type of admixtures. What all the subtypes have in common is the tendency to produce a subordinate layer of species with higher soil requirements, which only incidentally become part of the main forest stand. The subtype with spruce admixture is the most characteristic. In this subtype, spruce forms the undergrowth layer and the lower forest strata, in individual cases matching the height of pine trees. In older forest stands, fine low layers of self-sown initiation stand stage as well as stem exclusion stage of pine trees are observed. This is a characteristic feature of a fresh coniferous forest. Pine regenerates in gaps and thinned areas. By skilfully applying shelterwood cutting system, forest stands with a varied spatial and age structure can be grown in such regenerated areas. Increasing the productivity of the habitat is possible by maintaining deciduous admixtures, particularly shade trees, as well as covering the ground with brushwood and liming. Bioecologically, a fresh coniferous forest is considerably richer in birds than a dry coniferous forest, and the type of coniferous forest the richest in anthills [488].

5.21.1.3.5 Moist coniferous forest

The communities of moist coniferous forest occur in the strip of land surrounding dunes and in dune slacks, forming small surface patches. The forest stand there consists mainly of pine (*Pinus sylvestris*), sometimes with a small admixture of silver birch (*Betula pendula*) and common white birch (*Betula pubescens*). These are low and poorly compacted stands with very poor growth dynamics. The proximity of open sea associated with winds and large fluctuations in groundwater level caused by the influence of storms, as well as the extremely poor soil are the reasons for the oligotrophic nature of the moist coniferous forest habitat. The habitats of moderately moist coniferous forest lack the undergrowth layer except for a single juniper. Pine initiation stand patches may occur occasionally in exposed locations. The following species can be found in the prostrate shrub layer: marsh Labrador tea (*Ledum palustre*), bog blueberry (*Vaccinium uliginosum*), and cross-leaved heath (*Erica tetralix*). Additionally, the species making the heavily moist coniferous forest diversified are: purple moor-grass (*Molinia caerulea*), stiff clubmoss (*Lycopodium annotinum*) and peat mosses (*Sphagnum rubellum*, *S. molle*, *S. fallax*, *S. palustre*). Apart from peat moss species, common hair cap moss (*Polytrichum commune*) and bog groove-moss (*Aulacomnium palustre*) can also be found there.

5.21.1.3.6 Fresh semi-deciduous forest

Patches of fresh semi-deciduous forest occur scattered at the edges of the area discussed and belong to a group of moderately fertile (mesotrophic) habitats. The tree stand includes beech (*Fagus sylvatica*) with an admixture of common oak (*Quercus robur*) and silver birch (*Betula pendula*). The layer of

shrubs is poorly developed, and its main components are rowan (*Sorbus aucuparia*) and alder buckthorn (*Frangula alnus*) as well as an undergrowth with species comprising the tree stand. The ground cover layer consists mainly of the following species: European blueberry (*Vaccinium myrtillus*), hairy wood-rush (*Luzula pilosa*), bent grass (*Deschampsia flexuosa*), common bracken (*Pteridium aquilinum*), and false lily of the valley (*Maianthemum bifolium*). A small group of the following differentiating species indicates that it is a fresh mixed forest: wood anemone (*Anemone nemorosa*), rough bluegrass (*Poa trivialis*), blue bugle (*Ajuga reptans*) and others. The moss layer is poorly developed.

5.21.1.3.7 Moist semi-deciduous forest

The mixed forest habitats belong to the mesotrophic group, i.e. they occupy an intermediate position in the typological grid between the peat and forest habitats. They occur in a complex with other moist or bog habitats. The habitats of moist mixed forest are usually overgrown by stands of pine, birch or mixed forest with the absence or slight admixture of native oaks. Artificial spruce stands are also present there. The habitats of heavily moist mixed forest are often overgrown with black alder (*Alnus glutinosa*). Common hazel (*Corylus avellana*) and alder buckthorn (*Frangula alnus*) are present in the undergrowth. In terms of fertility, the habitat of moist mixed forest occupies the same position in the typological grid as the fresh mixed forest but differs with the degree of moisture, i.e. the depth of the average groundwater level. A significant group of differentiating species are those occurring in the habitat of fresh mixed forest – orchard grass (*Dactylis glomerata*), greater stitchwort (*Stelaria holostea*) and wall lettuce (*Mycelis muralis*).

5.21.1.3.8 Ash-alder forest

It occupies fertile, swampy habitats with very shallow or shallow moving groundwater characterised by neutral or alkaline pH. It occurs on silty-gleyic or mucky-gleyic soils as well as silty-mucky soils with mucky mull. These soils are formed from mucks or low peats lying over fluvial sands and fluvisols or tills and clays, mostly marly. This habitat often forms a transition to moist forest. The groundwater level is very high and flooding can also occur periodically; however, the clump structure, which is typical of alder forests, does not form here. The ground cover is very lush, sometimes forming tiers (as in the case of the wet riparian forest). The tall sedges that are so characteristic of alder forests are rarely found here. There are hardly any mosses, but climbing plants such as hops and ground ivy are common. There are also no root clumps, so the vegetation also lacks the clump structure typical of alder forests. Species differentiating ash-alder forests from alder forests include *Humulus lupulus* – common hop, *Chrysosplenium alternifolium* – alternate-leaved golden-saxifrage, *Valeriana officinalis* – valerian. Species differentiating alder forest and ash-alder forest from moist forest include: *Filipendula ulmaria* – meadowsweet, *Solarium dulcamara* – bittersweet, *Caltha palustris* – marsh-marigold, *Cirsium oleraceum* – cabbage thistle, *Scutellaria galericulata* – common skullcap, *Lycopus europaeus* – gypsywort, *Cardamine amara* – large bitter-cress. Frequently occurring species include: *Urtica dioica* – common nettle, *Stachys sylvatica* – hedge woundwort, *Impatiens noli-tangere* – touch-me-not balsam, *Circaea lutetiana* – broad-leaved enchanter's nightshade, *Geum urbanum* – wood avens, *Mercurialis perennis* – dog's mercury, *Festuca gigantea* – giant fescue, *Geranium robertianum* – herb-robert, *Glechoma hederacea* – ground ivy, *Galeobdolon luteum* – yellow archangel. The ash-alder forest is compact, formed by a mix of various species as well as coherent clumps of species. Groups and small stands of ash trees stand out from the general background. The shrub layer is strongly developed, with a characteristic presence of hops climbing on tree trunks and branches in gaps. Herbaceous ground cover is tall and lush, with nettle as the predominant component. Tall sedges and mosses, which are common in alder forests, are not present here. Degraded ash-alder forests gradually transition into aspen and alder stands, coppice stands, single-species alder carrs, birch stands or post-bog meadows with clumps of bushy coppice alder [489].

In the northern part of the planned project, from km 33+500 to 33+700, fresh mixed coniferous forests occur. Further, fresh coniferous forests can be found from km 33+780 to 34+150. Between km 34+150 and 34+390, there is a dry coniferous forest and further on, a small fragment of fresh coniferous forest. The section between km 34+450 and 34+600 km is occupied by moist coniferous forests. Between km 34+600 and 35+750 there is a fresh mixed coniferous forest, with small fragments of fresh coniferous forest. From km 35+750 to 36+000 there is an ash-alder forest. Between km 36+000 and 36+350, there is a fresh semi-deciduous forest with a small fragment of fresh mixed coniferous forest. This is followed by a fresh mixed coniferous forest at km 36+350 to 37+870. Behind this complex, up to km 39+380, there is a fresh coniferous forest, with a small complex of fresh mixed coniferous forest. Next, up to km 40+400, i.e. up the southern boundary of forest areas within the impact area of the proposed project, there is a complex of fresh coniferous forest, with a small area of fresh mixed coniferous forest.

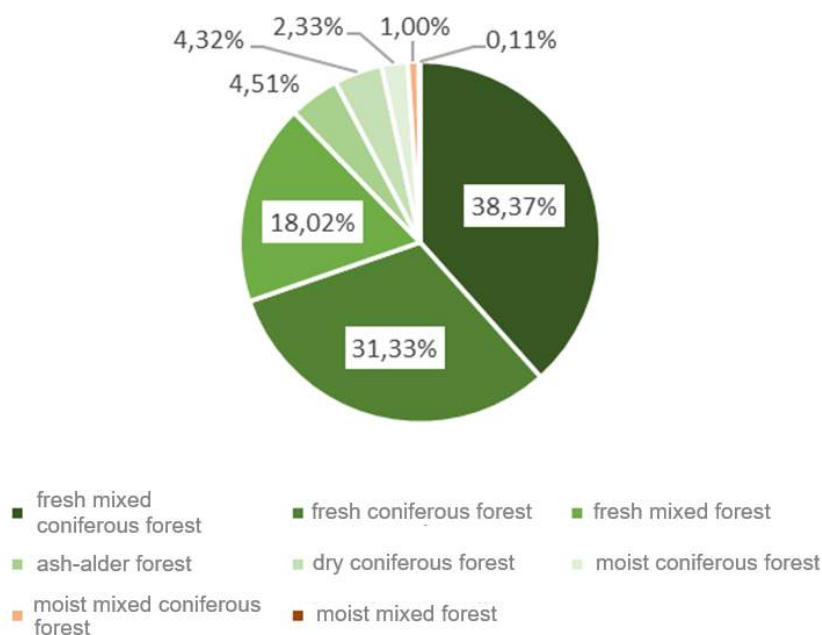


Figure 5.45. Forest habitat types within the impact area of the planned project [source: internal materials based on: <https://www.bdl.lasy.gov.pl/portal/mapy/>]

5.21.1.4 Fungi

Characteristics of macroscopic fungi were prepared on the basis of a year-long inventory of abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) and literature materials as well as the Register of Protected and Endangered Fungi – GREJ (<http://www.grzyby.pl>). Fungi were characterised within the impact area of the planned project.

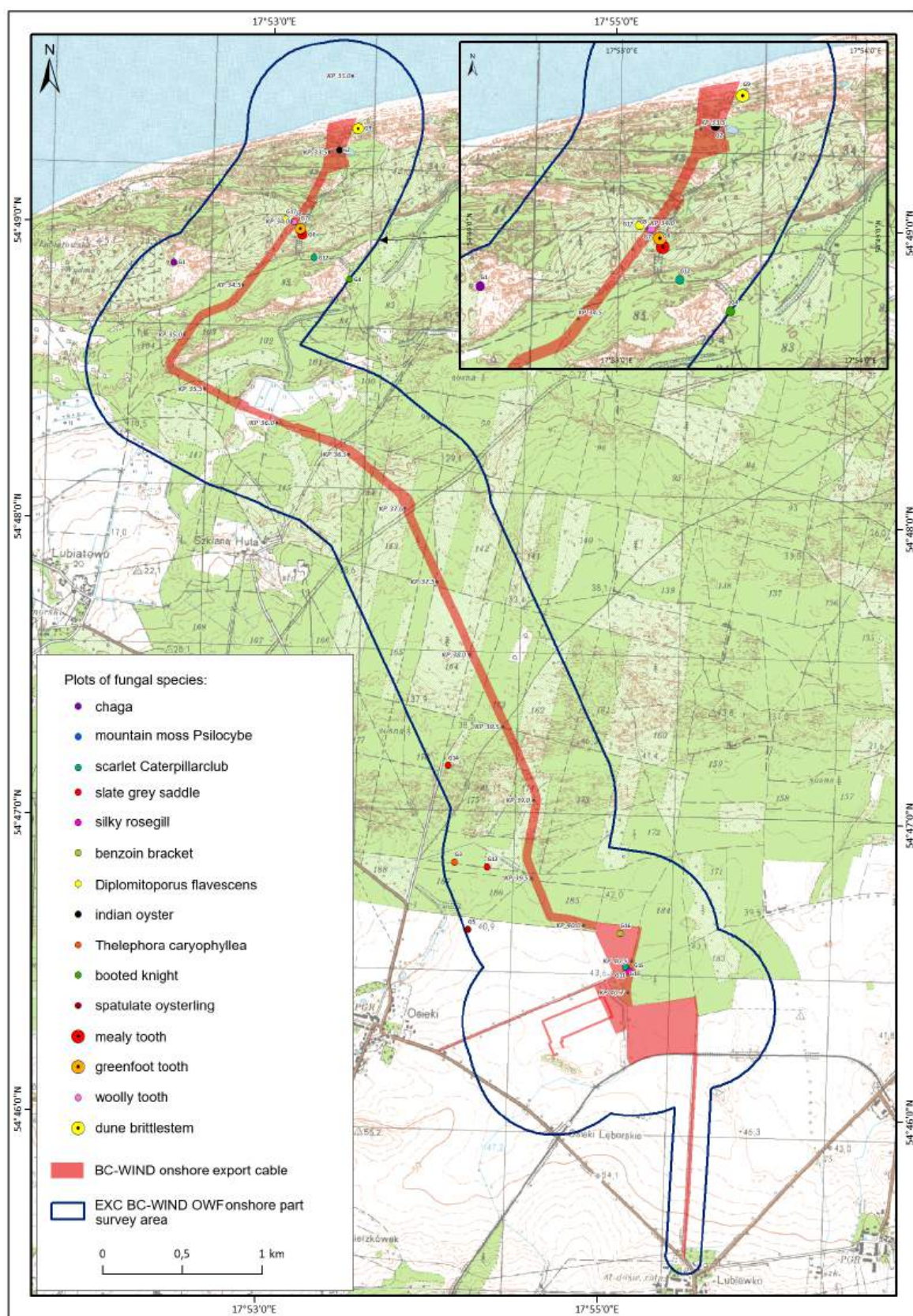
As a result of the inventory survey, 270 species of Macromycetes were identified, including: 27 Ascomycota and 243 Basidiomycota. Among the species encountered, 18 species of high nature conservation value were identified.

Two species under strict protection were found – *Hydnellum glaucopus*, which grew in the coastal crowberry coniferous forest, classified as a species extinct or probably extinct in Poland. Its fruiting bodies grew in the coastal crowberry coniferous forest *Empetro nigri-Pinetum* in several neighbouring locations. It has been under strict protection since 2004, with no possibility of applying exemptions from protection justified on the grounds of agricultural, forestry or fisheries management. The other species under strict protection is mealy tooth *Hydnellum ferrugineum*.

Moreover, one species under partial protection was recorded: chaga mushroom *Inonotus obliquus*, occurring in several plots.

Among the fungi species endangered in Poland, there were five species, including booted knight *Tricholoma focale*, spatulate oysterling *Arrhenia spathulata*, mealy tooth *Hydnellum ferrugineum*, woolly tooth *Phellodon tomentosus* and dune brittlestem *Psathyrella ammophila*. Four species are classified as vulnerable: carnation earthfan *Thelephora caryophyllea*, Indian oyster *Pleurotus pulmonarius*, benzoin bracket *Ischnoderma benzoinum* and crown coral *Artomyces pyxidatus*. Seven taxa are rare species: slate grey saddle *Helvella lacunosa*, chaga mushroom *Inonotus obliquus*, crimped gill *Plicaturopsis crispa*, silky rosegill *Volvariella bombycina*, mountain moss *Psilocybe Deconica montana*, caterpillar fungus *Cordyceps militaris* and *Diplomitoporus flavescens*. Despite their status as endangered fungi, the species belonging to the "rare" category listed above can be found at relatively many sites in the Pomerania region, with crimped gill being particularly common. The survey area is predominantly covered by plantations of Scots pine, which forms large areas of even-aged monocultures. Small amounts of large-size deadwood, which provides a suitable habitat for saproxylic species, can be found in some places.

On the basis of the inventory survey conducted, the most valuable areas in terms of macroscopic fungi biota are the ones situated in the northern part of the connection area in the vicinity of coniferous forests; several plots were also recorded in the southern part of the survey area. [Figure 5.46].



5.21.1.5 Lichens

Detailed characteristics of lichen species were developed on the basis of year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature. The characteristics of lichens was carried out within the potential impact area of the planned project [Figure 5.47].

So far, 53 lichen species of exceptional nature conservation value have been found in the area covered by the inventory survey, of which:

- 28 taxa found are under legal protection (12 species under strict protection, 16 species under partial protection);
- 48 species found are included in the Red List of lichens in Poland (6 species considered critically endangered, 17 species considered endangered, 21 species considered vulnerable, 2 species considered near-threatened, and 2 species for which there is insufficient data regarding threat category);
- 34 species are listed in the Red List of Threatened Lichens in Gdańsk Pomerania (1 species considered to be critically endangered, 7 species considered to be endangered, 23 species considered to be vulnerable, 1 species for which there is insufficient data regarding threat category).

The map below illustrates the distribution of plots of lichen species of high nature value.

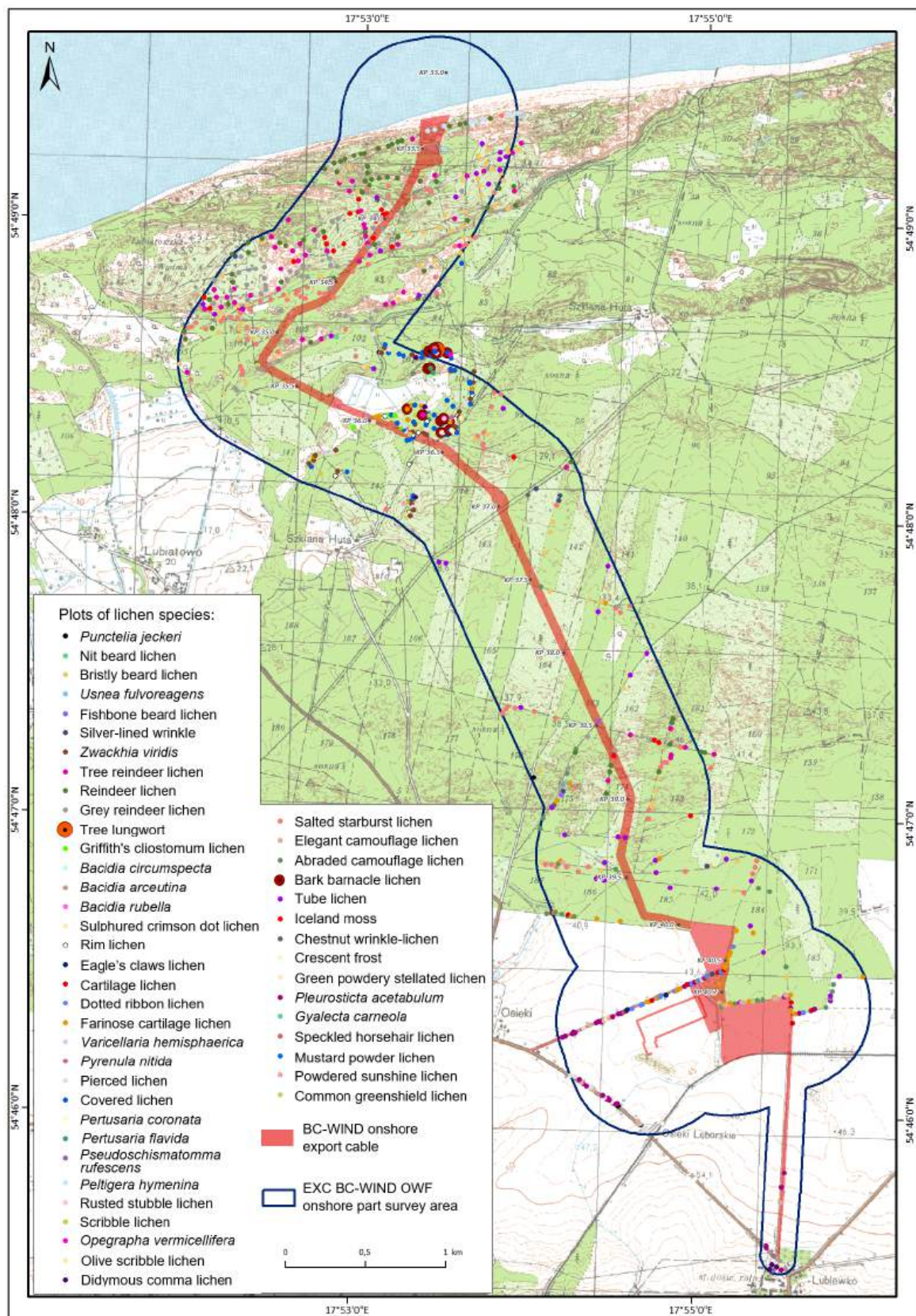


Figure 5.47. Plots of lichen species of high nature value [source: C-Wind Sp. z o.o. data]

The most valuable elements of the lichen biota of that area include two strictly protected taxa – tree lungwort *Lobaria pulmonaria* and bark barnacle lichen *Thelotrema lepadinum*. In accordance with the

Regulation of the Minister of the Environment (2014), establishing plot protection zones is required for these species.

5.21.1.6 Mosses and liverworts

A detailed characteristics of moss and liverwort species was developed on the basis of year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature. The characteristics of mosses and liverworts were carried out for the area of potential impact of the planned project [Figure 5.48].

As far as the bioflora is concerned, the area analysed does not have any unique properties. The protected species found within the area inventoried are common in the country and in the region. Two strictly protected species were recorded (tamarisk scalewort *Frullania tamarisci* and shingle moss *Neckera pennata* Hedw.) as well as 13 species under partial protection.

The *Sphagnum* genus occurring in dune slacks and in the damp ground cover of coastal coniferous forests is represented by a fairly common spiky bog-moss *Sphagnum squarrosum*.

The map below illustrates the distribution of plots of moss and liverwort species of high nature conservation value.

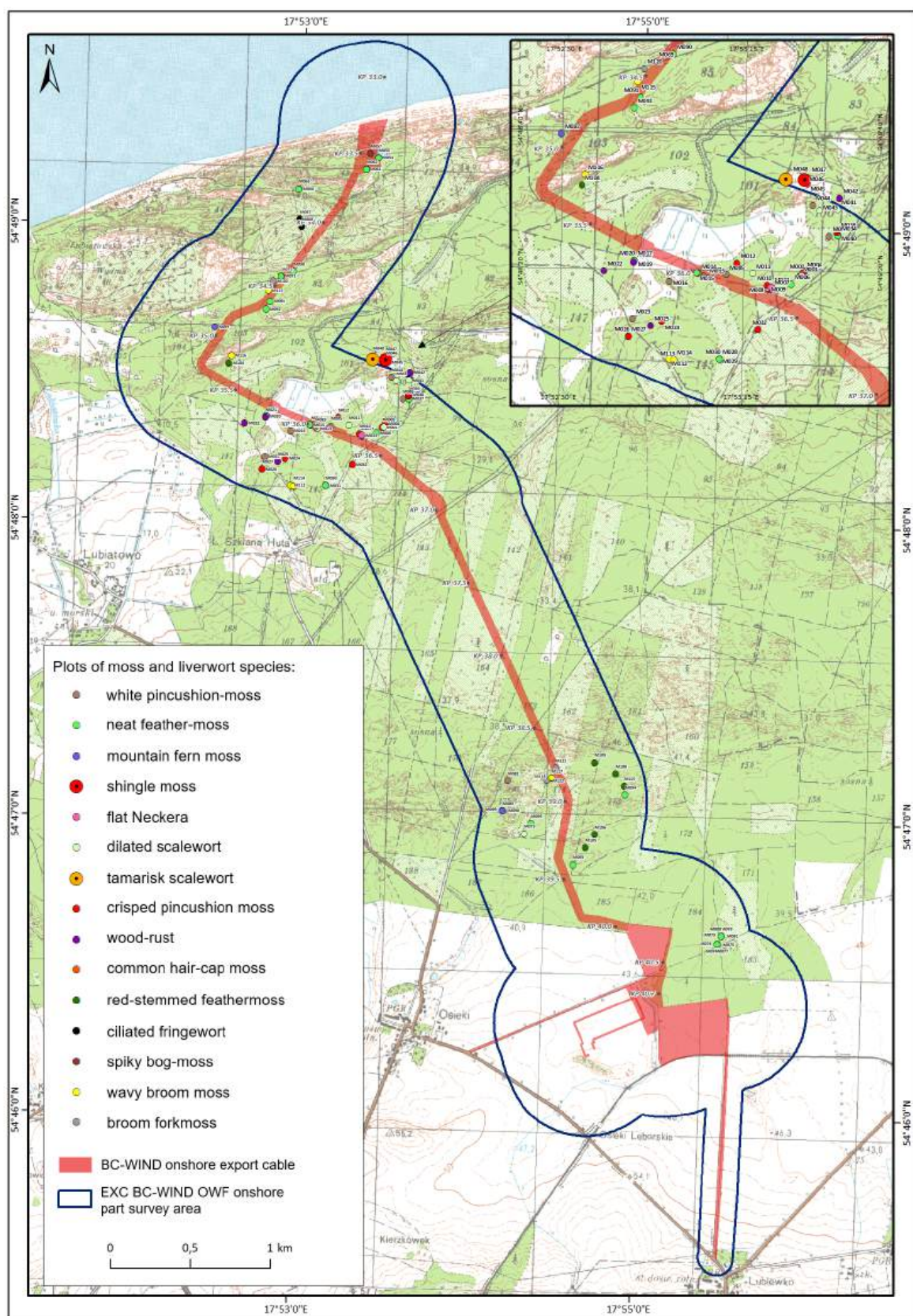


Figure 5.48. Plots of moss and liverwort species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

5.21.1.7 Vascular plants and natural habitats

Detailed characteristics of vascular plants and natural habitats were developed on the basis of year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature. The characteristics of plants and habitats was carried out for the area of potential impact of the planned project [Figure 5.49, Figure 5.50].

Among vascular plants, two species under strict protection were recorded, namely cross-leaved heath *Erica tetralix* and sweetgale *Myrica gale*, as well as 6 partially protected species (marsh Labrador tea *Ledum palustre*, black crowberry *Empetrum nigrum*, dwarf everlast *Helichrysum arenarium*, broad-leaved helleborine *Epipactis helleborine*, sand sedge *Carex arenaria*, and western yew *Taxus baccata*).

Figure 5.49 illustrates the distribution of plots of vascular plant species of high nature conservation value.

A concentration of valuable vascular plant species is observed in the northern and central-southern parts of the survey area.

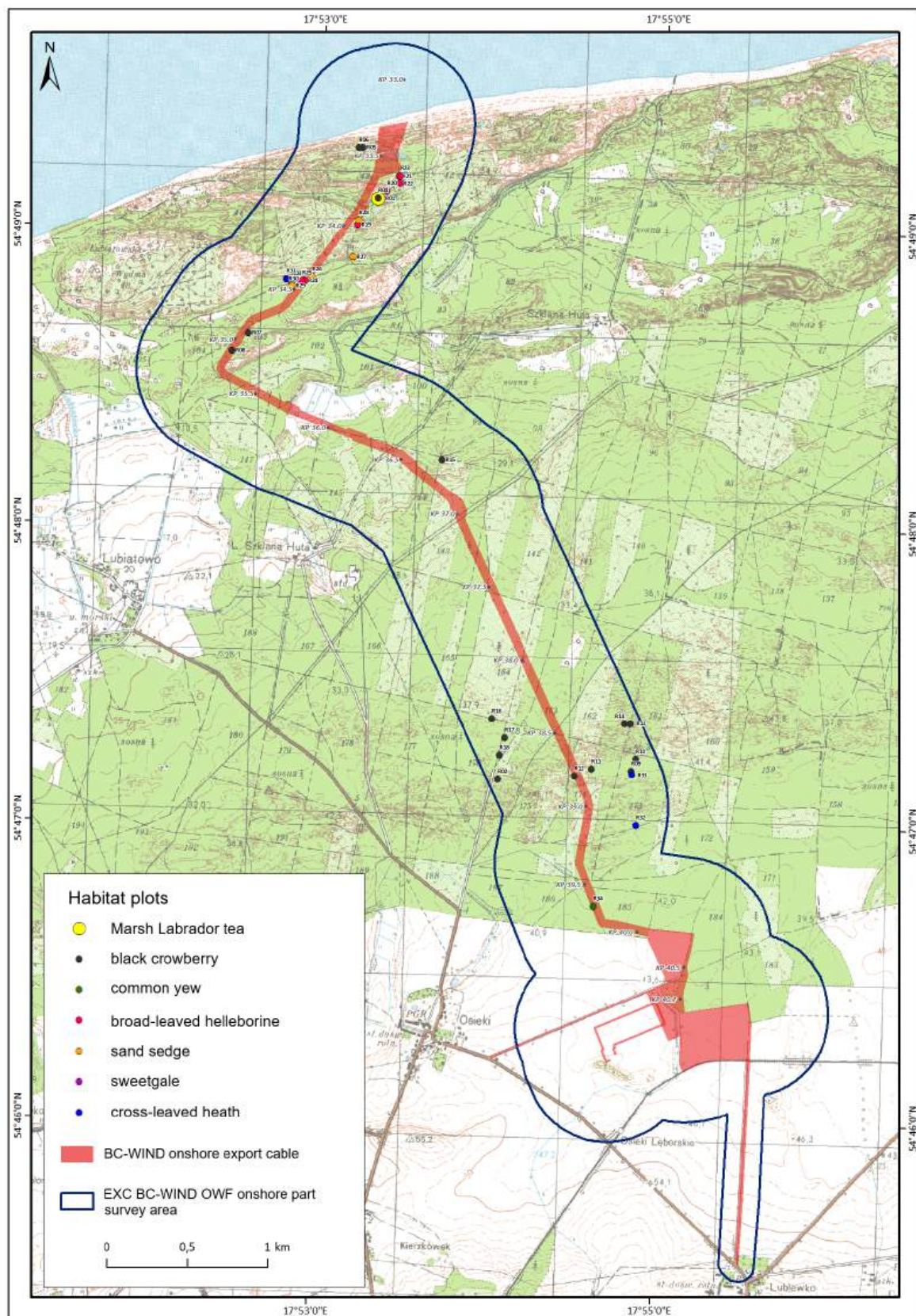


Figure 5.49. Plots of vascular plant species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

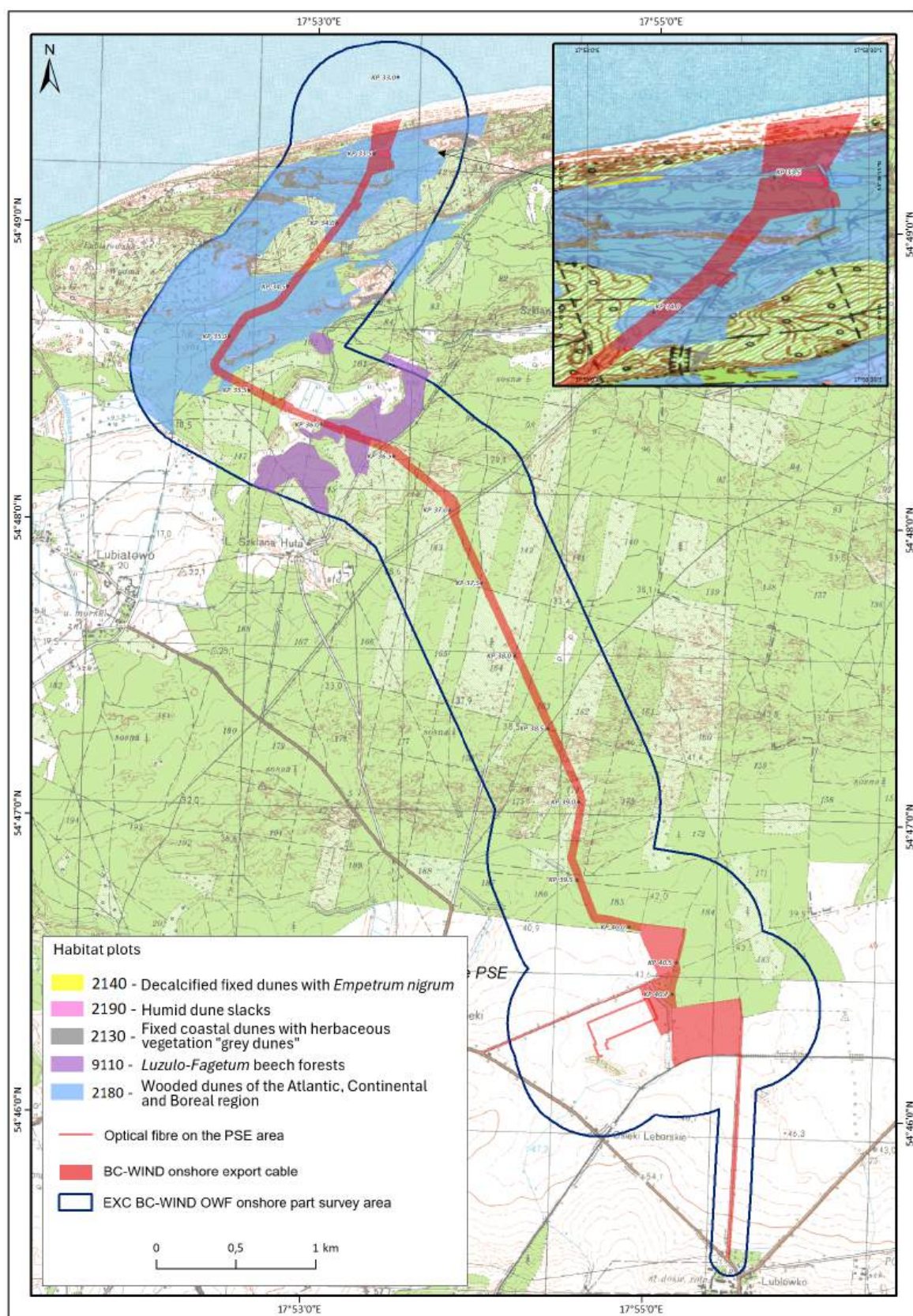


Figure 5.50. Plots of natural habitats listed in Annex I to Directive 92/43/EE in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

The northern part of the survey area – a strip of coastal dunes, in particular of parabolic dunes, located south of the transverse dunes directly adjacent to the beach – is the most valuable in terms of the presence of rare and protected vascular plant species and natural habitats. The remaining part of the survey area is characterised by moderate values. Also noteworthy are the relatively well-preserved patches of *Luzulo-Fagetum* beech forests.

5.21.1.8 Invertebrates

The characteristics of invertebrates was developed on the basis of the one-year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature. The characteristics of invertebrates was carried out within the potential impact area of the planned project [Figure 5.51].

A range of rare and valuable species associated with the coastal dunes and sandy areas were found.

As a result of the work conducted, 85 species of nature conservation value were found, 13 of which are partially protected. These include: the heath humble-bee *Bombus jonellus* (1 site), the red-tailed bumblebee *Bombus lapidarius* (1 site), the white-tailed bumblebee *Bombus lucorum* (5 sites), the common carder bee *Bombus pascuorum* (13 sites), the early bumblebee *Bombus pratorum* (2 sites), the red-shanked carder bee *Bombus ruderarius* (1 site), the buff-tailed bumblebee *Bombus terrestris* (7 sites), *Carabus convexus* (3 sites), *Carabus coriaceus* (1 site), *Formica polyctena* (28 anthills), the black-backed meadow ant *Formica pratensis* (2 anthills), the southern wood ant *Formica rufa* (4 anthills) and the sand hopper *Talitrus saltator* (12 sites).

The map below presents the location of valuable invertebrate species.

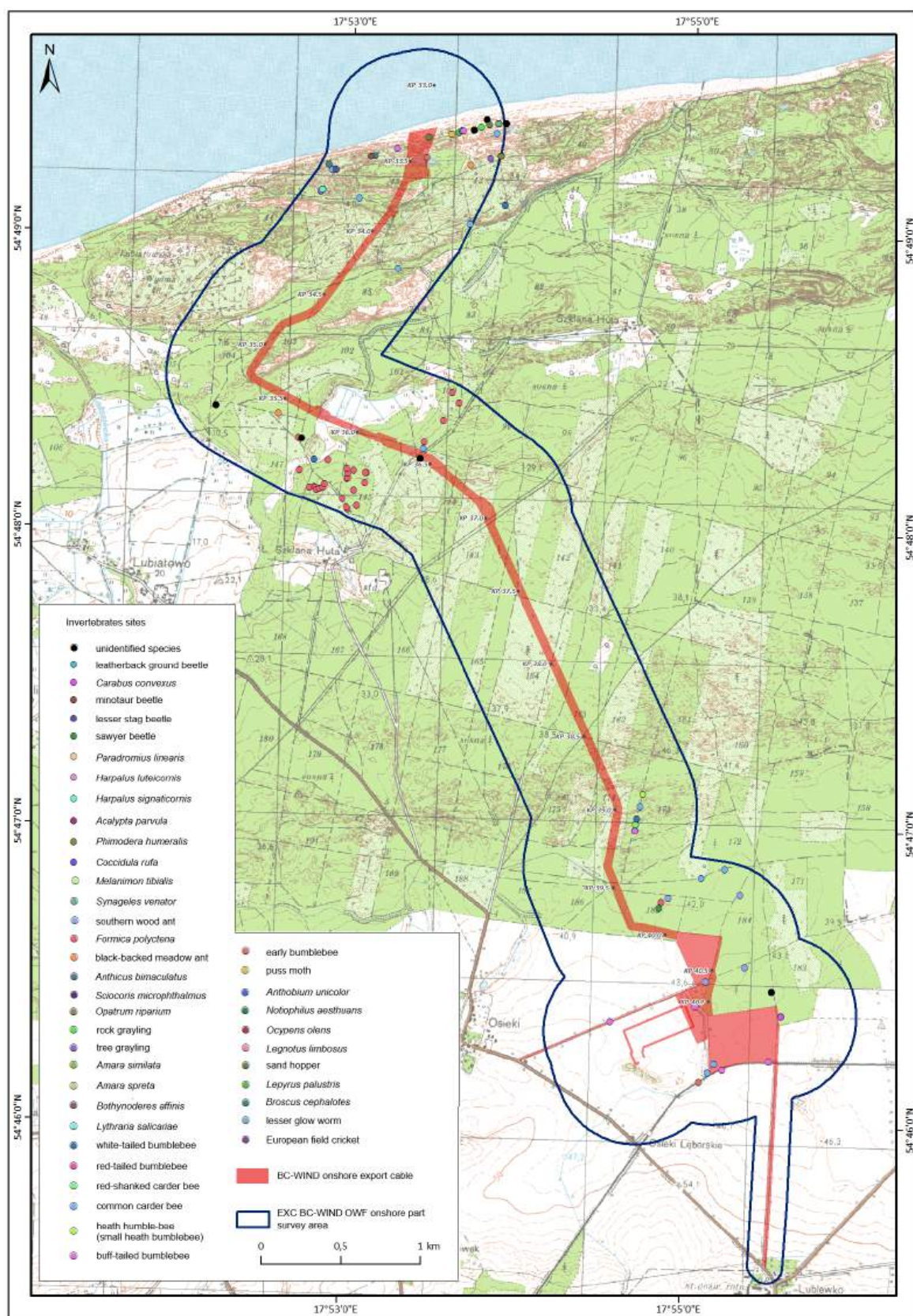


Figure 5.51. Sites of invertebrate species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]

5.21.1.9 Ichthyofauna

A detailed characteristics of ichthyofauna was developed on the basis of the one-year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature.

The characteristics of ichthyofauna were carried out at the survey stations in the area of the planned project potential impact. As a result of observations, 10 sites initially selected were excluded. These were dry peat bogs and small watercourses where no water was found. 3 sites were confirmed for subsequent inventory collections: the rivers *Bezimienna* and *Lubiatówka* and a small mid-field pool located in the southern part of the designated survey area. The map showing the location of the sites is presented below [Figure 5.52].

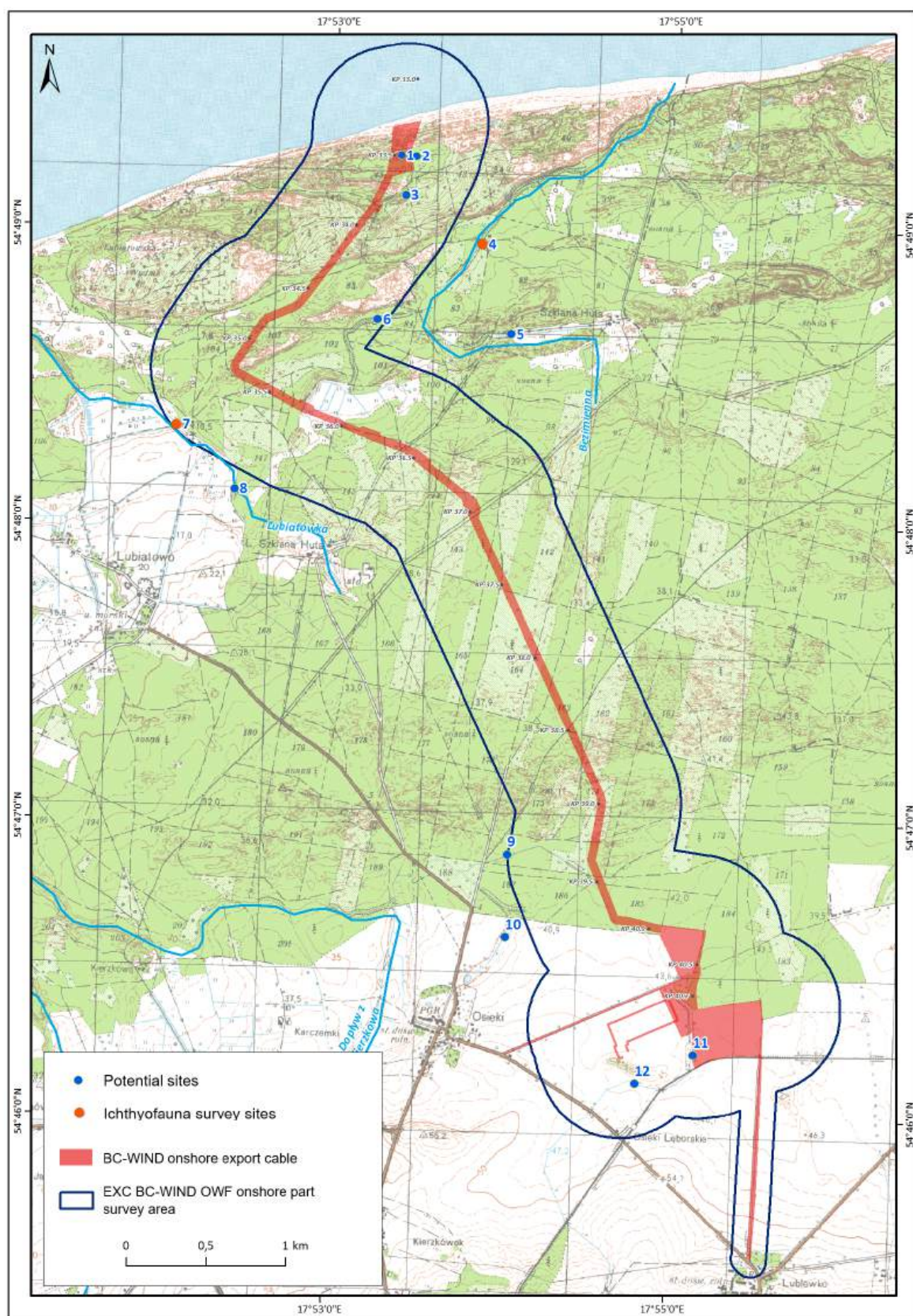


Figure 5.52. Location of the survey sites as part of the ichthyofauna surveys [source: C-Wind Sp. z o.o. data]

On the basis of the surveys conducted so far, it can be confirmed that no protected fish and lamprey species are present in the *Bezimienna* river.

7 three-spined stickleback *Gasterosteus aculeatus* and 32 lamprey larvae *Lampetra* were caught in the *Lubiatówka* river in summer. On the other hand, in autumn and spring, no lamprey individuals were caught, nor any fish were noted in the *Lubiatówka* river. On the basis of the outer appearance of the larvae caught in the *Lubiatówka* river in summer, it is impossible to identify this species. No adult lamprey individuals were noted during spring and autumn periods. Additionally, below as well as at the analysed section of the *Lubiatówka* river, water gates can be found, which make it impossible for lampreys to travel up the watercourse. On that basis, it can be assumed that the larvae discovered belong to the brook lamprey species. It is an isolated population. The species is listed in Annex II of the Habitats Directive and is under partial protection. In the Red List of Threatened Animals in Poland, the brook lamprey is classified as NT (near threatened). On the other hand, in accordance with the IUCN Red List of Threatened Species Version 2019-1, the species is classified as LC (least concern).

5.21.1.10 Herpetofauna

Detailed characteristics of herpetofauna were developed on the basis of the one-year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature.

7 amphibian species were noted. The great crested newt *Triturus cristatus*, the European tree frog *Hyla arborea* and the common spadefoot *Pelobates fuscus* are the most valuable species. All three species are under strict protection. The great crested newt is listed in Annex II of the Habitats Directive and has a near-threatened status in the Red List of Threatened Animals in Poland.

Three breeding sites for amphibians were found [Figure 5.53]:

- **Site no. 1:** the swamps in the north, which form the drainage basin of the *Bezimienna* river and periodically feed it - smooth newt breeding site;
- **Site no. 2:** the *Lubiatówka* river section, in the immediate vicinity of the village of Lubiatowo - common toad breeding site;
- **Site no. 3:** the mid-field pool in the south of the survey area, near the closed railway line – breeding site of all amphibian species found within the survey area.

Within the entire survey area, only a single location of the abundant migration of the common toad was observed, where this migration is threatened. It is the region of the *Lubiatówka* river, where common toad mating took place in April and the highest mortality intensity occurred in the first half of that month. Five dead (run over) individuals of the common toad were found there, usually on the main asphalt road, as well as on forest dirt roads, which are access roads to private properties. A second wave of increased migration, and, consequently, increased mortality, was noted in autumn, mainly at the end of September. Two individuals of the common toad, two of the slow worm and one of the viviparous lizard were found during that time.

Among the reptiles, three species were recorded: the viviparous lizard *Zootoca vivipara*, the sand lizard *Lacerta agilis* and the slow worm *Anguis fragilis*. These species were not recorded in great abundance, and the slow worm was recorded only once. The viviparous lizard was recorded near the backwaters of the *Bezimienna* river, whereas, the sand lizard was recorded on the dunes, at the roadside well exposed to sunlight, and at the forest edges in the southern part of the survey area. Six reptile residence and reproduction sites were noted, mostly those of the sand lizard, but also two belonging to the viviparous lizard [Figure 5.53].

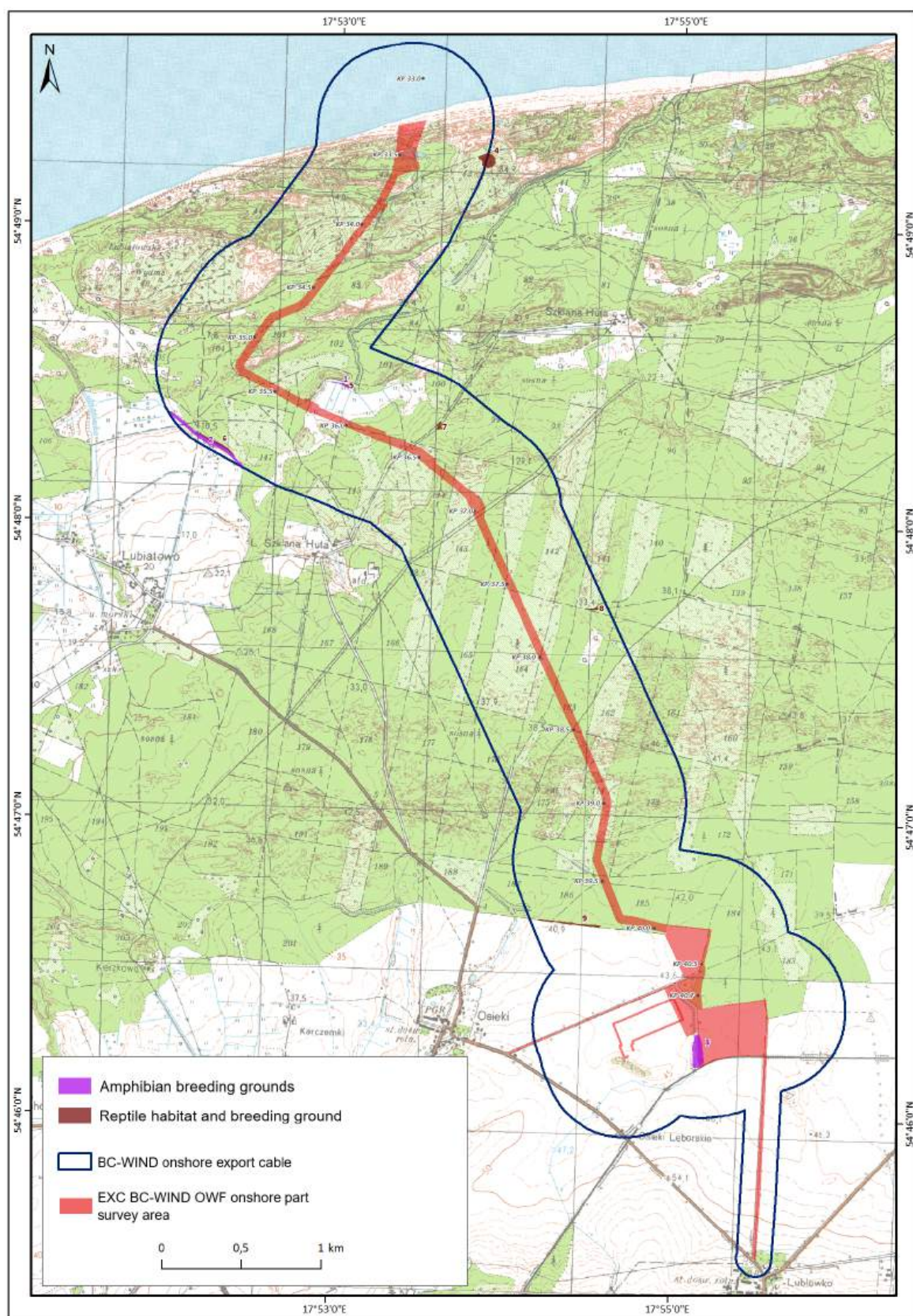


Figure 5.53. Amphibian breeding site and reptile habitat and breeding site in the onshore part of the EXC BC-Wind OWF area
[source: C-Wind Sp. z o.o. data]

Usually these are local, small populations in sunlit, forest roadsides or dunes. The most abundant population was observed at the southern edge of the forest complex, near Osieki Lęborskie (by the spruce plantation).

5.21.1.11 Avifauna

Detailed characteristics of avifauna were developed on the basis of the one-year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature.

Due to the fact that the field surveys could only begin at the turn of March and April 2022, the avifauna survey had to be completed in March 2023.

Spring period

During spring period, 3216 individuals from 56 species were recorded in flight in total at all the observation points, and the flight intensity was 107.2 ind./h, including 2219 individuals at P1, 414 at P2 and 953 at P3. The high value of intensity was due to the recording of an intensive migration of the Eurasian siskin *Spinus spinus*. The Eurasian siskin dominated, representing over 52% of all records, followed by the common chaffinch *Fringilla coelebs* with 8.2%, and the long-tailed duck *Clangula hyemalis* with 3.2%.

During spring period, 65 breeding bird species belonging to 8 orders were found within the survey area: Caprimulgiformes, Columbiformes, Gruiformes, Piciformes, Cuculiformes, Charadriiformes, Passeriformes and Accipitriformes, including eight listed in Annex I to the Birds Directive and one from the Red List of Birds in Poland.

Summer period

During summer period, 1347 individuals from 56 species were recorded in flight in total at all observation points, and the flight intensity was 40.81 ind./h, including 946 individuals at P1, 47 at P2 and 354 at P3. The black-headed gull *Chroicocephalus ridibundus* distinctly predominated, representing over 31% of all records, followed by the common gull *Larus canus* with 11.2% and the barn swallow *Hirundo rustica* with 9.9%.

During summer period, the focus was on supplementing the inventory of breeding species. During the surveys conducted, 13 breeding bird species belonging to 5 orders were found within the survey area: Caprimulgiformes, Galliformes, Piciformes, Cuculiformes, and Passeriformes, including three listed in Annex I to the Birds Directive and two from the Red List of Birds in Poland.

Autumn period

During the autumn survey period, a total of 3311 individuals from 58 species were recorded in flight at all three observation points, with the flight intensity of 122.62 ind./h, including 684 individuals at P1, 172 at P2 and 2455 at P3. The high value of intensity was due to the recording of a passage of a flock of starlings *Sturnus vulgaris* made up of 1000 individuals. The common starling was clearly the dominant species, accounting for more than 35% of all detections, followed by the European golden plover *Pluvialis apricaria* at 13.47%, and geese *Anser* sp. (unidentified as to the species) at 8%. In autumn, 1654 individuals were recorded in total at all observation points.

No breeding bird inventories were carried out during the autumn period.

Winter period and March 2023

During winter and in March 2023, a total of 480 individuals from 58 species were recorded in flight at all three observation points, with the flight intensity of 26.67 ind./h, including 164 individuals at P1, 123 at P2 and 193 at P3. The unidentified as to the species geese of *Anser* sp. were clearly dominant

at 21.46% of all sightings. Within the period analysed, 131 individuals were recorded in total at all observation points.

During winter and in March 2023, 68 breeding bird species belonging to 10 orders were found in the survey area: Accipitriformes, Anseriformes, Apodiiformes, Caprimulgiformes, Columbiformes, Gruiformes, Piciformes, Cuculiformes, Charadriiformes, and Passeriformes, including 8 listed in Annex I to the Birds Directive and 2 from the Red List of Birds in Poland.

During the breeding avifauna inventory survey, a total of 68 breeding bird species were found in the survey area, including 8 listed in Annex I to the Birds Directive and 2 from the Red List of Birds in Poland. Among the species listed in the Directive, the following were recorded: the black woodpecker *Dryocopus martius*, the red-backed shrike *Lanius collurio*, the barred warbler *Sylvia nisoria*, the red kite *Milvus milvus*, the woodlark *Lullula arborea*, the European nightjar *Caprimulgus europaeus*, the red-breasted flycatcher *Ficedula parva* and the common crane *Grus grus*. All of them, with the exception of the red kite, were species breeding in the survey area, from one of the three breeding categories: possible, probable, and certain. The species listed in the latest Red List of Birds in Poland were the European pied flycatcher *Ficedula hypoleuca* and the common quail *Coturnix coturnix*.

Spring migrations

During spring migrations, flights of 3848 individuals from 64 species were recorded, with the flight intensity of 160.33 ind./h, including 2244 individuals at P1, 656 at P2 and 948 at P3. The high value of intensity was due to the recording of an intensive migration of the Eurasian siskin *Spinus spinus* on 25 March 2022.

Autumn migrations

During autumn migrations, a total of 3649 flights of individuals from 77 species were recorded at all observation points, and the flight intensity was 86.88 ind./h, including 937 individuals at P1, 187 at P2 and 2525 at P3. The common starling was clearly the dominant species, accounting for more than 32% of all detections, followed by the European golden plover *Pluvialis apricaria* at 12.22%, and unidentified as to the species geese of *Anser* sp. at 7.26%. The high number of birds observed was due to the recording of the passage of a flock of starlings made up of 1000 individuals on 23 September.

Wintering

During the wintering period, 59 bird species belonging to 11 orders were identified in the survey area: Accipitriformes, Anseriformes, Ciconiiformes, Columbiformes, Charadriiformes, Falconiformes, Gaviiformes, Passeriformes, Piciformes, Podicipediformes and Suliformes including 8 listed in Annex I of the EU Birds Directive and 6 from the Red List of Birds in Poland. Among the species listed in the Directive, the following were recorded: the white-tailed eagle *Haliaeetus albicilla*, the white stork *Ciconia ciconia*, the black woodpecker *Dryocopus martius*, the red kite *Milvus milvus*, the woodlark *Lullula arborea*, the whooper swan *Cygnus cygnus*, the black-throated diver *Gavia arctica*, and the common crane *Grus grus*.

5.21.1.12 Mammals

Detailed characteristics of mammals was developed on the basis of the one-year-long inventory surveys on abiotic and biotic resources of the EXC BC-WIND OWF survey area (Appendix 1) as well as data from literature.

Mammals (excluding bats)

17 mammal species were inventoried within the area monitored, including one species under strict protection (the grey wolf *Canis lupus*) and 4 species under partial protection (the common shrew *Sorex*

araneus, the northern white-breasted hedgehog *Erinaceus roumanicus*, the European mole *Talpa europaea* and the red squirrel *Sciurus vulgaris*). The vast majority of them include common species occurring across Poland. The most valuable species is the grey wolf. Its tracks and trails were recorded across the entire survey area discussed, however, most frequently in the northern (dune area) and southern (arable lands area) parts of the survey area. Wolf tracks were found regularly throughout the entire survey period. After three quarters of surveys, it can be concluded that the land area most commonly penetrated by that species is the northern part of the survey area. In particular, the area of dunes and the beach. The presence of the elk within this area is also noteworthy. This species is rarely encountered in the regions of Pomerania and Kashubia.

The site of the grey wolf, understood as its habitat, received the highest value. In the area covered by the analysis, this species can find all natural elements necessary for its functioning, including a rich food base. The remaining habitats, although meeting the requirements of the species occurring in the survey area, belong to habitats classified as rather moderate in terms of value. The advantage of the habitats in the area under analysis is their low level of anthropization.

5.21.1.12.1 Bats

The survey area is located in the vicinity of an area with intense residential/holiday housing development. The structure of bat species within the buildings in the north of the country usually refers to 4 species that occupy residential buildings: the common pipistrelle, the Nathusius' pipistrelle, the soprano pipistrelle and the serotine bat. Additionally, the common noctule can be noted in the open spaces. The use of space over arable fields by bats depends mainly on the type of crops and is subject to severe changes with every season and year, while their activity is usually in the lower spectrum (up to 3 flights per hour). However, above the water in the vicinity of and within forests the species composition and activity level of bats is less prone to fluctuation.

The cumulative level of bat activity in the survey area during spring, summer and autumn periods was very low (median = 23.7; average = 44.8). The species identified are mostly common, not endangered at a regional or national scale. The survey area can be considered average, as no rare species or species with highest protection status according to Annex II of the Habitats Directive were detected.

5.21.1.12.1.1 Bat species diversity

During fields trips, seven bat species were spotted in flight and identified out of 17 living in the north of the country, where species found in landscapes of this type were recorded. The common noctule which uses mainly open areas and the serotine bat, which feeds mainly along trees and roads crossing forest patches. The common and the soprano pipistrelle are mainly recorded in the vicinity of village buildings and their surroundings, while the Nathusius' pipistrelle is dominant within agricultural areas. Bats of the *Myotis* genus consist usually of the Daubenton's bat *Myotis daubentoni*, which feed above watercourses and water reservoirs. However, due to the difficulty in distinguishing between their echolocation signals from other *Myotis* bats, their species remain unidentified.

The bat species found are: the Natterer's bat *Myotis nattereri*, the serotine bat *Eptesicus serotinus*, the common pipistrelle *Pipistrellus pipistrellus*, the soprano pipistrelle *Pipistrellus pygmaeus*, the Nathusius' pipistrelle *Pipistrellus nathusii*, the common noctule *Nyctalus noctula*, and the brown long-eared bat *Plecotus auritus*.

5.21.1.12.1.2 Spring migrations of bats

Pipistrelles were dominant during surveys. During the spring migrations and periods of the formation of breeding colonies, the highest activities of bats were recorded in the northern part of the survey area and in the vicinity of the southern boundary of a stocked forest area. The acoustic monitoring

sites with the highest number of bat activities are located in the most varied area – near mixed forests, forest margins and waterlogged areas.

5.21.1.12.1.3 Breeding period

During the breeding period, at most acoustic monitoring sites, the bat activity was very high. Attention should be drawn to the particularly high bat activity in the coastal belt, where it reached the highest values. The common noctules and pipistrelles (of which the soprano pipistrelle were the most common) were dominant among the chiroptero fauna composition. The third most numerous species during the breeding period was the serotine bat. The very high activity of the pipistrelles is explained by the fact that the breeding colonies of the soprano pipistrelle are located in the village of Kopalino (110 and 130 individuals).

5.21.1.12.1.4 Dispersal of breeding colonies and the beginning of migration period

The period of the dispersal of breeding colonies and the beginning of migration was marked by a very high activity of bats at all the monitoring stations. It was the highest in the northern part of the survey area. Species recorded most often in this period were: the common noctule as well as the soprano pipistrelle, followed by the common pipistrelle and serotine bats.

5.21.1.12.1.5 Bat autumn migrations

During autumn migration period, bat activity decreased slightly, however at most monitoring sites it remained high. During this period, mostly pipistrelles, particularly the soprano pipistrelles, were recorded. The size of the bat concentration in this period was influenced to a lesser degree by the other species.

5.21.1.12.1.6 Long-distance bat migrations

Some bat species, similarly to some bird species, undertake long-distance migrations. This behaviour is typical primarily for the common noctule and the Nathusius' pipistrelle. Both these species occur in the survey area. As the wintering sites of these bats are often very distant from their breeding sites, it should be assumed that the bats arrive at the inspected area in spring and fly away in autumn, therefore they are not expected to be present in or around the project area during winter.

5.21.1.12.1.7 Bat occurrence sites

It is impossible to identify precisely the sites of individuals or species. In the course of their activities, these animals use numerous habitats, often many kilometres apart. Whether they are long-distance migrants or sedentary species, bats are constantly on the move. They spend the winter in some locations, they give birth to their young in others, they use multiple feeding and resting grounds or autumn swarming sites, particularly during seasonal passages. The areas used by them often cover tens or hundreds of kilometres. Even when remaining in a colony, they can cover up to several kilometres during one night, on average. Therefore, it is difficult to define what constitutes a habitat in the case of such animals unrelated to any specific site. It should be assumed that bats associated with the project area will occur in different habitats at different times of their activity, particularly between spring and autumn, when their dispersal in the area is the greatest. One exception may be the brown long-eared bat, which belongs to the species regarded as sedentary.

5.21.1.12.1.8 Bat roosts

Potential area with bat roosts in the tree hollows within the planned project impact area were located [Figure 5.54].

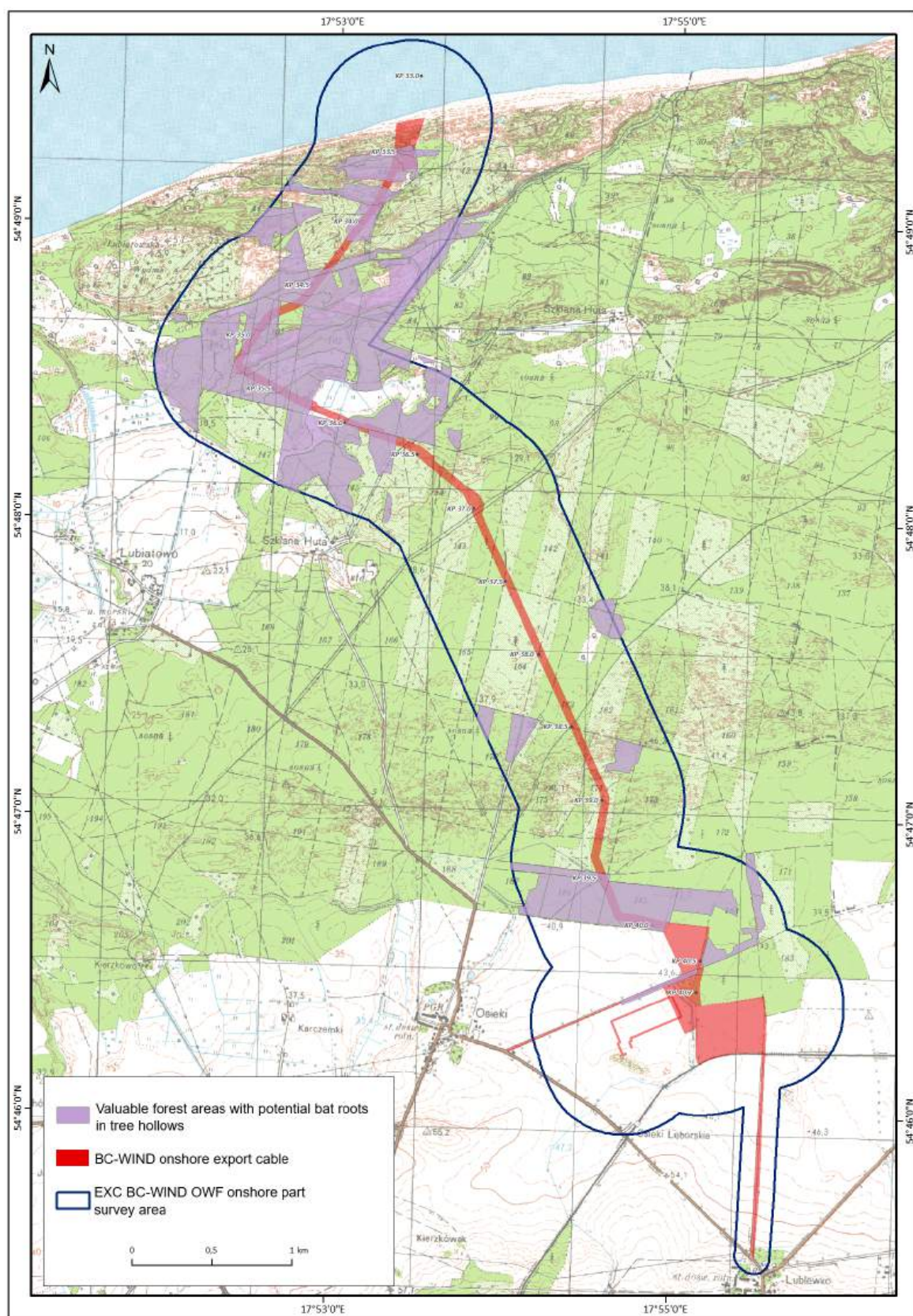


Figure 5.54. Course of the onshore part of the EXC BC-Wind OWF against valuable forest areas with tree hollows used as potential bat roots [source: C-Wind Sp. z o.o. data]

Due to a low detectability of wintering sites and breeding colonies within trees, areas with mature tree stands were identified as potential bat roosts during different phenological periods. Special care must be taken at these areas during tree feeling, and the work should be conducted under environmental supervision.

5.21.1.12.1.9 Bat breeding grounds

During the searches for swarming sites in the August–September period several places with mating activity of soprano pipistrelles, common pipistrelles and Nathusius' pipistrelles were discovered. Part of the mating activity of bats was recorded during standard inspections along transects and at sites. Bats using mating calls were recorded in the villages of Kopalino and Osieki Lęborskie, as well as at monitoring point P1 and along all transects except transects 6 and 9.

No breeding colonies were identified in the survey area.

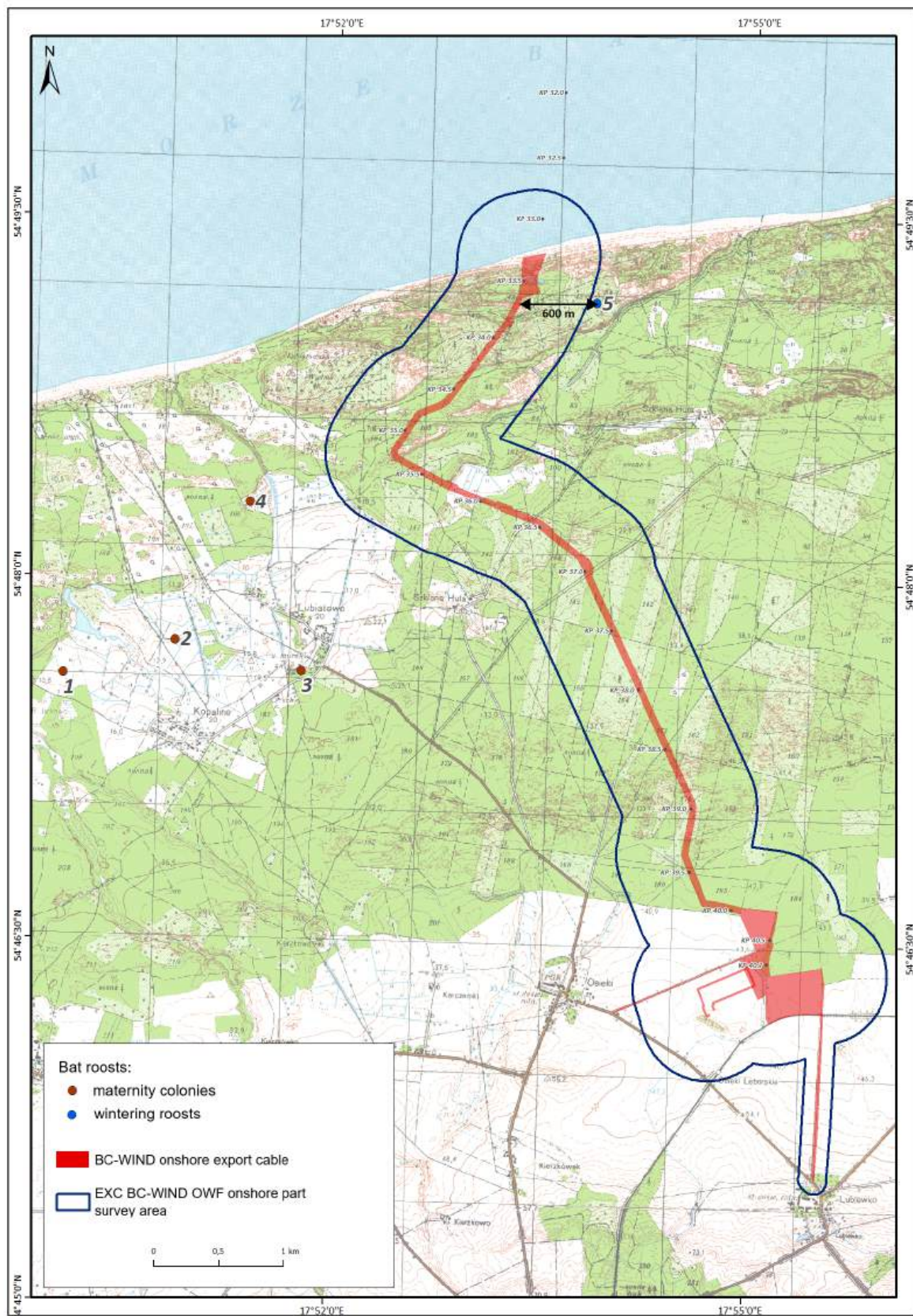


Figure 5.55. Identified bat colonies (1–4 breeding colonies, 5 – wintering site) [source: C-Wind Sp. z o.o. data]

No heavy equipment work causing noise and trembling of the earth's surface should be carried out between the beginning of November and mid-March within a radius of 500 m from the identified bat wintering site.

5.21.1.12.1.10 Bat feeding grounds

No sites were identified in the survey area that could be classified as regular bat feeding grounds. In various locations, single passing bats were observed capturing prey, but none of these observations were related to feeding grounds. Similarly, the acoustic monitoring sessions failed to indicate areas where numerous bats were feeding. Single foraging bats were recorded incidentally in different parts of the survey area. None of the sites stood out in terms of bat foraging activity.

5.21.1.12.1.11 Winter roosts of bats

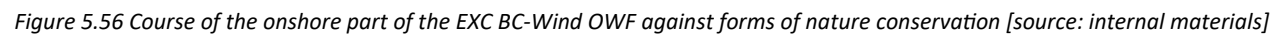
Two inspections were carried out on 22 January and 2 February 2023. Four brown long-eared bat *Plecotus auritus* were recorded at one building. This building is a remaining garage facility of the Polish Air Defence Force Unit, specifically adapted to accommodate wintering bats [Figure 5.55].

5.21.2 Conservation areas including Natura 2000 sites

At a distance of 10 km from the planned project, the following nature conservation areas are located, pursuant to Article 6(1) of the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended):

- *Babnica* wild flower reserve, situated 1.9 km east of the boundary of the planned project impact area;
- *Białogóra* wild flower reserve, situated more than 4 km east of the boundary of the planned project impact area;
- *Długosz królewski w Wierzchucinie* [Royal Fern in Wierzchucino] nature reserve, situated at a distance of 7.5 km east of the boundary of the planned project impact area;
- *Borkowskie Wąwozy* [the Borkowo Gullies] forest reserve, situated 8.8 km west of the boundary of the planned project impact area;
- *Choczewskie Cisy* [the Choczewo Yews] wild flower reserve, situated approximately 8.5 km west of the boundary of the planned project impact area;
- Polish Coastal Landscape Park, situated more than 4 km east of the boundary of the planned project impact area;
- Coastal Protected Landscape Area, situated within the entire planned project impact area, with the exception of the area of the ONS and PSE stations;
- Choczewsko-Saliński Protected Landscape Area, situated at a distance of more than 2 km south of the area of the ONS and PSE stations;
- *Torfowisko w Szklanej Hucie* [Peat Bog in Szklana Huta] ecological area, situated at a distance of 26 m north of the site planned for the location of the transition joint bays;
- *Źródłiska Bezimiennej* [Bezimienna springs] ecological area, situated at a distance of more than 0.7 km south-east of the boundary of the planned project impact area;
- *Białogórskie Torfowisko* [Białogóra Peat Bog] ecological area, situated at a distance of 3.7 km east of the boundary of the planned project impact area;
- *Osoczne oczko* [Osoczne Pond] ecological area, situated at a distance of more than 2.3 km west of the boundary of the planned project impact area;
- *Torfowisko przejściowe Gajówka* [Gajówka Poor Fen] ecological area, situated at a distance of 3 km south-west of the boundary of the planned project impact area;
- 70 natural monuments, the nearest of which, located approximately 0.8 km from the area of the planned customer substation, is a Roman Catholic cemetery in Osieki Lęborskie.

The planned project is located within the boundaries of the Coastal Protected Landscape Area, and within the boundaries of the buffer zone of the Polish Coastal Landscape Park, except for the area of the ONS and the PSE substations.



5.21.2.1 *Babnica* wild flower reserve

A wild flower type reserve situated on a parabolic dune overgrown with trees, which was shaped in the Holocene as a result of sand migrations. The conservation objective is to preserve the old beech and oak forest growing on the dune slope due to its scientific and educational value, including lichen plots that contain relict species of old-growth forests. They grow on poorly-developed podzols; 79 lichen species can be found there, more than half of which is included in the Red List of Extinct and Threatened Lichens, for example, tree lungwort, bristly beard lichen, and species of the *Pertusaria* genus. The flora of vascular plants is exceptionally sparse, which is due to a depleted and poorly-diversified substratum. Four species under partial protection can be found there: alder buckthorn, sand sedge, marsh Labrador tea, and common polypody. This is the habitat of boars, deer and foxes; the old beech trees with hollows are the breeding location for various cavity nesters. *The main threat to the reserve is the unorganised tourist traffic (pedestrian, equestrian, bicycle) and increasing air pollution (the lichens found there represent the species most sensitive to pollution) [491].*

5.21.2.2 *Białogóra* wild flower reserve

A wild flower type reserve situated in a peat-filled dune slack within the coastal dune strip. The conservation objective in this reserve is to preserve this, unique on the Polish coast, spatial complex of dunes and dune slacks, Atlantic bog vegetation communities with threatened and rare plant species at the boundary of their geographical range, phytocenoses of the coastal bog and crowberry coniferous forest as well as a crane refuge. The dunes were formed mainly in the Holocene as a result of the accumulation activity of the sea waves, the nearshore currents and wind. The dune slacks are endorheic, however, they lie in the zone of a high impact of the sea state on the groundwater level (surges of the Baltic Sea waters cause a rise in the freshwater level), which results in a permanent or periodic flooding of the area. This is the reason for the formation of a peat layer on gleyic sands. The flora of the reserve is affected by a thin layer of highly decomposed oligotrophic peat on barren, gleyic dune sands. Approximately 80 species grow on such a substratum, including 27 vascular plant species and 3 spore plant species of global conservation concern (species of varying degrees of threat and legally protected species). The most valuable species are: many-stalked spike-rush (the only plot in Gdańsk Pomerania, at the same time, its easternmost plot), brown beak-sedge (one of the most abundant plots in Gdańsk Pomerania), bog pondweed, *Littorella uniflora*, spoonleaf sundew, round-leaved sundew, sweetgale, cross-leaved heath, creeping lady's-tresses, and *Sparganium angustifolium*. The reserve is a periodic nesting place and a regular habitat for the crane [491].

5.21.2.3 *Długosz królewski w Wierzhucinie* nature reserve

A wild flower type reserve with a meltwater valley landscape form. The *Błota Przymorskie Plain* was formed after the edge of the ice sheet from the last ice age in the area of the Southern Baltic Sea retreated and it represents the final stage in the development of the Late Glacial Pomerania valley network. The conservation objective is to preserve one of the two largest plots of the multiannual fern – royal fern and the largest population of stiff clubmoss in the Gdańsk Area, to preserve the remnants of a raised bog and a poor fen together with the plant species and communities characteristic for those ecosystems. The reserve area is dominated by histols formed mainly from fen and raised bog peats, to a small extent from poor fen peats, with a significant area undergoing moorshification. Valuable flora species can be found there: royal fern (the largest population in the entire Gdańsk Pomerania), stiff clubmoss (can be found there in large numbers, forming clusters over an area of several hundred or, in exceptional cases, even several thousand metres), early coralroot (a species endangered in Gdańsk Pomerania), crested wood fern (a species vulnerable in Poland and in Gdańsk Pomerania, rare in the region of Gdańsk and currently extinct at most plots), sweetgale, round-leaved sundew, cross-leaved heath, marsh Labrador tea, stag's-horn clubmoss, and yellow water-lily. The reserve is also an

important nesting location for species endangered in Europe: the European turtle dove, the spotted flycatcher, the red-back shrike; the rare green sandpiper can also be found nesting there. This is the habitat for deer, boars, the European hare, the northern white-breasted hedgehog, as well as the following predators: foxes, racoon dogs, badgers, otters, weasels, and the European pine marten. Amphibians are represented there by five species: two toad species – the common toad and the European green toad, three frog species – the common water frog, the moor frog, and the common frog. Four species of reptile species can be found there: the sand lizard, the slow worm, the common European adder, and the grass snake [491].

5.21.2.4 Borkowskie Wąwozy forest reserve

The reserve covers a forested slope which is a part of the *Chetst* river valley. The conservation objective in this reserve is to preserve the springs area together with the surrounding forest with characteristic rare and protected plant species. On the sloping seabed of an erosional geological niche, the so-called spring cirque, a flow-through fen is “suspended”, which is fed by groundwater from numerous seepages and outcrops of the aquifers located along the foot slope. Deposits of peat reach a maximum depth of 2 meters there. The wetland area with a dome and valley physiognomy is overgrown with a swamp forest of the alder-ash riparian type. The following species can be found within the shrub layer mezereum, common spindle and common hazel. The fertile and well-saturated mud-gley soils of the domes are overgrown with a lush multi-species ground cover of flowering plants, ferns with a height of up to 2 m as well as bryophytes. The fragment of the area has the character of a Pomerania oak-hornbeam forest with specimens of old-growth hornbeam, beech and oak. The reserve has a high nature and landscape value. Plots of a series of protected and rare plant species, such as northern firemoss, marsh orchid, yellow pimpernel, and *Glyceria nemoralis* can be found there. The reserve is probably the northernmost plot of hard-fern in Poland [492].

5.21.2.5 Choczewskie cisy nature reserve

This is a wild flower reserve covering a section of a peated depression at an interface with a dune hill. The subject of protection is a plot of a naturally-regenerating common yew in a multi-species mixed forest at the only such abundant plot in the Pomorskie Voivodeship. The majority of the population is made up of 1 and 2-year-old yew seedlings. Several dozen trees exceed 30 cm in girth, and several of the oldest (aged about 145 years) are 140–150 cm in girth and 10–13 m high. In terms of space, mixed forest communities are predominant with a share of beech, oak and birch, and in some of its patches pine from planting, forming the oldest stand in the reserve. Yew, hornbeam and hazel can also be found there. For example, the following plants under species protection or rare can be found there: heath spotted-orchid, cross-leaved heath, sweetgale, northern firemoss, *Glyceria nemoralis*, and yellow pimpernel.

5.21.2.6 Polish Coastal Landscape Park

It was established in 1978 as one of the first landscape parks in Poland (Resolution No. IX/49/78 of the Voivodeship National Council in Gdańsk of 5 January 1978). The objectives and prohibitions applicable in the Park were specified in the Resolution No. 142/Vii/11 of the Pomorskie Voivodeship Regional Assembly of 27 April 2011 *on the Polish Coastal Landscape Park*.

The Park surface area is 18 804 ha (including 7452 ha of the onshore part and 11 352 ha of the waters of the Puck Bay), the buffer zone – 17 540 ha. Over half of the Park surface area are the waters of the Puck Lagoon, which is separated from the rest of the Bay area with a sandy, elongated shoal called *Ryf Mew* [Seagull Sandbar]. The onshore part of the Park covers the entire Hel Peninsula and a narrow seashore strip, running from Białogóra to Władysławowo together with the *Karwieńskie Błota* wetlands. South of Władysławowo, the PCLP boundary includes the coastal fragments of the *Kępa*

Swarzewska and *Puck* mounds, meltwater depressions of the *Plutnica* stream and *Reda* river to the village of Mechelinki.

All types of seashores, characteristic of the Southern Baltic can be found in the Park:

- cliffed coast, genetically associated with the moraine uplands, formed as a result of a high shore abrasion by sea waves (e.g. Chłapowski Cliff, cliff in Jastrzębia Góra);
- dune coast shaped as a result of the accumulation activity of the sea waves and nearshore currents (e.g. seaside shore of the Hel Peninsula, Białogóra);
- flat lagoon coast associated with the occurrence of peat plains or organogenic and mineral plains on the Hel Peninsula (e.g. *Słone Łąki* and *Torfowe Kłyle* nature reserves);

This type of landform and the associated presence of specific habitats makes the PCLP flora very rich and diversified. Halophilic (salt-tolerant), psammophilic (characteristic for dune sands), and peat bog plant communities associated with the Atlantic raised bogs and dune slacks, which are rare on a national scale, can be found there. More than 40% of the Park area is covered by forests, mainly coniferous forest communities, for example, the crowberry coniferous forest characteristic for the coast with its distinctive shrublet – black crowberry. Cloudberry, which is a boreal relict, and sweetgale, with the eastern boundary of its range there, can be found in the Park. The diversity of ecosystems in the PCLP offers favourable living conditions for many animal species. The avifauna of the Park is particularly abundant. The Hel Peninsula is the location of intensive bird flights during the autumn and spring migrations (Southern Baltic route of bird migrations). The shallow waters of the Puck Bay enable mass wintering of numerous bird species, mainly ducks. The PCLP provides breeding sites for bird species very rare in Poland – such as wood sandpipers, Eurasian oystercatchers, common shelducks, and citrine wagtails. Until recently, dunlins from the endangered Baltic subspecies *Calidris alpina schinzii*, nested there.

The planned project impact area, with the exception of the ONS area, is located within the PCLP buffer zone.

5.21.2.7 Coastal Protected Landscape Area

It was established on 10 December 1994 under the Regulation No. 5/94 of 8 November 1994 on establishing protected landscape areas, specifying landscape park borders and delineating buffer zones around them with the introduction of bans and restrictions applicable therein (Official Journal of the Gdańsk Voivodeship of 1994, No. 27, item 139). It includes the seashore, forested and forest free strip of dunes running along the coast, and in the eastern part, the *Błota Przymorskie* Plain and northern fragments of the neighbouring *Żarnowiecka* Upland. Its main value is the preserved natural arrangement of landscape zones. The most important threats include intensive and unorganised development of tourist infrastructure, excessive pressure of tourist traffic and disturbance of water relations within the *Bielawskie Błota* protected area (land drainage system). The legal act applicable for the Coastal Protected Landscape Area is the Resolution No. 458/XXII/12 of the Pomorskie Voivodeship Regional Assembly of 25 July 2016 on the protected landscape areas in the Pomorskie Voivodeship.

The planned project impact area, with the exception of the ONS area, is located within the Coastal Protected Landscape Area.

5.21.2.8 Choczewsko-Saliński Protected Landscape Area

It was established on 10 December 1994 under the Regulation No. 5/94 of 8 November 1994 on establishing protected landscape areas, specifying landscape park borders and delineating buffer zones around them with the introduction of bans and restrictions applicable therein (Official Journal of the Gdańsk Voivodeship of 1994, No. 27, item 139). The area is characterised by a significant accumulation

of natural values; the relief is characterised by a significant genetic and morphometric diversification. A grouping of the following lobelia lakes, largest in the voivodeship, can be found there: Dąbrze, Czarne, Choczewskie, Leśne and Salińskie. The communities of fertile beech forests and beech-hornbeam-oak forests are dominant in the area [174]. The legal act applicable for the Coastal Protected Landscape Area is the Resolution No. 458/XXII/12 of the Pomorskie Voivodeship Regional Assembly of 25 July 2016 on the protected landscape areas in the Pomorskie Voivodeship.

5.21.2.9 Ecological area *Torfowisko in Szklana Huta*

The ecological area was established on 31 December 2000 by the Regulation No. 183/2000 of the Pomorskie Voivodeship Governor of 28 November 2000 (Official Journal of the Pomorskie Voivodeship No. 115, item 738) on establishing some areas as ecological areas.

This is a poor fen with a surface area of 0.86 ha, situated in the Choczewo Forest District, Choczewo precinct, Biała Góra forestry, section 42c, 43b, with populations of rare and protected vascular plant species. Situated directly at the back of a windblown white dune. The thickness of the peat underlayer reaches approximately 30 cm and periodically becomes heavily gritted. This is a poor fen transitioning from the *Scheuchzeria-Caricetea fuscae* class, overgrown with common alder, common reed, and common willow. The dominant species are hare's-tail cottongrass, *Eriophorum vaginatum*, common sedge *Carex fusca*, and small cranberry *Vaccinium oxycoccos*. The rare and protected species are: round-leaved sundew *Drosera rotundifolia*, cross-leaved heath *Erica tetralix*, inundated club moss *Lycopodiella inundata*, marsh Labrador tea *Ledum palustre*, black crowberry *Empetrum nigrum*, intermediate wintergreen *Pyrola media*, and sidebells wintergreen *Orthilia secunda*. The conservation objective is to preserve the poor fen and the plots with protected and rare species in their unaltered state. A ban on the site dewatering and landfilling has been established [179].

5.21.2.10 Źródlika Bezimienniej ecological area

This is the headwater area of the *Bezimienna* stream with well-maintained reed rushes *Phragmitetum australis* and fragments of moss beds. The dominant species are common reed *Phragmites australis*, water horsetail *Equisetum fluviatile*, common skullcap *Scutellaria galericulata*, great water-parsnip *Sium latifolium*, and lesser pond-sedge *Carex acutiformis*. The conservation objective is to maintain the watercourse springs in their unaltered state. A ban on the site dewatering and landfilling has been established.

5.21.2.11 Białogórskie Torfowisko ecological area

This is a poor fen transitioning from the *Scheuchzeria-Caricetea fuscae* class with numerous populations of protected and rare plant species. It formed in a blowout depression in a dune area with a reduced groundwater level. The following rare and protected species can be found there: sweetgale *Myrica gale*, spoonleaf sundew *Drosera intermedia*, cross-leaved heath *Erica tetralix*, white beaksedge *Rhynchospora alba*, and marsh pennywort *Hydrocotyle vulgaris*. The conservation objective is to preserve the poor fen and the population of rare and protected species in their unaltered state. The following three bans – site dewatering, peat exploitation, landfilling, and deshrubbing as well as a possible obligation of reed-cutting have been established [178].

5.21.2.12 Osoczne oczko ecological area

This is a mid-forest small pond. The conservation objective is to protect ecosystems significant for the preservation of various habitat types [176].

5.21.2.13 *Torfowisko przejściowe Gajówka* ecological area

The conservation objective is to protect ecosystems significant for the preservation of various habitat types [175].

5.21.2.14 Natura 2000 sites

At a distance of up to 10 km from the planned project, the following Natura 2000 sites can be found:

- Special Protection Area (SPA) for Birds *Przybrzeżne wody Bałtyku* (PLB990002) – situated at a distance of more than 210 m north of the site planned for the location of the transition joint bays;
- Special Protection Area (SPA) for Birds *Lasy Lęborskie* (PLB220006) – situated at a distance of more than 6.5 km south-west of the southern boundary of the planned project impact area;
- **Special Habitat Protection Area *Białogóra* (PLH220003) – in the beach area, the subsea cables are led under the (PLH220003) area through an HDD borehole along an approximately 20 m section; moreover, along an approximately 300 m section, the special habitat protection area coincides with the planned project impact area, the route of the planned project is situated at a distance of at least 50 m from the boundary of the Special Habitat Protection Area *Białogóra* (PLH220003);**
- Special Habitat Protection Area *Piaśnickie Łąki* (PLH220021) – situated at a distance of more than 6.7 km east of the boundary of the planned project impact area;
- Special Habitat Protection Area *Jeziora Choczewskie* (PLH220096) – situated at a distance of more than 1.7 km south of the southern boundary of the planned project impact area;
- Special Habitat Protection Area *Mierzeja Sarbska* (PLH220018) – situated at a distance of more than 8.8 km west of the boundary of the planned project impact area.



The characteristics of the areas situated nearest to the planned project impact area presented below include a list of the subjects of protection.

5.21.2.14.1 Przybrzeżne wody Bałtyku (PLB990002)

This Natura 2000 site was established by the Regulation of the Minister of Environment of 21 July 2004 *on the Natura 2000 special protection areas for birds* (Journal of Laws of 2004, No. 229, item 2313). The area includes the Baltic Sea coastal waters of the depth from 0 to 20 m. Its boundaries stretch for 200 km beginning with the base of the Hel Peninsula and ending in the Pomeranian Bay. The seabed is uneven, height differences reach up to 3 m. This is a bird refuge of European importance E 80. A significant number of two bird species from the ones listed in Annex I of the Council Directive 79/409/EEC, namely the black-throated diver and the red-throated diver (C7) winter in this area. During winter, there is over 1% of the migratory species of (C3) the long-tailed duck and at least 1% of the black guillemot and the velvet scoter. In terms of benthic fauna, small crustaceans prevail. Rarely, large marine mammals are observed, for example, ringed seals *Phoca hispida*, grey seals *Halichoerus grypus* and porpoises *Phocaena phocaena* (SDF, February 2023).

Table 5.16 presents the species subject to protection. No priority species have been identified among birds.

Table 5.16. Species subject to protection within the special protection area for birds Przybrzeżne wody Bałtyku (PLB990002)
[source: SDF, February 2023]

No.	Binomial nomenclature	Common name
1.	<i>Alca torda</i>	Razorbill
2.	<i>Cephus grylle</i>	Common vole
3.	<i>Clangula hyemalis</i>	Long-tailed duck
4.	<i>Gavia arctica</i>	Black-throated diver
5.	<i>Gavia stellata</i>	Red-throated diver
6.	<i>Larus argentatus</i>	European herring gull
7.	<i>Larus canus</i>	Common gull
8.	<i>Melanitta fusca</i>	Velvet scoter
9.	<i>Melanitta nigra</i>	Common scoter

5.21.2.14.2 Lasy Lęborskie (PLB220006)

The area was established by the Regulation of the Minister of the Environment of 5 September 2007 amending the regulation on the Natura 2000 special protection areas for birds (Journal of Laws of 179, item 1275). The area is situated within the Baltic Sea catchment area, between the rivers *Piaśnica* and *Łeba*. The area is slightly undulated, sporadically intersected with terrain depressions and rises with steep slopes. Several lakes with surface areas from 70 to 170 ha can be found there. The few watercourses have a stream character, the largest of which is the Chelst Canal. Wetlands and forested wetland habitats are present in abundance. In forests, more than 60% of the forest area is covered with pine plantings, and spruce coming in second. At least eight bird species listed in Annex I of the EU Birds Directive were found in the *Lasy Lęborskie* refuge. Moreover, two among the species listed there, were included in the Polish Red Data Book of Animals as threatened bird species. This is a very important refuge for the boreal owl (PRDB). More than 1% of the Polish population of the boreal owl (C6) nests there (SDF, March 2022).

5.21.2.14.3 Białogóra (PLH220003)

This site was established on 5 February 2008 by the Commission Decision of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the continental biogeographical region [notified under document

C(2007)5043)(2008/25/EC)]. The area covers a part of the Słowińska Spit, composed of various aeolian formations, with the preponderance of parabolic dunes and large dune slacks with varying levels of peat content. A parabolic dune with deflation depressions covered with marshy coniferous forest and bog birch forest constitutes the main part of the refuge. The dune horns are covered by crowberry coniferous forests. White and grey dunes are present within the area. At the back of the dune embankment, there is a humid, dune slack with a shallow peat layer surrounded by marshy coniferous forest. This is one of two places on the Gdańsk Pomerania coast, where the processes of paludification of the mineral substrate take place at present. The habitats listed in Annex I to the Council Directive 92/43/EEC – 10 types – occupy almost 40% of the area. In the area, there is a complex of peatlands and forests unique to the southern shores of the Baltic Sea which create a natural series of ecological succession. Plant communities of Atlantic character, which are very rare on a national scale, were also found there. *Eleocharitetum multicaulis*, *Rhynchosporium fuscae*, *Ericetum tetralicis*, and *Myricetum gale* occur there in dense patches and cover relatively large surfaces, as well as a coastal form of marshy coniferous forest with *Erica tetralix* and *Myrica gale*, a humid, rare on a regional scale, form of crowberry coniferous forest, fragments of well-preserved bog birch forest and birch and oak as well as beech and oak forests (the last ones only at the forehead of a parabolic dune). The flora of vascular plants and spore plants, including lichen flora, with many species of Atlantic range type is unique. A number of these species is present there in populations of several hundreds and thousands of representatives, e.g. *Drosera intermedia*, *Rhynchospora fusca*, *Myrica gale*, and *Erica tetralix*. In the area, there is the only site in Pomerania, and one of 5 in Poland of *Eleocharis multicaulis*. This area has an exceptional landscape value (SDF, March 2022).

Table 5.17 presents the habitats subject to protection.

Table 5.17. Habitats under protection within the special habitat protection area Białogóra (PLH220003) [source: SDF, March 2022]

No.	Habitat code	Habitat name
1.	2110	Embryonic shifting dunes
2.	2120	Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")
3.	2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")
4.	2140	Decalcified fixed dunes (<i>Empetrum nigrum</i>)
5.	2180	Wooded dunes of the Atlantic, Continental and Boreal region
6.	2190	Humid dune slacks
7.	4010	Northern Atlantic wet heaths with <i>Erica tetralix</i>
8.	7110	Active raised bogs (<i>Cladietum marisci</i> , <i>Caricetum buxbaumii</i> , <i>Schoenetum nigricantis</i>)
9.	7150	Depressions on peat substrates of the Rhynchosporion
10.	91D0	Bog woodland (<i>Vaccinio uliginosi</i> <i>Betuletum pubescentis</i> , <i>Vaccinio uliginosi</i> <i>Pinetum</i> , <i>Pino mugo</i> - <i>Sphagnetum</i> , <i>Sphagno girgensohnii</i> - <i>Piceetum</i>) and birch-pine, bog, boreal forests

Habitats 2130, 2140, 7110 and 91D0 are considered priority habitats.

A Protective Task Plan for the Natura 2000 site *Białogóra* (PLH220003) was established under the Regulation of the Regional Director for Environmental Protection in Gdańsk of 30 April 2014 on establishing the protective task plan for the Natura 2000 site *Białogóra* (PLH220003) (Journal of Laws of 2014, item 1916) amended by the Regulation of the Regional Director for Environmental Protection in Gdańsk of 17 February 2016 (Journal of Laws of 2016, item.1082).

5.21.2.14.4 *Piaśnickie Łąki* (PLH220021)

This site was established on 5 February 2008 by the Commission Decision of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the continental biogeographical region [notified under document C(2007)5043)(2008/25/EC)].

The area covers a section of the *Błota Przymorskie* Plain. In small parts, it is covered by grassland and rushes of variable moisture content. The oxbow lake of the *Piaśnica* river is situated within the boundaries of the area, among diversified mosaic of non-forest and forest vegetation communities (mainly beech and oak forest). Patches of willow thickets and sweetgale emerge among them. Within the boundaries of the area there are also *Wierzchucińskie Bagno* raised bog, unforested dunes in the vicinity of the *Piaśnica* river, the *Piaśnica* river estuary and a section of the seashore with a typical habitat complex. This is a unique complex of meadow, rush, scrub and woodland plant communities, characteristic of the region in the past. Protected sections of the area in the reserves are well-preserved and very valuable, the rest of the area offers great opportunities for restoration. Ten habitat types listed in Annex I to Council Directive 92/43/EEC were identified there; among them, floristically rich *Molinia* meadows (the only plot with well-preserved *Molinia* meadows in Pomerania), *Caricion fuscae* (including the *Caricetum buxbaumii* community), mat-grass swards, *Myrica gale* brushes and beech and oak forests; regenerating raised bog with a coniferous swamp and a bog birch forest. Some of the above-mentioned communities have their only plots on the Baltic Coast, others occur at the eastern boundary of their range. Very rich and ecologically-diversified flora of vascular plants (265 species), including approx. 20 taxa considered threatened in Poland and in Pomerania, the only or one of the few plots in Pomerania of *Iris sibirica* (the most abundant population in northern Poland), as well as of the rare *Gladiolus imbricatus*, *Carex buxbaumii*, *Viola persicifolia*, *Cnidium dubium*, *Laserpitium prutenicum*, and *Carex hartmanii*. The *Wierzchucińskie Bagno* peat bog is a Baltic type raised bog, disfigured by dewatering, however, a complex of bog birch forest and well-regenerating old peat extraction sites are present there.

A Protective Task Plan for the area was established under the Regulation of the Regional Director for Environmental Protection in Gdańsk of 17 April 2014 *on establishing the protective task plan for the Natura 2000 site Piaśnickie Łąki (PLH220021)* (Journal of Laws of 2014, item 1816) amended by the Regulation of the Regional Director for Environmental Protection in Gdańsk of 26 November 2015 (Official Journal of the Pomorskie Voivodeship of 2015, item 4392), amended by the Regulation of the Regional Director for Environmental Protection in Gdańsk of 4 November 2016 amending the regulation on establishing the protective task plan for the Natura 2000 site *Piaśnickie Łąki (PLH220021)* (Official Journal of the Pomorskie Voivodeship of 2016, item 3596).

5.21.2.14.5 Jeziora Choczewskie (PLH220096)

This site was established by the Commission Decision of 10 January 2011 on the adaptation, pursuant to Council Directive 92/43/EEC, of the fourth updated list of sites of Community importance for the continental biogeographical region (notified under document No. C(2010) 9669) (2011/64/UE)).

This area includes two northernmost lobelia lakes of Poland Lake Choczewskie and Lake Czarne together with some of their catchment areas. They are located in a forest (Lake Czarne) or forest-agricultural landscape (Lake Choczewskie), with acidophilous oak forests and alder carrs dominant in the catchment areas. Those lakes have significant, for lobelia lakes, surface areas; Lake Czarne is also quite deep (max. 21 m). Lake Choczewskie is a shallow, mesotrophic lake and a reservoir relatively rich in calcium. The characteristic feature of this lake's vegetation is the co-existence of plant communities from the class *Littorelletea* (*Isoëto-Lobelietum littorelletosum*, small patches of *Isoëto-Lobelietum lobelietosum*), *Charetea* (*Charetum asperae*) and from the Potamion association (e.g. *Potametum lucentis*). A population of *Luronium natans* has been recorded in the lake in the past [85, 22]; in 2008, no plot was confirmed for the species. Lake Czarne is an oligotrophic reservoir with acidic water (pH 5.25) low in calcium and carbonates (content of Ca 6.7 mg/dm³), with low electrical conductivity (28 S/cm). That lake has been strongly transformed as a result of being included into the drainage network and the constant flow of drainage water. As a result, the lake water is rich in humic substances and is heavily coloured (240 mg Pt/dm³). Submerged vegetation is scarce, poorly-developed and limited to the depths of 0.5 m. Patches of *Isoëto-Lobelietum typicum* and *Isoëtetum echinosporae* can be found

in the littoral zone. The refuge shelters the two northernmost lobelia lakes in Poland, including one with a population of *Luronium natans* reported in literature (Lake Choczewskie). Lake Choczewskie deserves protection also due to its specific nature – a unique mosaic of underwater plant communities, including well-developed plant communities from the *Charetea* class. Moreover, one of the eight Polish populations of *Isoëtes echinospora* (Lake Czarne) can be found in the refuge (SDF, March 2022).

No protective task plan was established for the site [177].

5.21.2.14.6 Mierzeja Sarbska (PLH220018)

This site was established on 5 February 2008 by the Commission Decision of 13 November 2007 adopting, pursuant to Council Directive 92/43/EEC, a first updated list of sites of Community importance for the continental biogeographical region (notified under document C(2007)5043)(2008/25/EC)). The Regulation of the Minister of the Environment of 13 March 2018 on the Special Habitat Protection Area *Mierzeja Sarbska* (PLH220018) (Journal of Laws of 2018, item 859) applies.

The area covers a narrow strip between the Baltic Sea and a crypto-depressive Lake Sarbsko, as well as the lake itself. This lake is one of the 11 brackish water coastal lakes in Poland. The refuge constitutes a unique complex of transverse and parabolic dunes (partially shifting) with vegetation that constitutes a complex of white dune, grey dune and crowberry heathland communities as well as crowberry forests of diversified humidity. Dune slacks are filled with shallow peat. Unique plant communities of moist depressions form there, such as bog-myrtle bushes, beak-rush bushes, wet willow and erica heathlands, with vanishing, rare plots in Poland. Apart from the predominant crowberry coniferous forests, bog woodlands, alder and bog birch forests can be found there. A significant part of the area (approx. 30% of its surface area) is protected as the Sarbska Spit nature reserve. The area encompasses the coastal Lake Sarbsko, which is a priority habitat 1150 (coastal lagoons), a narrow sandspit constituting a unique complex of transverse and parabolic dunes. It is one of the few fragments of spit on the Polish coast, apart from the Słowiński National Park, with shifting dunes, in the horns of which there are deflation basins with very rare peat and psammophyte communities. The value of this area is enhanced by the floristically-rich moist dune slacks, including brushes with sweetgale *Myrica gale*, a legally protected Atlantic species, which is in general rare in Poland. Its valuable element is the well-developed coastal crowberry coniferous forest on dunes. The dunes in the area host the population of *Linaria loeselii*, and Lake Sarbskie is home to one of Poland's few plots of the lesser ramshorn snail *Anisus vorticulus*. Exceptionally numerous are the populations of vascular plant species and animals threatened and legally protected in Poland. The area is characterised by exceptional landscape values. Nature habitat 1150 – coastal lagoons – is represented by Lake Sarbsko. The reservoir is very shallow (its average depth does not exceed 1.2 m and the maximum depth is 3.2 m), however, relatively vast (its surface area is just over 650 ha). This is a polymictic and eutrophic lake. Water clarity is 0.5–1m, which is quite high for coastal lakes. The lake serves an important function in the ecological landscape as the feeding ground for the white-tailed eagle, the osprey, the cormorant, as well as the breeding and resting place for water birds. It is also the biotope of the lesser ramshorn snail. It is an atypical coastal lake in that the surface water exchange with the sea is quite limited. However, the lake is supplied with saltwater through groundwater. The lake remains fairly well-preserved, although it is under enormous recreational pressure. Its significance to national resources has been rated as B. Natural habitats 2120 and 2110 – white dunes with their initial stages – are present within the area, however, their occurrence on the sea shore is limited by the dominant abrasive processes. Thus, the significance of the area to national resources has been rated as C. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"), in their initial stages, emerge periodically, especially at the 172–174 km section of the shoreline, where they are practically permanently present, but also along sections of shoreline in the Sarbska Spit nature reserve further along the chainage. Their occurrence can be dynamic: the initial stages of dunes are formed by the wind, but can be completely destroyed

as a result of autumn storms. Two types of dunes have been classified as white dunes: a) typical white dunes, with a transverse orientation along the sea shore. They are usually overgrown with European beachgrass and sand ryegrass – *Elymo-Ammophiletum*. The greatest role is played by *Ammophila arenaria* with a smaller or larger share of *Elymus arenarius* and *Festuca rubra subsp. arenaria*. b) “white” shifting dunes of the Spit interior, highly dynamic, displaced by the wind as large moving dune formations. First of all, two large shifting dunes east of the Stilo Bank should be mentioned here. Scarce vegetation is similar in nature to the one found on the coastal transverse dunes. The complex of the following natural habitats: “grey dunes” (2130), decalcified fixed dunes with *Empetrum nigrum* (2140) and humid dune slacks (2190), constitutes the most valuable natural asset of the area, although it is currently threatened by the lack of aeolian processes, which would dynamically shape the entire dune system (a result of the former afforestation and consolidation of a part of the dunes). In terms of those natural habitats, the area is unique on a national scale (significance rating B). Coastal crowberry coniferous forests, well-developed and partially under strict protection in the Sarbska Spit nature reserve dominate in terms of space occupied within the area. The area is the second major plot in Poland, after the Slowinski National Park, for the conservation of crowberry coniferous forests (general significance rating A). The mosaic of the area natural habitats is complemented by: Northern Atlantic wet heaths with *Erica tetralix* (4010), bod woodland (91D0), old acidophilous oak woods with *Quercus robur* on sandy plains (9190), although in the case of those habitat types, the area is one of many places where they occur in Poland. The area holds about 4–8% of the Polish population of *Linaria odorata*. The occurrence of the species is associated with the windblown dunes. The population is quite strong in the Sarbska Spit area, because in the years 2008–2012, the species was observed in as many as 11 locations. As is the case for their entire range of occurrence, these are mainly windblown dune crests of transverse dunes by the sea as well as the blowouts on dunes further inland on the Spit. The structure of the population does not diverge from the national average. The abundance within the area is estimated at approx. 500–1500 specimens. Lake Sarbsko is one of the few known sites in Poland of the lesser ramshorn snail *Anisus vorticulus*, although, in general, the distribution of that species in Poland is probably not well-known. The population from Lake Sarbsko fits in with the national average, it is characterised by low densities, with the most likely adequate habitat condition. The continued presence of the species at this site has been documented for more than 20 years (SDF, March 2022).

A Protective Task Plan for the area was established under the Regulation of the Regional Director for Environmental Protection in Gdańsk of 8 April 2014 *on establishing the protective task plan for the Natura 2000 Mierzeja Sarbska (PLH220018) site* (Journal of Laws of 2014, item 1715) amended by the Regulation of the Regional Director for Environmental Protection in Gdańsk of 19 January 2016 amending the regulation *on establishing the protective task plan for the Natura 2000 Mierzeja Sarbska (PLH220018) site* (Official Journal of the Pomorskie Voivodeship of 2016, item 160).

5.21.3 Wildlife corridors

Pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended), a wildlife corridor is an area enabling the migration of animals, plants or fungi. Corridors facilitate the existence and exchange of genetic pools, abundances and above all the migration of species and individuals, conditioning the maintenance of environmental biodiversity. Their boundaries include mainly forest areas, surface waters, habitats of high nature value, as well as agricultural land, where a small share of communication and developed areas is visible. Depending on the impact area and the significance of impacts, terrestrial corridors can be divided into: supra-regional, regional, sub-regional and local.

The project does not intersect any wildlife corridors [200] [Figure 5.58]. The system of wildlife corridors is an official system available on the websites of GDEP (<https://www.gdos.gov.pl/dane-i-metadane>).

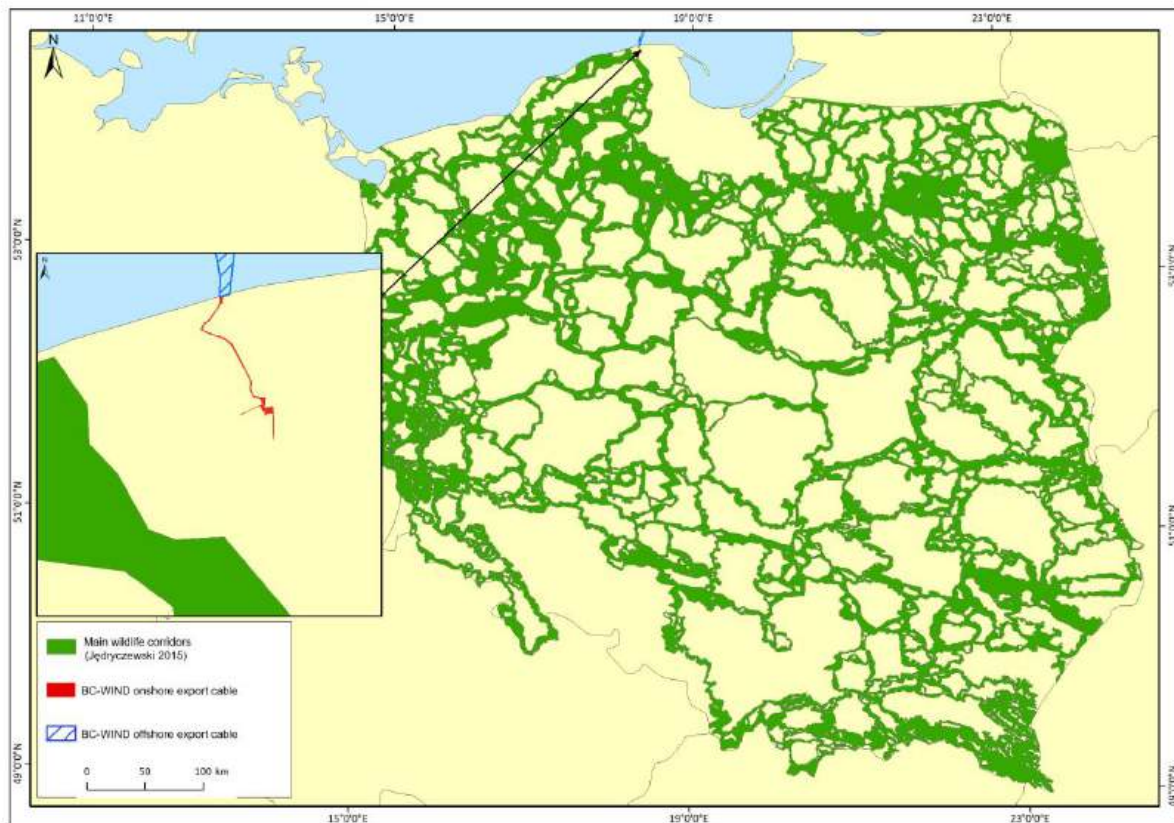


Figure 5.58 Course of the EXC BC-Wind OWF against main wildlife corridors (2005 concept) [source: internal materials on the basis of [200]]

However, on a national scale, this picture changed with the 2011 publication [199], when new areas were added to the existing wildlife corridors. According to the publication, the planned project is located within the impact area of the Kashubian Coast wildlife corridor (code KPn-20C) [Figure 5.59].



Figure 5.59 Course of the onshore part of the EXC BC-Wind OWF against wildlife corridors (2011 concept) [source: internal materials on the basis of [199]]

In accordance with the Concept of the Ecological Network of Pomorskie Voivodeship [227] the planned project is located within the Coastal Corridor area of a supra-regional importance.

The **Coastal Corridor** constitutes a forest-water-meadow-peat strip along the Baltic Sea coastline. This corridor is diversified in terms of structure and includes a strip of dunes, which runs also within the boundaries of the Słowiński National Park, on the Hel Peninsula, coastal forests and meadows, marshlands, swamps and two coastal lakes: Łebsko and Gardno. In the western part, outside the area adjacent to the shoreline, the corridor also includes a strip of forests located below, to the north and parallel to the *Moszczeniczka* valley. Forests, including the tree-covered and shrubby areas, cover more than 50% of the corridor surface area, and water – more than 15%. The share of grassland area is large, estimated to be around 25% of the corridor area. Some of the forests and grassland communities are located in wetlands, the total share of which in the corridor is over 6%. The proportion of developed land in the corridor is small (approx. 0.6% of the corridor surface area), since larger concentrations of developments are located within the settlement and recreational centres [Figure 5.60].

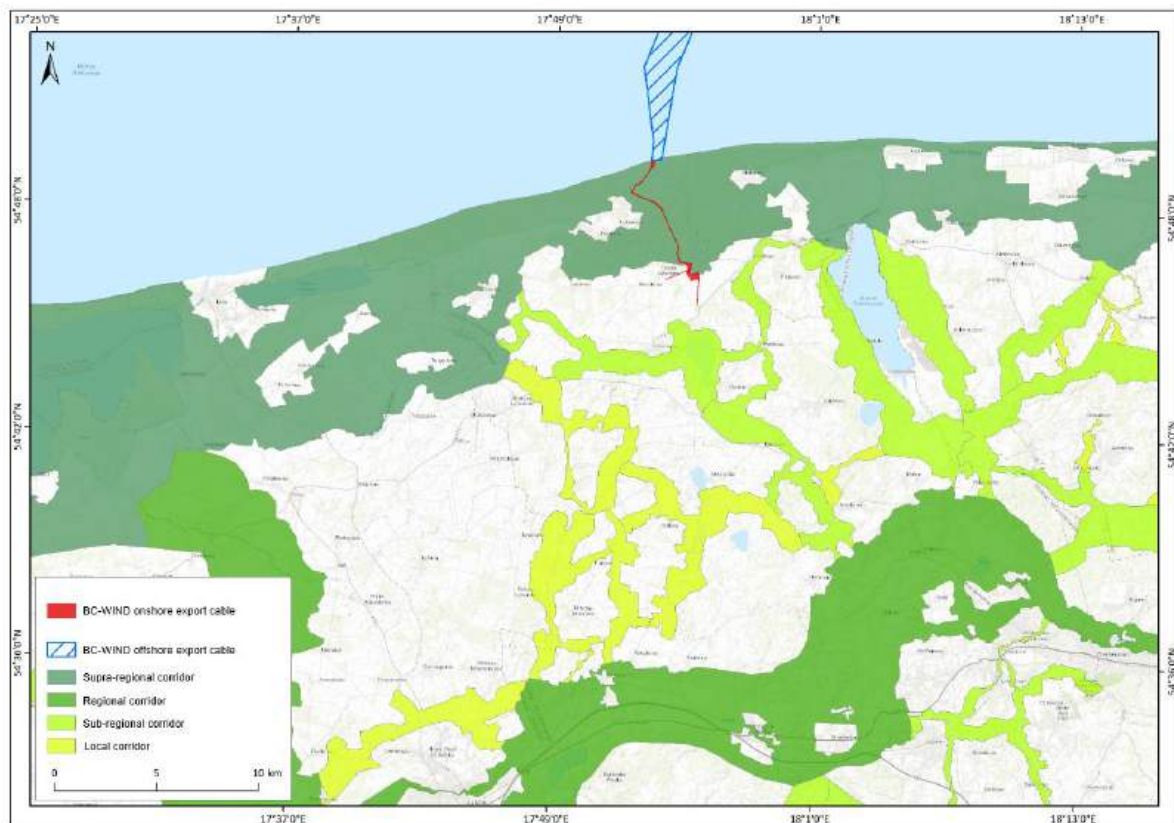


Figure 5.60. Location of the planned project against wildlife corridors [Source: internal materials on the basis of [227]]

The Coastal Corridor maintains direct connectivity with a corridor of a supra-regional importance of the *Śłupia* and *Wda* rivers as well as the regional corridors of the *Łupawa* Valley and the Ice-marginal Valley of *Reda* and *Łeba* (near-mouth sections of *Śłupia*, *Łupawa* and *Łeba* river valleys are already contained within the coastal corridor). Moreover, the direct connectivity of the coastal corridor with the above-mentioned supra-regional and regional corridors is guaranteed thanks to several sub-regional corridors that fulfil the connective function.

The extensive, structurally diversified coastal corridor includes the Lubichowski piece of land, which comprises a dense complex of coastal forests in a strip west of the town of *Łeba* and east of the village of *Dębki*.

However, the above-mentioned concepts, completely fail to take into account the needs of birds, their places of concentration and migration routes. According to the publications of Berthold [30] and Newton [285], along the south coast of the Baltic Sea runs one of the branches of the East Atlantic Flyway, which connects the breeding grounds in northern Europe, the wintering grounds located in southern and western Europe, Africa, and also in Asia, for a small number of species. A schematic representation of this route including the location of the survey area is shown in Figure 5.61.

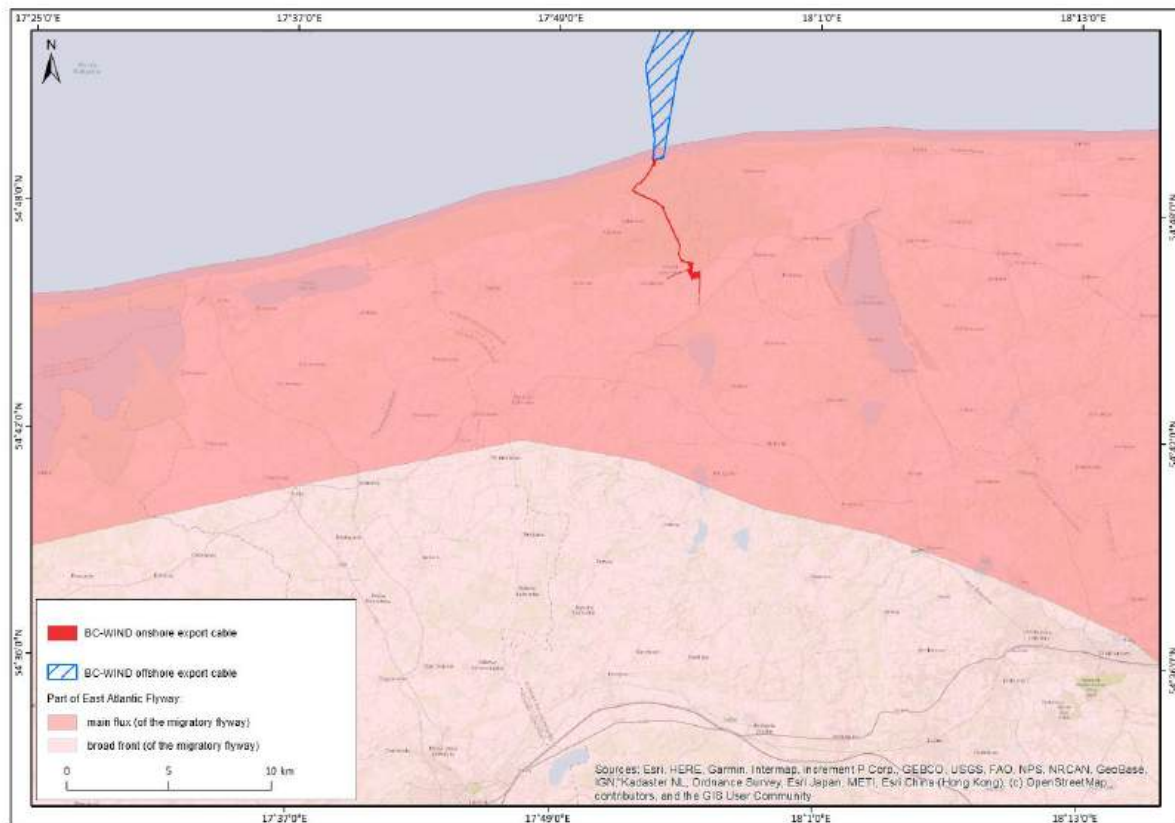


Figure 5.61 Location of the planned project against the East Atlantic Flyway [Source: internal materials on the basis of [30] and [285]]

5.21.4 Biodiversity

One of the most severe European environmental issues is the loss of biodiversity. The studies in this area identify five main factors affecting biodiversity habitat loss and fragmentation, overexploitation and misuse of natural resources, pollution, invasive alien species and climate change. In accordance with Article 2 of the Convention on Biodiversity, biodiversity should be understood as a diversification of all living organism forms, for example, terrestrial, marine and other aquatic ecosystems and the ecological complexes, which they are a part of. It refers to diversity within species (genetic diversity), between species and between ecosystems.

The biodiversity of a site is not uniform and is connected to the number and mosaicism of habitats. Variability of biodiversity also depends on the season of the year, the interrelationship between the abundance of the organisms concerned and the study group. An area exhibiting high plant biodiversity may not be particularly attractive to mammal or reptile species and, conversely, areas favourable to birds need not be rich in vascular plant species (e.g. dunes).

5.21.5 Environmental valorisation of the area

An environmental valorisation of the area for both variants was conducted on the basis of the year-long inventory surveys on abiotic and biotic resources of the survey area and those areas that fell within the areas of the potential impact of the planned project were listed.

5.21.5.1 Fungi

The impact area of the proposed project is dominated by common species, widely distributed across coastal coniferous forests. In the recent years, in the area of the coastal coniferous forests (*Empetro*

nigri-pinetum), the expansion of *Boletus projectellus* originating from North America has been noticeable. Despite conducting very thorough observations in the field, the resultant list of the species of *Macromycetes* identified is rather short. The main reasons for that are little habitat diversity and soil moisture deficit due to the lack of rain. The macroscopic fungi species listed are relatively common and widespread, with a high naturalness rate in lowland forest areas.

The fungal species included in the inventory survey were divided into four groups, representing exceptional nature conservation value, high value, moderate value and low value. Two species were assigned to the first group (mealy tooth *Hydnellum ferrugineum* and *Hydnellum glaucopus*), one species was assigned to the second group (dune brittlestem *Psathyrella ammophila*), eleven species were assigned to the third group (Indian oyster *Pleurotus pulmonarius*, chaga mushroom *Inonotus obliquus*, carnation earthfan *Thelephora caryophyllea*, booted knight *Tricholoma focale*, spatulate oysterling *Arrhenia spathulata*, mountain moss *Psilocybe Deconica montana*, caterpillar fungus *Cordyceps militaris*, slate grey saddle *Helvella lacunose*, silky rosegill *Volvariella bombycine*, benzoin bracket *Ischnoderma benzoinum*, and *Diplomitoporus flavescens*), and four species were assigned to the fourth group (crimped gill *Plicaturopsis crispa*, yellow knight *Tricholoma equestre* (L.) P. Kumm., woolly tooth *Phellodon tomentosus*, and crown coral *Artomyces pyxidatus*).

The natural habitats in the survey area retain largely a high degree of naturalness and their status can be described as adequate. The presence of well-preserved forest communities, especially pine forests and beech forests, is conducive to the population preservation of the taxa of macroscopic fungi of high nature conservation value.

Fungal species of high nature conservation value were recorded in the northern and southern parts of the survey area [Figure 5.46].

5.21.5.2 Lichens

Forest areas (beech as well as pine and beech forests), within which the plots of two strictly protected taxa are located, should be considered the most valuable fragments of the survey area in terms of species composition and diversified lichen biota – the area of the Szklana Huta forest range, divisions 111 and 112. They should be preserved during the implementation of the planned project.

A small fragment of a beech forest situated north-east of the Szklana Huta forester's lodge (Szklana Huta forestry, Division 166 h) is also characterised by significant natural values.

Valuable and diversified lichen biota is also present in the southern part of the area covered by inventory survey. The tree alley/row growing along a dirt road is also worth noting. Plots with rare and valuable lichen species can also be found in the southern part of the area, at the edge of the deciduous and mixed forest complexes. In addition, single trees or group of trees which serve as habitats for strictly protected lichen, should be considered features of high value.

The natural habitats in the survey area retain largely a high degree of naturalness and their status can be described as adequate. Leaving fragments of old beech forests and the presence of well-preserved pine forests is conducive to the preservation of the population of rare epiphytic taxa.

The most valuable lichen plots are concentrated in the northern and southern parts of the area [Figure 5.47].

5.21.5.3 Mosses and liverworts

All the species identified were under protection, including two under strict protection and the remaining thirteen under partial protection.

For the purpose of species evaluation, 4 groups were distinguished: exceptionally valuable, valuable, species of low value, and common species. Two strictly protected species were included in the

exceptionally valuable group, and one species (wood-rust *Nowellia curvifolia*) was classified as valuable. In the low-value group, 3 species were included (flat neckera moss *Neckera complanata*, dilated scalewort *Frullania dilatata* and crisped pincushion moss *Ulotia crispa*). The remaining species were classified as common (neat feathermoss *Pseudodoscleropodium purum*, mountain fern moss *Hylocomium splendens*, red-stemmed feathermoss *Pleurozium schreberi*, hairy palmate liverwort *Ptilidium ciliare*, wavy broom moss *Dicranum polysetum* and broom forkmoss *Dicranum scoparium*, large white-moss *Leucobryum glaucum*, shingle moss *Neckera pennata*, tamarisk scalewort *Frullania tamarisci*, common hair-cap moss *Polytrichum commune*, and spiky bog-moss *Sphagnum squarrosum*).

Most mosses and liverworts were found in the northern part of the survey area, in the area of mixed and coniferous forests on coastal dunes as well as in acidophilous beech forests, however, the most valuable species were recorded in the latter.

The diversity of plant habitats and communities in these areas preserves, to a large extent, the high degree of naturalness, therefore their condition in terms of the presence of bryophytes can be described as adequate, determining the species diversity of the flora. The preservation of species diversity is also favoured by numerous peat bogs, with varying degrees of hydration, and the development of vascular plant species. The presence of well-preserved coniferous forest stands determines the proper species biodiversity of coniferous forest lichens.

5.21.5.4 Vascular plants and natural habitats

The northern part of the survey area is clearly characterised by the highest natural value. It is mostly occupied by coastal crowberry coniferous forests (natural habitat 2180) characterised by good conservation status. Numerous plots of black crowberry *Empetrum nigrum* are found in these forests, while in moister areas cross-leaved heath *Erica tetralix* and marsh Labrador tea *Ledum palustre* occur. One plot of the strictly protected sweetgale *Myrica gale* has also been recorded.

The following natural habitats listed in Annex I to Directive 92/43/EEC have been found within the onshore connection are:

- Fixed coastal dunes with herbaceous vegetation ("grey dunes") (2130*) – conservation status A in most cases, with single patches classified as B or C;
- Decalcified fixed dunes with *Empetrum nigrum* (2140*) – conservation status B or C;
- Wooded dunes of the Atlantic, Continental and Boreal region (2180) – conservation status B or C;
- Humid dune slacks (2190) – conservation status B or C;
- *Luzulo-Fagetum* beech forests (9110) – conservation status B or C.

Figure 5.50 illustrates the distribution of Annex I habitats of Directive 92/43/EEC in the area affected by the planned project.

5.21.5.5 Invertebrates

Three valuable areas and habitats can be identified in terms of rare and protected invertebrates:

- a strip of beaches and the directly adjacent white dunes – a habitat for many rare halophilic and psammophilic species. Forty rare and protected invertebrate species were found in this habitat;
- a strip of grey dunes and coastal crowberry coniferous forests – a habitat of rare psammophilic species and the tree grayling butterfly species. 34 rare and protected invertebrate species were found in this habitat;

- forest areas east of the village of Lubiatowo (near Szklana Huta) – and old deciduous and mixed tree stand, including old beech forests – the location of many anthills of the protected ant species of the *Formica* genus, particularly the red wood ant *Formica polyctena*.

Only 5 anthills were found in the southern part of the area, dominated by pine forests. However, no anthills were found in the central part, which is covered by a relatively young pine forest.

A small patch of oak wood in the southern part of the surveyed area is also worth noting, since 2 protected species of *Carabus* beetles were noted here.

Sand hopper

A separate subject of invertebrate inventory surveys is the sand hopper *Talitrus saltator* – a species covered by partial protection in accordance with the Regulation of the Minister of the Environment of 16 December 2016 *on the protection of animal species* (Journal of Laws of 2016, item 2183), a crustacean from the order of Amphipoda and the Talitridae family. The sand hopper is also listed in the Helsinki Commission Red List of Species in danger of becoming extinct (HELCOM Red List 2013).

During the sand hopper inventory along the 3 designated survey profiles, 30 individuals were found. The lowest abundance of this crustacean (3 individuals) was recorded along survey profile 2, located in the middle section of the area surveyed.

5.21.5.6 Ichthyofauna

In terms of ichthyofauna, the survey area is considered very poor regarding the presence of fish and lampreys. It also lacks valuable ichthyofauna habitats.

5.21.5.7 Herpetofauna

All amphibian species occurring in Poland shall be classified as valuable resources. It should be noted that amphibians are a group of animals which are extremely vulnerable to habitat alterations caused by human activity on a mass scale.

All reptile species naturally occurring in Poland shall be classified as valuable resources.

The area covered by the survey generally does not differ from the surrounding terrain and is altogether (except for one habitat) not particularly favourable for either of the two herpetofauna divisions.

Three amphibian breeding sites were noted, among which the field swamps in the south of the survey area are of high natural value. A large variety of species with high population can be found there, as well as good habitat conditions. Not many water bodies with similar conditions, in which these amphibians could reproduce, can be found in the immediate vicinity. This body of water and its immediate vicinity should remain excluded from the planned project. In the case of the remaining amphibian breeding sites, caution should be exercised during the construction works.

All reptile breeding grounds are characterised by average nature value. Forest management and vehicle traffic are considered threats.

5.21.5.8 Avifauna

The abundance of avifauna species found in the survey area was high, with the highest numbers recorded during autumn migration and the lowest during the wintering period of birds. No significant usage of airspace above the proposed project was observed, nor were any larger bird concentrations recorded during the period of bird wintering. Small flocks observed at the survey area were mostly European herring gulls, long-tailed ducks, scoters and great crested grebes sitting on the water.

The planned project area is diversified in terms of habitats, which results in the abundance of avifauna. The northern area of the project (greater part of sector 1 and northern part of sector 2, to be precise) constitutes a habitat within the coastal dune strip, covered with young pine tree stands. However, despite this, a fairly high number of woodlark sites were recorded in this area. Next, an area can be distinguished where an old, more diverse tree stand with an admixture of beech forest can be found and where red-breasted flycatchers nest. It is an area adjacent to the springs of the *Bezimienna* river and swampy grounds (the southern part of sector 2, sector 3 and a fragment of the northern part of sector 4). Black woodpeckers, red-breasted flycatchers, cranes, European nightjars, woodlarks, tawny owls and common buzzards have been found to nest in this area. Next, there is a large area of poor habitats covered by a pine stickstand, which does not constitute an attractive breeding ground for avifauna. Nevertheless, breeding Eurasian woodcock and European nightjar were found there. The southern section of the area surveyed is a diverse zone with old forest stands (2 breeding pairs of common buzzards, a red-breasted flycatcher, a black woodpecker, a tawny owl, a woodlark and a red crossbill were found there), agricultural terrains with waterlogged areas (2 pairs of common crane and a mute swan nested there), and a disused railway track (breeding red-backed shrikes and a barred warbler were recorded there).

Table 5.18. Total amount of breeding species identified across particular sectors of the area [source: C-Wind Sp. z o.o. data]

	T01	T02	T03	T04	T05	T06	T07	T08
Number of breeding species	26	21	26	18	14	13	25	25

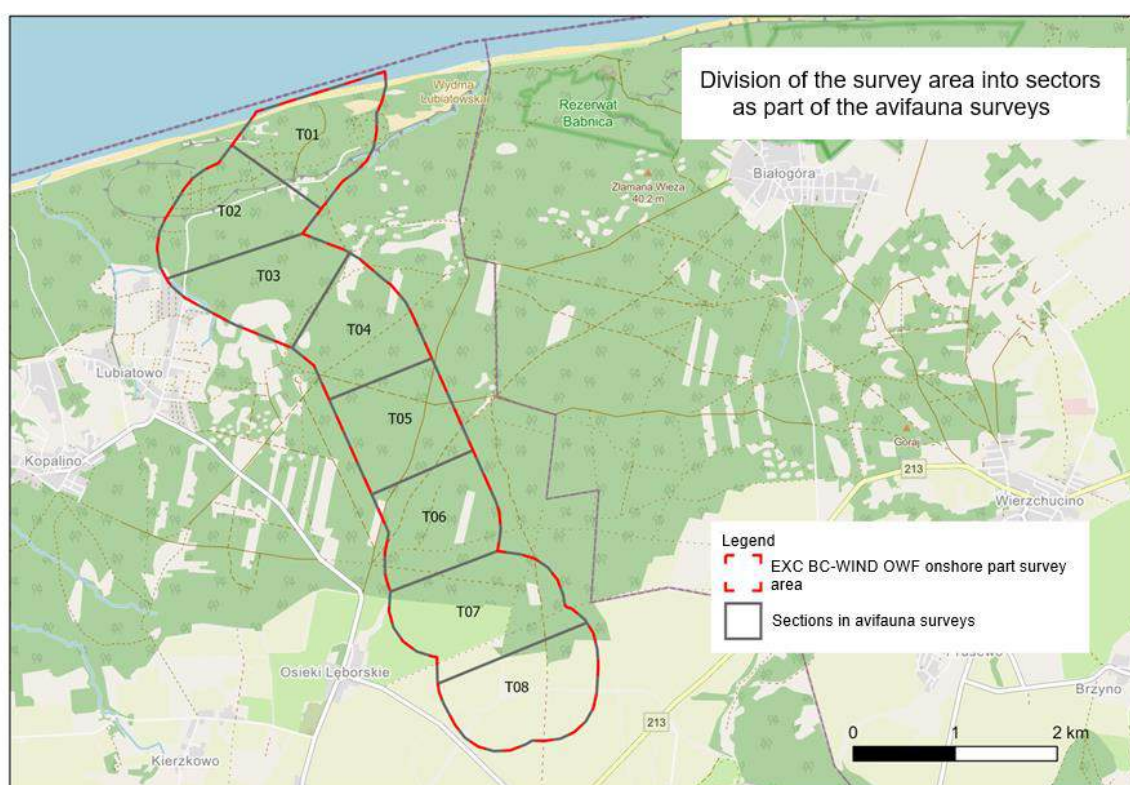


Figure 5.62. Division of survey area into sectors as part of avifauna surveys [source: C-Wind Sp. z o.o. data]

All of the swampy, waterlogged areas adjacent to the springs of the *Bezimienna* river constitute valuable habitats for the breeding avifauna and should be preserved in an unchanged form. In the northern and southern part of the project, there is an area characterised by a greater abundance of avifauna. No nesting of rare bird species or larger birds of prey that could collide with the project was

discovered in the central part of the project area covered by a pine stickstand. Fragmentation of existing habitats should also be avoided.

5.21.5.9 Mammals (excluding bats)

Figure 5.63 illustrates the location of habitats recognised as valuable for protected mammal species (excluding bats).

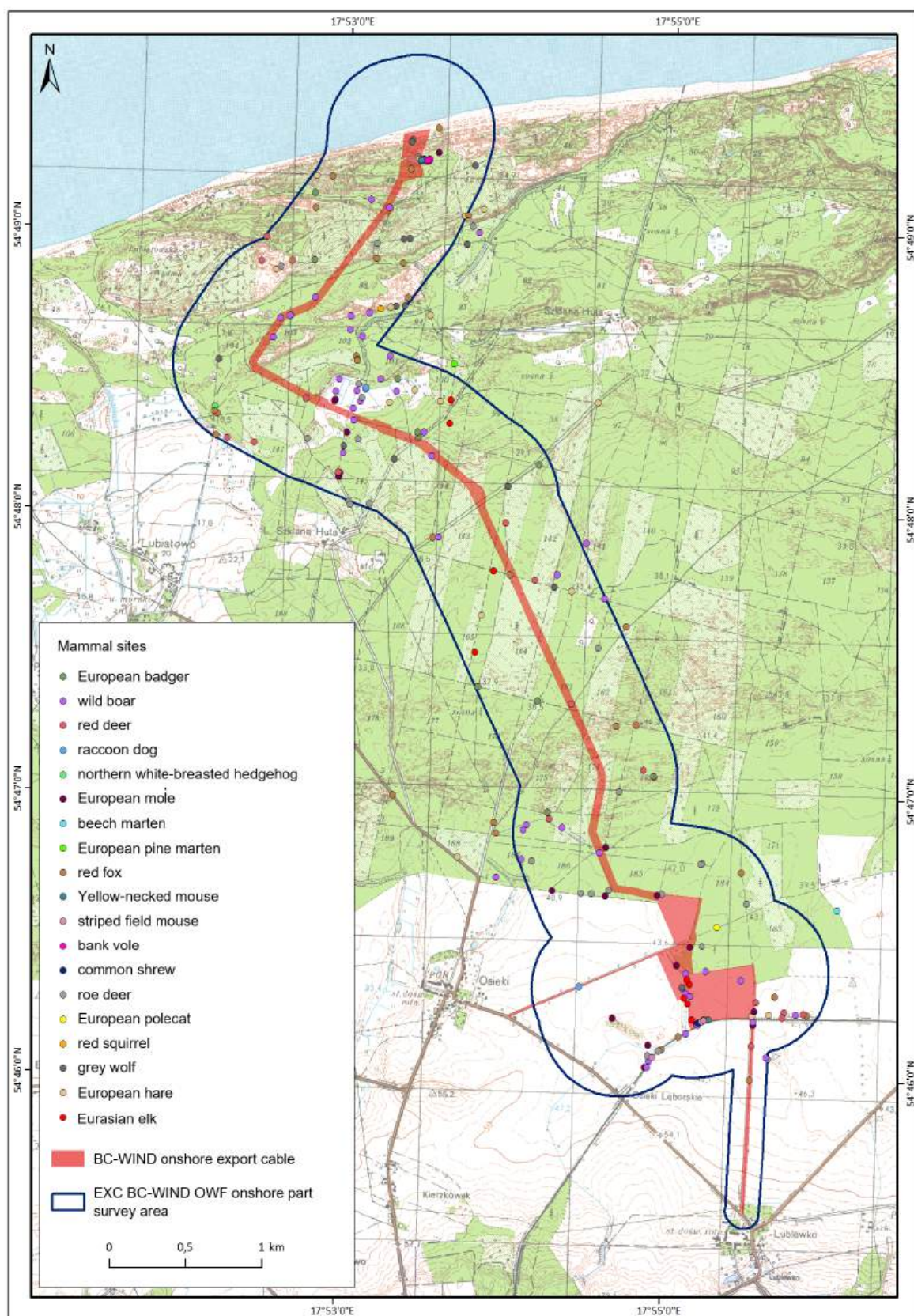


Figure 5.63. Location of habitats recognised as valuable for protected mammal species (excluding bats) [source: C-Wind Sp. z o.o. data]

The site of the grey wolf, understood as its habitat, received the highest value. In the area covered by the analysis, this species can find all natural elements necessary for its functioning, including a rich food supply. The remaining habitats, although meeting the requirements of the species occurring in the survey area, belong to habitats classified as rather average in terms of value. The advantage of the habitats in the area under analysis is their low level of anthropization.

5.21.5.10 Bats

The commonly occurring common and soprano pipistrelles as well as the common noctule were characterised as a group of species with low habitat requirements. The common northern bat, the Nathusius' pipistrelle, a group of mouse-eared bats unidentified as to the species and long-eared bats constitute species of medium value. The species of high value in the area are the possibly occurring greater mouse-eared bat, the pond bat and the Western barbastelle.

Due to very high activity at all transects and at the monitoring point, the *Population* parameter was rated at 2 points. No species of the highest nature conservation value were recorded. Transects T1, T2, T4, T5, T6, T9 and P1 were rated at 1 point for the *Species value* parameter. This parameter was rated at 0 points at transects T3, T7 and T8. With the exception of T8 and T9, all the transects are located within a large nature conservation area – the buffer zone of the Polish Coastal Landscape Park and the Coastal Protected Landscape Area. Point P1 as well as a part of transect T1 and transect T2 are located within the Natura 2000 site *Białogóra* (PLH220003). Additionally, transect T2 runs through the ecological area “Torfowisko in Szklana Huta”. The *Habitat* parameter was rated at 2 points for all transects, except for T9 which was rated at 0. Transects T1, T2, T4, T5, T6, T9 and point P1 were assessed as habitats of high nature conservation value, while transects T3, T7, T8 and T9 were assessed as of medium nature conservation value. No low value was assigned.

The map below illustrates the location of transects and the P1 monitoring point.

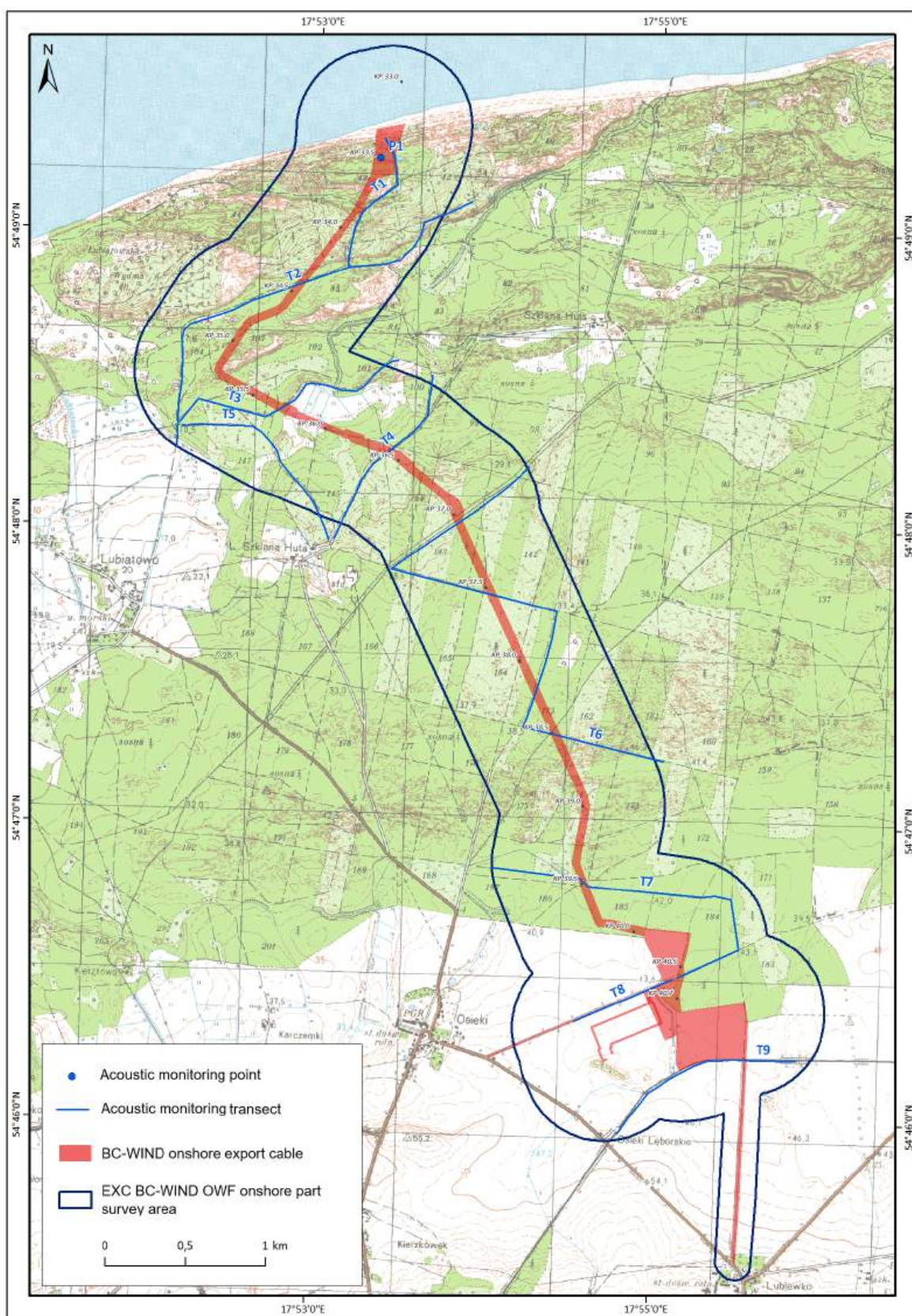


Figure 5.64. Locations of transects and the monitoring point [source: C-Wind Sp. z o.o. data]

Summing up, the results of the inventory survey conducted show relatively high biodiversity in the area of the proposed project. The greatest biodiversity occurs in the area of the *Wydmy Lubiatwskie* dunes and in the *Bezimienna* stream valley.

5.22 Cultural values, monuments and archaeological sites and objects

The Act of 23 July 2003 *on the protection and care of monuments* (consolidated text: Journal of Laws of 2014, item 840, as amended) is the legal basis regarding environmental characteristics in terms of cultural values, historic monuments as well as archaeological sites and objects.

Pursuant to Article 7 and Article 19 (1)(a) of the above-mentioned Act, the forms of monument protection are:

- entry into the Register of Monuments;
- entry into the List of Heritage Treasures;
- recognition as a historical monument;
- creation of a cultural park;
- establishment of protection in the local spatial development plan or in a decision on the location of a public purpose investment, a decision on land development conditions, a decision on a permit for the implementation of a road project, a decision on the location of the railway line or a decision on a permit for the implementation of a project such as a public airport.

Immovable monuments

An immovable monument is considered to be a part or all of the real estate with the features of a monument. In addition to buildings and structures, immovable monuments are also places commemorating historical events or the activities of great people or institutions. The Act also mentions cultural landscapes, urban and rural systems, defence constructions, technical facilities, cemeteries and parks.

The inventory of immovable monuments was carried out on the basis of the resources of the register of archaeological resources of the National Institute of Cultural Heritage [484].

Based on the information obtained, the immovable monuments included in the register of monuments of the Pomorskie Voivodeship Heritage Conservation Officer (PVHCO) and in the record of monuments (VRM – voivodeship record of monuments, CRM – commune record of monuments) located in a separate survey buffer around the planned project were identified. Moreover, the map and the provisions of the local spatial development plan were analysed in terms of objects or areas protected due to their historic value. Figure 5.65 presents the location of the planned project in relation to the layout of immovable monuments under conservation protection.

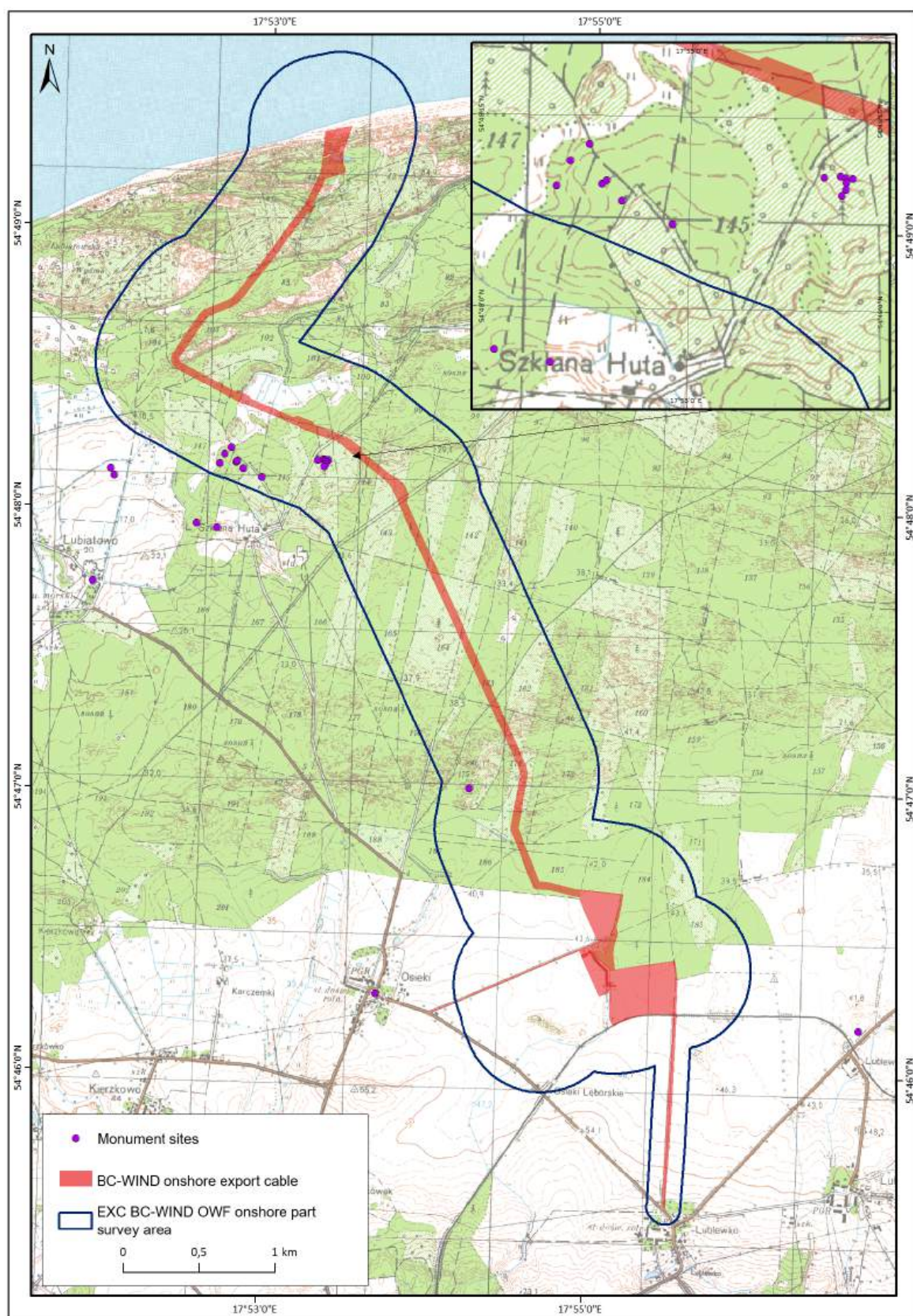


Figure 5.65 Location of the EXC BC-Wind OWF in reference to the immovable monuments [source: internal materials based on the Archaeological Monument Record Sheets]

According to the information obtained, none of the immovable monuments is located within the boundaries of the planned project. Furthermore, the closest immovable monuments are located in the vicinity of the village of Szklana Huta at a distance of over 100 m west from the boundary of the planned project impact area. These are 6 monuments entered into the record of monuments, and 3 immovable monuments entered into the register of monuments. Table 5.19 presents a list of immovable monuments located closest to the planned project.

Table 5.19. List of immovable monuments located in the closest vicinity of the planned project impact area [source: internal materials on the basis of data from the National Institute of Cultural Heritage]

Name, site	Form of protection	Description
Kierzkowo, site 21	Record of monuments	Historical village
Lubiatowo, site 1	Record of monuments	dune
Lubiatowo, site 7	Record of monuments	Historical village, mentioned in historical sources in 1437
Osieki, site 1	Record of monuments, Register of monuments: C-349 (272/A)	Barrow burial site: 9 mounds
Osieki, site 10	Record of monuments	Barrow burial site: 2 barrows
Osieki, site 2	Record of monuments, Register of monuments: C-350 (273/A)	Barrow burial site: 7 barrows
Osieki, site 9	Record of monuments	Motte-and-bailey castle
Starbienino, site 6	Record of monuments, Register of monuments: 323/Archeol.	Burial site, Early Iron Age
Szklana Huta, site 1	Record of monuments	Glassworks, 18th–20th century Modern era

The above-mentioned monuments are examples of the monuments of regional culture characteristic of this region, i.e. a residential building of the so-called Pomeranian house type, made of red bricks on a stone foundation and a stone farm building. The manor park, on the other hand, is a remnant of the former manor and farm complex in Osieki (Osseck, Ossecken), the first records of which date back to the end of the 13th century. The manor house itself was destroyed and in 1964 it was decided to demolish it. The farm that has remained is now privately owned.

Other monuments identified in other towns are located more than 1 km (Lubiatowo) and more than 1.5 km (Osieki) from the boundaries of the planned project, outside the impact area.

Pursuant to Resolution No. XLVII/359/2022 of the Choczewo Commune Council of 29 March 2023 on the amendment of the Study of Conditions and Directions of Spatial Development of the Choczewo Commune in part 2 it was agreed that:

- The rural layout of the village of Osieki Lęborskie is planned to retain strictly its layout and structure and to be included in the exposure protection zone
- The grange complex in the village of Osieki Lęborskie (a granary from the 2nd half of the 19th century, an outbuilding from the turn of the 19th and 20th centuries and a manor park from the 2nd half of the 19th century) is planned to retain strictly its layout and structure;
- Residential buildings no. 5, 7, 12, 13 and 14 in the village of Osieki Lęborskie (from the 2nd half of the 19th century and the 1st half of the 20th century) are planned to retain their layout and structure due to their historical and cultural value;
- The forester's lodge in Szklana Huta, the complex of school buildings as well as building no. 2 and residential buildings 12 and 28 in Lubiatowo are planned to retain their layout and structure due to their historical and cultural value;

- The park and cemetery in Osieki Lęborskie planned to retain their layout and structure due to their historical and cultural value.

Archaeological monuments

An archaeological monument is any trace of human activity in the ground or under water, the preservation of which is in the public interest because of its historical, artistic or scientific value. Archaeological monuments can be both movable and immovable.

Archaeological sites and objects listed in the Pomorskie Voivodeship register of historical monuments and in the archaeological (conservation) protection zone, located in areas in which archaeological sites can be found, are under archaeological protection.

The location of archaeological sites was determined on the basis of the Study of Conditions and Directions of Spatial Development of the Commune, amended in 2022.

Table 5.20 presents the archaeological sites located in the area of the planned project impact and in its nearest vicinity, up to 200 m from the border of the planned project impact area.

Table 5.20. Archaeological sites located in the area of the planned project impact and in its nearest vicinity, up to 200 m from the boundary of the planned project impact area [source: internal materials on the basis of data from the National Institute of Cultural Heritage]

AZP area	Site number in the AZP*	Village/town in the AZP	Function	Chronology	Object description	Location: village/town, precinct and survey plot numbers	Distance from the planned project impact area boundary [m]	Form of protection
2-37	11	Kierzkowo	1. Settlement 2. Traces of settlement 3. Settlement	1. Early Iron Age 2. Late La Tène Period 3. Early Middle Ages	1. ceramic pieces with cereal grain impressions 2. ceramic pieces 3. ceramic pieces, iron products and slags, flint and stone products, chunks of amber, animal bones	Lubiatowo, precinct: Kierzkowo, plot no. 292–298, 312, 313	43	WEZ
2-37	9	Kierzkowo	Barrow burial site	unidentified	At least 10 earthen mounds, approx. 7–14m in diameter and 0.5–1.3m high, with traces of stone mantles	Szklana Huta, precinct: Kierzkowo, plot no. 319, 320, 321	0	Site entered in the register of historical monuments on 23.03.1976 under no. 273/Archeol. It has been assigned a new register number in book C: C-350
2-37	8	Kierzkowo	Barrow burial site	Bronze Age, Lusatian culture	At least 16 earthen mounds, approx. 5–12 m in diameter and 0.5–1m high, with traces of stone mantles	Szklana Huta, precinct: Kierzkowo, plots no. 321, 322	> 160	Site entered in the register of historical monuments on 23.03.1976 under no. 272/Archeol. At present it has been assigned a new register number in book C: C-349
2-37	12	Kierzkowo	Motte-and-bailey castle	Early Middle Ages	A defensive structure on a morainic plateau measuring approximately 30–35 m, with a shallow moat and a rampart approx. 1.3–1.6 m high	Osieki Łęborskie, precinct: Kierzkowo, plot no. 338	145	WEZ

An archaeological site (no 11 in AZP), which is a settlement with Neolithic, La Tène and early Middle Ages traces, is located at km 34+800 of the planned project route, at a distance of 57 m north of the planned project route (partially within the boundaries of its impact area).

The route of the planned project passes through an archaeological site (no. 9 in AZP), which is a barrow burial site from an unknown period, along a section of approximately 320 m from km 36+580 to km 36+900.

An archaeological site (no. 8 in AZP), which is a Lusatian culture barrow burial site from the Bronze Age, is located at km 36+000 approximately 160 m south from the boundary of the planned project impact area.

At km 39+100, at a distance of approximately 160 m west, an archaeological site (no. 12 in AZP), which is a motte-and-bailey castle from the early Middle Ages, is located.

Figure 5.66 presents the location of archaeological sites in the area of the planned project impact (up to 200 m from the boundary of the planned project impact area).

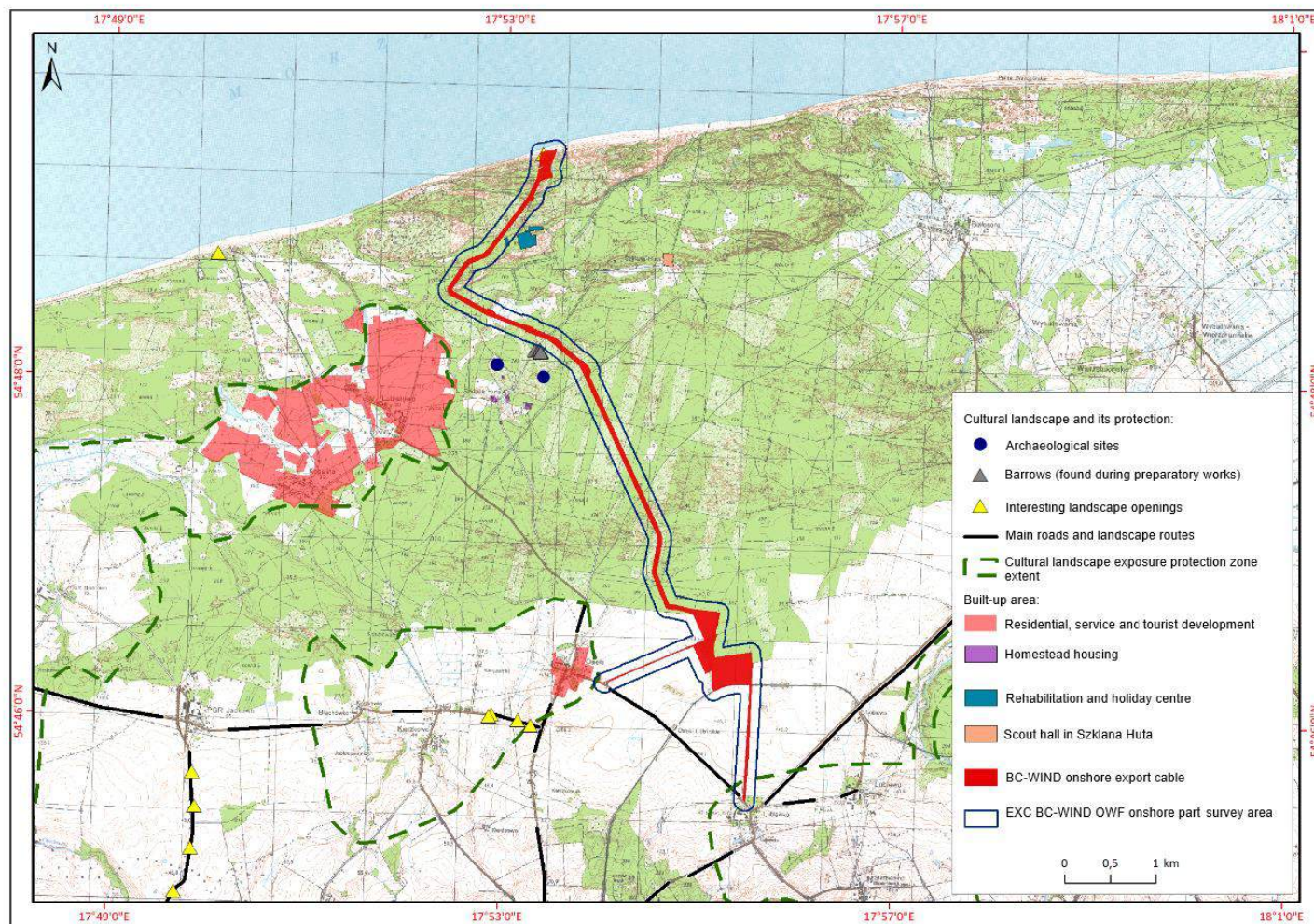


Figure 5.66. The location of archaeological sites in the area of the planned project impact and its closest vicinity [source: internal materials based on the data from Report XXX and the amendment of the Study of the Choczewo Commune]

An archaeological site listed in the register of historical monuments is in conflict with the route of the planned project.

The planned project is in conflict with the archaeological site no. AZP 2-37/9, within which the presence of 9 barrows was confirmed, however, the course of the planned project route was delineated in a way to avoid the barrows inventoried [Figure 5.67]. It is likely that the Project Owner will be obligated by the Pomorskie Voivodeship Heritage Conservation Officer to conduct non-invasive archaeological surveys within the AZP 2-37/9 archaeological site, based on which the Pomorskie Voivodeship Heritage Conservation Officer will issue an opinion in reference to possible intersection methods (an open trench or trenchless method).

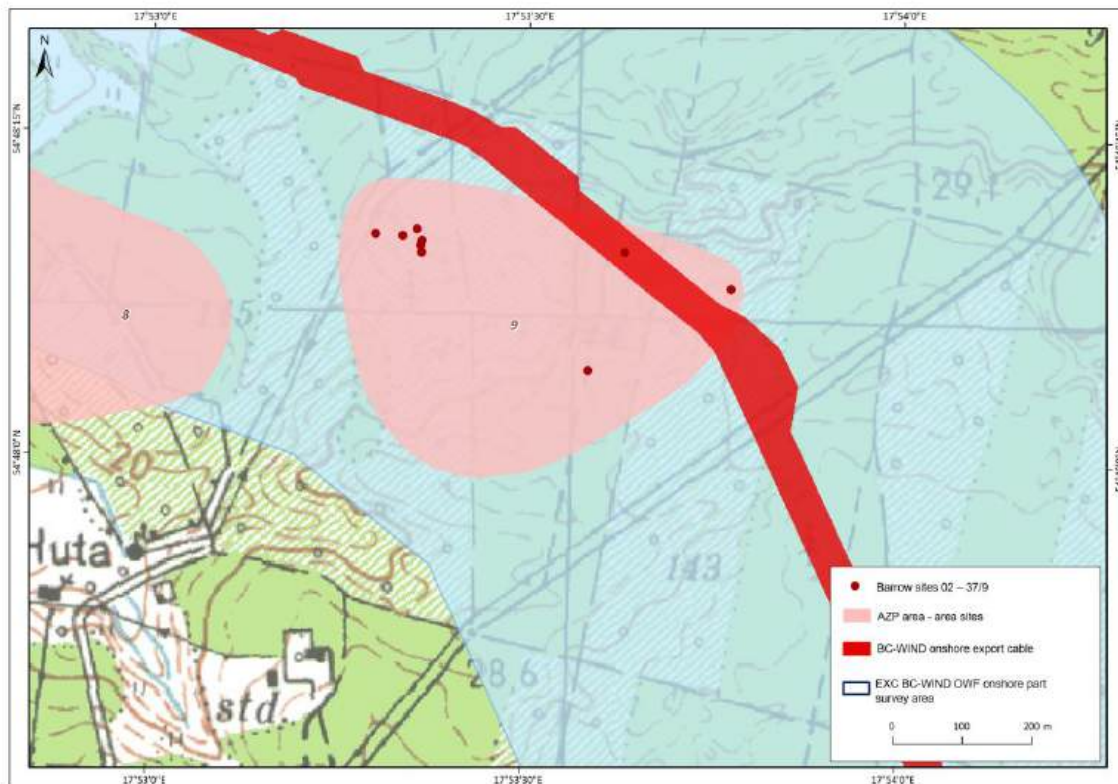


Figure 5.67. The barrows inventoried within the archaeological site 2-37/9 [source: internal materials based on the Archaeological Monument Record Sheet AZP 2-37/9 of the Pomorskie Voivodeship Heritage Conservation Officer]

Pursuant to Article 7(4) of the Act of 23 July 2003 on the protection and care of historical monuments (consolidated text: Journal of Laws of 2021, item 710, as amended), the arrangements of the local spatial development plan are also regarded as a form of conservation protection. Neither the archaeological site through which the planned project route passes, nor the archaeological sites in the closest vicinity of the impact area boundaries (up to 200 m) are included in the findings of the local spatial development plan.

The Study (2022 amendment) states that one of the main risks for the areas of the sites and the archaeological protection zones are “*earthworks, which might cause disturbance and damage to layers and archaeological objects deposited below the ground surface. Those include: subdivisions, development, drainage, waterworks, gas pipelines, and sewage systems. Tree clearing and forest ploughing might pose a risk for areas located in forests.*”

The archaeological site, through which the route of the planned project passes, is listed in the register of monuments. In accordance with the amended study, archaeological sites listed in the

register of monuments are under strict conservation protection, which means that no investment nor economic activity associated with soil structure disturbance, especially tree clearing, can be carried out (p. 102, of the study). “For archaeological sites with their own landscape form, such as barrow burial sites and gords (Lublewo, Kopalino, Szklana Huta), intended for permanent protection, it is forbidden to invest in their area and in the area directly adjacent to them. *Within the amendment scope of the Study no. 2: it is forbidden to invest and carry out work causing soil structure disturbance in the area of strict and full conservatory protection of archaeological stations, as well as to transform topographic forms within their area and in the area directly adjacent.*”

According to the study, barrows and barrow burial sites are of particular importance to the commune’s cultural landscape, and should be marked and authenticated in the area (information boards).

Preliminary archaeological surveys within the plot 105/4, Lublewo precinct, Choczewo commune were carried out between September and October 2022. The work was carried out in accordance with the decision of the Pomorskie Voivodeship Heritage Conservation Officer of 11 August 2022, document no. ZA.5161.667.2022.SS. Maciej Marczewski was the head of surveys. Preliminary surveys of rescue type were associated with the construction of the EXC BC-Wind OWF infrastructure, complete with a set of devices for power evacuation. Initially, the plot 105/4, Lublewo precinct was under archaeological supervision, however, archaeological objects were discovered during work, which caused the need to designate an archaeological site there.

A total of 430 areas were surveyed during works. 78 archaeological objects were discovered during the surveys, including 32 objects classified as hearths, 39 objects classified as caves, 6 objects classified as post-holes and one classified as an aggregation of ceramics. Movable heritage assets allowed dating 21 objects to a time period associated with the Lusatian culture. The hearths were very clearly legible, both in projection and in profile. In the case of caves and post-holes, the vast majority was poorly legible in projection, often with blurred boundaries. The objects didn’t follow clear spatial layouts, they are scattered. Slightly larger density was observed in the western part of the area surveyed. 307 movable heritage assets, represented by 306 fragments of ceramics that can be associated with the Lusatian culture, were discovered during exploration of objects. Moreover, an iron object of undefined function was found. Detailed information on the archaeological surveys carried out for this Report are provided in Appendix 2.

5.23 Use and management of land and tangible property

Main types of land use are:

- forests;
- waterlogged meadows in the *Bezimienna* stream valley;
- arable lands within the ONS;
- local road (Spacerowa street) and fire break lanes;
- surface waters (watercourses and small water reservoirs).

In summer, these areas are visited by a great number of tourists. A street runs there (Spacerowa street) which leads along the *Wydmę Lubiatowskie* dunes in the eastern direction. It is a part of a tourist trail. A red tourist trail and a bicycle path runs through the impact area and the route of the planned project opposite the Szklana Huta village, at km 36+400. The areas, across which the project will run, belong to the 46th Missile Air Defence Battalion, formed in 1971 and dissolved on 28 December 2001. At present, a rehabilitation and holiday centre for disabled people is located there (38 Spacerowa Street, Lubiatowo), constructed on the premises of a former military unit.

Moreover, in the vicinity of the planned project, a fire observation tower is located. It belongs to the State Forests and is used for the observation of fire hazards in the area of the Choczewo Forest District.

There are two areas included in the findings of the local spatial development plan located in the planned project impact area:

- the area of the rehabilitation centre for disabled people, at km 43+400 covered by the arrangements of the local spatial development plan adopted by Resolution No. IX/76/2007 Choczewo Commune Council of 13 September 2007 on the enactment of the local spatial development plan in the Lubiatowo region, Kierzkowo precinct, in the Choczewo commune. The route of the planned project runs at a distance of approximately 10 m from the boundary of the area covered by the plan arrangements. Areas with planned functions (forest and single family housing areas) are located within the planned project impact area;
- the route of the planned project, in its southern section, runs through terrains covered by the arrangements of the local spatial development plan adopted by Resolution No. XIV/144/2008 Choczewo Commune Council of 19 March 2008 on the enactment of the local spatial development plan „Wiatraki w Lublewie” [Wind turbines in Lublewo] in the Choczewo commune. The route of the planned project passes through a section of approximately 70 m along the edge of areas with an agricultural function along the edge of agricultural lands, then it crosses a public road at km 40+550 and continues up to km 40+780 through a forest area. The ONS area as well as the 400 kV line area, are located on agricultural lands.

5.24 Landscape, including the cultural landscape

In the onshore area, the planned project is located within the landscape of lowlands as well as valleys and depressions. The northern part of the planned project is located within an aeolian lowland landscape of a hill-like type. The central part lies within a deltaic-accumulative landscape of valleys and depressions and a fluvioglacial lowland landscape of a plain and undulating type. On the other hand, the southern part of the planned project lies within the area of a glacial lowland landscape of a hill-like type. The glacial lowland landscape is characterised by significant height differences, changeable terrain slopes and varied relief as well as a strongly developed hydrographic network with numerous wetlands, marshes, smaller watercourses and lakes. In the case of the hill-like type, clay-illuvial, brunic and brown soils prevail, which determinate the presence of mixed coniferous forests and oak-hornbeam forests. In the case of the planned project, this landscape is mainly determined by significant surface areas of arable land of diversified relief.

The landscape of the fluvioglacial lowlands occurs in patches in the glacial and periglacial landscape. These are mainly outwash fans of poor soils, in large part covered with coniferous forests. In the case of the planned project, this landscape is mainly determined by the river *Chetst* with a network of channels and smaller watercourses within their vicinity as well as extensive pine forests.

The aeolian lowland landscape is characterised by the presence of aeolian hills in the form of parabolic and embankment-like sandy dunes. In the case of the planned project, this landscape is determined mainly by extensive areas of pine forests on dunes. The most valuable element determining the aeolian landscape of the planned project area is the *Wydma Lubiatowska* dune.

The landscape of valleys and deltaic-accumulative depressions occurs in the area of large river estuaries, where the material carried by the river is deposited and blocks the free outflow of water, which results in smaller, lateral troughs in the deposited material. These areas are overgrown mainly with riparian forests. Due to the presence of very fertile soils (alluvial soils), the deltaic landscapes are dominated by intensive agriculture. In the case of the planned project, this landscape is determined mainly by the *Biebrowski* canal and the *Lubiatówka* stream with a network of channels and smaller watercourses with agricultural fields visible in the area as well as extensive pine forests and waterlogged areas.

Considering the physical and geographical regionalisation of Poland [228], the planned project is located in the Słowińskie Coast and the Choczewo Upland.

5.24.1 Słowińskie Coast

The Słowińskie Coast is a narrow strip of land along the Baltic Sea coast, and its main landscape elements include beaches, coastal dunes, coastal swamps and lakes as well as elements of post-glacial relief. The landscape visible there is determined mainly by the reciprocal interaction of the sea and land (i.e., abrasive processes, shoreline evolution as a result of wave motion and wind activity, or accumulation of sediments), as well as intensive human activity (i.e., tourist traffic, coastal reinforcement works, erection of harbour facilities) [228].

5.24.2 Choczewo Upland

The Choczewo Upland is a region, in which 100 MASL are exceeded locally. This area is covered by many upland mounds divided by depressions and post-glacial valleys. There are numerous lakes and a relatively extensive network of smaller watercourses and channels in the depressions between upland mounds. The entire Choczewo Upland area is characterised by a mosaic of arable fields and woodlands. The anthropogenic elements which significantly influence the landscape of the Choczewo Upland include the remains of an unfinished nuclear power plant in the area of Lake Żarnowieckie (north-eastern part of the Upland) and the Żarnowiec Hydroelectric Power Plant constructed in the vicinity.

In accordance with Corine Land Cover 2018, the planned project runs mainly across forest areas and semi-natural ecosystems, and to a small degree across agricultural areas. The arable lands are visible in the area of the designed ONS – the landscape of these lands should be considered culturally disharmonious, where the human activity relatively strongly transforms the landscape of the surrounding area. Forest areas are located along the entire route of the underground cable line – the landscape of these areas should be considered as naturally and culturally harmonious.

The Act of 23 July 2003 on the protection and care of monuments (Journal of Laws of 2003, No. 162, item 1568, as amended), determines the cultural landscape as a space, which contains natural elements and artefacts of civilisation, historically shaped under the influence of natural factors and human activity. Historical elements of major importance from the point of view of the cultural landscape in the vicinity of the planned project are archaeological sites in the form of cemeteries (Osieki Lęborskie 1 and Osieki Lęborskie 2) near the Szklana Huta forester's lodge. During excavation works carried out in the 1970s several stone box graves from the Iron Age (650–125 BC) were found there. Moreover, in the village of Osieki Lęborskie, an object entered into the Voivodeship Register of Monuments is located – a Roman Catholic Church of the Saint Mary's Star of the Sea (former Evangelic Church) including a church graveyard.

The planned project will be located within the area of the Coastal Protected Landscape. The applicable legal act is the Resolution No. 458/XXII/12 of the Pomeranian Voivodeship Regional Assembly of 25 July 2016 on the protected landscape areas in the Pomorskie Voivodeship, which

includes the provisions resulting from the landscape protection needs. The Coastal Protected Landscape Area encompasses, first of all, the coastal zone represented by the dune spits and organogenic accumulation plains. This area is characterised by very high landscape values due to the strip-like arrangement of moraine uplands, extensive coastal plains, dunes, beaches and the seashore. The significant problems of this area include increased tourist traffic, which overstrains the natural environment, mainly in places of intensive recreational and tourist investments, i.e. in the area of Karwia, Białogóra or Ostrowo [349].

In accordance with the Study of Conditions and Directions for the Choczewo Commune Spatial Development (Resolution No. XXVIII/220/2021 of the Choczewo Commune Council adopted on 26 January 2021), the planned project does not run across natural and cultural landscape exposure protection zones, viewing axes, exposition fields or in the vicinity of viewing points. In the area of the shoreline, the planned project runs in direct vicinity of a viewing axis.

5.25 Population and living conditions of people

In 2020 the total number of inhabitants in the Choczewo commune amounted to 5495 people, which constituted 0.23% of the residents of the Pomorskie Voivodeship and 2.52% of the residents of the Wejherowo district. The Choczewo commune is the smallest commune in the Wejherowo district. On the voivodeship level, the Choczewo commune is considered very small, taking 38th place in terms of size, counting from the smallest commune (out of 124 communes in the voivodeship). Fluctuations in the number of inhabitants of the commune are caused by a negative balance in migration, as well as from a relatively high birthrate resulting from, i.a. large family model, traditional in the region.

The planned project is located mainly in forest areas, while the ONS, as well as the 400 kV line are to be located on agricultural lands.

The area of the rehabilitation and holiday centre for disabled people (38 Spacerowa Street, Lubiatowo), where occupational therapy workshops for disabled people are held, is located within the planned project impact area. The Anna Dymna's "Against the Odds" Foundation and disabled parking [Figure 5.66].

There are no built-up areas within the planned project impact area. There is a scout hall owned by the Polish Scouting and Guiding Association located more than 1 km east. The residential home *Dom Seniora Osieki Sp. z o.o.* is located in the area of the planned ONS, within 736 m west from the boundary of the planned project impact area.

Built-up areas closest to the planned project:

- village of Osieki Lęborskie – more than 0.7 km west of the boundary of the planned project impact area;
- village of Lubiatowo – more than 300 m south-west
- village of Osieczki – more than 1.5 km east.

Single residential homestead housing in Szklana Huta, a part of the village of Lubiatowo, is located at a distance of 450 m from the planned project route.

The village of Lubiatowo is a former agricultural settlement, which nowadays serves as a summer resort. The main sectors of the commune economy are focused on tourism, agriculture and services of various types. Agriculture is the dominant business activity. Agricultural holdings and entities operating around agriculture, including tourism, constitute the economic potential of the commune.

The village of Osieki Lęborskie is a former Kashubian settlement, under the Kierzkowo village council office. It is located near the suspended route of the Wejherowo-Choczewo-Lębork railway line.

The village of Osieczki is a Kashubian settlement, which does not have a village administrator, belongs to the Osieki Lęborskie council office, and is a former State Agricultural Enterprise.

6 MODELLING AND ANALYSES PERFORMED FOR THE PURPOSES OF THE PROJECT IMPACT ASSESSMENT

A summary of the modelling and analyses performed for the purposes of this EIA Report is summarised below and attached as appendices thereto.

6.1 Acoustic analysis

An acoustic analysis was performed for the proposed Onshore Substation, which is the only element of the Connection Infrastructure that generates noise during the operation phase of the EXC BC-Wind OWF. The noise analysis was carried out in two variants: the primary variant covering emissions from the EXC BC-Wind OWF ONS, and a cumulative variant additionally covering emissions from the other transformer stations located in the immediate vicinity. As part of the analysis, an inventory survey was performed, covering noise sources at the ONS as well as acoustically protected areas.

The results of the analyses indicate that in accordance with the Regulation of the Minister of the Environment of 14 June 2007 *on permissible noise levels in the environment* (consolidated text: Journal of Laws of 2014, item 112), the levels of noise generated at the ONS during the EXC BC-Wind OWF operation phase do not exceed permissible levels in protected areas, both in the case of standalone operation on its own and in the cumulative scenario, accounting for the operation of transformer stations of other project owners.

As a result of the ONS design progress, equipment with lower sound power levels were designed in comparison with the sound power levels considered in the modelling [Table 6.1]. Only in the case of reactors is the actual sound power 2 dB higher than the values modelled. The reduction in sound power levels on the remaining equipment is higher, the highest value being 13 dB for the generator and 8 dB for the continuous operation equipment related to the STATCOM cooling system. Thus, the actual noise levels from the EXC BC-Wind OWF ONS will be lower than those indicated in the model calculations, both in the case of standalone operation and in the cumulative scenario, which accounts for the operation of transformer stations of other project owners.

Table 6.1. Comparison of the modelled values of acoustic power levels L_{WA} with the actual characteristics of the equipment designed at the EXC BC-Wind OWF ONS [source: internal materials].

No.	Type of device / facility	Name of device	Type of operation	Sound power level L_{WA} [dB]		Change
				modelled	actual	
1	400 kV power transformers	OW 2 transformer OW 3 transformer	continuous	85	80	decrease
2	reactors	OW 6 reactor OW 7 reactor	continuous	85	87	increase
3	STATCOM power transformers (220 kV)	STATCOM power transformer 1 STATCOM power transformer 2	continuous	85	80	decrease
4	STATCOM cooling systems	STATCOM 1 cooling systems STATCOM 2 cooling systems	continuous	93	85	decrease
5	STATCOM buildings	OW 4 STATCOM OW 5 STATCOM	continuous	75	75	no change

No.	Type of device / facility	Name of device	Type of operation	Sound power level L_{WA} [dB]		Change
				modelled	actual	
6	generator	OW generator	1 hour during daytime	97	85	decrease
7	infrastructure building	OW 8 sum infrastructure building (ventilation and air conditioning)	continuous	75	75	no change
8	harmonic filters	OW 1 400 kV filter	continuous	90	85	decrease

Details regarding the acoustic analysis method and the results obtained are presented in Appendix 3.

6.2 Electromagnetic field modelling

Power cables buried in the ground are sources of electromagnetic field, which in certain situations, at significant values of intensities of individual field components, may negatively affect the environment and human health.

Cables are not sources of electric field. Its normal (radial) component disappears completely due to the presence of a semi-conductive screen surrounding the copper or aluminium phase wire, and a conductive screen surrounding the electrical insulating sheath.

On the other hand, the electric current flowing through the phase wire is a source of magnetic field with relatively high values. The value of this field is mainly determined by the depth at which the cable line is laid underground and by the distances between the individual conductors (phases) forming the electrical circuit (cable run) as well as – in the case of several cable lines laid in close proximity to one another – by the configuration of the phases in the individual three-phase cable lines.

According to the Regulation of the Minister of Health of 17 December 2019 *on the permissible levels of electromagnetic fields in the environment* (Journal of Laws 2019, item 2448), the intensity of the magnetic field (for an electromagnetic field with a frequency of 50 Hz) should not exceed the permissible value of 60 A/m.

For the purposes of this Report, the distribution of magnetic field strength was modelled for both the cables between the OSSS and ONS (in the onshore part) and for the cables between the ONS and the Choczewo Substation.

The results obtained clearly show that even at the maximum load of the EXC BC-Wind OWF cable lines, the permissible value (60 A/m) for the magnetic field at 50 Hz is not exceeded in any case at any height, and the expected maximum values at 2.0 MAGL are several times lower than the permissible value. This means that the presence of people (environmental exposure) is allowed without time limits, even directly above the cable line, irrespective of the cable line section analysed.

Details of the analysis and its results are included in Appendix 4.

6.3 Modelling of thermal impact of cable lines

High-voltage cable power lines buried in the ground are heat sources. The extent of the thermal impact of typical underground structures involving power cable lines is caused mainly by power losses in the phase conductors and dielectric losses in the main insulation. The heat flux generated by individual power losses flows into the immediate surroundings upon an increase in cable temperature above the ambient temperature. The extent of the thermal impact depends mainly

on the technical parameters of the cable lines, the method and depth of their laying, the magnitude of the external temperature fields from other heat sources and the thermal parameters of the ground.

The results obtained from the model calculations indicate the occurrence of thermal impact when all cable lines are under full load. The impact is limited. Characteristic boundary isotherms at a level of 50°C and 60°C occur in the area directly adjacent to the surface of the cable lines.

Under extremely unfavourable hydrogeological ground conditions, the temperature field generated in the ground can cause drying of the ground in the direct vicinity of the cable system, which may result in moisture migration consistent with the direction of the heat flux originating from the cables. It is assumed that this phenomenon may be local in nature.

The cable lines in the outermost circuits demonstrate the lowest temperature values, which has a significant impact on minimising the extent of horizontal impact on adjacent areas. The greatest cumulative heat impact occurs in the inner circuits, and their central cables reach the highest temperature values.

Cables with XLPE insulation have a maximum long-term operating temperature of 90°C and this is their technological limitation. Under normal operating conditions, all cable lines will operate below the temperature in question. Only temporary temperature exceedances are allowed, associated with short-term overload or short-circuit conditions that are automatically suppressed by protection automation systems. These are transient states, not taken into account in the thermal calculations, particularly in the determination of the thermal impact of the cables on the environment.

The cables will be operated below the long-term operating temperature limit (90°C). The calculation results present the maximum extent of the thermal impact under the conditions indicated, assuming full power generation. The specificity of offshore wind farm operation does not assume full generation in a continuous manner but will depend on the wind speed at any given time. This may result in fluctuations in the operating temperature of the cable lines, within temperature ranges equal to or lower than those demonstrated in the calculations.

Detailed information on the method of calculating the thermal conditions around the cable lines for both the cables between the OSS and the ONS (in the onshore part) and for the cables between the ONS and the Choczewo Substation, along with the results obtained, are presented in Appendix 5.

6.4 Navigation analysis for the EXC BC-Wind OWF

For the purpose of this EIA Report, a navigation analysis was performed, which assessed the impact of the activities associated primarily with the EXC BC-Wind OWF construction phase on the existing vessel traffic in the area of the planned works. The analysis also indicated risks of major accidents or natural and construction disasters, together with defined actions aimed at their prevention through the implementation of various design, technological and organisational safeguards.

Details of the analysis and its results are included in Appendix 6.

6.5 Modelling of suspended solids dispersion

For the purpose of this EIA Report, an analysis was performed to determine the concentrations of suspended solids in the water column, along with their dispersion and deposition on the seabed during the Export Cable of the BC-WIND Offshore Wind Farm works. Modelling was carried out for

various burial methods applicable to connection infrastructure power cables, including ploughing, jetting, as well as mass flow excavation in cohesive and non-cohesive soils.

As the analysis demonstrated, none of the cable burial methods (i.e. non-displacement ploughing, displacement ploughing, or jetting) will cause dangerous and irreversible changes to the environment, considering their short-term and localised impact. Increasing the speed of the cable laying vessel increases the concentration and the scope of impact of suspended solids. Speed is a factor that enables controlling, to a certain extent, the disturbing effects of suspended solids on the environment.

Taking into account the results of the calculations carried out for the underwater work technologies considered within the area discussed, it can be concluded that the most intrusive method impacting the marine environment will be mass flow excavation during the excavation works in the locations of directional drilling, whereas the method with the least impact on the environment will be cable laying by non-displacement ploughing.

Details of the analysis and its results are included in Appendix 7.

7 DESCRIPTION OF THE ENVIRONMENTAL IMPACTS PREDICTED IN THE CASE THE PROJECT IS NOT IMPLEMENTED, TAKING INTO ACCOUNT THE AVAILABLE INFORMATION ON THE ENVIRONMENT AND SCIENTIFIC KNOWLEDGE

The implementation of the project is necessary to integrate the power generated in the BC-Wind OWF into the National Power System. The issue should be considered together with the issue of failing to develop the BC-Wind OWF, for which a decision on the environmental conditions has already been issued approving the project implementation. If the project is not implemented, the development of the BC-Wind OWF is also groundless, which means that joining the wind farm development programme in the Polish sea areas would be impossible.

The BC-Wind OWF, along with its transmission infrastructure, is a project of strategic importance for the diversification of energy sources. This project is a tool for achieving a range of political and economic objectives, the most important including:

- the reduction in emissions of air pollutants, including greenhouse gases, to stop climate change and improve the quality of human life and health. The development of the BC-Wind OWF alone would result in avoidance of significant emissions of hazardous substances into the atmosphere. Assuming the use of 45% of its power output and 25 years of operation, the 500 MW BC-Wind OWF could generate 55.85 TWh/201.05 PJ of electricity, thus avoiding the emission of over 20 million Mg CO₂, over 270 million Mg SO₂, approximately 37 thousand Mg of nitrogen oxides and more than 0.625 million Mg of particulate matter from lignite-fired power plants (BC-Wind OWF calculations based on [108]);
- the sustainable economic development of Europe and Poland based on energy security achieved among others through diversification of energy sources. In accordance with the assumptions used, over time, the Polish Offshore Grid would gain the opportunity of integrating with subsea grids of other Baltic Sea states, thus enabling transboundary power transmission. This is of high importance for improving the energy security and the reliability of the power supply in the northern regions of Poland as well as in the seaside areas of other Baltic Sea states. Integrating the power transmission systems of the Baltic Sea states is one of the strategic economic objectives mainly for the reasons of the security of energy supply.

Failure to implement the project would lead to numerous consequences for the environment in the field of natural, social and economic conditions. Failure to implement the project in combination with other offshore wind farms in the long-term would mean abandoning the option of using an alternative source of electricity with a significant power output (covering over 7% of national electric power demand), which would require a compensation through exploitation of conventional sources with a similar power output, along with the emissions of gaseous and particulate pollutants from combustion of fuels (hard coal or lignite), the generation of approx. 20% of waste from combustion in relation to the amount of the fuel combusted, and indirectly with the effects of environmental changes in the areas where fossil fuels are extracted.

The lack of opportunities for the wind power industry development as an element of increasing the flexibility of the national power system will slow down the diversification of the energy mix and will result in maintaining its dominant proportion of emission sources. Failure to implement the project in combination with the BC-Wind OWF is likely to significantly reduce the chance of

meeting the targets for reducing greenhouse gas emissions and increasing the proportion of renewable energy sources by Poland.

The implementation of the EXC BC-Wind OWF will be associated with various impacts on the onshore and offshore environment. Taking a direct approach, the abandonment of the project will eliminate the anticipated impacts and no impacts on biotic and abiotic components of the environment will occur. They would also be excluded from the pool of cumulative impacts, thus reducing their scale, range and environmental impact in the overall calculation. The abandonment of the EXC BC-Wind OWF implementation will also result in the absence of restrictions on the availability of these areas (in all phases of the project) to the existing and potential, new users. It should be stressed, however, that the potential impacts of the project have been mostly assessed as moderate, low and/or negligible. Thus, the environmental, social and economic benefits resulting from the project implementation greatly outweigh potential damage to the environment which might occur as a consequence of its implementation.

8 PROJECT IMPACT IDENTIFICATION AND ASSESSMENT

8.1 Applicant Proposed Variant (APV)

8.1.1 Construction phase in the offshore part

8.1.1.1 Impact on geological structure, seabed relief, seabed sediments and access to raw materials and deposits

A significant aspect of the assessment of the project impact on the processes taking place on the seabed and the seabed itself is to determine the magnitude and extent of the impact. The impact could be considered significant if the change to the character of the surface and the structure of the seabed was greater than the size of geomorphological features present on the seabed. The impact range described as local, in geological and geomorphological terms, refers to local or linear changes in the topography and structure of the seabed and does not extend beyond the size of the features present on the seabed.

The receptor sensitivity is assessed on a five-step scale in accordance with the descriptions included in Table 8.1.

Table 8.1. Sensitivity of seabed topography and structure to impacts resulting from the activities associated with the EXC BC-Wind OWF construction [Source: internal materials]

Sensitivity	Description
Irrelevant	No changes in the topography and structure of the seabed or changes similar to the ones observed caused by natural processes
Low	Changes noticeable, but not altering the character of the topography and structure of the seabed; local range
Moderate	Changes noticeable, altering the character of the topography and structure of the seabed to a degree not affecting the general character of the area; local range
High	Changes affecting the topography and structure of the seabed, altering its character and affecting processes taking place on the seabed; local range, limited to the project area, possible small impact on the character of the topography of adjacent areas
Very high	Changes significantly affecting the topography and structure of the seabed in the area analysed, which may significantly affect geological and geomorphological processes of the project area and adjacent areas

Depending on its structure, the seabed may exhibit different sensitivity to the impact of the project during the construction phase. The seabed made of till and till with a stony cover is difficult to wash out and withstands morphological changes. A sandy, sandy-silty, and silty seabed is more prone to washout and material movement. As a result, the elements of the connection infrastructure may be exposed or buried, both as a result of natural processes involving the transport of rock material along the seabed and as a result of this movement being disrupted by the connection infrastructure components (if the cables are laid on the seabed and are protected with extra measures).

During the EXC BC-Wind OWF construction phase, the actions taken may affect the geological structure, seabed relief and seabed sediments by:

- physical interference with the seabed when performing preparatory activities within the cable bed area and during cable laying (e.g. deepening, levelling, separating clusters of stones, dredged material deposition) leading to changes in its topography;

- seabed deposition of suspended solids generated as a result of the disturbance of seabed sediments during the preparatory activities and construction works leading to changes in the seabed level;
- seabed disturbance resulting in formation of depressions in anchoring locations of vessels installing the elements of transmission infrastructure.

The physical interference with the seabed when laying a power cable presents the greatest impact during the EXC BC-Wind OWF construction phase. Regardless of the technology adopted and the type of seabed sediments, the impact will be direct and of local extent. The maximum area of seabed disturbance as a result of the EXC BC-Wind OWF construction will be 16.5 km². Following the laying of the cable at the desired depth, in order to protect it, the locations where it has been laid will be buried, thus the impact will be short-term at most and reversible. Once the works have been completed, the basic seabed parameters (depth, topography) will be restored to the initial state by, basically, intentional actions and natural processes resulting from seabed sediment transfer along the seabed.

As a result of the disturbance of seabed sediments, suspended solids will be released to the water column, which, depending on the type of the sediment disturbed and the hydrological conditions prevailing during the works, will be transferred to further regions and gradually deposited on the seabed. It is assumed that the maximum amount of a newly deposited sediment will be 3.7 mm at a distance of 150 m to 1.7 mm at a distance of 500 m from the cable route axis to the work site.

The interference with the seabed will be considerably smaller as a result of the deployment of anchors from ships (cable-laying vessels) when laying a power cable. In such a case, the seabed will be disturbed by anchors locally. Once they are lifted, they will leave behind depressions in the seabed, which, after a certain period of time, will self-level as a result of natural sediment transfer along the seabed.

Table 8.2 and Table 8.3 present an assessment of the scale and of the significance of the impacts on geological structure, seabed relief and seabed sediments during the EXC BC-Wind OWF construction phase.

Table 8.2. Assessment of the scale of impacts on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Physical interference with the seabed	x					x				x			x	7
Deposition of suspended solids		x				x				x			x	6
Seabed disturbance from vessel anchoring	x					x				x			x	7

Table 8.3. Assessment of the significance of the impact on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical interference with the seabed	low	moderate	low
Deposition of suspended solids	low	moderate	low
Seabed disturbance from vessel anchoring	low	moderate	low

8.1.1.2 Impact on the quality of seawater and seabed sediments

States of water and sediments in water bodies are strictly correlated. There exists a balance between the various components of the marine environment and, in particular, between water and seabed sediment. An alteration to one of these components may cause a change in another one and vice versa.

Most pollutants (heavy metals and toxic organic compounds of low solubility and slow degradation) which are released into the environment as a result of human economic activity and reach surface waters are retained in sediments [41]. Seabed sediments are not only a place of deposition of persistent and toxic pollutants reaching the environment, but also a place of existence, source of nourishment, place of reproduction and growth of numerous aquatic organisms. Contaminated sediments pose high risks to these organisms, as some of the harmful substances contained in sediments may enter the water as a result of chemical and biochemical processes and be accessible to living organisms [122, 46].

This subsection identifies, describes and evaluates the impacts resulting from the operations envisaged during the EXC BC-Wind OWF construction phase on the quality of seawater and seabed sediments. It has been assumed that these include:

- the release of contaminants and nutrients from sediments into the water resulting from carrying out all the works physically interfering with the seabed;
- the contamination of water and seabed sediments with oil derivatives from vessels and other devices deployed during the construction phase;
- the contamination of water and seabed sediments with antifouling agents.

Furthermore, the assessment considered possible unintended situations which could affect the quality of the seawater and seabed sediments in the area of the work site, which arise directly from the presence of vessels in the work site vicinity, i.e. contamination of water and seabed sediments with accidentally released:

- municipal waste or domestic sewage;
- chemicals and waste.

8.1.1.2.1 Release of pollutants and nutrients from sediments into water

The disturbance of seabed sediments related to physical interference with the seabed leads to the release of the chemical compounds contained therein into the water column [428, 46, 122, 90]. During the operations disturbing the seabed, substances including labile metal forms, toxic organic compounds, i.e. PAHs and nutrients will be released into the water.

The most significant elements affecting the magnitude of the impact include: the volume of sediment disturbed resulting from the size of the work site, the nature and amount of pollutants contained in the sediments and the type of seabed sediments.

Pollutant transfer from sediments to the water, and thus also water quality deterioration and formation of suspended solids remaining in the water column, depends primarily on the sediment type. More contaminants and nutrients will enter the water from a sediment with an increased amount of organic matter, i.e. silty, clayey sediments, characterised by higher concentrations of metals and persistent organic pollutants. These deposits will also contribute to the formation of a greater amount of suspended solids, which will remain in the water for a long time. Intense resuspension may cause the release of nutrients immobilised in the sediment and contribute to eutrophication. In the case of sandy deposits with low organic matter content, the said processes will be less intense. These sediments are generally characterised by a small number of fine fractions and low concentrations of metals and persistent organic pollutants.

The geochemical surveys of the sediments within the EXC BC-Wind OWF area indicated that these are generally characterised by a low proportion of fine fractions and a low concentration of metals and persistent organic pollutants. Therefore, it is estimated that the processes related to their release as a result of the activities performed will occur at low intensity within the entire EXC BC-Wind OWF area.

The substances released from the seabed sediments will enter the water column. However, during the period of approximately one year after the cessation of the activities associated with the seabed disturbance, these substances after reaching equilibrium will re-enter the sediment.

A power cable can be buried in the seabed using two main technologies:

- SLB – simultaneous laying and burial of the cable in the seabed;
- PLB – post-lay burial of the cable.

A less favourable solution in the context of the environmental impact is the application of the PLB technology and the deployment of self-propelled remotely operated water jetting and mechanical trenching equipment during works. In the case of this technology, the volume of sediment disturbed would be larger than in the case of the SLB technology.

Moreover, during the EXC BC-Wind OWF construction, the seabed sediment will also be disturbed due to anchoring of vessels. The very process of anchoring at a depth of approximately 3 m is short-term and local (spot-like) in nature. Therefore, the volume of sediment disturbed will be negligible in relation to the volume of sediment disturbed as a result of the works related to cable laying.

On the basis of the above assumptions and concentrations of pollutants and nutrients found within the EXC BC-Wind OWF area, an estimation of their release into the water was made. The calculations assume an average sediment volumetric density of $1.52 \text{ g}\cdot\text{cm}^{-3}$ ($1520 \text{ kg}\cdot\text{m}^{-3}$) and an average sediment moisture content of 18.0%. For the purpose of the calculations, the volume of sediment disturbed as a result of the cable laying process was assumed to be $36\,000 \text{ m}^3$ per one kilometre of the cable route.

The estimated amount of heavy metals, pollutants and nutrients that may be released during the implementation of the EXC BC-Wind OWF in the APV is presented in Table 8.4. The calculations were made for a single cable. If 2 cable lines are laid, the values will be two times higher.

However, they will not be significant in comparison with the loads entering the Baltic Sea each year through Polish rivers and through precipitation [428], which are also presented in Table 8.4.

Table 8.4. Comparison of the loads of pollutants and nutrients that may be released into the water during the EXC BC-Wind OWF construction in the APV with the load entering the Baltic Sea through Polish rivers and rain [source: internal materials]

Parameter	Unit	EXC BC-Wind OWF area in the APV	Annual load entering the Baltic Sea through the rivers	Annual load entering the Baltic Sea through precipitation
Volume of the sediment disturbed	m ³	1 198 800	-	-
Weight of the sediment disturbed	Mg	1 822 176	-	-
Dry weight of the sediment disturbed	Mg	1 494 184	-	-
Lead (Pb)	kg	2406	24 000	200 000
Copper (Cu)	kg	1031	112 000	no data
Chromium (Cr)	kg	926	3800	no data
Zinc (Zn)	kg	4752	61 900	no data
Nickel (Ni)	kg	523	687 000	no data
Cadmium (Cd)	kg	below limit of quantification	2300	7100
Mercury (Hg)	kg	8	2100	3400
Arsenic (As)	kg	below limit of quantification	no data	no data
Congeners from the PCB group	g	below limit of quantification	260 000	715 000
Analytes from the PAHs group	g	22	no data	no data
Available phosphorus (P)	kg	447 508	9 500 000 (P _{tot.})	163 000 000
Nitrogen (N)	kg	below limit of quantification	150 000 000 (N _{tot.})	5 700 000

8.1.1.2.2 Contamination of water and seabed sediments with petroleum products

Pollutants entering the marine environment during normal operation of vessels are the second largest source of oil pollution. As a result of this activity, approximately 33% of oil derivatives entering the environment are released to the Baltic Sea, mainly due to increased maritime traffic in this region [207]. In comparison, approximately 37% of oil entering the sea is a run-off from land brought by rivers, while the tanker disasters only rank third (12%).

During the construction phase, different types of vessels will be involved, from which small amounts of petroleum products (lubricating oil, fuel oil, petrol, etc.) may leak into the water during their normal operation. To a minor extent, they may contribute to the deterioration in water quality. A visible effect of an oil spill is an oil slick which, under the influence of gravity and surface tension, spreads at a speed depending on the type of oil and hydrological conditions. The size and extent of the spill are determined by such factors as oil volume, density, viscosity, temperature, wind speed and time. The estimated speed of an oil slick movement in large water bodies is approximately 2–3% of the wind speed value.

Taking into account the scale of the activities associated with the construction of the EXC BC-Wind OWF in the APV, it should be assumed that these will be small (Tier I) spills, up to 20 m³. Visible traces of such contaminants may disappear spontaneously in favourable conditions, as a result of evaporation and dissipation in water. The extent of these potential spills will be practically limited to the development area and areas along vessel routes.

The contamination of the seawater and/or seabed sediments with oil derivatives released during normal operation of vessels is considered a direct negative impact of local extent, which is short-term and reversible.

8.1.1.2.3 Contamination of water and seabed sediments with antifouling agents

In order to protect ship hulls and other underwater parts of ships against fouling, biocides are used, the composition of which may include for example: copper, mercury and organotin compounds (e.g. tributyltin). Such compounds may enter the water and ultimately end up in seabed sediments. It should be assumed that the releases of these compounds will be limited due to their dilution in the water. Among the substances listed, organotin compounds are the most harmful (toxic) to aquatic organisms. The use of tributyltin (the most harmful substance) in anti-fouling paints is now prohibited, but the presence of those compounds in older vessels cannot be ruled out. The sensitivity of the seawater and seabed sediments to biocides released from hulls was considered moderate.

During the EXC BC-Wind OWF construction phase, different types of vessels will be deployed, the external coating of which may release certain amounts of anti-fouling substances into the water during normal operation. Consequently, they can contaminate sediments. To avoid this, at every stage of the project, it is recommended to use vessels the hulls of which have not been coated with anti-fouling paint containing TBT. This will eliminate this most harmful impact on aquatic organisms.

The most important parameters influencing the level of impact are the type and amount of anti-fouling substances released and the type of the seabed sediment at the place where potential contamination may occur.

Contamination of water and seabed sediments with antifouling substances during the construction phase is considered a direct negative impact which is local, short-term and reversible.

8.1.1.2.4 Contamination of water and seabed sediments by accidental release of municipal waste or domestic sewage

During the EXC BC-Wind OWF construction, waste will be generated aboard vessels, mostly municipal and other waste not related directly to the construction process, as well as domestic sewage. Waste and sewage may accidentally enter the marine environment while being received from vessels by another vessel, resulting in a local increase in nutrient concentrations and the deterioration in water and sediment quality. However, the pollutants are expected to disperse quickly, and thus will not contribute to a permanent environmental deterioration in the project area. The sensitivity of the seawater and seabed sediments to this type of impact is considered low.

The most important parameters affecting the level of this impact are the type and quantity of the waste or sewage released, the weather conditions as well as the type of the seabed sediment at the place of contamination. The sensitivity of both receptors in the case of this impact is low.

The contamination of water and seabed sediments with accidentally released municipal waste or domestic sewage is considered a direct negative impact of local extent, short-term at most and reversible.

8.1.1.2.5 Contamination of water and seabed sediments with accidentally released chemicals and waste

During the EXC BC-Wind OWF construction, waste directly related to this process will be generated on vessels and at the work site. These may include, among others, damaged parts of the EXC BC-Wind OWF components, machine fluids and other chemical substances used or replaced during construction works. These may be accidentally released into the marine environment.

Such waste mostly belongs to group 17 of the appendix to the Regulation of the Minister of Climate of 2 January 2020 *on waste catalogue* (Journal of Laws of 2020, item 10), including, but not limited to, cable scrap, sanitary waste from ships, flammable waste, oil and chemical waste, as well as construction waste. Waste should be neutralised in accordance with the applicable regulations concerning industrial waste.

The most important parameters affecting the level of this impact are the type and quantity of the waste or sewage released, the weather conditions as well as the type of the seabed sediment at the place of contamination.

For projects such as the EXC BC-Wind OWF, a detailed plan is prepared to prevent the risks and contamination generated during its construction, operation and decommissioning. The plan contains mitigating measures and a procedure to be followed in case of such events. The sensitivity of both receptors (water and seabed sediments) in the case of this impact is moderate.

The contamination of water and seabed sediments resulting from an accidental release of chemicals and waste is considered a direct impact of local extent, short-term at most and reversible.

8.1.1.2.6 Summary of the assessment of the impact on the quality of seawater and seabed sediment

Table 8.5 and Table 8.6 present an assessment of the scale and of the significance of the impacts on the quality of seawater and seabed sediments during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.5. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Release of pollutants and nutrients from the sediment into the water	x					x				x			x	7
Contamination of water and seabed sediments with petroleum products	x					x				x			x	7
Contamination of water and seabed sediments with antifouling agents	x					x				x			x	7
Contamination of water and seabed sediments by accidental release of municipal waste or domestic sewage	x					x				x			x	7
Contamination of water and seabed sediments with accidentally released chemicals and waste	x					x				x			x	7

Table 8.6. Assessment of the significance of the impact on the quality of seawater and seabed sediments resulting from the contamination of water and seabed sediments with accidentally released chemicals and waste during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Release of pollutants and nutrients from the sediment into the water	low	moderate	Low
Contamination of water and seabed sediments with petroleum products	low	moderate	Low
Contamination of water and seabed sediments with antifouling agents	low	moderate	Low
Contamination of water and seabed sediments by accidental release of municipal waste or domestic sewage	low	low	Negligible
Contamination of water and seabed sediments with accidentally released chemicals and waste	low	moderate	Low

8.1.1.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

At the location of the operations related to cable laying as part of the EXC BC-Wind OWF construction, there will be an increased emission of pollutants into the atmosphere, including greenhouse gases, which will result from the increased traffic of vessels involved in the project construction. However, the magnitude of these atmospheric emissions cannot be assessed at this stage, as the number, type and duration of the use of specialist vessels will only be determined in the detailed design. Due to the specific nature of the project and the Project Owner's obligations with regard to sustainable development, i.a. in the context of the environmental protection, it should be assumed that only the vessels which comply with national standards and standards resulting from international agreements on pollution emissions would be used.

During the construction phase, the significance of the proposed project impact on climate and air quality will be irrelevant, as there will be no factors that could have any noticeable impact on their change.

The impact of the proposed project on ambient air quality during the construction phase will be temporary and will cease once the works are completed. Furthermore, since the area where activities are to be carried out is open and unobstructed, pollutant concentrations will be quickly diluted. Therefore, this impact will be direct, of local extent, short-term at most and reversible.

Table 8.7 and Table 8.8 present an assessment of the scale and of the significance of the impacts on climate and ambient air quality during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.7. Assessment of the scale of impacts on climatic conditions and ambient air quality during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Emission of exhaust gases from vessels	x					x				x			x	7

Table 8.8. Assessment of the significance of the impact on climatic conditions and ambient air quality during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Emission of exhaust gases from vessels	low	low	negligible

8.1.1.4 Impact on ambient noise

The activities associated with the EXC BC-Wind OWF construction will generate underwater noise. It will be a continuous sound in the low frequency range. Regular, considerable vessel traffic takes

place in the vicinity of the EXC BC-Wind OWF area in the APV, which affects the current ambient noise level.

Higher sound intensities resulting from the work carried out within the EXC BC-Wind OWF area in the APV will increase both the sound detectability and the potential risk of negative sound impacts on receptors. The extent of this impact will be restricted in time to the period of the cable laying works, and in space, as a result of noise attenuation by water – from a few hundred metres for high frequencies to several kilometres from the sound source of low frequencies. Passing ships mostly generate low-frequency sounds. The impact on ambient noise will be direct, of local extent and medium-term at most.

Table 8.9 and Table 8.10 present an assessment of the scale and of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.9. Assessment of the scale of impacts on ambient noise during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Noise from ships and equipment	x					x			x				x	8

Table 8.10. Assessment of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Noise from ships and equipment	moderate	low	low

8.1.1.5 Impact on nature and protected areas

8.1.1.5.1 Impact on biotic components within the offshore area

8.1.1.5.1.1 Phytobenthos

The environmental surveys aimed at detecting phytobenthos indicated that it does not occur within the EXC BC-Wind OWF area in the APV. Therefore, the activities carried out during the construction phase will not affect phytobenthos.

8.1.1.5.1.2 Macrozoobenthos

This subsection identifies, describes and evaluates the impacts on macrozoobenthos resulting from the operations envisaged during the construction phase of the EXC BC-Wind OWF in the APV. It has been assumed that these include:

- seabed disruption;
- increased concentration of suspended solids;
- deposition of suspended solids on the seabed;

- release of pollutants from sediments to water.

8.1.1.5.1.2.1 Seabed disruption

Activities related to the seabed disruption directly affect organisms living in or on the seabed. The result of these activities leads to destruction of macrozoobenthos at the work site.

This is a factor with the greatest impact on the macrozoobenthic communities inhabiting the surface and the interior of the seabed sediments [225, 481, 35]. This applies in particular to zoobenthic species inhabiting the surface of sandy and silty sediments as well as rocky seabed, which are not able to move actively in the sediments. As a result of the sediment structure disturbance, the zoobenthos in the areas of seabed disturbance is eliminated. In the case of the EXC BC-Wind OWF area in the APV, the impact on zoobenthos will be limited to the area of the seabed intervention works. The macrozoobenthos of this area is not unique in terms of quality and quantity composition in the context of zoobenthos resources inhabiting similar habitats in the remaining part of the Southern Baltic. Moreover, it is characterised by a high capacity to recover its resources in a relatively short time.

8.1.1.5.1.2.2 Increased concentration of suspended solids

The works resulting in disturbance of seabed sediments will lead to an increase in concentration of suspended solids in the water column. Higher suspended solids concentration and longer exposure time of mineral and organic particles in the water cause adverse effects on the condition of benthic fauna [284, 171]. When there is an excessive concentration of suspended solids in the water, organisms that filter-feed or feed on suspended solids and organic matter deposited in sediments, e.g. bivalves, may feed less effectively. At a suspension concentration above 250 mg·l⁻¹, the growth of macrozoobenthic organisms is limited [107], and it may even increase the mortality of bivalves, which is the result of the clogging effect [277, 273]. Despite the fact that macro-invertebrates are naturally adapted to high concentrations of suspended solids, such as the ones occurring during storms [33, 273], the Baltic Sea bivalves are physiologically less adapted to filtering suspended solids at high concentrations, because they are not prepared to living in conditions of strong currents or tides [107, 68].

The sensitivity to this impact for the macrozoobenthic community inhabiting the soft bottom in the vicinity of the EXC BC-Wind OWF area in the APV is irrelevant. Since the abundance structure of this community of organisms is dominated by organisms inhabiting the interior of the sediment, i.e. primarily polychaetes and oligochaetes rather than the representatives of the epifauna such as bivalves, the influence of the increased concentration of suspended solids in the water is not expected to cause significant changes in the structure and functioning of this community of organisms.

On the other hand, the hard-bottom macrozoobenthic community consisting primarily of filtering organisms, i.e. the *Mytilus trossulus* bivalves, will be characterised by low sensitivity, since it cannot be excluded that with the increase in suspended solids concentration in water, the functioning of the filtering system, and hence the survival of some of the most exposed individuals, may be restricted.

8.1.1.5.1.2.3 Deposition of suspended solids on the seabed

Deposition of suspended solids on the seabed is an impact which might cause increased mortality of benthic organisms due to covering them with an additional layer of sediment or deterioration in their habitat conditions. Suspended solid particles that fall onto the seabed may be subject to

erosion by being transported in the re-suspension process, which results from the hydrodynamic conditions in the sea area [481]. Given the mechanical capability of some of the macroinvertebrates to move in the sediment towards the oxygenated above-seabed layer, or the physiological resistance to hypoxic or even anoxic conditions [273, 170, 33], the deposition of suspended solids on the seabed will not lead to the mortality of all organisms. The species most sensitive to this impact are those representing the sedentary epifauna and macrozoobenthos larvae, since when covered by an additional layer of sediment, these organisms will have a limited capacity to move and reach the sediment surface, which is an essential condition for respiration and feeding. The bivalves will extend their siphons above the sediment layer [261, 171, 273, 133]. Vagile infauna species (e.g. polychaetes and oligochaetes) are more tolerant to being covered with an additional sediment layer, as they are able to move through a layer with a thickness of up to 10 cm, although that depends on the sediment grain fraction and the duration of the negative impact. Typically, the macrozoobenthos is quite tolerant to being covered by an additional layer, up to 0.2–0.3 m thick, of suspended solids undergoing deposition, especially if this layer is composed of a fine sand fraction [107, 273, 133]. However, the long duration of negative impact contributes to increased mortality of all benthic species by covering them with an additional layer of suspended solids [171].

The sensitivity of the soft-bottom macrozoobenthic community within the EXC BC-Wind OWF area in the APV to the deposition of suspended solids on the seabed was considered low, because the structure of this community – in addition to numerous representatives of the infauna (polychaetes), which may be exposed to anoxic conditions for a short period – also comprises epibenthos, including bivalves, mainly *Limecola balthica*, but also *Mya arenaria* and *Mytilus trossulus*. These are organisms which, when covered by an additional layer of sediment, may have an obstructed access to the oxygen dissolved in the water and may reduce their filtration process.

The hard-bottom macrozoobenthic community, represented primarily by the *Mytilus trossulus* bivalves, will also exhibit low sensitivity to deposition of suspended solids on the seabed due to the negative impact associated with inhibited filtration.

Despite the fact that the deposition of suspended solids on the seabed may temporarily reduce the benthos resources and, therefore, reduce the food supply for the fish and seabirds in the affected area, the maximum sediment layer thickness, apart from the areas closest to the cables being laid, will not exceed the lethal values specified in literature for all the macrozoobenthos taxa identified within the project area and besides, this impact will be short-term and reversible.

8.1.1.5.1.2.4 Release of pollutants from sediments to water

Due to the disturbance of the seabed sediments during the cable line construction, benthic fauna will be exposed to an increased concentration of pollutants, e.g. heavy metals, toxic organic compounds such as PAHs, PCBs and TBT, entering the water column from the sediments as a result of chemical and biochemical processes [46, 90, 428]. Among the substances listed, organotin compounds are the most harmful (toxic) to aquatic organisms. The use of TBT in antifouling paints is currently prohibited. Tributyltin is bioaccumulated by marine organisms, while the degree of harmfulness depends mainly on the final concentration in tissues. Bivalves are not able to degrade TBT via debutylation like e.g. fish and some sea snails. Accumulation of toxic substances leads to reproductive disorders, diseases and increased mortality of macrozoobenthos, resulting in reduced abundance and biodiversity of the benthic fauna that will be dominated by opportunistic species. Filtering organisms, such as bivalves, are highly susceptible to this impact as they develop cancer due to the accumulation of toxic substances in soft tissues [404, 126, 141, 182, 140].

As a result of the geochemical surveys conducted within the EXC BC-Wind OWF area in the APV, it was determined that the surface seabed sediments analysed belonged to inorganic deposits with the organic matter content below 10%. They are characterised by a low nutrient content. Concentrations of persistent organic pollutants (i.e. PAHs, PCBs, TBT) and harmful substances such as labile forms of heavy metals (arsenic, total chromium, zinc, copper, cadmium, lead, mercury, nickel), which under favourable conditions may be released from the sediment to the water column and be responsible for their toxicity and bioavailability or quantities of mineral oils, within the area surveyed were low and did not deviate substantially from literature data for sandy sediments of the Southern Baltic. Concentrations of the labile forms of the elements tested were more or less even within the entire survey area. The sediments tested were also characterised by low concentrations of the radioactive element ¹³⁷Cs, typical for sandy sediments.

Due to the possibility of redistribution of pollutants from sediment into water, the sensitivity of both the soft- and hard-bottom macrozoobenthic community representatives to this impact will be irrelevant. Given the low values of pollutants surveyed, this impact is expected to have very little effect on any changes in the structure and function of the two macrozoobenthic communities.

8.1.1.5.1.2.5 Summary of the assessment of the impact on macrozoobenthos

Table 8.11 and Table 8.12 present an assessment of the scale and of the significance of the impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.11. Assessment of the scale of impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Seabed disruption	x					x				x		x		8
Increased concentration of suspended solids	x					x					x		x	6
Deposition of suspended solids on the seabed	x					x					x		x	6
Release of pollutants from sediments to water	x					x					x		x	6

Table 8.12. Assessment of the significance of the impact on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Seabed disruption	moderate	moderate	low
Increased concentration of suspended solids	low	irrelevant	negligible
Deposition of suspended solids on the seabed	low	low	negligible
Release of pollutants from sediments to water	low	low	negligible

8.1.1.5.1.3 Ichthyofauna

The following possible impacts on fish during the construction phase of the EXC BC-Wind OWF in the APV were identified:

- change in acoustic conditions,
- changes in the habitat parameters,
- emissions of toxic chemicals,
- increased concentration of suspended solids.

8.1.1.5.1.3.1 Change in acoustic conditions

Thanks to their hearing organs, fish are able to perceive acoustic stimuli. Ambient sound is used for spatial orientation, registration of environmental conditions, communication, reproduction (mating), predator avoidance and prey location [6, 342]. For most fish, the frequencies detected range from below 50 Hz to approximately 300–500 Hz, but some species can detect sounds between 3 and 4000 Hz [243, 340].

Fish sensitivity to sound depends on the structure of their receptors. Fish without a swim bladder (e.g. adult flatfish) or fish in which the swim bladder is far away from the ear (e.g. salmon) are only able to perceive the movement of water particles. This is due to the narrow range of frequencies heard (usually up to approximately 500 Hz) and the higher hearing threshold. In the case of fish with a swim bladder located close to or directly connected to the ear (e.g. cod and clupeids), the hearing threshold is lower and the range of frequencies perceived can reach 3000–4000 Hz [340].

On the one hand, the range of noise impact depends on the structure of the hearing organ, and on the other hand – on sound intensity. Environmental factors affecting sound propagation, e.g. seabed morphology and salinity, also play an important role. Fish can perceive anthropogenic sounds from a distance of up to dozens of kilometres.

Depending on the noise intensity and the distance from its source, the impact can have various effects, ranging from behavioural changes to the death of fish [Table 8.13].

Table 8.13. Potential impact of noise on ichthyofauna [source: internal materials based on [341]]

No.	Impact effect	Impact characteristics
1.	Death	Death due to the damage resulting from an exposure to sound
2.	Damage to tissue, disturbance of physiology	Example of damage: internal haemorrhage, damage to organs filled with gas, such as swim bladder and the surrounding tissues
3.	Hearing system damage (TTS, PTS)	Hair cell damage, temporary (TTS) or permanent threshold shift (PTS)
4.	Masking	Masking of important biological sound signals from the environment, including from other individuals

No.	Impact effect	Impact characteristics
5.	Behavioural changes	Disturbance of normal activities, such as: feeding, spawning, shoal formation, migration, movement from preferred areas, avoidance response

The installation of the cable line on the seabed will involve underwater noise emissions resulting both from the traffic of the vessels involved in the installation and from the operation of the machines and equipment used for cable laying. The noise generated by vessels reaches between 160 and 190 $\mu\text{Pa}^2\text{s}$, depending on the size and speed of the vessel [311]. The sound generated by a vessel laying a cable should not differ from that of other vessels of similar size [465], while the low speed (up to 3 knots) during operation should further reduce noise levels. According to Hammar *et al.* [158], the impact of this factor on cod in the area of an OWF located in the Danish Straits will be irrelevant.

Little information is available in literature on the noise emitted by jetting equipment or devices flushing away seabed sediment. According to Nedwell *et al.* [283], the noise level generated by a plough when digging trenches for cable laying was 178 dB re 1 $\mu\text{Pa}^2\text{s}$ at a distance of 1 metre from the work site. These authors assessed the potential impact of this noise level taking into account the hearing thresholds of different fish species: cod, salmon and common dab. For none of these species was the sound level emitted at a distance of 100 m from the noise source found to exceed the hearing threshold by more than 75 dB. This value, according to Nedwell and Howell [282], is the threshold above which a moderate behavioural response, such as avoidance, is to be expected. A higher noise level generated during such works, i.e. 187 dB re 1 $\mu\text{Pa}^2\text{s}$, was reported by Taormina *et al.* [409]. Model simulations based on these values indicate that an increased noise level (120 dB re 1 μPa) will occur within an area of 400 km^2 from the sound source. A detailed analysis of the potential impact of noise generated during a high-voltage cable installation planned across the Strait of Georgia (Canada) showed that the predicted noise level during the works will not differ from the level existing in the area of the proposed project [196].

The impact of noise on marine organisms will be relatively small [262, 358, 309, 310, 28, 409]. In the case of vessels, the noise will be generated by the engine running and the operation of the propeller and thrusters. Large vessels equipped with DP systems, e.g. cable laying vessels, generate noise with low frequencies ranging from 30 Hz to 3 kHz, and sound pressure from 100 to 197 dB re 1 μPa at a distance of 1 m from the source.

The operation of underwater devices involved in the construction of the cable lines also entails the generation of noise into the environment. The highest noise levels will be generated by underwater devices operating in the mechanical trenching technology, which emit sounds with a sound pressure from 172 to 185 dB re 1 μPa at a distance of 1 m from the source.

The impact of noise and vibration on adult fish will be: direct, temporary and local. In the case of fish with a swim bladder, such as cod, herring, sprat, sand goby, common goby and twaite shad, the species sensitivity is assessed to be high, whereas for fish without a swim bladder, such as flounder, common seasnail and straightnose pipefish, it is assessed to be moderate.

The significance of the impact was considered negligible for all the fish species examined. As far as the protected fish are concerned, during the surveys, only the larval stages occurred, for which the impact will be local.

8.1.1.5.1.3.2 Change in the habitat parameters

The occurrence of several factors associated with the construction of transmission infrastructure, such as noise and increased concentrations of suspended solids, may cause fish to avoid the work

area. The significance of this effect will depend both on the size of the project area as well as on the duration and season of the year when the works take place. The scale of the impact depends both on the biology of individual species and their developmental stage [27]. The effect of fish avoiding even a small area that is an important spawning ground may be noticeable on a much larger sea area [455].

During the cable-laying works, especially during the cable burial operations, the seabed structure is considerably disturbed. In case of using ploughs with skids, the width of the seabed strip subjected to the disturbance ranges from 2 to 8 m [59]. According to BERR [358], in the course of a properly conducted cable burial operation using a plough, seabed disturbance should affect a small area while a major part of the furrow should be backfilled with the sediment running down from its slopes immediately after the passage of the equipment. According to Carter *et al.* [59], in the case of cable burial using the water jetting method (sediment fluidisation with a water jet injected under the surface of the sediment causes spontaneous sinking of the cable), the width of the disturbed seabed strip should not exceed 5 m.

Physical disturbance of the sediment and the seabed morphology may result in the disturbance of fish spawning [185, 186, 324, 344, 37]. The disruption of the primary sediment structure may cause periodical suspension of spawning or result in unfavourable development conditions for fish eggs or fry [87, 324]. Such a phenomenon may concern herring, the spawning of which requires a seabed covered with sediment allowing the attachment of eggs [218, 344].

During the works, some benthic organisms will be physically destroyed, especially the infauna, i.e. the organisms living below the sediment surface. This may lead to a reduction in the food supply for benthivorous fish and cause a reduction in their abundance [75, 69, 382]. However, given the linear layout and the width of the area (defined on the scale of tens of metres) on which the disturbance will take place, it appears that it should not be a significant problem for fish as organisms actively seeking food.

During the works, the eggs deposited on the seabed or on vegetation attached to the seabed may be destroyed. This will affect such species as herring, ammodytids and protected species such as common seasnail and some species of gobies. In the case of gobies, spawning takes place in shallow water areas down to a depth of approximately 10 m. In situations where works are carried out in spawning or nursery areas, the significance of the area affected must be assessed. If its exclusion is likely to cause a significant effect on the ichthyofauna of the area, consideration should be given to carrying out works in periods outside spawning and nursery rearing [358]. Taormina *et al.* [409] assess the potential impact of habitat changes on fish as low.

For the major part of the EXC BC-Wind OWF in the APV, cables will be buried in the seabed sediment. The exceptions may be the areas of the seabed characterised by dense sediment structure or covered by numerous boulders [Figure 5.3], within which cables will be laid on the seabed surface and protected against damage. Cable landfalls shall be constructed using a trenchless method, without the disturbance of surface seabed sediments.

The vicinity of the EXC BC-Wind OWF area is neither a spawning ground of cod nor of the deep-water spawning European flounder, dominant in this area, nor sprat. Herring spawning may occur within the EXC BC-Wind OWF area in the APV, however, given the size of the area, any disturbances in the reproductive process will not affect the recruitment of this species at the population level. The presence of a few larvae of ammodytids, long-spined bullhead and rock gunnel in the samples collected indicates that spawning of these taxa may occur in the near-shore area. This is confirmed by the data from literature pointing to shallow, near-shore areas with the seabed covered with sandy or gravelly sediment as a natural environment conducive to the

reproduction of these fish. However, the trenchless landfall will help avoid adverse impacts directly in the near-shore zone, whereas the disturbance of spawning in the deeper zone will not affect the recruitment of these species at a population level due to the wide spawning areas along the entire coastline in relation to the size of the EXC BC-Wind OWF area in the APV.

The impact related to the change of habitat will be negative, indirect, temporary and local. The sensitivity to the impact for the fish inhabiting the vicinity of the EXC BC-Wind OWF area in the APV was rated as high. The significance of the impact is considered negligible for all the fish species examined.

8.1.1.5.1.3.3 Emission of toxic chemicals

During the works resulting in seabed disturbance, chemical substances contained therein will be released. A number of toxic substances may transfer into the water, e.g. heavy metals (cadmium, chromium, copper, lead, mercury, nickel, zinc, arsenic), chlorinated biphenyls, chloro- and phospho-organic pesticides, TBT and its decomposition products, the sum of hydrocarbons, polychlorinated dibenzodioxins, polychlorinated dibenzofurans and PCBs [164]. Previous surveys of sediments in the Polish Sea Areas had not indicated the occurrence of high concentrations of these substances. The detected concentrations of PCBs, organochlorine and organophosphorus pesticides and heavy metals (copper, zinc, cadmium, lead, mercury) in the sediments from different locations of the Polish Sea Areas were too low to cause negative effects for organisms [84]. Also, the DDT, HCB, PCDD/F concentrations in the sandy sediments of this area remain at a level not causing a toxic effect in the marine organisms [405]. The low concentrations of heavy metals in the sediments of the Polish part of the Southern Baltic are indirectly confirmed by the results of the Polak-Juszczak study [335], during which no significant accumulation of harmful substances was found in the tissues of the flounder leading a benthic lifestyle. Also, the results of the geochemical surveys conducted in the vicinity of the EXC BC-Wind OWF area in the APV in the years 2020–2021 showed low concentrations of harmful substances in the sediment. Similarly low concentrations of harmful substances in seabed sediments were recorded during the surveys conducted for the purpose of other OWFs and connection infrastructure in this area [24, 303, 304, 305].

Additional sources of emissions may be the spills of petroleum products resulting from failures of vessels and equipment used for cable laying. During a failure of equipment fitted with hydraulic cylinders, spillage of hydraulic fluids may occur. According to BERR [358], remotely operated underwater vehicles (ROVs), the leakage of which may range from 60 to 100 litres of hydraulic fluids are the most probable sources of serious contamination with these substances.. However, it can be assumed that compliance with the practices resulting from the International Convention for the Prevention of Pollution from Ships (MARPOL) by vessels involved in the construction should significantly reduce the risk of such events.

The sensitivity of fish to harmful substances depends on their developmental stage, sex and species. Maturing females, embryos and early larval stages are particularly sensitive. High concentrations of some harmful substances in the gonads of spawning fish may cause high mortality of their offspring [159, 447, 93].

The exposure of fish to toxic substances may cause morphological changes, such as abnormal development of reproductive organs, deformities of the lower jaw, eyes, spinal anomalies and reduced larval size at hatching. Such effects were observed during surveys at the North Sea in such species as common dab, flounder, cod [93] and herring [252]. Physiological changes such as reduced heart rate and endocrine disruptions, including those that reduce spawning efficiency,

may also take place. Some authors [192, 394, 443] provide also the information on the occurrence of behavioural disorders resulting in the reduced effectiveness of fish feeding.

Among the petroleum substances posing a potential risk as a result of shipwrecks/collisions, PAHs may be particularly dangerous. Their negative impact on the embryonic stages of fish have already been observed at low concentrations [70]. However, according to the U.S. National Oceans and Atmosphere Administration (NOAA), the impact of petroleum products on fish is largely limited to coastal and closed sea areas where active risk avoidance is hindered. Also, the studies of Koehler [224] and Vethaak and Wester [438] did not show a statistically significant link between the PAH concentrations and the occurrence of liver tumours in the flounder in Danish and German waters of the North Sea. However, potential carcinogenicity of these substances has not been excluded.

Given the potential for fish to avoid contaminated areas, the relatively small extent of the impact and the likely rapid dilution of substances released from the sediment, it can be expected that the risk to fish in the context of emissions of harmful substances released during the works is low, assuming that highly polluted areas are avoided [309]. Taormina *et al.* [409] assess the potential impact of toxic substance emissions on fish as low.

The concentrations of persistent organic pollutants (i.e. PAHs, PCBs and TBT) and hazardous substances, such as metals or mineral oils in the vicinity of the EXC BC-Wind OWF area, were low and did not deviate substantially from the data from literature regarding the sandy sediments of the Southern Baltic. The sediments tested were also characterised by low concentrations of the radioactive element ¹³⁷Cs typical for sandy sediments.

The impact related to the release of toxic substances from the sediment into the water will be negative, direct, temporary and local. Cod, European flounder, common seasnail, sand goby, sprat and herring sensitivity to the impact was considered moderate.

The significance of the impact is considered negligible for all the fish species examined.

8.1.1.5.1.3.4 Increased concentration of suspended solids

The works resulting in seabed disturbance when laying power cables will lead to increased concentration of suspended solids in the water column. Its level will depend on a number of factors arising both from the technology of the process itself (the size of the interference area, devices applied, work rate) as well as on environmental conditions (physical properties of the sediment, seabed morphology, hydrodynamics of water). According to Taormina *et al.* [409], concentrations of suspended solids during the cable laying can reach several dozen mg·l⁻¹.

The most commonly applied cable burial technologies are ploughing and the water jetting method based on sediment fluidisation. In the latter case, a strong water jet under the surface of the sediment causes spontaneous sinking of the cable into the hydrated sediment. According to OSPAR [310], water jetting is associated with higher sediment resuspension than ploughing. Also the information reported by Carter *et al.* [59] indicates that the former method caused less sediment disturbance. The range of impact and persistence of higher concentrations of suspended solids depends on the type of sediment as well as the strength and directions of currents present in the area of the work site. In the case of sandy sediments, especially those with coarser grain-size distribution, both the spatial range and the retention time of sediment particles in the water column will be much lower than in the case of silty sediments or silt and sand sediments. At the same time, it can be assumed that the duration of the impact should not be long, considering the rate of cable installation varying from 100 to 2000 m/day, depending on the technology used [351]. The conducted analysis of suspended solids dispersion for the EXC BC-Wind OWF indicated that, for the work connected to cable burial as well as rock and boulder clearance along the CI

route, the dwell time of suspended solids with concentrations exceeding $30 \text{ mg}\cdot\text{l}^{-1}$ was short and for that work would not exceed 6 hours, whereas concentrations exceeding $4 \text{ mg}\cdot\text{l}^{-1}$ could be observed up to 24 hours.

According to Newcombe and MacDonald [284], the effects of the resuspension of suspended solids on fish can be classified into three categories:

- lethal effect: death of individuals, may affect population size;
- sub-lethal effect: tissue injury, disruption of physiological processes, reduced growth rate, increased susceptibility to disease;
- behavioural effect: changes in behaviour and reproductive performance, avoidance response.

The intensity of the impact of the increased concentration of suspended solids in the water column on fish depends on both physical factors, such as sediment parameters (grain size, mineral composition, adsorption and absorption capacity), salinity, temperature and oxygen concentration in the seawater [103], and biotic factors related to fish condition, their developmental stage, method of reproduction and mode of life. The effect of the impact is also closely related to the concentration of suspended solids, its spatial extent and the duration of ichthyofauna exposure to the impact [284].

The basic biological factor affecting the intensity of the impact of suspended solids on fish is the developmental stage of the organism. The suspended solids concentration causing lethal effect in early life stages (larvae and eggs) is 100 to 1000 times lower than that needed to cause such effect in juvenile and adult fish [103].

The higher sensitivity at the earliest life stages is the result of high metabolism entailing high oxygen requirements [16, 320]. Therefore, the particles of suspended solids penetrating the gills of larvae may impede respiration and cause increased larval mortality [87, 158]. Experimental studies have shown slower growth of Atlantic herring larvae at suspension concentrations exceeding $540 \text{ mg}\cdot\text{dm}^{-3}$, while suspension concentrations of $19 \text{ g}\cdot\text{dm}^{-3}$ resulted in 100% mortality [268]. Exposure of Pacific herring to concentrations up to $400 \text{ mg}\cdot\text{dm}^{-3}$ did not affect the condition or growth rate of larvae of this species [143]. In similar studies involving the Arctic grayling, Newcombe and MacDonald [284] indicated a slight (6%) increase in mortality at concentrations of $25 \text{ mg}\cdot\text{dm}^{-3}$, whereas, a 4-day exposure of larvae to suspended solids concentration exceeding $230 \text{ mg}\cdot\text{dm}^{-3}$ increased mortality up to 50%. Experiments conducted on cod by Westerberg *et al.* [446] showed a very high sensitivity of the earliest developmental stages of this species (larvae with yolk sac). The avoidance response was observed at suspended solids concentration of $3 \text{ mg}\cdot\text{dm}^{-3}$, and increased mortality at values of $10 \text{ mg}\cdot\text{dm}^{-3}$.

High concentrations of sediment particles in water may also affect fish larvae indirectly by reducing visibility. This can result in a reduced ability of larvae to see and forage for food, as their visual range often does not exceed their body length [43]. According to Utne-Palm [435], high turbidity (80 JTU) negatively affects the ability of herring larvae to obtain food. On the other hand, the limitation of visibility caused by increased suspended solids concentration may indirectly positively affect the survival rate of larvae by reducing the predation pressure [142].

The increased sensitivity of larvae in comparison to adult fish results also from a significantly lower mobility of such developmental stages, and thus a limited possibility to abandon the area with increased suspended solids concentration.

A negative impact of increased suspended solids concentrations on fish eggs was also observed. This involves mainly the limitation of gas and metabolite exchanges by the suspended solid

particles adhering to the egg membrane [62, 11]. According to Rönköping and Westerberg [361], a significant increase in mortality of cod larvae at a suspended solids concentrations exceeding $100 \text{ mg}\cdot\text{dm}^{-3}$ was observed.

The deposition of suspended solid particles on the surface of pelagic eggs may lead to a decrease in their buoyancy, causing them to sink to deeper water layers or to the seabed where they encounter less favourable oxygen conditions. These unfavourable conditions also increase predation pressure from benthic organisms as well as mechanical and physiological stress. This has been confirmed in studies by Rönköping and Westerberg [361], which show a loss of buoyancy of cod eggs already at relatively low concentrations of suspended solids extending over a longer period ($5 \text{ mg}\cdot\text{dm}^{-3}$ for 4 days).

The impact of the increased concentrations of suspended solids on demersal eggs is probably less intensive than in the case of pelagic eggs. Information on the harmful impact of this factor concern mainly freshwater fish or fish spawning in freshwater, and a decrease in hatching success was observed only at relatively high concentrations ($500\text{--}1000 \text{ mg}\cdot\text{dm}^{-3}$) [16]. On the other hand, no distinct impact of an increased concentration of suspended solids in water was observed in relation to the hatching of herring eggs, even at values up to $7000 \text{ mg}\cdot\text{dm}^{-3}$ [268]. Also, Kjørboe *et al.* [218] did not observe a negative effect of increased suspended solids concentrations ($300\text{--}500 \text{ mg}\cdot\text{dm}^{-3}$) on the development of eggs of this species, although they note that the negative impact of this factor may be much stronger in the case of poor oxygen conditions. A different response of Pacific herring eggs to the increased concentration of suspended solids was found by Griffin *et al.* [144]. Their study showed that a two-hour exposure of eggs to suspension concentrations of 250 and $500 \text{ mg}\cdot\text{dm}^{-3}$ affected embryonic development and caused a decrease in larval survival and growth rates. Also, the harmfulness of suspended solid particles covering the eggs deposited on the sediment surface cannot be excluded. The survival rate of herring eggs depends on the amount of clayey material depositing from the water [96]. A thin layer does not cause significant damage, sometimes only changing the rate of eggs development. A thick layer of clay, especially if it is rich in organic particles, may lead to considerable mortality, particularly if the eggs are deposited in multiple layers. In this case, only 40% of the larvae hatch from the two near-surface layers.

Due to the possibility of active avoidance of areas with high suspended solids concentration by adult developmental stages of fish, sublethal rather than lethal impacts should be expected [219]. The values of suspended solids concentrations triggering avoidance of contaminated areas differ depending on the species and the development stage. In general, it can be assumed that pelagic fish will be far less resistant to the impact of suspended solids than demersal fish. For juvenile herrings, the avoidance effect was observed at $12 \text{ mg}\cdot\text{dm}^{-3}$ [268], whereas for adult fish a similar response was observed at a slightly lower concentration ($10 \text{ mg}\cdot\text{dm}^{-3}$) [202].

According to Westerberg *et al.* [446], an avoidance response of adult herring and cod was already observed at concentrations above $3 \text{ mg}\cdot\text{dm}^{-3}$, while studies by Hansson (indicated in: [401]) suggest that such a response should only be expected at concentrations above $100 \text{ mg}\cdot\text{dm}^{-3}$. The increase in suspended solids concentration may also indirectly affect the herring reproductive success. De Groot [87] indicates that as a result of problems in finding traditional spawning grounds, eggs may be deposited at random locations that do not provide suitable conditions for development.

On the other hand, the studies conducted by Hammar *et al.* [156] during the construction of the Lillgrund OWF located in the Danish Straits did not confirm a significant impact of the suspended solids concentrations reaching up to $10 \text{ mg}\cdot\text{dm}^{-3}$ on the distribution of fish in the project area.

Studies by Moore [277] demonstrated that 14-day exposure of plaice (demersal fish) to very high concentrations of suspended solids ($4000 \text{ mg}\cdot\text{dm}^{-3}$) did not increase mortality in this species. A reverse reaction to avoidance responses is also possible for species preferring an increased level of turbidity, which limits the pressure of predation [219].

In the analysis conducted using the Ecological Risk Assessment (ERA) method, the significance of suspended solids impact on different developmental stages of cod were assessed in the area of the project implemented on the spawning grounds of this species in the Danish straits [158]. The analysis indicated that only for the early developmental stages (eggs, larvae and fry up to 3 months old), there is a low risk of the impact of this factor. However, no significant impact was identified at later developmental stages.

In a generalised assessment of the impact of OWFs on the Baltic Sea environment, Bergström *et al.* [28] classify the impact of suspended solids as low (Gulf of Bothnia) or moderate (Baltic Proper and the Danish Straits). Meißner *et al.* [262] conclude that with appropriate technology applied, concentrations of suspended solids during cable laying should not exceed those observed under natural conditions. Taormina *et al.* [409] consider the impact of suspended solids on fish as low.

It is assumed that the construction phase of the EXC BC-Wind OWF in the APV (laying up to 2 cable lines and their landing) will be completed as quickly as possible and will be finalised within approximately 6 months from its commencement. The start date of construction work will not depend on the time of year.

It is not expected that the levelling of the seabed along the cable line routes shall be necessary. The seabed sediment which will be disturbed during the underwater works will be used only for cable burial and will not be transferred to other locations of the sea area nor transported to the land. It is expected that part of the sediment disturbed will be subject to resuspension into the water column and re-deposition at a certain distance from the location of the underwater works.

The results of the analysis of the dispersal of suspended solids resulting from the EXC BC-Wind OWF construction in the APV indicates that in the case of adult stages of demersal fish only the avoidance response should be assumed. The level of concentrations temporarily exceeding 480 or $186 \text{ mg}\cdot\text{dm}^{-3}$, as predicted in the least favourable variant (for the mass flow excavation and jetting methods, respectively, cohesive soils, speed of 8 km/day), may be harmful for pelagic fish; however, the areas affected will be very limited in terms of surface. Given the possibility of active avoidance of adverse conditions, this risk is not expected to be significant.

In the case of fish larvae, suspended matter concentrations exceeding $500 \text{ mg}\cdot\text{dm}^{-3}$ may inhibit the growth of herring larvae but the temporary and spatially limited nature of this impact is not expected to be significant. Moreover, the range of concentrations over most of the area with a suspended solids concentration of up to $150 \text{ mg}\cdot\text{dm}^{-3}$, is not expected to affect pelagic larvae and eggs, according to the majority of literature on the subject.

At the same time, the results of the analysis of the suspended solids dispersion in the vicinity of the BC-Wind OWF Area in the APV indicate that the increase of their content in water will be short-term and local.

The impact on ichthyofauna related to the increase of suspended solids content will be negative, direct, local, and short-term.

Cod, European flounder, common seasnail, sand goby, sprat and straight-nosed pipefish sensitivity to the impact was considered moderate, whereas for herring it was considered high. The significance of the impact is considered negligible for all the fish species examined.

8.1.1.5.1.3.5 Summary of the assessment of impact on marine ichthyofauna

Table 8.14 and Table 8.15 present an assessment of the scale and of the significance of the impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.14. Assessment of the scale of impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Change in acoustic conditions	x					x					x		x	6
Change in the habitat parameters		x				x					x		x	5
Emission of toxic chemicals	x					x					x		x	6
Increased concentration of suspended solids	x					x				x			x	7

Table 8.15. Assessment of the significance of the impact on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in acoustic conditions	Low	High	Low
Change in the habitat parameters	Irrelevant	High	Negligible
Emission of toxic chemicals	Low	Moderate	Low
Increased concentration of suspended solids	Low	High	Low

8.1.1.5.1.4 Marine mammals

The following potential impacts on marine mammals were identified for the EXC BC-Wind OWF construction phase:

- change in acoustic conditions;
- changes in the habitat parameters;
- changes in food supply.

Characteristics of particular impacts are described below. The assessment was carried out jointly for both seal species together (the grey seal and the harbour seal) as well as for the harbour porpoise. No important or significant impacts were identified, and the response to all impacts is likely to be very similar for all species, should they occur within the area in question [38, 211].

8.1.1.5.1.4.1 Change in acoustic conditions

The construction of EXC BC-Wind OWF in the APV will require the presence of ships as well as deployment of machines and equipment directly associated with laying and burying power cables

on or in the seabed in the area of the work site. During the construction works, both ships and machines/equipment are the sources of underwater noise. The information describing the characteristics of these sound sources are presented in Subsections 3.4.2.1.2 and 8.1.1.5.1.3.1.

Due to the specific nature of the proposed project, noise sources will not be stationary. As a consequence, its propagation conditions will vary over time and space depending on a range of factors, including but not limited to: topography and type of the seabed, wave motion, depth, water temperature, direction of vessel traffic. Therefore, it is impossible to determine the exact extent of the impact, and the values found in literature are estimates based on the knowledge available from surveys conducted as part of similar projects [415, 293, 24, 290, 145].

It is expected that none of the noise sources related to the construction of the EXC BC-Wind OWF in the APV will exceed the exposure limits determined on the basis of the injury criteria for marine mammals. The underwater noise emissions predicted for the subsea construction phase do not pose a risk of injuries to marine mammals, but may cause disturbances in their behaviour and the need to avoid the work sites. The maximum extent of disturbances for marine mammals will be between several dozen metres in the case of the noise generated by smaller vessels and installation works and several hundred metres for large DP vessels.

Taking into account that marine mammals occur in the area of the EXC BC-Wind OWF construction site in the APV only occasionally and that they can move freely to other sea areas which meet the requirements for their proper functioning, it can be assumed that the disturbance caused by underwater noise will not affect the welfare of these animals.

The impacts of underwater noise resulting from the construction of the EXC BC-Wind OWF in the APV on marine mammals will be direct, local, temporary and reversible.

8.1.1.5.1.4.2 Change in the habitat parameters

The construction of the EXC BC-Wind OWF in the APV will lead to changes in the water column, which provides habitat for the marine mammals present therein. The works causing disturbance of the seabed sediments will result in the release of suspended solids and chemical compounds occurring in the seabed sediments into the water column. Moreover, the presence of ships as well as machines and equipment in the area of works will result in physical disturbance of the maritime space, both on the sea surface and in the water column.

The effects of the activities mentioned above will contribute to the deterioration in natural parameters of marine mammal habitat. As a result, marine mammals will avoid the area with disturbed habitat parameters.

Taking into account that marine mammals occur in the vicinity of the EXC BC-Wind OWF construction site in the APV only occasionally and that they can move freely to other sea areas which meet the requirements for their proper functioning, it can be assumed that the disturbance caused by a change in the habitat parameters will not affect the welfare of these animals.

The impacts leading to a change in the habitat parameters in consequence of the EXC BC-Wind OWF construction affecting marine mammals will be direct, local, short-term and reversible.

8.1.1.5.1.4.3 Change in food supply

The construction of the EXC BC-Wind OWF in the APV will disturb the existing trophic balance. Damage to the zoobenthic communities at the locations of interference with the seabed will result in the depletion of the food supply for fish, which subsequently constitute food for mammals. A physical disturbance in the water column will also keep fish away from the work site. The same

phenomenon will be observed for marine mammals, which will move to areas unaffected by disturbance.

Taking into account that marine mammals occur in the vicinity of the EXC BC-Wind OWF construction site only occasionally and that they can move freely to other sea areas which meet the requirements for their proper functioning, it can be assumed that the disturbance caused by a change in the food supply will not affect the welfare of these animals.

The impacts leading to a change in the food supply in consequence of the EXC BC-Wind OWF construction affecting marine mammals will be indirect, local, short-term and reversible.

8.1.1.5.1.4.4 Summary of marine mammal impact assessment

Table 8.16 and Table 8.17 present an assessment of the scale and of the significance of the impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.16. Assessment of the scale of impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Change in acoustic conditions	x					x					x		x	6
Changes in habitat parameters	x					x				x			x	7
Change in food supply		x				x				x			x	6

Table 8.17. Assessment of the significance of the impact on marine mammals during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in acoustic conditions	Low	High	Low
Changes in habitat parameters	Low	Low	Negligible
Change in food supply	Low	Low	Negligible

8.1.1.5.1.5 Seabirds

The following potential impacts on seabirds were identified for the EXC BC-Wind OWF construction phase in the APV:

- presence and traffic of vessels;
- change in acoustic conditions;
- changes in food supply;
- changes in the habitat parameters.

8.1.1.5.1.5.1 Presence and traffic of vessels

Presence and traffic of vessels involved in the EXC BC-Wind OWF construction phase in the APV will lead to the disturbance of water-dwelling birds, and consequently to their relocation to other areas, unaffected by construction works. Water-dwelling birds are mainly the species wintering and feeding mostly in the nearshore zone between October and March.

Birds scared away from their dwelling places in the immediate vicinity of the work site will move to neighbouring areas with similar environmental conditions. Once the impact is over, birds will be able to return to their original dwelling place.

Disturbance of birds will be considered a direct, local, temporary and reversible impact. It will affect wintering birds (the razorbill, the common guillemot, the long-tailed duck, the common scoter and the velvet scoter) and will not affect gulls, the presence of which within the survey area is mostly attributed to the presence of fishing vessels, which these birds accompany during fishing.

8.1.1.5.1.5.2 Change in acoustic conditions

The underwater noise generated during the construction of the EXC BC-Wind OWF in the APV may cause fish to avoid the work site within the range of acoustical changes, and thus to depletion of fish stocks. This will cause a deterioration in the access to food for piscivorous birds, i.e. bird species for which fish are a primary food component (razorbills, common guillemots, and gulls).

If the birds do not find sufficient food resources, they will move to neighbouring areas with similar environmental conditions, where they will be able to feed. Once the impact is over, birds will be able to return to their original dwelling place.

The change in acoustic conditions will impact birds indirectly, locally and temporarily. The impact will be reversible.

8.1.1.5.1.5.3 Change in food supply

The works resulting in seabed disturbance during the construction of the EXC BC-Wind OWF in the APV, directly at the work site, will lead to destruction of zoobenthic communities, which are the food supply for benthivorous birds. As a consequence, this will lead to depletion of the food supply for benthivorous birds, i.e. the bird species feeding on benthic organisms (velvet scoters, long-tailed ducks and common scoters). This disruption will be greater within the southern part of the EXC BC-Wind OWF area due to the presence of a higher number of birds within this part of the area in relation to the northern part.

If the birds do not find sufficient food resources, they will move to neighbouring areas with similar environmental conditions, where they will be able to feed. The recolonisation of disturbed seabed areas by benthic communities will result in the return to the conditions before the disturbance.

In the case of these bird species, the impacts leading to the depletion of the food supply for benthivorous birds will be indirect, local, medium-term and reversible.

8.1.1.5.1.5.4 Changes in habitat parameters

The works resulting in seabed disturbance during the EXC BC-Wind OWF construction phase in the APV will lead to an increase in the concentration of suspended solids in the water depth and the resulting reduction in water transparency. This will make it difficult for birds using sight when foraging (divers, sea ducks, razorbills). The significance of this impact will be reduced since, in the first place, foraging birds will avoid the work sites due to the presence and traffic of vessels by

moving to neighbouring sea areas. The further the distance from the work site, the less significant the changes in the habitat parameters will be.

If the birds do not find sufficient food resources as a result of the reduction in water transparency, they will move to neighbouring areas with similar environmental conditions, where they will be able to feed. Complete deposition of suspended solids will lead to the return to the conditions resulting from natural changes in water transparency.

In the case of these bird species which use sight when foraging for food the impact resulting in the reduced visibility in the water depth will be direct, local, temporary and reversible.

8.1.1.5.1.5.5 Summary of seabird impact assessment

Table 8.18 and Table 8.19 present an assessment of the scale and of the significance of the impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.18. Assessment of the scale of impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Presence and traffic of vessels	x					x					x		x	6
Change in acoustic conditions		x				x					x		x	5
Change in food supply		x				x			x				x	7
Changes in habitat parameters		x				x					x		x	5

Table 8.19. Assessment of the significance of the impact on seabirds during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible
Change in acoustic conditions	Irrelevant	Irrelevant	Negligible
Change in food supply	Low	Moderate	Low
Changes in habitat parameters	Irrelevant	Moderate	Negligible

8.1.1.5.2 Impact on protected areas

8.1.1.5.2.1 Impact on protected areas other than Natura 2000

Within the offshore part of the EXC BC-Wind OWF area in the APV, there are no protected areas other than those protected as part of the European ecological network Natura 2000. Therefore, the activities carried out during the construction phase in the offshore part of the area will not

impact protected areas other than those protected as part of the European ecological network Natura 2000.

8.1.1.5.2.2 Impact on Natura 2000 protected sites

The offshore part of the EXC BC-Wind OWF route in the APV, in the southern section, will run within the site belonging to the European ecological network Natura 2000, *Przybrzeżne wody Bałtyku* (PLB990002). Information regarding this site is provided in Section 5.8.2. An assessment of the impact during the construction phase of the EXC BC-Wind OWF in the APV was carried out regarding three aspects, such as:

- subjects of protection;
- integrity of the site;
- coherence of the network.

8.1.1.5.2.2.1 Impact on subjects of protection

Within the boundaries of the Natura 2000 site *Przybrzeżne Wody Bałtyku*, there are nine bird species subject to protection [Table 5.2]. The impacts thereon were defined and assessed in Section 8.1.1.5.1.5. The significance of the impact on the bird species subject to protection within the *Przybrzeżne Wody Bałtyku* (PLB990002) site was assessed to be low at most.

8.1.1.5.2.2.2 Impact on integrity of the site

The construction of the EXC BC-Wind OWF in the APV will take place within the boundaries of the *Przybrzeżne wody Bałtyku* (PLB990002) site. Therefore, all of the above-mentioned impacts will occur within the boundaries of this site. The specific nature of the planned activities (linear infrastructure construction) indicates that they will take place at different times and locations. For this reason, also the extent of the impacts will move along with the progress of works, ceasing in the place of their completion and arising in the place where the works are being carried out. After the complete cessation of the works, most of the effects of the impacts will cease within a relatively short time. Depletion of the food supply for benthivorous birds (the velvet scoter, the long-tailed duck, the common scoter) will be the longest lasting disturbance directly in the locations where power cables will be buried. Regarding the small size of the cable laying area in relation to the total area of the *Przybrzeżne wody Bałtyku* (PLB990002) site and the fact that the regeneration of the entire macrozoobenthos community and the restoration to its original state once the works are completed will be possible within the period from one to several years (this is the length of time it will take to rebuild the quantitative structure of the longest-living species in this group, such as the mussels *Mya arenaria* and *Limecola balthica* as well as *Mytilus trossulus* [325, 482]), the local depletion of the food supply will not have a significant impact on the deterioration in the welfare of the subjects of protection and their habitats.

Pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880), the integrity of the Natura 2000 site is defined as: “coherence of structural and functional factors determining the sustainable duration of populations of species and natural habitats for the protection of which a Natura 2000 site has been designed or designated.” As indicated by the analysis, the impacts on the subjects of protection of the *Przybrzeżne wody Bałtyku* (PLB990002) site will mainly involve local and short-term scaring of protected bird species as well as temporary and local depletion of the food supply for benthivorous birds, without having an impact on the integrity of the Natura 2000 site under assessment.

8.1.1.5.2.2.3 *Impact on the network coherence*

The activities associated with the construction phase of the EXC BC-Wind OWF in the APV carried out inside and outside the area of the *Przybrzeżne wody Bałtyku* (PLB990002) site, due to their specific nature, including in particular temporary and local impacts both on the subjects of protection and their habitats, will not have any impacts on the coherence of the Natura 2000 network. The execution of the project discussed will not lead to the disturbance in the movement of birds between the *Przybrzeżne wody Bałtyku* (PLB990002) site and other Natura 2000 sites.

8.1.1.5.3 **Impact on wildlife corridors**

A wildlife corridor, pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended), is defined as an area enabling the migration of plants, animals or fungi. The network of wildlife corridors connecting the European ecological network Natura 2000 in Poland was developed in 2011 [199]. This study indicates that no wildlife corridors exist within the Polish Sea Areas. In the spring and autumn periods, regular bird migrations take place within the Baltic Sea area; however, the migration tactics and their routes are very poorly recognised. Bird migration routes depend mainly on the prevailing meteorological conditions.

Also marine mammals move within the maritime areas, however, in their case, the migration routes are not fixed, but result from the need to forage for food.

Given the lack of information on the occurrence, functioning and significance of wildlife corridors within the maritime areas, it was conservatively assumed that the value of this resource is medium. Considering the spatial scale of the activities associated with the construction of the EXC BC-Wind OWF in the APV in relation to the size of the maritime area and their specific nature resulting from the presence of installation vessels proceeding along with the progress of works, it was concluded that no impacts which might in any way prevent animals from migrating will occur.

8.1.1.5.4 **Impact on biodiversity**

8.1.1.5.4.1 **Phytobenthos**

No phytobenthos was recorded within the area of the EXC BC-Wind OWF in the APV. Hence, the construction of the cable lines will not cause phytobenthos depletion. Cables laid on the seabed along some sections of the cable line, in combination with the applied protection against their damage, might provide favourable conditions for benthic organisms to colonise their surface. This situation can contribute to a local increase in biodiversity by altering the habitat conditions.

8.1.1.5.4.2 **Macrozoobenthos**

The construction of the EXC BC-Wind OWF in the APV will cause damage to macrozoobenthic communities at the location of the disturbance of seabed sediments. As a consequence, the loss of biodiversity will be local and short-term. After the cessation of the works, the original seabed conditions will be restored. Except the cable line sections where power cables will be possibly laid on the seabed and protected against damage, there will be no change in sediment conditions. Therefore, considering the high reproductive capacity of macrozoobenthic organisms and their commonness, the state from before the commencement of operations disturbing the seabed will be restored relatively quickly, both in terms of their biomass and abundance. The qualitative and quantitative reconstruction of the macrozoobenthic communities will not lead to a change in the taxonomic composition in this area.

8.1.1.5.4.3 Ichthyofauna

The activities associated with the construction of the EXC BC-Wind OWF in the APV will have an impact on fish present in the vicinity of the work site, in particular, making them flee to areas where conditions are undisturbed. Once the causes of the impact have ceased to exist, the habitat conditions will be restored to their original state, thereby enabling the fish to return to their original habitat. Therefore, there will be no change in ichthyofauna diversity in the vicinity of the EXC BC-Wind OWF area in the APV.

8.1.1.5.4.4 Marine mammals

Marine mammals occur in the vicinity of the construction site of the EXC BC-Wind OWF in the APV only occasionally. The works conducted may lead to local disturbance in their habitat, therefore, these animals will avoid the work site. This situation will in no way affect the marine mammal species diversity, neither in the vicinity of the EXC BC-Wind OWF area in the APV nor within the Southern Baltic.

8.1.1.5.4.5 Seabirds

The impacts on the seabirds present in the vicinity of the work site were identified for the construction phase of the EXC BC-Wind OWF in the APV. They will result in birds being scared away due to the presence of vessels. In addition, there will be a local and medium-term at most deterioration in habitat conditions for birds foraging in the cable burial locations. Taking account of the size and proximity of alternative feeding grounds, mostly for benthivorous birds, the works conducted will not affect the biodiversity of birds present in the vicinity of the work site.

8.1.1.6 Impact on cultural values, monuments and archaeological sites and features

During geophysical surveys within the EXC BC-Wind OWF area in the APV, no sites of cultural interest or monuments were identified. No archaeological sites or features are located in this area.

Two shipwrecks lying on the seabed west of the EXC BC-Wind OWF area in the APV, as a consequence of the works resulting in seabed disturbance, if westerly sea currents occur, will be within the range of deposition of suspended solids from the water column onto the sediment surface. The deposition of suspended solids may partially result in covering the elements of these shipwrecks protruding above the seabed with a layer of fine fraction of suspended solids with a thickness of no more than a few millimetres. Similar values of suspended solids concentration and the resultant deposition values are recorded on a regular basis during storm events, therefore, the significance of the impact on the shipwrecks resulting from the operations disturbing the seabed will be low.

Table 8.20 and Table 8.21 present an assessment of the scale and of the significance of the impact on cultural values during the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.20. Assessment of the scale of impacts on cultural values during the EXC BC-Wind OWF construction phase
 [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Suspended solids deposition		x				x					x		x	6	

Table 8.21. Assessment of the significance of the impact on cultural values during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Suspended solids deposition	Low	High	Low

8.1.1.7 Impact on the use and management of the sea area and tangible property

One of the primary uses of maritime areas is navigation, including the movement of fishing vessels to and from fisheries to ports. Impacts on shipping will result from the activity of the vessels involved in the activities associated with the cable line construction in the vicinity of the EXC BC-Wind OWF area. A description and assessment of these impacts, taking into account their characteristics, is described and assessed in Appendix 6.

8.1.1.8 Impact on landscape, including cultural landscape

Pursuant to the definition provided in the *Act on the protection and care of historical monuments* of 23 July 2003 (Journal of Laws of 2003, No. 162, item 1568, as amended), the sea area can be considered a space which contains natural elements shaped under the influence of natural factors. During the EXC BC-Wind OWF construction phase in the APV, vessels involved in the process of power cable burial will be present within this space.

During the construction phase, the impact of the project on the landscape, including the cultural landscape, will result from the presence of vessels involved in the process of power cable burial. The involvement of various types of vessels, i.e. CLVs, cable barges, tugboats, service vessels or other multi-purpose vessels is expected. The largest vessels expected to participate in the construction works are CLVs, which are up to 200 m long.

The greatest impact will be observed in the nearshore zone, where vessels are normally not seen or hardly seen during their regular activity. Outside this zone, the presence of various types of vessels is a permanent element of the seascape, therefore the impact will be considerably lower.

As a result of the cable line construction, no structural elements protruding above the water surface shall be erected. Also the coastal landscape will remain undisturbed during the construction phase, as the cable lines will be landed using the horizontal directional drilling technique, which will allow the coastal water area, the beach and the dune zone to be excluded from the construction works.

Considering the manner of implementation of the proposed project and the current use of the area, the impact on the landscape during the EXC BC-Wind OWF construction phase in the APV will be direct, local, temporary and reversible.

Table 8.22 and Table 8.23 present an assessment of the scale and of the significance of the impact on landscape, including cultural landscape, identified for the construction phase of the EXC BC-Wind OWF in the APV.

Table 8.22. Assessment of the scale of impacts on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics														Joint assessment
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
Points															
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13		
Presence and traffic of vessels	x					x					x		x	6	

Table 8.23. Assessment of the significance of the impact on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible

8.1.1.9 Impact on population, health and living conditions of people

Passage through the sea areas will be temporarily impeded for other users during the EXC BC-Wind OWF construction phase in the APV. This applies to shipping/fishery and, to a much lesser extent, tourism. In the case of ships sailing along the shipping route to and from the ports of Gdynia and Gdańsk, it will be necessary to modify the sailing course due to the presence of vessels involved in the cable line construction.

The cable line construction will also result in temporary restrictions for fishing vessels fishing in this area or sailing to and from fisheries.

Except for the above-mentioned impact on co-users of the sea area, there will be no other impacts on population, human health and living conditions during the EXC BC-Wind OWF construction phase in the APV.

Table 8.24 and Table 8.25 present an assessment of the scale and of the significance of the impacts on population, human health and living conditions identified for the EXC BC-Wind OWF construction phase.

Table 8.24. Assessment of the scale of impacts on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics														Joint assessment
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
Points															
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13		
Presence and traffic of vessels	x					x					x		x	6	

Table 8.25. Assessment of the significance of the impact on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible

8.1.2 Operation phase in the offshore part

8.1.2.1 Impact on geological structure, seabed topography, seabed sediments and access to raw materials and deposits

Depending on its structure, the seabed may exhibit different sensitivity to the impact of the cables buried in it. The seabed made of till and till with a stony cover is difficult to wash out and withstands morphological changes. A sandy, sandy-silty, and silty seabed is more susceptible to the washout and material being displaced over it, e.g. in the form of sand waves. Thus, the elements of the connection infrastructure may be exposed or buried, both as a result of natural processes involving the movement of sediment material along the seabed and as a result of this movement being disrupted by the connection infrastructure components remaining on the seabed. If the cables are left on the seabed and protected against damage with concrete mats or rip-rap, it might generate an impact on the processes of sediment transport: seabed washouts upstream/downstream of the OWF infrastructure components, formation of sediment accumulation upstream/downstream of the infrastructure components (sandy drifts). This may in particular be the case in the coastal zone, where seabed dynamics is more intense than in areas further away from the shore.

The technology involving laying cables to a depth of 4 MBSB, which was assumed by the Applicant and dominates along the entire cable line route, will, to a considerable extent, eliminate the events of this type.

Owing to the fact that the EXC BC-Wind OWF in the APV is located outside areas with known raw material resources and deposits, there will be no impacts on these environmental resources at the operation stage.

Table 8.26 and Table 8.27 present an assessment of the scale and of the significance of the impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits identified for the operation phase of the EXC BC-Wind OWF in the APV.

Table 8.26. Assessment of the scale of impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Physical disturbance of the seabed	x					x	x					x		12

Table 8.27. Assessment of the significance of the impact on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical disturbance of the seabed	High	Low	Low

8.1.2.2 Impact on the quality of seawater and seabed sediments

During the EXC BC-Wind OWF operation phase in the APV, works affecting the quality of water and seabed sediments will be carried out. These will mainly include maintenance works (cable line inspections) and possible interventions in case of an emergency situation.

These activities may induce two types of impacts such as the contamination of water and seabed sediments with oil derivatives. Additionally, power transmission will result in a change in thermal conditions of the seabed sediments and, to a smaller extent, of the water in the immediate vicinity of the cable lines.

8.1.2.2.1 Contamination of water and seabed sediments with oil derivatives during normal operation of vessels in the course of routine maintenance activities

During normal operation of vessels, when carrying out periodic inspections on the connection infrastructure and possible repairs, leakages of various types of oil derivatives (lubricating and diesel oils, petrol) may occur.

To a minor extent, these substances may contribute to the deterioration of water quality. Heavier oil fractions may undergo sorption on the surface of organic and mineral suspended solids, which will increase their specific gravity and make them gradually sink to the bottom. It is also where they may be deposited in the seabed sediments.

8.1.2.2.2 Change in sediment and water temperature as a result of the heat reception from transmission cables

The electric current flowing through a power cable causes its heating related to the power losses due to resistance, in accordance with Joule's law. As the temperature of the cable increases above the ambient temperature, the transfer of heat from the cable to its surroundings begins. A precise indication of the amount of dissipated heat is difficult because of the following phenomena: heat conduction, convection and radiation, subject to different laws of physics [391].

Increasing the temperature of sediments in which the cable is buried and the interstitial waters (water filling the spaces between sand grains in the sediment) may cause:

- increased bacterial activity resulting in accelerated decomposition of organic matter;
- decrease in water oxygen content;
- release of harmful substances, including metals, from sediment into water;
- adverse effects on benthic organisms.

The most important parameters affecting the impact level are the depth of cable burial and the type of seabed.

In the operating Nysted Offshore Wind Farm, the temperature increase emitted by the transmission cable (132 kV) buried at a depth of 1 m did not exceed 1.4°C in a layer of 20 cm above the cable, whereas on the seabed surface the temperature changes were already imperceptible [267]. This cable was buried in gravel sediment, which favours much higher heat loss in interstitial spaces between sediment grains than in the case of fine-grained sediment [267]. Both these types of sediment are common in the area of the planned construction of the EXC BC-Wind OWF, however, the transmission cables to be used will have an operating voltage between 220 and 275 kV.

Heating of the seabed sediment and interstitial waters may also be conducive to the transfer of metals from sediment to the water column and accelerate the processes of decomposition of organic pollutants in the seabed sediment. Benthic fauna is adapted to seasonal temperature changes and is insensitive or shows very low sensitivity to a temperature increase of 2°C [33]. According to the standards proposed by the German Federal Agency for Nature Conservation, the increase in temperature due to the heat emission by an OWF transmission cable in a layer 20 cm below the seabed, which is the main habitat of the infauna, must not exceed 2°C.

An increase in sediment temperature by 1°C may cause a 10-fold increase in bacterial activity, which may accelerate and increase organic matter decomposition processes. This situation may also promote the decomposition of organic nitrogen, which becomes more available due to increased and accelerated mineralisation to inorganic compounds (the amount of inorganic nitrogen forms – generally well soluble in water – increases). An increase in temperature may also cause a decrease in the oxygen content of the water [271, 474, 424] and promote the conversion of ammoniacal nitrogen compounds contained in water and sediments to the gaseous form, which is harmful to living organisms [110]. At a temperature of 5°C and pH 8.2, approximately 2% of ammonium compounds convert into the gas form, while at a temperature of 25°C approximately 8% of ammonium compounds convert into the gas form (approx. a 4-fold increase). The proportion of the different forms of ammonia is very important for fish and other marine organisms, for which the gaseous form (NH₃) is toxic, as opposed to the NH₄⁺ ions [110]. According to Directive 76/464/EEC, the lethal concentration of ammonia for rainbow trout is 5 mg·dm⁻³, whereas for crustaceans it is 8 mg·dm⁻³.

Heating of the seabed sediment and interstitial waters may also intensify the processes of transfer of metals from the sediment to the water column and accelerate the processes of decomposition (degradation) of organic pollutants in the seabed sediment. An increase in sediment temperature may also adversely affect the condition of benthic organisms [267]. Moreover, the nutrient and oxygen content may be altered as a result of disturbance in the temperature profile [465].

If the power cables are laid on the seabed and covered with protection structures, the heat emitted will immediately dissipate in the seawater and will not affect the marine environment condition.

8.1.2.2.3 Summary of the assessment of the impact on the quality of seawater and seabed sediment

Table 8.28 and Table 8.29 present an assessment of the scale and of the significance of the impacts on the quality of seawater and seabed sediments identified for the EXC BC-Wind OWF operation phase.

Table 8.28. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the EXC BC-Wind OWF operation phase [source: internal materials].

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Spills of petroleum products	x					x				x			x	7
Change in sediment and water temperature	x					x	x						x	10

Table 8.29. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the EXC BC-Wind OWF operation phase [Source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Spills of petroleum products	Low	Low	Negligible
Change in sediment and water temperature	High	Low	Low

8.1.2.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

During the operation phase of the EXC BC-Wind OWF in the APV, periodic inspections of the power cables laid on the seabed are foreseen along their entire length. These will take place at least once every 5 years and will be carried out by small service vessels. Therefore, no noticeable impact on climate, greenhouse gas emissions and air quality is expected to result from the activities performed.

8.1.2.4 Impact on ambient noise

The power transmission cables buried in the seabed or laid on the seabed and protected against damage will generate vibrations in the form of sound emitted to the environment. The sound measured during a period of very low ambient noise levels at a distance of 100 m from a 138 kV AC transmission line passing through Trincomali Channel (Canada) did not exceed 80 dB re 1 µPa. Taking into account the cylindrical model of sound attenuation, it can be assumed that the noise level at a distance of 1 m from the cable will be approximately 100 dB re 1 µPa [196].

Periodic maintenance and possible repairs of the cables requiring operations of smaller vessels, similar to those described in detail for the construction phase, will be limited to a smaller area and will be considerably less intense. Therefore, considering the level of underwater noise resulting

from the current activities in the sea areas, mostly shipping, the impact of ambient noise in the operation phase will be negligible.

8.1.2.5 Impact on electromagnetic field

The impact of cables buried in the seabed on the electromagnetic field is negligible. According to Normandeau Associates Inc. [291], depending on the distance from a cable buried in the seabed at a depth of 1 MBSB, the strength of the electric component of the field is up to $8 \cdot 10^{-4} \text{ V} \cdot \text{m}^{-1}$ on the seabed, $3.4 \cdot 10^{-5} \text{ V} \cdot \text{m}^{-1}$ in the water column 5 MASB and $1.24 \cdot 10^{-5} \text{ V} \cdot \text{m}^{-1}$ in the water column 10 MASB. The magnetic field strength induced by AC cables is $0.89 \text{ A} \cdot \text{m}^{-1}$ on the seabed, $4 \cdot 10^{-2} \text{ A} \cdot \text{m}^{-1}$ in the water column 5 MASB and $1.5 \cdot 10^{-2} \text{ A} \cdot \text{m}^{-1}$ in the water column 10 MASB.

8.1.2.6 Impact on nature and protected areas

8.1.2.6.1 Impact on biotic components within the offshore area

8.1.2.6.1.1 Phytobenthos

The design solutions for the EXC BC-Wind OWF in the APV provide for the possibility of cables not being buried in the seabed at short cable line sections. In such a case, the cables left on the seabed will be protected against damage with e.g. concrete mattresses, rip-rap, concrete protections. If such structures are located in areas with conditions favourable for the development of macroalgae, the possibility will arise that phytoperiphyton communities will grow on them [225, 362, 86]. If protection systems are installed at a depth of approximately 20 m, it can be expected that these structures will be covered in small amounts mainly with red algae, which will be replaced by bay mussels and balanuses in the later phase of the artificial reef development [258, 362]. The course of succession of periphyton communities is not fully known and not always uniform, as it depends on the interaction of biotic factors (interspecific competition) and abiotic factors (waters hydrodynamics, type of substrate introduced) [321]. The emergence of an artificial reef within the area is considered, on the one hand, a negative impact (disturbance of the original conditions), and, on the other hand, a positive one (local increase in biodiversity) [81, 86].

The magnitude of this impact will be insignificant, as the areas where the cables will be left on the seabed, together with their protection systems, represent a potentially small percentage of the total cable line length, which means that the area of newly created habitats will be small. The sensitivity of macroalgae should be considered high as they have a high potential to develop in the presence of hard substrates to which they easily attach.

Table 8.30 and Table 8.31 present an assessment of the scale and of the significance of the impacts on phytobenthos identified for the EXC BC-Wind OWF operation phase.

Table 8.30. Assessment of the scale of impacts on phytobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
	Creation of habitats for phytobenthos		x				x		x						x

Table 8.31. Assessment of the significance of the impact on phytobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Creation of habitats for phytobenthos	Moderate	High	Moderate

8.1.2.6.1.2 Macrozoobenthos

The following three impacts on macrozoobenthos resulting from the presence of power cables were identified for the EXC BC-Wind OWF operation phase in the APV:

- habitat alteration as a result hard substrate formation along the sections of the route of the cable lines laid on the seabed and protected against damage;
- electromagnetic field emissions;
- heat emissions.

8.1.2.6.1.2.1 Habitat alteration

The sections of the route of the cable lines laid on the seabed and protected against damage will create favourable conditions for the colonisation of hard surfaces by zooperiphyton communities. As a consequence, the artificial reef effect will take place, i.e. the colonisation of hard substrates by zoo- and phytoperiphyton communities and by mobile epifauna. Although this impact is widely documented in the literature (e.g. [34, 248, 33, 450, 215, 45, 362, 195, 28, 88, 255, 449]), so far it has been impossible to monitor the artificial reef phenomenon in the PSA of the Southern Baltic [27, 417, 418, 337]. Only experimental studies have been conducted on an artificial structure installed in the environment [101].

On the one hand, this is a positive phenomenon, since there will be an increase in local biodiversity [440, 450, 245, 28, 88], while on the other hand, the artificial reef effect can be considered a negative impact, as the original character of the seabed habitat will be altered and it may be conducive to the propagation of non-native, invasive alien species [56, 53, 81]. The invasive alien species quickly displace native species, leading to changes in the existing balance of the food web [194, 292, 239].

In the case of the EXC BC-Wind OWF in the APV, the cables may potentially be left on the seabed and protected along a relatively short section of the cable line route within the hard bottom, where stones and boulders are present. They provide habitat for, among others, periphytic organisms. The newly formed hard substrate will be, thus, colonised by the same species. Therefore, the artificial reef that may be formed on the concrete cable protections will

compensate for the destruction of the natural habitat, and the biodiversity at the site will be maintained. Incidentally, such areas may also be formed on the seabed types that previously had a different character, where cable burial proves unfeasible. In general, on the basis of experimental research [101], it is assumed that hard substrates will be firstly colonised by barnacles (*Amphibalanus improvisus*) and bay mussels (*Mytilus* sp.), followed by mobile crustaceans (such as *Gammarus* spp., *Corophium volutator* and *Monoporeia affinis*) as well as macroalgae. In the case of a single location, confined only to a structure fixed to the seabed (concrete cable protection), it is unlikely for alien species to occur at the site.

What is subject to assessment is no longer the original assembly of benthic communities of the EXC BC-Wind OWF area in the APV, but the impact of the artificial reef on the natural environment. It is possible to evaluate only the scale of this phenomenon. Although the artificial reef effect will be long-term and permanent, due to its localised extent (very small surface, e.g. single sections of the cable line route), the impact significance will be low.

8.1.2.6.1.2.2 Electromagnetic field emissions

The operation of the EXC BC-Wind OWF in the APV will involve the generation of an electromagnetic field around the cables. The first commercial HVDC cable in the Baltic Sea was installed in 1954 between Sweden and Gotland [409], but since that time, although the literature on the potential effects of this impact on benthic fauna in the Baltic Sea is better and better documented, knowledge on this subject is still inconclusive [263, 481, 81]. An important input information is the determination of cable laying depth, the magnitude of this radiation, time of exposure as well as cable type and cable insulation method applied [7, 313, 409].

The presence of power cables in the marine environment modifies natural conditions for marine organisms. However, so far, no legislation has been developed specifying what magnitude of EMF is harmful for marine animals. The impact of EMF on individual species of benthic fauna, including bivalves, crustaceans or polychaetes, has so far been examined only on the basis of laboratory tests [40, 193, 314, 389], and their results vary depending on the output characteristics of the EMF emitted and the organisms examined. The conclusions formulated on the basis of laboratory experiments exploring negative effects on benthos may be inadequate (lower impact than in reality) compared to the *in situ* situation [71]. Many of the laboratory experiments conducted include invertebrate species that are commercially important resources for people (crabs, lobsters) [71, 183]. The results of an experiment conducted on the benthic fauna species which are representative and important in the PSA, i.e. the *Limecola balthica* bivalve and the *Hediste diversicolor* polychaete suggest negative, cytotoxic and genotoxic impact of the EMF with a frequency of 50 Hz and magnetic induction of 1 mT on these organisms, leading to cancer. The authors of this experiment [389] recommend considering the *L. balthica* bivalve as a bioindicator for the EMF impact on the benthic fauna. On the other hand, Jakubowska *et al.* [193] observed changes in motor skills as well as changes in bioturbation in polychaetes under the influence of EMF. Pursuant to the Marine Strategy Framework Directive (MSFD) [98], it is recommended to investigate the impact of EMF on aquatic organisms to determine the minimum value of harmful influence of this parameter on individual groups of animals.

In summary, EMF may not affect the structure and functioning of benthos in the project area at all or may have a slight negative impact on benthic species at the level of biochemical and physiological changes [40, 28, 314]. As demonstrated in the analyses, in the case of AC EHV export cables, already at a distance of approximately 1.5 m from the cable, the EMF intensity levels are negligible in the context of the impact on the marine environment [291]. The burial of the cable at this depth or greater will neutralise the impact of EMF on benthic marine organisms sensitive

to EMF. Nevertheless, it is still difficult to determine whether the magnitude of the EMF emitted by the AC cables within the EXC BC-Wind OWF area will cause any adverse impact on macrozoobenthos.

8.1.2.6.1.2.3 Heat emissions

The heat emitted by power cables, causing an increase in the surrounding air temperature, results from electric current flow and the cable heating up according to Joule's law. As the temperature of the cable rises, the heat is released to the environment. The heat emission is considerably higher for AC cables (this cable type will be used for the purpose of the EXC BC-Wind OWF) than for DC cables [409]. The increase in sediment temperature may lead to adverse changes in the qualitative and quantitative structure of macrozoobenthos living on and in the seabed in the immediate vicinity of the cables due to chemical and physical modifications of the seabed sediments and the availability of oxygen for benthic organisms, which results in the elimination of the most sensitive taxa [409]. At the Nysted Offshore Wind Farm (western Baltic Sea), the increase in temperature emitted by the transmission cable (132 kV) buried at a depth of 1 m did not exceed 1.4 °C in a layer of 20 cm above the cable, whereas on the seabed surface the temperature changes were already imperceptible [267]. The cable was buried in gravel sediment, which favours much higher heat loss in interstitial spaces between sediment grains than in the case of fine-grained sediment. Both types of sediment can be found within the EXC BC-Wind OWF area.

Benthic fauna is adapted to significant seasonal temperature changes and is insensitive or shows very low sensitivity to a temperature increase of 2°C [481, 33]. According to the standards proposed by OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, the temperature increase due to the heat emission by transmission cables in a layer 20 cm below the seabed, which is the most biologically active habitat of the infauna, should not exceed 2°C.

Since as part of the EXC BC-Wind OWF implementation, the AC cable type will be used, which is characterised by a high temperature of the phase conductor of up to 90°C, it is possible that this factor may have some influence on the macrozoobenthic communities living above the buried cable, although according to the literature knowledge this impact will be insignificant [291, 409]. Moreover, burying the cables at a depth of up to 4 MBGL will result in even smaller impacts on macrozoobenthic organisms living in the sub-surface layer and on the seabed in the project area, during the operation phase. The actual effect of this impact, which is poorly documented in literature, cannot be determined.

8.1.2.6.1.2.4 Summary of the assessment of the impact on macrozoobenthos

Table 8.32 and Table 8.33 present an assessment of the scale and of the significance of the impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the APV.

Table 8.32. Assessment of the scale of impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Habitat alteration	x					x	x						x	10
Electromagnetic field emissions	x					x	x						x	10
Heat emissions	x					x	x						x	10

Table 8.33. Assessment of the significance of the impact on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Habitat alteration	High	Irrelevant	Negligible
Electromagnetic field emissions	High	Irrelevant	Negligible
Heat emissions	High	Irrelevant	Negligible

8.1.2.6.1.3 Ichthyofauna

The following three impacts on macrozoobenthos resulting from the presence of power cables were identified for the EXC BC-Wind OWF operation phase in the APV:

- noise and vibrations,
- habitat alteration,
- electromagnetic field emission.

8.1.2.6.1.3.1 Noise and vibrations

Cable vibration resulting from AC current flow emits sound. The sound measured during a period of very low ambient noise levels at a distance of 100 m from a 138 kV AC transmission line passing through Trincomali Channel (Canada) did not exceed 80 dB re 1 µPa. Taking into account the cylindrical model of sound attenuation, it can be assumed that the noise level at a distance of 1 m from the cable will be approximately 100 dB re 1 µPa [196]. This value is definitely lower than the one which may occur during the EXC BC-Wind OWF operation [309]. However, it should be remembered that in this case it is a continuous sound source. According to Meissner *et al.* [262], it can be assumed that the impact should not be significant. A similar assessment was made by Taormina *et al.* [409], underlining that due to the lack of data on the long-term noise impacts on living organisms, this problem should be approached with special attention.

As the cable will be buried deeper than 1 MBSB or will be protected, the noise level on the seabed will be considerably reduced.

Emissions of noise and vibrations generated during the EXC BC-Wind OWF operation in the APV may directly affect the ichthyofauna. These impacts will be negative, direct, local and permanent.

In the case of fish with a swim bladder, such as cod, herring, sprat, sand goby, common goby and twaite shad, the species sensitivity is assessed to be high, whereas for fish without a swim bladder, such as flounder, common seasnail and straightnose pipefish, it is assessed to be moderate.

8.1.2.6.1.3.2 *Habitat alteration*

In locations where cable burial in the sediment is impossible, it may be necessary to apply various means of infrastructure protection against damage. These may include various types of concrete structures (concrete mats), boulder and stone embankments, plastic and metal covers [358]. Such objects, as well as the cable itself lying on the sediment surface, create a new habitat that can be colonised by organisms [409]. In this case, the so-called artificial reef effect occurs, the scale of which depends both on the size of the area where these structures are placed, on their surface area and complexity as well as the environmental conditions in which it was created and the composition of the fauna in its area [244, 157]. The formation of an artificial reef on a seabed lacking hard substrate will have a much more significant impact than in an environment where such substrate is present [409].

At the first stage, the reef becomes inhabited by periphyton organisms, macrophytes and invertebrates [114]. Several months later already, numerous populations of fish [421, 392] appear in the reef area, both the ones returning after the cessation of the disturbances related to the construction [354] as well as those absent in the area before (increase in biodiversity). According to Kerckhof *et al.* [216], after 6 years, we can speak about a fully developed community of organisms inhabiting the artificial reef (climax community).

After being inhabited by periphyton, macrophytes and invertebrates, artificial reef becomes an attractive habitat for ichthyofauna. The information on this issue is based on studies conducted in the OWF area. However, there have been no studies on the artificial reef effect caused by the presence of elements protecting the transmission infrastructure on the seabed. It may be assumed, however, that despite its smaller scale, the nature of this impact will be similar to the one identified for the OWF. Artificial reefs formed by cable protection structures, as well as the cable lying on the seabed itself, can offer rich food resources and shelter, also creating favourable conditions for reproduction of many fish species, for adult stages as well as eggs, larvae and juvenile individuals. Such a situation was observed for structural elements of wind turbines and anti-erosion protection solutions, which offered attractive hiding places for young (2–3-year-old) cod [357]. The studies by Reubens *et al.* [356], which compared the fish catch efficiency of cod and bib on a sandy seabed and in regions where hard artificial substrates were present (wrecks, OWFs), indicated distinct groupings of these species in the project area, particularly in the periods of intense feeding (summer, autumn). Artificial reefs may also provide favourable breeding conditions for numerous fish species such as herring, pogge, garfish, lumpfish and rock gunnel [481] According to Jensen *et al.* [198], the artificial reef area also provides preferable spawning conditions for gobies, which include species protected in Poland.

Artificial reefs offering environmental conditions significantly different from those previously prevailing in a given area may constitute an environment facilitating invasion of alien species [244]. Most of the information about the appearance of alien species on artificial reefs concerns the periphyton and crustaceans, but it cannot be excluded that such areas may create a favourable environment also for alien fish species.

The newly created habitat, with its hard substrate and relatively rich food supply for benthivorous fish, may constitute a favourable environment for the colonisation by the invasive round goby. However, artificial reefs created as a result of the construction of transmission infrastructure are not an area where the reproduction of this species takes place. Round goby spawns at depths of

0.2 to 1.5 m, i.e. in areas where the construction of cable protection elements on the seabed surface is unlikely [441, 375].

Taormina *et al.* [409] identify the potential impact of the artificial reef effect created by subsea cables as small, while emphasising the need for further studies to collect more information on the subject. Meißner *et al.* [262] estimate that due to the small width of the strip of hard substrate created by the cable or its protective structures, the impact will be highly localised, although long-lasting.

The species sensitivity to the impact was assessed as high for cod, flounder, herring, common seasnail, sand goby, common goby and straight-nose pipefish, whereas for sprat and twaite shad it was assessed as low.

Taking into account a low probability of creating a new habitat over a considerably large seabed area, the sensitivity to the impact for cod, flounder, herring, common seasnail, sand goby and common goby and straight-nose pipefish was assessed as moderate, whereas for sprat and twaite shad it was assessed as low.

8.1.2.6.1.3.3 Electromagnetic field emissions

An electric current flowing through a power cable induces a magnetic field, the intensity of which depends on the current intensity. The field intensity decreases, both horizontally and vertically, with the distance from the current conductor. In the case of alternating current, the direction of flow changes, which entails changes in the magnetic field over time. As a result, the changing magnetic field induces an alternating electric field in seawater [135]. The use of three-phase AC cables practically allows to eliminate the emission of the magnetic field outside the cable due to current phase shifts in individual conductors of the cable [310]. The electric field, being dependent on the magnetic field, will diminish with the distance from the cable.

Based on the calculations for various AC transmission system designs, Tricas and Gill [291] determined the average value of the magnetic field to be expected at different depths, depending on the distance from a cable buried in the seabed at the depth of 1 [Table 8.34].

Table 8.34. Magnetic field strength [μT] in relation to vertical distance from the seabed and horizontal distance from the cable (alternating current, cable burial depth 1 m) [source: internal materials based on [291]]

Vertical distance from the seabed [m]	Magnetic field strength [μT] at horizontal distance from the cable [m]		
	0	4	10
0	7.85	1.47	0.22
5	0.35	0.29	0.14
10	0.13	0.12	0.08

The spatial range of the induced electric field usually reaches up to several metres from its source [306, 102].

The sensitivity of ichthyofauna to the impact of electromagnetic field depends on:

- the species-specific detection threshold;
- the type of sensor in the fish (magnetic, electrical);
- lifestyle (demersal, pelagic – seabed dwellers are exposed to a higher intensity of EMF) [102].

Magnetic fields can impact both the physiology and behaviour of fish as well as their spatial cognition. At physiological level, the impacts may include, for example, altered hormone values in

brook trout [250]. Slower embryonic development has also been observed in sea trout and rainbow trout [121]. Laboratory studies conducted by Fey *et al.* [116] do not confirm a direct impact of magnetic field (10 mT) on the mortality and growth in the latter species. However, an experiment demonstrated a faster absorption of the yolk sac in larvae, which may negatively affect their condition. Krzemieniewski *et al.* [238] observed increased mortality of Wels catfish larvae exposed to a magnetic field of 0.4–0.6 T. On the other hand, no effect of long-term exposure to magnetic field (3.7 mT) was observed in juvenile flounder [40].

Disturbances in the natural field may cause problems with the orientation of migratory fish, such as European eel. However, previous *in situ* studies do not indicate a significant impact of cable-induced EMF on the migration capabilities of this species. Studies on the impact of the magnetic field generated by the submarine cable in the San Francisco Bay area on the migration of Chinook salmon (*Oncorhynchus tshawytscha*) did not indicate a significant impact of this potential source of interferences on the migration route, although its route was slightly changed [134]. Also, during the experimental surveys on the halibut's response to EMF, no significant changes in the behaviour of these fish were observed [464].

The extensive studies on the impact of cables running across the Nysted OWF area (the Danish straits) on ichthyofauna have indicated that although they constitute no barrier for fish, however, they can be an obstacle to their movement, especially the migration of eel. The authors of the EIA Report conclude that although changes in the behaviour of fish along the cable route have been observed, their cause-and-effect relationship with EMF is unclear [82].

According to Poleo *et al.* [336], the Osteichthyes display a physiological response to an electric field of $7 \text{ mV}\cdot\text{m}^{-1}$ and a behavioural response in the range $0.5\text{--}7.5 \text{ V}\cdot\text{m}^{-1}$. Studies on the impact of electric field on salmonids and eels indicate the likelihood of such reactions as accelerated pulse (field strength of $0.007\text{--}0.07 \text{ V}\cdot\text{m}^{-1}$) as well as gill and fin vibration (field strength of $0.5\text{--}7.5 \text{ V}\cdot\text{m}^{-1}$) [259]. Harmful effects such as paralysis and temporary loss of consciousness were observed in fish exposed to an electric field with a strength above $15 \text{ V}\cdot\text{m}^{-1}$ [118], i.e. at values significantly exceeding the ones generated by subsea cables.

In the OWF environmental impact assessment carried out by Bergström *et al.* [28], the EMF impact was assessed as low. Also, in the environmental impact assessment of the Horns Rev 2 OWF, the impact was classified as low or negligible [198]. According to Taormina *et al.* [409], the significance of this impact was classified as low for cables buried in the sediment and moderate for cables lying on the seabed.

As the analyses have shown, in the case of AC EHV export cables, already at a distance of approximately 1.5 m from the cable, the EMF intensity levels are negligible in the context of the impact on the marine environment. The burying of a cable at this depth or greater will neutralise the impact of EMF on the benthic and pelagic marine organisms sensitive to EMF.

The impact related to the emission of EMF will be negative, direct, local, long-term and permanent. The sensitivity to the impact was assessed as moderate for all the fish species examined.

8.1.2.6.1.3.4 Summary of impacts on marine ichthyofauna

Table 8.35 and Table 8.36 present an assessment of the scale and of the significance of the impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the APV.

Table 8.35. Assessment of the scale of impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Noise and vibrations	x					x	x						x	10	
Habitat alteration	x					x	x						x	10	
Electromagnetic field emissions	x					x	x						x	10	

Table 8.36. Assessment of the significance of the impact on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Noise and vibrations	High	Moderate	Moderate
Habitat alteration	High	Moderate	Moderate
Electromagnetic field emissions	High	Moderate	Moderate

8.1.2.6.1.4 Marine mammals

During the operation phase of the EXC BC-Wind OWF in the APV, marine mammals may be impacted by the noise generated by vessel traffic, the operation of underwater equipment and the interference in the seabed during periodic inspections or cable repair works. Due to the local and short-term nature of this impact, insignificance of this area for particular marine mammal species recorded in the Southern Baltic and the resulting sporadic occurrence of such species within the project area, this impact will be no greater than during the construction phase.

8.1.2.6.1.5 Seabirds

During the operation phase of the EXC BC-Wind OWF in the APV, no significant impact on seabirds is expected. After the construction phase is completed, the seabed will be recolonised by benthic communities, which will restore the original feeding areas of benthivorous and piscivorous birds. Therefore, it is anticipated that during the operation phase, the habitat conditions for birds within the project area will be similar to the current ones and that they will be subject to conditions other than those which may arise from the presence of power cables.

Periodic inspections will be conducted by a single vessel equipped with a remotely operated underwater vehicle (ROV). Disturbance of birds will be occasional, temporal and reversible. The vessel traffic within the EXC BC-Wind OWF area in the APV will not be more intense than in the surrounding areas.

The cable line operation period may have a positive impact on seabirds. The establishment of a protection zone for the cable lines may involve restrictions on some forms of commercial fishing within its boundaries and consequently reduce the by-catch of birds – mainly ducks diving into the

fishing nets. At this stage, it is impossible to determine the scale of this impact, and thus it was not assessed.

Summarising the above information, it should be assumed that during the operation phase of the EXC BC-Wind OWF in the APV, there will be no negative impacts on birds which could manifest in a noticeable or measurable manner.

8.1.2.6.2 Impact on protected areas

8.1.2.6.2.1 Impact on protected areas other than Natura 2000

Within the offshore area of the proposed project location and within the extent of its potential impact, there are no territorial forms of protection other than the sites of the Natura 2000 European ecological network. Therefore, no activities related to the operation of the EXC BC-Wind OWF in the APV will cause any impact on such areas.

8.1.2.6.2.2 Impact on Natura 2000 protected sites

During the operation phase of the EXC BC-Wind OWF in the APV, no impacts will occur that could significantly affect the subjects of protection of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002), the integrity of this area or the coherence of the Natura 2000 network.

Periodic inspections of the subsea cables will be carried out by small vessels. The necessity of conducting possible repairs of subsea cables may occur almost exclusively in emergency situations and is very unlikely due to various types of cable line protection measures: their durable design, burial in the seabed sediment or proper protection if they are laid on the seabed, as well as a special avoidance zone for cable lines established by the Director of the Maritime Office in Gdynia.

Periodic inspections of the cable lines will only involve bird scaring in the vicinity of vessels. In this part of the sea, the traffic of vessels is intensive due to the shipping route of cargo vessels, therefore, a short-term presence of a single vessel does not contribute to a visible increase in bird-scaring in the area; particularly in the context of the already intense shipping use of the sea area in which the project is partially located. After the construction phase is completed, the restoration of macrozoobenthic communities, constituting a possible food supply for benthivorous birds, will begin. At the operation stage, all the impacts identified for the construction phase will cease.

The operation of the cable line may have a positive impact on the Natura 2000 site features subject to protection. The establishment of a protection zone for the cable lines may involve restrictions on some forms of commercial fishing within its boundaries and consequently reduce the by-catch of birds – mainly ducks diving into the fishing nets. At this stage, it is impossible to determine the scale of this impact, and thus it was not assessed.

Summarising the information above, it should be assumed that during the operation phase of the EXC BC-Wind OWF in the APV, there will be no negative impacts on seabirds subject to protection within the *Przybrzeżne Wody Bałtyku* (PLB990002) site, on the integrity of the area or on the connections with other Natura 2000 sites which could manifest in a noticeable or measurable manner.

8.1.2.6.3 Impact on wildlife corridors

During the operation phase of the EXC BC-Wind OWF in the APV, the extent and significance of environmental impacts will be much smaller compared to the construction phase. No impacts that

could adversely affect the movement of animals both within and near the EXC BC-Wind OWF area in the APV are anticipated.

8.1.2.6.4 Impact on biodiversity

8.1.2.6.4.1 Phytobenthos

At present, no phytobenthos was found within the EXC BC-Wind OWF area in the APV, not even on a stony seabed. Leaving the cables on the seabed with additional protection at short sections of the entire cable line route may foster the conditions for the development of periphytic flora. This situation may occur in places shallower than the parts of the EXC BC-Wind OWF area in the APV within which a stony seabed not covered by phytobenthos was found. Creation of new places where phytobenthos can occur would result in a local increase in species diversity. Due to the fact that this area will potentially be small and will provide only a possible increase in diversity, this hypothetical situation will not affect changes in biodiversity within the Southern Baltic in the context of phytobenthos, thus, the impact will be negligible.

8.1.2.6.4.2 Macrozoobenthos

During the operation phase of the EXC BC-Wind OWF in the APV, there will be no changes in biodiversity – neither in terms of habitat nor species.

In the case of the soft bottom, the cables embedded in the seabed will not affect the surface layer of the sediments, the physical and chemical structure of which and the macrozoobenthic community colonising the sediments will be restored after a few years since the end of the disturbance at the latest. In the case of the hard bottom, covering the power cables with concrete covers or rip-rap will not alter the substrate characteristics in terms of its suitability for periphyton to colonise it.

The species diversity on both types of habitats will be restored close to its original condition after 3–4 years since the completion of the construction phase at the latest.

8.1.2.6.4.3 Ichthyofauna

The assessment of impacts occurring during the operation phase (noise and vibration, electromagnetic field, habitat alteration) indicates that they will not have a significant effect on ichthyofauna. In the case of the first two impacts, the technical solutions should reduce their occurrence to a minimum. Therefore, it is not anticipated that they will affect the biodiversity of this group of organisms. However, a possible local impact on ichthyofauna biodiversity can be assumed due to the presence of cable protection structures in places where they have not existed before. Structures such as rip-rap and concrete structures will provide a substrate for the formation of an artificial reef. This may result in a more abundant presence of certain fish species in their vicinity and a possible increase in certain diversity indicators. However, it should be emphasised that this phenomenon will have a very localised impact, given the probably small area on which the construction of such structures will be required. Thus, the significance of impacts on biodiversity in the context of ichthyofauna was assessed as negligible.

8.1.2.6.4.4 Marine mammals

During the operation phase of the EXC BC-Wind OWF in the APV, there will be no additional, significant disturbance in the marine mammal habitat which would prevent its use by these

animals. In this area, which is used by marine mammals incidentally, service vessels will be present occasionally. Therefore, it will not affect the biodiversity in the context of marine mammals.

8.1.2.6.4.5 Seabirds

During the operation phase of the EXC BC-Wind OWF in the APV, there will be no impacts that could affect the biodiversity in the context of birds. After the construction phase is completed, the habitat conditions will be restored to their pre-disturbance state. Benthic communities, providing a food supply for birds, will be restored naturally at the former work sites, whereas the occasional presence of service vessels will not lead to changes in the species structure of the birds using this area, mainly during the wintering period.

8.1.2.7 Impact on cultural values, monuments and archaeological sites and features

During the operation phase of the EXC BC-Wind OWF in the APV, no underwater works are anticipated that would result in seabed interference, except for cable repairs in case of damage. Potential impacts on wrecks during the operation phase will result from the sedimentation of the sediments mobilised into the water column during the exposure of a damaged cable section. Mass flow excavation (MFE) of damaged sections of cable lines is associated with more intense resuspension and sedimentation than the technologies planned to be used during the construction phase. The need for the application of MFE technology will only arise in emergency situations and that the underwater works will cover only short cable line sections. For this reason, the impact of sedimentation on the surface of wrecks is expected to be smaller than during the construction phase, and will not affect the conservation status of the wrecks. The scale of the impact of potential repair work during the operation phase on the conservation status of the wrecks located within its boundaries and in the surrounding area will be irrelevant and the impact will be negligible.

8.1.2.8 Impact on the use and management of the sea area and tangible property

During the operation phase of the EXC BC-Wind OWF in the APV, the impact on the use and development of the sea area will result virtually exclusively from the establishment by the Director of the Maritime Office in Gdynia of the safety zone for the cable lines within which prohibitions and restrictions will apply in order to protect the subsea cables from damage or destruction. These issues are governed by separate provisions.

Out of the existing uses of the sea area, the protection zone will impose the strongest restrictions on fishing activities as regards fish catching as the use of demersal fishing gear will most likely be prohibited within the zone. The analysis of commercial fishing and fishing effort in the statistical rectangles showed that there are no significant commercial fisheries within their boundaries. Therefore, the EXC BC-Wind OWF will have a negligible impact on the fishing activity in this area. The designated zone will not affect the possibility of free passage.

During the operation phase, the cable lines will be inspected periodically, at least once every 5 years. This type of work is usually performed by one vessel. Therefore, no impacts on navigation and other uses of the sea area are anticipated.

8.1.2.9 Impact on landscape, including cultural landscape

During the operation phase of the EXC BC-Wind OWF in the APV, the cable lines will be inspected periodically, using relatively small service vessels. Their presence in the offshore area will not

affect the landscape character, which is formed, i.a. anthropogenically by the intensive use of this part of the Baltic Sea for navigation.

8.1.2.10 Impact on population, health and living conditions of people

Restrictions on the use of the EXC BC-Wind OWF area in the APV resulting from establishing a safety zone for the cable lines will result in the exclusion of this part of the sea area from demersal fishing for ichthyofauna. Due to the fact that it plays a very minor role in commercial fishing and due to the small surface of the sea area predicted to be covered by the restrictions, it is expected that the impacts of the EXC BC-Wind OWF on the population and living conditions of people resulting from the restrictions on fisheries are considered negligible. There will be no impacts on human health.

8.1.3 Decommissioning phase in the offshore part

The following two options for implementing the decommissioning phase of the EXC BC-Wind OWF in the APV are envisaged:

- deactivation of the connection infrastructure and leaving the cables buried in the seabed – the method preferred by the Applicant);
- deactivation of the connection infrastructure, removing the cables from the seabed and transferring them for disposal.

The former option assumes that most of the impacts occurring during the operation phase will cease. If the cables are removed from the seabed, the impacts, including their significance, will be identical to those identified for the construction phase due to the intended scope of dismantling work being very similar to the scope of construction work. For each of the environmental components examined, both methods of implementing the decommissioning phase were analysed to identify new impacts which were subsequently analysed to assess their significance.

8.1.3.1 Impact on geological structure, seabed sediments, access to raw materials and deposits

In the case of the option assuming deactivation of the transmission infrastructure and leaving the cables in the seabed, there will be no impacts on the geological structure, seabed topography or seabed sediments.

In the case of the option assuming deactivation of the cable lines and the removal of the cables from the seabed, the types of impacts will be similar to those occurring during the construction phase, however, they will be less intense. The extent of interference in the seabed will not be as severe as in the case of the construction phase.

Changes within the seabed associated with the decommissioning of the project will be of a local nature and, within the entire area occupied by the project site, insignificant for the overall nature of the seabed and its structure. The work carried out during the cable removal operations will slightly disturb seabed sediments and will lead to a local change in the seabed topography resulting in the formation of small alluvia along the route caused by the retrieval of the cables. In the event that the seabed surface is not levelled after these operations, the natural processes occurring on the seabed will cause a gradual fading of the effects of the work conducted during the decommissioning phase. In the case of this option, the impact on the seabed topography will be negligible. No impact on the geological structure or seabed sediments is envisaged.

Possible decommissioning of the project might cause an impact on the seabed through local changes in its topography related to the removal of connection infrastructure components and depressions in the seabed formed at the anchoring places of the vessels participating in the decommissioning of the connection infrastructure.

Table 8.37 and Table 8.38 present an assessment of the scale and of the significance of the impacts on geological structure, seabed sediments, access to raw materials and deposits identified for the decommissioning phase of the EXC BC-Wind OWF in the APV.

Table 8.37. Assessment of the scale of impacts on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
	Physical interference in the seabed	x					x				x				x

Table 8.38. Assessment of the significance of the impact on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the APV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical interference in the seabed	Low	Irrelevant	Negligible

8.1.3.2 Impact on the quality of seawater and seabed sediments

If the option assuming deactivation of the EXC BC-Wind OWF in the APV without removing the cables from the seabed is implemented, no impacts on the quality of seawater and seabed sediments will occur. In the case of potential deactivation of the EXC BC-Wind OWF involving the removal of the cables from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.1.3.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

If the option assuming deactivation of the EXC BC-Wind OWF in the APV without removing the cables from the seabed is implemented, there will be no impacts on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, or the impact on atmospheric air (air quality). In the case of potential deactivation of the EXC BC-Wind OWF in the APV involving the removal of the cables from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.1.3.4 Impact on ambient noise

If the option assuming deactivation of the EXC BC-Wind OWF in the APV without removing the cables from the seabed is implemented, no impacts on ambient noise will occur. In the case of potential deactivation of the EXC BC-Wind OWF in the APV involving the removal of the cables

from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.1.3.5 Impact on electromagnetic field

In the case of both options, deactivation of the EXC BC-Wind OWF in the APV will not have any impact on electromagnetic field.

8.1.3.6 Impact on nature and protected areas

8.1.3.6.1 Impact on biotic components within the offshore area

8.1.3.6.1.1 Phytobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the phytobenthos, which will possibly grow on cable protection structures.

If the cables and elements protecting them are removed, the phytoperiphyton communities and the substrate inhabited by them will be removed. This will result in the ecosystem alteration in the area of the connection infrastructure, i.e. the original conditions prevailing before the construction phase will be restored.

8.1.3.6.1.2 Macrozoobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the macrozoobenthic communities, which will be present in the area of the project throughout the entire operation period, inhabiting both the seabed and cable protection structures.

If the cables and elements protecting them are removed from the seabed, the periphyton communities may be destroyed and the functioning of the macrozoobenthic organisms living in the immediate vicinity of the interference in the seabed may be disturbed.

8.1.3.6.1.3 Ichthyofauna

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on ichthyofauna.

If the cables and elements protecting them are removed from the seabed, impacts on ichthyofauna may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.1.4 Marine mammals

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on marine mammals.

If the cables and elements protecting them are removed from the seabed, impacts on marine mammals may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.1.5 Seabirds

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on seabirds.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.2 Impact on protected areas

8.1.3.6.2.1 Impact on protected areas other than Natura 2000

Within the offshore area of the planned project location and within the range of its potential impact, there are no territorial forms of protection other than the sites of the Natura 2000 European ecological network. Therefore, no activities related to the possible decommissioning of the EXC BC-Wind OWF in the APV will cause any impact on such areas.

8.1.3.6.2.2 Impact on Natura 2000 protected sites

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the subjects of protection of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002), the integrity of this area or the coherence of the Natura 2000 network.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.3 Impact on wildlife corridors

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts which might affect the free movement of animals in the area of the project.

Also, if the cables and elements protecting them are removed from the seabed, no impacts which might in any way prevent animals from migrating will occur.

8.1.3.6.4 Impact on biodiversity

8.1.3.6.4.1 Phytobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts which might affect the biodiversity in the context of phytobenthos.

If the cables and elements protecting them are removed from the seabed in a situation when they are covered by phytoperiphyton communities, these organisms will be lost, which however, will not have a significant impact on the biodiversity in the context of phytobenthos.

8.1.3.6.4.2 Macrozoobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the macrozoobenthic communities in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on macrozoobenthic communities may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.4.3 Ichthyofauna

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the ichthyofauna in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on ichthyofauna may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.4.4 Marine mammals

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the marine mammals in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on marine mammals may occur, the same, at most, as those identified for the construction phase.

8.1.3.6.4.5 Seabirds

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the seabirds in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.1.3.7 Impact on cultural values, monuments and archaeological sites and features

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the cultural values, monuments and archaeological sites and features in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on cultural values, monuments and archaeological sites and features may occur, the same, at most, as those identified for the construction phase.

8.1.3.8 Impact on the use and management of the sea area and tangible property

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the use and management of the sea area and tangible property in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on the use and management of the sea area and tangible property may occur, the same, at most, as those identified for the construction phase. After the cable removal operations are completed, the EXC BC-Wind OWF area will be restored to its pre-construction condition.

8.1.3.9 Impact on landscape, including cultural landscape

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the landscape, including the cultural landscape, in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on landscape, including cultural landscape, may occur, the same, at most, as those identified for the construction phase.

8.1.3.10 Impact on population, health and living conditions of people

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the APV and leaving the cables in the seabed, there will be no impacts on the population, health and living conditions of people in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on population, health and living conditions of people may occur, the same, at most, as those identified for the construction phase.

8.1.4 Construction phase in the onshore part

8.1.4.1 Impact on geological structure, coastal zone, soils, and access to raw materials and deposits

8.1.4.1.1 Impact on geological structure and coastal zone

Geological structure may be potentially affected by the coastal zone crossing constructed using an HDD or HDD Intersect trenchless method at a depth of up to 50 MBSB or MBGL. The crossing of the coastal zone at such great depths is aimed at avoiding potential failures of the planned infrastructure, connected mainly to the coastal zone dynamics, or leaving the offshore and onshore parts of the coastal zone undisturbed. The drilling of a borehole and the extraction of the spoil on the ground may disturb the system of sediment layers and entail a risk of contamination of deeper sediment layers in case of failure.

There are no detailed data on the geological structure within the drilling site planned in the coastal zone. Therefore, before the construction works are commenced, a detailed identification of the geological structure will be carried out on the basis of geotechnical surveys as well as the results of seismic surveys. The borehole parameters and trajectory, as well as the precise landfall location of the power cables will be specified depending on the final technological solution adopted for execution, the drilling method, the geological structure, the morphodynamics as well as the environmental conditions. Based on the results of the surveys conducted, the appropriate type of drilling fluid and drilling equipment will be selected. Usually, bentonite drilling fluids, which do not pose a direct threat to the environment, are used for that purpose.

In the case of a failure to maintain an appropriate technological regime, the soil and the deeper sediment layers may become contaminated (an indirect or direct contamination of water may also take place) with fuel spills from the construction machinery. However, if the location of work is properly secured and the work organised and supervised, the probability of such an event can be considered low.

No operations will be conducted on the coastal zone surface as part of the planned construction works. Therefore, there will be no project impact on the topography and dynamics of the coastal zone, both landwards and seawards.

The construction of power lines using the open trench method, and in the case of crossing watercourses, roads or an archaeological site, using a trenchless method, does not pose a risk to the geological structure.

Table 8.39 and Table 8.40 present an assessment of the scale and significance of the impact on geological structure for the EXC BC-Wind OWF in the construction phase.

Table 8.39. Assessment of the scale of impacts on geological structure during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4–13
Disturbance of sediment layers beneath the coastal zone and the removal of spoil	x					x				x		x		8	

Table 8.40. Assessment of the significance of the impact on geological structure during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of sediment layers beneath the coastal zone and the removal of spoil	Moderate	Moderate	Low

8.1.4.1.2 Impact on soils

Most of the EXC BC-Wind OWF cable line construction area is located within forest areas. A fragment of the southern section of the cable bed and the ONS area are located on non-forest land. The soil types dominant within the proposed project area are brunice arenosols and podzols as well as arenosols in the northern part.

In the impact assessment, particular attention was paid to hydrogenic soils, i.e. histosols, murshic histosols, gleyic albic podzols and umbric albic gleysols, since they are the most sensitive to the impacts of the proposed project (construction and maintenance of trenches and their possible drainage). This type of soil is particularly sensitive to changes in water relations.

The construction of the proposed project will involve permanent and temporary occupation of land for the permanent and temporary technical belts, as well as the construction and maintenance, in a relatively short time, of trenches intended for cable laying and construction of transition joint bays. The cables and its protective elements are non-toxic and chemically neutral and thereby do not pose a threat to the ground-water environment, including soils.

As a result of the project implementation within the boundaries of the permanent and temporary technical belts as well as within the construction sites, soils will be subject to periodic disturbance of their existing properties resulting from:

- changes in the soil profile in the locations of trenches and levelling;
- soil compaction due to the use of equipment, devices and vehicles;
- disturbance of water relations as a result of the drainage conducted;
- aeolian erosion;
- possible contamination;
- permanent occupation of land by service roads, buildings and facilities within the ONS.

In the location of earthworks, a change in the soil profile will occur resulting from the excavation of earth masses onto the surface and leaving the trenches open for a short period of time until the cables are laid and the trenches backfilled. The trenches within the cables laid will be partially backfilled with a bentonite layer and covered with virgin soil on the surface.

A change in soil structure through compaction may occur within the strip of the road along which heavy construction equipment and vehicles will move. Soil compaction can also be expected in the locations of material and equipment bases. As a result of soil compaction, water and gas conditions change. The volume of the pores decreases, the roots receive less oxygen, and the penetration by the organisms is also more difficult. The ability to infiltrate rainwater also decreases, and an increase in surface runoff increases the risk of erosion. Depending on the type of soil, its structure can be regenerated. Sandy, low-porosity soils are less sensitive to compaction than loamy soils. In the case of complete saturation with water, the sensitivity to compaction increases. Due to the above, hydrogenic soils are particularly at risk of this type of impact. Both the storage yards and access roads will be located outside hydrogenic soils. The main material and equipment stockyard will be located on the ONS premises on cambisols and brunec arenosols.

Water relations are an environmental factor influencing other components. The main reasons for the possible disturbance of water relations include: excavations, trench draining and construction of entry and exit pits for trenchless methods. If the elevation of the trench bottom is lower than the groundwater elevation, it may cause the trench to function as a drain and the need to drain the trench. Groundwater drainage caused by excavation may cause local drying of the top soil layer, as a result of which the aeolian erosion of soil takes place, soil is blown away, and therefore, its most valuable elements are lost. The trenches will need to be drained in places, in which the level of groundwater is above the trench bottom elevation. One waterlogged area is present along the route of the proposed project, where a trenchless method will be used. When constructing the cable entry and exit pits, it will be necessary to construct only point excavations with possible need for drainage. The sections to be drained will be selected at further stages of design works. The stabilisation of the groundwater table at the previous level is likely to take place 1–2 days after the completion of pumping. The type of drainage planned to be applied will be determined after analysing the results of the ground surveys.

Sensitivity to wind erosion depends on the degree of soil formation and structure, as well as on the bedrock and organic matter content. The most sensitive are the early development stage soils, with a loose structure, composed of single, unbound particles, i.e. arenosols. Arenosol-type soils can be found in the northern part of the EXC BC-Wind OWF development area. In most of this area, the cable lines will be constructed using a trenchless method, and thus, the soil structure will not be disturbed.

Especially sensitive to contamination by grease and oil spills are sandy soils, which do not have the capacity to absorb hydrocarbons due to their low organic matter content. Soils from waterlogged areas are similarly sensitive due to the possibility of contaminants migrating more freely with the water. It is planned to cross the areas with hydrogenic soils located along the project route with horizontal directional drilling. It is also planned not to construct access roads and storage yards on such soils. Therefore, they are not at risk of this type of impact. The largest complex of arenosols (sandy soils), occurring on the *Wydma Lubiatowska* dune, is also planned to be crossed by a horizontal directional drilling.

Due to the construction of a customer substation, the top soil layer will be removed. It will be necessary to conduct levelling works and construct small scale excavations in the locations of foundation of buildings and station equipment.

Table 8.41 and Table 8.42 present an assessment of the scale and significance of the impacts on soils identified for the EXC BC-Wind OWF construction phase.

Table 8.41. Assessment of the scale of impacts on soils during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4–13
Disturbance of the soil profile	x					x				x		x		8	
Changes in water relations	x					x				x			x	7	
Compacting of soil	x					x				x			x	7	
Wind erosion		x				x				x			x	6	
Contamination	x					x					x		x	6	

Table 8.42. Assessment of the significance of the impact on soils during the EXC BC-Wind OWF construction phase
 [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of the soil profile	Moderate	High	Moderate
Changes in water relations	Low	Moderate	Low
Compacting of soil	Low	Low	Negligible
Wind erosion	Low	Low	Negligible
Contamination	Low	Moderate	Low

8.1.4.1.3 Impact on access to raw materials and deposits

In the area of the proposed project and in its nearest surroundings, no mineral deposits nor mining areas and sites have been documented; therefore, the project will not affect access to raw materials and deposits.

The project area is located within the boundaries of the area covered by concession no. 5/2019/Ł for the prospecting and exploration of crude oil and natural gas deposits and for the extraction of crude oil and natural gas from the deposits within the Żarnowiec area, issued on 13 June 2019 by the Minister of the Environment for ShaleTech Energy Sp. z o.o. The concession was issued for a period of 10 years, including 5 years for the prospecting and exploration phase and 5 years for the extraction phase.

In compliance with the schedule of actions presented in the concession, at the current stage, hydrocarbon deposit prospecting works should be carried out at present within the concession area, which should be completed by 2024. During that time, the concessionaire should construct two boreholes up to a maximum depth of 5000 m.

Considering the size of the concession area – 1196.31 km² – in relation to the size of the EXC BC-Wind OWF development area, the project in question will not limit access to the crude oil and natural gas deposits within the Żarnowiec area. The construction of the EXC BC-Wind OWF will also not impact other deposits identified in its vicinity, due to the distances between those projects.

8.1.4.2 Impact on the quality of surface waters

In the EXC BC-Wind OWF construction phase, the contamination of surface waters may result from:

- rainwater and meltwater run-off from the contaminated construction sites;
- improper storage of construction materials;
- operation of vehicles, machinery and equipment, in particular as a result of their failure.

As a result of the run-off from the paved surfaces which were contaminated, this contamination can enter surface waters. Depending on the quantity of substances and the size of the reception container, off-site pollution may occur.

Moreover, surface waters may be directly polluted by petroleum products (diesel oils, greases and petroleum) leaking from construction machinery and equipment, for example, as a result of a failure. The most hazardous can be the spills in the immediate vicinity of watercourses and in depressions where water stagnates. In such a situation, fast dispersion of contaminants in the groundwater system may take place.

With appropriate securing of the construction site as well as proper organisation of work and operation of equipment, machinery and vehicles, the probability of such an event can be considered low. Such situations should be eliminated through appropriate supervision over the operation of equipment, machinery and vehicles as well as their maintenance in good technical condition. The construction contractor should have sorbents and basic equipment for eliminating even minor spills.

Taking that into consideration, no negative impact on the surface water bodies within the area analysed, i.e. the immediate catchment area of the sea CWDW1801 and the RWB Chelst River to its outlet into Lake Sarbsko RW200017476925 is anticipated.

Table 8.43 and Table 8.44 present an assessment of the scale and significance of the impacts on the quality of surface waters identified for the EXC BC-Wind OWF construction phase.

Table 8.43. Assessment of the scale of impacts on the quality of surface waters during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Emissions of contaminants to water	x					x				x			x	7

Table 8.44. Assessment of the significance of impact on the quality of surface waters during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Emissions of contaminants to water	Low	Moderate	Low

8.1.4.3 Impact on hydrogeological conditions and groundwater

During the EXC BC-Wind OWF construction phase, operations will be conducted which could impact surface waters. That impact concerns two aspects in particular:

- disturbances to water relations;
- contamination and deterioration of water quality.

As part of the work conducted, within the cable bed area, cables will be laid in open trenches and using trenchless methods. Trenches will also be constructed in the locations of pits constructed for the HDD boreholes. Depending on the work site location and hydrological conditions, the necessity to provide drainage is anticipated to maintain dry excavations. The drainage method and scale will be selected after the analysis of the subsoil test results at a further stage of the design work, on the basis of the information on the actual levels of groundwater. It is assumed that drainage will be local in nature, limited to small sections of the proposed project.

Regardless of the choice of the excavation drainage method and scale, the pumped out water will be discharged outside the construction site to the existing watercourses running in the vicinity of the proposed project or will be distributed over the surrounding area, away from the excavations, compliant with the applicable legal regulations. Drainage works will be carried out in advance until the cable lines are laid and buried. Upon the completion of construction works, the groundwater level at the excavation sites should level out within a few days. Moreover, a relatively short open trench maintenance time including a potential necessity for drainage will cause short-term and local disturbances to water relations, which will prevent the formation of a cone of depression.

As a result of the earthworks conducted within the ONS area, no impact on water relations is expected due to the depth of groundwater in that area (below 20 MBGL).

As a result of the conducted construction works, groundwater can be indirectly contaminated as a result of:

- rainwater and meltwater run-off from the contaminated construction sites;
- use of vehicles, machinery or equipment, including in particular their failure.

To ensure the best protection of ground water against pollution, prefabricates and construction equipment must be stored on a hardened surface. The construction site should be equipped with portable toilets with a reservoir and a tank for sanitary sewage which will be serviced by specialist companies.

Groundwater can be indirectly contaminated with petroleum products (fuels, oils, and greases) leaking from construction machinery and equipment, for example, as a result of a their normal operation or on a larger scale as a result of failure, due to previous contamination of soil or surface waters, which will then come into contact with the groundwater aquifer. The most hazardous can be the spills in the immediate vicinity of watercourses and in terrain depressions where water stagnates. In such a case, fast spreading of pollutants in surface waters and their permeation through soil to ground- and deep waters may occur.

With appropriate securing of the construction site as well as proper organisation of work and operation of equipment, machinery and vehicles, the probability of such an event can be considered low. Such situations should be eliminated through appropriate supervision over the operation of equipment, machinery and vehicles as well as their maintenance in good technical condition. The construction contractor should have sorbents and basic equipment for eliminating even minor spills.

Table 8.45 and Table 8.46 present an assessment of the scale and significance of the impacts on hydrogeological conditions and groundwater identified for the EXC BC-Wind OWF construction phase.

Table 8.45. Assessment of the scale of impacts on hydrogeological conditions and groundwater during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permane nce		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Disturbances to water relations	x					x				x			x	7
Emissions of contaminants to water		x				x				x			x	6

Table 8.46. Assessment of the significance of the impact on the hydrogeological conditions and groundwater during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbances to water relations	Low	Moderate	Low
Emissions of contaminants to water	Low	Moderate	Low

8.1.4.4 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

Due to the work conducted during the EXC BC-Wind OWF construction phase, the following will take place:

- exhaust emissions from the operation of vehicles and machinery;
- dust emissions from the disturbance of earth layers and from transport.

The construction work conducted will cause the emission of pollutants to air due to the operation of installation equipment and means of transport. Vehicle traffic, excavation works, earth storage and other work disturbing the soil may cause periodic emission of dust into the atmosphere, limited mainly to the construction site.

The emission figures of individual pollution types caused by combustion of fuel in combustion engines of machines are provided in the "EMEP/EEA air pollutant emission inventory Guidebook" [104] published by the European Environment Agency [Table 8.47].

The highest figures were adopted in the calculations for the two categories of machines used in industry and forestry. These figures reflect the quantity of pollution caused as a result of the combustion of 1 kg of fuel (diesel oil density of 0.82 g·dm⁻³ was adopted in the calculations).

Table 8.47. Figures of air pollutant emission resulting from the combustion of 1 kg of diesel oil in utility machinery engines [source: EMEP/EEA air pollutant emission inventory guidebook (2007)]

Category	Pollutant emission factor [g-per kilogram of fuel consumed]							
	NO _x	NM-VOC	CH ₄	CO	NH ₃	N ₂ O	OfC	PM _{2.5}
Forestry	50.3	6.50	0.17	14.5	0.007	1.32	2.42	2.27
Industry	48.8	7.08	0.17	15.8	0.007	1.30	2.29	2.15

In compliance with the EMEP/EEA air pollutant emission inventory guidebook [104], it was assumed that the proportion of NO₂/NO_x is 55%. It was also adopted that the mean daily fuel consumption by all the machines used will be 100 l·h⁻¹ (82 kg). Moreover, it was adopted that all machines will work for a maximum of 8 hours per day (non-stop) for 252 business days per year [Table 8.48].

Table 8.48. Levels of air pollutant emission [source: internal materials based on [104]]

Substance emitted	Emissions	
	hourly [kg·h ⁻¹]	annual [Mg·year ⁻¹]
NO ₂	2.270	4.574
LZO VOC	0.581	1.170
CH ₄	0.014	0.028
CO	1.296	2.612
NH ₃	0.0006	0.001
N ₂ O	0.108	0.218
PM ₁₀	0.195	0.400
PM _{2.5}	0.176	0.355

The highest concentrations of pollutants in reference to the permissible concentrations will apply to NO₂ emissions, which is a consequence of diesel fuel combustion. The emission of pollutants in the EXC BC-Wind OWF construction phase will take place as a result of the work of relatively small groups of equipment and machinery at various stages of the proposed project implementation (the stages of work will only partially overlap). As a consequence, emission of pollutants from all equipment and machinery will be distributed over both time and space. Thus, it is estimated that the implementation of the project will not cause emissions at a level which may exceed the permissible concentrations of substances in the air. The emission of the remaining substances will be of a trace amount and will not result in exceeding the permissible values of pollutants in the air.

The magnitude of dust emissions from road traffic and earthworks will depend on the prevailing weather conditions. The substratum moisture content significantly limits dust emissions. Due to the fact that most of the works will be carried out in a trench and will be limited in time, the impact on the atmosphere will be limited and immediate in nature. Construction works related to the construction of the ONS will be carried out in agricultural areas, away from the residential buildings of Osieki Lęborskie and will have a negligible impact on the climate. They will be associated with the transport of materials for the construction and the welding of reinforcement elements for the power line foundations and towers.

A significant element affecting the dispersion of potential compounds and substances into the air, both in the form of exhaust fumes and dust, is the wind conditions in the work area. Western and south-western winds dominate within the EXC BC-Wind OWF area. The development areas in

Lubiatów, Osieki Lęborskie and Lublewko nearest to the construction site are located on the western and southern sides of the proposed project. This will additionally decrease the possible nuisance to humans in those locations.

Table 8.49 and Table 8.50 present an assessment of the scale and significance of the impacts on air quality identified for the EXC BC-Wind OWF construction phase.

Table 8.49. Assessment of the scale of impacts on air quality during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Exhaust emissions from the operation of vehicles and machinery	x					x				x			x	7
Dust emissions from the disturbance of earth layers	x					x					x		x	6
Dust emissions from transport	x					x					x		x	6

Table 8.50. Assessment of the significance of the impact on air quality during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Exhaust emissions from the operation of vehicles and machinery	Low	High	Moderate
Dust emissions from the disturbance of earth layers	Low	Low	Negligible
Dust emissions from transport	Low	Low	Negligible

8.1.4.5 Impact on ambient noise

In the EXC BC-Wind OWF construction phase, the following construction machinery and equipment, although not exclusively, will be used at various work stages: diggers, backhoe loaders, bulldozers, compactors, pump units, vibro hammers, cranes, lifts, jib cranes, drilling rig, specialist machinery for cable tensioning, winches and various types of trucks and passenger vehicles used to transport materials, equipment and people.

Due to the (linear) nature of the project, work related to the construction of cable lines will be performed in such a way that machinery and equipment, which is a source of noise, will move with the progress of the work. In the case of work related to horizontal directional drilling and the construction of the ONS, construction works generating noise emission to the environment will be carried out in the same locations for extended periods of time.

Depending on the type and scope of construction works, their location and characteristics of the equipment used, noise levels during the project implementation will be different. The acoustic power levels of the construction machinery and equipment used in the EXC BC-Wind OWF construction phase are estimated at a level from 75 to 119 dB.

Most of the construction work will, as far as possible due to technological and organisational considerations, be carried out in the daytime with the use of equipment and machinery providing

the most effective noise protection possible. The sound power levels of the equipment and machinery used in construction is subject to restrictions depending on the type of device and the installed net power in accordance with the guidelines contained in the Regulation of the Minister of Economy of 21 December 2005 *on the essential requirements for equipment for use outdoors regarding noise emission to the environment* (Journal of Laws of 2005, No. 263, item 2202 as amended).

Most of the construction work on the cable bed will be carried out in areas at a significant distance from the locations of permanent human habitation and acoustically protected areas as well as surrounded by a forest complex. This will make the essential part of the construction work take place in an area isolated from the acoustically protected sites. The only acoustically protected site in the vicinity of the proposed project (a rehabilitation and holiday centre for disabled people) is located in Lubiatowo at 38 Spacerowa Street (see: Section 5.19). Due to the presence of a forest complex between the work site and the rehabilitation and holiday centre as well as due to short-term noise emissions in the vicinity of the centre, it is assessed that noise generated as a result of the cable line construction will not be significantly burdensome for the people residing there.

The greatest noise emissions to the environment will take place during borehole construction using the HDD method. Due to the technological and organisational nature of these operations, a 24/7 work schedule is assumed. During the land-sea borehole execution, it is necessary to construct an entry pit using sheet piling driven into the ground with a vibro hammer with an acoustic power of LWA = approx. 119 dB. The acoustic environment will deteriorate only in the vicinity of the construction site. Due to the location of the borehole, no significant noise impact on the acoustically protected areas will occur.

During the ONS construction, the noise sources will be concentrated, and emission will be generated by a large number of construction machines running. A large concentration of machinery and equipment will have a negative impact on the acoustic climate in the immediate vicinity of the area covered by construction works. The distance of the ONS construction site from the existing infrastructure is more than 1 km, therefore, the noise generated there will not have a significant impact on the acoustically protected areas.

The level of noise generated during the construction phase will depend on the various types of vehicles used, including trucks with an acoustic power of up to 103 dB, transporting people, materials and equipment to the construction site and removing, for example, waste from the construction site as well as those used within the construction site boundaries. The noise will be diffused and will occur with varying levels of intensity depending on the location and stage of the construction works.

Table 8.51 and Table 8.52 present an assessment of the scale and significance of the impact on ambient noise identified for the EXC BC-Wind OWF construction phase.

Table 8.51. Assessment of the scale of impacts on ambient noise during the EXC BC-Wind OWF construction phase
 [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
	4-13													
Noise emission from construction machinery and equipment	x					x				x			x	7
Noise emission from transport	x					x					x		x	6

Table 8.52. Assessment of the significance of the impact on ambient noise during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Noise emission from construction machinery and equipment	Low	Moderate	Low
Noise emission from transport	Low	High	Low

8.1.4.6 Electromagnetic field emission

In the EXC BC-Wind OWF construction phase, there will be no emission of electromagnetic field, as it occurs around equipment and cables that are energised, i.e. in the operation phase.

8.1.4.7 Impact on nature and protected areas

8.1.4.7.1 Impact on biotic elements in the onshore area

8.1.4.7.1.1 Fungi

There are 10 plots of valuable species of fungi within the project area. Among them, there is one plot of an exceptionally valuable and strictly protected species – mealy tooth *Hydnellum ferrugineum*. The remaining ones are plots of species of moderate and low nature conservation value, which are not under species protection. These are: carnation earthfan *Thelephora caryophyllea*, booted knight *Tricholoma focale*, woolly tooth *Phellodon tomentosus*, scarlet caterpillarclub *Cordyceps militaris*, slate grey saddle *Helvella lacunosa*, silky rosegill *Volvariella bombycina*, benzoin bracket *Ischnoderma benzoinum*, and mountain moss *Deconica montana*. Some of the above-mentioned plots are located in the project proper area (including one within the borehole area), some in the immediate vicinity of access roads. It should be assumed that during the construction phase, most of them will be destroyed, maybe only with the exception of the plot of woolly tooth, which is located along the borehole section. Moreover, the plots of the following species, classified as having low nature conservation value and frequently encountered within the survey area, will probably be destroyed: crimped gill *Plicaturopsis crispa*, yellow knight *Tricholoma equestre* and crown coral *Diplomitoporus flavescens*.

Moreover, a physical destruction of fungal habitat surfaces will take place within the project area. This impact will occur within the entire tree-felling area as well as in the locations, where the soil cover will be disturbed and dead wood removed. This will be a negative impact on the mycelia and fruiting bodies of all the fungal species present within the impact area.

The indirect negative impact involves overdrying of the fungal habitats connected to the possible decrease in the groundwater level. This may apply to the plots located at a small distance from the project area. This impact may affect the plots of the following species: greenfoot tooth *Hydnellum glaucopus* (of exceptional nature conservation value), mealy tooth *Hydnellum ferrugineum* (of high nature conservation value) as well as *Diplomitoporus flavescens* and wooly tooth *Phellodon tomentosus*.

Table 8.53 and Table 8.54 present an assessment of the scale and significance of the impact on the fungus biota identified for the EXC BC-Wind OWF in the construction phase.

Table 8.53. Assessment of the scale of impacts on the biota of fungi during the EXC BC-Wind OWF construction phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration				Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Physical destruction of fungal plots	3					1	5					2		11
Physical destruction of fungal habitats, including soil substrata, dead wood	3					1	5					2		11
Overdrying of habitats due to changes in water relations		2				1				1			1	5

Table 8.54. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of the plot of a fungal species of an exceptional nature conservation value	High	Very high	Significant
Physical destruction of the plots of other fungal species	High	Moderate	Moderate
Physical destruction of the habitat of a fungal species of an exceptional nature conservation value	High	Very high	Significant
Physical destruction of habitats of other fungal species, including soil substrata, dead wood	High	Moderate	Moderate
Overdrying of habitats due to changes in water relations	Moderate	Moderate	Moderate

The locally and regionally significant impacts indicated in the table are due to the high sensitivity of the receptor, a fungal species of exceptional value – mealy tooth *Hydnellum ferrugineum* – to the destruction of one of its plots. The minimisation measures indicated [Section 13] will enable their preservation. Thanks to them, the project impact on the biota of fungi during the construction phase will be moderate [Table 8.55].

Table 8.55. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of the plot of a fungal species of an exceptional nature conservation value	No impact		
Physical destruction of the plots of other fungal species	High	Moderate	Moderate
Physical destruction of the habitat of a fungal species of an exceptional nature conservation value	No impact		
Physical destruction of habitats of other fungal species, including soil substratum, dead wood	High	Moderate	Moderate
Overdrying of habitats due to changes in water relations	Moderate	Moderate	Moderate

8.1.4.7.1.2 Lichens

Within the project area, and therefore in an area where lichen plots will probably be destroyed, species protected and/or threatened in Poland were recorded 218 times.

Within the project area, there are no species classified as having exceptional nature conservation value, i.e. tree lungwort *Lobaria pulmonaria* and bark barnacle lichen *Thelotrema lepadinum*, which require zonal protection. However, in the immediate vicinity of the roads included in that area, i.e. at a distance from them not smaller than 10 m, three such plots of bark barnacle lichen are located. They are at risk of potential destruction.

On the other hand, within the project area, there are 26 plots out of a total of 7 species classified as having high nature conservation value. These are the plots of:

- powdered speckled shield lichen *Punctelia jeckeri* (1)
- sulphured crimson dot lichen *Pyrrhospora quernea* (3)
- eagle's claws lichen *Anaptychia ciliaris* (1)
- covered lichen *Pertusaria hymenea* (13)
- *Pertusaria flavida* (2)
- elegant camouflage lichen *Melanohalea elegantula* (5)
- crescent frost *Physconia perisidiosa* (1).

The number of plots of each species, which are potentially at risk of being destroyed, is provided in brackets.

Apart from the destruction of lichen plots and habitats, the construction phase impacts affecting the biota of lichens will involve emissions of gases and dusts generated by vehicles and machinery as well as due to the erosion (blowing away) of soil. These impacts are much less significant.

Table 8.56 and Table 8.57 present an assessment of the scale and significance of the impacts on lichen biota identified for the EXC BC-Wind OWF construction phase.

Table 8.56. Assessment of the scale of impacts on lichen biota during the EXC BC-Wind OWF construction phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Physical destruction of lichen plots	3					1	5					2		11
Physical destruction of lichen habitats, including trees, soil substrata, dead wood	3					1	5					2		11
Air pollution caused by exhaust emissions from construction machinery and vehicles as well as transport		2				1				2			1	6
Air pollution caused by dust emissions from construction works and erosion of exposed soil layers		2				1				2			1	6

Table 8.57. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF construction phase
[source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of the plots of lichen species of an exceptional nature conservation value	High	Very high	Significant
Physical destruction of the plots of lichen of other nature conservation value	High	High	Important
Physical destruction of the habitats of lichen species of an exceptional nature conservation value	High	Very high	Significant
Physical destruction of the habitats of other lichen species of high nature conservation value, including trees, soil substrata, dead wood	High	High	Important
Air pollution caused by exhaust emissions from construction machinery and vehicles as well as transport	Low	Moderate	Low
Air pollution caused by dust emissions from construction works and erosion of exposed soil layers	Low	Moderate	Low

The locally and regionally significant impacts indicated in the table are due to the high sensitivity of the receptor, a species of exceptional value – bark barnacle lichen *Thelotrema lepadinum* – to the destruction of several of its plots. The minimisation measures indicated [Section 13] will enable their preservation. Thanks to them, the project impact on the biota of lichens in the construction phase will be moderate [Table 8.58].

Table 8.58. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of the plots of lichen species of exceptional nature conservation value	No impact		
Physical destruction of lichen plots	High	Moderate	Moderate
Physical destruction of the habitats of lichen species of high nature conservation value, including trees, soil substrata, dead wood	No impact		
Physical destruction of lichen habitats, including trees, soil substrata, dead wood	High	Moderate	Moderate
Air pollution caused by exhaust emissions from construction machinery and vehicles as well as transport	Low	Moderate	Low
Air pollution caused by dust emissions from construction works and erosion of exposed soil layers	Low	Moderate	Low

8.1.4.7.1.3 Mosses and liverworts

Within the project area, there are 23 plots of 9 moss species under partial protection. These species have a moderate or low nature conservation value: large white-moss *Leucobryum glaucum*, neat feathermoss *Pseudodoscleropodium purum*, mountain fern moss *Hylocomium splendens*, dilated scalewort *Frullania dilatata*, common haircap *Polytrichum commune*, red-stemmed feathermoss *Pleurozium schreberi*, spiky bog-moss *Sphagnum squarrosum*, wavy broom moss *Dicranum polysetum*, and broom forkmoss *Dicranum scoparium*. They are at risk of destruction. The moss and liverwort habitats within the project area will also be destroyed.

The changes in water relations that are likely to occur during the construction phase will also affect the moss population in the immediate vicinity of the project. This applies mainly to the species of humid habitats.

Table 8.59 and Table 8.60 present an assessment of the scale and significance of the impacts on mosses and liverworts identified for the EXC BC-Wind OWF construction phase.

Table 8.59. Assessment of the scale of impacts on bryoflora during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Physical loss of moss and liverwort plots	3					1	5					2		11
Physical destruction of moss and liverwort habitats, including trees, soil substrata, dead wood	3					1	5					2		11
Overdrying of habitats due to changes in water relations		2				1				1			1	5

Table 8.60. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of plots	High	High	Important
Physical destruction of moss and liverwort habitats, including trees, soil substrata, dead wood	High	High	Important
Overdrying of habitats due to changes in water relations	Low	Moderate	Low

The destruction of the indicated moss and liverwort species plots will not disturb their local metapopulation significantly, nor, all the more, the regional or national species resources, because they belong to the taxa relatively common both regionally and nationally.

8.1.4.7.1.4 Vascular plants and natural habitats

During the construction phase, the resources of the following local populations will be disturbed: cross-leaved heath *Erica tetralix* (species considered to be of high nature conservation value), black crowberry *Empetrum nigrum* (species of high nature conservation value), marsh Labrador tea *Ledum palustre*, sand sedge *Carex arenaria* and broad-leaved helleborine *Epipactis helleborine*. The only plot of common yew *Taxus baccatta* within the survey area will be most probably destroyed. The habitats of those species will also be physically destroyed within the project area.

The plots of liverwort species of nature conservation value in the immediate vicinity of the project will also be affected by the changes in water relations that are likely to occur during the construction phase. This applies mainly to the following species of humid habitats: sweetgale *Myrica gale* (species considered to be of exceptional nature conservation value, with one plot within the survey area), cross-leaved heath, and marsh Labrador tea.

The project area intersects the patches of the following natural habitats:

- 2130* Fixed dunes with herbaceous vegetation ("grey dunes")
- 2180 Wooded dunes of the Atlantic, Continental and Boreal region
- 2190 Humid dune slacks
- 9110 Acidophilous beech forests

The surface area of natural habitats within the project area, subdivided into the borehole area and its other parts, is presented in Table 8.61.

Table 8.61. Surface area of the natural habitats found within the EXC BC-Wind OWF area [source: internal materials]

Natural habitat code and name	Habitat surface area within the project area [ha]	Within the borehole area [ha]	In the remaining part of the project area [ha]
2130* Fixed dunes with herbaceous vegetation ("grey dunes")	0.3	0.3	0
2180 Wooded dunes of the Atlantic, Continental and Boreal region	11	4	7
2190 Humid dune slacks	0.19	0.19	0
9110 Acidophilous beech forests	1.7	0.6	1.1

The surface of each of the habitat indicated in the table, which are located within the project area, may be potentially destroyed. However, the application of the drilling method will enable preserving the resources of habitats 2130* Fixed dunes with herbaceous vegetation ("grey

dunes”) as well as 2190 Humid dune slacks undisturbed, provided that no additional infrastructure will be constructed within the patches of those habitats and no service/access roads will be routed through them. A small fragment of habitat 2180 Wooded dunes of the Atlantic, Continental and Boreal region (7 ha) and habitat 9110 Acidophilous beech forests (1.1 ha) will be destroyed.

The changes in water relations, which will probably take place during the construction phase, will negatively affect the patches of natural habitats in the immediate vicinity of the project. This applies mainly to the patch of habitat 2190 Humid dune slacks, which is located near transition joint bays, therefore, within the immediate range of the project impact on water relations. Moreover, the project may have a negative impact within the patches of habitat 2180 Wooded dunes of the Atlantic, Continental and Boreal region, through which the excavation will be routed, by causing changes in water relations. This impact will affect the humid crowberry coniferous forest (phytocoenoses of the *Empetro nigri-Pinetum ericetosum* complex).

Table 8.62 and Table 8.63 present an assessment of the scale and significance of the impacts on vascular plants and natural habitats identified for the EXC BC-Wind OWF construction phase.

Table 8.62. Assessment of the scale of impacts on vascular plant species and natural habitats during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Physical destruction of liverwort plots	3					1	5					2		11
Physical destruction of liverwort species habitats and natural habitats	3					1	5					2		11
Overdrying of species habitats and natural habitats due to changes in water relations		2				1				1			1	5

Table 8.63. Assessment of the significance of the impact on liverworts and natural habitats during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of liverwort plots	High	High	Important
Physical destruction of liverwort species habitats and natural habitats	High	High	Important
Overdrying of species habitats and natural habitats due to changes in water relations	Low	Moderate	Low

The locally significant impact results from the high sensitivity of the receptors (plant species and natural habitats of nature conservation value) to the mechanical destruction of the specimens and

their plots. The physical destruction of the indicated species of exceptional and high nature conservation value constitutes a disturbance of their populations. On a regional and national scale, these impacts do not significantly deplete the resources. Similarly, the disturbance of the indicated surface of the Natura 2000 natural habitats decreases their local resources, however, it does not significantly influence the level of national resources. Measures minimising the significance of impacts were identified [Section 13].

8.1.4.7.1.5 Invertebrates

Due to earthworks as well as forest clearing and vegetation destruction, the population of invertebrates will be disturbed (destruction of specimens) and the habitats of invertebrate species inhabiting that area will be destroyed. The populations will be disturbed especially in the case of nesting ants. Ant nests will be destroyed within the cable bed excavations, within the forest clearing area and in all regions, where construction works will be performed.

Moreover, during the construction works, the environment of many invertebrate species' occurrence, which use that area in search of food or temporary hiding and feeding places, will be destroyed or transformed. This will cause their permanent or temporary relocation to other areas.

The presence of people and machinery within the project area may cause the animals to be startled and scared away, also for that reason they may relocate to other areas.

Table 8.64 and Table 8.65 present an assessment of the scale and significance of the impacts on invertebrates identified for the EXC BC-Wind OWF construction phase.

Table 8.64. Assessment of the scale of impacts on invertebrates during the EXC BC-Wind OWF construction phase
 [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Disturbance of population resources (destruction of specimens)	3					2				2			1	8
Physical loss of species habitats		2				1	5					2		10
Species habitat fragmentation and structure change		2				1			3				1	7
Startling of animals due to noise, human presence, etc.	3					1				2			1	7

Table 8.65. Assessment of the significance of the impact on invertebrates during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of population resources (destruction of specimens)	Moderate	High	Moderate
Physical loss of species habitats	High	Moderate	Moderate
Species habitat fragmentation and structure change	Low	Moderate	Low
Startling of animals due to noise, human presence, etc.	Low	Moderate	Low

8.1.4.7.1.6 Herpetofauna

During the construction works within the project area, the population resources of species of nature conservation value will be disturbed. The amphibian and reptile individuals are likely to fall into and die in excavations in the construction site and as a result of collisions with vehicles and machinery. This phenomenon will be particularly intensified during amphibian migration periods, in the vicinity of their breeding sites (site 1–3; cf. App. 1, Section 9.7).

The project will have a very significant impact on the herpetofauna of the area due to the probable destruction or disturbance of the site (breeding site) of amphibians and reptiles in the southern part of the project area, within the Onshore Substation area.

The physical destruction of species habitats and their fragmentation and change in their structure will apply to species inhabiting the cable bed area, within the entire area subject to tree-felling and in other areas, in which construction works will be carried out. Similarly, periodic startling of animals will occur in these areas due to noise, human presence, etc.

Table 8.66 and Table 8.67 present an assessment of the scale and significance of the impacts on herpetofauna identified for the EXC BC-Wind OWF construction phase.

*Table 8.66. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF construction phase
[source: internal materials]*

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Disturbance of population resources – death of individuals in excavations on the construction site	3					1				2			1	7
Disturbance of population resources – death of individuals as a result of being run over by machinery and vehicles during migration	3					1				2			1	7
Destruction of amphibian and reptile sites (breeding sites)	3					1	5					2		11
Physical loss of species habitats		2				1	5					2		10
Species habitat fragmentation and structure change		2				1			3			2		8
Startling of animals due to noise, human presence, vibrations, etc.	3					1				2			1	7

Table 8.67. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of population resources – death of individuals in excavations on the construction site	Low	Very high	Moderate
Disturbance of population resources – death of individuals as a result of being run over by machinery and vehicles along migration routes	Low	Very high	Moderate
Destruction of amphibian and reptile sites (breeding sites)	High	Very high	Significant
Physical loss of species habitats	High	High	Important
Species habitat fragmentation and structure change	Moderate	High	Moderate
Startling of animals due to noise, human presence, vibrations, etc.	Low	Moderate	Low

The locally and regionally significant impacts indicated in the table are due to the high sensitivity of the receptors (amphibian and reptile species of nature conservation value) to the mechanical destruction of their breeding sites – the impact applies to the breeding site most valuable within the area (site 3). The minimisation measures indicated [Section 13] will enable their preservation. Thanks to them, the project impact on herpetofauna will not be significant [Table 8.68].

Table 8.68. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of population resources – death of individuals in excavations on the construction site	Low	Very high	Moderate
Disturbance of population resources – death of individuals as a result of being run over by machinery and vehicles along migration routes	Low	Very high	Moderate
Destruction of amphibian and reptile sites (breeding sites)	No impact		
Physical loss of species habitats	High	High	Important
Species habitat fragmentation and structure change	Moderate	High	Moderate
Startling of animals due to noise, human presence, vibrations, etc.	Low	Moderate	Low

8.1.4.7.1.7 Birds

Due to the planned forest clearing within the location of the cable bed area, a physical, irreversible loss of forest bird species' habitats will take place. As a result, they will no longer inhabit the area. On the other hand, species of open, shrubland habitats as well as species typical of early succession forest communities (e.g. European nightjar) and forest edges will appear.

Tree felling across large areas of land involves destruction of bird broods, if performed during the bird breeding season. Broods located on road-side trees and shrubs as well as broods on the ground in non-forest areas within the project area will also be at risk.

During the project implementation, birds will be startled by the presence of people, machinery, illumination and noise. This applies to both breeding and migratory species. Startling of birds may cause losses in broods.

Table 8.69 and Table 8.70 present an assessment of the scale and significance of the impacts on birds identified for the EXC BC-Wind OWF construction phase.

Table 8.69. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Physical loss of species habitats		2				1	5					2		10
Destruction of broods (e.g. during tree felling)	3					1				2			1	7
Startling of animals due to noise, human presence, illumination, etc.	3						1				2		1	7

Table 8.70. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical loss of species habitats	High	High	Important
Destruction of broods (e.g. during tree felling)	Low	High	Low
Startling of animals due to noise, human presence, illumination, etc.	Low	High	Low

8.1.4.7.1.8 Mammals

Unintentional killing of animals during construction works as a result of collisions of animals with the machinery and vehicles operating within the project area, construction of excavations and creating accidental traps, in which the animals can get caught.

Physical loss of species habitats will take place as a result of the land and vegetation transformation within the project area, and also the construction of infrastructure – both permanent and temporary.

Startling of animals due to noise, human presence, illumination, and vibrations etc. is connected to the execution of construction works and intensification of the use of the access roads to the project site.

Table 8.71 and Table 8.72 present an assessment of the scale and significance of the impacts on mammals identified for the EXC BC-Wind OWF construction phase.

Table 8.71. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Unintentional killing of animals during construction works	3					1					1		1	6
Physical loss of species habitats		2				1	5					2		10
Startling of animals due to noise, human presence, illumination, vibrations, etc.	3					1					1		1	6

Table 8.72. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Unintentional killing of animals during construction works	Low	High	Low
Physical loss of species habitats	High	High	Important
Startling of animals due to noise, human presence, illumination, vibrations, etc.	Low	High	Low

8.1.4.7.2 Impact on protected areas

8.1.4.7.2.1 Impact on protected areas other than Natura 2000

The project is located within the boundaries of the Coastal Protected Landscape Area and the buffer zone of the Polish Coastal Landscape Park. A part of the ecological area *Torfowisko w Szklanej Hucie* [Peat bog in Szklana Huta] is located within the boundaries of the project area. The remaining part of that area lies within the project direct impact zone.

The project impacts on those areas will be multifaceted. The impacts are provided in Table 8.73 and Table 8.74 together with an assessment of the scale of impact on these areas.

The implementation of the project will infringe a series of bans specified in Resolution No. 259/XXIV/16 of the Pomorskie Regional Assembly of 25 July 2016 *on the protected landscape areas in the Pomorskie Voivodeship* (Official Journal of the Pomorskie Voivodeship, item 2942). However, pursuant to Article 24 section 2(c) of the *Nature Conservation Act* of 16 April 2004 (consolidated text: Journal of Laws of 2021, item 1098, as amended), the bans applicable within the protected landscape area do not apply to the public purpose investments, which the planned project can be classified as.

Table 8.73. Assessment of the scale of impacts on protected areas other than Natura 2000 sites during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range*		Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
	Coastal Protected Landscape Area													
Landscape change – permanent clearing of a forest section	3					1			3				1	8
Permanent transformation of the lithosphere top layer	3					1	5					2		11
Reduction of nature conservation value – loss of valuable organisms sites, startling of animals, disturbance of natural habitats	3					1	5						1	10
Air pollution due to dust and gas emissions	3						1				1		1	6
	Ecological area <i>Torfowisko w Szklanej Hucie</i> [Peat bog in Szklana Huta]													
Startling animals due to noise, human presence, illumination, etc.	3					2				2			1	8
Change in water relations (overdrying) of the peat bog	3					2				2			1	8

*in terms of the entire area

Table 8.74. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Scale of the impact on the area	Receptor sensitivity*	Impact significance
Coastal Protected Landscape Area			
Landscape change – permanent clearing of a forest section	Moderate	High	Moderate
Permanent transformation of the lithosphere top layer	High	Moderate	Moderate
Reduction of nature conservation value – loss of valuable organisms sites, startling of animals, disturbance of natural habitats	High	High	Important
Air pollution due to dust and gas emissions	Low	High	Low
Ecological area Torfowisko w Szklanej Hucie [Peat bog in Szklana Huta]			
Startling animals due to noise, human presence, illumination, etc.	Moderate	High	Moderate
Change in water relations (overdrying) of the peat bog	Moderate	Very high	Moderate

8.1.4.7.2.2 Impact on Natura 2000 sites

A small beach section, beneath the Special Habitat Protection Area *Białogóra* PLH220003, is crossed by the subsea cables using horizontal directional drilling. Moreover, a fragment of the protected area is located within the proposed project impact zone, because its route is located near the western boundary of the area.

Table 8.75 and Table 8.76 present an assessment of the scale and significance of the impact on Natura 2000 site *Białogóra* PLH220003 identified for the EXC BC-Wind OWF construction phase.

Table 8.75. Assessment of the scale of impacts on Natura 2000 site *Białogóra* PLH220003 during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Change in water relations (overdrying) of natural habitat 2190 Humid dune slacks	x				x					x			1	8
Change in water relations (overdrying) of natural habitat 2180 Wooded dunes of the Atlantic, Continental and Boreal region	x				x					x			1	8

*in terms of the entire area

Table 8.76. Assessment of the significance of the impact on Natura 2000 site *Białogóra* PLH220003 during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in water relations (overdrying) of natural habitat 2190 Humid dune slacks	Moderate	High	Moderate
Change in water relations (overdrying) of natural habitat 2180 Wooded dunes of the Atlantic, Continental and Boreal region	Moderate	Very high	Moderate

8.1.4.7.3 Impact on wildlife corridors

As a result of tree stand felling within the boundaries of the cable bed area, the spatial continuity of the Coastal Wildlife Corridor of supra-regional rank will be interrupted. Throughout the construction phase, due to the presence of humans, machinery, noise, illumination, etc., the functioning of the corridor will be additionally limited.

8.1.4.7.4 Impact on biodiversity

The crucial impacts of the proposed project at the implementation stage in terms of biodiversity are:

- destruction of biologically active areas;
- destruction, disturbance of the protected species habitats and natural habitats;
- startling of sensitive species;
- transformation of water relations;
- destruction of valuable organism sites;
- increased mortality in populations.

Individual impacts and their effects at the operation stage were assessed with reference to particular components of the biotic environment in the previous subsections. Concluding, in total, the impact of the implementation phase of the proposed project on biodiversity will be moderate.

8.1.4.8 Impact on cultural values, monuments and archaeological sites and features

Within the construction works area, and especially in the vicinity of access roads, there are sites of high cultural value as well as monuments in Osieki Lęborskie and Szklana Huta. Traffic of vehicles connected to the EXC BC-Wind OWF construction may cause dust emissions and vibrations. As the main access road to the ONS and the cable bed construction sites, the Applicant envisages a road on its southern side, significantly distant from the nearest listed buildings. The western road to the ONS has an optional significance. Such an organisation of transport means that there will be no significant impacts on monuments and other sites of cultural value. Moreover, with appropriate measures relating to the transport of dusty materials in place (e.g. securing the transported materials against dusting using tarpaulins), no danger to these sites will occur.

One archaeological site AZP 2-37/9 is located along the proposed EXC BC-Wind OWF cable bed route. The cable bed construction project assumes that cable lines will be laid in the area of that site with a trenchless method (HDD), therefore, there will be no interference with that site and no impact.

8.1.4.9 Impact on the use and development of land and tangible property

Most of the EXC BC-Wind OWF area runs across forest areas, where forest management is carried out. As a result of the construction works, there will be a permanent change of the existing land

use, through the felling of trees and shrubs, both within the cable bed area along sections where the cables will be laid in an open trench, as well as in the neighbouring areas intended for the construction works and service roads.

The ONS construction area is currently used for agricultural purposes. As a result of the construction works, its existing use will also change.

No tangible property is located within the EXC BC-Wind OWF construction area. During construction, access roads will be used by construction vehicles.

Table 8.77 and Table 8.78 present an assessment of the scale and significance of the impacts on the use and development of land and tangible property identified for the EXC BC-Wind OWF construction phase.

Table 8.77. Assessment of the scale of impacts on the use and development of land and tangible property during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Change in the existing land use	x					x		x				x		9
Vehicle traffic	x					x		x					x	8

Table 8.78. Assessment of the significance of the impact on the use and development of land and tangible property during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in the existing land use	Moderate	Moderate	Low
Vehicle traffic	Moderate	Low	Low

8.1.4.10 Impact on landscape, including cultural landscape

During the EXC BC-Wind OWF construction phase, new elements will appear in the previously undisturbed landscape. Increased traffic of vehicles involved in the construction works will take place and the existing conditions (low development level) will be transformed through felling of trees and shrubs, trenching, creation of material storage areas, presence of equipment and devices as well as people performing individuals tasks.

The cable bed construction site, located mostly in a forest complex, invisible from most locations inhabited by people, will hide most of the works from view. Progressive changes in the landscape will be more noticeable in the case of the ONS construction in open areas.

Visual impacts will appear in space with the progress of works, however, their duration will be limited to the period of the construction works implementation. After the completion of the construction works, the areas around the excavations and along the temporary access roads will be restored to their previous use. Permanent changes compromising the visual quality and existing structure of the landscape will occur along the cable bed area (along the sections constructed using the open trench method), including within the boundaries of the land-sea borehole and the ONS construction sites.

The spatial extent of the impact on landscape will include the area of the project implementation, as well as the areas from which particular works or structures erected will be visible.

Table 8.79 and Table 8.80 present an assessment of the scale and significance of the impact on landscape, including cultural landscape, identified for the EXC BC-Wind OWF construction phase.

Table 8.79. Assessment of the scale of impacts on landscape, including cultural landscape, during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics														Joint assessment
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
Points															
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13		
Landscape change	x					x			x				x	8	

Table 8.80. Assessment of the significance of the impact on landscape, including cultural landscape, during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Landscape change	Moderate	High	Moderate

8.1.4.11 Impact on population, health and living conditions of people

During the EXC BC-Wind OWF construction phase, potential impact on population, health and living conditions of people may be connected to the nuisance of the conducted construction works, causing emission of pollutants to the atmosphere, noise, and vibrations of the ground as a result of the construction-related vehicle traffic.

Due to the location of the proposed project area outside of towns and human settlements, mostly at significant distances from the development areas, the nuisance will have no significant impact.

The temporary nuisance during the construction phase may concern the people staying in the Rehabilitation and Holiday Centre for disabled people, which is located in the immediate vicinity of the proposed project. In order to limit them, the construction works generating the highest noise level should be carried out, if possible, only during daylight hours, excluding Sundays and holidays (except for the works that must be performed on a continuous basis, e.g. horizontal drilling), and the management of the Centre should be informed about the work schedule. Moreover, when planning the construction works, noise generating devices, should be placed as far away from the facilities of the Centre as possible.

The nuisance related to the impact of the road transport of construction materials, equipment and people, i.e. air pollution (exhaust fumes and dust from roads), noise and ground vibrations will be limited spatially to road surroundings and temporally (the duration of construction works). Wind conditions are an important factor reducing the nuisance indicated. Western and south-western winds are dominant within the construction work area, which will facilitate the movement of pollutants to uninhabited areas.

Table 8.81 and Table 8.82 present an assessment of the scale and significance of the impacts on population, human health and living conditions identified for the EXC BC-Wind OWF construction phase.

Table 8.81. Assessment of the scale of impacts on population, health and living conditions of people during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
	4–13													
Pollution and noise emissions		x				x			x				x	7

Table 8.82. Assessment of the significance of the impact on population, health and living conditions of people during the EXC BC-Wind OWF construction phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Pollution and noise emissions	Low	High	Low

8.1.5 Operation phase in the onshore part

8.1.5.1 Impact on geological structure, coastal zone, soils, and access to raw materials and deposits

8.1.5.1.1 Impact on geological structure

During the EXC BC-Wind OWF operation phase, no impact on geological structure is expected.

8.1.5.1.2 Impact on the topography and dynamics of the coastal zone

Due to the potential negative impact on the topography and dynamics of the coastal zone, construction of the cable landfall across the coastal zone (sandbank zone, beach and dunes) using the open trench method was excluded at the EXC BC-Wind OWF designing stage. A trenchless method (HDD or Direct Pipe) has been designed to be used, which enables maintaining the natural arrangement of the coastal zone rock layers and does not disturb its current dynamic status as well as prevents any impacts on the topography and dynamics of the coastal zone to occur in the operation phase.

8.1.5.1.3 Impact on soils

In the EXC BC-Wind OWF operation phase, land in the immediate vicinity of the cable bed area and ONS will be excluded from its current use. The land within the cable bed area, due to the safety of the transmission infrastructure operation will be permanently maintained in an altered form, including by preventing the succession of trees and shrubs.

Electricity transmission via high-voltage power cable lines generates a thermal field which impacts their immediate vicinity. The thermal effect of typical power cable lines occurs as a result of power losses in the phase wire and dielectric losses in the main insulation. The temperature generated during electricity transmission will cause local drying of the ground.

The cable lines in the outermost circuits demonstrate the lowest temperature values, which has a significant impact on minimising the extent of horizontal impact on adjacent areas. The greatest

cumulative heat impact occurs in the inner circuits, and central cables reach the highest temperature values. During current transmission, cable lines with an XLPE insulation are characterised by the maximum long-term temperature (90°C). This constitutes their technological limitation. Under normal operating conditions, all cable lines will operate below this temperature. The specific nature of the offshore wind farm operation does not assume full generation on a continuous basis. It depends primarily on the wind conditions prevailing at a particular time. This may result in fluctuations in the operating temperature of the cable lines, within temperature ranges equal to or lower than those demonstrated in the calculations. If the maximum temperature is exceeded, which is associated with short-term overload or short-circuit conditions, the current transmission is automatically shut down by the protection automation systems.

Thermal field distribution around the EXC BC-Wind OWF cable lines was calculated using modelling and its detailed results are included in Appendix 5.

The potential impact on soils in the operation phase is their contamination as a result of transformer oil leak from the transformers and reactors present on the ONS premises. To minimise the risk of contamination with oil from the equipment, systems with separators and leak-proof tanks will be installed to collect the substance in case of failure. Transformers and reactors will be equipped with oil sumps with a capacity of at least 10% larger than the volume of oil contained in them. In addition, during the operation of the ONS, periodic inspections of the technical condition of the equipment will be carried out in order to detect irregularities and prevent technical failures that may cause adverse environmental impacts, and additionally the substation will be equipped with leakage detection systems.

Table 8.83 and Table 8.84 present an assessment of the scale and significance of the impacts on soils identified for the EXC BC-Wind OWF operation phase.

Table 8.83. Assessment of the scale of impacts on soils during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Change in the existing land use			x			x	x					x		9	
Temperature increase		x				x	x					x		10	
Contamination of soils within the ONS area		x				x					x		x	5	

Table 8.84. Assessment of the significance of the impact on soils during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in the existing land use	Moderate	High	Moderate
Temperature increase	High	Moderate	Moderate
Contamination of soils within the ONS area	Irrelevant	Moderate	Negligible

8.1.5.1.4 Impact on the access to raw materials and deposits

Due to the distance of the proposed project from the identified areas with raw materials and deposits, the EXC BC-Wind OWF will have no impact on the access to such areas in its operation phase.

Due to the size of the area covered by concession Żarnowiec No. 5/2019/Ł owned by ShaleTech Energy Sp. z o.o. and the nature of the resultant planned operations, during the operation phase of the EXC BC-Wind OWF, no impact is expected on the prospecting, exploration and potential extraction of crude oil and natural gas.

8.1.5.2 Impact on the quality of surface waters

In the operation phase, the EXC BC-Wind OWF impact on the quality of surface waters may be caused by pollutants entering surface waters from:

- vehicles used for the maintenance purposes;
- equipment located within the ONS area.

Due to the use of vehicles during cable line maintenance works, leaks of consumable fluids and fuels may occur. If these substances enter surface waters, local contamination may occur. This situation may occur particularly within the boundaries of the ecological area *Torfowisko w Szklanej Hucie* [Peat bog in Szklana Huta], within which a service road leading to the transition joint bays and the cable landfall of the sea-land drilling, is scheduled. Taking into consideration the assumed low frequency of maintenance work with a properly functioning transmission infrastructure and assuming that the vehicles used will be in good working condition, such situations can be classified as unlikely.

Within the ONS area, equipment containing substances that could, in the event of an emergency leak, indirectly contribute to local surface water pollution will be in operation. The ONS will be equipped with tight oil pans connected to the rainwater treatment system through oil separators. Moreover, the ONS will be permanently equipped with portable kits containing sorbents and agents designed to handle the spilled and leaking hazardous substances. Their amount and types will be adjusted to the size of the facility and the number of pieces of equipment containing such substances.

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Leaks of petroleum products from vehicles	x					x					x		x	6
Leaks from equipment within the ONS		x				x					x		x	5

Table 8.85 and Table 8.86 present an assessment of the scale and significance of the impacts on the quality of surface waters identified for the EXC BC-Wind OWF operation phase.

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4–13
Leaks of petroleum products from vehicles	x					x					x		x	6	
Leaks from equipment within the ONS		x				x					x		x	5	

Table 8.85. Assessment of the scale of impacts on the quality of surface waters during the EXC BC-Wind OWF operation phase [source: internal materials]

Table 8.86. Assessment of the significance of the impact on the quality of surface waters during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Leaks of petroleum products from vehicles	Low	High	Negligible
Leaks from equipment within the ONS	Irrelevant	High	Negligible

8.1.5.3 Impact on hydrogeological conditions and groundwater

During the EXC BC-Wind OWF operation phase, no significant impact on hydrogeological conditions is expected. Indirectly, groundwater contamination may occur through surface waters, but this situation is highly unlikely. The significance of the project impact in that phase has been assessed as negligible.

Groundwater may be directly impacted, if a water intake is constructed within the ONSS area. Constructing a water intake system will be covered by the procedure of obtaining a water permit, in which the water intake methods and amounts will be specified in a way ensuring its rational use, taking into consideration the requirements necessary for the proper functioning of the ONSS.

8.1.5.4 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

During the EXC BC-Wind OWF operation phase, exhaust emissions from the vehicles used for maintenance and supervision works will occur, especially in the area of the cable bed and transition joint bays. The number of vehicle trips will be based on regular maintenance and the need to respond to emergency situations. It is assumed that the total number of such trips will be negligible in terms of emissions.

A power generator will be used within the ONS area as an auxiliary system. It will not be used in the ONS normal operating conditions. Only for technological purposes will it operate temporarily in test mode as a source of exhaust emissions. Due to the duration and frequency of its operation, the amount of emissions generated will be negligible.

8.1.5.5 Impact on ambient noise

During the EXC BC-Wind OWF operation phase, the main elements emitting noise to the environment, will be the equipment located within the ONS area and operating on an ongoing basis throughout the Project life time. To assess the impact of noise coming from the ONS,

modelling was conducted (Section 6.1, Appendix 3), which took into consideration all designed equipment, its location and the measurement points at the boundary of the areas subject to protection against noise. The levels of noise coming from the ONS were measured at those points, for which, in compliance with the Regulation of the Minister of the Environment of 15 October 2013 *on permissible noise levels in the environment* (consolidated text: Journal of Laws of 2014, item 112), the permissible levels of noise from installations have been specified.

The results obtained from the modelling conducted indicate that the ONS operations does not result in exceedances of the permissible noise levels.

8.1.5.6 Impact of electromagnetic field

During the EXC BC-Wind OWF operation phase, the operating cable lines buried in the ground will be a source of electromagnetic field. To assess the significance of the electromagnetic field impact, modelling of the magnetic field strength distribution was carried out (Section 6.2, Appendix 4), both for 220 kV cables exporting electricity from the BC-Wind OWF to the ONS (onshore part) and 400 kV cables connecting the ONS and the Choczewo Substation.

The results obtained clearly show that even at the maximum load of the EXC BC-Wind OWF cable lines, the permissible value (60 A/m) for the magnetic field at 50 Hz, indicated in the Regulation of the Minister of Health of 17 December 2019 *on the permissible levels of electromagnetic fields in the environment* (Journal of Laws of 2019, item 2448) is not exceeded in any case at any height, and the expected maximum values at 2.0 MAGL are several times lower than the permissible value. This means that the presence of people (environmental exposure) is allowed without time limits, even directly above the cable lines, irrespective of the cable line section analysed.

8.1.5.7 Impact on nature and protected areas

8.1.5.7.1 Impact on biotic components in the onshore area

8.1.5.7.1.1 Fungi

The cable bed area may be inhabited by new species of fungi. As a result of maintenance works, if the cable bed area is maintained in the form of grassland vegetation, these plots will be destroyed. Both the fungal fruiting bodies and their mycelium as well as the species habitat will be disturbed.

Forest clearing within the cable bed area will change the light and moisture conditions in the forest ecotone zone, which may affect the occurrence of fungal species, particularly mycorrhizal fungi. Lower soil moisture may reduce the incidence of the fruiting bodies and may cause species requiring more moisture to relocate from that area.

Table 8.87 and Table 8.88 present an assessment of the scale and significance of the impacts on fungi identified for the EXC BC-Wind OWF operation phase.

Table 8.87. Assessment of the scale of impacts on fungi during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Destruction of fruiting bodies and mycelia as a result of maintenance works	3					1	5						1	10
Physical loss of a habitat or its fragment as a result of maintenance works		2				1	5						1	9
Change of habitat conditions in the forest ecotone zone		2				1	5					2		10

Table 8.88. Assessment of the significance of the impact on fungi during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Destruction of fruiting bodies and mycelia as a result of maintenance works	High	Low	Low
Physical loss of a habitat or its fragment as a result of maintenance works	Moderate	Low	Low
Change of habitat conditions in the forest ecotone zone	High	Moderate	Moderate

8.1.5.7.1.2 Lichens

The cable bed area may be inhabited by new lichen species. As a result of maintenance works, if the cable bed area is maintained in the form of grassland vegetation, these plots will be destroyed. Both the lichen thalli and their habitat will be disturbed.

Forest clearing within the cable bed area will change the light and moisture conditions in the forest ecotone zone, which may affect the presence of lichens. It is possible that typical “forest” species will relocate from the area and will be replaced by lichens with a higher tolerance to insolation and low humidity.

Table 8.89 and Table 8.90 present an assessment of the scale and significance of the impacts on fungi identified for the EXC BC-Wind OWF operation phase.

Table 8.89. Assessment of the scale of impacts on lichens during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Destruction of lichen thalli as a result of maintenance works	3					1	5						1	10
Physical loss of a habitat or its fragment as a result of maintenance works		2				1	5						1	9
Change of habitat conditions in the forest ecotone zone		2				1	5					2		10

Table 8.90. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Destruction of lichen thalli as a result of maintenance works	High	Low	Low
Physical loss of a habitat or its fragment as a result of maintenance works	Moderate	Low	Low
Change of habitat conditions in the forest ecotone zone	High	Moderate	Moderate

8.1.5.7.1.3 Mosses and liverworts

The change in the light and moisture conditions of the forest ecotone zone within the cable bed area mentioned in the previous subsections will generate quantitative and qualitative changes in the bryoflora of the area.

Table 8.91 and Table 8.92 present an assessment of the scale and significance of the impacts on mosses and liverworts identified for the EXC BC-Wind OWF operation phase.

Table 8.91. Assessment of the scale of impacts on mosses and liverworts during the EXC BC-Wind OWF operation phase
 [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Change of habitat conditions in the forest ecotone zone		2				1	5					2		10

Table 8.92. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change of habitat conditions in the forest ecotone zone	High	Moderate	Moderate

8.1.5.7.1.4 Vascular plants and natural habitats

The change in the light and moisture conditions in the forest zone directly adjacent to the cable bed area will have little impact on the vegetation cover within the area of pine coniferous forests. The impact will be slightly greater within the areas with naturally high groundwater level.

During the operation of the project, the occurrence of species that are non-native in terms of habitat and geographical provenance should be expected along the cable bed area (e.g. foxglove *Digitalis purpurea*).

Table 8.93 and Table 8.94 present an assessment of the scale and significance of the impacts on vascular plants and natural habitats identified for the EXC BC-Wind OWF operation phase.

Table 8.93. Assessment of the scale of impacts on vascular plants and natural habitats during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration				Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	4–13
Change of habitat conditions in the forest ecotone zone		2				1	5					2		10
Spread of invasive species as a result of leaving the project area in a deforested condition and using service roads.			1			1	5					2		9

Table 8.94. Assessment of the significance of the impact on vascular plants and natural habitats during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change of habitat conditions in the forest ecotone zone	High	Moderate	Moderate
Spread of invasive species as a result of leaving the project area in a deforested condition and using service roads.	Moderate	Moderate	Low

8.1.5.7.1.5 Invertebrates

Altered environmental conditions may contribute to changes in the species structure of the invertebrate fauna, particularly those trophically related to different vegetation types. However, these will be transformations of a local character (e.g. withdrawal of species connected with the forest interior in favour of other, more flexible species) or changes in the qualitative and quantitative structure of mobile species penetrating larger areas (e.g. bumblebees). Changes in faunal biodiversity may also concern its enrichment, which is typical of ecotone habitats.

Table 8.95 and Table 8.96 present an assessment of the scale and significance of the impacts on invertebrates identified for the EXC BC-Wind OWF operation phase.

Table 8.95. Assessment of the scale of impacts on invertebrates during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Temporary disturbances of the invertebrate environment due to maintenance works and human presence		2					1	5					1	9

Table 8.96. Assessment of the significance of the impact on invertebrates during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Temporary disturbances of the invertebrate environment due to maintenance works and human presence	Moderate	Low	Low

8.1.5.7.1.6 Herpetofauna

Table 8.97 and Table 8.98 present an assessment of the scale and significance of the impacts on herpetofauna identified for the EXC BC-Wind OWF operation phase.

Table 8.97. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF operation phase
 [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Disturbance of population resources – death of individuals as a result of being run over by maintenance vehicles during the migration period	3					1					1		1	6

Table 8.98. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of population resources – death of individuals as a result of being run over by maintenance vehicles during the migration period	Low	Moderate	Low

8.1.5.7.1.7 Birds

Table 8.99 and Table 8.100 present an assessment of the scale and significance of the impacts on birds identified for the EXC BC-Wind OWF operation phase.

Table 8.99. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Startling of animals (presence of people and vehicles during maintenance works)	3					1					1		1	6
Destruction of nests and broods during cable line maintenance works (mowing/vegetation clearing)	3					1				2			1	7
Disturbance of population resources – death of individuals as a result of electrocution, collision with structures	3					1	5						1	10
Constant noise emission from equipment	3					1	5					2		11
Forest habitat fragmentation		2				1	5					2		10

Table 8.100. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Startling of animals (presence of people and vehicles during maintenance works)	Low	Moderate	Low
Destruction of nests and broods during cable line maintenance works (mowing/vegetation clearing)	Low	High	Low
Disturbance of population resources – death of individuals as a result of electrocution, collision with structures	High	Moderate	Moderate
Constant noise emission from equipment	High	High	Important
Forest habitat fragmentation	High	High	Important

8.1.5.7.1.8 Mammals

Table 8.101 and Table 8.102 present an assessment of the scale and significance of the impacts on mammals identified for the EXC BC-Wind OWF operation phase.

Table 8.101. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Collisions with vehicles, unintentional killing and disturbance of animals	3					1	5				1		1	6
Illumination of buildings and infrastructure elements		2				1	5					2		10
Noise from equipment operation		2				1	5					2		10
Habitat fragmentation		2				1	5					2		10

Table 8.102. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Collisions with vehicles, unintentional killing and disturbance of animals	Low	Low	Negligible
Illumination of buildings and infrastructure elements	High	High	Important
Noise from the equipment operation	High	Low	Low
Habitat fragmentation	High	High	Important

8.1.5.7.2 Impact on protected areas

8.1.5.7.2.1 Impact on protected areas other than Natura 2000

At the operation stage, quite a wide deforested area will become visible in the landscape protected as part of the Coastal Protected Landscape Area. The remaining operation phase impacts will concern vegetation, fungi and animals. Individual impacts and their effects at the operation stage were assessed with reference to particular environmental components in the previous sections. In this section, a joint assessment of the proposed project operation stage on the Coastal Protected Landscape Area was carried out and the impact was assessed as low.

No project impact on other protected areas is expected at the operation stage.

8.1.5.7.2.2 Impact on Natura 2000 sites

During the project operation, there will be no impacts that could directly affect the subjects of protection from the Natura 2000 site *Białogóra* PLH220003. Although the functionality of the Coastal Wildlife Corridor connecting the Natura 2000 sites *Białogóra* PLH220003 and *Mierzeja Sarbska* PLH220018 will be disrupted as a result of forest clearing for the purpose of the cable bed implementation, this corridor is not considered significant for the subjects of protection of these Natura 2000 sites.

8.1.5.7.3 Impact on wildlife corridors

As a result of maintaining the cable bed area in a deforested state, the Coastal Wildlife Corridor of a supra-regional importance will have a permanently limited functionality. The scale of this impact is high.

8.1.5.7.4 Impact on biodiversity

The crucial impacts of the proposed project in the operation phase in terms of biodiversity will concern:

- disruption of the continuity of the forest ecosystem;
- creation of barriers in the form of new large-surface structures and new service roads;
- change in land use of the cable bed and ONS areas.

The effects of the above-mentioned negative impacts will be manifested mainly in:

- reduced exchange of individuals between populations inhabiting separated fragments of the forest;
- qualitative change of the plant cover, fungi and animal groupings (appearance of species associated with open areas and ecotone zones, but also invasive and synanthropic species);
- increased mortality of birds as a result of direct collisions with the high ONS structures.

The appearance of a new type of land use (open areas above the cable bed) will considerably change the local biodiversity and may even contribute to its enrichment with species preferring open areas. An important way of minimising the impact of the proposed project on biodiversity will be the proper management of the cable bed area to allow its colonisation by new species.

The use of service roads within the cable bed area for purposes other than cable line maintenance will favour the spread of synanthropic species.

8.1.5.8 Impact on cultural values, monuments and archaeological sites and features

There will be no impacts on cultural values, monuments and archaeological sites and features in the EXC BC-Wind OWF area during the operation phase.

8.1.5.9 Impact on the use and development of the land area and tangible property

During the EXC BC-Wind OWF operation phase, the change in the existing use and development of land, which was initiated during the construction phase, will be maintained. The significance of this impact will be at most as the one assessed for the construction phase. During the entire period of the transmission infrastructure operation, only areas necessary for its proper functioning will be maintained. The remaining areas (e.g. for the temporary access roads or construction sites and areas for storing materials and construction equipment) will be rehabilitated to restore their former function.

8.1.5.10 Impact on landscape, including cultural landscape

As a result of the BC-Wind CI construction, essentially two permanent changes to the existing landscape will emerge during the operation period. One of them will be a permanent deforestation of the forest area in the locations of the cable line construction using the open trench method, while the other one will be the presence of the ONS. Both of these changes will have a significant impact on the landscape in their location and from the places from which they

will be visible to people. Taking into consideration the location of the two elements of the transmission infrastructure and their surroundings, greater impact on the landscape will result from the presence of the ONS.

Table 8.103 and Table 8.104 present an assessment of the scale and significance of the impact on landscape, including cultural landscape, identified for the EXC BC-Wind OWF operation phase.

Table 8.103. Assessment of the scale of impacts on landscape, including cultural landscape, during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4–13
Permanent deforestation within the cable bed area	x					x	x					x		11	
Presence of the ONS	x					x	x					x		11	

Table 8.104. Assessment of the significance of the impact on landscape, including cultural landscape, during the EXC BC-Wind OWF operation phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Permanent deforestation within the cable bed area	High	High	Important
Presence of the ONS	High	High	Important

8.1.5.11 Impact on population, health and living conditions of people

During the EXC BC-Wind OWF operation phase, impacts on population, both local as well as temporarily residing in that area, may occur. Such impacts will primarily result from a change in the nature of the existing use of the Project area, including landscape values (Section: 8.1.5.10). The location of the cable bed area as well as the ONS at a significant distance from the permanent places of human habitation will result in the absence of any deterioration in living conditions and human health as a result of emissions, be it noise, electromagnetic field or air pollution.

8.1.6 Decommissioning phase in the onshore part

8.1.6.1 Impact on geological structure, coastal zone, soils, and access to raw materials and deposits

8.1.6.1.1 Impact on geological structure

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on the geological structure will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

In the case of the scenario involving deactivation and removal of the power cables from the ground, there will also be a short-term disturbance to the surface layer, which will be rehabilitated immediately after the potential cable extraction.

8.1.6.1.2 Impact on topography and dynamics of the coastal zone

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on the topography and dynamics of the coastal zone will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

Potential extraction of the cables from the ground will take place outside the coastal zone. Therefore, no impacts on the topography and dynamics of that zone will occur.

8.1.6.1.3 Impact on soils

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on soils will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, there may be, locally at the work site, a temporary disturbance in the soil profile formed during the operation phase, which after land rehabilitation will be largely restored to its state prior to the disturbance.

8.1.6.1.4 Impact on the access to raw materials and deposits

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on the access to raw materials and deposits will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, no impacts on the access to raw materials and deposits will occur either.

8.1.6.2 Impact on the quality of surface waters

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on the quality of surface waters will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, local and temporary deterioration of the surface water quality due to the ingress of pollutants from machinery and vehicles involved in the decommissioning phase could potentially occur. Taking into consideration the scale of the possible operations, the impact will be much smaller than during the construction phase.

8.1.6.3 Impact on hydrogeological conditions and groundwater

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on hydrogeological conditions and groundwater will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, local and temporary disturbance to the hydrological conditions and groundwater could potentially occur. This disturbance will subside once the site is rehabilitated following the completion of the works. Impacts from those works will not be greater than during the construction phase.

8.1.6.4 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, nor impacts on atmospheric air (air quality) will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, local and temporary impact on climate, including greenhouse gas emissions, and thus impact on atmospheric air (air quality), could potentially occur. This will result from the exhaust emissions to air from the equipment and vehicles involved in the decommissioning operations. Due to the scale of the work conducted, those impacts will not be greater than during the construction phase.

8.1.6.5 Impact on ambient noise

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on the geological structure will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the cables are removed from the ground, local and temporary impact on ambient noise could potentially occur. This will result from the noise emitted from the equipment and vehicles involved in the decommissioning operations. Due to the scale of the work conducted, those impacts will not be greater than during the construction phase.

8.1.6.6 Electromagnetic field impact

Regardless of the scenario pursued, no electromagnetic field impact will occur during the EXC BC-Wind OWF decommissioning phase. Upon deactivation, the EXC BC-Wind OWF will cease to be a source of electromagnetic field.

8.1.6.7 Impact on nature and protected areas

8.1.6.7.1 Impact on biotic components in the onshore area

8.1.6.7.1.1 Fungi

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on fungi will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

During the operation period, the EXC BC-Wind OWF areas may be colonised by new fungal species. This may especially apply to areas above the cable lines. If the EXC BC-Wind OWF is decommissioned by physical removal of its components, also those plots will be eliminated.

Table 8.105 and Table 8.106 present an assessment of the scale and significance of the impacts on the biota of fungi identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.105. Assessment of the scale of impacts on the biota of fungi during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Physical destruction of fungal plots	3					1	5					2		11
Physical destruction of fungal habitats, including soil substrata, dead wood	3					1	5					2		11

Table 8.106. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of fungal plots	High	Moderate	Moderate
Physical destruction of fungal habitats, including soil substrata, dead wood	High	Moderate	Moderate

8.1.6.7.1.2 Lichens

In the case of the scenario involving deactivation of the power cables without removal from the ground, no impacts on lichens will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

During the operation period, the EXC BC-Wind OWF areas may be colonised by new lichen species. This may apply particularly to trees growing in the ONS area. If the BC-Wind CI is decommissioned by physical removal of its components, also those plots will be eliminated.

Table 8.107 and Table 8.108 present an assessment of the scale and significance of the impacts on lichens identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.107. Assessment of the scale of impacts on lichens during the EXC BC-Wind OWF decommissioning phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Physical destruction of lichen plots	3					1	5					2		11
Physical destruction of lichen habitats, including substrata.	3					1	5					2		11

Table 8.108. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of sites	High	Moderate	Moderate
Physical destruction of lichen habitats, including substrata.	High	Moderate	Moderate

8.1.6.7.1.3 Mosses and liverworts

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on mosses and liverworts will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

At the stage of operation, the EXC BC-Wind OWF will most probably be rich in moss species typical of coniferous forests, occurring also in the adjacent forest patches, as well as in some ubiquitous species, but they will not represent a high nature conservation value. At the stage of decommissioning, those plots will be destroyed.

Table 8.109 and Table 8.110] present an assessment of the scale and significance of the impacts on mosses and liverworts identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.109. Assessment of the scale of impacts on bryoflora during the EXC BC-Wind OWF decommissioning phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
	4–13													
Physical loss of moss and liverwort plots	3					1	5					2		11
Physical destruction of moss and liverwort habitats		2				1	5					2		10

Table 8.110. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of plots	High	Moderate	Moderate
Physical destruction of moss and liverwort habitats, including trees, soil substrata, dead wood	High	Moderate	Moderate

8.1.6.7.1.4 Vascular plants and natural habitats

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on vascular plants and habitats will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

During the operation period, the EXC BC-Wind OWF areas may be colonised by new species of vascular plants. In the area of the patches of habitat 2180, psammophilous species typical of the coastal grey dunes may occur, namely grey hair-grass *Corynephorus canescens*, sand sedge *Carex arenaria*, red fescue *Festuca rubra ssp. arenaria*, dwarf everlast *Helichrysum arenarium*, common heather *Calluna vulgaris* and other grassland species. If the EXC BC-Wind OWF is decommissioned by physical removal of its components, also those plots will be eliminated. No habitats patches are expected to develop.

Table 8.111 and Table 8.112 present an assessment of the scale and significance of the impacts on vascular plants and natural habitats identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.111. Assessment of the scale of impacts on vascular plant species and natural habitats during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Physical destruction of vascular plant plots	3					1	5					2		11
Physical destruction of vascular plant species habitats and natural habitats	3					1	5					2		11

Table 8.112. Assessment of the significance of the impact on vascular plants and natural habitats during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical destruction of vascular plant plots	High	Moderate	Moderate
Physical destruction of vascular plant species habitats and natural habitats	High	Moderate	Moderate

8.1.6.7.1.5 Invertebrates

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on invertebrates will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

During the operation period, the EXC BC-Wind OWF area will be used by various species of invertebrates. However, it is difficult to predict whether the area will only be visited by individuals in search of food or some fragment will qualify as a site. It was therefore concluded that during the project decommissioning through the deactivation and removal of the power cables as well as dismantling of the ONS, no impact on the protected and/or threatened species of invertebrates is anticipated.

8.1.6.7.1.6 Herpetofauna

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on herpetofauna will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

Table 8.113 and Table 8.114 present an assessment of the scale and significance of the impacts on herpetofauna identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.113. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Disturbance of population resources – death of individuals as a result of being run over by machinery and vehicles during migration	3					1					1		1	6
Startling of animals due to noise, human presence, vibrations, etc.	3					1					1		1	6

Table 8.114. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Disturbance of population resources – death of individuals as a result of being run over by machinery and vehicles during migration	Low	High	Low
Startling of animals due to noise, human presence, vibrations, etc.	Low	Low	Negligible

8.1.6.7.1.7 Birds

Startling of birds (presence of people and vehicles during dismantling works) – this threat will affect both breeding and migratory birds, however, a much greater negative impact will affect the breeding species attached to a particular fragment of land. Startling may cause local losses in broods and the abandonment of breeding sites. Birds will be startled due to the periodic, frequent presence of people performing decommissioning work.

Physical loss of habitats that developed during the operation phase – this impact will mainly affect an extensive area of the cable bed. During the operation phase, habitats (such as grassland or heathland) will be created there and will be used by a variety of bird species, including species that are rare or listed in Annex I of the Birds Directive (the European nightjar, the woodlark). Alteration of the character of this habitat (e.g. through afforestation) will result in the withdrawal of certain species and the appearance of others, initially associated with forest crops and young stands and later with mature forests.

Destruction of broods during dismantling works as well as tree felling and shrub clearance – this threat is mainly associated with the dismantling of buildings as well as the clearance of trees and shrubs, if the clearance is carried out during the breeding season. Both the buildings and other infrastructure elements as well as trees and bushes may constitute nesting sites for several bird species.

Table 8.115 and Table 8.116 present an assessment of the scale and significance of the impacts on birds identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.115. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF decommissioning phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Physical loss of species habitats		2				1	5					2		10
Destruction of broods (e.g. during demolition works and tree felling)	3					1				2			1	7
Startling of animals due to noise, human presence, illumination, etc.	3						1				2		1	7

Table 8.116. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical loss of species habitats	High	Moderate	Moderate
Destruction of broods (e.g. during demolition works and tree felling)	Low	High	Low
Startling of animals due to noise, human presence, illumination, etc.	Low	High	Low

8.1.6.7.1.8 Mammals

Table 8.117 and Table 8.118 present an assessment of the scale and significance of the impacts on mammals identified for the EXC BC-Wind OWF decommissioning phase.

Table 8.117. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF decommissioning phase
[source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4–13	
Unintentional killing of animals during dismantling works	3					1					1		1	6
Physical loss of species habitats		2				1	5					2		10
Startling of animals due to noise, human presence, illumination, vibrations, etc.	3					1					1		1	6

Table 8.118. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF decommissioning phase [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Unintentional killing of animals during dismantling works	Low	High	Low
Physical loss of species habitats	High	Moderate	Moderate
Startling of animals due to noise, human presence, illumination, vibrations, etc.	Low	High	Low

8.1.6.7.2 Impact on protected areas

8.1.6.7.2.1 Impact on protected areas other than Natura 2000

In the case of the project decommissioning by dismantling, there will be similar impacts on the Coastal Protected Landscape Area as during the construction (with the exception of a permanent clearance of a forest section). The individual components of the environment will be subject to the impacts described in the previous sections. This section provides an overall assessment of the impact of the decommissioning stage on the Coastal Protected Landscape Area as a result of the proposed project dismantling; the impact was assessed as moderate.

No project impact on other protected areas is expected at the decommissioning stage.

8.1.6.7.2.2 Impact on Natura 2000 sites

In the case of the project decommissioning, no direct nor indirect impact on subjects of protection of the Natura 2000 sites will occur.

After decommissioning, the cable bed area will most likely be afforested, which will result in the restoration of habitat continuity and the restoration of proper functioning of the Coastal Wildlife Corridor connecting the Natura 2000 sites *Białogóra* PLH220003 and *Mierzeja Sarbska* PLH220018.

8.1.6.7.3 Impact on wildlife corridors

In the case of the project decommissioning by dismantling, animals will be startled by operating machinery, human presence and the illumination of the construction sites in the area covered by the works. After the completion of the dismantling, the cable bed area will most probably be afforested and the ONS area will be returned to agricultural use, which will result in the restoration of habitat continuity and the restoration of corridor functions.

8.1.6.7.4 Impact on biodiversity

In the case of possible decommissioning of the project, impacts in the context of biodiversity will concern:

- transformation of secondarily created species habitats;
- noise emissions, which may result in scaring of vulnerable species;
- the permeation of pollutants into water and soil and directly into habitats.

The effects of the above-mentioned negative impacts will be manifested mainly in:

- the limitation of the availability of the food supply, reproduction locations, etc.;
- temporary abandonment of habitats;
- increase in mortality through direct collisions during dismantling works.

Individual impacts and their effects at the decommissioning stage were assessed with reference to particular biotic environmental components discussed in the previous sections. In this section, a joint assessment of the proposed project decommissioning stage on biological diversity was carried out and the impact was assessed to be moderate.

8.1.6.8 Impact on cultural values, monuments and archaeological sites and features

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on cultural values, monuments and archaeological sites and features will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

Therefore, no impact on cultural values, monuments and archaeological sites and features will occur. Potential decommissioning works will be conducted as part of the same areas within which works were carried out during the construction phase and within which transmission infrastructure has been functioning for an assumed number of decades.

8.1.6.9 Impact on the use and development of the land area and tangible property

In the case of both EXC BC-Wind OWF decommissioning scenarios, within the area of the cable bed, activities carried out during the operation phase aimed at the safe operation of the transmission infrastructure will be discontinued. As a result, the area will be subject to ecological succession, including the natural process of overgrowth by plant communities and the occupation and use of the land by animals, until ecological balance is reached between the area undergoing succession and the neighbouring areas.

The continued functioning of the ONS in the NPS will not lead to any impacts on the use and development of the land area and tangible property as part of the EXC BC-Wind OWF decommissioning phase. Potential dismantling of the ONS will result in the restoration of its land to its existing use or to a use compatible with a new, future purpose.

8.1.6.10 Impact on landscape, including cultural landscape

In the case of both EXC BC-Wind OWF decommissioning scenarios, within the area of the cable bed, activities carried out during the operation phase aimed at the safe operation of the transmission infrastructure will be discontinued. As a result, the area will be subject to ecological succession, including the natural process of overgrowth by plant communities and the occupation and use of the land by animals, until ecological balance is reached between the area undergoing succession and the neighbouring areas. Once the balance in nature is reached, the landscape values will also recover to their state from before the construction stage, however, they will differ from the landscape that has formed and lasted for what is assumed to be several decades during the EXC BC-Wind OWF operation phase.

Similarly, depending on the ONS decommissioning scenario selected, return to the landscape from before the construction phase will take place or the altered operation phase landscape will remain unchanged. During the potential dismantling works, vehicles and machinery will be used within the ONS area the presence of which will affect the landscape; however, the significance of this impact will not be greater than during the construction phase.

8.1.6.11 Impact on population, health and living conditions of people

In the case of the scenario involving deactivation without removal of the power cables from the ground, no impacts on population, health and living conditions of people will occur. Also, the continued functioning of the ONS in the NPS will not lead to any impacts as part of the EXC BC-Wind OWF decommissioning phase.

If the power cables are removed from the ground or the ONS is dismantled, impacts on population, health and living conditions of people will occur. Potential decommissioning works will be carried out within the same areas where works were conducted during the construction phase. The presence of vehicles and machinery involved in the decommissioning works will cause noise and pollutant emissions. Taking into consideration the scale of the potential works, the significance of the impact on population, health and living conditions of people will not be greater than during the construction phase.

8.2 Reasonable Alternative Variant (RAV)

The Reasonable Alternative Variant (RAV) of the EXC BC-Wind OWF differs from the Applicant Proposed Variant (APV) in the route of the planned cable lines in the offshore part of the project. Due to the existing environmental, technological and locational conditions, including the need to connect the EXC BC-Wind OWF to the NPS in a specific location (Choczewo Substation), there are no rational reasons to indicate the RAV in relation to the APV in the onshore area.

Within the BC-Wind OWF Area, the possibility of implementing the EXC BC-Wind OWF in the RAV remains the same as in the case of the APV. Outside the BC-Wind OWF Area in the RAV, the cable lines run to the west, then they shift to the south and run perpendicularly to the shoreline, up to the drilling site, which is identical as in the case of the APV [Figure 8.1]. The cable line route for the offshore part of the EXC BC-Wind OWF in the RAV is approximately 8.5 km longer than the cable line route in the APV.

According to the provisions of the Maritime Spatial Plan of the Polish Sea Areas [402], the route of the EXC BC-Wind OWF in the RAV runs through the sea areas, within which it is permitted to locate connection infrastructure from an OWF.



An assessment of the RAV for the offshore part of the EXC BC-Wind OWF was made further in this section.

8.2.1 Construction phase for the offshore part

8.2.1.1 Impact on geological structure, seabed relief, seabed sediments and access to raw materials and deposits

The information on the type of impacts resulting from the construction phase of the transmission infrastructure on geological structure, seabed relief, seabed sediments and access to raw materials and deposits is described when assessing the impact for the APV in Section 8.1.1.1. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.119 and Table 8.120 present an assessment of the scale of the impacts identified and an assessment of the significance of the impacts identified on the geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.119. Assessment of the scale of impacts on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment t	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Physical interference with the seabed	x					x				x			x	7	
Deposition of suspended solids		x				x				x			x	6	
Seabed disturbance from vessel anchoring	x					x				x			x	7	

Table 8.120. Assessment of the significance of the impact on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical interference with the seabed	Low	Moderate	Low
Deposition of suspended solids	Low	Moderate	Low
Seabed disturbance from vessel anchoring	Low	Moderate	Low

8.2.1.2 Impact on the quality of seawater and seabed sediments

The information on the type of impacts resulting from the construction phase of the transmission infrastructure on the seawater and seabed sediment quality is described when assessing the impact for the APV in Section 8.1.1.2. In the case of the RAV, the type of impacts and the receptors are the same.

The main difference between the APV and the RAV stems from the length of the cable lines and the resulting larger area of the seabed under the influence of the project discussed. The estimated amount of heavy metals, pollutants and nutrients that may be released during the implementation of the EXC BC-Wind OWF in the RAV is presented in Table 8.121. The calculations were made for a single cable. If 2 cable lines are laid, the values will be two times higher.

However, they will not be significant in comparison with the loads entering the Baltic Sea each year through Polish rivers and through precipitation [428], which are also presented in Table 8.121.

Table 8.121. Comparison of the loads of pollutants and nutrients that may be released into the water during the EXC BC-Wind OWF construction in the RAV with the load entering the Baltic Sea through Polish rivers and rain [source: internal materials]

Parameter	Unit	EXC BC-Wind OWF area according to the RAV	Annual load entering the Baltic Sea through precipitation	Annual load entering the Baltic Sea through rain
Volume of the sediment disturbed	m ³	1 476 000	-	-
Weight of the sediment disturbed	Mg	2 243 520	-	-
Dry weight of the sediment disturbed	Mg	1 839 686	-	-
Lead (Pb)	kg	2962	24 000	200 000
Copper (Cu)	kg	1269	112 000	no data
Chromium (Cr)	kg	1140	3800	no data
Zinc (Zn)	kg	5851	61 900	no data
Nickel (Ni)	kg	644	687 000	no data
Cadmium (Cd)	kg	below the limit of quantification	2300	7100
Mercury (Hg)	kg	10	2100	3400
Arsenic (As)	kg	below the limit of quantification	no data	no data
Congeners from the PCB group	g	below the limit of quantification	260 000	715 000
Analytes from the PAH group	g	27	no data	no data
Available phosphorus (P)	kg	550 986	9 500 000 (P _{tot.})	163 000 000
Nitrogen (N)	kg	below the limit of quantification	150 000 000 (N _{tot.})	5 700 000

Table 8.122 and Table 8.123 present an assessment of the scale and of the significance of the impacts on the quality of the seawater and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.122. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the EXC BC-Wind OWF construction phase in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Release of pollutants and nutrients from sediments into water	x					x				x			x	7
Contamination of water and seabed sediments with petroleum products	x					x				x			x	7
Contamination of water and seabed sediments with antifouling agents	x					x				x			x	7
Contamination of water and seabed sediments by accidental release of municipal waste or domestic sewage	x					x				x			x	7
Contamination of water and seabed sediments with accidentally released chemicals and waste	x					x				x			x	7

Table 8.123. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Release of pollutants and nutrients from sediments into water	Low	Moderate	Low
Contamination of water and seabed sediments with petroleum products	Low	Moderate	Low
Contamination of water and seabed sediments with antifouling agents	Low	Moderate	Low
Contamination of water and seabed sediments by accidental release of municipal waste or domestic sewage	Low	Low	Negligible
Contamination of water and seabed sediments with accidentally released chemicals and waste	Low	Moderate	Low

8.2.1.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

The information on the type of impacts generated during the construction phase of the transmission infrastructure on climate, including greenhouse gas emissions and impacts relevant

for adaptation to climate change, and the impact on atmospheric air (air quality) are described in Section 8.1.1.3 in the impact assessment for the APV. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.124 and Table 8.125 present an assessment of the scale and of the significance of the impacts on climate and atmospheric air quality during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.124. Assessment of the scale of impacts on climatic conditions and atmospheric air quality during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Emission of exhaust gases from vessels	x					x				x			x	7

Table 8.125. Assessment of the significance of the impact on climatic conditions and atmospheric air quality during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Emission of exhaust gases from vessels	Low	Low	negligible

8.2.1.4 Impact on ambient noise

The information on the type of impacts generated during the construction phase of the transmission infrastructure on the ambient noise is described when assessing the impact for the APV in Section 8.1.1.4. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.126 and

Table 8.127 present an assessment of the scale and of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.126. Assessment of the scale of impacts on ambient noise during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
	Noise from ships and equipment	x					x			x					x

Table 8.127. Assessment of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Noise from ships and equipment	Moderate	Low	Low

8.2.1.5 Impact on nature and protected areas

8.2.1.5.1 Impact on biotic components within the offshore area

8.2.1.5.1.1 Phytobenthos

The environmental surveys aimed at detecting phytobenthos indicated that it does not occur within the EXC BC-Wind OWF area in the RAV. Therefore, the activities carried out during the construction phase will not affect phytobenthos.

8.2.1.5.1.2 Macrozoobenthos

The information on the type of impacts generated during the construction phase of the transmission infrastructure on macrozoobenthos is described when assessing the impact for the APV in Section 8.1.1.5.1.2. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.128 and Table 8.129 present an assessment of the scale and of the significance of the impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.128. Assessment of the scale of impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Seabed disruption	x					x				x		x		8
Increased concentration of suspended solids	x					x					x		x	6
Sedimentation of suspended solids on the seabed	x					x					x		x	6
Release of pollutants from sediments to water	x					x					x		x	6

Table 8.129. Assessment of the significance of the impact on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Seabed disruption	Moderate	Moderate	Low
Increased concentration of suspended solids	Low	Irrelevant	Negligible
Sedimentation of suspended solids on the seabed	Low	Low	Negligible
Release of pollutants from sediments to water	Low	Low	Negligible

8.2.1.5.1.3 Ichthyofauna

The information on the type of impacts generated during the construction phase of the transmission infrastructure on ichthyofauna is described when assessing the impact for the APV in Section 8.1.1.5.1.3. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.130 and Table 8.131 present an assessment of the scale and of the significance of the impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.130. Assessment of the scale of impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Change in acoustic conditions	x					x					x		x	6	
Change in the habitat parameters		x				x					x		x	5	
Emission of toxic chemicals	x					x					x		x	6	
Increased concentration of suspended solids	x					x				x			x	7	

Table 8.131. Assessment of the significance of the impact on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in acoustic conditions	Low	High	Low
Change in the habitat parameters	Irrelevant	High	Negligible
Emission of toxic chemicals	Low	Moderate	Low
Increased concentration of suspended solids	Low	High	Low

8.2.1.5.1.4 Marine mammals

The information on the type of impacts generated during the construction phase of the transmission infrastructure on marine mammals is described when assessing the impact for the APV in Section 8.1.1.5.1.4. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.132 and Table 8.133 present an assessment of the scale and of the significance of the impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.132. Assessment of the scale of impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Change in acoustic conditions	x					x					x		x	6
Changes in habitat parameters	x					x				x			x	7
Change in food supply		x				x				x			x	6

Table 8.133. Assessment of the significance of the impact on marine mammals during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Change in acoustic conditions	Low	High	Low
Changes in habitat parameters	Low	Low	Negligible
Change in food supply	Low	Low	Negligible

8.2.1.5.1.5 Seabirds

The information on the type of impacts generated during the construction phase of the transmission infrastructure on seabirds is described when assessing the impact for the APV in Section 8.1.1.5.1.5. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.134 and Table 8.135 present an assessment of the scale and of the significance of the impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.134. Assessment of the scale of impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Presence and traffic of vessels	x					x					x		x	6
Change in acoustic conditions		x				x					x		x	5
Change in food supply		x				x			x				x	7
Changes in habitat parameters		x				x					x		x	5

Table 8.135. Assessment of the significance of the impact on seabirds during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible
Change in acoustic conditions	Irrelevant	Irrelevant	Negligible
Change in food supply	Low	Moderate	Low
Changes in habitat parameters	Irrelevant	Moderate	Negligible

8.2.1.5.2 Impact on protected areas

8.2.1.5.2.1 Impact on protected areas other than Natura 2000

In the area of the offshore part of the EXC BC-Wind OWF area, in the RAV, there are no protected areas other than those protected as part of the European ecological network Natura 2000. Therefore, the activities carried out during the construction phase in the offshore part will not impact protected areas other than those protected as part of the European ecological network Natura 2000.

8.2.1.5.2.2 Impact on Natura 2000 protected sites

The offshore part of the EXC BC-Wind OWF route in the RAV, in the southern section, will run within the site belonging to the European ecological network Natura 2000, *Przybrzeżne wody Bałtyku* (PLB990002). Information regarding this site is provided in Section 5.8.2. An assessment of the impact during the construction phase of the EXC BC-Wind OWF in the RAV was carried out regarding three aspects, such as:

- subjects of protection;
- integrity of the site;
- coherence of the network.

8.2.1.5.2.2.1 *Impact on subjects of protection*

Within the boundaries of the Natura 2000 site *Przybrzeżne Wody Bałtyku*, there are nine bird species subject to protection [Table 5.2]. The impacts thereon were defined and assessed in Section 8.1.1.5.1.5. The significance of the impact on the bird species subject to protection within the *Przybrzeżne Wody Bałtyku* (PLB990002) site was assessed to be low at most.

8.2.1.5.2.2.2 *Impact on the site integrity*

The construction of the EXC BC-Wind OWF in the RAV will take place within the boundaries of the *Przybrzeżne wody Bałtyku* (PLB990002) site. Therefore, all of the above-mentioned impacts will occur within the boundaries of this site. The specific nature of the planned activities (linear infrastructure construction) indicates that they will take place at different times and locations. For this reason, also the extent of the impacts will move along with the progress of works, ceasing in the place of their completion and arising in the place where the works are being carried out. After the complete cessation of the works, most of the effects of the impacts will cease within a relatively short time. Depletion of the food supply for benthivorous birds (the velvet scoter, the long-tailed duck, the common scoter) will be the longest lasting disturbance directly in the locations where power cables will be buried. Regarding the small size of the cable laying area in relation to the total area of the *Przybrzeżne wody Bałtyku* (PLB990002) site and the fact that the regeneration of the entire macrozoobenthos community and the restoration to its original state once the works are completed will be possible within the period from one to several years (this is the length of time it will take to rebuild the quantitative structure of the longest-living species in this group, such as the mussels *Mya arenaria* and *Limecola balthica* as well as *Mytilus trossulus* [325, 482]), the local depletion of the food supply will not have a significant impact on the deterioration in the welfare of the subjects of protection and their habitats.

Pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880), the integrity of the Natura 2000 site is defined as: “coherence of structural and functional factors determining the sustainable duration of populations of species and natural habitats for the protection of which a Natura 2000 site has been designed or designated.” As indicated by the analysis, the impacts on the subjects of protection of the *Przybrzeżne wody Bałtyku* (PLB990002) site will mainly involve local and short-term scaring of protected bird species as well as temporary and local depletion of the food supply for benthivorous birds, without having an impact on the integrity of the Natura 2000 site under assessment.

8.2.1.5.2.2.3 *Impact on the network coherence*

The activities associated with the construction phase of the EXC BC-Wind OWF in the RAV carried out inside and outside the area of the *Przybrzeżne wody Bałtyku* (PLB990002) site, due to their specific nature, including, in particular, temporary and local impacts both on the subjects of protection and their habitats, will not have any impacts on the coherence of the Natura 2000 network. The execution of the project discussed will not lead to the disturbance in the movement of birds between the *Przybrzeżne wody Bałtyku* (PLB990002) site and other Natura 2000 sites.

8.2.1.5.3 **Impact on wildlife corridors**

A wildlife corridor, pursuant to the Nature Conservation Act of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended), is defined as an area enabling the migration of plants, animals or fungi. The network of wildlife corridors connecting the European ecological network Natura 2000 in Poland was developed in 2011 [199]. This study indicates that no wildlife corridors

exist within the Polish Sea Areas. In the spring and autumn periods, regular bird migrations take place in the Baltic area; however, the migration tactics and their routes are very poorly recognised. Bird migration routes depend mainly on the prevailing meteorological conditions.

Also marine mammals move within the sea areas, however, in their case, the migration routes are not fixed, but result from the need to forage for food.

Given the lack of information on the occurrence, functioning and significance of wildlife corridors within the sea areas, it was conservatively assumed that the value of this resource is medium. Considering the spatial scale of the activities associated with the construction of the EXC BC-Wind OWF in the RAV in relation to the size of the sea area and their specific nature resulting from the presence of installation vessels proceeding along with the progress of works, it was concluded that no impacts which might in any way prevent animals from migrating will occur.

8.2.1.5.4 Impact on biodiversity

8.2.1.5.4.1 Phytobenthos

No phytobenthos was recorded within the area of the EXC BC-Wind OWF in the RAV. Hence, the construction of the cable lines will not cause phytobenthos depletion. Cables laid on the seabed along some sections of the cable line, in combination with protection against their damage applied, might provide favourable conditions for benthic organisms to colonise their surface. This situation can contribute to a local increase in local biodiversity by altering the habitat conditions.

8.2.1.5.4.2 Macrozoobenthos

The construction of the EXC BC-Wind OWF in the RAV will cause damage to macrozoobenthic communities at the location of the disturbance of seabed sediments. As a consequence, the loss of biodiversity will be local and short-term. After the cessation of the works, the original seabed conditions will be restored. Except the cable line sections where power cables will be possibly laid on the seabed and protected against damage, there will be no change in sediment conditions. Therefore, considering the high reproductive capacity of macrozoobenthic organisms and their commonness, the state from before the commencement of operations disturbing the seabed will be restored relatively quickly, both in terms of their biomass and abundance. The qualitative and quantitative reconstruction of the macrozoobenthic communities will not lead to a change in the taxonomic composition in this area.

8.2.1.5.4.3 Ichthyofauna

The activities associated with the construction of the EXC BC-Wind OWF in the RAV will have an impact on fish present in the vicinity of the work site, in particular, making them flee to areas where conditions are undisturbed. Once the causes of the impact have ceased to exist, the habitat conditions will be restored to their original state, thereby enabling the fish to return to their original habitat. Therefore, there will be no change in ichthyofauna diversity in the vicinity of the EXC BC-Wind OWF area in the RAV.

8.2.1.5.4.4 Marine mammals

Marine mammals occur in the vicinity of the construction site of the EXC BC-Wind OWF in the RAV only occasionally. The works conducted may lead to local disturbance in their habitat, therefore, these animals will avoid the work site. This situation will in no way affect the marine mammal

species diversity, either in the vicinity of the EXC BC-Wind OWF area in the RAV or within the Southern Baltic Sea.

8.2.1.5.4.5 Seabirds

Impacts on seabirds present in the vicinity of the work site were identified for the construction phase of the EXC BC-Wind OWF in the RAV. The impact will mostly lead to birds being scared away due to the presence of vessels. In addition, there will be a local and medium-term at most deterioration in habitat conditions for birds foraging in the cable burial locations. Taking account of the size and proximity of alternative feeding grounds, mostly for benthivorous birds, the works conducted will not affect the biodiversity of birds present in the vicinity of the work site.

8.2.1.6 Impact on cultural values, monuments and archaeological sites and features

During geophysical surveys within the EXC BC-Wind OWF area in the RAV, no sites of cultural interest or monuments were identified. No archaeological sites or features are located in this area.

Two shipwrecks lying on the seabed west of the EXC BC-Wind OWF area in the RAV, as a consequence of the works resulting in seabed disturbance, if westerly sea currents occur, will be within the range of deposition of suspended solids from the water column onto the sediment surface. The deposition of suspended solids may partially result in covering the elements of these shipwrecks protruding above the seabed with a layer of fine fraction of suspended solids with a thickness of no more than a few millimetres. Similar values of suspended solids concentration and the resultant deposition values are recorded on a regular basis during storm events, therefore, the significance of the impact on the shipwrecks resulting from the operations disturbing the seabed will be low.

Table 8.136 and Table 8.137 present an assessment of the scale and of the significance of the impact on cultural values during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.136. Assessment of the scale of impacts on cultural values during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Suspended solids deposition		X				x					x		x	6

Table 8.137. Assessment of the significance of the impact on cultural values during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Suspended solids deposition	Low	High	Low

8.2.1.7 Impact on the use and management of the sea area and tangible property

One of the primary uses of sea areas is navigation, including the movement of fishing vessels to and from fisheries to ports. Impacts on shipping will result from the activity of the vessels involved in the works associated with the cable line construction in the vicinity of the EXC BC-Wind OWF area in the RAV. Given the proximity of the cable routes in the APV and the RAV and their similar direction, it was assumed that the impacts will be the same. A description and assessment of these impacts, taking into account the specificity of the vessels, is described and assessed in Appendix 6.

8.2.1.8 Impact on landscape, including cultural landscape

The information on the type of impacts generated during the construction phase of the transmission infrastructure on landscape, including cultural landscape is described when assessing the impact for the APV in Section 8.1.1.8. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.138 and Table 8.139 present an assessment of the scale and of the significance of the impact on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.138. Assessment of the scale of impacts on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
	Presence and traffic of vessels	x					x					x			x

Table 8.139. Assessment of the significance of the impact on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible

8.2.1.9 Impact on population, health and living conditions of people

The information on the type of impacts generated during the construction phase of the transmission infrastructure on population, health and living conditions of people is described when assessing the impact for the APV in Section 8.1.1.9. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.140 and Table 8.141 present an assessment of the scale and of the significance of the impacts on population, human health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the RAV.

Table 8.140. Assessment of the scale of impacts on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Presence and traffic of vessels	x					x					x		x	6

Table 8.141. Assessment of the significance of the impact on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Presence and traffic of vessels	Low	Low	Negligible

8.2.2 Operation phase in the offshore part

8.2.2.1 Impact on geological structure, seabed topography, seabed sediments and access to raw materials and deposits

The information on the type of impacts generated during the operation phase of the transmission infrastructure on geological structure, seabed relief, seabed sediments and access to raw materials and deposits is described when assessing the impact for the APV in Section 8.1.2.1. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.142 and Table 8.143 present an assessment of the scale and of the significance of the impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the RAV.

Table 8.142. Assessment of the scale of impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
Points														
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13	
Physical disturbance of the seabed	x					x	x					x		12

Table 8.143. Assessment of the significance of the impact on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical disturbance of the seabed	High	Low	Low

8.2.2.2 Impact on the quality of seawater and seabed sediments

The information on the type of impacts generated during the operation phase of the transmission infrastructure on the seawater and seabed sediment quality is described when assessing the impact for the APV in Section 8.1.2.2. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.144 and Table 8.145 present an assessment of the scale and of the significance of the impacts on the quality of seawater and seabed sediments during the operation phase of the EXC BC-Wind OWF in the RAV.

Table 8.144. Assessment of the scale of impacts on the quality of seawater and seabed sediment during operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
Spills of petroleum products	x					x				x			x	7
Change in sediment and water temperature	x					x	x						x	10

Table 8.145. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Spills of petroleum products	Low	Low	Negligible
Change in sediment and water temperature	High	Low	Low

8.2.2.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

During the operation phase of the EXC BC-Wind OWF in the RAV, periodic inspections of the power cables laid on the seabed are foreseen along their entire length. These will take place at least once every 5 years and will be carried out by small service vessels. Therefore, no noticeable impact on climate, greenhouse gas emissions and air quality is expected to result from the activities performed.

8.2.2.4 Impact on ambient noise

The power transmission cables buried in the seabed or laid on the seabed and protected against damage will generate vibrations in the form of sound emitted to the environment. Sound measured during a period of very low ambient noise levels at a distance of 100 m from a 138 kV AC transmission line passing through Trincomali Channel (Canada) did not exceed 80 dB re 1 μ Pa. Taking into account the cylindrical model of sound attenuation, it can be assumed that the noise level at a distance of 1 m from the cable will be approximately 100 dB re 1 μ Pa [196].

Periodic maintenance and possible repairs of the cables requiring operations of smaller vessels, similar to those described in detail for the construction phase, will be limited to a smaller area and will be considerably less intense. Therefore, considering the level of underwater noise resulting from the current activities in the sea areas, mostly shipping, the impact of the operation phase of the EXC BC-Wind OWF in the RAV will be negligible.

8.2.2.5 Impact on electromagnetic field

The impact of cables buried in the seabed on the electromagnetic field is negligible. According to Normandeau Associates Inc. [291], depending on the distance from a cable buried in the seabed at a depth of 1 m under the seabed, the strength of the electric component of the field is up to $8 \cdot 10^{-4} \text{ V} \cdot \text{m}^{-1}$ on the seabed, $3.4 \cdot 10^{-5} \text{ V} \cdot \text{m}^{-1}$ in the water column 5 m above the seabed and $1.24 \cdot 10^{-5} \text{ V} \cdot \text{m}^{-1}$ in the water column 10 m above the seabed. The magnetic field strength induced by AC cables is $0.89 \text{ A} \cdot \text{m}^{-1}$ on the seabed, $4 \cdot 10^{-2} \text{ A} \cdot \text{m}^{-1}$ in the water column 5 m above the seabed and $1.5 \cdot 10^{-2} \text{ A} \cdot \text{m}^{-1}$ in the water column 10 m above the seabed.

8.2.2.6 Impact on nature and protected areas

8.2.2.6.1 Impact on biotic components within the offshore area

8.2.2.6.1.1 Phytobenthos

The information on the type of impacts generated during the operation phase of the transmission infrastructure on phytobenthos is described when assessing the impact for the APV in Section 8.1.2.6.1.1. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.146 and Table 8.147 present an assessment of the scale and of the significance of the impacts on phytobenthos during the operation phase of the EXC BC-Wind OWF in the RAV.

Table 8.146. Assessment of the scale of impacts on phytobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Creation of habitats for phytobenthos		x				x		x					x	8	

Table 8.147. Assessment of the significance of the impact on phytobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Creation of habitats for phytobenthos	Moderate	High	Moderate

8.2.2.6.1.2 Macrozoobenthos

The information on the type of impacts generated during the operation phase of the transmission infrastructure on macrozoobenthos is described when assessing the impact for the APV in Section 8.1.2.6.1.2. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.148 and Table 8.149 present an assessment of the scale and of the significance of the impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the RAV.

Table 8.148. Assessment of the scale of impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics														Joint assessment
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
Points															
3	2	1	3	2	1	5	4	3	2	1	2	1	4-13		
Habitat alteration	x					x	x						x	10	
Electromagnetic field emissions	x					x	x						x	10	
Heat emissions	x					x	x						x	10	

Table 8.149. Assessment of the significance of the impact on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Habitat alteration	High	Irrelevant	Negligible
Electromagnetic field emissions	High	Irrelevant	Negligible
Heat emissions	High	Irrelevant	Negligible

8.2.2.6.1.3 Ichthyofauna

The information on the type of impacts generated during the operation phase of the transmission infrastructure on ichthyofauna is described when assessing the impact for the APV in Section 8.1.2.6.1.3. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.150 and Table 8.151 present an assessment of the scale and of the significance of the impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the RAV.

Table 8.150. Assessment of the scale of impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment	
	Type			Range			Duration					Permanence			
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible		
	Points														
	3	2	1	3	2	1	5	4	3	2	1	2	1		4-13
Noise and vibrations	x					x	x						x	10	
Habitat alteration	x					x	x						x	10	
Electromagnetic field emissions	x					x	x						x	10	

Table 8.151. Assessment of the significance of the impact on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Noise and vibrations	High	Moderate	Moderate
Habitat alteration	High	Moderate	Moderate
Electromagnetic field emissions	High	Moderate	Moderate

8.2.2.6.1.4 Marine mammals

During the operation phase of the EXC BC-Wind OWF in the RAV, marine mammals may be impacted by the noise generated by vessel traffic, the operation of underwater equipment and the interference in the seabed during periodic inspections or cable repair works. Due to the local and short-term nature of this impact, the insignificance of this area for particular marine mammal species recorded in the Southern Baltic and the resulting sporadic occurrence of such species within the project area, this impact will be no greater than during the construction phase.

8.2.2.6.1.5 Seabirds

During the operation phase of the EXC BC-Wind OWF in the RAV, no significant impact on seabirds is expected. After the construction phase is completed, the seabed will be recolonised by benthic communities, which will restore the original feeding areas of benthivorous and piscivorous birds. Therefore, it is anticipated that during the operation phase, the habitat conditions for birds within the project area will be similar to the current ones and that they will be subject to conditions other than those which may arise from the presence of power cables.

Periodic inspections will be conducted by a single vessel equipped with a remotely operated underwater vehicle (ROV). Disturbance of birds will be occasional, temporary and reversible. The vessel traffic within the EXC BC-Wind OWF area in the RAV will not be more intense than in the surrounding areas.

The cable line operation period may have a positive impact on seabirds. The establishment of a protection zone for the cable lines may involve restrictions on some forms of commercial fishing within its boundaries and consequently reduce the by-catch of birds – mainly ducks diving into the fishing nets. At this stage, it is impossible to determine the scale of this impact, and thus it was not assessed.

Summarising the above information, it should be assumed that during the operation phase of the EXC BC-Wind OWF in the RAV, there will be no negative impacts on birds which could manifest themselves in a noticeable or measurable manner.

8.2.2.6.2 Impact on protected areas

8.2.2.6.2.1 Impact on protected areas other than Natura 2000

Within the offshore area of the planned project location and within the extent of its potential impact, there are no territorial forms of protection other than the areas of the Natura 2000 European ecological network. Therefore, no activities related to the operation of the EXC BC-Wind OWF in the RAV will cause any impact on such areas.

8.2.2.6.2.2 Impact on Natura 2000 protected sites

During the operation phase of the EXC BC-Wind OWF in the RAV, no impacts will occur that could significantly affect the subjects of protection of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002), the integrity of this area or the coherence of the Natura 2000 network.

Periodic inspections of the subsea cables will be carried out by small vessels. The necessity of conducting possible repairs of subsea cables may occur almost exclusively in emergency situations and is very unlikely due to various types of cable line protection measures: their durable design, burial in the seabed sediment or proper protection if they are laid on the seabed, as well as a special avoidance zone for cable lines established by the Director of the Maritime Office in Gdynia.

Periodic inspections of the cable lines will only involve bird scaring in the vicinity of vessels. In this part of the sea, the traffic of vessels is intensive due to the shipping route of cargo vessels, therefore, a short-term presence of a single vessel does not contribute to a visible increase in bird-scaring in the area; particularly in the context of the already intense shipping use of the sea area in which the project is partially located. After the construction phase is completed, the restoration of macrozoobenthic communities, constituting a possible food supply for benthivorous birds, will begin. At the operation stage, all the impacts identified for the construction phase will cease.

The operation of the cable line may have a positive impact on the Natura 2000 site features subject to protection. The establishment of a protection zone for the cable lines may involve restrictions on some forms of commercial fishing within its boundaries and consequently reduce the by-catch of birds – mainly ducks diving into the fishing nets. At this stage, it is impossible to determine the scale of this impact, and thus it was not assessed.

Summarising the information above, it should be assumed that during the operation phase of the EXC BC-Wind OWF in the RAV, there will be no negative impacts on seabirds subject to protection within the *Przybrzeżne Wody Bałtyku* (PLB990002) site, on the integrity of the area or on the connections with other Natura 2000 sites which could manifest themselves in a noticeable or measurable manner.

8.2.2.6.3 Impact on wildlife corridors

During the operation phase of the EXC BC-Wind OWF in the RAV, the extent and significance of environmental impacts will be much smaller compared to the construction phase. No impacts that could adversely affect the movement of animals both within and near the EXC BC-Wind OWF area in the RAV are anticipated.

8.2.2.6.4 Impact on biodiversity

8.2.2.6.4.1 Phytobenthos

At present, no phytobenthos was found within the EXC BC-Wind OWF area in the RAV, not even on a stony seabed. Leaving the cables on the seabed with additional protection at short sections of the entire cable line route may foster the conditions for the development of periphytic flora. This situation may occur in places shallower than the parts of the EXC BC-Wind OWF area in the RAV within which a stony seabed not covered by phytobenthos was found. Creation of new places where phytobenthos can occur would result in a local increase in species diversity. Due to the fact that this area will potentially be small and will provide only a possible increase in diversity, this hypothetical situation will not affect changes in biodiversity within the Southern Baltic in the context of phytobenthos, thus, the impact will be negligible.

8.2.2.6.4.2 Macrozoobenthos

During the operation phase of the EXC BC-Wind OWF in the RAV, there will be no changes in biodiversity – neither in terms of habitat nor species.

In the case of the soft bottom, the cables embedded in the seabed will not affect the surface layer of the sediments, the physical and chemical structure of which and the macrozoobenthic community inhabiting the sediments will be restored after a few years since the end of the disturbance at the latest. In the case of the hard bottom, covering the power cables with concrete covers or rip-rap will not alter the substrate characteristics in terms of its suitability for periphyton to colonise it.

The species diversity on both types of habitats will be restored close to its original condition after 3–4 years since the completion of the construction phase at the latest.

8.2.2.6.4.3 Ichthyofauna

The assessment of impacts occurring during the operation phase (noise and vibration, electromagnetic field, habitat alteration) indicates that they will not have a significant effect on ichthyofauna. In the case of the first two impacts, the technical solutions should reduce their occurrence to a minimum. Therefore, it is not anticipated that they will affect the biodiversity of this group of organisms. However, a possible local impact on ichthyofauna biodiversity can be assumed due to the presence of cable protection structures in places where they have not existed before. Structures such as rip-rap and concrete structures will provide a substrate for the formation of an artificial reef. This may result in a more abundant presence of certain fish species in their vicinity and a possible increase in certain diversity indicators. However, it should be emphasised that this phenomenon will have a very localised impact, given the probably small area on which the construction of such structures will be required. Thus, the significance of impacts on biodiversity in the context of ichthyofauna was assessed as negligible.

8.2.2.6.4.4 Marine mammals

During the operation phase of the EXC BC-Wind OWF in the RAV, there will be no additional, significant disturbance in the marine mammal habitat which would prevent its use by these animals. In this area, which is used by marine mammals incidentally, service vessels will be present occasionally. Therefore, it will not affect the biodiversity in the context of marine mammals.

8.2.2.6.4.5 Seabirds

During the operation phase of the EXC BC-Wind OWF in the RAV, there will be no impacts that could affect the biodiversity in the context of birds. After the construction phase is completed, the habitat conditions will be restored to their pre-disturbance state. Benthic communities, providing a food supply for birds, will be restored naturally at the former work sites, whereas the occasional presence of service vessels will not lead to changes in the species structure of the birds using this area, mainly during the wintering period.

8.2.2.7 Impact on cultural values, monuments and archaeological sites and features

During the operation phase of the EXC BC-Wind OWF in the RAV, no underwater works are anticipated that would result in seabed interference, except for cable repairs in case of damage. Potential impacts on wrecks during the operation phase will result from the sedimentation of the sediments mobilised into the water column during the exposure of a damaged cable section. Mass flow excavation (MFE) of damaged sections of cable lines is associated with more intense resuspension and sedimentation than the technologies planned to be used during the construction phase. The need for the application of MFE technology will only arise in emergency situations and the underwater works will cover only short cable line sections. For this reason, the impact of sedimentation on the surface of wrecks is expected to be smaller than during the construction phase, and will not affect the conservation status of the wrecks. The scale of the impact of potential repair work during the operation phase on the conservation status of the wrecks located within its boundaries and in the surrounding area will be irrelevant and the impact will be negligible.

8.2.2.8 Impact on the use and management of the sea area and tangible property

During the operation phase of the EXC BC-Wind OWF in the RAV, the impact on the use and development of the sea area will result virtually exclusively from the establishment by the Director of the Maritime Office in Gdynia of the safety zone for the cable lines within which prohibitions and restrictions will apply in order to protect the subsea cables from damage or destruction. These issues are governed by separate provisions.

Out of the existing uses of the sea area, the protection zone will impose the strongest restrictions on fishing activities as regards fish catching since the use of demersal fishing gear will most likely be prohibited within the zone. The analysis of commercial fishing and fishing effort in the statistical rectangles showed that there are no significant commercial fisheries within their boundaries. Therefore, the EXC BC-Wind OWF will have a negligible impact on the fishing activity in this area. The designated zone will not affect the possibility of free passage.

During the operation phase, the cable lines will be inspected periodically, at least once every 5 years. This type of work is usually performed by one vessel. Therefore, no impacts on navigation and other uses of the sea area are anticipated.

8.2.2.9 Impact on landscape, including cultural landscape

During the operation phase of the EXC BC-Wind OWF in the RAV, the cable lines will be inspected periodically, using relatively small service vessels. Their presence in the offshore area will not affect the landscape character, which is formed, i.a. anthropogenically by the intensive use of this part of the Baltic Sea for navigation.

8.2.2.10 Impact on population, health and living conditions of people

Restrictions on the use of the EXC BC-Wind OWF area in the RAV resulting from establishing a safety zone for the cable lines will result in the exclusion of this part of the sea area from demersal fishing for ichthyofauna. Due to the fact that it plays a very minor role in commercial fishing and due to the small surface of the sea area predicted to be covered by the restrictions, it is expected that the impacts of the EXC BC-Wind OWF in the RAV on the population and living conditions of people resulting from the restrictions on fisheries are considered negligible. There will be no impacts on human health.

8.2.3 Decommissioning phase of the offshore part

The following two options for implementing the decommissioning phase of the EXC BC-Wind OWF in the RAV are envisaged:

- deactivation of the connection infrastructure and leaving the cables buried in the seabed – the method preferred by the Applicant);
- deactivation of the connection infrastructure, removing the cables from the seabed and transferring them for disposal.

The former option assumes that most of the impacts occurring during the operation phase will cease. If the cables are removed from the seabed, the impacts, including their significance, will be identical to those identified for the construction phase due to the intended scope of dismantling work being very similar to the scope of construction work. For each of the environmental components examined, both methods of implementing the decommissioning phase were analysed to identify new impacts which were subsequently analysed to assess their significance.

8.2.3.1 Impact on geological structure, seabed sediments, access to raw materials and deposits

The information on the type of impacts generated during the decommissioning phase of the transmission infrastructure on geological structure, seabed sediments and access to raw materials and deposits is described when assessing the impact for the APV in Section 8.1.3.1. In the case of the RAV, the type of impacts and the receptors are the same.

Table 8.152 and Table 8.153 present an assessment of the scale and of the significance of the impacts on geological structure, seabed sediments, access to raw materials and deposits identified for the decommissioning phase of the EXC BC-Wind OWF in the RAV.

Table 8.152. Assessment of the scale of impacts on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact characteristics													Joint assessment
	Type			Range			Duration					Permanence		
	Direct	Indirect	Secondary	Transboundary	Regional	Local	Permanent	Long-term	Medium-term	Short-term	Temporary	Irreversible	Reversible	
	Points													
	3	2	1	3	2	1	5	4	3	2	1	2	1	
	4-13													
Physical interference in the seabed	x					x				x			x	7

Table 8.153. Assessment of the significance of the impact on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the RAV [source: internal materials]

Impact	Impact scale	Receptor sensitivity	Impact significance
Physical interference in the seabed	Low	Irrelevant	Negligible

8.2.3.2 Impact on the quality of seawater and seabed sediments

If the option assuming deactivation of the EXC BC-Wind OWF in the RAV without removing the cables from the seabed is implemented, no impacts on the quality of seawater and seabed sediments will occur. In the case of potential deactivation of the EXC BC-Wind OWF and the removal of the cables from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.2.3.3 Impact on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)

If the option assuming deactivation of the EXC BC-Wind OWF in the RAV without removing the cables from the seabed is implemented, there will be no impacts on climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, or the impact on atmospheric air (air quality). In the case of potential deactivation of the EXC BC-Wind OWF in the RAV and the removal of the cables from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.2.3.4 Impact on ambient noise

If the option assuming deactivation of the EXC BC-Wind OWF in the RAV without removing the cables from the seabed is implemented, there will be no impacts on ambient noise. In the case of potential deactivation of the EXC BC-Wind OWF in the RAV and the removal of the cables from the seabed, impacts of, at most, the same significance as those identified for the construction phase will occur.

8.2.3.5 Impact on electromagnetic field

In the case of both options, deactivation of the EXC BC-Wind OWF in the RAV will not have any impacts on electromagnetic field.

8.2.3.6 Impact on nature and protected areas

8.2.3.6.1 Impact on biotic elements within the offshore area

8.2.3.6.1.1 Phytobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the phytobenthos, which will possibly grow on the cable protection structures.

If the cables and elements protecting them are removed, the phyto-periphyton communities and the substrate inhabited by them will be removed. This will result in the ecosystem alteration in the area of the connection infrastructure, i.e. the original conditions prevailing before the construction phase will be restored.

8.2.3.6.1.2 Macrozoobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the macrozoobenthic communities, which will be present in the area of the project throughout the entire operation period, inhabiting both the seabed and cable protection structures.

If the cables and elements protecting them are removed from the seabed, the periphyton communities may be destroyed and the functioning of the macrozoobenthic organisms living in the immediate vicinity of the interference in the seabed may be disturbed.

8.2.3.6.1.3 Ichthyofauna

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on ichthyofauna.

If the cables and elements protecting them are removed from the seabed, impacts on ichthyofauna may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.1.4 Marine mammals

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on marine mammals.

If the cables and elements protecting them are removed from the seabed, impacts on the marine mammals may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.1.5 Seabirds

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on seabirds.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.2 Impact on protected areas

8.2.3.6.2.1 Impact on protected areas other than Natura 2000

Within the offshore area of the planned project location and within the extent of its potential impact, there are no territorial forms of protection other than the areas of the Natura 2000 European ecological network. Therefore, no activities related to the possible decommissioning of the Baltica OWF CI will cause any impact on such areas.

8.2.3.6.2.2 Impact on Natura 2000 protected sites

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the subjects of protection of the Natura 2000 site *Przybrzeżne wody Bałtyku* (PLB990002), the integrity of this area or the coherence of the Natura 2000 network.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.3 Impact on wildlife corridors

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts which might affect the free movement of animals in the area of the project.

Also, if the cables and elements protecting them are removed from the seabed, no impacts which might in any way prevent animals from migrating will occur.

8.2.3.6.4 Impact on biodiversity

8.2.3.6.4.1 Phytobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts which might affect the biodiversity in the context of phytobenthos.

If the cables and elements protecting them are removed from the seabed in a situation when they are covered by phytoperiphyton communities, these organisms will be lost, which however, will not have a significant impact on the biodiversity in the context of phytobenthos.

8.2.3.6.4.2 Macrozoobenthos

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the macrozoobenthic communities in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on the macrozoobenthic communities may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.4.3 Ichthyofauna

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the ichthyofauna in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on ichthyofauna may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.4.4 Marine mammals

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the marine mammals in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on the marine mammals may occur, the same, at most, as those identified for the construction phase.

8.2.3.6.4.5 Seabirds

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the seabirds in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on seabirds may occur, the same, at most, as those identified for the construction phase.

8.2.3.7 Impact on cultural values, monuments and archaeological sites and features

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the cultural values, monuments and archaeological sites and features in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on cultural values, monuments and archaeological sites and features may occur, the same, at most, as those identified for the construction phase.

8.2.3.8 Impact on the use and management of the sea area and tangible property

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on the use and management of the sea area and tangible property in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on the use and management of the sea area and tangible property may occur, the same, at most, as those identified for the construction phase. After the cable removal operations are completed, the EXC BC-Wind OWF area in the RAV will be restored to its pre-construction condition.

8.2.3.9 Impact on landscape, including cultural landscape

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on landscape, including cultural landscape, in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on landscape, including cultural landscape, may occur, the same, at most, as those identified for the construction phase.

8.2.3.10 Impact on population, health and living conditions of people

In the case of the option assuming deactivation of the EXC BC-Wind OWF in the RAV and leaving the cables in the seabed, there will be no impacts on population, health and living conditions of people in the area of the project.

If the cables and elements protecting them are removed from the seabed, impacts on population, health and living conditions of people may occur, the same, at most, as those identified for the construction phase.

8.2.4 Summary of the RAV of the EXC BC-Wind OWF

The impact analysis has shown that the EXC BC-Wind OWF implementation in the RAV would entail the occurrence of impacts, the scale and significance of which would be of an equivalent scale and significance to those identified for the APV.

Also, no other elements of the marine environment than those identified for the APV are anticipated to be affected by the impacts caused by the RAV.

Nevertheless, the implementation of the EXC BC-Wind OWF in the RAV would entail using more materials, raw materials and energy in order to produce longer cables. The construction, operation and potential decommissioning of the RAV cable lines, which are approximately 8.5 km longer than in the case of the APV, would directly induce:

- longer periods required for construction and potential decommissioning and the resulting longer operation time of the vessels involved in these project phases, which would cause more disturbance in the environment due to the fact that all analogous impacts would last longer than in the case of the APV;
- the seabed area subject to the interference resulting from the power cable burial being approximately 25% larger than in the case of the APV, and therefore:
 - larger amounts of suspended solids and pollutants [Table 8.121] released from seabed sediments to the water column and the greater extent of their deposition;
 - greater, temporary loss of benthic organisms, providing a food source both for benthivorous fish and seabirds – benthivorous birds;
- a higher risk of damage to cable lines and the resulting potential greater number of operations, including the involvement of vessels in the event of a failure;
- a larger area with possible restrictions resulting from the designation of a safety zone around the cable lines in operation, i.a. in the context of using the sea area for fishing activities (Section 5.11.2).

Therefore, the APV represents a more favourable option for the Project in terms of environmental impact compared to the RAV.

9 CUMULATIVE IMPACTS OF THE PROPOSED PROJECT (TAKING INTO ACCOUNT THE EXISTING, BEING IMPLEMENTED AND PLANNED PROJECTS AND ACTIVITIES)

9.1 Existing, implemented, and planned projects functionally unrelated to the proposed project for which decisions on environmental conditions have been issued

While preparing this EIA Report, publicly available information on the projects, for which the proceedings regarding the issued DEC (decision on environmental conditions) are being conducted, or for which the DEC has been issued within the last 3 years, the impacts of which may lead to an accumulation of negative impacts when combined with the planned project was taken into account [Table 9.1].

Table 9.1. List of projects which may cause cumulative impacts when combined with the planned underground cable line [source: internal materials]

Authority issuing the DEC	Project name, stage of the DEC procedure	Short description	Assessment of the impact accumulation probability
Choczewo commune	Decision of 24 April 2019 (ref. no.: IKS.6220.01.2019.ZW) finding that there is no need to conduct an environmental impact assessment for the project entitled „Modernizacja stacji paliw płynących – Choczewo” [literally: “Modernisation of the petrol station in Choczewo”] and, at the same time, determining the environmental conditions for the said project	The project concerns the extension and reconstruction of the existing petrol station involving: the underground multi-chamber tank; new pumps; new tank emptying station. The planned modernisation of the station does not include LPG storage and distribution. The station is located in the north-eastern part of the village of Choczewo on the plots	The planned project is being implemented within the area of the village of Choczewo, at a distance of approximately 3.5 km from the planned connection. No accumulation of negative impacts is expected.

Authority issuing the DEC	Project name, stage of the DEC procedure	Short description	Assessment of the impact accumulation probability
		no. 100/13, 100/4, 100/5 within the precinct 006 Choczewo.	
RDEP in Gdańsk	Resolution of 19 July 2020 (ref. no.: RDOŚ-Gd-WOC.43.26.2020.MJ.8) approving the project implementation in terms of its impact on the Natura 2000 site <i>Białogóra</i> (PLH220003) for the project „Budowa stacji bazowej BT 44803 Białogóra wraz z systemem antenowym, wolnostojącym szafami telekomunikacyjnymi, drogami kablowymi oraz linią zasilającą, na terenie działki nr 86 w Białogórze” [literally: “Construction of the base station BT 44803 Białogóra including an antenna system, free-standing telecommunication cabinets, cable ducts and a power feeding line, on the plot no. 86 in Białogóra”]	The project involves the construction of the base station BT 44803 Białogóra to improve the quality and extend the range of services as well as to ensure the correct transmission within the network. The base station will be located in a rural area; there are no built up areas in the immediate vicinity. The base station will consist of the following elements: controllers, transceivers and power supply devices; sector antennas mounted on a tower (5 pcs); radio link antennas (5 pcs); antenna line elements.	The base station BT 44803 Białogóra including an antenna system, free-standing telecommunication cabinets, cable ducts and a power feeding line will be located on the plot no. 86 in Białogóra – i.e. at a distance of 5.5 km from the planned connection. No accumulation of negative impacts is expected.

Pursuant to Decision No. 184/2020 (RDOŚ-Gd-WOO.4210.74.2011.PW.MS.KSZ) of 8 April 2020, a decision refusing to determine environmental conditions for the project consisting in the construction of a wind farm complex near the villages of Osieki Lęborskie – Lublewo – Choczewo – Choczewko – Przebendowo – Słajkowo in the Choczewo commune together with necessary auxiliary infrastructure has been issued.

Due to considerable distances between the projects as well as their impacts being limited to the area of the project, the planned project is not expected to cause either cumulative impacts or accumulation of the impacts in combination with the above-mentioned projects.

On 25 May 2016, the General Directorate for Environmental Protection in Warsaw issued a notice (ref. no. DOOŚ-OA.4205.1.2015.24) informing the parties to the proceedings for issuing a DEC for the project involving the construction and operation of Poland’s first nuclear power plant with a capacity of up to 3750 MWe in the area of the communes of Choczewo or Gniewino and Krokowa, about the issuance by the General Director for Environmental Protection of the resolution of 25.05.2016 (DOOŚ-OA.4205.1.2015.23) specifying the scope of the Environmental Impact Assessment Report.

On 6 June 2022 in Warsaw, the General Director for Environmental Protection issued a notice of commencement of proceedings on the decision on environmental conditions for the above-mentioned project (ref. no. DOOŚ-OA.4205.1.2015.32), and from 20 July 2023 to 18 August 2023 public consultations are being held on the issue in question.

The project can be implemented in the areas of the Choczewo or Gniewino and Krokowa communes in the Pomorskie Voivodeship, in one of the three specific location alternatives: Lubiato-Kopalino, Choczewo and Żarnowiec [Table 9.1], which were selected at the stage of the environmental impact assessment and confirmed at the stage of the decision on site selection for the nuclear installation location.

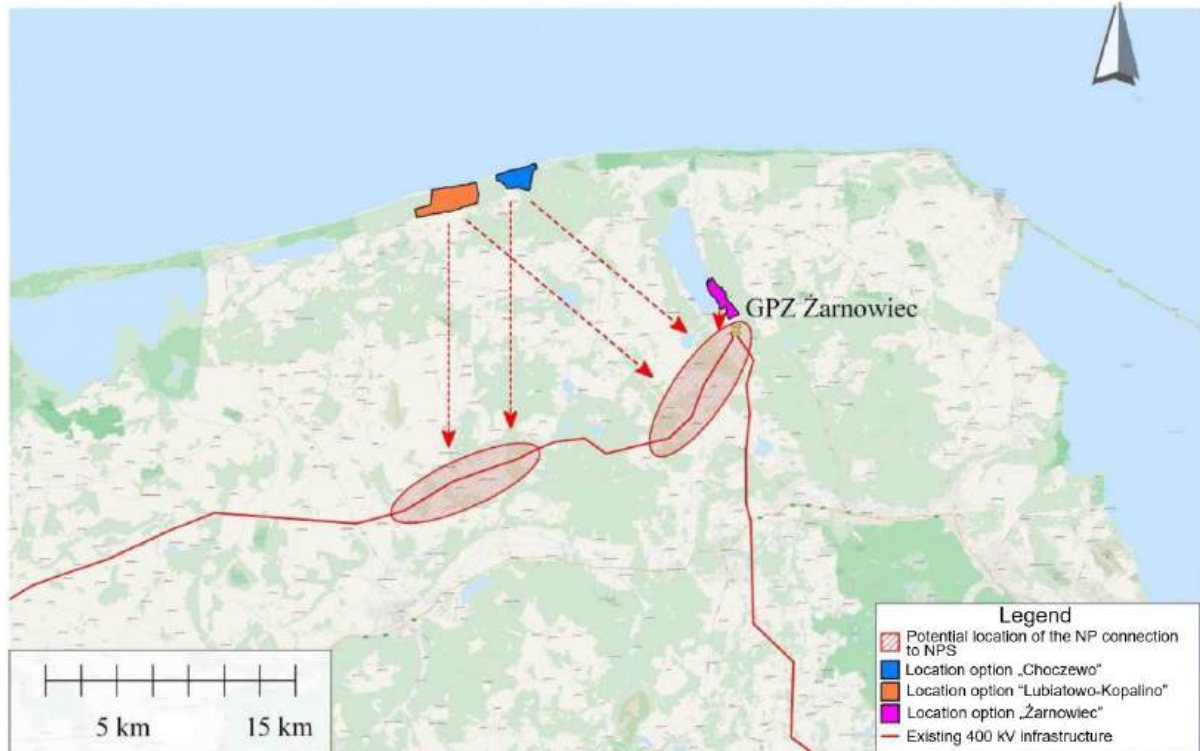


Figure 9.1. Alternative locations considered for Poland's first nuclear power plant with possible points connecting it to the National Power System [source: Poland's First Nuclear Power Plant. Project Specification Sheet. PGE EJ 1 Sp. z o.o., 2015]

The following decisions were issued by the Director of the Maritime Office in Gdynia for the project in question [402]:

- Decision No. 7/19 of 8 August 2019 on the laying and maintenance of cables and pipelines for the purpose of the cooling system of the nuclear power plant in the area of the territorial sea for the Lubiatowo-Kopalino Site;
- Decision No. 6/19 of 8 August 2019 on the laying and maintenance of cables and pipelines for the purpose of the cooling system of the nuclear power plant in the area of the territorial sea for the Żarnowiec Site;

According to the SIPAM data [402], concerning the Choczewo location variant, no decision on the laying and maintenance of cables and pipelines for the purpose of the cooling system of the nuclear power plant has been issued. In the region of the Choczewo location variant, decisions on the laying and maintenance of cables transmitting electricity from the OWF within the internal sea waters and territorial sea are applicable.

The Lubiatowo-Kopalino variant is located at a distance of approx. 5 km to the west, whereas the Żarnowiec variant is located at a distance of approx. 15 km to the east of the planned project. However, it is difficult to predict whether and when, and in which variant, the nuclear power plant will be built, as well as how long the construction phase will last. If the Lubiatowo-Kopalino variant is selected, with the nuclear power plant being built at the same time as the EXC BC-Wind OWF, the accumulation of impacts may occur in relation to:

- **climate and air quality** – the accumulation of impacts related to the air pollutant emissions may result from the increased volume of traffic of the vehicles involved in the construction works and material transportation. It is assumed that owing to the distance between the locations of both projects (approx. 5 km from each other) and good air

circulation, the accumulation of impacts on the air and climate will not persist and will not cause the air quality nor local climate to deteriorate. These will be medium-term impacts of a regional scale;

- **population and its living conditions** – it may happen that the vehicles involved in both projects will use the same access roads as the inhabitants of the adjacent areas. However, it should be noted that the EXC BC-Wind OWF construction in the onshore part has been progressing fairly quickly and has been carried out section by section – the accumulation of impacts will be medium-term and local.

The cumulative impacts of the nuclear power plant built according to the Lubiatowo-Kopalino variant in combination with the EXC BC-Wind OWF will be limited to the construction phase, since the operation phase of the EXC BC-Wind OWF proceeds practically automatically, being limited to maintenance work, which will take place once a year. These will be medium-term, regional and local impacts.

To conclude: if the proposed project is implemented simultaneously with other projects, the impacts associated with the construction phase might be related to physical transformations of the land surface, including its cover, land occupancy, increased vehicle traffic, emission of noise and vibration. During the operation phase, significant impacts on air, noise, electromagnetic fields, forests, protected areas, land use and development, landscape, population and its health and living conditions, may occur.

9.2 Infrastructure-related planned projects

9.2.1 Formal conditions

Due to the planned OWFs construction, a need has emerged for the extension of power networks to transmit the power generated by those farms. Currently, the construction of OWFs is planned by the subsidiaries of PGE Polska Grupa Energetyczna S.A. (Elektrownia Wiatrowa Baltica 2 Sp. z o.o., Elektrownia Wiatrowa Baltica 3 Sp. z o.o., Elektrownia Wiatrowa Baltica 1 Sp. z o.o.), Orlen S.A. (Baltic Power Sp. z o.o.) and C-Wind Polska Sp. z o.o. Table 9.2 presents a list of decisions issued by the Director of the Maritime Office in Gdynia concerning the laying and maintenance, within the internal sea waters and territorial sea, of cables evacuating power from the OWFs.

Table 9.2. List of binding decisions issued by the Director of the Maritime Office in Gdynia [source: data of the Maritime Office in Gdynia [402]]

Decision no.	Applicant	Subject of decision
Decision No. I/DS/20 of 06.11.2020	Elektrownia Wiatrowa Baltica 2 Sp. z o.o.	Laying and maintenance, within the internal sea waters and territorial sea, of cables transmitting electricity from the project entitled "Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1500 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym" [literally: "Offshore Wind Farms Complex with a Maximum Total Capacity of 1500 MW together with Technical, Research and Measurement, and Service Facilities Related to the Preparation, Construction and Operation Stages"]

Decision no.	Applicant	Subject of decision
Decision No. 2/DS/20 of 06.11.2020	Elektrownia Wiatrowa Baltica 3 Sp. z o.o.	Laying and maintenance, within the internal sea waters and territorial sea, of cables transmitting electricity from the project entitled "Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1050 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym" [literally: "Offshore Wind Farms Complex with a Maximum Total Capacity of 1500 MW together with Technical, Research and Measurement, and Service Facilities Related to the Preparation, Construction and Operation Stages"]
Decision No. 5/20 of 28.09.2020	Baltic Power Sp. z o.o.	Laying and maintenance of cables and pipelines within the internal sea waters and territorial sea for the project „Budowa przyłącza elektroenergetycznego Morskiej Farmy Wiatrowej Baltic Power do Krajowej Sieci Przesyłowej” [literally: "Construction of the Baltic Power Offshore Wind Farm Power Connection to the National Power System"]
Decision No. 9/DS/20 of 25.01.2021	Elektrownia Wiatrowa Baltica – 1 Sp. z o.o.	Laying and maintenance of subsea cables within the internal sea waters and territorial sea for the project entitled "Zespół Morskich Farm Wiatrowych Baltica – 1" [literally: "Offshore Wind Farms Complex – Baltica 1"]

The Baltic Power Sp. z o.o. company with the letter of 20 December 2019, corrected on 31 March 2021, applied for a permit for laying and maintaining cables for the project "Budowa przyłącza elektroenergetycznego Morskiej Farmy Wiatrowej Baltic Power do Krajowej Sieci Przesyłowej" [literally: "Construction of the Baltic Power Offshore Wind Farm Power Connection to the National Power System"]. This area includes the area of internal sea waters and territorial sea [decision approving the location of the cables in the exclusive economic zone was issued by the Minister of Maritime Economy and Inland Navigation in the letter of 7 July 2020 (ref. no. DGM.WZRMPP.3.430.24.2020.NZ.1) – Decision 1/K/20]. The Director of the Maritime Office in Gdynia requested the opinion of competent ministers with the letter (ref. no.: INZ1.1.8104.10.1.2019.MGw) and has received positive opinions. The Director of the Maritime Office issued a positive decision concerning the location of the above-mentioned project (Decision No. 5/20) in the letter of 28 September 2020 (ref. no. INZ1.1.8104.10.13.2019.MGw). The permit was issued for a period of 35 years. The planned project will involve the laying of high voltage (HV) or extra high voltage (EHV) AC or DC power cables including the necessary telecommunication and associated infrastructure. In the area of the territorial sea, it is planned to use the method of cable burying in the seabed or laying on the seabed with additional protection, whereas, in the coastal zone, the directional drilling method.

With the letter of 27 June 2019 (supplemented on 22 August 2019 and 14 October 2019, and corrected on 19 September 2019 and 20 April 2020) the Elektrownia Wiatrowa Baltica 2 Sp. z o.o. company applied for a permit for laying and maintenance, within the internal sea waters and territorial sea, of cables transmitting electricity from the project entitled "Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1500 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym" [literally: "Offshore Wind Farms Complex with a Maximum Total Capacity of 1500 MW together with Technical, Research and Measurement, and Service Facilities Related to the Preparation, Construction and Operation Stages"]. In response to this application, a decision of the Minister of Transport, Construction and Maritime Economy No. MFW/4//12 (ref. no. GT7/62/1157765/decyzja/2012) of 16 April 2012 was issued on the permit for the construction and use of artificial islands, structures and equipment in the Polish Sea Areas. The Director of the Maritime Office issued, therefore, a positive decision concerning the location of the above-

mentioned project (Decision No. 1/DS/20) in the letter of 6 November 2020 (ref. no. INZ5DS.8104.1.11.2020.AGB). The permit was issued for a period of 35 years. The proposed project will involve the laying and maintenance of high voltage (HV) or extra high voltage (EHV) AC or DC power cables including the necessary telecommunication and associated infrastructure, using the method of cable burying in the seabed or laying on the seabed with additional protection, whereas, in the coastal zone, the directional drilling method is planned. During the cable operation phase, inspections of the particularly vulnerable areas (e.g. crossings with the existing infrastructure) shall be carried out once a year, while a full inspection of the entire length of the cable lines shall be carried out only once every 5 years.

On 27 June 2019, Elektrownia Wiatrowa Baltica 3 Sp. z o.o. company applied for the permit for the laying and maintenance, within the internal sea waters and territorial sea, of cables transmitting electricity from the project entitled „Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1050 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: “Offshore Wind Farms Complex with a Maximum Total Capacity of 1050 MW together with Technical, Research and Measurement, and Service Facilities Related to the Preparation, Construction and Operation Stages”]. The application was supplemented on 22 August 2019 and 14 October 2019, and corrected on 19 September 2019 and 20 April 2020. In response to the application, a decision of the Minister of Transport, Construction and Maritime Economy No. MFW/5/12 (ref. no. GT7/62/1157768/decyzja/2012) of 16 April 2012 was issued on the permit for the construction and use of artificial islands, structures and equipment in the Polish Sea Areas. The Director of the Maritime Office issued a positive decision concerning the location of the above-mentioned project (Decision No. 2/DS/20) in the letter of 6 November 2020 (ref. no. INZ5DS.8104.2.11.2020.AGB).

Before issuing the above-mentioned decisions, the Director of the Maritime Office in Gdynia issued the decision (Decision No. 5/18 of the DMO in Gdynia of 23 November 2018) repealing the previously binding decision of 31 July 2014 concerning the laying and maintenance of subsea cables comprising maritime transmission infrastructure for electric energy – eastern part (MTI-E) in the area of the territorial sea of the Republic of Poland. The Applicant, Inwestycje Infrastrukturalne Sp. z o.o., in the letter of 29 June 2018 requested the previous decision to be repealed. The Applicant’s aim was to safeguard the space for future OWF investors, however, due to the fact that individual investors have commenced their work and the route of the proposed power cables has been specified, the area covered by the previous decision will not be designated for further development within the given scope.

9.2.2 Connection infrastructure for OWFs

In the offshore part, the EXC BC-Wind OWF Development Area is located in the exclusive economic zone, in the territorial sea and internal sea waters. West of the EXC BC-Wind OWF Development Area, a connection infrastructure is planned for the Baltica 2 and 3 OWFs, as well as for the Baltic Power OWF [Figure 9.2], in accordance with the decisions issued:

- Decision of the Director of the Maritime Office in Gdynia No. 5/20 of 28 September 2020, approving the laying and maintenance of cables and pipelines in the area of internal sea waters and the territorial sea for the project entitled „Budowa przyłącza elektroenergetycznego Morskiej Farmy Wiatrowej Baltic Power do Krajowej Sieci Przesyłowej” [literally: “Construction of the Baltic Power Offshore Wind Farm power connection to the National Transmission Grid”];

- Decision of the Director of the Maritime Office in Gdynia No. 9/20, dated 25.01.2021, approving the laying and maintenance of subsea cables in the area of internal sea waters and the territorial sea for the project entitled "Zespół Morskich Farm Wiatrowych Baltica – 1" [literally: "Offshore Wind Farms Complex – Baltica 1"];
- Decision of the Director of the Maritime Office in Gdynia No. 1/DS/20 of 06.11.2020, approving the laying and maintenance of subsea cables in the area of internal sea waters and the territorial sea for the project entitled „Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1500 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: "Offshore Wind Farms Complex with a Maximum Total Capacity of 1500 MW together with Technical, Research and Measurement, and Service Facilities Related to the Preparation, Construction and Operation Stages"];
- Decision of the Director of the Maritime Office in Gdynia No. 2/DS/20 of 06.11.2020 – permit for the laying and maintenance, within the internal sea waters and territorial sea, of cables transmitting electricity from the project entitled „Zespół Morskich Farm Wiatrowych o maksymalnej łącznej mocy 1050 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: "Offshore Wind Farms Complex with a Maximum Total Capacity of 1050 MW together with Technical, Research and Measurement and Service Facilities Related to the Preparation, Construction and Operation Stages"];

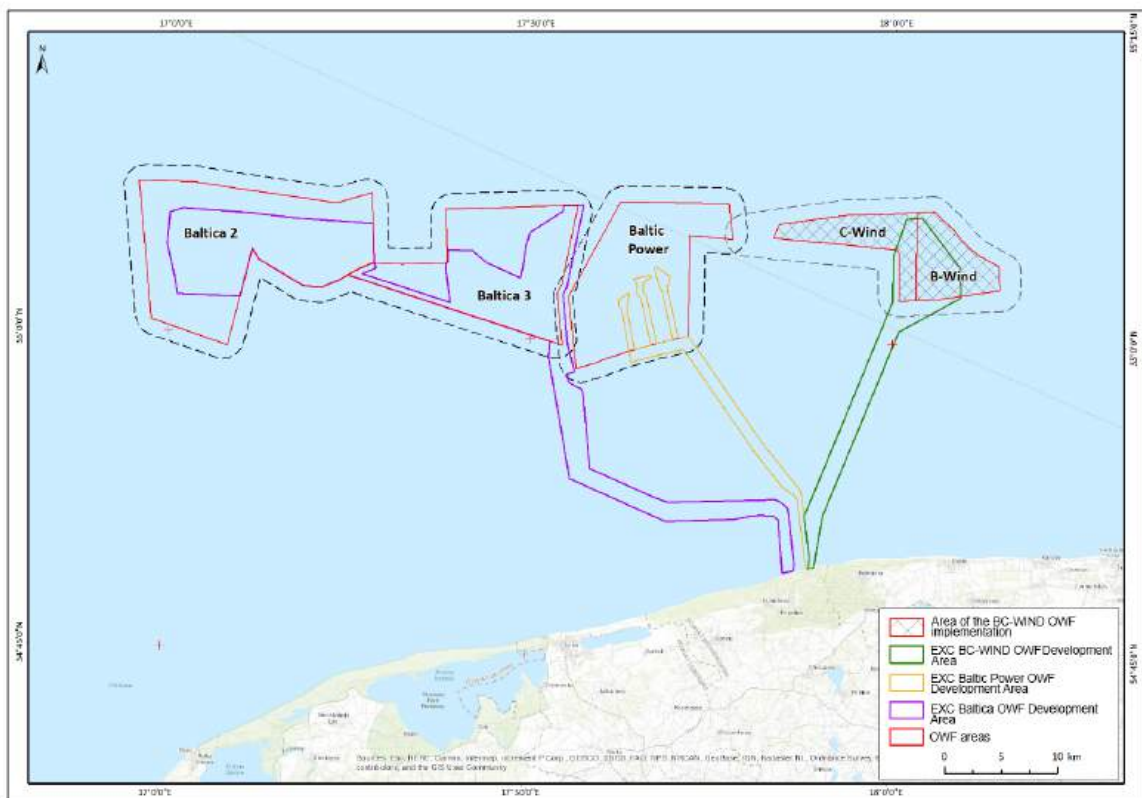


Figure 9.2. Development areas for the Connection Infrastructure of the Baltic Power OWF, Baltica OWF and BC-Wind OWF [source: internal materials]

In the case of the Baltica 2 and 3 OWF CI, the assumed length of a single cable line will be up to 89 km, while in the case of the EXC BC-Wind OWF, it will be up to 33 km. In the exclusive economic zone, the routes of all three development areas will be located within the offshore wind farms. In

the territorial sea, their routes will converge. Approximately 7 km from the shoreline up to the drilling locations, these areas will run parallel to each other.

In the onshore part, as agreed with the Choczewo Forest Inspectorate, the transmission infrastructures leading from the OWF were designed to be routed in a cable bed area [Figure 9.3], minimising the negative environmental impacts maximally by:

- minimising the tree felling area thanks to routing the connection infrastructure of the OWF investors through a common cable bed area;
- bypassing the environmentally valuable areas indicated by the Choczewo Forest Inspectorate at the stage of making agreements;
- using the cable technology and horizontal directional drilling as the least environmentally damaging.

The connections of individual investors are at different project phases. Construction works for cable lines will be performed at different times. The construction of the Baltica 2 and 3 OWF CI may be an exception. According to the information received from the Applicant, which results from the cooperation with the other investors, the construction of the Baltica 2 and 3 OWF CI may coincide with the construction of the BP OWF CI.

The southern part of the EXC BC-Wind OWF Development Area is adjacent in the east to the BP OWF CI.

The Baltica 2 and 3 OWF CI Development Area is located in the northern part at a distance of approx. 1.8 km to the west of the BP OWF CI. From km 35+300 of the BP OWF CI, the projects utilise a common corridor. In this case, the accumulation of negative impacts related to the construction phase such as the operation of machines and equipment used in construction work and their presence on the road between the villages of Osieki Lęborskie and Lubiato, may arise. The trench for the BP OWF CI will be made in sections with a length of 1 km, and it will stay open for no more than 1 week, which will reduce the likelihood of construction crews appearing simultaneously at the same sections. Due to the location of the planned projects in the forest area and away from inhabited areas, these impacts will not cause nuisance for local residents. The construction phase of the Baltica 2 and 3 OWF CI and the BP OWF CI will involve a temporary and local restriction on the tourism function of the regional forests.

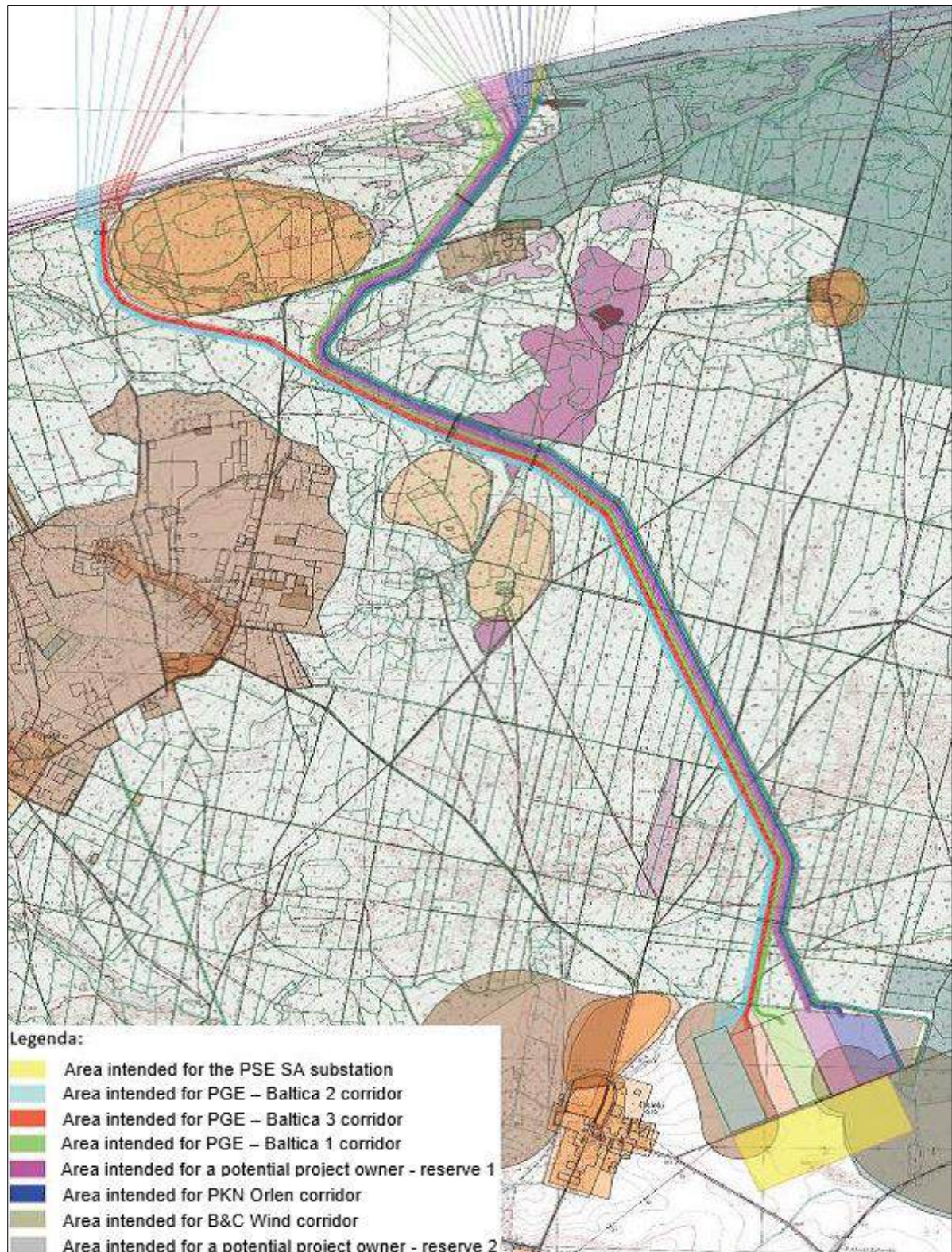


Figure 9.3. Course of the connection infrastructures of the offshore wind farms in the Choczewo commune [source: [304]]

Due to the lack of data, at the current investment stage, it is impossible to carry out an assessment of the cumulative impacts in the context of electromagnetic fields and thermal impacts in the common cable bed area, including an analysis of the cumulative impact on the Natura 2000 sites

Białogóra (PLH220003) and *Przybrzeżne wody Bałtyku* (PLB990002). However, it is important to emphasise that the planned connections and ONS will be located outside the Natura 2000 *Białogóra* (PLH220003) site.

9.2.3 Choczewo substation

The proposed project, at its final section in the form of a 400 kV underground cable line, enters the Choczewo substation, which will be used for electric power transmission and distribution. This substation is located west of the EXC BC-Wind OWF ONS, on an area of approximately 0.3 km², in part of the plot no. 25/3 (Kierzkowo precinct, Choczewo commune, Wejherowo district, Pomorskie voivodeship), on agricultural lands and tree- and shrub-covered arable lands.

The developer of the proposed project is the state-owned enterprise Polskie Sieci Elektroenergetyczne S.A. The project will be implemented on the basis of decisions on environmental conditions for the project entitled “Budowa stacji elektroenergetycznej 400 kV Choczewo” [literally: “Construction of a Choczewo 400 kV substation”] of 19.02.2022 and the Decision of the Pomorskie Voivodeship Governor on the location of a strategic project in the scope of transmission network entitled “Budowa stacji elektroenergetycznej 400 kV Choczewo” [literally: “Construction of a Choczewo 400 kV substation”], constituting a part of investment tasks entitled “Budowa linii 400 kV Choczewo – nacięcie linii Gdańsk Błonia – Grudziądz Węgrowo” [literally: “Construction of the Choczewo 400 kV line– cutting into line Gdańsk Błonia – Grudziądz Węgrowo”] and “Budowa linii 400 kV Gdańsk Przyjaźń – Choczewo” [literally: “Construction of the Gdańsk Przyjaźń – Choczewo 400 kV line”] on plots with registration numbers 25/5, 25/6 and 24, within 0016 Kierzkowo precinct in the Choczewo commune of 13.04.2022.

The Choczewo Substation shall be equipped with a 400 kV switchyard constructed using AIS technology and the 3S+2SO arrangement. The busbar systems (tubular version) shall be divided into sections (section A and B). The sections A and B shall be connected to each other by a longitudinal busbar coupler. Each section shall be equipped with a transverse busbar coupler, system earthing switches, bypass busbar couplers and voltage measurement bays. Two bypass busbars (tubular version) shall be installed. The linear bays for overhead terminals shall be equipped with anchor portals while cable line bays will have an enclosed cable termination station. Lightning protection shall be provided through the use of interception air rods, lightning masts and lightning rods installed on anchor portals. The station auxiliary system shall be based on power supply from transformers (0.4 kV), auxiliary transformers fed from an external MV network and an emergency power generator.

Within the PSE substation area, the following components are expected to be located:

- 400 kV overhead switchyard constructed using the 3S+2SO arrangement;
- auxiliary building;
- guardhouse;
- power generator (on paved ground);
- internal road system, including parking sites and yards;
- cable ducts and conduits system;
- water supply system (supply from a water main and/or deep well);
- drainage system for buildings, roads, cable ducts etc.;
- rainwater drainage system with a retention basin and soakway pond;
- fire water tanks with water connection points for firefighters;
- cesspool (sanitary sewerage system);
- exterior lighting;

- external fencing (made of concrete or panels) and regulatory fencing (interior – made of panels).

Furthermore, as part of the Choczewo Substation, auxiliary infrastructure such as utility connections and road exits shall be built.

In the immediate vicinity of the PSE substation, the substations owned by the entities to be connected (OWF intermediary substations) will be located. These substations are still in the development phase, therefore, due to the lack of data on the planned infrastructure, it is impossible to assess the cumulative impacts for the planned project.

9.3 Identification of potential cumulative impacts

In the vicinity of the offshore part of the EXC BC-Wind OWF area, there are areas in which similar activities related to the laying of subsea power cables of other investors are planned. Therefore, the accumulation of underwater noise resulting from the construction works being conducted simultaneously within the areas of more than one of these projects may result in cumulative impacts, particularly in the zone up to approx. 7 km from the shoreline, where these areas are the closest to each other.

For the same reason, i.e. the proximity of construction areas of other investors and the possibility of simultaneous cable laying and burying in the seabed, the phenomenon of impact accumulation may also occur in connection with an increase in the concentration of suspended solids in the water depth and their sedimentation.

As regards the onshore part of the EXC BC-Wind OWF, possible impact accumulations are related to noise generation as a result of machine and equipment operation in the construction phase and the noise generated as a result of electrical power equipment operation within the ONS and the PSE substation during their operation phase.

9.4 Assessment of cumulative impacts

9.4.1 Assessment of cumulative impacts for the offshore part of the EXC BC-Wind OWF area

9.4.1.1 Underwater noise

The noise impact range is relatively small for individual vessels; however, in the case of two or more noise sources, which result from simultaneous implementation of similar projects, an increase in the noise level may be substantial, especially in the area between them.

Although the noise generated by the vessels to be used for the purpose of construction and operation of the planned projects increases the environmental noise, it has a small range, which is only significant within a few hundred metres from the sound source. However, the scale and scope of this impact increase with the number of vessels involved in the construction of all the planned cable connections, hence, the noise increases in a larger area and the impact duration is longer. The accumulation of underwater noise may result in this phenomenon extending to a larger sea area than in the case of the activities carried out by one developer.

Taking into account the specificity of the project construction phase, including, in particular, its linear nature, the underwater noise levels increasing with the progress of work will pertain to subsequent sea areas around the vessels in operation, at the same time releasing the areas in which the cable has already been buried or laid on the seabed. For reasons of the safety of underwater operations, the vessels used for cable laying and burying will have to operate at

considerable distances from each other, which will additionally mitigate the possible accumulation of underwater noise.

Considering the above, including a significant possibility of marine mammals and fish avoiding sea areas characterised by a temporarily increased level of underwater noise, it can be assumed that this cumulative impact will be short-term (in the context of the entire southern part of the offshore connection infrastructure development areas), local, and its significance will be moderate at most.

9.4.2 Assessment of cumulative impacts for the onshore part of the EXC BC-Wind OWF area

9.4.2.1 Noise at the implementation stage

In terms of the impact of the noise generated by machines and equipment when drilling, laying cables and building the substation during the construction phase, cumulative impacts may arise due to the work carried out by various developers. However, considering different development stages of the projects implemented by individual developers, possible deliveries of power cables and substation equipment, especially transformers, as well as the rapid pace of construction works, the situation when these projects are implemented simultaneously is unlikely to occur. Therefore, the actual noise accumulation at the construction stage will be a short-term, reversible and local phenomenon, and the significance of this impact will be moderate at most.

9.4.2.2 Noise at the operation stage

The primary objective of the analysis of the cumulative impact of noise emission conducted was to provide the most exact prediction of future acoustic conditions in the area described, taking into account the distribution of the substations registered as planned, as well as the distribution of the facilities which at the time of preparing this Report can be considered as potentially planned, with the parametrisation of their components established on the basis of common knowledge and publicly available technical materials.

In view of the above, the analysis of the cumulative impact of noise emission was conducted on the basis of the data disclosed by the developers implementing adjacent projects planned in the area in question, namely:

- Polskie Sieci Elektroenergetyczne S.A.;
- PGE Baltica sp. z o.o.;
- Baltic Power Sp. z o.o.

Moreover, the locations of the potentially feasible projects indicated in the route of the shared cable bed, the sites of which were envisaged between the Baltica-3 onshore transformer station and the Baltic Power station, were evaluated. The assumed locations of these facilities corresponds to the location of the potential facilities built for the purpose of servicing offshore wind farms indicated in the Project Specification Sheet for the Construction of the Choczewo 400 kV Substation (Figure 13, p. 66, PSE 05.08.2012). At the same time, the assumed location of the planned facilities is at present the most realistic and reasonable variant of their implementation, taking into account the location in the shared cable bed area, possible avoidance of conflicts with other planned projects and the proximity of the Choczewo 400 kV substation. In the opinion of the author of the acoustic analysis attached as Appendix 3 to this Report, the planned location of the above-mentioned facilities, according to the precautionary principle, matches the worst possible reasonable implementation variant in terms of acoustic impact, which should be seen in the light of the feasibility to meet the applicable environmental standards. Bearing in mind that,

at present, it is impossible to obtain the detailed data necessary for the preparation of an acoustic model, guided by the precautionary principle, the number of emission sources and the noise power levels corresponding to their size and technical parameters were determined.

The computation results for the projected noise level emitted to the environment at monitoring points and at the facade are presented for daytime and night-time in Table 9.3.

Table 9.3. Maximum allowable cumulative noise levels in the environment during the construction and operation phases based on the Regulation of the Minister of the Environment [source: internal materials]

Receptor	Type of area	Computed level		Maximum allowable level		Exceedance
		Day L _{Aeq} (dB)	Night L _{Aeq} (dB)	Day L _{Aeq} (dB)	Night L _{Aeq} (dB)	
R1	The area with land development permission for a single-family house	40.1	39.4	50.0	40.0	No
R2	Undeveloped land. Potentially intended for residential development in the future	41.1	39.9	50.0*	40.0*	No
R3	Undeveloped land. Potentially intended for residential development in the future	41.0	39.9	50.0*	40.0*	No
R4	Undeveloped land. Potentially intended for residential development in the future	41.9	38.6	50.0*	40.0*	No
R5	The facade of the residential building on plot no. 17/115, Kierzkowo precinct	39.2	35.0	50.0	40.0	No
R6	Boundaries of plot 17/115, Kierzkowo precinct	39.2	36.1	50.0	40.0	No
R7	Undeveloped land. Potentially intended for residential development in the future	41.7	39.9	50.0*	40.0*	No

* The land not currently protected legally against noise

The computations performed for the noise levels show that the night-time (40 dB) and daytime (50 dB) cumulative noise limits set out for single-family development will not be exceeded at any monitoring point at the boundary of the potential residential developments.

The noise sources within the areas of individual substations and the detailed computation results, also in graphical form – as the ranges of cumulative noise impact of levels at 40 and 50 dB are presented in Appendix 3 to this Report.

9.4.2.3 Emissions to air

In terms of the impact of the exhaust emissions produced by the engines of the machines used for laying cables and the secondary emissions (the same applies to the decommissioning stage involving the removal of the lines from the ground), the cumulative impact is not very likely considering the rapid pace of construction works. For a conjunction (emission sources, receptor point), the total impact of the machines and secondary emission will not be significant for the air quality in the residential areas due to a very low impact potential during the works, resulting in particular from a small emission range, considerable distance from the residential areas (from the point of view of air quality assessment) and a very advantageous cable bed layout in relation to

Lubiatowo against the background of the wind directions prevailing in this area. The project variant selected does not affect the aforementioned assessment.

For these reasons, the impact of the emissions from the ONS construction site on the air quality in the Osieki Lęborskie area is also unlikely. Due to the low frequency of easterly (E) and north-easterly winds blowing eastward (ENE), in the range of 7–8%, and the remoteness of the construction sites of the more distant substations as well as the dispersal of the construction works these combined sources will not affect the air quality in Osieki Lęborskie. The project implementation variant selected does not affect the aforementioned assessment.

At the operation stage, none of the potential sources of emissions to air (irrespective of the implementation variant) will cause a cumulative impact due to the following conditions:

- emissions from the power generators: the generators will be tested independently. Simultaneous testing is unlikely;
- emissions from vehicle traffic on the access road to the ONS: these will be characterised by an insignificant, negligibly low range;
- emissions from vehicle traffic on service roads: as described above.

9.4.2.4 Electromagnetic field emission

The values of the individual components of the EMF generated by other substations identified in places where the distribution of the EMF generated by the EXC BC-WIND OWF busbar systems was modelled, are negligibly small due to a considerable distance between them. Therefore, they were not included in the model-based computations and their cumulative impact should not be expected.

The computations aimed at establishing the magnetic field distribution in the vicinity of the proposed shared cable bed area for all developers were carried out. The computations of the distribution of the magnetic field (H) generated by the cable lines supplying power to the 6 proposed customer substations, which form a shared cable bed consisting of 23 (APV) or 25 (RAV) cable lines, showed that in none of the cases analysed, the cumulative value of the magnetic field strength does exceed the limit value ($60 \text{ A}\cdot\text{m}^{-1}$) for places accessible to people specified in the applicable regulations. Regardless of the variants considered, the expected maximum values of the cumulative magnetic field strength at the heights specified (0.2, 1.0 and 2.0 MAGL) differ slightly. The highest value of the cumulative magnetic field strength is recorded at a height of 0.2 MAGL, which is explained by the smallest distance between the cable lines and the design point.

Considering that in each of the variants analysed, the cumulative value of the magnetic field strength is more than two times smaller than the limit value ($60 \text{ A}\cdot\text{m}^{-1}$), then from the point of view of the possible electromagnetic field effects on the environment, any of the solutions analysed can be selected.

9.4.2.5 Landscape transformations

The onshore transformer stations of individual developers and the Choczewo substation will be located on lands currently used for agricultural purposes. It is an open area with a high exposure rate; however, it is characterised by low landscape diversity (relief, elements filling the space), which is rather monotonous, with no distinguishing features. In an open agricultural landscape devoid of natural obstacles, the technical infrastructure will be an exposed part of the landscape. A number of substations and busbar systems located in this area will be visible from a long distance. The visual and aesthetic perception of the proposed infrastructure will be adversely affected by its size – all transformer substations and the Choczewo substation will occupy the area

of approx. 75 ha. Moreover, leaving a deforested area of the cable bed will have a substantial negative impact on the landscape. The visual and aesthetic perception of the forest clearance will be reinforced by relatively long straight sections of the approx. 150 m wide cable bed route stretching away to the horizon. The significance of this impact should be assessed as high. It can be partially mitigated by appropriate management of the cable bed, e.g. by introducing moor vegetation and ensuring a partial succession of vegetation within the cable bed area.

9.4.2.6 Changes in the functioning of wildlife corridors

The forest clearance for the purpose of a shared cable bed leading to all of the planned onshore customer substations will reinforce the barrier effect within the supra-regional Coastal Wildlife Corridor for species avoiding open areas. The significance of this impact should be assessed as moderate. It can be partially mitigated by appropriate management of the cable bed, e.g. by ensuring a partial succession of vegetation within the cable bed area, creating clusters of higher plants, leaving some stump wood and logs remaining from the felled trees, building stone piles, etc.

10 TRANSBOUNDARY IMPACT

The shortest distance from the EXC BC-WIND OWF construction area to the boundary of the exclusive economic zone is approximately 67.5 km, and approximately 115.5 km to the land border (in a straight line). No transboundary environmental impacts will occur during any phase of the project, mostly due to the location of the EXC BC-WIND OWF, but also in view of the scale, the implementation method and the anticipated impact.

11 ANALYSIS AND COMPARISON OF THE VARIANTS CONSIDERED AND THE VARIANT MOST BENEFICIAL FOR THE ENVIRONMENT

Taking into consideration the specificity of the planned project, i.e. the evacuation of the power generated by the BC-Wind OWF to the NPS, the location of the EXC BC-Wind OWF in the APV and RAV is determined by the location of the BC-Wind OWF as well as the PSE onshore substation.

The location of the BC-Wind OWF results from the location permits and decisions issued:

- Permit for the construction and use of artificial islands, structures and devices in Polish Sea Areas for the project entitled “Zespół morskich farm wiatrowych o maksymalnej łącznej mocy 200 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: “The Complex of Offshore Wind Farms with the Maximum Total Power of 200 MW together with Technical, Measurement and Research and Service Infrastructure Associated with the Pre-investment, Implementation and Operation Stages”] (decision no. MFW/7/12 of 9 May 2012, ref. no.: GT7ak/62/1165094/decyzja/2012)
- Permit for the construction and use of artificial islands, structures and devices in Polish Sea Areas for the project entitled “Zespół morskich farm wiatrowych o maksymalnej łącznej mocy 200 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: “The Complex of Offshore Wind Farms with the Maximum Total Power of 200 MW together with Technical, Measurement and Research and Service Infrastructure Associated with the Pre-investment, Implementation and Operation Stages”] (decision no. MFW/4/13 of 6 February 2013, ref. no.: GT7/62/1172655/decyzja/2013)
- Decision of the Minister of the Infrastructure of 10 May 2022 (ref. no.: DGM-3.530.23.2022) amending the decision of the Minister of Transport, Construction and Maritime Economy no. MFW/7//12 of 9 May 2012, ref. no. GT7ak/62/1165094/decyzja/2012 regarding the issuance of a permit for the construction and use of artificial islands, structures and devices in the Polish Sea Areas for the project entitled „Zespół morskich farm wiatrowych o maksymalnej łącznej zainstalowanej mocy 200 MW oraz infrastruktura techniczna, pomiarowo-badawcza i serwisowa związana z etapem przygotowawczym, realizacyjnym i eksploatacyjnym” [literally: “The Complex of Offshore Wind Farms with a Maximum Total Capacity of 200 MW together with Technical, Measurement and Research and Service Infrastructure Associated with the Pre-investment, Implementation and Operation Stages”], amended by the decision of the Minister of Transport, Construction and Maritime Economy no. MFW/7a/12 of 31 October 2012, ref. no. Gt7t/62/1165094/decyzja/2012 and by the decision of the Minister of Maritime Economy and Inland Navigation of 22 July 2016 ref. no. DGM.VII.53.71.2016.AK.7.

The location of the PSE onshore substation and the conditions of the connection of the EXC BC-Wind OWF to the NPS were determined by an entity different than the Applicant.

The route of the EXC BC-Wind OWF in the APV offshore area was sanctioned by the location decisions issued by the Minister of Infrastructure and the Director of the Maritime Office in Gdynia, which were listed in Section 1.3.

As part of the RAV, an alternative route for the cable lines in the offshore area has been proposed for the EXC BC-Wind OWF [Figure 8.1]. The type and scope of offshore works to be carried out according to the RAV would be the same as for the APV. The factor differentiating both variants is the route length, i.e. approximately 33 km in the case of the APV and approximately 40.2 km in the case of the RAV.

The method and location of the power cable landfall are identical for both variants.

In the case of the onshore part of the EXC BC-Wind OWF, in both the APV and the RAV, the starting point – the cable chamber location, as well as the end point – the current terminals at the PSE substation, are the same. The RAV was developed as a guarantee that the project connecting the BC-Wind OWF to the NPS will be implemented. Should the construction of the power connection according to the APV be unfeasible, e.g. due to adverse environmental conditions or a serious conflict with other users of the area, which could not be predicted before conducting environmental surveys and spatial analysis, the Applicant would initiate the process of applying for the issuance of a location decision for the RAV and proceeding the project in a different spatial configuration.

As part of the environmental impact assessment, both the APV and the RAV impact were assessed.

Table 11.1 contains a compilation of the results of the environmental impact assessment for both variants in the offshore part of the EXC BC-Wind OWF during the construction, operation and decommissioning phases.

In the case of the construction phase, the changes identified were mostly short-term, reversible and local, and the impact significance was assessed as negligible or low, while, in some cases, no impact was identified.

Failure-free operation of the planned project will not cause significant environmental impacts. The impacts associated with the operation phase will be long-term, however, they will be local.

In the case of the implementation of the decommissioning phase of the EXC BC-Wind OWF, the impact significance will be, at most, at the same level as during the construction phase, and in the case of the decision to keep the cable lines buried in the seabed after the discontinuation of the operation, there will be no environmental impact.

Table 11.1. Comparison of the impact significance of the EXC BC-Wind OWF on environmental components assessed during particular phases in the APV and RAV [source: internal materials]

Environmental component assessed	Construction phase		Operation phase		Decommissioning phase	
	APV	RAV	APV	RAV	APV	RAV
Geological structure, seabed relief, seabed sediments and access to raw materials and deposits	low	low	negligible	negligible	low	low
Seawater and seabed sediment quality	low	low	negligible	negligible	low	low
Climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)	negligible	negligible	negligible	negligible	negligible	negligible
Ambient noise	low	low	negligible	negligible	negligible	negligible
Electromagnetic field	none	none	negligible	negligible	none	none
Nature and protected areas						
Phytoplankton	none	none	negligible	negligible	negligible	negligible
Macrozoobenthos			negligible	negligible		
Ichthyofauna	low	low				
Marine mammals	low	low				
Seabirds	low	low				
Protected areas other than Natura 2000 sites	none	none	none	none	none	none
Natura 2000 sites	low	low	negligible	negligible	low	low
Wildlife corridors	none	none	none	none	none	none
Biodiversity	none	none				
Cultural values, monuments and archaeological sites and objects	low	low				
Use and management of the water area and tangible property	low	low				
Landscape, including the cultural landscape	none	none	none	none		
Population, health and living conditions	negligible	negligible				

Despite the indicated above and described in the report differences in the impact of the EXC BC-Wind OWF in the APV and RAV, the impact significance of the planned project on the environment

will be so close, that the same assessments can be assigned. The same level of impact significance for the APV and RAV does not indicate that particular impacts have the same intensity. It shows that the impact differences between the APV and RAV are not diverse enough to influence the level of impact significance assumed in the methodology of the environmental impact assessment.

Despite the identical impact assessments of the EXC BC-Wind OWF in the APV and RAV, the differences indicated in Section 8.2 between the two variants assessed show clearly that the APV variant is more beneficial for the environment.

12 COMPARISON OF THE TECHNOLOGICAL SOLUTIONS PROPOSED WITH THE TECHNOLOGICAL SOLUTIONS MEETING THE REQUIREMENTS REFERRED TO IN ARTICLE 143 OF THE ENVIRONMENTAL PROTECTION LAW

Pursuant to Article 143 of the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), the technologies used in newly commissioned systems should meet the requirements which consider, in particular:

- the use of substances with low hazard potential;
- the effective production and use of energy;
- ensuring rational consumption of water and other raw materials as well as consumables and fuels;
- the use of waste-free and low-waste technologies and possibility of waste recovery;
- indication of the type, range and size of emissions;
- the use of comparable processes and methods which have been effectively applied on industrial scale;
- scientific and technical progress.

According to Article 3(6) of the *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556), "installation" shall mean:

- a stationary technical unit;
- a group of stationary technical units which are technologically linked together, being under the management of the same entity, and located on the premises of the same plant;
- structures which are not technical units nor groups thereof, the operation of which may cause emission.

12.1 Use of substances with a low hazard potential

During the project construction and operation phases, hazardous waste described in Subsections 3.4.2 and 3.4.3 may be produced. Such waste will be stored at designated sites in a manner which is selective and safe for people and the environment; subsequently, it will be transferred to authorised waste collectors, thus limiting potential hazards. The operation of the ONS may cause a leakage of electrical insulating oils into the ground and the release of SF₆ insulating gas or refrigerants from the cooling system into the atmosphere. The ONS will be equipped with sealed oil pits connected to a rainwater pre-treatment system. In addition, trays or pans to contain the electrolyte in the event of spillage will be used. The SF₆ insulating gas will be prevented from release to the atmosphere thanks to automatic gas density monitoring. The station will not generate process wastewater. The Project Owner will take all necessary measures resulting from the legal provisions and good practices to reduce the risks.

12.2 Efficient generation and use of energy

The proposed project, the EXC BC-WIND OWF, will not involve power generation but its transmission by means of offshore and onshore cable lines as well as power processing and transformation. Rational power consumption will be ensured as part of its operation. With reference to the ONS, 1) the primary electricity demand will be satisfied internally by means of MV/LV auxiliary transformers, 2) back-up and emergency supply will be satisfied by means of an installed diesel generator and 3) optional supply – by means of an MV line. Heat supply will be

satisfied by means of electric heaters powered from the station's auxiliary system. During the construction phase, electricity required to power construction equipment will come from power generators, while during the operation phase, due to the use of modern technological solutions, including the use of a new type of phase conductors, electrical transmission losses will be reduced.

12.3 Ensuring rational consumption of water and other raw materials as well as consumables and fuels

The use of water, raw materials, consumables and fuels will be mostly related to the construction phase and maintenance works. During the operation of the planned project, there will be no need to use these resources. The ONS will not be intended for permanent staff presence. The occupancy time of the same persons per day should not exceed 4 hours. Consequently, the amount of water used and sanitary sewage generated will be less than in a small household. It confirms the rationality of the planned project in terms of resource use.

12.4 Use of waste-free and low-waste technologies and possibility of waste recovery

During the construction phase, the waste will be collected selectively at locations specially designated and adapted for this purpose, under conditions preventing the release of harmful substances into the environment. It will be ensured that they are collected by eligible entities responsible for waste management or reuse. The waste management will comply with the applicable Act of 14 December 2012 *on waste* (Journal of Laws of 2013, item 21, as amended). The underground power line operation will not produce any waste with the exception of minor amounts of waste related to maintenance works or the removal of possible failures.

12.5 Type, range and volume of emissions

During the operation phase, the proposed project in the form of an underground cable line will be a source of heat and EMF emission, which have been described in detail in this EIA Report. In the event of a failure, the onshore substation will be a source of noise, EMF, heat and gas emissions into the atmosphere. The construction phase will involve noise emissions and the release of pollutants from fuels burnt in vehicle engines into the atmosphere as well as waste and waste water generation. These emissions will be short-term and local.

12.6 Use of comparable processes and methods which have been effectively applied on an industrial scale

The dynamic development of the cable networks has been observed worldwide. The primary objective of the cable line development is to ensure high reliability of transmission and compliance with the relevant standards as well as economic and environmental requirements. The above-mentioned tasks are implemented through:

- introduction of conductive, insulating and structural materials characterised by enhanced operating parameters;
- modernisation and improvement of the technological parameters of production lines;
- conducting tests within the optimal range during the production cycle and thereafter, as well as after the cable line installation and during its operation;
- providing quality and reliability analyses of the cables on the basis of the statistical data and failure rates as well as the development of databases.

The selected technologies and materials which will be used for the construction of the underground power line and the ONS conform to the current EU standards and can be considered optimal for a project of this type – these technologies have been widely used in Poland, EU countries and in other parts of the world.

12.7 Scientific and technical progress

The solutions used during the project implementation will be best available techniques and technologies that are currently in use globally and are characterised by safety and high efficiency. All the work associated with the project implementation will be supervised by site managers experienced in construction of similar facilities, environmental specialists, expert construction and engineering supervision in accordance with the applicable provisions.

In view of the above, as part of the planned project, best available techniques (BAT) are to be applied as provided for in the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556).

This catalogue of requirements refers to newly launched industrial installations and equipment that are the source of environmental hazards. The OWF connection infrastructure, due to the technological characteristics of the construction, operation and decommissioning phases as well as the special conditions of operation in the marine and land environment, requires verification of these requirements at an early stage of project planning.

The structural elements of the OWF connection infrastructure are to be made of materials which are neutral to seawater and ground substrate (seabed) as well as to the soils in which the power cables will be buried onshore. Resistance to erosion, corrosion or chemical compounds present in seawater, seabed sediment and soil is an essential prerequisite for failure-free operation of power cables.

The efficiency and safety of power transmission from the BC-Wind OWF to the NPS will be among the basic criteria used when selecting cable types and their offshore and onshore routing. The overriding criterion of energy efficiency is ensuring that energy waste in transmission installations is kept at the lowest possible level.

The consumption of water, consumables, raw materials and fuels will take place during the process of laying submarine cables. During 20–30 years of operation, the cables will require the use of consumables and fuels for maintenance service activities.

Emissions and their range will mainly relate to the impacts resulting from the process of laying cables on the seabed and in the ground during the construction phase. These impacts will not significantly affect either the marine or land environment. No significant electromagnetic interactions or thermal actions are expected to occur during the operational phase.

The experiences related to the construction and operation of power cables offshore and onshore enable the selection and implementation of the most efficient and proven solutions for power transmission from the BC-Wind OWF to the NPS, meeting the requirements of the most advanced technologies, resistant to the conditions of operation in the marine and land environments, while keeping the energy waste at the lowest possible level, and affecting the natural environment to the smallest extent.

13 DESCRIPTION OF THE PROSPECTIVE ACTIONS TO AVOID, PREVENT AND REDUCE NEGATIVE IMPACTS ON THE ENVIRONMENT

13.1 Offshore Area

Measures to avoid, prevent and reduce possible impacts on vessel traffic in the area of the project in question are detailed in Appendix 6.

The prospective actions to mitigate the adverse impact of the EXC BC-WIND OWF implementation on seabirds and marine mammals are indicated below. In the case of other environmental components, which were the subject of the impact assessment (see Section 8), there was no need to apply measures mitigating the impact of the project in all phases of its implementation.

Recommendations to minimise the overall impact of the proposed project on the marine environment include:

- constructing subsea cable lines in the shortest possible time, using equipment and vessels meeting all environmental norms and standards, including equipping vessels with the technical means to contain, remove or neutralise petroleum contamination in the event of a spill;
- reducing the number of vessels operating simultaneously in the project area to the necessary minimum;

in the case of seabirds:

- intensifying the pace of construction works in the months of April–September, when the number of birds in the area is the lowest;
- at night, limiting sources of strong light directed upwards and to the necessary level, resulting from the applicable regulations and work safety standards; this mainly concerns the periods of bird migration, i.e. from 1 March to 31 May and 31 July to 15 November;

and in the case of marine mammals:

- carrying out the work in the best possible weather conditions and with good quality equipment (particularly important in the case of vessels with DP) in order to reduce as much as possible the level of the noise generated.

13.2 Onshore Area

Recommendations to minimise the overall impact of the proposed project on the terrestrial environment include:

1. in terms of the entire project area:

- ensuring good technical condition of the construction and transport equipment;
- using equipment and construction machinery ensuring effective noise protection;
- immediate elimination of spills of petroleum products from the equipment and the machinery operating at the site as well as removal and disposal of contaminated soil;
- rational waste management in accordance with the regulations applicable, including limiting waste generation to a minimum;
- carrying out organised sewage management, including the use of sealed septic tanks for temporary storage of sewage in order to transfer them to the authorised entities;

- carrying out tree and shrub felling between 16 October and the end of February, i.e. outside the bird breeding season and outside the period of occurrence of bat breeding colonies and mating groupings; the felling of trees outside this period will be authorised, provided that ornithological and chiropterological surveillance is ensured;
 - carrying out fencing work on trees not subject to felling under environmental supervision;
 - introduction of wildlife surveillance by a herpetologist and botanist during construction work;
 - the technical details of the mitigation measures required for individual organism groups should be agreed with the environmental supervision at the design stage.
2. in the case of the cable bed area:
 - avoiding leaving trenches uncovered for long periods of time and depositing excavated soil in the path of the run-offs of near-surface waters;
 - placing the noise generating devices as far away as (technically and technologically) possible from the buildings of the Rehabilitation and Holiday Centre for disabled people;
 - applying methods to minimise the formation of a cone depression within the boundaries of the ecological area “Torfowisko in Szklana Huta” [Peat bog in Szklana Huta] by performing drainage in a manner limited to the necessary minimum during the construction phase of the transition joint bays at the site of the sea-land HDD site.
 3. in the case of construction site areas:
 - protecting the construction sites against the ingress of harmful substances into the soil and equipping them with a sufficient quantity of sorbents for the removal of possible spills and leaks of oil and petroleum products;
 - storing and stockpiling of construction materials, equipment and devices which may cause contamination of the ground-water environment with petroleum products on a hardened and sealed surface.
 4. in the case of the Onshore Substation:
 - during the operation phase, equipping the Onshore Substation with technical measures for limiting the spreading, removal of or neutralisation of petroleum contaminations.
 5. in the case of access roads areas:
 - using the existing road infrastructure, dirt roads and forest tracks in the order of priority.
 6. in the case of biotic components:
 - all groups of organisms: during the construction phase, the surface of permanently deforested area should be limited to a minimum, the interference in dune and peat bog habitats should be restricted as much as possible and the emission of any pollutants into the soil within the natural habitats should be minimised; permanent environmental supervision must be ensured during the period of project implementation;
 - fungi: the plot of the exceptionally valuable species, the mealy tooth *Hydnellum ferrugineum*, next to the access road – plot G6, approx. 100 m east of the route of the onshore connection infrastructure (location in relation to the EXC BC-WIND OWF route according to the adopted KP 34.1 working chainage) should be effectively protected from destruction [Figure 13.1].



Figure 13.1. Location of the plot of the mealy tooth *Hydnellum ferrugineum* intended for mitigation measures [source: internal materials]

- lichens: trees with plots of exceptionally valuable lichen species located in the direct vicinity of access roads included in the project area, i.e. at a distance of less than 10 m, should be protected; the protection should be performed by effectively fencing and marking the protective zone of the tree within its crown; the recommendation concerns 3 plots of barnacle lichen *Theleothema lepodium* (compare Appendix 1, Section 8.2.3):
 - plot 703, at a distance of more than 500 m north of the route of the onshore connection infrastructure (KP 36.3), by the potential access road;
 - plots 659 and 655, at a distance of more than 50 m north of the route of the onshore connection infrastructure (KP 36.4), by the potential access road [Figure 13.2];

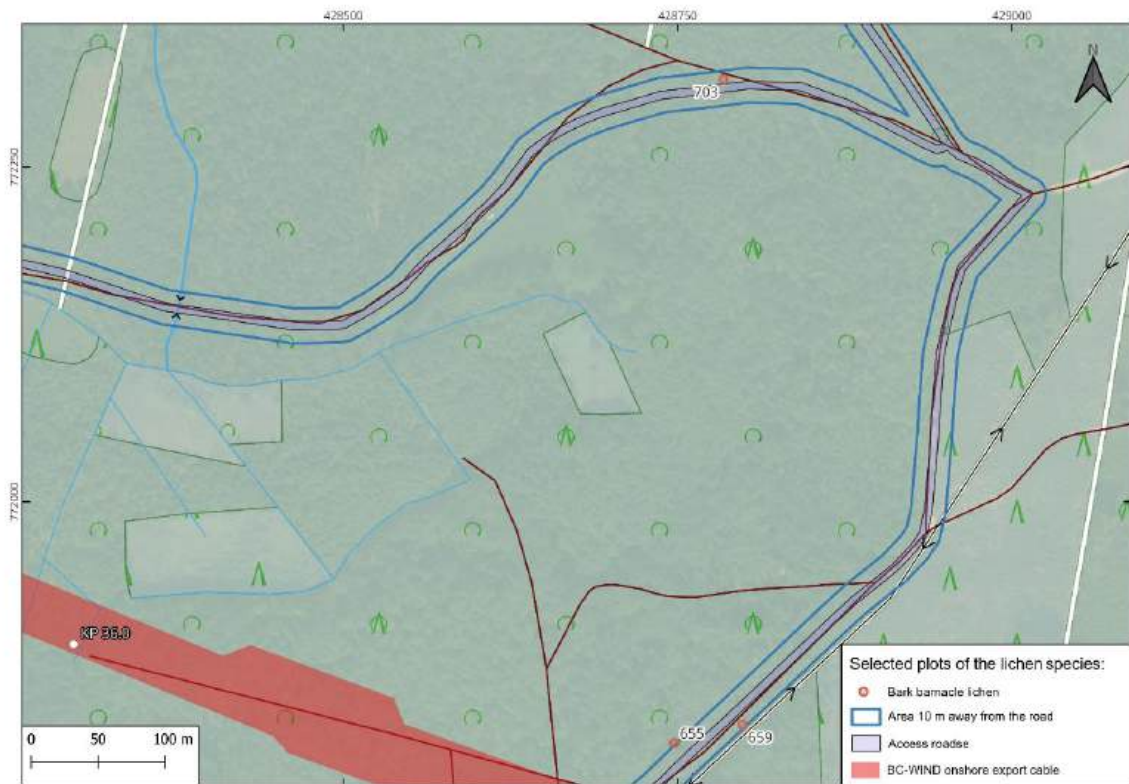


Figure 13.2. Location of the plots of bark barnacle lichen *Thelotrema lepadinum* intended for mitigation measures [source: internal materials]

- The trees in the project area, which are the plots of two lichen species of high value which are also very rare in the survey area, should also be preserved and similarly protected:
 - 1) powdered speckled shield lichen *Punctelia jeckeri* (one out of three plots within the survey area) – plot 92, at a distance of 500 m south-west of the route of the onshore connection infrastructure (KP 38.6), by the potential access road [Figure 13.3];
 - 2) and eagle's claws lichen *Anaptychia ciliaris* (four out of six plots within the survey area):
 - plots 485, 497 and 801 at the distances of: 300, 600 and 800 m west (KP 40.7) respectively, plot 432 500 m west of the route of the onshore connection infrastructure (KP 39.6), by the potential access road [Figure 13.3, Figure 13.4].



Figure 13.3. Location of the plot of powdered speckled shield lichen *Punctelia jeckerii* and one of the plots of the eagle's claws lichen *Anaptychia ciliaris* intended for mitigation measures [source: internal materials]

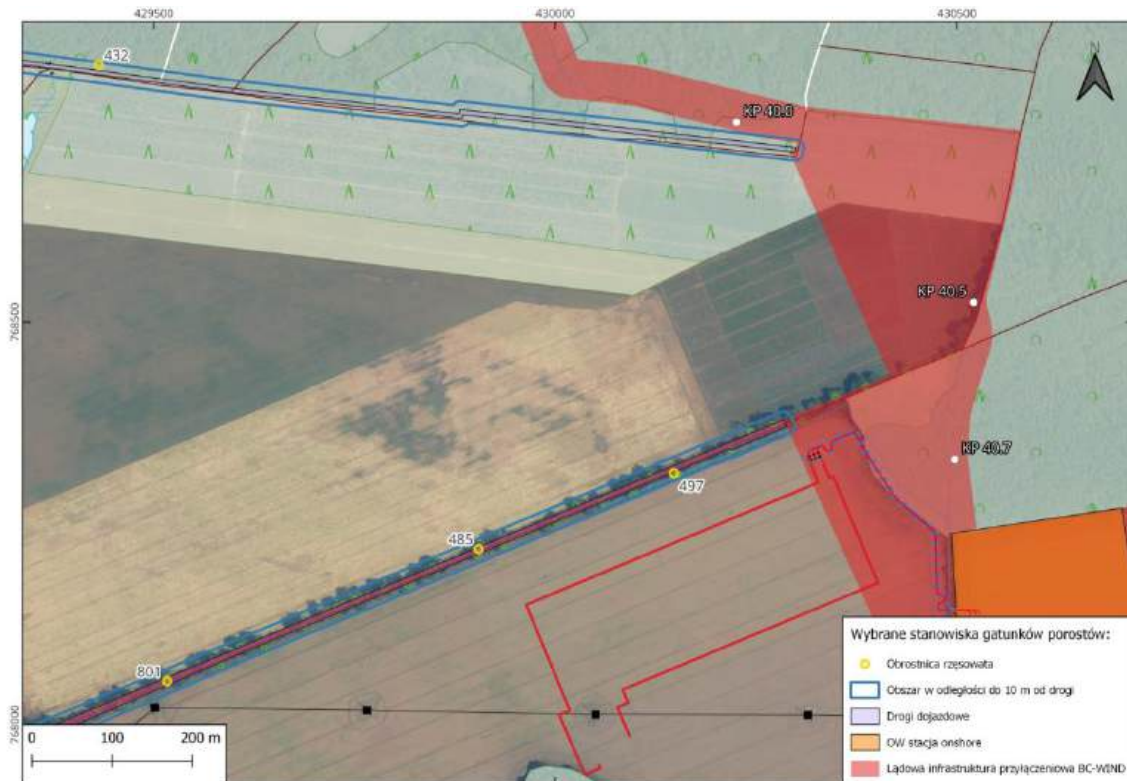


Figure 13.4. Location of the plots of eagle's claws lichen *Anaptychia ciliaris* intended for mitigation measures [source: internal materials]

- vascular plants and natural habitats: works within the patches of Natura 2000 natural habitats should be minimised, in particular construction sites, material stockpiles, waste disposal sites, etc. should not be located there; the construction site should be effectively fenced off within the habitat patches in order to prevent uncontrolled movement of people and vehicles within them;
 - habitat 2180:
 - KP 33.4–33.9 – a planned drilling with the exception of cable wells at the connection of the subsea cable with the onshore cable (KP 33.5–33.6) [Figure 13.5];
 - KP 33.9–34.4 – a planned drilling with the possibility of an open trench;
 - KP 34.4–35.4 – a planned open trench, with the exception of habitat 2130 (KP 34.8–35.4) [Figure 13.6];
 - habitat 9110 – KP 36.0–36.3 – a partially planned trench and construction site for the HDD exit under a peat bog [Figure 13.7].

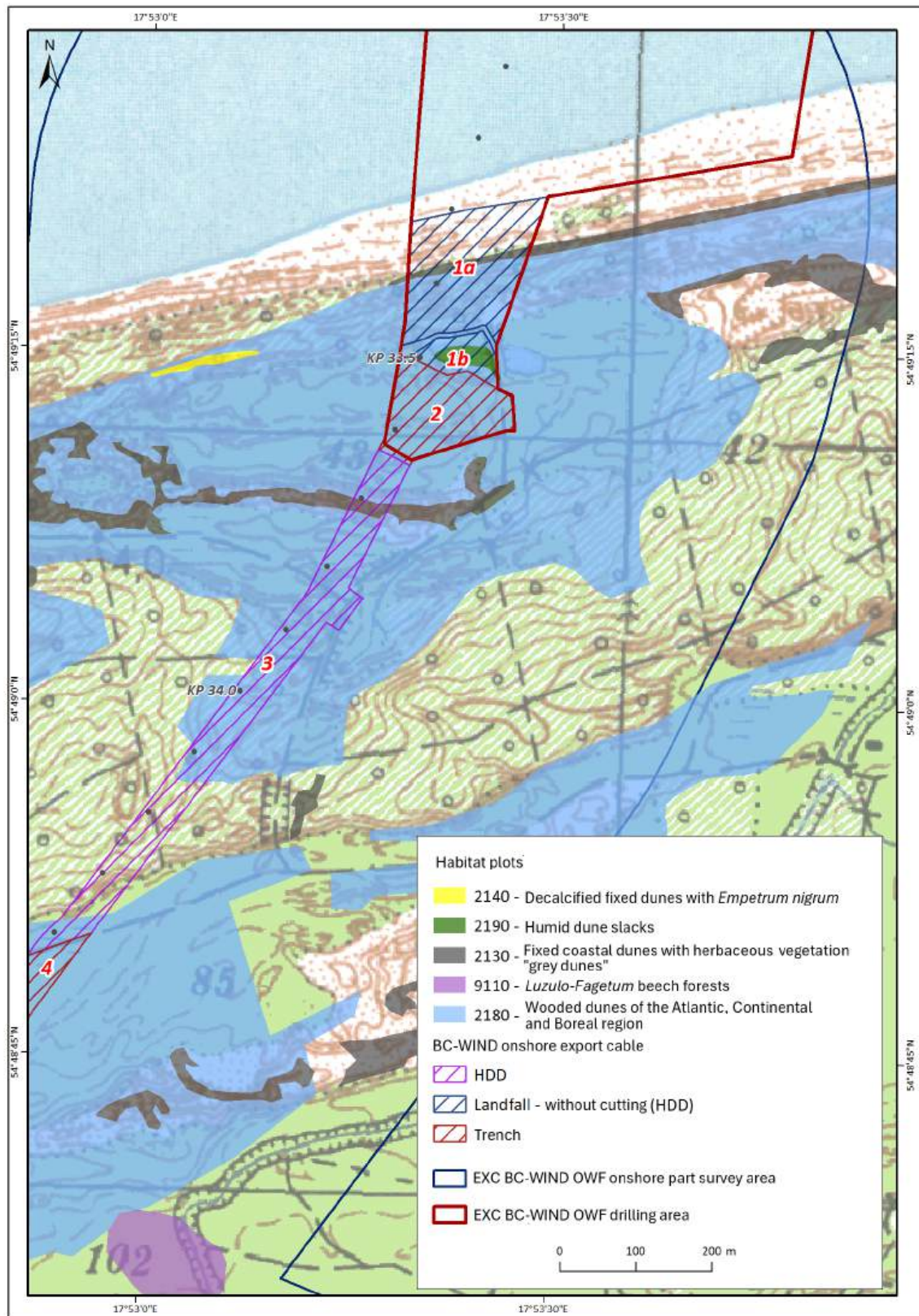


Figure 13.5. Location of habitat patches in relation to the course of the project for sections 1–4 [source: internal materials]

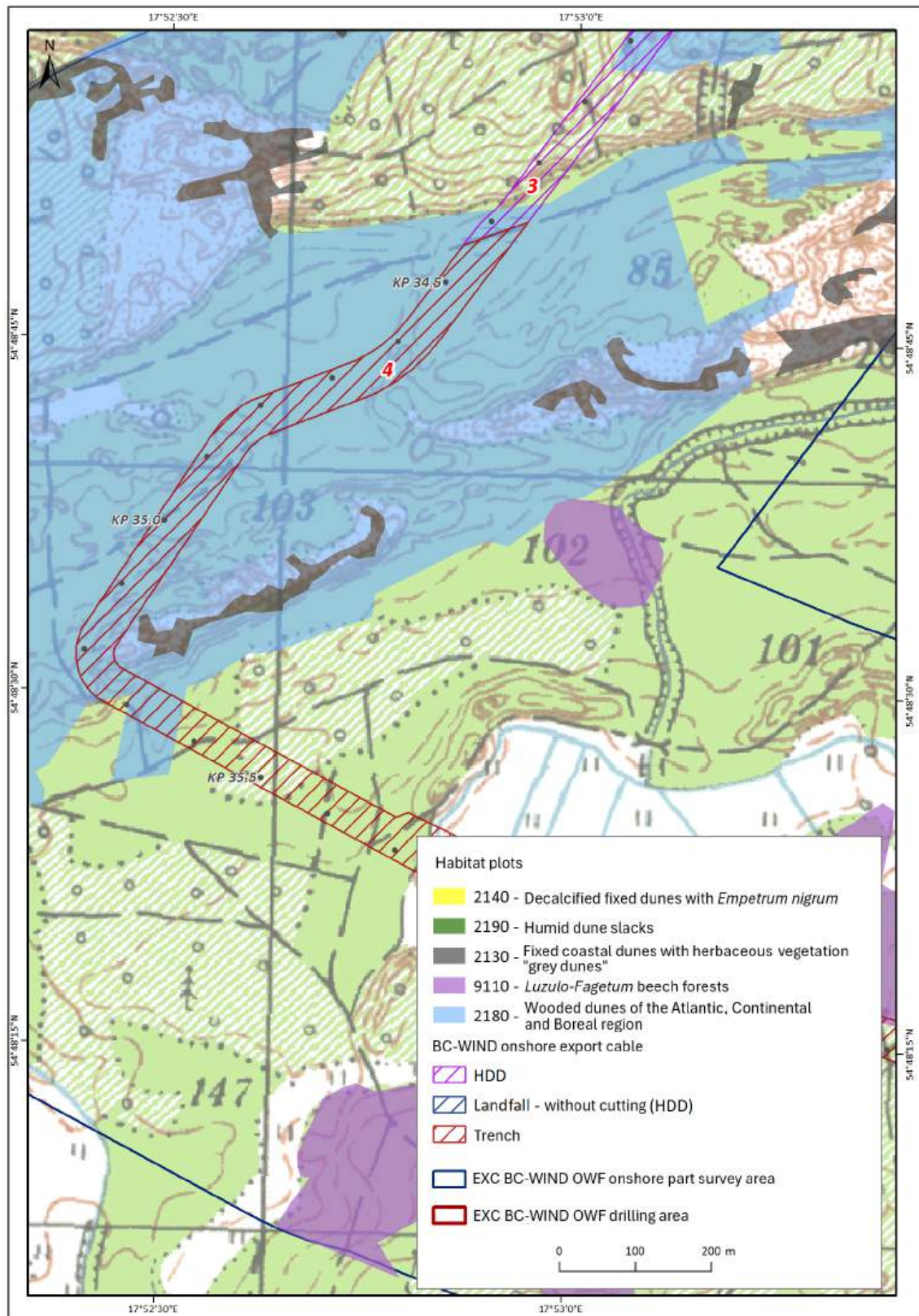


Figure 13.6. Location of habitat patches in relation to the course of the project for sections 3–4 [source: internal materials]

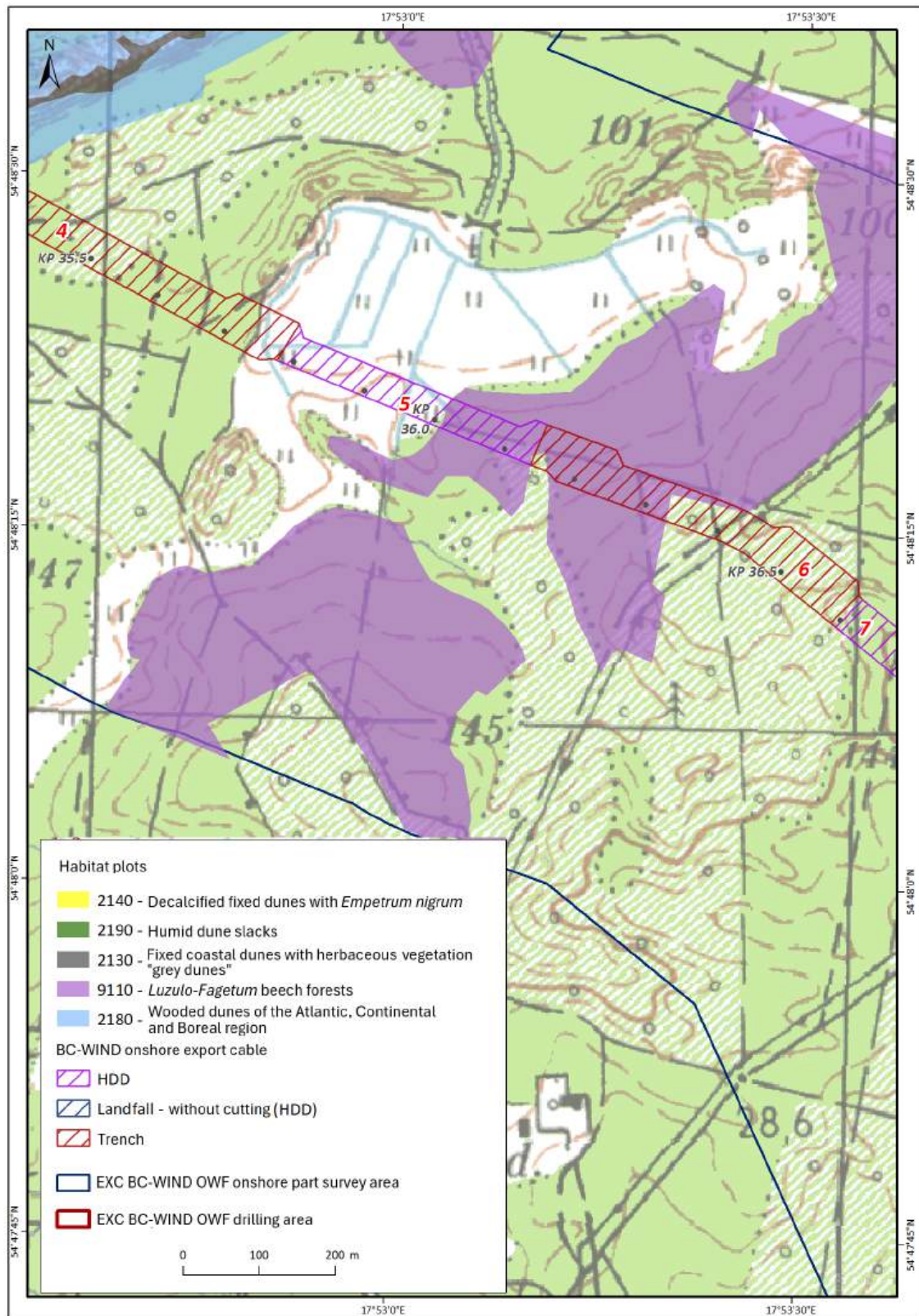


Figure 13.7. Location of habitat patches in relation to the course of the project for sections 4–7 [source: internal materials]

- all animal groups:
 - excavations and the construction site should be checked for the presence of animals; animals trapped in excavations or otherwise should be captured and relocated to a safe distance; if it is necessary to keep the excavation open for several days, the excavation should be secured (e.g. with small mesh nets, plastic film or amphibian fencing) to prevent animals from falling into the excavation. In uncomplicated cases, on the basis of a derogation decision obtained, the capture and relocation of animals may be carried out by personnel designated to carry out such tasks and trained by an environmental surveillance specialist.
- The area of excavations, access routes, depots, etc. should be secured against access of animals, especially small individuals (vertebrates). The sections that need to be fenced off, as well as the type of fencing and the duration of its use, should be agreed directly at the site with an environmental surveillance specialist, taking into account the following recommendations related to the protection of amphibian breeding sites;
- invertebrates: during the construction phase:
 - leaving some of the felled trees (or their fragments) at the closest possible distance from the project and leaving them in these places to decompose naturally if they are not going to be further used as wood raw materials;
 - making sure not to leave rubbish in the work areas;
- herpetofauna: during the construction phase:
 - the most valuable amphibian breeding site (*site 3* 7 m west of the onshore substation (KP 40.7)) should be excluded from the project area;
 - three amphibian breeding sites (compare Appendix 1, Figure 8.19) should be secured with protective fences to prevent animals from entering the construction site and the access road:
 - *site 1* at a distance of more than 200 m north of the route of the onshore connection infrastructure (KP 35.8), directly by the access road [Figure 13.9];
 - *site 2* at a distance of approximately 450 m south of the planned project area (KP 35.4) crossing the access road [Figure 13.9];
 - *site 3* at a distance of 7 m west of the onshore substation (KP 40.7).

The details concerning the implementation of fencing should be agreed directly at the site with an environmental surveillance specialist.



Figure 13.8. Location of amphibian breeding sites 1 and 2 intended for mitigation measures in relation to the project EXC BC-WIND OWF route [source: internal materials]



Figure 13.9. Location of amphibian breeding site 3 intended for mitigation measures in relation to the project EXC BC-WIND OWF route [source: internal materials]

14 PROPOSAL FOR THE MONITORING OF THE PLANNED PROJECT IMPACT AND INFORMATION ON THE AVAILABLE RESULTS OF OTHER MONITORING, WHICH MAY BE IMPORTANT FOR ESTABLISHING RESPONSIBILITIES IN THIS AREA

Pursuant to the Article 66 of the EIA Act, a proposal to monitor the impact of the planned project in its construction and operation phases is presented in this section, particularly concerning the impact on the forms of nature protection referred to in Article 6(1) of the *Nature Conservation Act* of 16 April 2004 (Journal of Laws of 2004, No. 92, item 880, as amended), including the objectives and the subject of protection of the Natura 2000 site, and the continuity of the wildlife corridors connecting them. Moreover, the section provides information on the results available for other monitoring, which may be important for establishing responsibilities in this area.

14.1 OFFSHORE AREA

14.1.1 Proposal for the monitoring of the planned project impact

The results of the environmental surveys of the EXC BC-Wind OWF development area as well as the identification of potential impacts have shown that the environmental resources in the project area are typical for the coastal waters of the southern part of the Baltic Sea and that such resources would not be affected by significant impacts.

The project will have the greatest impact on the marine environment during the construction phase, mainly due to the disturbance of the seabed, which will result in the destruction of the zoobenthos communities within the strip of the cable line construction, as well as in the scaring of fish and marine mammals from the area of underwater operations. The restoration of zoobenthos communities will begin directly after the conclusion of underwater operations. The qualitative and quantitative benthic resources will stabilise after a few days from the completion of the construction phase at the latest. The restoration time is likely to be much shorter as the zoobenthos species travelling on the seabed (including most mussel species) will relocate from the seabed areas adjacent to the construction area.

Underwater operations will also generate underwater noise which will scare away fish and marine mammals. It is anticipated that due to the noise characteristics and its duration, the scaring of animals will have a local scale and will cease after the completion of such works. The traffic of vessels involved in construction works will also temporarily scare away the marine mammals and seabirds within a small area. It should be noted that the EXC BC-Wind OWF development area is constantly used for navigation and fishing. Therefore, the presence of vessels involved in the project will not change the nature of this area and will not generate new environmental impacts in this part of the Baltic Sea, except for the activities directly related to the interference in the seabed.

During the operation phase, the impact will be much smaller than during the construction phase and will result from the inspections of cable lines carried out at least once every 5 years using non-invasive methods. The decommissioning phase will optionally involve the withdrawal of the connection infrastructure from service and abandonment in the environment or the removal of its components from the seabed. In that case, the impacts will be less severe than during the construction phase.

On the basis of the previous experiences describing the response of the marine environment components to the impacts generated by projects with characteristics similar to the project in question as well as due to the relatively small anticipated impact of the EXC BC-Wind OWF on the marine environment in each phase of its implementation, it is proposed that no environmental monitoring be conducted to identify and assess the impact of the project on the marine environment. The information cited above indicate that such a monitoring is unjustified in the context of gaining new knowledge and will not contribute to improving the protection and status of the environment, because the scope of impacts identified, their influence on the components of the environment as well as the receptors' response to the impacts are known and do not require further studies.

The Applicant – C-Wind Sp. z o.o. – will carry out monitoring for the purpose of the BC-Wind OWF, the wide scope of which will involve the impacts and components of the environment identified also in the EXC BC-Wind OWF. Thus, data from this monitoring can be used for the environmental impact assessment of the project in question.

14.1.2 Information on the available results of other monitoring, which may be important for establishing responsibilities in this area

Data are available from the State Environmental Monitoring (SEM) carried out by GDEP in accordance with the *Water Law Act* of 20 July 2017 (Journal of Laws of 2017, item 1566, as amended) and implementing regulations, i.e. the Regulation of the Minister of Infrastructure of 25 June 2021 *on the classification of ecological status, ecological potential and chemical status and the method of classification of the status of surface water bodies and the environmental quality standards for priority substances* (Journal of Laws of 2021, item 1475) and the Regulation of the Minister of Infrastructure of 13 July 2021 *on the forms and methods of monitoring surface and groundwater bodies* (Journal of Laws of 2021, item 1576).

The environmental monitoring of the Polish part of the Baltic Sea is carried out as part of the SEM. This monitoring includes the surveys of the following parameters:

- physico-chemical: temperature, salinity, oxygen concentration, Secchi disc visibility, content of nutrients, heavy metals and persistent organic pollutants;
- biological: phytoplankton, zooplankton, phytobenthos, zoobenthos, marine mammals and wintering seabirds.

Under the Marine Strategy Framework Directive, the level of harmful substances in the water and in marine organisms as well as the content of radionuclides in the water and in sediments are also monitored. In addition, ichthyofauna and optional microbiology surveys are carried out, as well as the surveys of hydrographic conditions, waste in the marine environment and underwater noise. The results of this monitoring are collected and stored in the Oceanographic Database at the Gdynia Maritime Branch of the IMWM-NRI and in the "ICHTIOFAUNA" database at the Chief Inspectorate for Environmental Protection in Warsaw.

14.2 ONSHORE AREA

14.2.1 Proposal for the monitoring of the planned project impact

In conclusion of the environmental impact assessment and analyses conducted, the recommendation for the onshore part of the EXC BC-Wind OWF is to:

- perform the measurements pursuant to Article 122(a) of the Act of 27 April 2001 – *Environmental Protection Law* [Obligation to perform measurements of electromagnetic field levels in the environment] (Journal of Laws of 2022, item 2556) for the substation.

14.2.2 Information on the available results of other monitoring, which may be important for establishing responsibilities in this area

Within the framework of SEM, as part of the task entitled "Bird monitoring including Natura 2000 Special Protection Areas", a number of bird monitoring surveys is carried out, which may be important for establishing the obligations of monitoring the impact of the planned project, including [318]:

- the Monitoring of Wintering Seabirds (MWS), covering the monitoring of species of average abundance and abundant species of Anseriformes wintering in the Polish zone of the Baltic Sea, including primary species (the red-throated diver, the black-throated diver, the horned grebe, the red-necked grebe, the long-tailed duck, the velvet scoter, the common scoter, the black guillemot, the razorbill, and the common guillemot) as well as additional species (the great crested grebe, the European herring gull, the great black-backed gull, the common gull, and the black-headed gull).

The results of these monitoring surveys are also collected and made available by the Chief Inspectorate for Environmental Protection in Warsaw.

In accordance with the Regulation of the Minister of Climate of 17 February 2020 on the methods of maintaining permissible levels of electromagnetic fields in the environment (Journal of Laws of 2020, item 258), such measurements should be carried out:

- directly before the plant or devices are put into operation;
- each time the operating conditions of the installation or equipment change, including those caused by changes in the installation or equipment components, insofar as these changes may lead to the changes in the levels of electromagnetic fields of which the installation or equipment is the source;
- each time there is a change to the existing planning and development of the property resulting in a change to the presence of places accessible to the public in the vicinity of the plant or equipment – at the written request of the owner or manager of the property on which the change occurred.

The results of the above-mentioned electromagnetic field measurements will be submitted to the Voivodeship Inspector of Environmental Protection and the State Voivodeship Sanitary Inspector within 30 days from the measurements.

15 LIMITED USE AREA

The issue of establishing limited use area (LUA) is regulated by the provisions of Article 135(1) of the Act of 27 April 2001 – *Environmental Protection Law* (consolidated text: Journal of Laws of 2022, item 2556): *“If the environmental review or the environmental impact assessment required under the provisions of the Act of 3 October 2008 on the provision of information on the environment and environmental protection, public participation in environmental protection and on environmental impact assessments or the post-implementation analysis show that, despite the application of technical, process and organisational solutions available, the environmental quality standards outside the premises of the plant or other facility cannot be met, then a limited use area is created for a wastewater treatment plant, municipal waste landfill, composting plant, communication route, airport, overhead power line and substation as well as a radiocommunication, radio navigation and radiolocation system”*.

The lines and the substation referred to in the article will be implemented as part of the planned project, and therefore may require creating an LUA.

The validity of establishing an LUA with respect to the planned EXC BC-Wind OWF should be examined by analysing whether the environmental quality standards cannot be met outside the area of the planned cable lines, Onshore Substation and the 400 kV line.

According to the local spatial development plan *Wiatraki w Lubiewie* [Wind Turbines in Lublewo], Choczewo commune (Resolution No. XIV/144/2008 of the Choczewo Commune Council dated 19 March 2008 (Official Journal of the Pomorskie Voivodeship of 24 June 2008, no. 58, item 1658), the area intended for the ONS and the 400 kV line is an agricultural area (11 R) intended for field cultivation, breeding, horticulture, and orcharding. The location of residential functions within agricultural settlements is excluded in that area, whereas the location of farm buildings, sheds and harbours serving agricultural production is permitted. In this respect, it is not an acoustically protected area; therefore, no need for an LUA was indicated.

16 ANALYSIS OF POSSIBLE SOCIAL CONFLICTS RELATED TO THE PLANNED PROJECT, INCLUDING THE ANALYSIS OF IMPACTS ON THE LOCAL COMMUNITY

The planned project will be implemented in the offshore and onshore areas, which will entail various potential social conflicts. Some of such conflicts will be resolved before they are triggered, e.g. a potential conflict with other project owners planning to build a linear infrastructure in the offshore area will be resolved with location permits issued by the Minister relevant for the matters of the maritime economy and the Director of the Maritime Office in Gdynia, and in the onshore area by including the project in the studies of conditions for spatial development and local plans. Other potential conflicts may emerge at the pre-implementation and implementation stages of the project.

The sea area in which the proposed project is located fulfils various functions resulting from the hitherto human activity and the natural resources present there. The most comprehensive list of the forms of the current and planned future use of sea space has been developed for the purpose of the preparation of Maritime Spatial Plan of Polish Sea Areas (MSPPSA) (Journal of Laws of 2021, item 935). Detailed information on the sea basins and sub-basins within which the EXC BC-Wind OWF will be located is included in Section 5.11.

The provisions of the MSPPSA indicate that the planned project can be carried out with the assumed technology within the boundaries of the above-described sea basins and sub-basins. A fragment of sea basin POM.54.T is an exception, in which the laying of the technical infrastructure was limited to the subareas established for that particular purpose. Exceptions can only be made for environmental, technological, economic or national security reasons. The issue of the possibility of locating the EXC BC-Wind OWF within sea basin POM.54.T was agreed with the marine administration, which issued a positive opinion in response to the Applicant's application, issuing relevant location decisions.

The analysis of the location of the planned project in relation to the current and planned use of sea space indicated that fishermen may submit their concerns regarding the continuation of their activities in an unchanged manner. Such a situation may take place especially when safety zones are delineated for cable lines on the basis of the decision of the Director of the Maritime Office in Gdynia. This conflict seems unlikely due to the low significance of the statistical rectangles in which the project will be located in the overall fishing activities.

The analysis of the data on fish catches in the years 2017–2019 (data provided by the Fisheries Monitoring Centre of the Fisheries Department of the Ministry of Marine Economy and Inland Navigation) indicated that with reference to the catches in the entire area of the PSA, the fisheries in statistical rectangles N7, N8, O6, O7 and O8, within the area of which the proposed project is located, did not constitute significant fishing locations. In the case of cod, the proportion of catches constitutes only approx. 0.18% (max. 0.5% in rectangle N8 in 2017), flounder – approx. 0.12% (max. 0.3% in rectangle N7 in the years 2017 and 2019), and herring – approx. 0.03% (max. 0.2% in rectangle O8 in 2017). Smaller catches, but with a higher average proportion in the total catches in the entire PSA, were characteristic of turbot (*Scophthalmus maximus*), Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta m. trutta*): 1.0% (max. 4.0% in rectangle N7 in 2017), 0.85% (max. 6.2% in rectangle O7 in 2018) and 0.56% (max. 2.0% in rectangle O8 in 2017), respectively. Despite slightly higher share in the total catches, also in the case of those species, it cannot be concluded that statistical rectangles N7, N8, O6, O7 and O8 are significant areas in terms of catching turbot, salmon or trout.

Additionally, the area of the planned project construction occupies only a small part of the surface area of the statistical rectangles – 1.3% of the N8 and O8 rectangles at maximum [Table 16.1].

Table 16.1. Surface area of statistical rectangles N7, N8, O6, O7 and O8 within the boundaries of the Export Cable of the BC-Wind OWF development area [source: internal materials]

Statistical rectangle	Statistical rectangle surface covered by the proposed location of the OWF Area [km ²]	Statistical rectangle surface covered by the proposed location of the OWF Area [%]
N7	2.30	0.6
N8	5.22	1.3
O6	0.41	0.8
O7	21.05	5.3
O8	5.11	1.3

The area occupied will be even smaller, taking into consideration the fact that the width of the construction belt for each of a maximum of 2 cable lines will not exceed 20 m and that the landfall of export cables will be constructed using a trenchless method (e.g. Horizontal Directional Drilling) up to a depth of approx. 13 m, measured from the water table to the seabed. This will most likely help to completely eliminate the impact of the project on ichthyofauna occurring up to this depth as well as the impact on fishery in rectangle O6, within which the maximum depth of water does not exceed 10 m.

Potential conflicts in the offshore area may also arise from the identification of, for example, objects of cultural heritage (e.g. historical wrecks) or objects hazardous to the environment and humans (UXO, unconventional warfare) in the development area of the planned project. In such a situation, the Applicant will notify the relevant state bodies and will closely cooperate with them on solutions protecting the newly-discovered objects of cultural heritage as well as the environment and people against exposure to post-war warfare.

The analysis of the use so far and the future development of the sea area, in which the implementation of the proposed project is planned, does not indicate that there are probable social conflicts, other than those indicated above, determined by the construction and exploitation of the offshore part of the EXC BC-Wind OWF.

In the onshore area, the planned project will be located in a mid-forest surroundings, far from residential, service and tourist developments of the Lubiatowo and Osieki Lęborskie villages, on the land belonging to the Choczewo Forest District, within the range of the Coastal Protected Landscape Area. Such a location of the project means that potential social conflicts may involve:

- protests of the land owners against the occupation of plots for the location of the customer substation (conflicts arising on economic grounds);
- protests of the inhabitants of residential, residential-service and tourist buildings in the surrounding area, fearing the EMF emitted by underground cable lines and fearing the EMF and noise emitted by the customer substation (conflicts arising on sociological grounds);
- protests of the inhabitants and ENGOs against the location of the BC -Wind OWF CI within the reach of the nature conservation forms (conflicts on environmental grounds);

Considering, on the one hand, the necessity to locate the transmission infrastructure, and on the other the tourist potential of the commune, from the very beginning, the Applicant conducted a series of activities aimed at familiarising the inhabitants and the commune authorities with the nature of the project, thus significantly reducing the risk of social conflicts. Table 16.2 presents a

cycle of information and consultation meetings which were held with the inhabitants of the Choczewo commune.

Table 16.2. List of information and consultation meetings held in the Choczewo commune [source: Applicant's data]

No.	Date	Description of the meeting
1.	2021-01-22 2021-02-24	on-line meeting and a meeting at the Choczewo Forest Inspectorate, attended by a representative of the State Forests authority to discuss the first version of the cable bed area layout; the Forest Inspectorate's comments on the planned infrastructure were presented; the purpose of the meeting was to discuss measures to minimise the negative impact of the infrastructure on the environment by: minimising the tree felling area and routing the connection infrastructure within a single cable bed area; bypassing the environmentally valuable areas indicated by the Choczewo Forest Inspectorate at the stage of making agreements; using the cable technology and horizontal directional drilling as the least environmentally damaging solutions
2.	2021-03-01	teleconference of OWF developers, PSE and the Choczewo Forest Inspectorate concerning the presentation and discussion of the concept of the connection infrastructure route in the Choczewo commune area
3.	2021-03-03	meeting with the Choczewo Commune Council, attended by the Choczewo Forest Inspectorate, concerning energy transport from offshore wind farms – presentation of the concept of the cable bed area
4.	2021-10-27	two meetings concerning the water supply system in Choczewo commune, at the Commune Office, and a meeting with representatives of the Commune Council and the local residents in Choczewo commune; the meeting began with the Council Head's statement on the government's 2014–2024 Programme for the Development of the Słupsk Region
5.	2022-12-09	meeting at the Choczewo Commune Council Office regarding water supply infrastructure, connection infrastructure and the implementation status of the first edition of the "Wind-Powered Commune" programme
6.	2023-01-26	meeting with the Head of the Anna Dymna Foundation in Lubiatowo, which is located in the direct vicinity of the Applicant's cable bed area; the meeting concerned the connection infrastructure and cooperation within the "Wind-Powered Commune" programme
7.	2023-03-02	meeting of representatives of local authorities of the Choczewo commune with representatives of PSE S.A. and project owners implementing offshore wind farm projects in the Baltic Sea: Baltic Power, PGE Baltica and Ocean Winds

During the meetings, the project owners summarised the progress of works on offshore wind farm projects carried out in Polish sea areas. They presented up-to-date project implementation plans and their status. In Choczewo, however, the discussion concerned primarily the schedules for the construction of onshore substations located to the west of the developments in Osieki Lęborskie, which will receive the energy generated at sea.

According to the schedules presented by the project owners, 2023 was primarily a period intended for preparatory work, with the main construction activities starting in 2024.

Work has already begun on the future Choczewo Substation. This is a strategic facility to which offshore wind farm operators will bring the green energy from offshore wind farms. The construction of the Choczewo Substation is expected to be completed in the fourth quarter of 2025.

The Applicant intends to start the construction phase of the EXC BC-Wind OWF a little later, at the beginning of 2025, while PGE Baltica and Ørsted communicated that they were at the stage of tender procedures; immediately after selecting contractors for the work, they will inform the Choczewo commune and residents about the dates of the construction work commencement. The

construction of two of the four extra-high voltage lines planned within the Choczewo commune by PSE S.A. is expected to begin in 2024.

Project Owners implementing offshore wind farm projects in the Baltic Sea announced an ongoing dialogue with the local government administration and the local community in order to inform them of their plans as early as possible and to limit the nuisance caused by their undertakings. The construction of two of the four extra-high voltage lines planned within the Choczewo commune is expected to start as early as 2024.

More than two years of activities of a working group resulted in the development of a comprehensive CSR programme called “Choczewo. Wind-Powered Commune”, which was implemented in February/March 2022. Among other things, the infrastructure connecting the BC-Wind OWF with the NPS will be provided in the commune. The programme is based on direct cooperation between offshore wind farm and connection infrastructure project owners and the Choczewo commune, which, with the support of specialists, identified its needs and problems in various areas, seeking to find the best solutions.

The entire process started with an analysis of available documents, articles and social media discussions concerning the Choczewo commune. Between March and April 2022, local needs, insights and problems were identified. Nearly 80 interviews, 8 workshops and 14 survey walkthroughs were conducted in Choczewo. In June 2022, a meeting was held to jointly discuss and summarise the activities carried out. Consultation points were also organised at which residents shared their ideas for improving life in the commune.

During the subsequent meetings in July 2022, 44 projects submitted by residents, NGOs and organisational units of the Choczewo commune were recommended for implementation.

In the first edition of the programme, 45 projects worth PLN 1 million were implemented with financial support from the project owners. The projects were related to social initiatives and social development, security, local activity centres, cultural and natural heritage, as well as the development of children and young people. The areas of support in the first edition of the programme, the number of projects and co-funding amounts are presented in Table 16.3.

Table 16.3. Number of projects and co-funding amounts in individual areas of support during the 1st edition of the “Choczewo. Wind-Powered Commune” programme [source: Project Owner's data]

No.	Area of support	Number of Projects	Amount of co-funding [PLN]
1.	Social initiatives, social development	9	450 000
2.	Security	6	80 000
3.	Local activity centres	11	220 000
4.	Cultural and natural heritage	11	165 000
5.	Development of children and young people	8	130 000

The Applicant's collaboration with the residents of the Choczewo commune included:

- 57 interviews lasting 60 minutes each, aiming to explore the residents' insights;
- 8 diagnostic workshops in groups of 5–15 people;
- 14 survey walkthroughs lasting approximately 90 minutes each; everyone was welcome to participate and the route was determined together with the participants;
- a joint kick-off workshop with more than 40 participants in 5 theme groups, discussing the results of the diagnostic work and the needs of village councils;

- 28 consultation points in Choczewo, where all interested parties could discuss the programme and ask questions about offshore wind farms; the campaign was popular, with 48 idea cards submitted;
- meetings of a pro-social project team; 44 projects were recommended for financing by project owners;
- promotion of the programme at the September harvest festival, where an exhibition on the programme and offshore wind farms was presented; there was also a stand visited by approx. 150–200 people; in addition, 4 articles and 3 videos were published in the local media.

Projects supported under the Programme are intended to:

- contribute to solving the problems identified by the residents of the Choczewo commune at the diagnostic stage;
- respond to actual needs identified by the community of the Choczewo commune;
- increase social involvement, as well as strengthen social capital and competencies of the Choczewo commune residents;
- provide wider benefits for the community of the Choczewo commune; benefits derived by the Beneficiary from the effects of the Project cannot exceed the benefits for other members of the community.

On 12 April 2023, the 2nd edition of the “Choczewo. Wind Powered Commune” programme was launched.

The programme is also implemented by the Applicant together with other offshore wind farm project owners for the community of the Choczewo commune, and assumes direct cooperation with the local community, which, with the support of specialists, identifies its needs and problems, looking for the best solutions.

The meeting inaugurating the 2nd edition of the “Choczewo. Wind Powered Commune” programme was attended by approximately 40 people, including participants in the first edition as well as several new organisations. Throughout April, consultation points were organised in villages, at which interested residents and organisations discussed new ideas for activities in the following areas: social initiatives and social development, security, support for villages, cultural heritage, environmental protection, as well as environmental education and the development of children and young people; a greater emphasis on these areas is planned in this year's edition of the Programme. In order to involve young people in the Programme, meetings have already been held at two schools with which regular communication is maintained.

Thanks to donations from offshore wind farm project owners PGE Group, PKN Orlen and Ocean Winds, among others, as well as European Union funds under the European Maritime and Fisheries Fund, a 1500 m long and 3 m wide pedestrian and cycle path with a natural surface was built in the Choczewo commune. The shared-use pedestrian and cycle path offers a fast and comfortable connection between the town centre of Sasino-Stilo and beach exit 51. The aim of building the path was to direct tourist traffic in the area so as to protect and safeguard valuable natural habitats and species in the area of the Coastal Protected Landscape Area and partly in the Natura 2000 site *Mierzeja Sarbska*.

Table 16.4 presents possible areas of social conflicts, divided into project stages. It also contains a description of the measures already being implemented as well as those planned, which enable the management of individual areas in a responsible manner compliant with the best practices.

Table 16.4 Possible areas of social conflicts related to the location of the EXC BC-Wind OWF [source: internal materials]

Conflict area	Extended description	Measures preventing or reducing the risk of conflict	Project stage at which the measures are applied
Conflict of data. No information or inaccurate information about the project, its scope or effects	The Choczewo commune community is not included in the investment process. No information on the project, information is unavailable or access to information is inhibited In effect, there is social unrest, reliable information about the company's plans is replaced by rumours and speculations	Presentation of the project to the local authorities Regular meetings with the representatives of the local government, providing information on the project progress Presentation of the project during meetings with the communities from the areas directly covered by the project or adjacent to it (two rounds of meetings) Providing informational materials on the project in the commune Informational meetings with organisations operating in the area covered by or adjacent to the project (Rehabilitation and Holiday Centre for disabled people, ul. Spacerowa 38, Lubiatowo) Launching a contact box for people who want to ask the Applicant questions Direct meetings with the inhabitants interested in the project (apart from the round of consultation meetings) Providing information on the questions concerning the project arising on an on-going basis Publication of information about the project in local media	Design phase All mitigation measures mentioned for this factor have been implemented or are being continuously implemented
Ownership. No consent of the land owners on the location of the project (substation and cables)	The owners of land on which the project implementation is planned do not give their consent to the implementation of the project within the area of their property	Professionally conducted negotiations Reliable method of property valuation (survey statements)	Design phase All mitigation measures mentioned for this factor have been implemented. Agreement has been reached with the property owners on the location of the project and the terms of the property acquisition. This applies both to the property owners on which the substation implementation is planned and to the State Forests across which cables will be routed from the offshore wind farm
Decrease in the tourist attractiveness of the project area	The community fears that the project will negatively affect the tourists, thus decreasing the interest in staying and resting in Choczewo commune	For the customer substation a location has been selected far away from the most attractive tourist areas. The facility will be constructed on an agricultural plot, which is currently overgrown with a tree nursery	Design phase All mitigation measures mentioned for this factor have been implemented or are being continuously implemented

Conflict area	Extended description	Measures preventing or reducing the risk of conflict	Project stage at which the measures are applied
		In the course of joint work of the entities involved in its construction, the entire infrastructure was accumulated and concentrated in a single area, which significantly limited the impact of these facilities to one fragment of the commune A decision was made to select a cable laying technology, which significantly reduces the aesthetic impact of the cable line (as opposed to the towers of the overhead line), particularly in the area near the beach and therefore with the greatest potential for tourism Cable landfall was designed in such a way so that the infrastructure is completely invisible from the beach level, which is where tourists reside in the summer The cable route was designed in such a way so that it bypasses the most attractive area of the <i>Wydmę Lubińskie</i> dunes. To additionally reduce the impact on the areas adjacent to the dune, the horizontal directional drilling technology will be used The local community and the local authorities were informed about the measures that the Applicant had undertaken to limit the impact on the tourism of the commune Due to the need to carry out a forest clearance in the area of the cable location, the Applicant will work closely with the local government of the commune and the State Forests in order to choose the optimal way to develop the clearance area (e.g. ecological/nature trail, bicycle route, etc.).	
Impact on the natural environment	The local community is afraid that the project will negatively affect the environment, in particular the area directly adjacent to the beach and the forest, across which the cable will be routed	For the location of the project, an area was selected outside the Natura 2000 site boundaries to bypass the commune areas which have the highest nature conservation value An agreement was reached with other OWF operators to agree on one common area for the location of cables, thus significantly reducing the impact of the project to a single strip in the forest area	Design phase All mitigation measures mentioned for this factor have been implemented
Value of areas adjacent to the project	The community fears that the project will result in a decrease in land values	For the implementation of the project, areas used for agricultural purposes, where the commune does not expect dynamic residential development, were selected. This is confirmed by the provisions of the study of conditions and directions of spatial development of the Choczewo commune and the local spatial development plan	Design phase All mitigation measures mentioned for this factor have been implemented

Conflict area	Extended description	Measures preventing or reducing the risk of conflict	Project stage at which the measures are applied
		The areas covered by the project are located outside the areas of high tourist activity The project is partially implemented directly near a forest area, which is owned by the State Forests. It also constitutes a natural aesthetic barrier on one side of the facility The planned project will be implemented at a distance of approximately 1170 m from the buildings of the Osieki Lęborskie village	
Concerns connected to the cable line and customer substation impact on the health of inhabitants	The community fears that the cable line and the substation will be a source of impacts, which may affect the quality of life or be a risk to health.	The Applicant organised a series of information meetings, during which it explained in detail the issues connected to the impacts of the cable line and the substation. The issue of the project impact was also discussed during the meetings with the councillors The Applicant prepared and presented visualisations depicting the areas of the planned project, showing that it is located outside the developed areas The currently binding regulations regarding noise and EMF levels to be met by the Applicant mean that the facilities will not have a negative impact on the health of the community	Design phase All mitigation measures mentioned for this factor have been implemented or are being continuously implemented
Nuisance connected to the construction phase of the project	The community may experience discomfort as a result of the construction process of the cable line and the substation (clearance, construction)	The Project Owner communicated the details of work, principles of implementation, deadlines, etc. to the local authorities and village administrators from the areas affected by the construction in advance. A non-specialist information pamphlet on the construction will be prepared which will communicate to the community the most important information about the construction phase During the construction phase, a hotline will be launched for the inhabitants where they can get information about the ongoing works and report any nuisance related to the construction The Applicant will provide information on an ongoing basis about the planned works and any possible nuisance associated with them via the commune website and village administrators In the construction phase, BC-Wind will implement mitigation measures proposed in the EIA Report.	Construction phase

Conflict area	Extended description	Measures preventing or reducing the risk of conflict	Project stage at which the measures are applied
Permanent vicinity of the power infrastructure	The presence of the substation facility in close proximity to the town may affect the character of the town and permanently change its surroundings	Regular good-neighbourly activities spread over some time, e.g. supporting youth development or addressing the needs of the local community living in the vicinity of the substation infrastructure	Operation phase

In summary: the construction of the underground cable line and the ONS on arable land class 4b and 5, outside the boundaries of nature conservation forms and at an appropriate distance from the residential buildings of the Osieki Lęborskie village (approx. 1170 m), eliminates the nuisance such as noise or deterioration of the landscape values. It also eliminates the residents' concerns regarding the acoustic and EMF impacts on human health and living conditions.

As the calculations have shown, there are no objective health-related grounds for social conflicts due to EMF (see Sub-section 8.1.5.6). Also, in terms of the predicted noise levels, there are no objective health reasons for social conflicts. Sub-section 6.1 of this EIA Report indicates that the permissible noise levels will not be exceeded during the EXC BC-Wind OWF operation phase.

The proper public consultation stage is foreseen within the environmental impact assessment procedure, where the environmental report will be made available to the interested parties. It will be possible to submit comments and applications following the beginning of a 30-day procedure of public participation in the proceedings. The comments submitted during the public consultations should be addressed in the justification to the decision.

17 INDICATION OF DIFFICULTIES RESULTING FROM TECHNICAL SHORTCOMINGS OR GAPS IN THE CURRENT KNOWLEDGE ENCOUNTERED DURING THE PREPARATION OF THE REPORT

When preparing the Environmental Impact Assessment Report for the EXC BC-Wind OWF, no difficulties resulting from technical shortcomings were encountered.

The main difficulties encountered during the preparation of this EIA Report were due to the lack of detailed data and information on other investment projects that will be carried out in the future in the vicinity of the project in question, i.e. the EXC BC-Wind OWF. On the basis of the generally available data and the analysis of the records of the Maritime Spatial Plan of the Polish Sea Areas (MSPPSA) (Journal of Laws of 2021, item 935), it can be determined that the offshore area of the planned project will be also intended for the construction of the connection infrastructure of other OWFs. In accordance with the MSPPSA, the possibility of locating, for example, connection infrastructure in the territorial sea shall be limited to sea sub-basins marked as “Technical Infrastructure” (symbol: I.) In sea basins intended for other purposes, the MSPPSA provisions significantly hinder its construction or even exclude it. Taking into consideration, the number of planned OWFs located in the vicinity of the BC-Wind OWF, it should be expected that in the next couple of years from several to over a dozen kilometres of HV or EHV power cables will be laid in the sub-basins situated between km 150 and 180 of the coast. The route of cables channelled through the corridor layout of the sub-basins indicated in the MSPPSA will be concentrated in the vicinity of the coast, where the possibility of laying infrastructure has been narrowed down to one common sub-basin designated as 40a.201.I, the southern boundary of which is between km 161 and 163 of the coastline. It is anticipated that near the coast the cable lines will run relatively close to one another, i.e. at a distance of at least several dozen of meters. After the landfall of the power cables is completed, their route will be determined also by the directions of the spatial development of the Choczewo commune as well as the location of the power substation of Polskie Sieci Elektroenergetyczne S.A. The route of the cable lines will be channelled into a single infrastructural corridor, in accordance with the amendment to the Study of the Conditions and Directions of Spatial Development proceeded by the Choczewo commune (announcement of the Head of the Choczewo commune of 18 December 2020). The cable bed area common for various projects may involve a cumulation of the environmental impacts resulting from the construction, operation and possible disassembly of some power lines. However, a proper analysis and assessment of the cumulative environmental impact is impossible without the information on technical and technological parameters of the planned projects and the duration of their implementation. Lack of this knowledge posed the biggest obstacle encountered when preparing this EIA Report. In order to make the assessment of cumulative impacts as reliable as possible, the most unfavourable variant of the implementation of the above-mentioned projects was assumed, including the time overlap of their construction, operation and decommissioning (see Section 8.2.4.

In the case of gaps in the current knowledge, it should be noted that there are no data available on the impact of EMF emitted by extra high voltage lines on marine and terrestrial organisms within the range of the field.

18 The environmental impacts associated with the construction, operation and decommissioning phases of the planned project are well recognised for this type of project, therefore the formulation of potential environmental impacts and the formulation of mitigation measures was rather straightforward.

SUMMARY OF INFORMATION ON THE PROJECT

The proposed project consisting in the construction, operation and decommissioning of the EXC BC-Wind OWF is located in Polish sea areas and in the area of the Choczewo commune, Pomorskie Voivodeship. The starting point of the Project will be the current terminals at the Offshore Transformer Station located in the BC-Wind OWF area, and the ending point – the current terminals of the line disconnectors of the 400 kV feeder panel at the Choczewo Substation.

The location of the Project construction area within the sea areas is specified in the decisions of the Minister of Infrastructure No. 5/K/21, 6/K/21 and 3/K/2022 approving the location and methods of cable maintenance in the exclusive economic zone for the project as well as decisions of the Director of the Maritime Office in Gdynia No. 6/21 and 7/21 – permit for the laying and maintenance of cables within internal sea waters and territorial sea.

The surface of the construction area within which the EXC BC-Wind OWF will be built is nearly 75 km².

The EXC BC-Wind OWF will comprise the following components:

- EHV power cable lines in the offshore area;
- transition joint bays located on land, where subsea and underground cable lines are to be connected;
- EHV power cable lines in the onshore area;
- 220/400 kV or 275/400 kV onshore substation;
- EHV power cable line connecting the Onshore Substation with the Choczewo Substation;
- access roads, optical fibres and cable joints as well as other necessary associated infrastructure.

The list of key EXC BC-Wind OWF components along with their values and/or descriptions is provided in Table 18.1.

Table 18.1 List of key EXC BC-Wind OWF components [source: internal materials]

Component / parameter	Value / description
Length of the power connection line in the offshore area	approximately 33 km
Length of the HDD or HDD Intersect trenchless technology landfall section between the offshore and onshore power cable route (including the offshore and onshore sections)	approximately 600–1700 m
Length of the grid connection line within the onshore area	approximately 8 km
Type of power cables within the offshore area	Three-core AC subsea cables with an integrated fibre-optic cable
Type of power cables within the onshore area	Single-core AC earth cables
Fibre-optic line	approximately 8 km of the onshore section
Operating voltage of the power cables	220 or 275 kV
Maximum number of cables within the offshore area	2 single (three-core) cable lines in a single cable corridor

Component / parameter	Value / description
Maximum number of cable lines within the onshore area	2 single cable lines, consisting of 3 single-core cables each
Cable landfall method	Trenchless method – Horizontal Directional Drilling (HDD)
Method of power cable laying within the offshore area	Buried in the seabed or laid on the seabed, mechanically secured
Method of power cable laying in the onshore area	Open-trench technology / burying directly in the ground or in casing pipes
Method of connecting the ONS with the PSE S.A. substation.	Open-trench technology, 400kV cable (3 single-core cables), laid directly in the ground or in casing pipes
Maximum length of the ONS connection line with the PSE S.A. substation	1000 m

The concept for the planned project was developed on the basis of information on the commonly used technological and technical solutions for the implementation of such projects. The information and data collected on the environment allowed verifying the assumptions made in order to minimise the impact on the natural environment and other users of the area in which the construction and operation of the EXC BC-Wind OWF is planned. For the time being, it is assumed that upon completion of the operation phase, two decommissioning scenarios will be possible for the EXC BC-Wind OWF: deactivation of the cable lines and leaving the cables buried in the seabed and in the ground, or their removal. In the case of the ONS, the Applicant allows it to remain in the NPS after its necessary upgrading. The Applicant will be responsible for selecting the course of action in compliance with applicable regulations.

The analysis of EXC BC-Wind OWF impacts demonstrated that there will be no significant impacts in the offshore area, at any stage of the Project implementation. Most of the environmental impacts will be negligible and, rarely, of low significance.

Table 18.2 presents the assessment results of the impact that the planned project will have on the elements of the environment in individual phases of its implementation for the APV and RAV in the offshore area. Table 18.3 presents the results of the assessment of the impact that the proposed project would have on the components of the environment during individual phases of its implementation in the onshore area in the APV and RAV. The number in brackets refers to the number of various impacts of the proposed project on a given receptor, for which a specific impact significance was indicated.

Table 18.2. Results of the assessment of the impacts of the proposed project on the environmental components in individual phases of its implementation in the offshore area, in the APV and RAV [source: internal materials]

Receptor	Construction phase	Operation phase	Decommissioning phase*
Geological structure of the seabed, seabed relief, seabed sediments and access to raw materials and deposits	Low (3)**	Low (1)	Negligible (1)
Seawater and seabed sediment quality	Low (4) Negligible (1)	Negligible (1) Low (1)	Low (4) Negligible (1)
Climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)	Negligible (1)	No impacts	Negligible (1)
Ambient noise	Low (1)	Negligible (1)	Low (1)
Electromagnetic field	No impacts	Negligible (1)	No impacts

Receptor	Construction phase	Operation phase	Decommissioning phase*
Phytobenthos	No impacts	Moderate (1)	Negligible (1)
Macrozoobenthos	Low (1) Negligible (3)	Negligible (3)	Low (1) Negligible (1)
Ichthyofauna	Low (3) Negligible (1)	Moderate (3)	Low (3) Negligible (1)
Marine mammals	Low (1) Negligible (2)	Low (1) Negligible (2)	Low (1) Negligible (2)
Seabirds	Low (1) Negligible (3)	No impacts	Low (2) Negligible (2)
Protected areas other than Natura 2000 sites	No impacts	No impacts	No impacts
Natura 2000 sites	Low (1)	No impacts	Low (1)
Wildlife corridors	No impacts	No impacts	No impacts
Biodiversity	No impacts	No impacts	No impacts
Cultural values, monuments and archaeological sites and objects	Low (1)	No impacts	Low (1)
Use and management of the sea area and tangible property	Low (1)	No impacts	Low (1)
Landscape, including cultural landscape	Negligible (1)	No impacts	Negligible (1)
Population, health and living conditions	Negligible (1)	No impacts	Negligible (1)

* impacts are indicated for the EXC BC-Wind OWF decommissioning scenario involving the removal of cables from the environment

Table 18.3 Results of the assessment of the impact of the proposed project on environmental components during individual phases of its implementation in the onshore area in the APV and RAV [source: internal materials]

Receptor	Construction phase	Operation phase	Decommissioning phase*
Geological structure and coastal zone	Low (1)	No impact	Low (1)
Soils	Moderate (1) Low (2) Negligible (3)	Moderate (2) Negligible (1)	Moderate (1) Low (2) Negligible (3)
Access to raw materials and deposits	No impact	No impact	No impact
Quality of surface waters	Low (1)	Negligible (1)	Low (1)
Hydrological conditions and groundwater	Low (2)	Negligible (1)	Low (1)
Climate, including greenhouse gas emissions and impacts relevant for adaptation to climate change, impact on atmospheric air (air quality)	Moderate (1) Negligible (2)	Negligible (1)	Moderate (1) Negligible (2)
Ambient noise	Low (2)	Negligible (1)	Low (1)
Electromagnetic field	No impact	Negligible (1)	No impact
Fungi	Moderate (3) Significant (2) / No impact (2)**	Moderate (1) Low (2)	Moderate (2)
Lichens	Significant (2) / No impact (2)** Important (2) Low (2)	Moderate (1) Low (2)	Moderate (2)
Mosses and liverworts	Important (2) Low (1)	Moderate (1)	Moderate (2)

Receptor	Construction phase	Operation phase	Decommissioning phase*
Vascular plants and natural habitats	Important (2) Low (1)	Moderate (1) Low (1)	Moderate (2)
Invertebrates	Moderate (2) Low (2)	Low (1)	No impact
Herpetofauna	Significant (1) / No impact (1)** Important (1) Low (1) Moderate (3)	Low (1)	Low (1) Negligible (1)
Birds	Important (1) Low (2)	Important (2) Moderate (1) Low (2)	Moderate (1) Low (2)
Mammals	Important (1) Low (2)	Important (2) Low (1) Negligible (1)	Moderate (1) Low (2)
Other protected areas	Low (1) Moderate (4) Important (1)	Low (1)	No impacts
Natura 2000 sites	Moderate (2)	No impacts	No impacts
Wildlife corridors	Low (1)	Moderate (1)	No impacts
Biodiversity	Moderate (1)	Moderate (1)	Moderate (1)
Cultural values, monuments and archaeological sites and objects	No impacts	No impacts	No impacts
Use and management of land and tangible property	Low (2)	Low (2)	No impacts
Landscape, including cultural landscape	Moderate (1)	Important (2)	Moderate (1)
Population, health and living conditions	Low (1)	Low (1)	Low (1)

* impacts are indicated for the EXC BC-Wind OWF decommissioning scenario involving the removal of cables from the environment

** results of the assessment before and after the application of mitigation measures

For the purpose of avoiding, preventing or reducing the potential negative impacts identified for the EXC BC-Wind OWF, the application of various mitigation measures was indicated, most of which refer to the impacts on the terrestrial environment components, including significant impacts.

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List of figures

Figure 1.1 Location of the EXC BC-Wind OWF [source: internal materials]	13
Figure 2.1. Outline of the Environmental Impact Assessment Report preparation [source: internal materials]	33
Figure 2.2. Outline of environmental impact identification and impact assessment, including the determination of impact significance [source: internal materials based on ESPOO REPORT (2017)]......	38
Figure 3.1. Location of the proposed project – the EXC BC-Wind OWF [source: internal materials].....	45
Figure 3.2. Location of the proposed project –the EXC BC-Wind OWF – in the onshore part [source: internal materials]	46
Figure 3.3. Example of an extra high voltage subsea power cable construction [Source: JDR CABLE SYSTEMS LTD]	72
Figure 3.4. Example of a subsea cable plough [source: royalihc.com].....	74
Figure 3.5. Examples of plough (1, 2) and crawler (3, 4) vehicles used for the construction as part of the water jetting and mechanical trenching technologies [Source: eta-ltd.com, ctoffshore.dgweb.dk, pharosoffshoregroup.com]	74
Figure 3.6. Spatial scope of the EXC BC-Wind OWF cable line construction in the APV and RAV in the offshore part [source: internal materials]	77
Figure 3.7. Examples of transition joint bays [source: dunmain.com.au, sl-engineers.asia.com]	79
Figure 3.8. Location of the area of the EXC BC-Wind OWF cable entry into the borehole in the coastal part [source: internal materials].....	80
Figure 3.9. Methods of laying underground cable lines: cable lines in the ground (1), cable lines in pipes (2), cable lines in a cable duct (3), cable culvert (4) [source: dreamstime.com dunmain.com.au, e-cigre.org, nationalgrid.com]	83
Figure 3.10. Examples of 220 kV cable drums (1), vehicles with a cable trailer (2), EHV cable winching operation (3), example of a cable winch (4) [source: okorder.com, lancier-cable.de, rampionoffshore.com, watucab.pl].....	84
Figure 3.11. Example of a cable joint cross-section [source: Technical standard for the conditions of construction of HV power cable lines including cables and accessories, TAURON, 2018]	85
Figure 3.12. Arrangement of cables in a trench [source: internal materials]	85
Figure 3.13. Location of the EXC BC-Wind OWF in the onshore part divided into sections [source: internal materials]	90
Figure 3.14. Access roads considered for the EXC BC-Wind OWF Onshore Substation and cable line development area [source: internal materials]	94
Figure 3.15. Location of the proposed project – Applicant Proposed Variant [source: internal materials].....	98
Figure 3.16. Location of the proposed project – Rational Alternative Variant (RAV) [source: internal materials]	100
Figure 3.17. Examples of power cable defects [source: http://www.kee.agh.edu.pl/EUI/pdf/2007/EUI2007_49.pdf].....	127
Figure 5.1. Bathymetric map of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	136
Figure 5.2. Map of seabed types in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data].....	137
Figure 5.3. Map of seabed sediments in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	140

Figure 5.4. Map of boulder distribution in the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data].....	141
Figure 5.5. Probability of the harbour porpoise detection in the Baltic Sea in August [source: [372]]	156
Figure 5.6. Location of the EXC BC-Wind OWF area in relation to the Natura 2000 site Przybrzeżne Wody Bałtyku (PLB990002) [source: internal materials]	158
Figure 5.7. Location of the EXC BC-Wind OWF area in relation to the shipment routes and chemical weapons dumping grounds in the Baltic Sea [source: internal materials based on [26]]	164
Figure 5.8. Location of the EXC BC-Wind OWF area against the background of the Maritime Spatial Plan of the Polish Sea Areas [source: internal materials based on the MSPPSA drawing].	166
Figure 5.9. Location of the EXC BC-WIND OWF construction area against the background of shipping routes, projected on the navigational chart [source: internal materials based on SIPAM]	170
Figure 5.10. Distribution of vessel traffic in the central part of Polish sea areas in 2018–2019 [source: internal materials based on AIS data]	171
Figure 5.11. Location of the offshore part of the EXC BC-Wind OWF against the background of shipping routes [source: internal materials based on AIS data, 2018–2020].....	172
Figure 5.12. Location of the offshore part of the EXC BC-Wind OWF against the background of planned shipping routes [source: internal materials].....	172
Figure 5.13. Location of the offshore part of the EXC BC-Wind OWF against the background of the fishing vessel traffic in the central part of Polish sea areas [source: internal materials based on AIS data, 2018–2020]	173
Figure 5.14. Location of the offshore part of the EXC BC-Wind OWF against the background of the fishing vessel traffic at speeds below 5 knots in the central part of Polish sea areas [source: internal materials based on AIS data, 2018–2020]	174
Figure 5.15. Location of the EXC BC-Wind OWF area against the background of statistical rectangles [source: internal materials]	175
Figure 5.16. Volume [t] and value [PLN thousand] of fish catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials].....	179
Figure 5.17. Species structure in the catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]	180
Figure 5.18. Monthly value [PLN thousand] of fish catches within statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials].....	182
Figure 5.19. The proportion of different types of fishing gear in the catches within statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials].....	182
Figure 5.20. Number of fishing days within statistical rectangles O6, O7, O8 and P8, and in the remaining fishing areas of the Baltic Sea, in 2017–2021 [source: internal materials]	183
Figure 5.21. Administrative location of the planned project [source: internal materials]	185
Figure 5.22. Position of the planned project against the coastal strip of the Maritime Office in Gdynia [source: internal materials based on www.umgdynia.gov.pl/]	186
Figure 5.23. Percentage share of individual types of Quaternary geological formations in the planned project impact area [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests].....	188
Figure 5.24. Distribution of geological formations constituting the bedrock of soils in the planned project impact area [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests].....	189

Figure 5.25. Area of the Wydmy Lubiatońskie dunes – geomorphological sketch; 1 – nearshore seabed, 2 – beach, 3 – main dune forms, 4 – other aeolian forms (dunes, deflation monadnocks, deflation troughs with local peat deposits), 5 – unseparated adjacent area of the Wydmy Lubiatońskie dunes (area of biogenic accumulation, single aeolian forms, in the southern part, glacial, fluvioglacial and fluvial landforms) [source: internal materials].....	191
Figure 5.26. Location of selected waterline (LW) and dune (LPW) baselines between 2005 and 2020 against the orthophotomap from 2020; area of km 159.6–161.2 [source: internal materials]	192
Figure 5.27. Areas without vegetation cover or with scant vegetation cover [source: internal materials]	193
Figure 5.28. Differential map of the relief of the areas with active aeolian processes in the Wydmy Lubiatońskie dunes, developed by analysing lidar data from 2008 and 2020; against the background of the DTM from 2020 [source: internal materials]	194
Figure 5.29. Percentage share of individual types of soils in the planned project impact area [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests]	195
Figure 5.30. Planned project against individual soil types [source: internal materials on the basis of the data from the SSPC SRI in Puławy and the State Forests and OSM]	196
Figure 5.31. Location of the planned project against the occurrence of deposits and mineral resources [source: internal materials on the basis of OSM and MIDAS shp base]	198
Figure 5.32. Hydrographic network in the onshore part of the EXC BC-Wind OWF [source: internal materials In the area of the planned project potential impact, surface waters are represented by:	199
Figure 5.33. Location of the planned project against Surface Water Bodies (SWBs) [source: internal materials] The RWB Chelst river to its outlet into Lake Sarbsko RW200017476925 is a natural water body. Its state of water is bad, there is a risk of the environmental targets not being met. The entire catchment area is sensitive to eutrophication caused by pollutants from municipal sources, understood as enrichment of waters with nutrients, in particular with nitrogen and phosphorus compounds. For the catchment area, an exemption was made consisting in the deferment of the achievement of environmental targets, which is connected to the fact that the environmental targets of the RWB for the following indices have not been met (or are at risk): TOC, mercury(b).....	201
Figure 5.34. Location of the planned project against areas of low or average probability of flooding once in 500 years and once in 100 years [source: internal materials on the basis of the data from: https://wody.isok.gov.pl/].....	202
Figure 5.35. Position of the planned project against a hydrological map of Poland at a scale of 1:50 000. The First Aquifer – Occurrence and Hydrodynamics (Choczewo sheet 0004) [source: internal materials on the basis of the hydrological map of Poland at a scale of 1:50 000 [241]]	203
Figure 5.36. Changes in the average monthly temperature in Wejherowo district according to scenario RCP4.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of https://klimada2.ios.gov.pl/klimat-scenariusze-portal/]	208
Figure 5.37. Changes in the average monthly temperature in Wejherowo district according to scenario RCP8.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of https://klimada2.ios.gov.pl/klimat-scenariusze-portal/]	208
Figure 5.38. Changes in the average monthly precipitation in Wejherowo district according to scenario RCP4.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of https://klimada2.ios.gov.pl/klimat-scenariusze-portal/]	209
Figure 5.39. Changes in the average monthly precipitation in Wejherowo district according to scenario RCP8.5 in the decades 2021–2030, 2031–2040, 2041–2050, 2051–2060 in comparison to 2011–2020 [source: internal materials on the basis of https://klimada2.ios.gov.pl/klimat-scenariusze-portal/]	210

Figure 5.40. Spatial distribution of average annual wind speeds in the Pomorskie Voivodeship in 2018 [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020].....	212
Figure 5.41. Spatial distribution of the average annual air temperature determined by the WRF/CALMET model in the Pomorskie Voivodeship in 2018 [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020].....	213
Figure 5.42. Spatial distribution of annual precipitation [mm] determined by the WRF/CALMET model in the Pomorskie Voivodeship in 2018. [source: Appendix 1 to the Resolution No. 308/XXIV/20 of the Regional Council of the Pomorskie Voivodeship of 28 September 2020]	214
Figure 5.43. Location of the EXC BC-Wind OWF survey area, onshore part [source: C-Wind Sp. z o.o. data]	218
Figure 5.44. Forest habitat types in the onshore part of the EXC BC-Wind OWF area [source: internal materials on the basis of https://www.bdl.lasy.gov.pl/portal/uslugi-mapowe-ogc – status as at March 2023] ..	222
Figure 5.45. Forest habitat types within the impact area of the planned project [source: internal materials based on: https://www.bdl.lasy.gov.pl/portal/mapy]	227
Figure 5.46. Plots of fungal species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data].....	229
Figure 5.47. Plots of lichen species of high nature value [source: C-Wind Sp. z o.o. data]	231
Figure 5.48. Plots of moss and liverwort species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	233
Figure 5.49. Plots of vascular plant species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	235
Figure 5.50. Plots of natural habitats listed in Annex I to Directive 92/43/EE in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	236
Figure 5.51. Sites of invertebrate species of high nature conservation value in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	238
Figure 5.52. Location of the survey sites as part of the ichthyofauna surveys [source: C-Wind Sp. z o.o. data]	240
Figure 5.53. Amphibian breeding site and reptile habitat and breeding site in the onshore part of the EXC BC-Wind OWF area [source: C-Wind Sp. z o.o. data]	242
Figure 5.54. Course of the onshore part of the EXC BC-Wind OWF against valuable forest areas with tree hollows used as potential bat roots [source: C-Wind Sp. z o.o. data]	247
Figure 5.55. Identified bat colonies (1–4 breeding colonies, 5 – wintering site) [source: C-Wind Sp. z o.o. data]	249
Figure 5.56 Course of the onshore part of the EXC BC-Wind OWF against forms of nature conservation [source: internal materials]	252
Figure 5.57. Course of the onshore part of the EXC BC-Wind OWF against the European Ecological Network Natura 2000 sites [source: internal materials]	258
Figure 5.58 Course of the EXC BC-Wind OWF against main wildlife corridors (2005 concept) [source: internal materials on the basis of [200]]	264
Figure 5.59 Course of the onshore part of the EXC BC-Wind OWF against wildlife corridors (2011 concept) [source: internal materials on the basis of [199]]	265
Figure 5.60. Location of the planned project against wildlife corridors [Source: internal materials on the basis of [227]]	266

Figure 5.61 Location of the planned project against the East Atlantic Flyway [Source: internal materials on the basis of [30] and [285]]	267
Figure 5.62. Division of survey area into sectors as part of avifauna surveys [source: C-Wind Sp. z o.o. data]	271
Figure 5.63. Location of habitats recognised as valuable for protected mammal species (excluding bats) [source: C-Wind Sp. z o.o. data]	273
Figure 5.64. Locations of transects and the monitoring point [source: C-Wind Sp. z o.o. data]	275
Figure 5.65 Location of the EXC BC-Wind OWF in reference to the immovable monuments [source: internal materials based on the Archaeological Monument Record Sheets]	277
Figure 5.66. The location of archaeological sites in the area of the planned project impact and its closest vicinity [source: internal materials based on the data from Report XXX and the amendment of the Study of the Choczewo Commune]	282
Figure 5.67. The barrows inventoried within the archaeological site 2-37/9 [source: internal materials based on the Archaeological Monument Record Sheet AZP 2-37/9 of the Pomorskie Voivodeship Heritage Conservation Officer]	283
Figure 8.1. Cable line route for the EXC BC-Wind OWF in the APV and RAV [source: internal materials]	400
Figure 9.1. Alternative locations considered for Poland's first nuclear power plant with possible points connecting it to the National Power System [source: Poland's First Nuclear Power Plant. Project Specification Sheet. PGE EJ 1 Sp. z o.o., 2015]	428
Figure 9.2. Development areas for the Connection Infrastructure of the Baltic Power OWF, Baltica OWF and BC-Wind OWF [source: internal materials]	432
Figure 9.3. Course of the connection infrastructures of the offshore wind farms in the Choczewo commune [source: [304]]	434
Figure 13.1. Location of the plot of the mealy tooth Hydnellum ferrugineum intended for mitigation measures [source: internal materials]	451
Figure 13.2. Location of the plots of bark barnacle lichen Thelotrema lepadinum intended for mitigation measures [source: internal materials]	452
Figure 13.3. Location of the plot of powdered speckled shield lichen Punctelia jeckeri and one of the plots of the eagle's claws lichen Anaptychia ciliaris intended for mitigation measures [source: internal materials]	453
Figure 13.4. Location of the plots of eagle's claws lichen Anaptychia ciliaris intended for mitigation measures [source: internal materials]	454
Figure 13.5. Location of habitat patches in relation to the course of the project for sections 1–4 [source: internal materials]	455
Figure 13.6. Location of habitat patches in relation to the course of the project for sections 3–4 [source: internal materials]	456
Figure 13.7. Location of habitat patches in relation to the course of the project for sections 4–7 [source: internal materials]	457
Figure 13.8. Location of amphibian breeding sites 1 and 2 intended for mitigation measures in relation to the project EXC BC-WIND OWF route [source: internal materials]	459
Figure 13.9. Location of amphibian breeding site 3 intended for mitigation measures in relation to the project EXC BC-WIND OWF route [source: internal materials]	460

List of tables

Table 1.1. Basic parameters of the EXC BC-Wind OWF in the Applicant Proposed Variant (APV) [source: internal materials]	14
Table 1.2. Contents of the EXC BC-Wind OWF EIA Report in relation to the requirements of Article 66 of the EIA Act [source: internal materials].....	14
Table 2.1. Characteristics of the surveys on abiotic and biotic components of the marine and terrestrial environment conducted within the EXC BC-Wind OWF area and within its impact range [source: internal materials]	34
Table 2.2. Compilation of the methodologies of the modelling and analyses conducted for the purposes of the assessment of the EXC BC-Wind OWF impact on the environment in the onshore section [source: internal materials]	37
Table 2.3. Characteristics of the project impacts on receptors [source: internal materials].....	39
Table 2.4. Method of assessing individual impacts on receptors [source: internal materials]	40
Table 2.5. Matrix defining the significance of the impact in relation to the impact scale and receptor sensitivity [source: internal materials].....	40
Table 3.1. List of key parameters of the proposed project [source: internal materials]	43
Table 3.2. Geographical coordinates of the EXC BC-Wind OWF development area boundaries in the offshore and onshore areas [source: internal materials].....	47
Table 3.3. List of the cadastral plots in which the proposed project, the EXC BC-Wind OWF, is to be implemented [source: internal materials].....	65
Table 3.4. List of the cadastral plots within the range of the EXC BC-Wind OWF project potential impact [source: internal materials]	66
Table 3.5. Characteristics of the permanent and temporary technical belts of the EXC BC-Wind OWF [source: internal materials]	69
Table 3.6. Technical assumptions behind the construction of the EXC BC-Wind OWF within the offshore area [source: internal materials].....	71
Table 3.7. Geographical coordinates of the EXC BC-Wind OWF development area boundaries in the offshore part [source: internal materials]	78
Table 3.8. Technical assumptions behind the construction of the EXC BC-Wind OWF in the onshore area from the cable landfall to the ONS [source: internal materials]	81
Table 3.9. Length and maximum widths of individual BC-Wind cable corridor sections in the onshore part [source: internal materials].....	88
Table 3.10. Technical assumptions behind the EXC BC-Wind OWF in the onshore part covering the connection of the OnST with the Choczewo Substation [source: internal materials]	92
Table 3.11. Technological and technical parameters differentiating the Applicant Proposed Variant (APV) and the Rational Alternative Variant (RAV) [source: internal materials].....	101
Table 3.12. Compilation of the maximum quantities of waste estimated to be generated in the construction phase of the offshore part throughout a single year [source: internal materials].....	105
Table 3.13. Average fuel consumption for different types of vessels [source: internal materials based on [44]]	107
Table 3.14. Type of equipment used for cable laying in the onshore area [source: internal materials]	108

Table 3.15. Compilation of the maximum quantities of waste estimated to be generated in the construction phase of the onshore part throughout a single year [source: internal materials]	110
Table 3.16. Balance of the process water used for HDD as part of the EXC BC-Wind OWF construction [source: C-Wind Sp. z o.o.]	112
Table 3.17. Compilation of the maximum quantities of waste estimated to be generated in the operation phase of the offshore part throughout a single year [source: internal materials]	113
Table 3.18. Compilation of the maximum quantities of waste estimated to be generated within one year of operation during the operation phase in the onshore part [source: internal materials]	117
Table 3.19. Example of the content of oil substances and other hazardous substances in the offshore substation [source: internal materials]	121
Table 3.20. Matrix of connections between the project parameters and impacts – offshore part [Source: internal materials]	131
Table 3.21. Matrix of connections between the project parameters and impacts – onshore part [Source: internal materials]	131
Table 5.1. Air pollution values in Łeba [source: CIEP data; available at: http://powietrze.gios.gov.pl/pjp/archives]	150
Table 5.2. Species covered by Article 4 of Directive 2009/147/EC, species listed in Annex II to Directive 92/43/EC, as well as population assessment within the Przybrzeżne wody Bałtyku site for these species [source: SDF [130]]	159
Table 5.3. Provisions of the Maritime Spatial Plan of the Polish Sea Areas for the sea basins and sub-basins within the boundaries of the EXC BC-Wind OWF area [source: internal materials, based on the MSPPSA]	167
Table 5.4. Area occupied by the EXC BC-Wind OWF area in the APV and in the RAV (the calculations accounted for catch volumes of vessels below 12 m in length operating within the OWF area) [source: internal materials]	176
Table 5.5. Average volume of catches [t] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the volume of catches within the EXC BC-Wind OWF area in the APV and to the total volume of Polish catches in the Baltic Sea, by registration ports [source: internal materials]	177
Table 5.6. Average value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the value of catches within the EXC BC-Wind OWF area in the APV and to the total value of Polish catches in the Baltic Sea, by registration ports [source: internal materials]	177
Table 5.7. Average volume of catches [t] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the volume of catches within the EXC BC-Wind OWF area in the RAV and to the total volume of Polish catches in the Baltic Sea, by registration ports [source: internal materials]	178
Table 5.8. Average value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, in relation to the value of catches within the EXC BC-Wind OWF area in the RAV and to the total value of Polish catches in the Baltic Sea, by registration ports [source: internal materials]	178
Table 5.9. Volume [t] and value [PLN thousand] of fish catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021, by major species [source: internal materials].	179
Table 5.10. Volume [t] and value [PLN] of catches in statistical rectangles O6, O7, O8 and P8 in 2017–2021, by vessel length [source: internal materials]	180
Table 5.11. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021 [source: internal materials]	180

Table 5.12. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, within the EXC BC-Wind OWF area in the APV [source: internal materials]	181
Table 5.13. Value of catches [PLN thousand] in statistical rectangles O6, O7, O8 and P8 in 2017–2021, within the EXC BC-Wind OWF Area in the RAV [source: internal materials]	181
Table 5.14. Depth to the first aquifer along the route of the planned project [source: internal materials on the basis of the hydrological map of Poland. Choczewo sheet (1:50 000) [251]]	204
Table 5.15. Permissible noise levels in the environment [Source: Regulation of the Minister of the Environment of 14 June 2007 on permissible noise levels in the environment (Journal of Laws of 2007, No. 120, item 826 as amended)]	215
Table 5.16. Species subject to protection within the special protection area for birds Przybrzeżne wody Bałtyku (PLB990002) [source: SDF, February 2023]	259
Table 5.17. Habitats under protection within the special habitat protection area Białogóra (PLH220003) [source: SDF, March 2022]	260
Table 5.18. Total amount of breeding species identified across particular sectors of the area [source: C-Wind Sp. z o.o. data]	271
Table 5.19. List of immovable monuments located in the closest vicinity of the planned project impact area [source: internal materials on the basis of data from the National Institute of Cultural Heritage]	278
Table 5.20. Archaeological sites located in the area of the planned project impact and in its nearest vicinity, up to 200 m from the boundary of the planned project impact area [source: internal materials on the basis of data from the National Institute of Cultural Heritage]	280
Table 6.1. Comparison of the modelled values of acoustic power levels L_{WA} with the actual characteristics of the equipment designed at the EXC BC-Wind OWF ONS [source: internal materials]	289
Table 8.1. Sensitivity of seabed topography and structure to impacts resulting from the activities associated with the EXC BC-Wind OWF construction [Source: internal materials]	295
Table 8.2. Assessment of the scale of impacts on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	296
Table 8.3. Assessment of the significance of the impact on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	297
Table 8.4. Comparison of the loads of pollutants and nutrients that may be released into the water during the EXC BC-Wind OWF construction in the APV with the load entering the Baltic Sea through Polish rivers and rain [source: internal materials]	298
Table 8.5. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	302
Table 8.6. Assessment of the significance of the impact on the quality of seawater and seabed sediments resulting from the contamination of water and seabed sediments with accidentally released chemicals and waste during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	302
Table 8.7. Assessment of the scale of impacts on climatic conditions and ambient air quality during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	303
Table 8.8. Assessment of the significance of the impact on climatic conditions and ambient air quality during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	303
Table 8.9. Assessment of the scale of impacts on ambient noise during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	304

Table 8.10. Assessment of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	304
Table 8.11. Assessment of the scale of impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	307
Table 8.12. Assessment of the significance of the impact on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	308
Table 8.13. Potential impact of noise on ichthyofauna [source: internal materials based on [341]]	308
Table 8.14. Assessment of the scale of impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	316
Table 8.15. Assessment of the significance of the impact on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	316
Table 8.16. Assessment of the scale of impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	318
Table 8.17. Assessment of the significance of the impact on marine mammals during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	318
Table 8.18. Assessment of the scale of impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	320
Table 8.19. Assessment of the significance of the impact on seabirds during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	320
Table 8.20. Assessment of the scale of impacts on cultural values during the EXC BC-Wind OWF construction phase [source: internal materials]	325
Table 8.21. Assessment of the significance of the impact on cultural values during the EXC BC-Wind OWF construction phase [source: internal materials]	325
Table 8.22. Assessment of the scale of impacts on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	326
Table 8.23. Assessment of the significance of the impact on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	326
Table 8.24. Assessment of the scale of impacts on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	327
Table 8.25. Assessment of the significance of the impact on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the APV [source: internal materials]	327
Table 8.26. Assessment of the scale of impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	328
Table 8.27. Assessment of the significance of the impact on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	328
Table 8.28. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the EXC BC-Wind OWF operation phase [source: internal materials].	330
Table 8.29. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the EXC BC-Wind OWF operation phase [Source: internal materials]	330
Table 8.30. Assessment of the scale of impacts on phytobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	332

Table 8.31. Assessment of the significance of the impact on phytobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	332
Table 8.32. Assessment of the scale of impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	335
Table 8.33. Assessment of the significance of the impact on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	335
Table 8.34. Magnetic field strength [μ T] in relation to vertical distance from the seabed and horizontal distance from the cable (alternating current, cable burial depth 1 m) [source: internal materials based on [291]]	337
Table 8.35. Assessment of the scale of impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	339
Table 8.36. Assessment of the significance of the impact on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the APV [source: internal materials]	339
Table 8.37. Assessment of the scale of impacts on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the APV [source: internal materials]	344
Table 8.38. Assessment of the significance of the impact on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the APV [source: internal materials]	344
Table 8.39. Assessment of the scale of impacts on geological structure during the EXC BC-Wind OWF construction phase [source: internal materials]	349
Table 8.40. Assessment of the significance of the impact on geological structure during the EXC BC-Wind OWF construction phase [source: internal materials]	349
Table 8.41. Assessment of the scale of impacts on soils during the EXC BC-Wind OWF construction phase [source: internal materials]	350
Table 8.42. Assessment of the significance of the impact on soils during the EXC BC-Wind OWF construction phase [source: internal materials]	351
Table 8.43. Assessment of the scale of impacts on the quality of surface waters during the EXC BC-Wind OWF construction phase [source: internal materials]	352
Table 8.44. Assessment of the significance of impact on the quality of surface waters during the EXC BC-Wind OWF construction phase [source: internal materials]	352
Table 8.45. Assessment of the scale of impacts on hydrogeological conditions and groundwater during the EXC BC-Wind OWF construction phase [source: internal materials]	354
Table 8.46. Assessment of the significance of the impact on the hydrogeological conditions and groundwater during the EXC BC-Wind OWF construction phase [source: internal materials]	354
Table 8.47. Figures of air pollutant emission resulting from the combustion of 1 kg of diesel oil in utility machinery engines [source: EMEP/EEA air pollutant emission inventory guidebook (2007)]	355
Table 8.48. Levels of air pollutant emission [source: internal materials based on [104]]	355
Table 8.49. Assessment of the scale of impacts on air quality during the EXC BC-Wind OWF construction phase [source: internal materials]	356
Table 8.50. Assessment of the significance of the impact on air quality during the EXC BC-Wind OWF construction phase [source: internal materials]	356

Table 8.51. Assessment of the scale of impacts on ambient noise during the EXC BC-Wind OWF construction phase [source: internal materials]	358
Table 8.52. Assessment of the significance of the impact on ambient noise during the EXC BC-Wind OWF construction phase [source: internal materials]	358
Table 8.53. Assessment of the scale of impacts on the biota of fungi during the EXC BC-Wind OWF construction phase [source: internal materials]	359
Table 8.54. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF construction phase [source: internal materials]	359
Table 8.55. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]	360
Table 8.56. Assessment of the scale of impacts on lichen biota during the EXC BC-Wind OWF construction phase [source: internal materials]	361
Table 8.57. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF construction phase [source: internal materials]	361
Table 8.58. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]	361
Table 8.59. Assessment of the scale of impacts on bryoflora during the EXC BC-Wind OWF construction phase [source: internal materials]	362
Table 8.60. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF construction phase [source: internal materials]	363
Table 8.61. Surface area of the natural habitats found within the EXC BC-Wind OWF area [source: internal materials]	363
Table 8.62. Assessment of the scale of impacts on vascular plant species and natural habitats during the EXC BC-Wind OWF construction phase [source: internal materials]	364
Table 8.63. Assessment of the significance of the impact on liverworts and natural habitats during the EXC BC-Wind OWF construction phase [source: internal materials]	364
Table 8.64. Assessment of the scale of impacts on invertebrates during the EXC BC-Wind OWF construction phase [source: internal materials]	365
Table 8.65. Assessment of the significance of the impact on invertebrates during the EXC BC-Wind OWF construction phase [source: internal materials]	365
Table 8.66. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF construction phase [source: internal materials]	366
Table 8.67. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF construction phase [source: internal materials]	367
Table 8.68. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF construction phase with the application of minimisation measures [source: internal materials]	368
Table 8.69. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF construction phase [source: internal materials]	368
Table 8.70. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF construction phase [source: internal materials]	368
Table 8.71. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]	369

Table 8.72. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]	369
Table 8.73. Assessment of the scale of impacts on protected areas other than Natura 2000 sites during the EXC BC-Wind OWF construction phase [source: internal materials]	370
Table 8.74. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF construction phase [source: internal materials]	371
Table 8.75. Assessment of the scale of impacts on Natura 2000 site Białogóra PLH220003 during the EXC BC-Wind OWF construction phase [source: internal materials]	371
Table 8.76. Assessment of the significance of the impact on Natura 2000 site Białogóra PLH220003 during the EXC BC-Wind OWF construction phase [source: internal materials]	371
Table 8.77. Assessment of the scale of impacts on the use and development of land and tangible property during the EXC BC-Wind OWF construction phase [source: internal materials]	373
Table 8.78. Assessment of the significance of the impact on the use and development of land and tangible property during the EXC BC-Wind OWF construction phase [source: internal materials]	373
Table 8.79. Assessment of the scale of impacts on landscape, including cultural landscape, during the EXC BC-Wind OWF construction phase [source: internal materials]	374
Table 8.80. Assessment of the significance of the impact on landscape, including cultural landscape, during the EXC BC-Wind OWF construction phase [source: internal materials]	374
Table 8.81. Assessment of the scale of impacts on population, health and living conditions of people during the EXC BC-Wind OWF construction phase [source: internal materials]	375
Table 8.82. Assessment of the significance of the impact on population, health and living conditions of people during the EXC BC-Wind OWF construction phase [source: internal materials]	375
Table 8.83. Assessment of the scale of impacts on soils during the EXC BC-Wind OWF operation phase [source: internal materials]	376
Table 8.84. Assessment of the significance of the impact on soils during the EXC BC-Wind OWF operation phase [source: internal materials]	376
Table 8.85. Assessment of the scale of impacts on the quality of surface waters during the EXC BC-Wind OWF operation phase [source: internal materials]	378
Table 8.86. Assessment of the significance of the impact on the quality of surface waters during the EXC BC-Wind OWF operation phase [source: internal materials]	378
Table 8.87. Assessment of the scale of impacts on fungi during the EXC BC-Wind OWF operation phase [source: internal materials]	380
Table 8.88. Assessment of the significance of the impact on fungi during the EXC BC-Wind OWF operation phase [source: internal materials]	380
Table 8.89. Assessment of the scale of impacts on lichens during the EXC BC-Wind OWF operation phase [source: internal materials]	381
Table 8.90. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF operation phase [source: internal materials]	381
Table 8.91. Assessment of the scale of impacts on mosses and liverworts during the EXC BC-Wind OWF operation phase [source: internal materials]	382
Table 8.92. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF operation phase [source: internal materials]	382

Table 8.93. Assessment of the scale of impacts on vascular plants and natural habitats during the EXC BC-Wind OWF operation phase [source: internal materials].....	382
Table 8.94. Assessment of the significance of the impact on vascular plants and natural habitats during the EXC BC-Wind OWF operation phase [source: internal materials]	383
Table 8.95. Assessment of the scale of impacts on invertebrates during the EXC BC-Wind OWF operation phase [source: internal materials].....	383
Table 8.96. Assessment of the significance of the impact on invertebrates during the EXC BC-Wind OWF operation phase [source: internal materials]	383
Table 8.97. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF operation phase [source: internal materials].....	384
Table 8.98. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF operation phase [source: internal materials]	384
Table 8.99. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF operation phase [source: internal materials]	385
Table 8.100. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF operation phase [source: internal materials]	385
Table 8.101. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF operation phase [source: internal materials].....	386
Table 8.102. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF operation phase [source: internal materials]	386
Table 8.103. Assessment of the scale of impacts on landscape, including cultural landscape, during the EXC BC-Wind OWF operation phase [source: internal materials]	388
Table 8.104. Assessment of the significance of the impact on landscape, including cultural landscape, during the EXC BC-Wind OWF operation phase [source: internal materials]	388
Table 8.105. Assessment of the scale of impacts on the biota of fungi during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	391
Table 8.106. Assessment of the significance of the impact on the biota of fungi during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	391
Table 8.107. Assessment of the scale of impacts on lichens during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	392
Table 8.108. Assessment of the significance of the impact on lichens during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	392
Table 8.109. Assessment of the scale of impacts on bryoflora during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	393
Table 8.110. Assessment of the significance of the impact on mosses and liverworts during the EXC BC-Wind OWF decommissioning phase [source: internal materials].....	393
Table 8.111. Assessment of the scale of impacts on vascular plant species and natural habitats during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	394
Table 8.112. Assessment of the significance of the impact on vascular plants and natural habitats during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	394
Table 8.113. Assessment of the scale of impacts on herpetofauna during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	395

Table 8.114. Assessment of the significance of the impact on herpetofauna during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	395
Table 8.115. Assessment of the scale of impacts on birds during the EXC BC-Wind OWF decommissioning phase [source: internal materials].....	396
Table 8.116. Assessment of the significance of the impact on birds during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	396
Table 8.117. Assessment of the scale of impacts on mammals during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	396
Table 8.118. Assessment of the significance of the impact on mammals during the EXC BC-Wind OWF decommissioning phase [source: internal materials]	396
Table 8.119. Assessment of the scale of impacts on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	401
Table 8.120. Assessment of the significance of the impact on geological structure, seabed relief and seabed sediments during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	401
Table 8.121. Comparison of the loads of pollutants and nutrients that may be released into the water during the EXC BC-Wind OWF construction in the RAV with the load entering the Baltic Sea through Polish rivers and rain [source: internal materials]	402
Table 8.122. Assessment of the scale of impacts on the quality of seawater and seabed sediment during the EXC BC-Wind OWF construction phase in the RAV [source: internal materials]	403
Table 8.123. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	403
Table 8.124. Assessment of the scale of impacts on climatic conditions and atmospheric air quality during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	404
Table 8.125. Assessment of the significance of the impact on climatic conditions and atmospheric air quality during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	404
Table 8.126. Assessment of the scale of impacts on ambient noise during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	404
Table 8.127. Assessment of the significance of the impact on ambient noise during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	405
Table 8.128. Assessment of the scale of impacts on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	405
Table 8.129. Assessment of the significance of the impact on macrozoobenthos during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	406
Table 8.130. Assessment of the scale of impacts on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	406
Table 8.131. Assessment of the significance of the impact on ichthyofauna during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	406
Table 8.132. Assessment of the scale of impacts on marine mammals during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	407
Table 8.133. Assessment of the significance of the impact on marine mammals during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	407

Table 8.134. Assessment of the scale of impacts on seabirds during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials].....	408
Table 8.135. Assessment of the significance of the impact on seabirds during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	408
Table 8.136. Assessment of the scale of impacts on cultural values during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	411
Table 8.137. Assessment of the significance of the impact on cultural values during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	411
Table 8.138. Assessment of the scale of impacts on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	412
Table 8.139. Assessment of the significance of the impact on landscape, including cultural landscape, during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	412
Table 8.140. Assessment of the scale of impacts on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	413
Table 8.141. Assessment of the significance of the impact on population, health and living conditions of people during the construction phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	413
Table 8.142. Assessment of the scale of impacts on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials].....	413
Table 8.143. Assessment of the significance of the impact on geological structure, seabed relief, seabed sediments, access to raw materials and deposits during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	414
Table 8.144. Assessment of the scale of impacts on the quality of seawater and seabed sediment during operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	414
Table 8.145. Assessment of the significance of the impact on the quality of seawater and seabed sediment during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	414
Table 8.146. Assessment of the scale of impacts on phyto-benthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	415
Table 8.147. Assessment of the significance of the impact on phyto-benthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	416
Table 8.148. Assessment of the scale of impacts on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	416
Table 8.149. Assessment of the significance of the impact on macrozoobenthos during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	416
Table 8.150. Assessment of the scale of impacts on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	416
Table 8.151. Assessment of the significance of the impact on ichthyofauna during the operation phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	417
Table 8.152. Assessment of the scale of impacts on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the RAV [source: internal materials]	421
Table 8.153. Assessment of the significance of the impact on geological structure, seabed sediments, access to raw materials and deposits during the decommissioning phase of the EXC BC-Wind OWF in the RAV [source: internal materials].....	422

Table 9.1. List of projects which may cause cumulative impacts when combined with the planned underground cable line [source: internal materials]	426
Table 9.2. List of binding decisions issued by the Director of the Maritime Office in Gdynia [source: data of the Maritime Office in Gdynia [402]]	429
Table 9.3. Maximum allowable cumulative noise levels in the environment during the construction and operation phases based on the Regulation of the Minister of the Environment [source: internal materials]	438
Table 11.1. Comparison of the impact significance of the EXC BC-Wind OWF on environmental components assessed during particular phases in the AVP and RAV [source: internal materials]	444
Table 16.1. Surface area of statistical rectangles N7, N8, O6, O7 and O8 within the boundaries of the Export Cable of the BC-Wind OWF development area [source: internal materials]	466
Table 16.2. List of information and consultation meetings held in the Choczewo commune [source: Applicant's data]	467
Table 16.3. Number of projects and co-funding amounts in individual areas of support during the 1st edition of the "Choczewo. Wind-Powered Commune" programme [source: Project Owner's data]	468
Table 16.4 Possible areas of social conflicts related to the location of the EXC BC-Wind OWF [source: internal materials]	471
Table 18.1 List of key EXC BC-Wind OWF components [source: internal materials]	477
Table 18.2. Results of the assessment of the impacts of the proposed project on the environmental components in individual phases of its implementation in the offshore area, in the APV and RAV [source: internal materials]	478
Table 18.3 Results of the assessment of the impact of the proposed project on environmental components during individual phases of its implementation in the onshore area in the APV and RAV [source: internal materials]	479