BUNDESAMT FÜR
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HYDROGRAPHIE

Preliminary Investigation of Site and Determination of Suitability

Description of sites N-3.7, N-3.8 & O-1.3 in the German EEZ in the North Sea and Baltic Sea

2021

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Federal Maritime and
Hydrographic Agency (BSH)

January 2021

on behalf of the BNetzA

Photo: Marcel Ruhnau, BSH

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1 Objectives and overview

Photo: Sebastian Fuhrmann, BSH

This document is aimed at those interested in the tenders issued by the Federal Network Agency (BNetzA) for the investigated sites N-3.7 and N-3.8 in area N-3 in the German Exclusive Economic Zone (EEZ) in the North Sea and site O-1.3 in area O-1 in the German EEZ in the Baltic Sea.

This document provides an overview of:

- the location and environment of the individual sites
- the site investigations carried out and their results in terms of the marine environment, subsoil, wind and oceanographic conditions and the traffic situation as well as
- the specifications applicable to the implementation of projects at the sites and in the planning approval process.

This document has been produced solely for information purposes and does not substitute the legally specified public announcement. Further information about site investigations including all reports, data and other products has been published at: https://www.bsh.de/EN/TOPICS/Offshore/Offshore_site_investigations/offshore_site_investigations_node.html

2 Introduction

As of 2021, the BNetzA will be determining, by means of an invitation to tender, the addressee and the subsidy level according to the Renewable Energies Act (EEG) pursuant to section 16 of the Offshore Wind Energy Act (WindSeeG) for offshore wind turbines that enter operation from 1 January 2026 onwards. The location, time and sequence of the sites to be put out to tender are each defined by the Site Development Plan (FEP). Pursuant to the currently applicable FEP, sites N-3.7, N-3.8 and O-1.3 are to be put out to tender in 2021.

The sites designated in the FEP are being subjected to site investigations by the Federal Maritime and Hydrographic Agency (BSH) pursuant to Sec. 9 et seq. WindSeeG. The site investigation includes investigations concerning the marine environment, a preliminary survey of the subsoil and an investigation concerning the wind and oceanographic conditions at the site to be put out to tender.

This information can be used by the bidders as the basis for the BNetzA invitation to tender. Additionally, the subsequent planning approval procedure for offshore wind turbines at these sites will be accelerated.

Based amongst other aspects on the results of the preliminary investigation of site investigation, the suitability of the sites for the invitation to tender will be examined. In this process, an evaluation is performed to determine whether the concerns of the marine environment, shipping and other concerns (i. e. spatial planning, Site Development Plan specifications, military concerns, concerns of cable and pipeline owners) that were to be taken into consideration in the preceding FEP preparation procedure and would have to be taken into consideration in the subsequent planning approval process would be affected by the development of the site with wind turbines.

A Strategic Environmental Assessment (SEA) must also be conducted in this process. To do this, a scope of investigation is defined for each site, an environmental report is produced and public-interest bodies, associations and the public are involved.

The determination of suitability can include specifications for the subsequent project, particularly concerning the nature and scope of the site development and the location of the development at the site, if there are otherwise concerns regarding impairments of the criteria and concerns pursuant to Sec. 10 para 2 WindSeeG due to the construction and the operation of offshore wind turbines at this site.

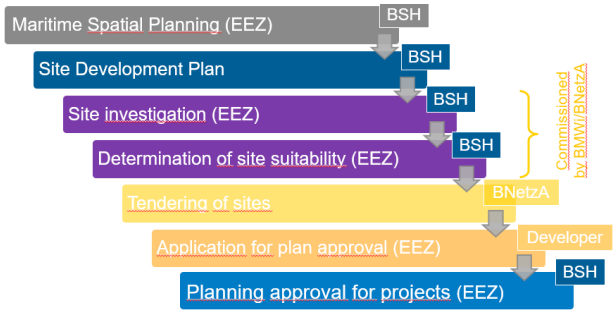


Figure 1: The preliminary investigation of site investigation and determination of suitability in the overall system of the central model for the area of the German EEZ in the North Sea and Baltic Sea

3 Description of the sites in the auction year 2021

Pursuant to Sec. 17 WindSeeG, the BNetzA will be putting the designated FEP sites out to tender each year on the bidding date of 1 September from 2021 onwards.

The currently applicable FEP has designated sites N-3.7, N-3.8 and O-1.3 for tender in 2021.

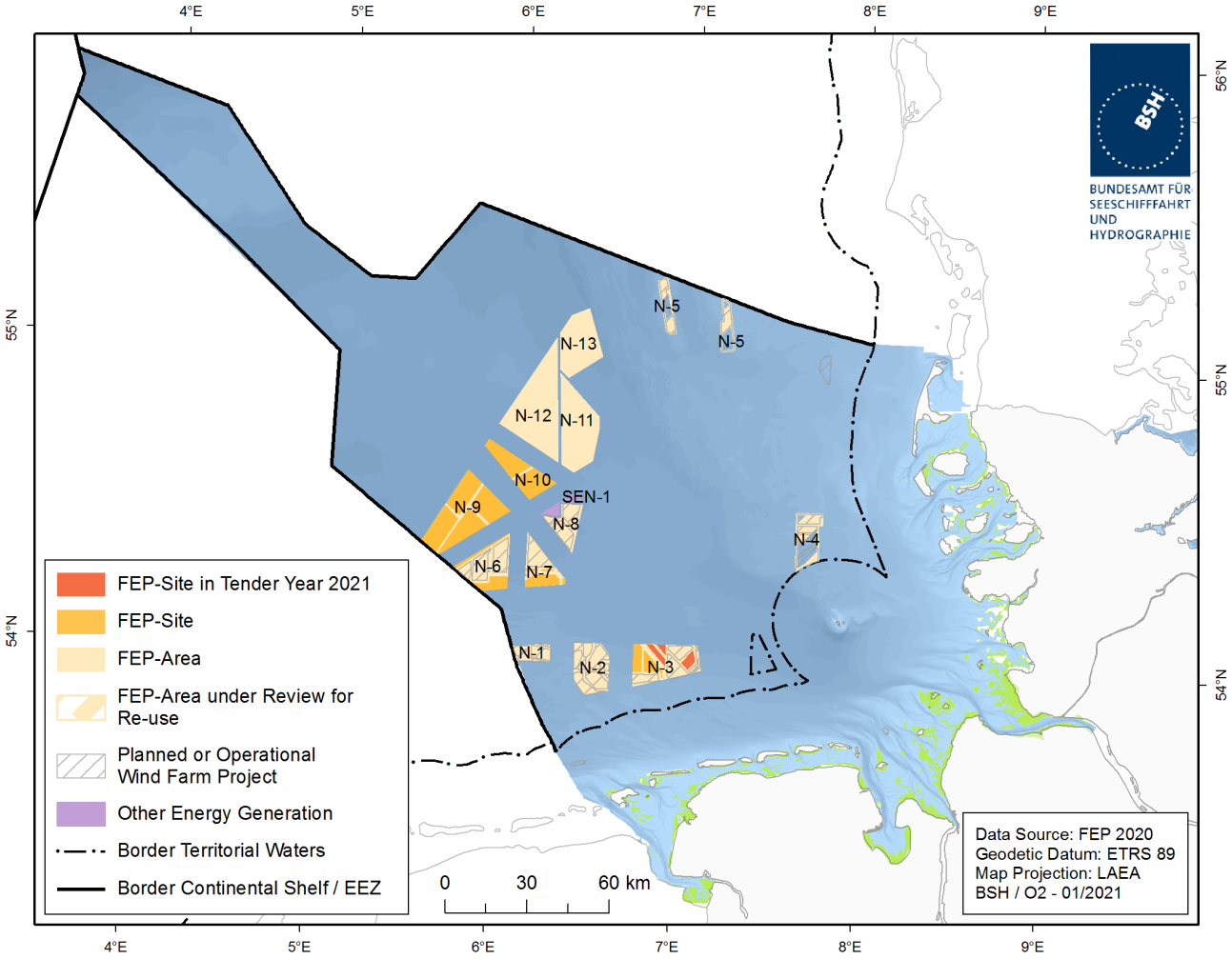


Figure 2: Overview of the location of areas and areas (ETRS 89, LAEA) in the German EEZ of the North Sea based on the FEP 2020. The coordinates are provided as additional information in the GeoSea portal (geodata infrastructure of the BSH).

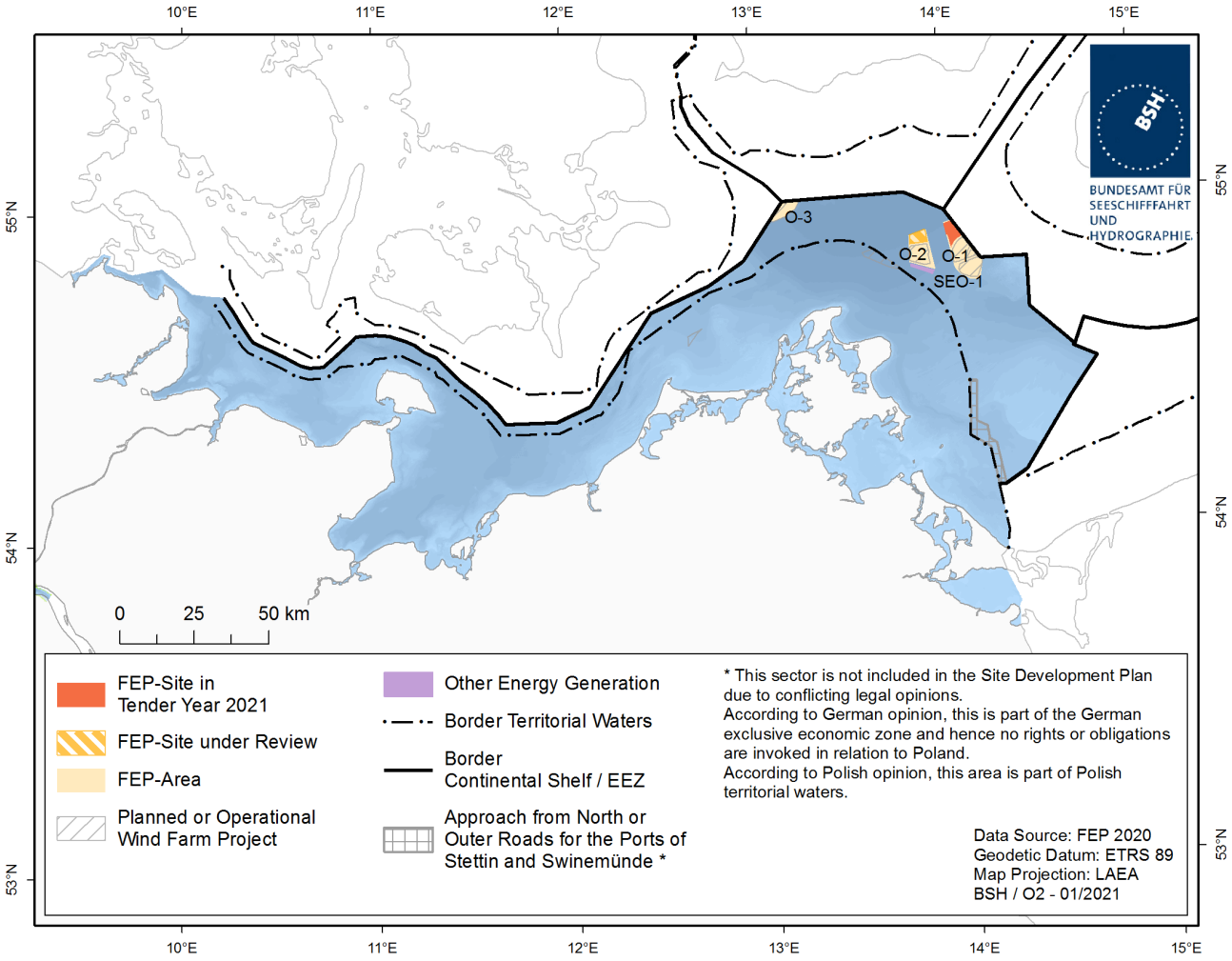


Figure 3: Overview of the location of areas and areas (ETRS 89, LAEA) in the German EEZ of the Baltic Sea based on the FEP 2020. The coordinates are provided as additional information in the GeoSea portal (geodata infrastructure of the BSH).

3.1 Site N-3.7

Site N-3.7 is situated in the German EEZ in the North Sea in the eastern part of area N-3 (Figure 4) which is defined in the FEP 2020.

It is located between the traffic separation schemes ‚German Bight Western Approach' and ‚Terschelling German Bight'. The area in which the site is located is bordered to the east by the traffic separation scheme ‚Jade Approach'. The water depths are 29 to 33 m (Lowest Astronomical Tide). Directly to the west are the offshore wind farms ‚Gode Wind 01' and ‚Gode Wind 02', which are already in operation. The area for the ‚Gode Wind 3' project, for which planning has already been approved, is situated to the east. The distances from the nearest islands of Norderney, Juist, Baltrum and Langeoog, which are located to the south of the site, are around 30–40 km.

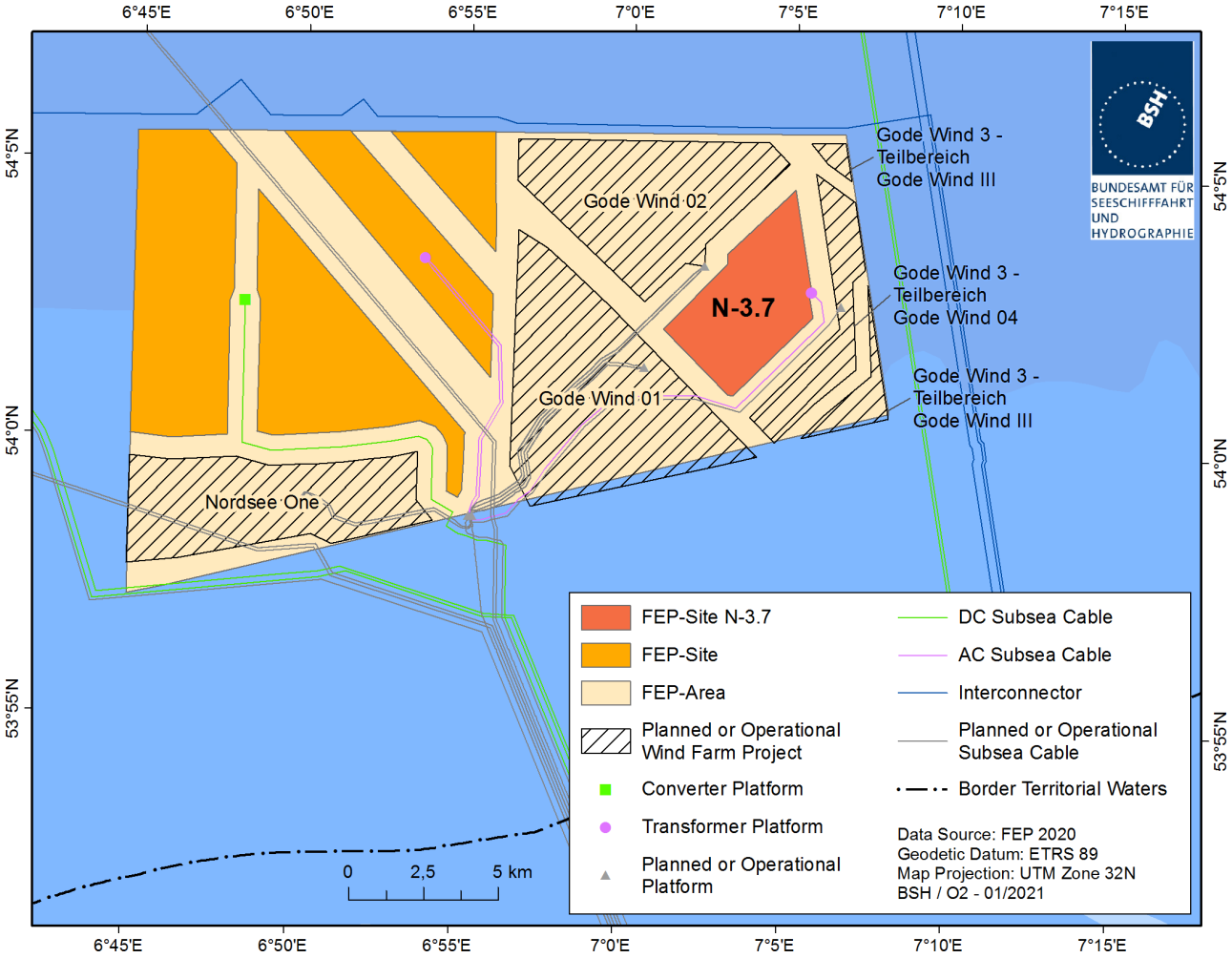


Figure 4: Overview of the location of site N-3.7 (ETRS 89, UTM 32N) in the German EEZ of the North Sea based on the FEP 2020. The coordinates are provided as additional information in the GeoSea portal (geodata infrastructure of the BSH).

3.2 Site N-3.8

Site N-3.8 is located in the German EEZ in the North Sea in the western part of area N-3 (Figure 5) which is defined in the FEP 2020. The operational TAT 14 data cable runs through the site. The site is bordered to the northwest by the ‚NorPipe' pipeline. Site N-3.8 is crossed by at least three decommissioned submarine cables.

It is bordered to the east by the offshore wind farms ‚Gode Wind 01' and ‚Gode Wind 02' which are already in operation. The traffic separation scheme ‚German Bight Western Approach' runs along the northern border. The water depths lie in a range from 29 to 33 m (LAT).

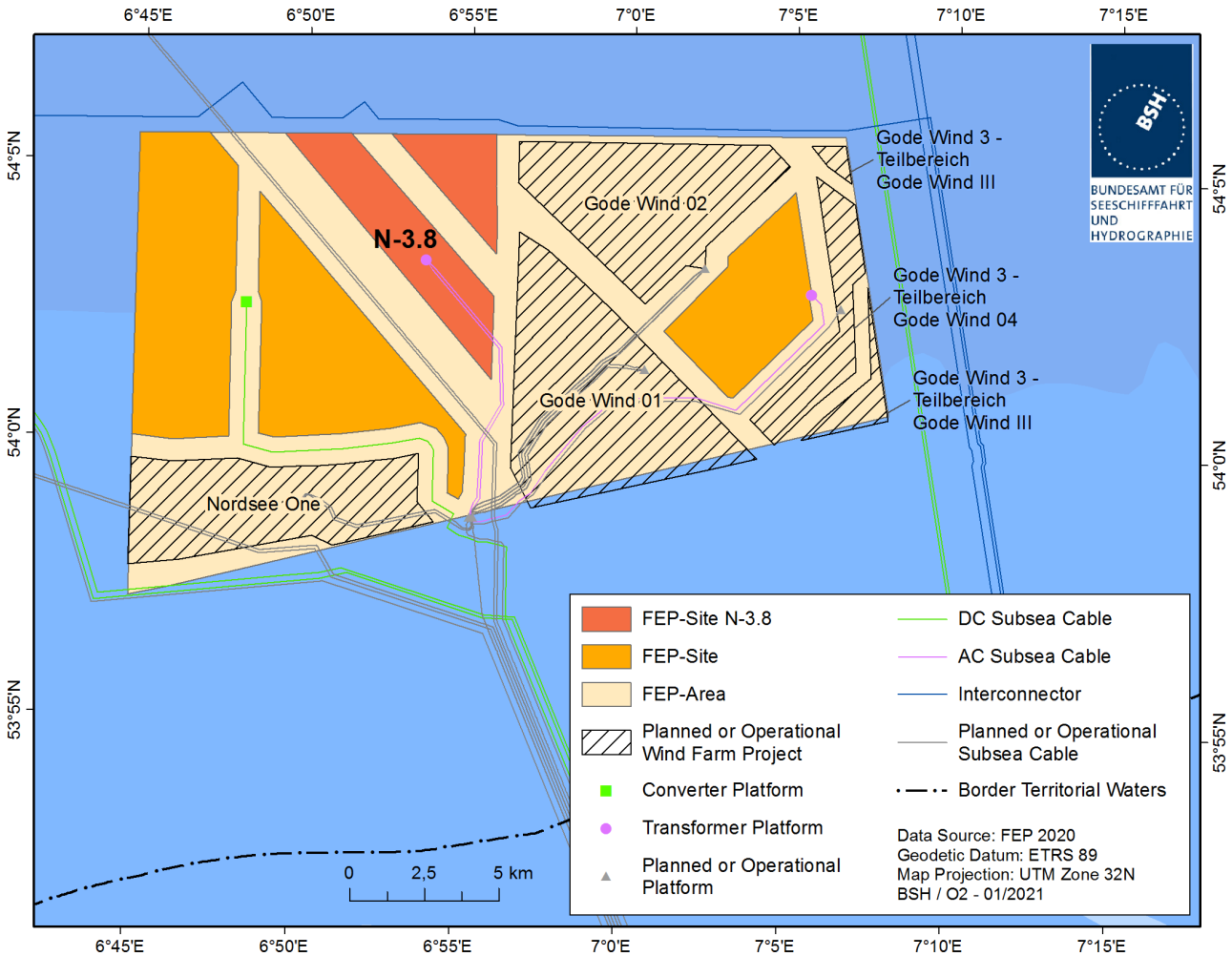


Figure 5: Overview of the location of site N-3.8 (ETRS 89, UTM 32N) in the German EEZ of the North Sea based on the FEP 2020. The coordinates are provided as additional information in the GeoSea portal (geodata infrastructure of the BSH).

3.3 Site O-1.3

Site O-1.3 is situated in the German EEZ in the Baltic Sea in the northern part of area O-1 which is defined in the FEP 2020. The site is located around 38 km northeast of the island of Rügen (Jasmund). The nearest mainland is situated approx. 82 km away in the southern area of the Greifswalder Bodden (community of Lubmin). The water depths are between 40 and 45 m (Mean Sea Level).

The traffic separation scheme ‚North of Rügen' runs to the north of the site and the shipping priority and reservation area designated as shipping route 20 in the Spatial Plan for the Baltic Sea is situated to the west. The operational offshore wind farms ‚Wikinger', ‚Wikinger South' and ‚Arkona Basin Southeast' border area O-1 directly to the south.

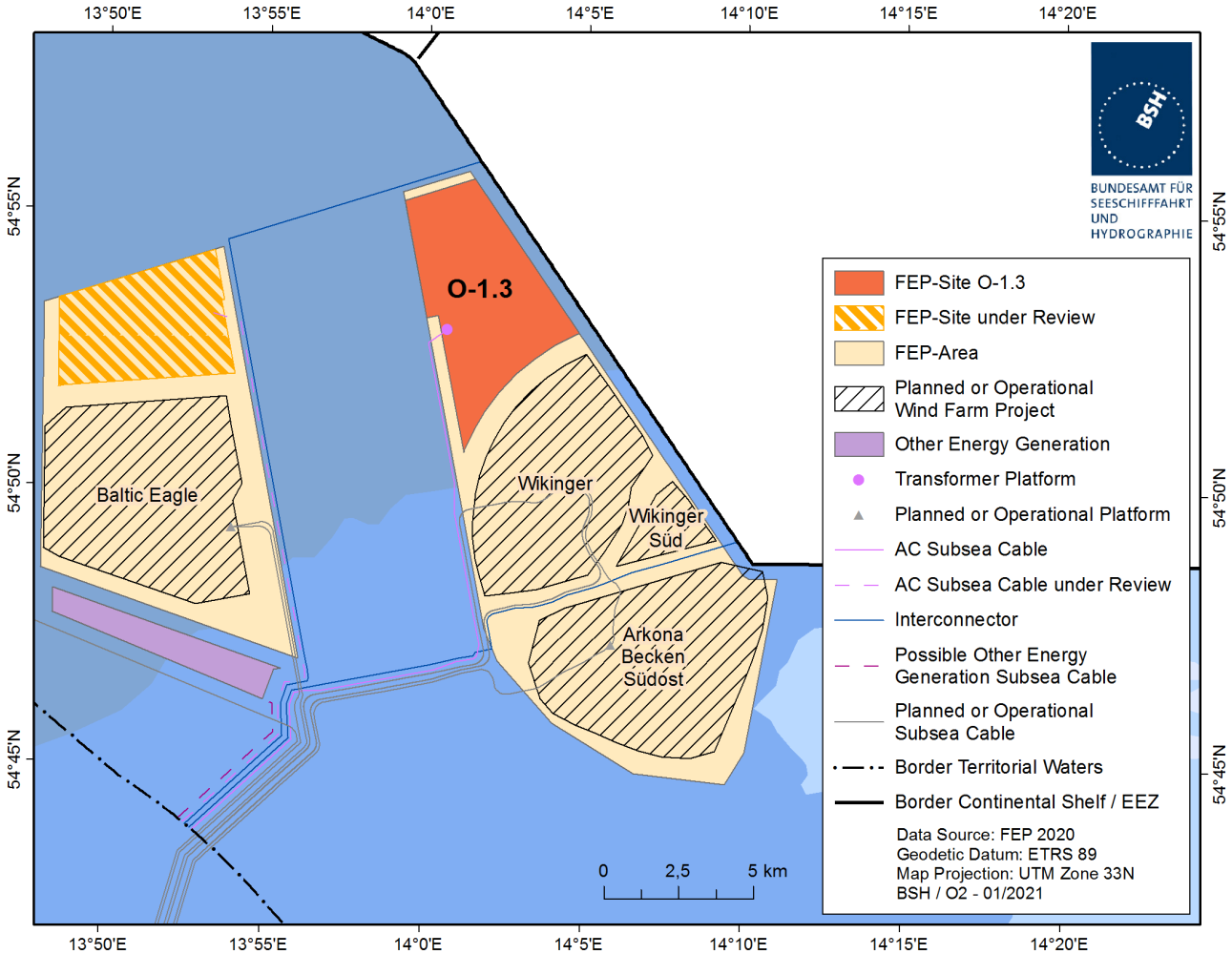


Figure 6: Overview of the location of site O-1.3 (ETRS 89, UTM 33N) in the German EEZ of the Baltic Sea based on the FEP 2020. The coordinates are provided as additional information in the GeoSea portal (geodata infrastructure of the BSH). This representation is for information purposes; the designation in the FEP remains authoritative for defining the site.

4 Preliminary investigation of sites

4.1 Preliminary investigation of sites at site N-3.7

The preliminary investigation of sites carried out at site N-3.7 are described in the following.

4.1.1 Preliminary investigation of sites concerning the marine environment

Standard gear for surveying fish according to StUK4: 7 m beam trawl on the starboard outrigger of a shrimp cutter chartered for the site investigation of the protected asset fish. (Photo: Sebastian Fuhrmann, BSH)

The preliminary investigation of sites concerning the marine environment that are described in the following implement the requirements of the ‚Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment' standard (currently StUK4). Pursuant to Sec. 10 para 1 sentence 1 WindSeeG, investigations that are required for an environmental impact assessment in the planning approval process pursuant to Sec. 45 WindSeeG concerning the construction of offshore wind turbines at this site and which can be carried out irrespective of the subsequent design of the project are carried out and documented.

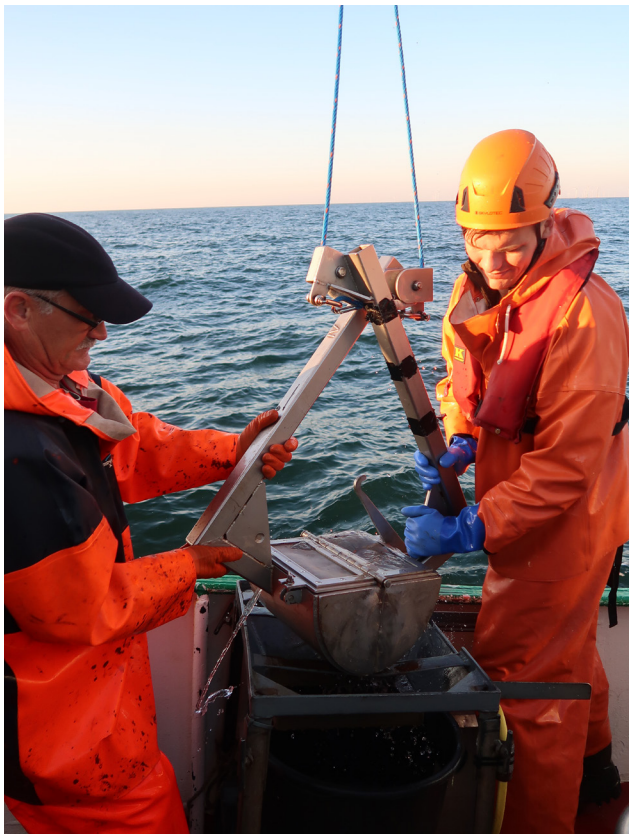
Data concerning the protected objects of benthos, biotopes, fish, avifauna and marine mammals are used to characterise the site in terms of its natural environment and species communities.

A two-year baseline survey following StUK4, with one survey in the spring and autumn of the first year and one survey in the autumn of the second year of the investigation, was conducted for the protected assets benthos and fish, respectively.

For the protected assets avifauna and marine mammals, one year pursuant to StUK4 essentially encompasses twelve calendar months including the month in which the investigations commence. Year-round investigations are required for resting birds and marine mammals. The recording of migratory birds is limited to the main migratory periods.

In the context of the site investigations, data from the cluster investigations north of Borkum (UMBO) are used to assess the protected assets avifauna and marine mammals.

4.1.1.1 Protected asset benthos



Standard gear for recording invertebrate infauna pursuant to StUK4: Van Veen grab sampler immediately before screening the sample. (Photo: Sebastian Fuhrmann, BSH)

The Institute for Applied Ecosystem Research (IfAÖ) was commissioned to carry out the baseline survey of the protected asset macrozoobenthos for site N-3.7.

A two-year baseline survey pursuant to StUK4, with one survey in spring and autumn, respectively, of the first year and one survey in autumn of the second year of the investigation, was conducted for the infauna (animals living in the ground) and the epifauna (animals living on the ground).

The infauna was sampled using a Van Veen grab sampler; the epifauna samples were obtained using a 2 m beam trawl. Sediment parameters were determined from the grab sampler samples. The species, abundance and biomass of the infauna were determined in the laboratory; if possible, those of the epifauna were identified on board. If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

With an average of 70 macrozoobenthos species per station, significantly more species were found during the autumn campaigns than the spring campaign, with an average of only around 50 species (Figure 7). A total of 259 taxa were detected, 173 of which could be identified down to species level. Bristle worms (polychaetes) and crustaceans were the most speciose major groups. Almost all of the typical representatives of one of the most commonly found communities in the North Sea, the *Tellina fabula* community, were identified at site N-3.7. Twenty-five of the 173 species identified at site N-3.7 are on the Red List for Germany due to their stock situation and development. Pre-existing anthropogenic impact on the area due to bottom trawling is to be assumed. On the whole, the macrozoobenthos stock at site N-3.7 is assessed as ‚average'.

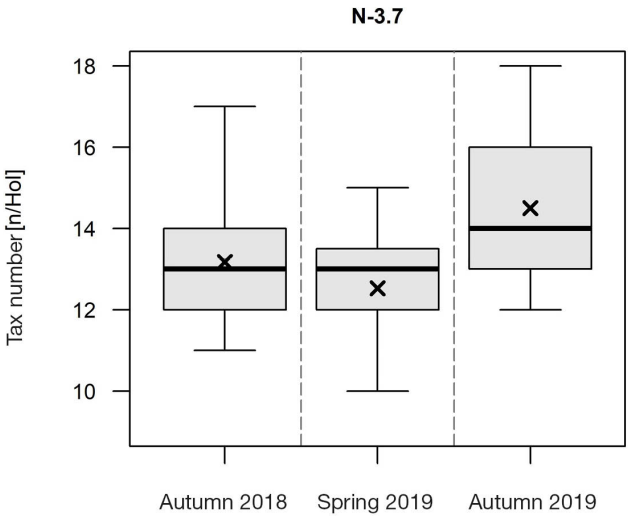


Figure 7: Number of species per station for the infauna of site N-3.7 in the autumn of 2018, spring of 2019 and autumn of 2019 (based on the station averages).

4.1.1.2 Protected asset fish

The IfAÖ was also commissioned to carry out a two-year baseline survey of the protected asset fish for site N-3.7, with one survey in spring and autumn, respectively, of the first year and one survey in autumn of the second year of the investigation.

Bottom trawl nets, so-called beam trawls with a width of 7.2 m and a head of 35 cm, were used for this investigation. At site N-3.7 and the respective reference site (see StUK4), 20 hauls with both the starboard and port beam trawls were carried out on each of 20 representatively distributed trawl tracks. The species, abundance, length and biomass were recorded on board as far as possible (Figure 8). If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

Figure 8: Whiting (Merlangius merlangus) of three different size classes. Young of the year (bottom two), one-year-old (centre) and two-year-old (top) specimen.
(Photo: Dr. Andreas Dänhardt, BSH)

On average, 13–14 species of fish were caught in all three fishing campaigns (Figure 9). A total of 40 fish species were recorded, with a species composition typical of the southern North Sea. The majority of the species were pleuronectids (plaice and other flatfishes) and clupeids (herring and other pelagic schooling fish). The detected fish community is characteristic of the south-eastern North Sea. According to the Red List, one critically endangered species (European eel) and five species that are vulnerable (twaite shad, cod, mackerel, sole and turbot) were caught. The importance of site N-3.7 to fish is evaluated as ‚medium to high'.

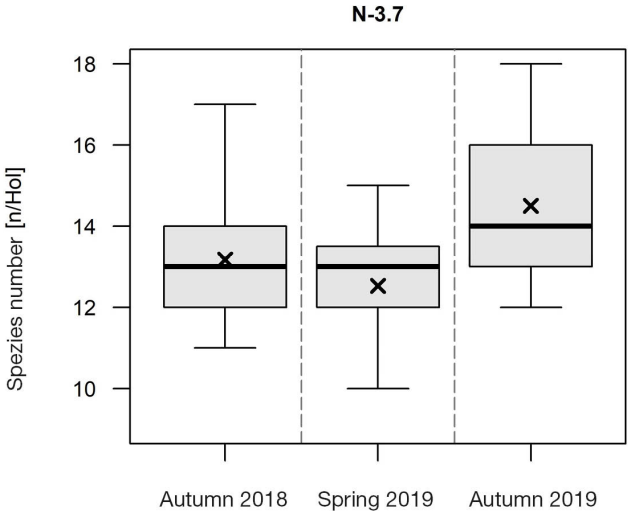


Figure 9: Number of species per station for the fish of site N-3.7 in the autumn of 2018, spring of 2019 and autumn of 2019 (box-whisker plot based on the individual hauls).

4.1.1.3 Protected asset resting birds

In the context of the preliminary investigation of sites, data from the cluster monitoring north of Borkum (UMBO) as a two-year baseline survey pursuant to StUK4 from 1 January 2018 to 31 December 2019 are being made available for the protected asset resting birds.

The data were collected by a consortium consisting of BioConsult SH GmbH & Co. KG, IBL Umweltplanung GmbH and Institut für angewandte Ökosystemforschung GmbH. The annual reports for 2018 and 2019 that were provided were also produced by this consortium.

The surveys of the resting birds in the assessment area ‚cluster north of Borkum' are used to determine the status quo of the spatial distribution, the abun-

dance and the behaviour of the birds in order to evaluate the importance of the environmental assessment area as a resting, feeding and/or moulting area. For this purpose, the resting birds were recorded by observers during transect passages by ships. Twelve transect surveys per year were carried out under consideration of the recording conditions pursuant to StUK4. The ship-based resting bird counts were supplemented by counts using an aircraft, during which high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) were taken with the HiDef system using digital video technology. Eight flights per year were carried out.

The extensive investigations showed unanimously for the environment of site N-3.7 a seabird community that is typical for the prevailing water depths and hydrographic conditions, the distance from the coast and the location-specific influences.

The seabird community is dominated by gulls, which are present all year round in the environment of site N-3.7. The most prevalent species are the lesser black-backed gull (*Larus fuscus*) and the black-legged kittiwake (*Rissa tridactyla*).

According to current knowledge, the environment of site N-3.7 is of medium overall importance to resting and foraging seabirds.

4.1.1.4 Protected asset migratory birds

The suitability assessment of site N-3.7 in terms of bird migration was based on radar investigations, visual observations and bird call recordings on the research platform FINO 1, which were carried out between 1 October 2018 and 31 December 2019 as part of the cluster investigations ‚North of Borkum' (UMBO). The consultant Avitec Research was commissioned for collecting data and reporting.

Each year, an estimated 10–100 million birds migrate from or to their northern breeding grounds over the German Bight. So far, more than 425 migratory bird species have been detected on Helgoland.

Between 53 and 87 species were determined in the vicinity of site N-3.7, primarily gulls, terns, waterfowl and songbirds with different weightings at different times of the day. The seasonal migration intensities varied both over the years and between day and night, with the majority of bird migration occurring within a few migration events. Within the recording range up to 1,000 m, bird migration was primarily detected at low altitudes of up to a few hundred metres. Visual observations showed that up to 80% of bird migration during the day in the extended vicinity of site N-3.7 occur below 50 m. With low overall variability, the migration directions in the spring corresponded to migration towards the breeding areas in north-easterly directions and in the autumn to migration towards the overwintering areas in a south-westerly direction.

Specific migration corridors were not discernible for any migratory bird species; instead, bird migration took place across a broad front with a tendency towards the coast. During the migration periods, bird migration takes place continuously, sometimes with high intensity; however, it is not significantly higher than that seen in other areas in the German Bight. The importance of site N-3.7 and its environment to bird migration is therefore evaluated as average.

Of the up to 87 species discovered in the vicinity of N-3.7, up to 12 species are listed in Annex I of the EU Birds Directive. The number of species is evaluated as average and the endangerment status as above average.

4.1.1.5 Protected asset marine mammals

In the context of the preliminary investigation of sites, data from the cluster monitoring north of Borkum (UMBO) as a two-year baseline survey pursuant to StUK4 from 1 January 2018 to 31 December 2019 are being made available for the protected asset marine mammals.

The data were collected by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG and IBL Umweltplanung GmbH. The annual reports for 2018 and 2019 that were provided were also produced by this consortium.

The records of the marine mammals in the assessment area ‚cluster north of Borkum' are used to determine occurrence, spatial distribution, behaviour and habitat use in order to assess the importance of the environmental assessment area for the marine mammals. To do this, counts were carried out using an aircraft. In this process, high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) are taken with the HiDef system using digital video technology. Eight flights per year were carried out. The flight-based surveys were supplemented by ship-based surveys in which marine mammals were recorded by observers during transect passages by ships in addition to resting birds. Twelve transect recordings per year were carried out under consideration of the recording conditions pursuant to StUK4. C-PODs (Cetacean & Porpoise Detectors), automated porpoise click detectors, were used to investigate habitat use. C-PODs are autonomous recording devices that record the high-frequency echolocation sounds of porpoises using an integrated underwater microphone (hydrophone). The recorded sounds are subsequently searched through automatically for porpoise-specific signals using special software.

While aircraft- and ship-based survey methods cover considerably larger areas but only yield snapshots, and C-PODs offer a very high temporal but low spatial resolution, a combination of both methods is reasonable and suitable for describing and evaluating the stock of marine mammals in the assessment area.

Three species of marine mammals regularly occur in the German EEZ in the North Sea: harbour porpoises (Phocoena phocoena), grey seals (Halichoerus grypus) and harbour seals (Phoca vitulina). All three species are characterised by their high mobility. Migration, particularly for foraging, is not restricted to the EEZ but also includes coastal waters and wide areas of the North Sea across national borders.

According to current knowledge, site N-3.7 is of medium to (seasonally in the spring) high importance to harbour porpoises. They cross and live in the area year-round, and probably also use it as a feeding ground. The site is used much more intensively in spring, while its use in the summer is usually average compared to the waters west of Sylt. The sightings of calves in area N-3 are rather sporadic and irregular, rendering a utilization of the area as nursery unlikely. There are no indications that area N-3, and therefore also site N-3.7, has any continuous special function for harbour porpoises.

Area N-3 and site N-3.7 are of slight to (in parts of the southern area) medium importance for grey and harbour seals.

4.1.1.6 Protected asset biotopes

Based on the side-scan sonar recordings carried out as part of the preliminary subsoil investigation, which reveal very homogeneous sediment and biotope structures at site N-3.7, the occurrence of protected biotopes at site N-3.7 is not to be assumed.

To rule out the occurrence of erratic marine boulders pursuant to German Federal Agency for Nature Conservation (BfN) mapping guideline (BfN (2018) ‚BfN-Kartieranleitung für „Riffe" in der deutschen ausschließlichen Wirtschaftszone (AWZ) Geschütztes Biotop nach Sec. 30 para 2 sentence 1 no. 6 BNatSchG, FFH - Anhang I - Lebensraumtyp (Code 1170)', (BfN mapping guideline for „reefs" in the German Exclusive Economic Zone (EEZ) Protected biotope in accordance with section Sec. 30 para 2 sentence 1 no. 6 BNatSchG, FFH - Annex I - habitat type (code 1170)) 70 pages), the data for identified objects were evaluated in greater detail and divers were sent down to investigate in suspected cases. In the period from 22 to 24 August 2019, a total of 22 objects were found on the seafloor at site N-3.7 by means of side-scan sonar (SSS). These SSS targets were compared with the bathymetry (multibeam echo sounder) results. It still proved subsequently impossible to clearly address three of the 22 targets; for visual clarification, they were filmed with a diving robot (Remotely Operated Vehicle; ROV) on 4 March 2020. Objects were found in neither of the three locations; at the other two locations, old rigging and plastic waste, respectively, were responsible for the signals in the SSS mosaic. The occurrence of legally protected biotopes at site N-3.7 can therefore be ruled out.

4.1.2 Results of the preliminary investigation of sites concerning the subsoil

The site investigations pertaining to the subsoil survey described in the following implement the requirements of the Standard Ground Investigations. Pursuant to Sec. 10 para. 1 no. 2 WindSeeG, the preliminary investigations include a preliminary investigation of the subsoil in accordance with the Standard Ground Investigations and the latest scientific and technical knowledge is carried out and documented in the context of the site investigations.

The preliminary geological survey serves to describe the sedimentary/lithological conditions, the general bedding conditions and, if necessary, tectonic factors in the investigation area as well as to provide a general assessment of the subsoil from a geological perspective.

It makes use of modern, high-performance hydrographic and geophysical methods whose results are verified on the basis of direct geotechnical exploration methods (CPTs, Sampling/Laboratory). Due to the seafloor's inaccessibility, hydrographic and geophysical methods are highly efficient for obtaining an overall overview of the seafloor characteristics and the subsurface conditions of the areas to be assessed.

The hydrographic survey provides area-wide information about the seafloor surface. The geophysical investigations provide findings regarding the structure of the seafloor and the subsurface along profile lines. Depending on the method used and the depth range analysed, these permit conclusions of varying detail to be drawn with regard to the local geological conditions.

In addition to the wide-ranging results of the hydrographic and geophysical measurement campaigns, the geotechnical investigation provides selectively indirect and direct geological information (CPTs, Sampling Boreholes, Geophysical Borehole Loggings) about the subsurface conditions. This information is used firstly to calibrate the geophysical methods. Secondly, drilling cores are sampled in laboratory tests to determine and classify the ground type, state and mechanical characteristics. The drilling core descriptions are assigned to the seismo-stratigraphic units and transferred to a spatial geological depth model of the subsurface.

The preliminary geological survey provides the geological report, which combines the results of the hydrographic survey, the geophysical and the

geotechnical investigations and contains the description of the geological depth model. It is oriented towards geological engineering.

A geotechnical data report for the offshore site investigation (gDF), which enables the potential project developer to determine the subsoil parameters, is also produced. It includes the results of the exploratory surveys and the respective laboratory investigations with reference to the geotechnical part of the preliminary survey pursuant to Sec. 10 para. 1 sentence 2 WindSeeG. In this process, tests are conducted to determine and classify the ground type, state and mechanical characteristics.

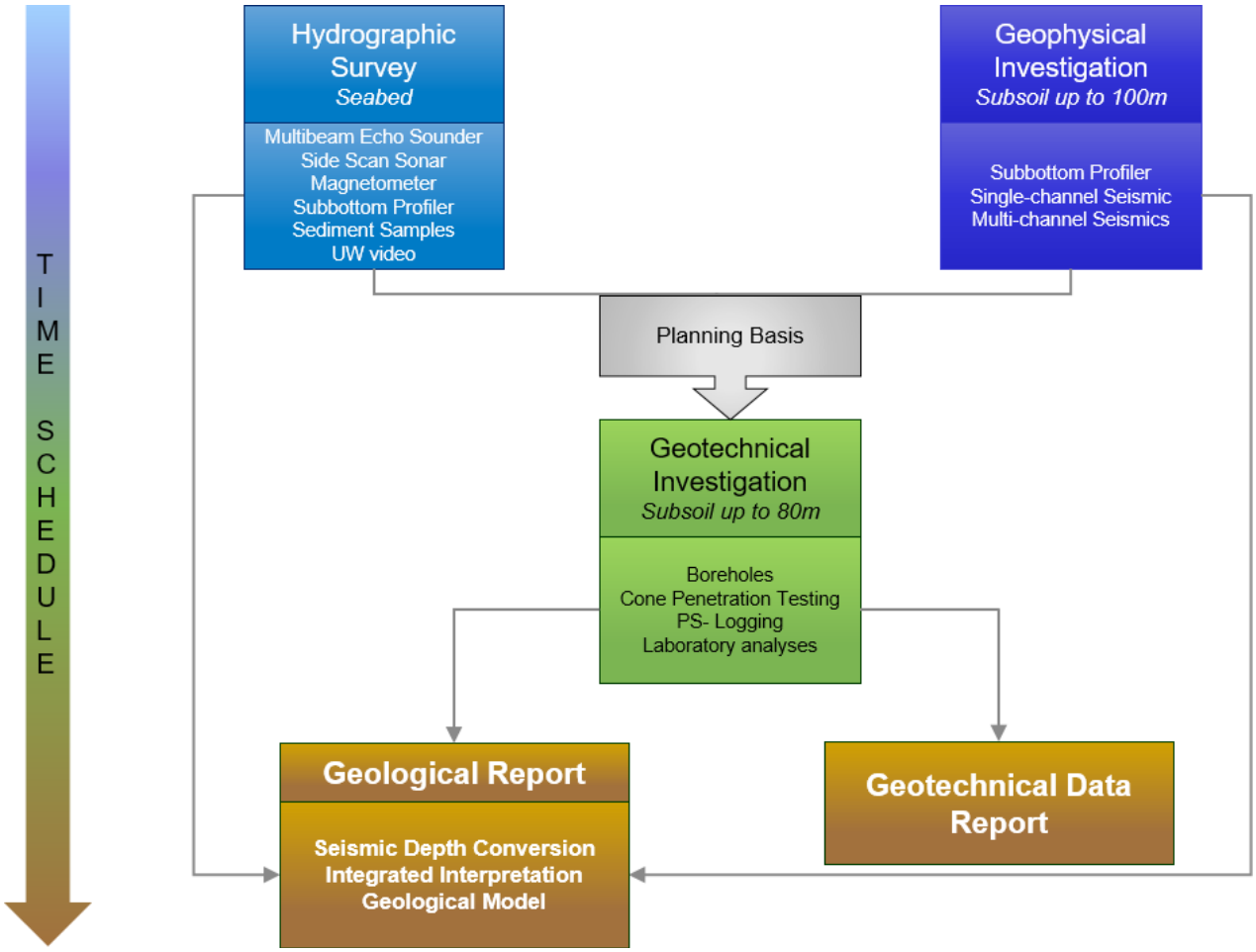


Figure 10: Overview of the preliminary geological survey in the context of the site investigation

4.1.2.1 Hydrographic survey of the seafloor

The measurement campaign for the hydrographic survey of the seafloor provides area-wide information about the seafloor surface. It involves the following investigative methods:

- Multibeam Echo Sounder investigation to record the bathymetric conditions
- Side Scan Sonar investigation to delimit seafloor surface sediment types and structures
- Magnetometer investigation to map magnetic anomalies
- Subbottom Profiler investigation of the structure of the subsurface down to a depth of 6 metres

The following investigations were additionally carried out to verify and interpret the data:

- Sediment samples for mapping the sediment types based on the Side Scan mosaic
- Underwater video recordings (UW video) for mapping the sediment types based on the Side Scan Sonar results
- ROV investigations to verify objects detected in the Multibeam Echo Sounder and Side Scan Sonar results

The hydrographic investigations of the seafloor surface at site N-3.7 were carried out according to the latest scientific and technical knowledge.

VBW Weigt GmbH was commissioned to carry out the measurement campaign. The investigations took place from 22 August to 24 August 2019.

The Multibeam Echo Sounder, Side Scan Sonar, Magnetometer and Subbottom Profiler investigations were carried out simultaneously with a profile spacing of approx. 75 m.

The seafloor descends from the south to the north. The water depths with reference to LAT are between 29 and 33 metres. The seafloor is consistently flat and not characterised by any abrupt depth changes.

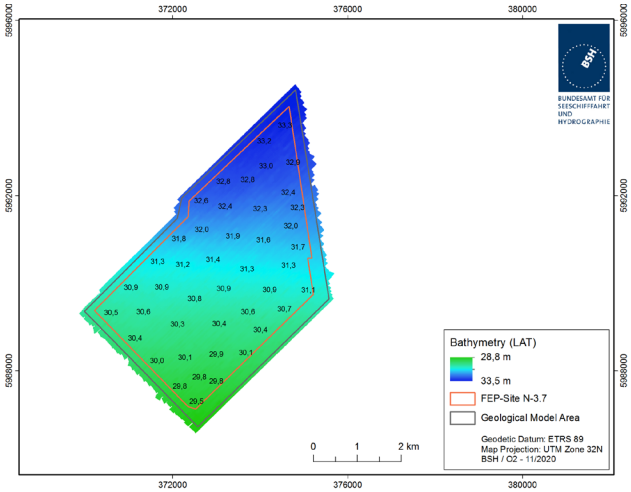


Figure 11: Results of the bathymetric survey

Very minor anomalies in the bathymetry were detected in three locations. These locations were compared against the Side Scan Ssonar results and investigated using a ROV equipped with video. Anthropogenic objects were identified in two positions.

A total of six sediment samples were taken at site N-3.7 using a Van Veen grab sampler. The sediment samples were classified in accordance with DIN 17892-4 and in accordance with Figge 1981 and Folk 1954/1974. The determination of the particle parameters from the particle size distribution of the ground samples taken from site N-3.7 reveals fine sands. One sample revealed a slight silt content of 5.5%.

The sediments were mapped according to the ‚Guideline for seafloor mapping' (BSH) and indicated that only fine sand is found at site N-3.7. No changes in intensities that indicate a sediment change are visible in the Side Scan mosaic.

The occurrence of marine boulders within the meaning of the BfN reef mapping guideline can be ruled out. Residual or relict sediments, coarse sands and pebbles are not to be anticipated in this area.

Further sands that impair further signal penetration due to their characteristics are located beneath an approx. 0.25 m to > 2 m thick upper layer of sand (marine surface layer, fine to medium sand) at site N-3.7. Their basis is therefore not recognisable in the measurement results. Widespread channel structures and trough-like, uneven depressions that are filled with sediment occur on the basis of the marine surface layer. Soft sediments that were mapped separately occur locally as the channel filling. Channel structures with a depth of > 10 m are locally discernible. Very strong, internally parallel reflectors indicating peat deposits occur occasionally and very irregularly on the basis of the marine surface layer. These were also mapped separately.

4.1.2.2 Geophysical investigation of the seafloor

The SeaZip Fix survey vessel in area N-3.7 looking aft across the working deck to the acquisition display (Photo: G. Frielinghaus, Fraunhofer IWES)

The geophysical investigation of the subsurface encompassed the use of the following investigation methods:

- Subbottom Profiler incl. Sound Velocity measurements for mapping geological structures and objects in a depth range from 0 m to 15 m under the seafloor with a vertical resolution capacity and a lateral sampling rate of at least 0.5 m.
- Single-channel seismic for mapping geological structures and objects in a depth range from 0 m to 30 m under the seafloor with a vertical resolution capacity of 1 m and a lateral sampling rate of at least 2.25 m.
- Multi-channel seismic for mapping geological structures and objects in a depth range from 0 m to 100 m under the seafloor with a vertical resolution capacity of at least 3 m and a lateral resolution capacity of at least 2 m. The lateral resolution capacity is taken to mean the bin interval of migrated data.

Data recording and subsequent data processing were carried out in 2019 by Fraunhofer IWES. A parametric sediment echo sounder was used, as were a sparker as a seismic source and a Single-channel and Multi-channel seismic streamer system. The recorded data set encompasses a regular profile grid with a profile spacing of 150 m in the main and transverse direction as well as an overall profile length of approx. 300 profile kilometres and localised Sound Velocity measurements.

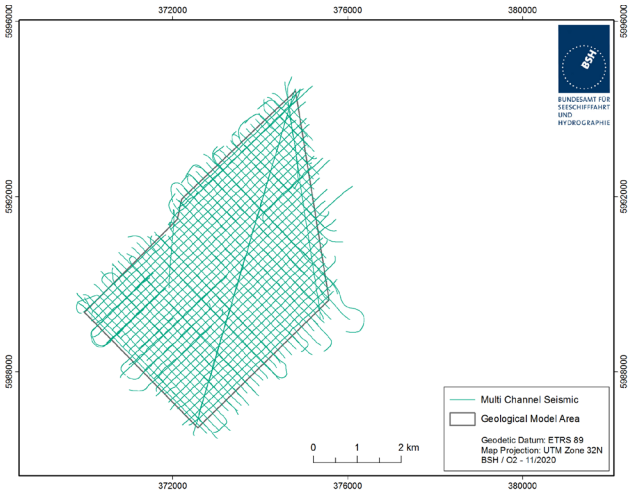


Figure 12: Profile overview Multi Channel seismic on site N-3.7

To guarantee complete data coverage for the site, data recording was carried out approx. 180 m beyond the actual FEP site. However, local deviations from the intended profile grid occurred due to

the adjacent safety zones of the Gode Wind 01 and 02 OWFs in the northwest and southwest. The entire data set was subjected to data preparation by Fraunhofer IWES. The prepared seismic data also underwent extensive processing including i.e. data cleansing, multiple suppression, signal deconvolution and migration in the time range.

An integrated evaluation of the geophysical data was carried out during the course of geological modelling.

4.1.2.3 Geotechnical investigation of the subsurface (down to a depth of 80 m)

Indirect and direct geological (engineering) information (CPTs, Sampling Boreholes) was collected in the context of the geotechnical survey. The ground samples obtained were then examined in laboratory tests to determine and classify the ground type, state and mechanical characteristics. The geotechnical investigation encompasses the following exploration methods:

- Representative CPTs to determine the bedding conditions of the subsurface down to a depth of 80 metres
- Representative Sampling Boreholes for ground identification and to obtain ground samples for the geotechnical laboratory tests down to a depth of 80 metres
- Geophysical Borehole Loggingsfor determining seismic interval velocities

To determine the ground parameters:

- Laboratory tests to determine and classify the ground type, state and mechanical characteristics

The exploration depth of the Sampling Boreholes and the CPTs was defined as 80 metres to cover the common foundation variants intended in the context of preliminary draft planning.

FUGRO Germany Land GmbH was commissioned to carry out the geotechnical investigation. The geotechnical surveys (offshore and laboratory work) were monitored by a geotechnical expert, Ramboll Deutschland GmbH, commissioned by the BSH. Ramboll produced the geological data report for the offshore site investigation (gDF) based on the results.

The location of the explorations was defined based on the results of geophysical surveys from existing data under consideration of geological structures and in a form that was representative for the site. The number of explorations is oriented to the 10% rule (standard subsoil).

The water depth at the investigated locations varies between 32.5 m and 35.1 m versus standard elevation zero (‚Normalhöhennull', (NHN)). The field work was carried out from the geotechnical drill ships MV Fugro Scout and MV Normand Flower between 22 October and 16 November 2019.

A pressure sounding, drilling with sampling and a geophysical borehole measurement down to approx. 80 m beneath the seafloor were carried out at a total of four representative locations.

A total of five entry points (including repositioned entry points) were sunk by means of discontinuous CPTs, four entry points with sampling (BKF) and four entry points with geophysical measurements down to a maximum drilling depth of 81.62 m beneath the seafloor.

The obtained samples were described, and the unit weight and water content were determined on selected samples in the offshore laboratory.

Depending on ground conditions, the cylindrical sample tubes were pressed into the ground in ‚WIP' mode with an internal diameter of 3" (72 mm) or 2" (53 mm) for sampling. The maximum sample length

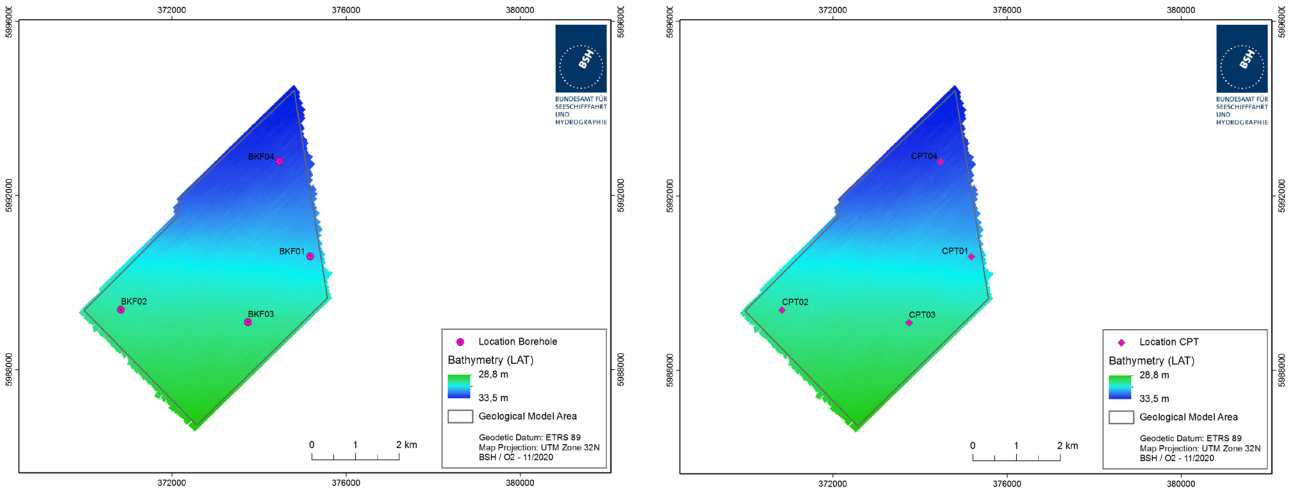


Figure 13: Position of the locations for boreholes and CPT at site N-3.7

is 0.98 m. This sampling corresponds to line 3 or line 4 in accordance with DIN EN ISO 22475-1 Table 1. Core catchers were used in non-cohesive and very soft cohesive material to ensure maximum core recovery.

A very thick-walled 2“ fitting was preferably used in very densely bedded sands, as it can be inserted into the ground with a higher pressure and recovers more sample.

Following sampling, laboratory investigations were carried out on the ground samples. To do this, the ground samples were classified and characterised and the following geotechnical laboratory tests were performed:

Geotechnical laboratory investigation	Standard	Number of tests performed
Particle size distribution (dry screening)	DIN EN ISO 17892-4	64
Particle size distribution (screen/wet analysis)	DIN EN ISO 17892-4	1
Determination of the consistency limits	DIN EN ISO 17892-12	2
Determination of the shrinkage limits	DIN 18122-2	1
Determination of the particle density	DIN EN ISO 17892-3	27
Determination of density of non-cohesive soils for maximum and minimum compactness	DIN 18126	12
Determination of the pH value	DIN ISO 10390:2005-12	19
Determination of the sulphate content	DIN EN ISO 11885 Acid leaching in accordance with DIN 4030-2	19
Determination of the chloride content	DIN EN ISO 10304-1	19
Determination of the organic contents	DIN 18128	2
Determination of the calcium content	DIN 18129	8
Determination of the thermal conductivity	ASTM D5334-05	9
Determination of the electrical conductivity	DIN EN 27888: 1993-11 from the 10:1 shaken eluate in accordance with DIN EN 12457-4	2
Determination of the water permeability coefficient	DIN EN ISO 17892-11	7
Determination of the particle shape	DIN EN ISO 14688-1	21
Triaxial test CID	DIN EN ISO 17892-9	1
Triaxial test CAUe	DIN EN ISO 17892-9	1
Shearbox test - cohesive soils	DIN EN ISO 17892-10	1
Shearbox test - non-cohesive soils	DIN EN ISO 17892-10	3
Direct simple shear test (DSS)	ASTM D6528-17 Fugro test method based on ASTM D6528-07	4
Ring shear test	Fugro test method L-M-203	3

Table 1: Laboratory investigations carried out on the ground samples at site N-3.7

4.1.2.4 Geological model

For the geological model, the results of the hydrographic survey and the geophysical investigations were combined with the results of the geotechnical investigation and interpreted in terms of their geology. To do this, the hydroacoustic and seismic data sets – using the geotechnical results – were transferred to the depth range (m) (depth model) from the time range (seismic travel times).

The geological model was produced by Ramboll Deutschland GmbH.

The stratigraphic classification of the structures in the subsurface undertaken during modelling reflects the sequence of Pleistocene and Holocene sediments typically found in this area of the North Sea. The surface of the middle Pleistocene (particularly densely bedded sands) is crossed by a narrow channel with an unknown filling running from north to south. Proglacial sands of the Upper Pleistocene are deposited above this. These are universally covered with thin Holocene sediments (particularly sand). The surface of the seabed is formed by mobile North Sea sands with seashells.

4.1.2.5 Reports

The results of the preliminary geological survey of the subsoil are described in two reports. Geodata are made available in the form of GIS projects, raw data and intermediate products, sorted according to disciplines.

The geological report combines the results of the geophysical recordings and the primary geotechnical survey and interprets them in terms of their geology. The report forms the basis for further planning and includes a description of the geological subsurface model on which the structures are to be constructed. It is oriented towards geological engineering and represents the information and data basis from the preliminary geological survey of the subsoil together with the geotechnical data report for the offshore site investigation.

The geological report was produced based on the results of the preliminary survey conducted by Ramboll Deutschland GmbH.

The geotechnical data report for the offshore site investigation is also produced by Ramboll Deutschland GmbH.

4.1.3 Results of the preliminary investigation of sites concerning the wind conditions

The following data sources and methods were used to investigate the wind conditions at site N-3.7:

- Wind velocity and direction measurements
- Ensemble of atmospheric reanalyses

One significant data source is the wind profile measurements that have been taking place at an altitude range of between approximately 30 and 100 m on the FINO1 research platform since 2001. As the wind field has already changed due to the wind farms that are already in operation, one-year measurements of the wind profile and other meteorological variables directly at site N-3.7 according to the scientific and technical state of the art were additionally commissioned. These were carried out by UL International GmbH, Wilhelmshaven, using LiDAR systems. The measurements were statistically processed and summarised in a report.

To universally classify the above measurements, the COSMO-REA6 and ERA5 reanalyses were statistically evaluated by the DWD (German Weather Service) and the results were summarised in a report.

The two aforementioned reports were used by Guidehouse Energy GmbH in cooperation with ProPlanEn GmbH as the basis for producing an overall report. One of the results shown by the overall report is that the wind field at site N-3.7 has already changed due to the wind farms that are already in operation. This involves a direction-dependent decrease in the mean wind velocity and an increase in turbulence.

4.1.4 Results of the preliminary investigation of sites concerning the oceanographic conditions

View of the Offshore Windfarm Alpha Ventus from FINO 1 Research Platform (Photo: Olaf Outzen, BSH)

The preliminary investigation of sites concerning the oceanographic conditions at site N-3.7 were conducted by the BSH according to the scientific and technical state of the art. Their scope is based on the documents to be submitted for requesting initial approval in terms of the site conditions according to the ‚Standard Design – Minimum requirements concerning the constructive design of offshore structures within the Exclusive Economic Zone (EEZ)' issued by the BSH.

The oceanographic reports contain fundamental information about the following:

- Water level
- Swell
- Current
- Seawater characteristics (density, salinity, temperature).

The in-situ data required for the report concerning the oceanographic conditions at site N-3.7 originate from the FINO1 research platform on which the BSH conducts oceanographic measurements. The measuring station has been in operation since 2004 and reliably provides data on swell, current, water temperature and salinity.

Current and swell data from the RAVE research project are additionally used. This project undertakes, amongst others, oceanographic measurements from the substation of the ‚North Sea One' wind farm located to the west of site N-3.7 in area 3.

The data measured in-situ as well as model data were combined and statistically evaluated in a summary report produced by the BSH. The objective of this approach is to enable the results to be validated and the error limits to be estimated.

4.2 Preliminary investigation of sites at site N-3.8

The preliminary investigation of sites carried out at site N-3.8 are described in the following.

4.2.1 Preliminary investigation of sites concerning the marine environment

Constant companions of the offshore site investigations: large gulls following the ship, in this case lesser black-backed gulls (Larus fuscus), herring gulls (L. argentatus) and occasionally common gulls (L. canus). (Photo: Dr Andreas Dänhardt, BSH)

The preliminary investigation of sites concerning the marine environment that are described in the following implement the requirements of the ‚Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment' standard (currently StUK4). Pursuant to Sec. 10 para 1 sentence 1 WindSeeG, investigations that are required for an environmental impact assessment in the planning approval process pursuant to Sec. 45 WindSeeG concerning the construction of offshore wind turbines at this site and which can be carried out irrespective of the subsequent design of the project are carried out and documented.

Data concerning the protected objects of benthos, biotopes, fish, avifauna and marine mammals are used/collected to characterise the site in terms of its natural environment and species communities.
A two-year baseline survey following StUK4, with one survey in the spring and autumn of the first year and one survey in the autumn of the second year of the investigation, was conducted for the protected assets benthos and fish, respectively.

For the protected assets of avifauna and marine mammals, one year pursuant to StUK4 essentially encompasses twelve calendar months including the month in which the investigations commence. Year-round investigations are required for the resting birds and marine mammals. The recording of migratory birds is limited to the main migratory periods.

In the context of the site investigations, data from the cluster investigations north of Borkum are used to assess the protected assets avifauna and marine mammals.

4.2.1.1 Protected asset benthos

The IfAÖ was commissioned to carry out the baseline survey of the protected asset macrozoobenthos for site N-3.8.

A two-year baseline survey pursuant to StUK4, with one survey in spring and autumn, respectively, of the first year and one survey in autumn of the second year of the investigation, was conducted for the infauna (animals living in the ground) and the epifauna (animals living on the ground).

The infauna was sampled using a Van Veen grab sampler; the epifauna samples were obtained using a 2 m beam trawl. Sediment parameters were determined from the grab sampler samples. The species, abundance and biomass of the infauna were determined in the laboratory; if possible, those of the epifauna were identified on board. If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

With an average of between 65 and 75 macrozoobenthos species per station, significantly more species were found during the autumn campaigns than the spring campaign, with an average of only around 50 species (Figure 14). A total of 260 taxa were detected, 172 of which could be identified down to species level. Bristle worms (polychaetes) and crustaceans were the most speciose major groups. Almost all of the typical representatives of one of the most commonly found communities in the North Sea, the Tellina fabula community, were identified at site N-3.8. Twenty-four of the 172 species identified at site N-3.8 are on the Red List for Germany due to their stock situation and development. Pre-existing anthropogenic impact on the area due to bottom trawling is to be assumed. On the whole, the macrozoobenthos stock at site N-3.8 is assessed as ‚average'.

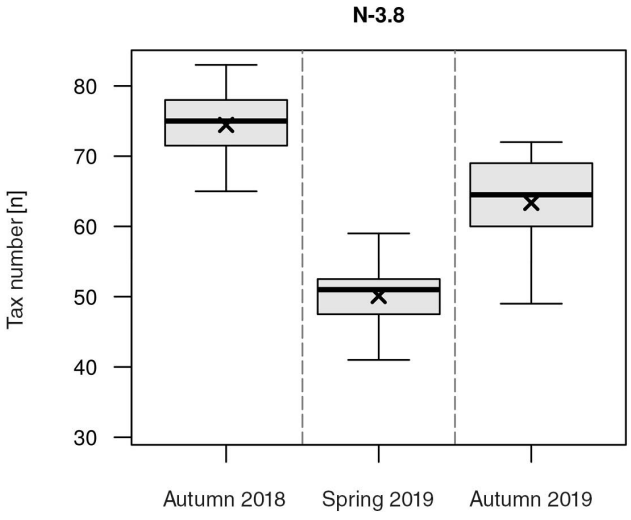


Figure 14: Number of species per station for the infauna of site N-3.8 in the autumn of 2018, spring of 2019 and autumn of 2019 (based on station averages).

4.2.1.2 Protected asset fish

The IfAÖ was also commissioned to carry out a two-year baseline survey of the protected asset fish for site N-3.8, with one survey in the spring and autumn, respectively, of the first year and one survey in the autumn of the second year of the investigation.

Bottom trawl nets, so-called beam trawls with a width of 7.2 m and a head of 35 cm, were used for this investigation. At site N-3.8 and the respective reference site (see StUK4), 20 hauls with both the starboard and port beam trawl were carried out on each of 20 representatively distributed trawl tracks. The species, abundance, length and biomass were recorded on board as far as possible. If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

On average, 11–14 species of fish were caught in all three fishing campaigns (Figure 15). A total of 39 fish species were recorded, with a species composition typical of the southern North Sea. The majority of the species were pleuronectids (plaice and other flatfishes) and gadoids (cod and other benthopelagic roundfishes). The detected fish community is characteristic of the south-eastern North Sea. A species at risk of extinction pursuant to the Red List (thornback ray) and a species of unknown endangerment (snake pipefish) were caught. The importance of site N-3.8 to fish is evaluated as ‚medium to high'.

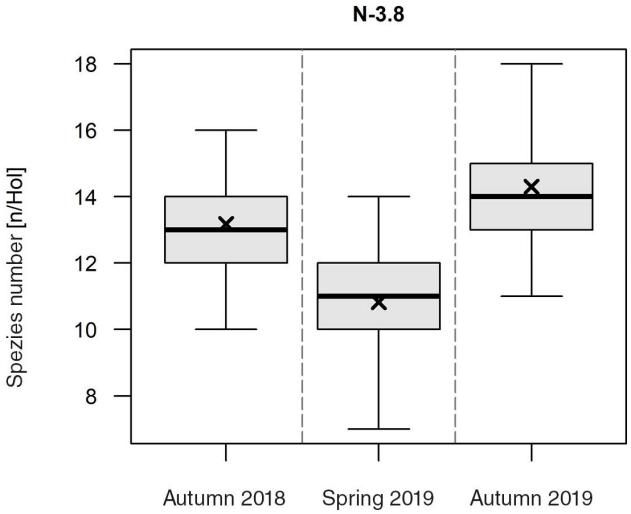


Figure 15: Number of species per station for the fish of site N-3.8 in the autumn of 2018, spring of 2019 and autumn of 2019 (box-whisker plot based on the individual hauls).

4.2.1.3 Protected asset resting birds

In the context of the site investigations, data from the cluster monitoring north of Borkum (UMBO) as a two-year baseline survey pursuant to StUK4 from 1 January 2018 to 31 December 2019 are being made available for the protected asset resting birds.

The data were collected by a consortium consisting of BioConsult SH GmbH & Co. KG, IBL Umweltplanung GmbH and Institut für angewandte Ökosystemforschung GmbH. The annual reports for 2018 and 2019 that were provided were also produced by this consortium.

The surveys of the resting birds in the assessment area ‚cluster north of Borkum' are used to determine the status quo of the spatial distribution, the abundance and the behaviour of the birds in order to evaluate the importance of the environmental assessment area as a resting, feeding and/or moulting area. For this purpose, the resting birds were recorded by observers during transect passages by ships. Twelve transect surveys per year were carried out under consideration of the recording conditions pursuant to StUK4. The ship-based resting bird counts were supplemented by counts using an aircraft, during which high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) were taken with the HiDef system using digital video technology. Eight flights per year were carried out.

The extensive investigations showed unanimously for the environment of site N-3.8 a seabird community that is typical for the prevailing water depths and hydrographic conditions, the distance from the coast and the location-specific influences.

The seabird community is dominated by gulls, which are present all year round in the environment of site N-3.8. The most prevalent species are the lesser black-backed gull (*Larus fuscus*) and the black-legged kittiwake (*Rissa tridactyla*).

According to current knowledge, the environment of site N-3.8 is of medium overall importance to resting and foraging seabirds.

4.2.1.4 Protected asset migratory birds

The suitability assessment of site N-3.8 in terms of bird migration was based on radar investigations, visual observations and bird call recordings on the research platform FINO 1, which were carried out between 1 January 2018 to 31 December 2019 as part of the cluster investigations ‚North of Borkum' (UMBO). The consultant Avitec Research was commissioned for collecting data and reporting.

Each year, an estimated 10–100 million birds migrate from or to their northern breeding grounds over the German Bight. So far, more than 425 migratory bird species have been detected on Helgoland.

Between 53 and 87 species were determined in the vicinity of site N-3.8, primarily gulls, terns, waterfowl and songbirds with different weightings at different times of the day. The seasonal migration intensities varied both over the years and between day and night, with the majority of bird migration occurring within a few migration events. Within the recording range up to 1,000 m, bird migration was primarily detected at low altitudes of up to a few hundred metres. Visual observations showed that up to 80% of bird migration during the day in the extended vicinity of site N-3.8 occur below 50 m. With low overall variability, the migration directions in spring corresponded to migration towards the breeding areas in north-easterly directions and in autumn to migration towards the overwintering areas in a south-westerly direction.

Specific migration corridors were not discernible for any migratory bird species; instead, bird migration took place across a broad front with a tendency

towards coasts. During the migration periods, bird migration takes place continuously, sometimes with high intensity; however, it is not significantly higher than that seen in other areas in the German Bight. The importance of site N-3.8 and its environment to bird migration is therefore evaluated as average.

Of the up to 87 species discovered in the vicinity of N-3.8, up to 12 species are listed in Annex I of the EU-Birds Directive. The number of species is evaluated as average and the endangerment status as above average.

4.2.1.5 Protected asset marine mammals

In the context of the site investigations, data from the cluster monitoring north of Borkum (UMBO) as a two-year baseline survey pursuant to StUK4 from 1 January 2018 to 31 December 2019 are being made available for the protected asset marine mammals.

The data were collected by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG and IBL Umweltplanung GmbH. The annual reports for 2018 and 2019 that were provided were also produced by this consortium.

The records of the marine mammals in the assessment area ‚cluster north of Borkum' are used to determine occurrence, spatial distribution, behaviour and habitat use in order to assess the importance of the environmental assessment area for the marine mammals. To do this, counts were carried out using an aircraft. In this process, high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) are taken with the HiDef system using digital video technology. Eight flights per year were carried out. The flight-based surveys were supplemented by ship-based surveys in which marine mammals were recorded by observers during transect passages by ships in addition to resting birds. Twelve transect recordings per year were carried out under consideration of the recording conditions pursuant to StUK4. C-PODs (Cetacean & Porpoise Detectors), automated porpoise click detectors, were used to investigate habitat use. C-PODs are autonomous recording devices that record the high-frequency echolocation sounds of porpoises using an integrated underwater microphone (hydrophone). The recorded sounds are subsequently searched through automatically for porpoise-specific signals using special software.

While aircraft- and ship-based survey methods cover considerably larger areas but only yield snapshots, and C-PODs offer a very high temporal but low spatial resolution, a combination of both methods is reasonable and suitable for describing and evaluating the stock of marine mammals in the assessment area.

Three species of marine mammals regularly occur in the German EEZ in the North Sea: harbour porpoises (*Phocoena phocoena*), grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*). All three species are characterised by their high mobility. Migration, particularly for foraging, is not restricted merely to the EEZ but also includes coastal waters and wide areas of the North Sea across national borders.

According to current knowledge, site N-3.8 is of medium to (seasonally in the spring) high importance to harbour porpoises. They cross and live in the area year-round, and probably also use it as a feeding ground. The site is used much more intensively in spring, while its use in the summer is usually average compared to the waters west of Sylt. The sightings of calves in area N-3 are rather sporadic and irregular, rendering a utilization of the area as nursery unlikely. There are no indications that area N-3, and therefore also site N-3.8, has any continuous special function for harbour porpoises.

Area N-3 and site N-3.8 are of slight to (in parts of the southern area) medium importance for grey and harbour seals.

4.2.1.6 Protected asset biotopes

Based on the side-scan sonar recordings carried out as part of the preliminary subsoil investigation, which reveal very homogeneous sediment and biotope structures at site N-3.8, the occurrence of protected biotopes at site N-3.8 is not to be assumed.

To rule out the occurrence of erratic marine boulders pursuant to BfN mapping guideline (BfN (2018) ‚BfN-Kartieranleitung für „Riffe" in der deutschen ausschließlichen Wirtschaftszone (AWZ) Geschütztes Biotop nach Sec. 30 para. 2 sentence 1 no. 6, FFH – Anhang I – Lebensraumtyp (Code 1170)', 70 pages), the data for identified objects were evaluated in greater detail and divers were sent down to investigate in suspected cases.

In the summer of 2018 objects were detected in 35 positions using SSS and were compared against the bathymetry results. In the period from 19 to 26 March 2020, 11 of these objects were verified by divers. No objects were found at seven of the 11 locations; at the remaining four locations, a flanged pipe and the remains of nets caused the signals in the SSS mosaic. The occurrence of legally protected biotopes at site N-3.8 can therefore be ruled out.

4.2.2 Results of the preliminary investigation of sites concerning the subsoil

The preliminary investigation of sites pertaining to the subsoil survey described in the following implement the requirements of the Standard Ground Investigations. Pursuant to Sec. 10 para. 1 no. 2 WindSeeG, the preliminary investigations include a preliminary investigation of the subsoil in accordance with the Standard Ground Investigations and the latest scientific and technical knowledge is carried out and documented in the context of the site investigations.

The preliminary geological survey serves to describe the sedimentary/lithological conditions, the general bedding conditions and, if necessary, tectonic factors in the investigation area as well as to provide a general assessment of the subsoil from a geological perspective.

It makes use of modern, high-performance hydrographic and geophysical methods whose results are verified on the basis of direct geotechnical exploration methods (CPTs, Sampling /Laboratory). Due to the seafloor's inaccessibility, hydrographic and geophysical methods are highly efficient for obtaining an overall overview of the seafloor characteristics and the subsurface conditions of the areas to be assessed.

The hydrographic survey provides area-wide information about the seafloor surface. The geophysical investigations provide findings regarding the structure of the seafloor and the subsurface along profile lines. Depending on the method used and the depth range analysed, these permit conclusions of varying detail to be drawn with regard to the local geological conditions.

In addition to the wide-ranging results of the hydrographic and geophysical measurement campaigns, the geotechnical investigation provides selectively indirect and direct geological information (CPTs, Sampling Boreholes, Geophysical Borehole Loggings) about the subsurface conditions. This information is used firstly to calibrate the geophysical methods. Secondly, drilling cores are sampled in laboratory tests to determine and classify the ground type, state and mechanical characteristics.

The drilling core descriptions are assigned to the seismo-stratigraphic units and transferred to a spatial geological depth model of the subsurface.

The preliminary geological survey provides the geological report, which combines the results of the hydrographic survey, the geophysical and the geotechnical investigations and contains the description of the geological depth model. It is oriented towards geological engineering.

A geotechnical data report for the offshore site investigation (gDF), which enables the potential project developer to determine the subsoil parameters, is also produced. It includes the results of the exploratory surveys and the respective laboratory investigations with reference to the geotechnical part of the preliminary survey pursuant to Sec. 10 para. 1 no. 2 WindSeeG. In this process, tests are conducted to determine and classify the ground type, state and mechanical characteristics.

The objective of the preliminary geological survey is to establish an adequate information basis to enable the winning bidder to select the site of the wind turbines and to undertake preliminary planning of the structures during the development phase as per the ‚Standard Design'. The challenge of the preliminary geological survey is to ensure this without knowing the layout of the wind farm. As a result of this, the minimum requirements of the subsoil standard are exceeded in some cases.

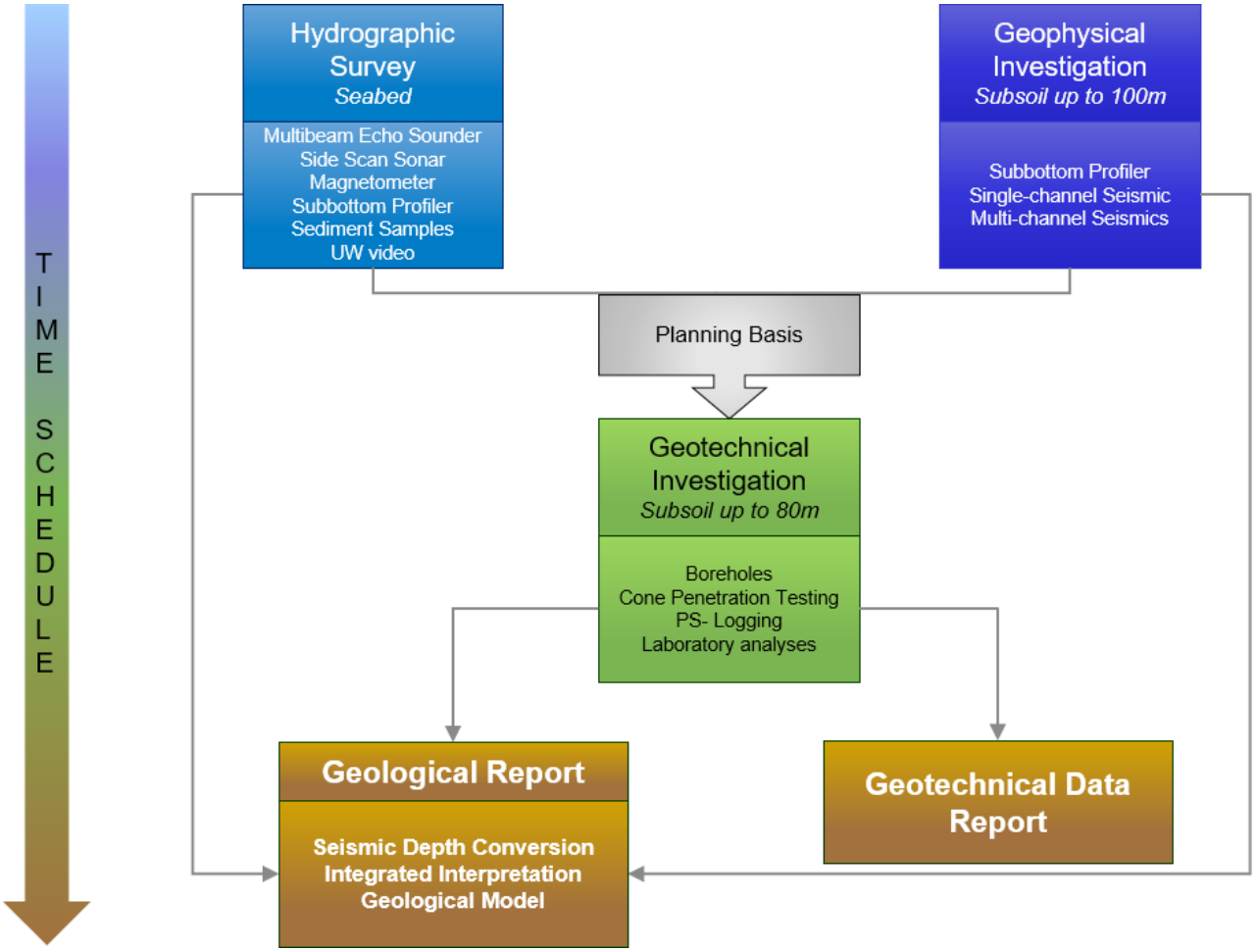


Figure 16: Overview of the preliminary geological survey in the context of the site investigation

4.2.2.1 Hydrographic survey of the seafloor

The measurement campaign for the hydrographic survey of the seafloor provides area-wide information about the seafloor surface. It involves the following investigative methods:

- Universal MultiBeam Echo Sounder investigation to record the bathymetric conditions
- Universal Side Scan Sonar investigation to delimit seafloor surface sediment types and structures
- Magnetometer investigation to map magnetic anomalies
- Subbottom Profiler investigation of the structure of the subsurface down to a depth of 6 metres

The following investigations were additionally carried out to verify and interpret the data:

- Sediment samples for mapping the sediment types based on the Side Scan mosaic
- Underwater video recordings (UW video) for mapping the sediment types based on the Side Scan Sonar results
- Diver investigations to verify objects detected in the Multibeam Echo sounder and Side Scan Sonar results

The hydrographic investigations of the seafloor surface at site N-3.8 were carried out according to the latest scientific and technical knowledge.

VBW Weigt GmbH was commissioned to carry out the measurement campaign. The investigations took place from 27 September to 11 October 2018.

The Multibeam Echo sounder, SideScan Sonar, Magnetometer and Subbottom Profiler investigations were carried out simultaneously with a profile spacing of approx. 80 m.

The seafloor descends from the south to the north. The water depths with reference to LAT are between 29 and 33 metres. The seafloor is consistently flat and not characterised by any abrupt depth changes. Small, shallow depressions of approx. 10-30 cm occur sporadically; their origin is unknown. Ripple structures can be found on the seabed in the extreme south of site N-3.8.

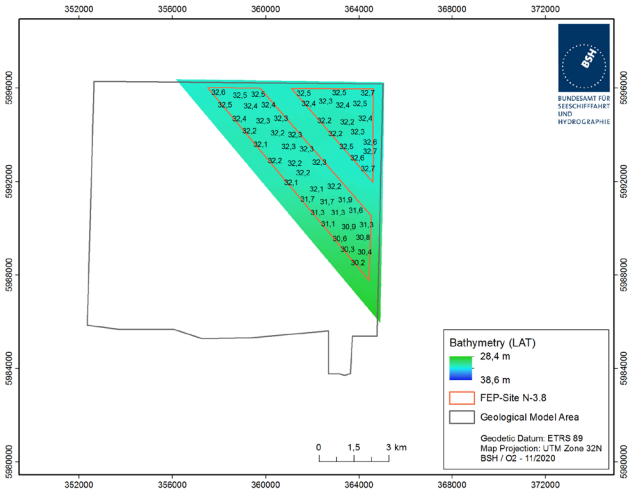


Figure 17: Bathymetry on site N-3.8

Possible objects were detected in several locations in the Side Scan Sonar results. These were compared against the results of the Multibeam Echo Sounder investigation and then instigated by the survey, wreck-search and research ship Wega. One object within site N-3.8 was identified as an anthropogenic object.

A total of 10 sediment samples were taken at the site under investigation using a Van Veen grab sampler. The sediment samples were classified in accordance with DIN 17892-4 and in accordance with Figge 1981 and Folk 1954/1974. The determination of the particle parameters from the particle size distribution of the ground samples taken from site N-3.8 reveals fine sands. One sample revealed a slight silt content of 8.5%.

The sediments were mapped according to the ‚Guideline for seafloor mapping' (BSH) and indicated that only fine sand is found at site N-3.8. No changes in intensities that indicate a sediment change are visible in the Side Scan Sonar mosaic.

The occurrence of marine boulders within the meaning of the BfN reef mapping guideline can be ruled out. Residual or relict sediments, coarse sands and pebbles are not to be anticipated in this area.

Further sands that impair further signal penetration due to their characteristics are located beneath an approx. 0.25 m to > 2 m thick upper layer of sand (marine surface layer, fine to medium sand) at site N-3.8. Their basis is therefore not recognisable in the measurement results. Widespread channel structures and trough-like, uneven depressions that are filled with sediment occur on the basis of the marine surface layer. Soft sediments that were mapped separately occur locally as the channel filling. Channel structures with a depth of > 10 m are locally discernible. Very strong, internally parallel reflectors indicating peat deposits occur occasionally and very irregularly on the basis of the marine surface layer. These were also mapped separately.

4.2.2.2 Geophysical investigation of the seafloor

On the right, the multichannel seismic streamer; on the left, the sparker source with the GPS case. (Photo: G. Frielinghaus, Fraunhofer IWES)

On the right, the multichannel seismic streamer; on the left, the sparker source with the GPS case. (Photo: G. Frielinghaus, Fraunhofer IWES)

By way of surrender pursuant to Sec. 41 WindSeeG, a cross-site geophysical data set was already available for sites N-3.5, N-3.6 and N-3.8. This consists of a Multi-channel seismic data set with Mini GI gun source (profile spacing approx. 400 m–600 m) with a penetration of more than 100 m and a Single-channel seismic data set with a boomer source (profile spacing approx. 150 m) with a penetration of less than 30 m. For a gap-free data basis, this data set was compressed in 2019 by Fraunhofer IWES in the context of a measurement campaign (site under investigation N-03W). In the

area of site N-3.8, this compression included the recording of approx. 170 profile kilometres of Multi-channel seismic sparker data, from which a Single-channel seismic data set was additionally extracted. The following data sets are therefore available as the result of the geophysical investigation of site N-3.8:

- Multi-channel seismic data (sparker and MiniGI) with a line density of 150 m–200 m
- Single-channel seismic data (sparker) with a line density of 350 m–1,000 m
- Single-channel seismic data (boomer) with a line density of 150 m (within the meaning of sediment echo sounder recordings)
- Localised Sound Velocity measurements

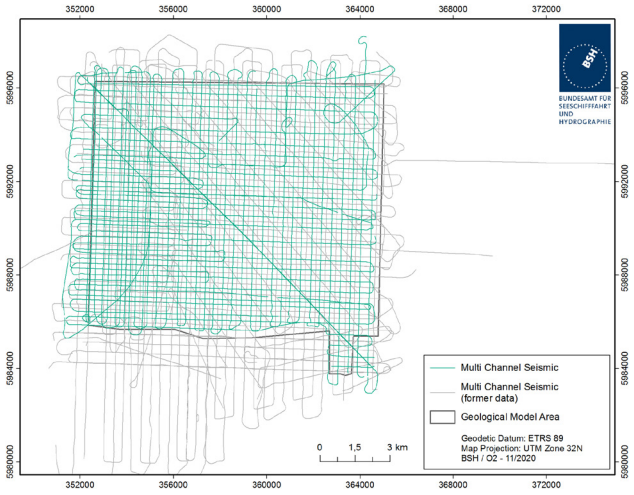


Figure 18: Profile overview Multi Channel Seismic N-3.8

The newly acquired seismic raw data sets were processed in terms of their respective target depth ranges to achieve an optimum resolution. This includes e.g. data cleansing, multiple suppression, signal deconvolution and migration in the time range. The existing Single- and Multi-channel seismic data were subjected to data preparation.

An integrated evaluation of the geophysical data was carried out during the course of geological modelling.

4.2.2.3 Geotechnical investigation of the subsurface (down to a depth of 80 m)

Indirect and direct geological (engineering) information (CPTs, Sampling Boreholes) was collected in the context of the geotechnical survey. The ground samples obtained were then sampled in laboratory tests to determine and classify the ground type, state and mechanical characteristics. The geotechnical investigation encompasses the following exploration methods:

- Representative CPTs to determine the bedding conditions of the subsurface down to a depth of 80 metres
- Representative Sampling Boreholes for ground identification and to obtain ground samples for the geotechnical laboratory tests down to a depth of 80 metres
- Geophysical Borehole Loggings investigation for determining seismic interval velocities

To determine the ground parameters:

- Laboratory tests to determine and classify the ground type, state and mechanical characteristics

The exploration depth of the Sampling Boreholesand the CPTs is defined as 80 metres to cover the common foundation variants intended in the context of preliminary draft planning.

FUGRO Germany Land GmbH was commissioned to carry out the geotechnical investigation. The geotechnical surveys (offshore and laboratory work) were monitored by a geotechnical expert, Ramboll Deutschland GmbH, commissioned by the BSH. BAW produced the geological data report for the offshore site investigation (gDF) based on the results.

Data from geotechnical surveys are available for site N-3.8. These were surrendered to the BSH to attain the right of access (see Sec. 41 WindSeeG) unencumbered by third-party rights. These data

were checked and classified as only of limited use due to the exploration depth amongst other aspects. Additional investigations were therefore carried out after weighing up technical and economic aspects. To do this, drilling with sampling and CPTs were carried out at three representative locations.

The location of the explorations was defined based on the results of geophysical surveys from existing data under consideration of geological structures and in a form that was representative for the site.

The water depth at the investigated locations varies between 29.5 m and 34.6 m versus standard elevation zero (‚Normalhöhennull', (NHN)). The field work was carried out from the geotechnical drill ship MV Fugro Scout between 21 September and 08 November 2019.

This report contains the following geotechnical information:
A total of three entry points were sunk by means of discontinuous pressure soundings (CPT), six entry points (including repositioned entry points) with sampling (BKF) and three entry points with geophysical measurements down to a maximum drilling depth of 83.00 m beneath the seafloor.

Drilling Vessel GARGANO (Photo: Fugro)

The obtained samples were described, and the unit weight and water content were determined on selected samples in the offshore laboratory.

Depending on ground conditions, the cylindrical sample tubes were pressed into the ground in ‚WIP' mode with an internal diameter of 3" (72 mm) or 2" (53 mm) for sampling. The maximum sample length is 0.98 m. This sampling corresponds to line 3 or line 4 in accordance with DIN EN ISO 22475-1 Table 2.

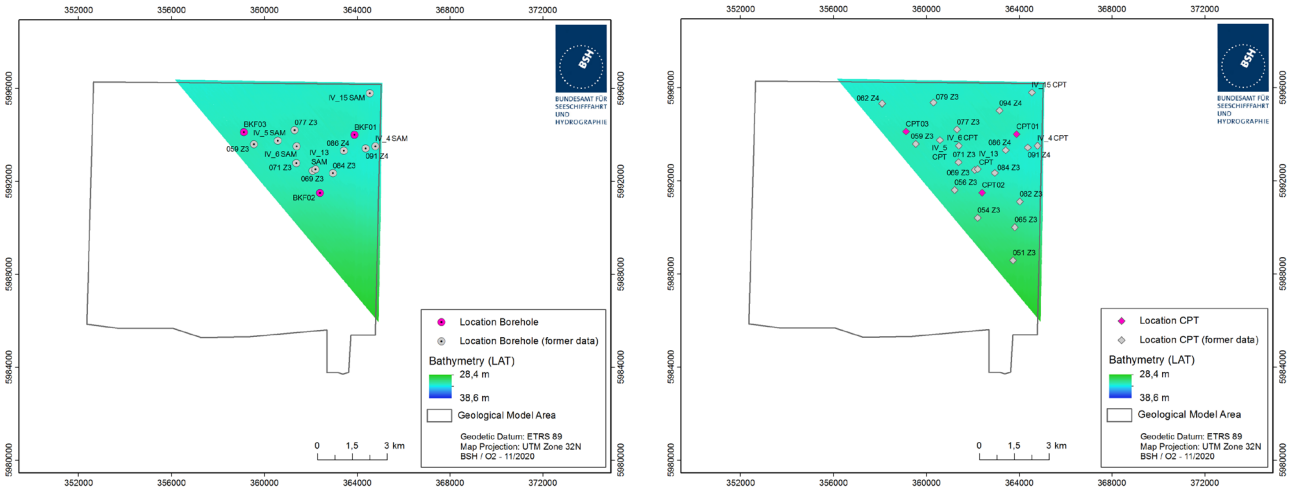


Figure 19: Position of the borehole and CPT locations at site N-3.8

Core catchers were used in non-cohesive and very soft cohesive material to ensure maximum core recovery.

A very thick-walled 2“ fitting was preferably used in very densely bedded sands, as it can be inserted into the ground with a higher pressure and recovers more sample.

Following sampling, laboratory investigations were carried out on the ground samples. To do this, the ground samples were classified and characterised and the following geotechnical laboratory tests were performed:

Geotechnical laboratory investigation	Standard	Number of tests performed
Particle size distribution (dry screening)	DIN EN ISO 17892-4	58
Particle size distribution (wet screening)	DIN EN ISO 17892-4	1
Particle size distribution (screen/wet analysis)	DIN EN ISO 17892-4	6
Determination of the consistency limits	DIN EN ISO 17892 12	3
Determination of the particle density	DIN EN ISO 17892-3	36
Determination of density of non-cohesive soils for maximum and minimum compactness	DIN 18126	8
Determination of the pH value	DIN ISO 10390:2005-12	10
Determination of the sulphate content	DIN EN ISO 11885 Acid leaching in accordance with DIN 4030-2	10
Determination of the chloride content	DIN EN ISO 10304-1	10
Determination of the organic contents	DIN 18128	16
Determination of the calcium content	DIN 18129	25
Determination of the thermal conductivity	ASTM D5334-05	7
Determination of the electrical conductivity	DIN EN 27888: 1993-11 from the 10:1 shaken eluate in accordance with DIN EN 12457-4	8
Pollen analysis	Petrological-palynological investigation	1
Determination of the water permeability coefficient	DIN EN ISO 17892-11	10
Determination of the particle shape	DIN EN ISO 14688-1	16
Triaxial test CID	DIN EN ISO 17892-9	17
Triaxial test CAUe	DIN EN ISO 17892-9	1
Shearbox test - non-cohesive soils	DIN EN ISO 17892-10	17
Direct simple shear test (DSS)	ASTM D6528-17, Fugro test method based on ASTM D6528-07	11
Ring shear test	Fugro test method L-M-203	11

Table 2: Laboratory investigations carried out on the ground samples on the site N-3.8

4.2.2.4 Geological model

Besides FEP site N-3.8, the geological model also encompasses the adjacent sites, N-3.5 and N-3.6.

For the geological model, the results of the hydrographic survey and the geophysical investigations were combined with the results of the geotechnical investigation and interpreted in terms of their geology. To do this, the seismic data sets – using the geotechnical results – were transferred to the depth range (m) (depth model) from the time range (seismic travel times).

The geological model was produced by Ramboll Deutschland GmbH.

The stratigraphic classification of the structures in the subsurface undertaken during modelling reflects the sequence of Pleistocene and Holocene sediments typically found in this area of the North Sea. The surface of the middle Pleistocene (particularly densely bedded sands) is crossed by a system of channels. A channel with heterogeneous filling runs from north to south in the western area of the model site (in the area of N-3.6). A larger channel meanders from southwest to northeast and is filled with silts and clays. Proglacial sands of the Upper Pleistocene are deposited above this. These are universally overlaid by thin Holocene sediments (particularly sand; also peats and mud deposits locally at the base). The surface of the seabed is formed by mobile North Sea sands with seashells.

4.2.2.5 Reports

The results of the preliminary geological survey of the subsoil are described in two reports. Geodata are made available in the form of GIS projects, raw data and intermediate products, sorted according to disciplines.

The geological report combines the results of the geophysical recordings and the primary geotechnical survey and interprets them in terms of their geology. The report forms the basis for further planning and includes a description of the geological subsurface model on which the structures are to be constructed. It is oriented towards geological engineering and represents the information and data basis from the preliminary geological survey of the subsoil together with the geotechnical data report for the offshore site investigation.

Both reports were produced based on the results of the preliminary survey conducted by Ramboll Deutschland GmbH.

4.2.3 Results of the preliminary investigation of sites concerning the wind conditions

The following data sources and methods were used to investigate the wind conditions at site N-3.8:

- Wind velocity and direction measurements
- Ensemble of atmospheric reanalyses

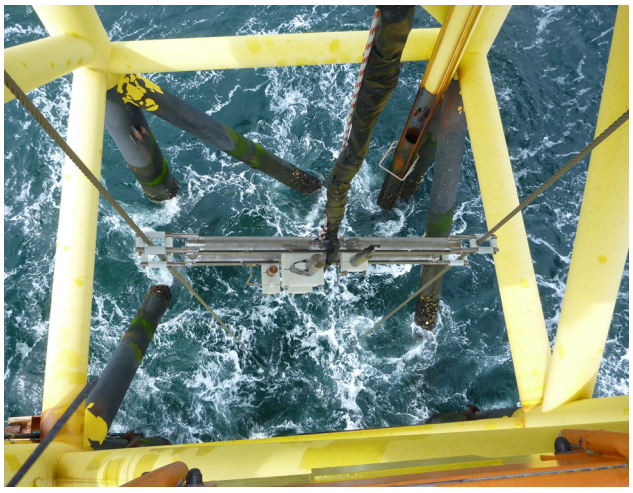
One significant data source is the wind profile measurements that have been taking place at an altitude range of between approximately 30 and 100 m on the FINO1 research platform since 2001. As the wind field has already changed due to the wind farms that are already in operation, one-year measurements of the wind profile and other meteorological variables directly at site N-3.8 according to the scientific and technical state of the art were additionally commissioned. These were carried out by UL International GmbH, Wilhelmshaven, using LiDAR systems. The measurements were statistically processed and summarised in a report.

To universally classify the above measurements, the COSMO-REA6 and ERA5 reanalyses were statistically evaluated by the DWD (German Weather

Service) and the results were summarised in a report

The two aforementioned reports were used by Guidehouse Energy GmbH in cooperation with ProPlanEn GmbH as the basis for producing an overall report. One of the results shown by the overall report is that the wind field at site N-3.8 has already changed due to the wind farms that are already in operation. This involves a direction-dependent decrease in the mean wind velocity and an increase in turbulence.

4.2.4 Results of the preliminary investigation of sites concerning the oceanographic conditions



Measurement Chain at FINO 1 Research Platform (Photo: Olaf Outzen, BSH)

The preliminary investigation of sites concerning the oceanographic conditions at site N-3.8 were conducted by the BSH according to the scientific and technical state of the art. Their scope is based on the documents to be submitted for requesting initial approval in terms of the site conditions according to the ‚Standard Design – Minimum requirements concerning the constructive design of offshore structures within the Exclusive Economic Zone (EEZ)' issued by the BSH.

The oceanographic reports contain fundamental information about the following:

- Water level
- Swell
- Current
- Seawater characteristics (density, salinity, temperature).

The in-situ data required for the report concerning the oceanographic conditions at site N-3.8 originate from the FINO1 research platform on which the BSH conducts oceanographic measurements. The measuring station has been in operation since 2004 and reliably provides data on swell, current, water temperature and salinity.

Current and swell data from the RAVE research project are additionally used. This project undertakes, amongst others, oceanographic measurements from the substation of the ‚North Sea One' wind farm located to the west of site N-3.7 in area 3.

The data measured in-situ as well as model data were combined and statistically evaluated in a summary report produced by the BSH. The objective of this approach is to enable the results to be validated and the error limits to be estimated.

4.3 Preliminary investigation of sites at site O-1.3

The preliminary investigation of sites carried out at site O-1.3 are described in the following.

4.3.1 Preliminary investigation of sites concerning the marine environment

Recovering the catch of the standard fishing gear pursuant to StUK4 in the Baltic Sea: the wind farm trawl, a bottom trawl net with otter boards. (Photo: Dr Andreas Dänhardt, BSH)

The preliminary investigation of sites concerning the marine environment that are described in the following implement the requirements of the ‚Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment' standard (currently StUK4). Pursuant to Sec. 10 para. 1 sentence 1 WindSeeG, investigations that are required for an environmental impact assessment in the planning approval process pursuant to Sec. 45 WindSeeG concerning the construction of offshore wind turbines at this site and which can be carried out irrespective of the subsequent design of the project are carried out and documented.

Data concerning the protected objects of benthos, biotopes, fish, avifauna and marine mammals are used/collected to characterise the site in terms of its natural environment and species communities.

A two-year baseline survey following StUK4, with one survey in the spring and autumn of the first year and one survey in the autumn of the second year of the investigation, was conducted for the protected assets benthos and fish, respectively.

For the protected assets of avifauna and marine mammals, one year pursuant to StUK4 essentially encompasses twelve calendar months including the month in which the investigations commence. Year-round investigations are required for resting birds and marine mammals. The recording of migratory birds is limited to the main migratory periods.

In the context of the preliminary investigation of sites, data from the cluster investigations ‚West of Adlergrund' and a bird study commissioned by the BSH (autumn 2019) were used to assess the protected assets avifauna and marine mammals.

4.3.1.1 Protected asset benthos

The IfAÖ was commissioned to carry out the baseline survey of the protected asset macrozoobenthos for site O-1.3.

A two-year baseline survey pursuant to StUK4, with one survey in spring and autumn, respectively, of the first year and one survey in autumn of the second year of the investigation, was conducted for the infauna (animals living in the ground) and the epifauna (animals living on the ground).

The infauna was sampled using a Van Veen grab sampler; the epifauna samples were obtained using a 2 m beam trawl. Sediment parameters were determined from the grab sampler samples. The species, abundance and biomass of the infauna

were determined in the laboratory; if possible, those of the epifauna were identified on board. If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

An average of between 10 and 12 macrozoobenthos species (infauna), significantly fewer than in the North Sea, were found per station in all three campaigns (Figure 20). A total of 63 taxa were detected, 44 of which could be identified down to species level. Bristle worms (polychaetes) were the most speciose major groups. Four of the 44 species identified at site O-1.3 are on the Red List for Germany due to their stock situation and development. Pre-existing anthropogenic impact on the area due to bottom trawling is to be assumed. On the whole, the macrozoobenthos stock at site O-1.3 is assessed as ‚average'.

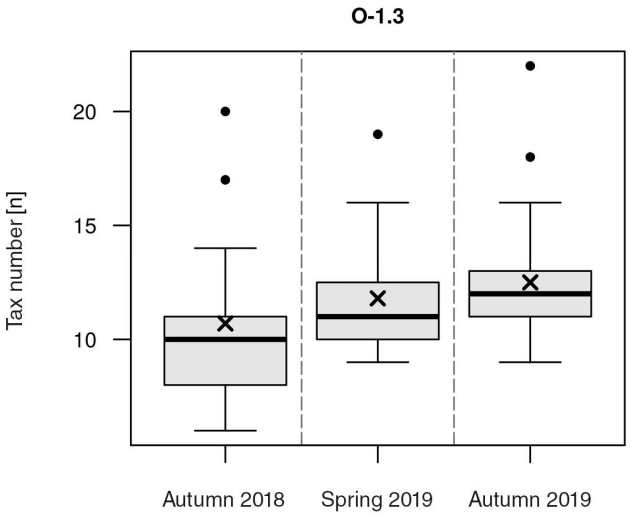


Figure 20: Number of species per station for the infauna of site O-1.3 in the autumn of 2018, spring of 2019 and autumn of 2019 (based on station averages).

4.3.1.2 Protected asset fish

Das IfAÖ wurde ebenfalls mit der Durchführung The IfAÖ was also commissioned to carry out a two-year baseline survey of the protected asset fish for site O-1.3, with one survey in spring and autumn, respectively, of the first year and one survey in autumn of the second year of the investigation.

A bottom trawl net, called " wind farm trawl", was used for this investigation. At site O-1.3 and the respective reference site (see StUK4), 30 individual hauls with the wind farm trawl were carried out on representatively distributed trawl tracks. The species, abundance, length and biomass were determined on board as far as possible. If necessary, animals that could not be identified on board were subsequently identified in the laboratory.

On average, 6–9 species of fish were caught in all three fishing campaigns (Figure 21). A total of 27 fish species were recorded, with a species composition typical of the western Baltic Sea, dominated by cod, flounder and plaice. No extinct/missing species, species at risk of extinction or extremely rare species pursuant to the Red List were discovered. One critically endangered species was caught, the European eel; the data basis was insufficient to assess the endangerment of three further species. Site O-1.3 and the surrounding area are known to be a spawning ground of the Arkona cod stock. The importance of site O-1.3 to fish is evaluated as ‚average'.

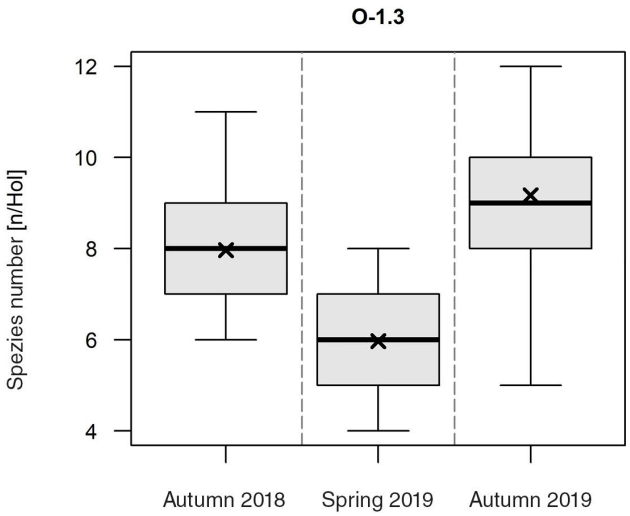


Figure 21: Number of species per station for the fish of site N-3.8 in the autumn of 2018, spring of 2019 and autumn of 2019 (box-whisker plot based on the individual hauls).

4.3.1.3 Protected asset resting birds

In the context of the site investigations, data from the cluster monitoring ‚West of Adlergrund' as a two-year baseline survey pursuant to StUK4 from March 2016 to February 2018 are being made available for the protected asset resting birds.

The data were collected by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH and BioConsult SH GmbH & Co. KG.

The site-specific evaluation and production of the report for site O-1.3 were carried out by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG and IBL Umweltplanung GmbH.

The surveys of the resting birds in the assessment area ‚cluster West of Adlergrund' are used to determine the status quo of the spatial distribution, the abundance and the behaviour of the birds in order to evaluate the importance of the environmental assessment area as a resting, feeding and/or moulting area. For this purpose, the resting birds were recorded by observers during transect surveys by ships. Twelve transect recordings per year were carried out under consideration of the recording conditions pursuant to StUK4. The ship-based resting bird counts were supplemented by counts using an aircraft, during which high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) were taken with the HiDef system using digital video technology. Ten flights per year were carried out.

The extensive investigations showed unanimously for the environment of site O-1.3 a seabird community that is typical for the prevailing water depths and hydrographic conditions, the distance from the coast and the location-specific influences.

The resting bird community is clearly dominated by the long-tailed duck (*Clangula hyemalis*). The highest mean seasonal densities were usually determined in the winter. Herring gulls (*Larus argentatus*) are the most frequent gull species found in the Baltic Sea and occur throughout the year.

The environment of site O-1.3 only touches the boundary areas of the extended resting habitats of the Bay of Pomerania and Adlergrund in the south and southeast. Overall, site O-1.3 and its environment reveal an average seabird population and also an average population of species that are endangered and require protection.

4.3.1.4 Protected asset migratory birds

The suitability assessment of site O-1.3 in terms of bird migration was based on radar investigations, visual observations and bird call recordings that took place between 1 January 2018 to 31 December 2019 in the context of the cluster surveys ‚West of Adlergrund'. The IFAÖ, the DHI and AviTech Research GbR also conducted a study on behalf of the BSH in the autumn of 2019. Supplementary and further methods as well as innovative method combinations were used in this in addition to recording methods pursuant to StUK4 (Figure 22).

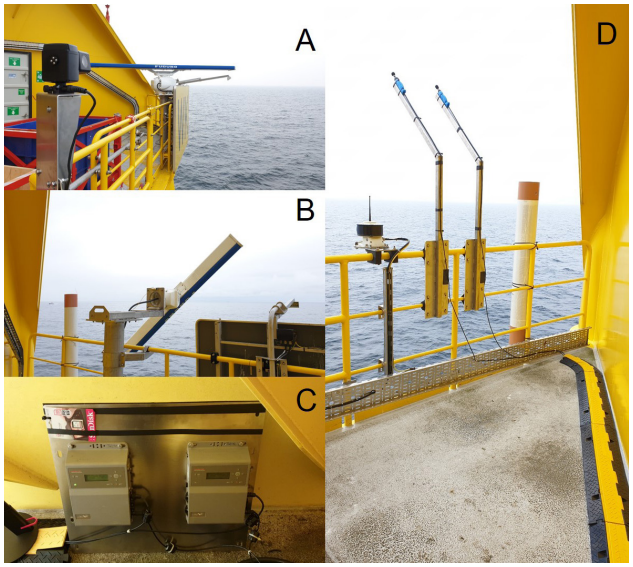


Figure 22: Measuring methods used for the BSH bird migration study: video camera and horizontal radar (A), vertical radar (B), recording devices (C) and microphones (D).

Specific migration corridors and lanes over the western Baltic Sea are known for some species and species groups that migrate during the day, whereas small birds migrate over a broad front at night according to current knowledge.

Bird migration takes place continuously in the vicinity of site O-1.3 during the migration period, primarily at night on individual days and also in high intensity during the day in the case of certain species. The weather conditions also extensively influence the dynamics of migratory activity.

During the aforementioned investigations, species listed in Annex I of the Birds Directive and further protection and endangerment categories (SPEC, AEWA) were recorded, as a result of which an above-average occurrence of protected and endangered species over site O-1.3 is ascertained in relation to the Baltic Sea as a whole.

For specific species or species groups and under certain migration conditions, site O-1.3 and its environment as a whole are of medium to occasionally high importance for bird migration.

4.3.1.5 Protected asset marine mammals

In the context of the site investigations, data from the cluster monitoring ‚West of Adlergrund' as a two-year baseline survey pursuant to StUK4 from March 2016 to February 2018 are being made available for the protected asset marine mammals.

The data were collected by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH and BioConsult SH GmbH & Co. KG.

The site-specific evaluation and production of the report for site O-1.3 were carried out by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG and IBL Umweltplanung GmbH.

The records of the marine mammals in the assessment area ‚cluster West of Adlergrund' are used to determine occurrence, spatial distribution, behaviour and habitat use of in order to assess the importance of the environmental assessment area for the marine mammals. To do this, counts were carried out using an aircraft. In this process, high-resolution pictures (approx. seven frames per second and a resolution of 2 cm on the sea surface) are taken with the HiDef system using digital video technology. Ten flights per year were carried out. The flight-based surveys were supplemented by ship-based surveys in which marine mammals were recorded by observers during transect passages by ships in addition to resting birds. Twelve transect recordings per year were carried out under consideration of the recording conditions pursuant to StUK4. C-PODs (Cetacean & Porpoise Detectors), automated porpoise click detectors, were used to investigate habitat use. C-PODs are autonomous recording devices that record the high-frequency echolocation sounds of porpoises using an integrated underwater microphone (hydrophone). The recorded sounds are subsequently searched through automatically for porpoise-specific signals using special software.

While aircraft- and ship-based survey methods cover considerably larger areas but only yield snapshots, and C-PODs offer a very high temporal but low spatial resolution, a combination of both methods is reasonable and suitable for describing and assessing the stock of marine mammals in the assessment area.

Three species of marine mammals regularly occur in the German EEZ in the Baltic Sea: harbour porpoises (*Phocoena phocoena*), grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*). All three species are characterised by their high mobility. Migration, particularly for foraging, is not restricted to the EEZ but also includes coastal waters and wide areas of the Baltic Sea across national borders.

Like the entire western Baltic Sea, site O-1.3 in the EEZ in the Baltic Sea therefore forms part of the habitat of the harbour porpoises. According to current knowledge, site O-1.3 and its environment are used regularly but to a very minor extent by harbour porpoises. Compared to the area to the west of the Darss Sill, particularly around the island of Fehmarn, in Kiel Bight, the Belt Sea and the Kattegat, the occurrence of harbour porpoises at site O-1.3 is minor. There are currently no indications that site O-1.3 has any particular function as a feeding ground or nursery for harbour porpoises. Site O-1.3 and its environment are therefore of medium to seasonally high importance for harbour porpoises. The high importance of this area arises from its possible use by individuals of the separate and severely endangered harbour porpoise population of the central Baltic Sea in the winter months.

Site O-1.3 and its environment are of minor to, at most, medium importance for grey seals and harbour seals.

4.3.1.6 Protected asset bats

In the context of the site investigations, data from the cluster monitoring ‚West of Adlergrund' as a two-year baseline survey pursuant to StUK4 from May 2014 to October 2015 are being made available for the protected asset bats.

The data were collected by BioConsult SH GmbH & Co. KG.

The site-specific evaluation and production of the report for site O-1.3 were carried out by a consortium consisting of Institut für angewandte Ökosystemforschung GmbH, BioConsult SH GmbH & Co. KG and IBL Umweltplanung GmbH.

The objective of the investigations is to record the temporal variation of bat migration in the area of site O-1.3 and its spatial variation in the area of the western Baltic Sea. The investigations concerning the protected asset bats were carried out in parallel with the night-time recording of migratory bird calls from an anchoring ship following StUK4. Bat detectors from Avisoft Bioacoustics were used to record the flight calls of the bats.

During the investigation period, calls were recorded on 65 nights in 2014 and 2015, and individual Nathusius's pipistrelle (*Pipistrellus nathusii*) and common pipistrelle (*Pipistrellus pipistrellus*) bats were detected as well as individual nyctaloids that could not be identified at species level. The Nathusius's pipistrelle was dominant, with twelve individuals being recorded. It is known to be a species that regularly migrates long distances and is often found in the Swedish coastal area of the Baltic Sea. Conversely, only one individual common pipistrelle bat was verified.

A population evaluation in the area of site O-1.3 is not possible, because the data basis is not sufficient for a reliable evaluation..

4.3.1.7 Protected asset biotopes

Underwater video recordings confirmed the preliminary geophysical investigations indicating the predominance of fine surface substrate with very occasional lumps of marl as well as the presence of hard substrates in the form of individual stones and occasionally blocks. The biotopes ‚Sublittoral mud bottom of the Baltic Sea with infauna', ‚Sublittoral, flat sandy bottom of the Baltic Sea with infauna' and ‚Sublittoral mixed substrate of the Baltic Sea' defined by FINCK et al. (2017) were discovered at site O-1-3. The latter could be part of a geogenic reef and may therefore be a legally protected biotope pursuant to Sec. 30 Federal Nature Conservation Act (BNatSchG). None of the criteria of the BfN mapping guideline for the biological verification of the reef type ‚Residual sediment with occasional stones and/or blocks' was fulfilled, whereby the residual sediment area at O-1.3 is not to be regarded as a reef area pursuant to Sec. 30 BNatSchG. Further objects and structures ascertained in the context of the geological offshore site investigation were then examined in accordance with the BfN mapping guideline to determine whether legally protected biotopes pursuant to Sec. 30 BNatSchG are present in these locations. The occurrence of legally protected biotopes pursuant to Sec. 30 BNatSchG within site O-1.3 as a whole was ruled out.

4.3.2 Results of the preliminary investigation of sites concerning the subsoil

The preliminary investigations pertaining to the subsoil survey described in the following implement the requirements of the Standard Ground Investigations. Pursuant to Sec. 10 para. 1 no. 2 WindSeeG, the preliminary investigations include a preliminary investigation of the subsoil in accordance with the Standard Ground Investigations and the latest scientific and technical knowledge is carried out and documented in the context of the preliminary investigation of sites investigations.

The preliminary geological survey serves to describe the sedimentary/lithological conditions, the general bedding conditions and, if necessary, tectonic factors in the investigation area as well as to provide a general assessment of the subsoil from a geological perspective.

It makes use of modern, high-performance hydrographic and geophysical methods whose results are verified on the basis of direct geotechnical exploration methods (CPTs, Sampling/Laboratory). Due to the seafloor's inaccessibility, hydrographic and geophysical methods are highly efficient for obtaining an overall overview of the seafloor characteristics and the subsurface conditions of the areas to be assessed.

The hydrographic survey provides area-wide information about the seafloor surface. The geophysical investigations provide findings regarding the structure of the seafloor and the subsurface along profile lines. Depending on the method used and the depth range analysed, these permit conclusions of varying detail to be drawn with regard to the local geological conditions.

In addition to the wide-ranging results of the hydrographic and geophysical measurement campaigns, the geotechnical investigation provides selectively indirect and direct geological information (CPTs, Sampling Boreholes, Geophysical Borehole Loggings) about the subsurface conditions. This information is used firstly to calibrate the geophysical methods. Secondly, drilling cores are sampled in laboratory tests to determine and classify the ground type or the bedrock, state and mechanical characteristics. The drilling core descriptions are assigned to the seismo-stratigraphic units and transferred to a spatial geological depth model of the subsurface.

The preliminary geological survey provides the geological report, which combines the results of the hydrographic survey, the geophysical and the geotechnical investigations and contains the description of the

geological depth model. It is oriented towards geological engineering.

A geotechnical data report for the offshore site investigation (gDF), which enables the potential project developer to determine the subsoil parameters, is also produced. It includes the results of the exploratory surveys and the respective laboratory investigations with reference to the geotechnical part of the preliminary survey pursuant to Sec. 10 para. 1 sentence 2 WindSeeG. In this process, tests are conducted to determine and classify the ground type, state and mechanical characteristics.

The objective of the preliminary geological survey is to establish an adequate information basis to enable the winning bidder to select the site of the wind turbines and to undertake preliminary planning of the structures during the development phase as per the ‚Standard Design'. The challenge of the preliminary geological survey is to ensure this without knowing the layout of the wind farm. As a result of this, the minimum requirements of the subsoil standard are exceeded in some cases.

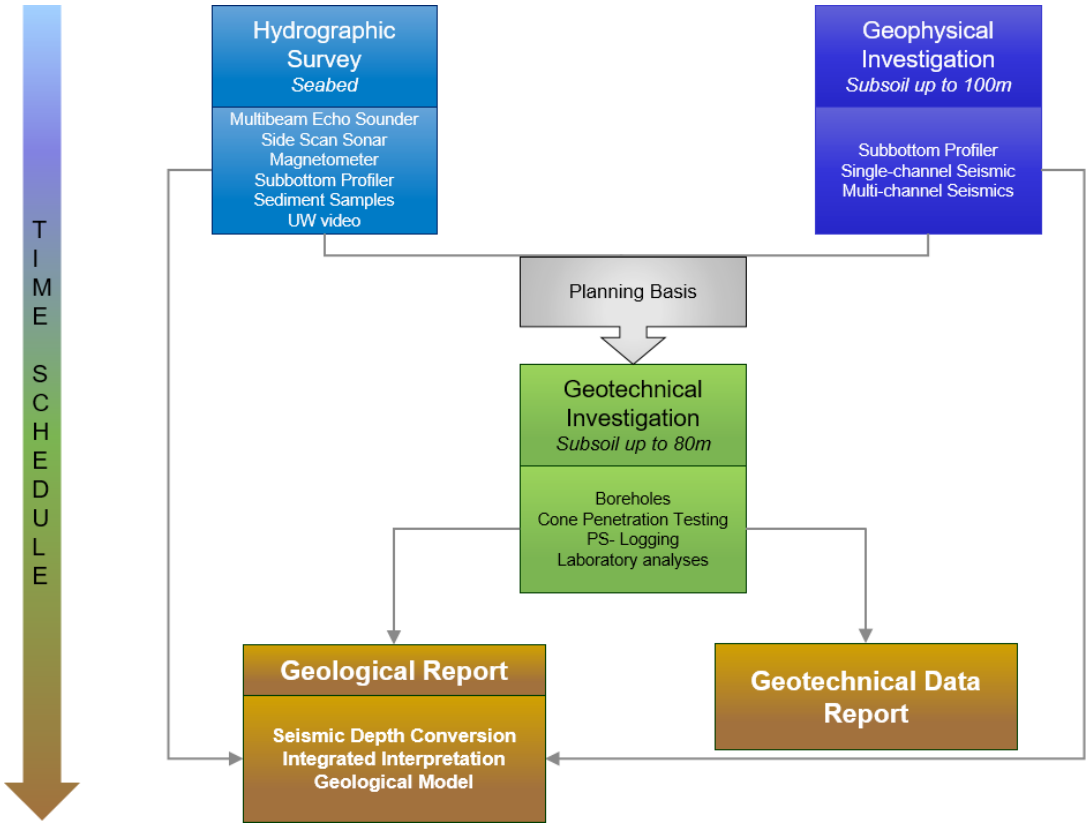


Figure 23: Overview of the preliminary geological survey in the context of the site investigation

4.3.2.1 Hydrographic survey of the seafloor

The measurement campaign for the hydrographic survey of the seafloor provides area-wide information about the seafloor surface. It involves the following investigative methods:

- Universal Multibeam Echo Sounder investigation to record the bathymetric conditions
- Universal Side Scan Sonar investigation to delimit seafloor surface sediment types and structures
- Magnetometer investigation to map magnetic anomalies
- Subbottom Profiler investigation of the structure of the subsurface down to a depth of 6 metres

The following investigations were additionally carried out to verify and interpret the data:

- Sediment samples for mapping the sediment types based on the Side Scan mosaic underwater video recordings (UW video) for mapping the sediment types based on the SideScan Sonar results
- ROV investigations to verify objects detected in the Multibeam Echo sounder and SideScan Sonar results

Data existing from 2010 from Multibeam Echo Sounder, SideScan Sonar, Subbottom Profiler and Magnetometer investigations are available for site O-1.3. These were surrendered to the BSH to attain the right of access (see Sec. 41 WindSeeG) unencumbered by third-party rights. These data were checked and classified as insufficient due, amongst other aspects, to the new requirements concerning the protected asset ground (‚Guideline for Seafloor Mapping 2016' as well as ‚BfN Kartieranleitung 2018'). Due to this, VBW Weigt GmbH was commissioned to carry out a measurement campaign according to the latest scientific and technical knowledge.

The investigations took place in the period from 13 October to 18 October 2019.

The Multibeam Echo Sounder, SideScan Sonar, Magnetometer and Subbottom Profiler investigations were carried out simultaneously with a profile spacing of approx. 75 m.

With reference to NHN, the water depths lie between 40 metres in the south of the site and 45.5 metres in the north. Numerous signs of fishing were observed throughout the site under investigation.

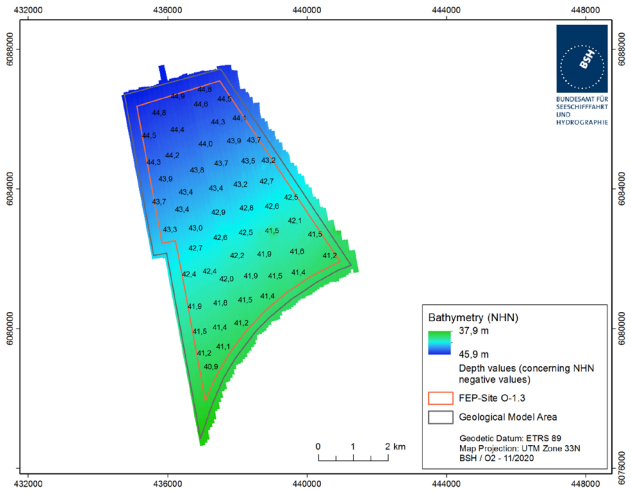


Figure 24: Bathymetry on site O-1.3

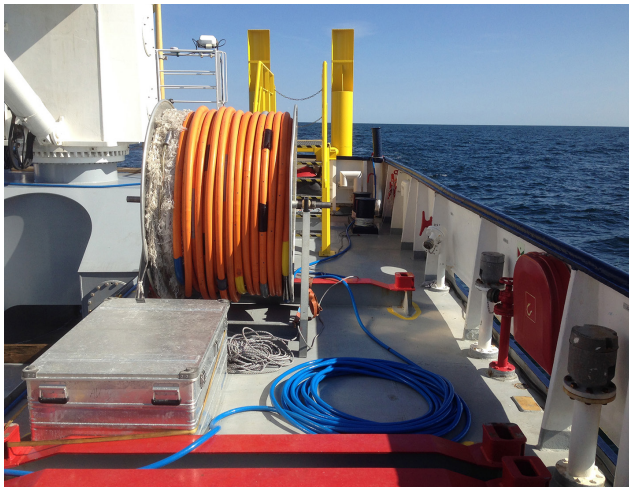
Possible objects were detected in several locations in the Side Scan Sonar results. These were compared against the results of the Multibeam Echo Sounder investigation. Video investigations using a ROV were carried out at a total of twelve locations. Stones with a maximum edge length of 1.5 m were recorded in eleven locations. One object was identified as an anthropogenic object. The occurrence of marine boulders within the meaning of the BfN reef mapping guideline can be ruled out.

A total of 10 sediment samples were taken at site O-1.3 using a Van Veen grab sampler. The sediment samples were classified in accordance with DIN 17892-4 and in accordance with Folk 1954/1974. The determination of the particle parameters from the particle size distribution of the ground samples taken from site O-1.3 largely reveals clayey silts (mud) with varying contents of sandy sediment. Areas with sands and pebbles are encountered in the south-eastern and eastern parts of site O-1.3.

In the eastern area, the Side Scan Sonar mosaic shows four extensive changes in intensities indicating coverage that deviates from the general ground cover (mud). Two of these sites consist of sand with a mud content. One site consists of sand with a pebble content and one of pebbly sand.

Near to the surface, the subsurface of site O-1.3 consists of a layer of mud with a thickness of a few decimetres to > 2.5 m. Beneath this lie late-glacial deposits of silts, clays and fine sands, locally with sandy or pebbly contents. There is no indication of stones in either the mud or in the Late-glacial, near-surface layers located beneath. In four locations, the Late-glacial sediments occur slightly further up. The thickness of the mud decreases there but is still present in a thin layer.

4.3.2.2 Geophysical investigation of the seafloor



Looking aft across working deck of offshore support vessel LEV TORNADO at the multichannel seismic streamer winch. (Photo: Florian Meier, Fraunhofer IWES)

Fraunhofer IWES surveyed the seafloor and the underlying layers in the autumn of 2017 in the course of the geophysical investigations. The following methods were used in this process:

- Subbottom Profiler incl. Sound Velocity measurements for mapping geological structures and objects in a depth range from 0 m to 15 m under the seafloor with a vertical resolution capacity and a lateral sampling rate of at least 0.5 m.
- Single-channel seismic for mapping geological structures and objects in a depth range from 0 m to 30 m under the seafloor with a vertical resolution capacity of 1 m and a lateral sampling rate of at least 2.25 m.
- Multi-channel seismic for mapping geological structures and objects in a depth range from 0 m to 100 m under the seafloor with a vertical resolution capacity of at least 3 m and a lateral resolution capacity of at least 2 m. The lateral resolution capacity is taken to mean the bin interval of migrated data.

Data recording took place along a 100 x 100 m grid. An electrical source (sparker) was used as a seismic signal generator. As the result of this investigation, 154 profiles with a total length of approx. 645 km and 9 Sound Velocity measurements are available. Approximately half of the recorded profiles subsequently underwent data processing optimised for the special conditions; this included multiple suppression and data migration. A processed data set with a line spacing of 200 x 200 m incl. a diagonal profile is therefore available. The unprocessed data sets were provided and can be used for a more detailed evaluation if necessary.

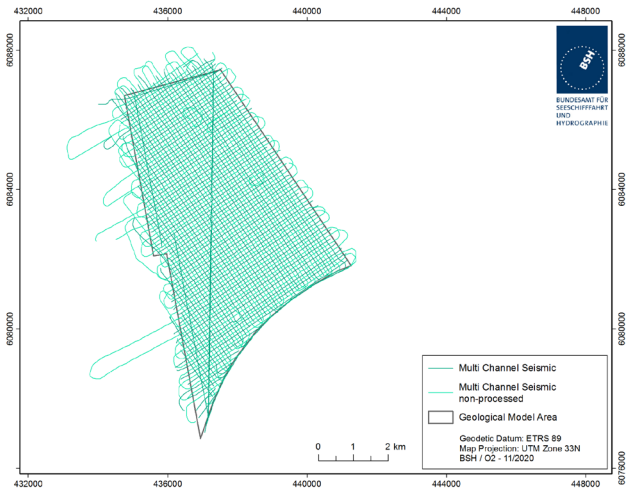


Figure 25: Profile overview Multi Channel Seismic on site O-1.3

The drilling sites for the subsequent geotechnical survey were selected based on a preliminary evaluation of the geophysical data.

An integrated evaluation of the geophysical data was carried out during the course of geological modelling.

4.3.2.3 Geotechnical investigation of the subsurface (down to a depth of 80 m)

Indirect and direct geological (engineering) information (CPTs, Sampling Boreholes) was collected in the context of the geotechnical survey. The drilling cores obtained were then sampled in laboratory tests to determine and classify the ground or rock type, state and mechanical characteristics. The geotechnical investigation encompasses the following exploration methods:

- Representative CPTs to determine the bedding conditions of the subsurface down to a depth of 80 metres
- Representative Sampling Boreholes for ground identification and to obtain ground and rock samples for the geotechnical laboratory tests down to a depth of 80 metres
- Geophysical Borehole Loggings investigation for determining seismic interval velocities

To determine the ground parameters:

- Laboratory tests to determine and classify the ground type, state and mechanical characteristics

The exploration depth of the Sampling Boreholes and the CPTs is defined as 80 metres to cover the common foundation variants intended in the context of preliminary draft planning.

FUGRO Germany Land GmbH was commissioned to carry out the geotechnical investigation. The geotechnical surveys (offshore and laboratory work) were monitored by a geotechnical expert, Ramboll Deutschland GmbH, commissioned by the BSH. Ramboll produced the geological data report for the offshore site investigation (gDF) based on the results.

Data from geotechnical surveys are available for site O-1.3. These were surrendered to the BSH to attain the right of access (see Sec. 41 WindSeeG) unencumbered by third-party rights. These data were checked and classified as only of limited use due to the exploration depth amongst other aspects. Additional investigations were therefore carried out after weighing up technical and economic aspects. To do this, drilling with sampling and CPTs were carried out at three representative locations.

The location of the explorations was defined based on the results of geophysical investigations under consideration of geological structures and in a form that was representative for the respective site.

The water depth at the investigated locations varies between 41.6 m and 45.2 m versus standard elevation zero (‚Normalhöhennull', (NHN)). The field work was carried out from the geotechnical drill ships MV Gargano and MV Normand Flower between 04 November and 05 December 2019.

A total of nine entry points (including repositioned entry points) were sunk by means of discontinuous pressure soundings (CPT), seven entry points with sampling (BKF) and four entry points with geophysical measurements down to a maximum drilling depth of 82.80 m beneath the seafloor.

The obtained samples were described, and the unit weight and water content were determined on selected samples in the offshore laboratory.

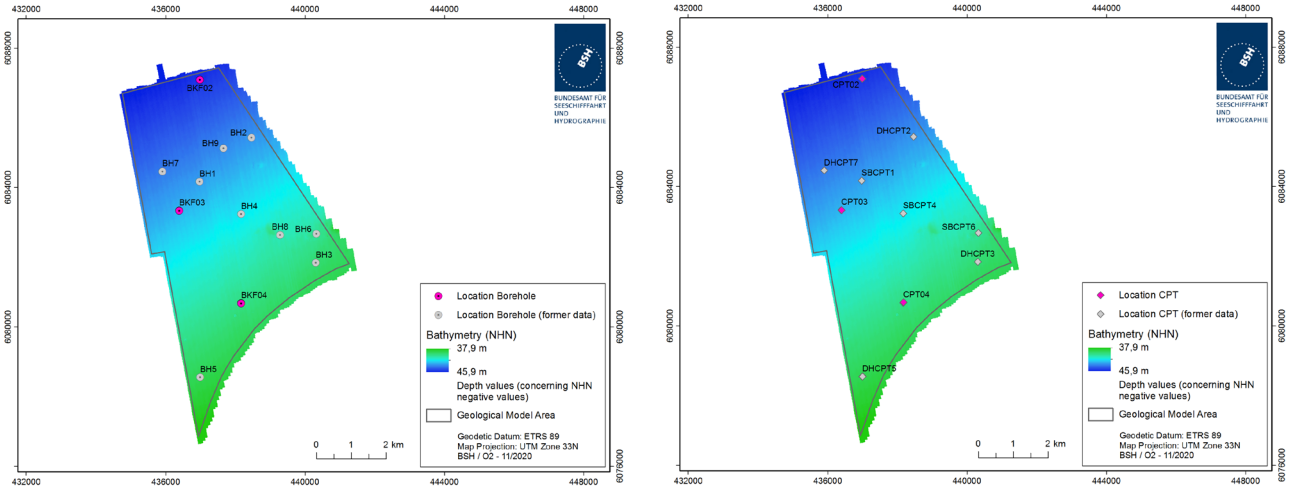


Figure 26: Position of the borehole and CPT locations at site O-1.3

Depending on ground conditions, the cylindrical sample tubes were pressed into the ground in ‚WIP' mode with an internal diameter of 3" (72 mm) or 2" (53 mm) for sampling. The maximum sample length is 0.98 m. This sampling corresponds to line 3 or line 4 in accordance with DIN EN ISO 22475-1 Table 3. Core catchers were used in non-cohesive and very soft cohesive material to ensure maximum core recovery.

A very thick-walled 2" fitting was preferably used in very densely bedded sands, as it can be inserted into the ground with a higher pressure and recovers more sample.

After reaching the till horizon and/or the chalk, a switch was made to the core drilling method (GeoBor-S). The maximum sample length is 1.50 m and the core diameter is 102 mm. This sampling corresponds to line 4 in accordance with DIN EN ISO 22475-1 Table 5.

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Drill core from a granite block in the Baltic Sea (Photo: BAW)

Following sampling, laboratory investigations were carried out on the ground and rock samples. To do this, the ground samples were classified and characterised and the following geotechnical laboratory tests were performed:

Geotechnical laboratory investigation	Standard	Number of tests performed
Triaxial test (UU test)	DIN EN ISO 17892-8	65
Unconfined compression	DIN EN ISO 17892-7	21
Laboratory vane shear test	DIN 4094-4	6
Particle size distribution (screen/wet analysis)	DIN EN ISO 17892-4	17
Particle size distribution (hydrometer analysis)	DIN EN ISO 17892-4	16
Determination of the consistency limits	DIN EN ISO 17892-12	51
Determination of the shrinkage limits	DIN 18122-2	12
Determination of the particle density	DIN EN ISO 17892-3	46
Determination of the pH value	DIN ISO 10390:2005-12	21
Determination of the sulphate content	DIN EN ISO 11885	30
Determination of the chloride content	DIN EN ISO 10304-1	30
Determination of the organic contents	DIN 18128	3
Determination of the calcium content	DIN 18129	69
Determination of the thermal conductivity	ASTM D5334-05	8
Determination of the water permeability coefficient	DIN EN ISO 17892-11	9
Determination of the particle shape	DIN EN ISO 14688-1	16
Oedometer test	DIN EN ISO 17892-5	30
Oedometer test, additional loads	DIN EN ISO 17892-5	11
Oedometer test, disturbed	DIN EN ISO 17892-5	11
Triaxial test CIU	DIN EN ISO 17892-9 BS1377-8	12
Triaxial test CID	DIN EN ISO 17892-9	4
Triaxial test CAUc (chalk)	DIN EN ISO 17892-9	11
Triaxial test CAUc (soil)	DIN EN ISO 17892-9 BS1377-8	5
Triaxial test CAUe	DIN EN ISO 17892-9	4
Shearbox test – cohesive soils	DIN EN ISO 17892-10	11
Direct simple shear test (DSS)	ASTM D6528-17 Fugro test method based on ASTM D6528- 07	9
Ring shear test	Fugro test method L-M-203	10
Direct shear test (CNS) in chalk (chalk)	DIN EN ISO 17892-10	16
Resonant column test	Fugro test method L-M-309	7

Table 3: Laboratory investigations carried out on the ground and rock samples on the site O-1.3

4.3.2.4 Geological model

For the geological model, the results of the hydrographic survey and the geophysical investigations were combined with the results of the geotechnical investigation and interpreted in terms of their geology. To do this, the hydroacoustic and seismic data sets - using the geotechnical results - were transferred to the depth range (m) (depth model) from the time range (seismic travel times).

The geological model was produced by Ramboll Deutschland GmbH.

The stratigraphic classification of the structures in the subsurface undertaken during modelling reflects the sequence of chalk sediments, bounder clays and Holocene sediments typically found in this area of the Baltic Sea. The chalk surface interpreted in the working area is crossed by two pronounced channel

systems. The unit lying above this was interpreted as bounder clay and is characterised by an extensive relief on the surface and complex internal structures. Holocene soft sediments (particularly sand, silt, clay) extensively cover and compensate the irregular relief. The surface of the seafloor is covered almost universally by a thin layer of mud.

4.3.2.5 Reports

The results of the preliminary geological survey of the subsoil are described in two reports. Geodata are made available in the form of GIS projects, raw data and intermediate products, sorted according to disciplines.

The geological report combines the results of the geophysical recordings and the primary geotechnical survey and interprets them in terms of their geology. The report forms the basis for further planning and includes a description of the geological subsurface model on which the structures are to be constructed. It is oriented towards geological engineering and represents the information and data basis from the preliminary geological survey of the subsoil together with the geotechnical data report for the offshore site investigation.

Both reports were produced based on the results of the preliminary survey conducted by Ramboll Deutschland GmbH.

4.3.3 Results of the preliminary investigation of sites concerning the wind conditions

The following data sources and methods were used to investigate the wind conditions at site O-1.3:

- Wind velocity and direction measurements
- Ensemble of atmospheric reanalyses

The wind profile measurements in the altitude range of approximately 30-100 m on the FINO2 research platform were firstly used to determine the climatology of the wind conditions at site O-1.3. This platform is located roughly 60 km west of the site O-1.3.

In addition, data from the Arkona Basin wind measurement mast were used, which had been provided to the BSH as part of the procedure for acquiring the right of first refusal (cf. Sec. 41 WindSeeG). Measurements of the wind velocity and the wind directions at various altitudes between 30 and around 100 m are available for the December 2006 – May 2012 period. A report on the meteorological and oceanographic conditions at the Windanker wind farm was also submitted.

To universally classify the above measurements, the COSMO-REA6 and ERA5 reanalyses were statistically evaluated by the DWD (German Weather Service) and the results were summarised in a report.

The two aforementioned data sources were used by Guidehouse Energy GmbH in cooperation with ProPlanEn GmbH as the basis for producing an overall report. One of the results shown by the overall report is that the wind field at site O-1.3 has already changed due to the wind farms that are already in operation. This involves a direction-dependent decrease in the mean wind velocity and an increase in turbulence.

4.3.4 Results of the preliminary investigation of sites concerning the oceanographic conditions

Measuring Station Arkona Becken (Photo: Mike Sommer, IOW)

The scope of the preliminary investigation of sites concerning the oceanographic conditions at site O-1.3 is based on the documents to be submitted for requesting initial approval in terms of the site conditions according to the ‚Standard Design – Minimum requirements concerning the constructive design of offshore structures within the Exclusive Economic Zone (EEZ)' issued by the BSH.

The oceanographic reports contain fundamental information about the following:

- Water level
- Swell
- Current
- Seawater characteristics (density, salinity, temperature).

The in-situ data required for the report concerning the oceanographic conditions at site O-1.3 originate from the BSH MARNET ‚Arkona Basin' measuring station. The measuring station has been in operation since 2002 and reliably provides data on swell, current, water temperature and salinity. The ‚Arkona Basin' measuring station is located approx. 5 nm (9 km) east of site O-1.3 in a water depth of approx. 43 m.

The data measured in-situ as well as model data were combined and statistically evaluated in a summary report produced by the BSH. The objective of this approach is to enable the results to be validated and the error limits to be estimated.

4.4 Results of the preliminary investigation of sites concerning the traffic situation

The BSH defined the safety and efficiency of traffic as an additional investigation object in the context of the site investigations.

With regard to the issue of whether the safety and efficiency of shipping traffic are significantly impaired in this sense, the BSH commissioned a report on the suitability of sites in the EEZ in the North Sea and the Baltic Sea from the point of view of shipping traffic and maritime policing[1] in the context of the site investigation. As part of the analyses, the possible effects of developing the sites to be investigated with offshore wind turbines on the safety and efficiency of shipping traffic including the related risks were investigated and assessed. The risks were analysed both qualitatively and quantitatively in this process.

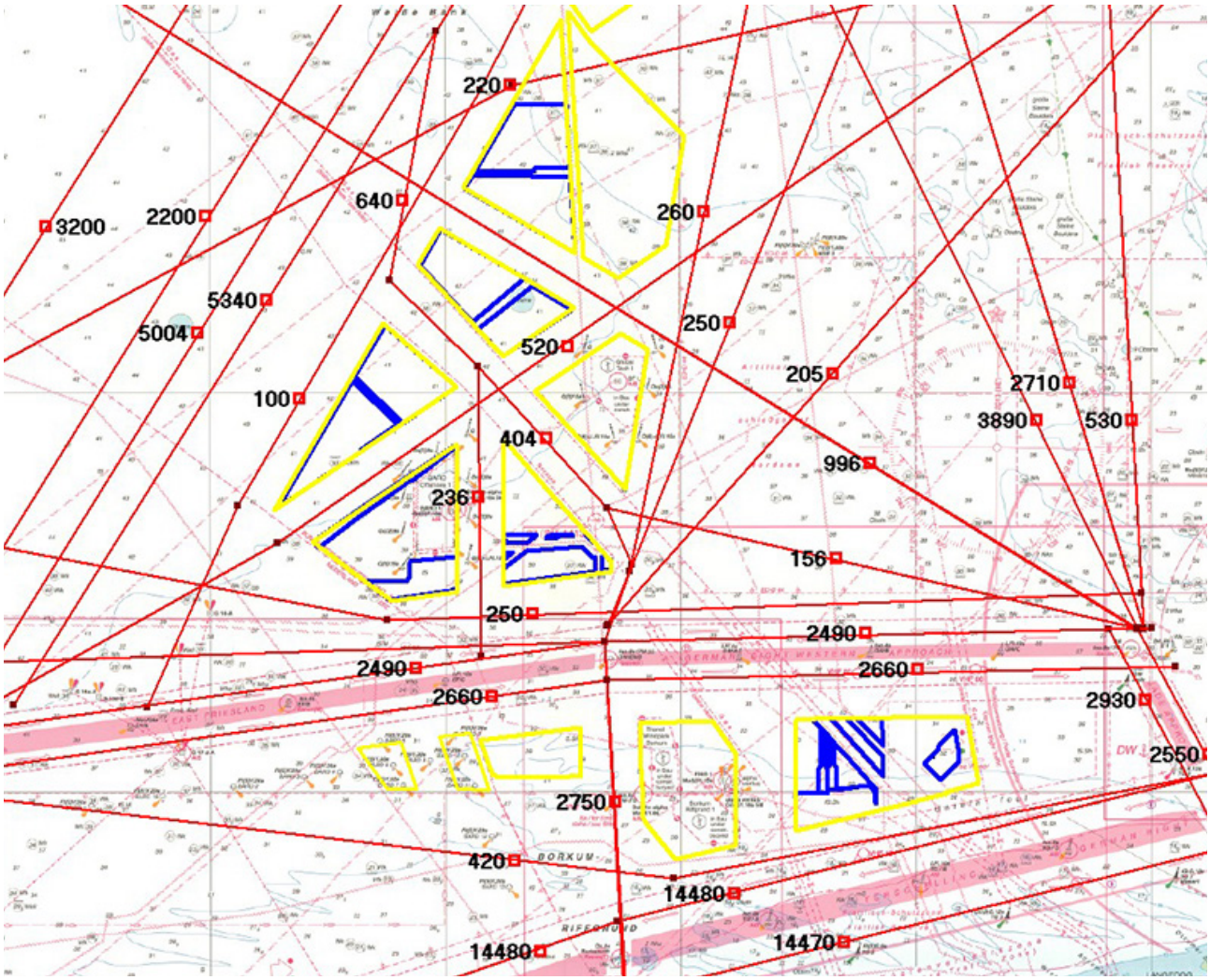

Figure 27: North Sea, ship routes with ship numbers and sites analysed in the expert report (‚Gutachterliche Stellungnahme gemäß §12 Abs.3 WindSeeG – Voruntersuchung zur verkehrlich-schifffahrtspolizeilichen Eignung von Flächen in der AWZ der Nord- und Ostsee', DNV GL, 06.12.2019)

[1] *Gutachterliche Stellungnahme gemäß § 12 Abs.3 WindSeeG – Voruntersuchung zur verkehrlich- schifffahrtspolizeilichen Eignung von Flächen in der AWZ der Nord- und Ostsee', DNV GL on behalf of the Federal Maritime and Hydrographic Agency, 06.12.2019 (Report No.: M-W-ADER 2019.137, Rev. 1.00)*

In the qualitative analysis for each site, a description of the relevant traffic area was followed by an analysis of current and forecast future shipping traffic. The next step was a qualitative assessment of the effects of site development both for the construction phase and for the phase after completion of the respective wind farm. Various traffic situations such as encounters, overtaking or intersecting courses were subsequently analysed and also qualitatively evaluated in terms of the possible effects. Finally, recommendations for risk-mitigating measures were derived.

A cumulative analysis with all of the developed wind farm sites in the respective traffic area was undertaken to assess the effects of the additional development at the respective site in quantitative terms.

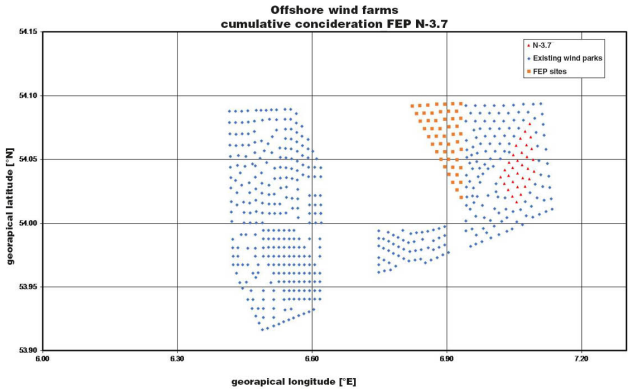

Figure 28: Installation pattern of the cumulatively analysed OWFs for site N-3.7 (‚Gutachterliche Stellungnahme gemäß § 12 Abs. 3 WindSeeG - Voruntersuchung zur verkehrlich-schifffahrtspolizeilichen Eignung von Flächen in der AWZ der Nord- und Ostsee', DNV GL, 06.12.2019)

The time sequence of the development of all of the analysed sites was established according to the Site Development Plan (FEP 2019) defined on 28 June 2019. Key variables for the assessment of the suitability of a site were, firstly, the statistically expected time between two collisions and, secondly, the classification of the calculated risk in the risk matrix of the BSH standard ‚Design of Offshore Wind Turbines' (Standard Design). Classification was based on a combination of the collision frequency and the expected quantity of pollutants to be released, expressed as the risk priority number (RPN). The calculation of the expected time between two collisions is based on the harmonised assumptions according to the results achieved by the two Federal Ministry of Transport, Building and Urban Affairs (now the BMVI) working groups in 2004/2005 and 2008 concerning parameters and basic assumptions for the creation of technical risk analyses for offshore wind farms[2].

The results are analysed with and without the consideration of additional measures that mitigate the risk of collision. In the quantitative section of the investigation, the following risk-mitigating measures were taken into consideration:

- Fitting of the ships with AIS (Automatic Identification System)
- Traffic monitoring and maritime surveillance
- Emergency towing capacities

The levels of effectiveness of the respective collision avoidance measures taken into account are based on the results of a study carried out by Germanischer Lloyd in 2008.

The quantitative study is based on model installation patterns of the sites to be developed in the future as well as the installation patterns of the existing wind farms. The sites under consideration each represent the cumulative situation at the time of completed construction within a radius of 20 nautical miles (nm).

Result

For all of the analysed sites, the report showed that the guideline value of 100 years is not undershot or

[2] *‚Offshore Windparks – Parameter für Risikoanalysen im Genehmigungsverfahren Wirksamkeit kollisionsverhindernder Maßnahmen - Bericht', Germanischer Lloyd on behalf of the Federal Maritime and Hydrographic Agency, 29.07.2010 (Report No. SO-ER 2010.095 Version 1.0/2010-07-29).*

that undershooting it can be compensated for through specifications in the determination of suitability and that, as a result, there is no risk to the safety of shipping. Nor do the construction and operation of wind turbines at the sites lead to any significant impairment in the efficiency of traffic.

The collision repetition rate determined for site N-3.7 under consideration of risk-mitigating measures is 113 years and is thus higher than the relevant guideline value defined as at least 100 years by the Federal Ministry of Transport's ‚Approval-relevant guideline values' working group. As the value of' 113 years is only marginally higher than the guideline value of 100 years, the project developer must submit an updated risk analysis in the planning approval process so that the statement can be assessed during the planning approval process and further mitigation measures such as the reservation of an additional private emergency towing vessel can be ordered if necessary.

The assessment in the context of the qualitative risk analysis and the classification of the scenarios in the risk matrix according to ‚Standard Design' do not reveal any special circumstances of the individual case that could oppose the suitability of the site in terms of shipping traffic and maritime policing. Insofar as was possible without knowledge of the specific project parameters, the required measures determined in each case were adopted as specifications in the draft determination of suitability (Sec. 16 to 20 and Sec. 38). Reference is therefore made to the rationales of the individual specifications with respect to the safety and efficiency of shipping traffic.

Taking risk-mitigating measures into consideration, the collision repetition rate determined for site N-3.8 is 100 years and therefore corresponds to the relevant guideline value defined as at least 100 years by the Federal Ministry of Transport's ‚Approval-relevant guideline values' working group.

The assessment in the context of the qualitative risk analysis and the classification of the scenarios in the risk matrix according to ‚Standard Design' do not reveal any special circumstances of the individual case that could oppose the suitability of the site in terms of shipping traffic and maritime policing. As the guideline value of 100 years is just achieved here, a review of the result of the expert report on the collision repetition rate is required as part of the subsequent planning approval process to determine any additionally required mitigation measures such as the reservation of an additional private emergency towing vessel. Updating will be specified in the determination of suitability.

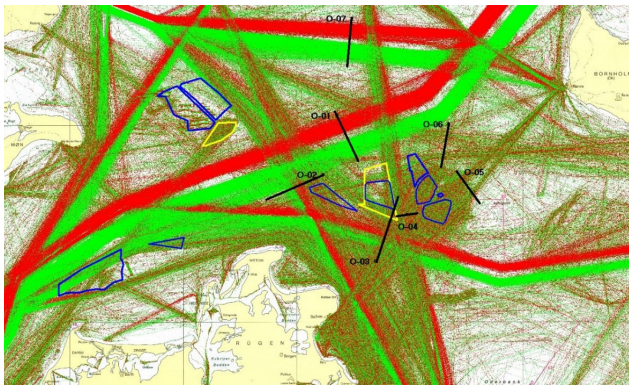

Figure 29: Shipping movements in the Baltic Sea (‚Gutachterliche Stellungnahme gemäß §12 Abs.3 WindSeeG - Voruntersuchung zur verkehrlich- schifffahrtspolizeilichen Eignung von Flächen in der AWZ der Nord- und Ostsee', DNV GL, 06.12.2019)

Insofar as is possible without knowledge of the specific project parameters, the further measures required according to the report will also be adopted as specifications in the draft determination of suitability (Sec. 16 to 19 and Sec. 41). Reference is therefore made to the rationales of these specifications.

Taking risk-mitigating measures into consideration, the collision repetition rate determined for site O-1.3 is 155 years and therefore corresponds to the relevant guideline value for a socially acceptable risk defined as at least 100 years by the Federal

Ministry of Transport's ‚Approval-relevant guideline values' working group.

The assessment in the context of the qualitative risk analysis and the classification of the scenarios in the risk matrix according to ‚Standard Design' do not reveal any special circumstances of the individual case that could oppose the suitability of the site in terms of shipping traffic and maritime policing. In particular there is no significant impairment of the efficiency of shipping traffic. Although the site is currently crossed by a north-south transit route, meaning that the development would make bypassing necessary, this circumstance alone does not constitute a relevant impairment to the efficiency of shipping traffic. Instead, the impairment would only become significant if considerable detours and time delays had to be taken into account or the narrowing of existing traffic routes were to lead to traffic backing up and thus to considerable disruptions to the smooth process[3]. This is not anticipated based on the results of the supplementary expert analysis[4] and the results of the assessment of compatibility with the UNCLOS. For one thing, this is not an international shipping route or one designated in the Spatial Plan for the Baltic Sea.

However, as this site which is currently routinely navigated by transit traffic will no longer be available to shipping in the future, the developed site will have to be permanently identified as a ‚general hazard area' by means of cardinal marks in accordance with the IALA Maritime Buoyage System. Insofar as is possible without knowledge of the specific project parameters, the further measures required according to the report will also be adopted as specifications in the draft determination of suitability (Sec. 16 to 19 and Sec. 45). Reference is therefore made to the rationales of the specifications.

[3] *Brandt/Gaßner, SeeAnlV, Sec. 3, recital 16.*
[4] *Erweiterte Untersuchungen der verkehrlichen Auswirkungen einer Bebauung der Fläche O-1.3 der Ostsee', DNV GL 2020.*

5 Determination of suitability and definition of the capacity to be installed

With ordinance of 15 December 2020 Erste-Windenergie-auf-See-Verordnung (1st WindSeeV) BSH has based on its statutory authorisation determined the suitability of the sites N-3.7, N-3.8 and O-1.3. The determination of suitability occurred based on the Site Development Plan of 29 June 2019 (FEP 2019). The first update of the Site Development Plan (FEP 2020) entered into force on 18 December 2020. Therefore the 1st WindSeeV refers to the FEP 2019.

Part 1
General provisions

Sec. 1
Scope

For sites N-3.7 and N-3.8 in the German Exclusive Economic Zone in the North Sea and O-1.3 in the German Exclusive Economic Zone in the Baltic sea, as defined in the Site Development Plan of 28 June 2019, this ordinance determines

1. their suitability pursuant to Sec. 12 para. 5 sentence 1 of the Offshore Wind Energy Act of 13 October 2016 (Federal Law Gazette I p. 2258, 2310), last amended by article 2 of the law of 3 December 2020 (Federal Law Gazette I p. 2682),
2. the specifications for the subsequent project pursuant to Sec. 12 para. 5 sentence 2 of the Offshore Wind Energy Act, particularly concerning the nature and scope of the site development and the location of the development at the sites and
3. the capacity to be installed at the sites pursuant to Sec. 12 para. 5 sentence 1 in combination with Sec. 10 para. 3 of the Offshore Wind Energy Act.

Sec. 2
Definitions

Within the meaning of this ordinance:

1. ‚Waste' is waste within the meaning of Sec. 3 para. 1 of the Circular Economy Act of 24 February 2021 (Federal Law Gazette I p. 212), last amended on 23 October 2020 (Federal Law Gazette I p. 2232),
2. ‚Installation' is an installation within the meaning of Sec. 44 para. 1 of the Offshore Wind Energy Act with the exception of converter platforms and offshore connecting cables,
3. ‚Baseline survey' means the investigations underlying the environmental impact assessment for the planning approval process for the construction and operation of an offshore wind farm pursuant to the ‚Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment' standard[5)],
4. ‚Third year of the investigation' means the updating of the baseline survey insofar as no more than five years lie between the completion of the baseline survey investigations and the start of construction,
5. ‚Emissions' are the direct or indirect introduction of substances or energy such as heat, sound, shock, light, electrical or electromagnetic radiation into the marine environment,
6. ‚FATO' means the defined final approach and take-off area above which the final approach procedure for hovering or landing an aircraft is completed and from which the take-off procedure of an aircraft is begun,
7. ‚Flight corridor' is the airspace area used by helicopters to approach and take off from offshore platforms,
8. ‚Unexploded ordnance' means explosive remnants of war within the meaning of Sec. 3 para. 1 no. 16 of the Explosives Act in the version of the notice of 10 September 2002 (Federal Law

[5)] Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

Gazette I p. 3518), last amended by article 232 of the ordinance of 19 June 2020 (Federal Law Gazette I p. 1328),

9. ‚MARPOL' is the International Convention for the Prevention of Marine Pollution from Ships with its six Annexes (Federal Law Gazette II 1977, p. 1492.),
10. ‚Offshore platform' is an installation within the meaning of no. 2 that is not a wind turbine; instead, it is an artificial platform in the sea with all of the necessary infrastructure components and safety equipment, irrespective of its design and type of use,
11. ‚TLOF' is the defined touch-down and take-off area on which a helicopter can touch down or take off; on a helicopter landing deck, FATO and TLOF are identical,
12. ‚Project developer' is
    a) is the natural person or legal entity that submits the winning bid in the Federal Network Agency's invitation to tender pursuant to Sec. 23 of the Offshore Wind Energy Act and thus obtains the right to implement a planning approval process at the respective site pursuant to Sec. 24 of the Offshore Wind Energy Act,
    b) is the addressee of the planning approval decision or planning permission within the meaning of Sec. 56 para. 1 of the Offshore Wind Energy Act, or
    c) the legal successor of the natural person or legal entity according to a or b.

Part 2
Determination of suitability

Chapter 1
Determination of suitability

Sec. 3
Determination of suitability

Sites N-3.7 and N-3.8 in the German Exclusive Economic Zone in the North Sea and O-1.3 in the German Exclusive Economic Zone in the Baltic sea, as defined in the Site Development Plan of 28 June 2019, are suitable in accordance with the result of the site investigation of these sites pursuant to part 2 Sec. 2 of the Offshore Wind Energy Act pertaining to the invitation to tender for sites which have undergone a site investigation in accordance with part 3 Sec. 2 of the Offshore Wind Energy Act.

Chapter 2
Specifications for the subsequent project

Division 1
General

Subdivision 1
Impacts of the project on the marine environment

Sec. 4
Monitoring

(1) The project developer shall monitor the construction-related and operation-related impacts of the installations during the construction phase and at least during the first three years of operation of the installations as the basis for any measures to protect the marine environment to be ordered by the planning approval authority or the Federal Maritime and Hydrographic Agency as the responsible supervisory authority pursuant to Sec. 48 para. 4 sentence 3 of the Offshore Wind Energy Act or pursuant to Sec. 57 para. 2 sentence 3 or 5 of the Offshore Wind Energy Act.

(2) As a basis for monitoring, the result of the baseline survey shall be updated based on the results of a third survey year to be carried out before the start of construction if there are no more than five years between the end of the baseline survey and the start of construction. If more than five years lie between the end of the baseline survey and the start of construction,

the baseline survey shall be completely repeated prior to the start of construction.

(3) The marine environment investigations shall be carried out according to the scientific and technical state of the art. Adherence to the scientific and technical state of the art is assumed if the investigations are carried out subject to observance of the ‚Standard – Untersuchung der Auswirkungen von Offshore-Windenergieanlagen auf die Meeresumwelt' (Standard for the Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment).

Sec. 5
Installation and dimension of internal wind farm submarine cables

(1) The project developer shall observe the planning principle of the Site Development Plan for sediment warming when dimensioning and laying the internal wind farm submarine cables.

(2) The method for installing the internal wind farm submarine cables shall be selected so that the coverage required to adhere to the maximum sediment heating in accordance with para. 1 is achieved with the minimum possible impact on the environment.

Sec. 6
Avoidance or reduction of emissions

(1) The project developer shall avoid emissions or reduce them if they are unavoidable.

(2) For this purpose, the project developer shall in particular:

1. plan and implement the installations such that emissions that are avoidable in accordance with the state of the art are not caused or, if causing such emissions is unavoidable due to the actions that are mandatory to meet the safety requirements of shipping and air traffic, that the impairments to the marine environment are minimised as far as possible,
2. use environmentally-compatible operating materials wherever possible to operate the installation and shall give preference to biologically degradable operating materials, if available,
3. secure all technical facilities used on the installation by means of state-of-the-art structural safety systems and measures and monitor them such that accidents involving pollutants and introduction into the environment are avoided and that it is ensured in the event of damage that the project developer can intervene immediately at any time and
4. implement organisational and technical precautionary measures for changing operating materials and for refuelling measures in order to avoid accidents involving pollutants and introduction into the environment.

Sec. 7
Avoidance of noise emissions during the foundation, installation and operation of installations

(1) During the foundation and installation of an installation, the project developer shall use the state-of-the-art working method that produces as little noise as possible in accordance with the given circumstances.

(2) The noise emissions caused by pile driving shall not exceed a sound pressure value of 160 decibels and a peak sound pressure level value of 190 decibels, each with reference to micropascals per second, at a distance of 750 metres.

(3) During pile driving work, the duration of the pile driving process including repelling shall be minimised.

(4) The project developer shall select the installation design that produces as little operating noise as possible in accordance with the state of the art.

(5) All blasting is prohibited.

Sec. 8
Waste

The introduction and discharge of waste into the marine environment are prohibited, unless they are permissible in accordance with the regulations of this ordinance.

Sec. 9
Corrosion protection

(1) The corrosion protection used for the installation by the project developer shall be as free of pollutants and low in emissions as possible.
(2) If possible, external current systems shall be used as cathodic corrosion protection on foundation structures.
(3) If the use of galvanic anodes is unavoidable, it is only permissible in combination with coatings on the foundation structures. The content of minor constituents of the anode alloys, particularly cadmium, lead, copper and mercury, shall be reduced as far as possible. The use of zinc anodes is prohibited.
(4) The use of biocides to protect the technical surfaces against the undesired colonisation of organisms is prohibited.
(5) The project developer shall provide the installation with an oil-repellent coating in the area of the splash water zone.

Sec. 10
Installation cooling

A closed-loop cooling system, in which no cooling water or other material discharges into the marine environment occur, should be used to cool the installation.

Sec. 11
Waste water

(1) Subject to para. 3, the project developer shall collect waste water from sanitation facilities, medical facilities, kitchens and laundries, transport it ashore and dispose of it there in accordance with the applicable statutory waste regulations.
(2) The installation and operation of a waste water treatment plant on an offshore platform is not permissible.
(3) Contrary to para. 2, a waste water treatment plant is permissible in individual cases on a permanently manned offshore platform, in particular if the negative impacts on the marine environment associated with transporting the waste water ashore exceed the impacts associated with the discharge of the treated waste water. Proof that an individual case in accordance with sentence 1 exists shall be furnished by the project developer in the context of the planning approval process. The waste water treatment plant shall correspond to the technical state of the art.
(4) In the case of waste water treatment plants that are permissible in accordance with para. 3, the project developer shall
    1. treat all waste water from sanitation facilities, medical facilities, kitchens and laundries,
    2. plan suitable sampling points at the infeed and discharge and
    3. regularly sample and analyse the waste water.

    The chlorination of waste water is not permissible.

Sec. 12
Drainage system

(1) When using a light liquid separator, drainage water that is incurred shall not exceed an oil content of 5 milligrams per litre.
(2) The oil content of the drainage water shall be continuously monitored at the discharge by the project developer by means of sensors. The current values measured with the sensors shall be remotely readable by the project developer.
(3) Through automatic valves, the project developer shall ensure that the drainage water is not discharged into the marine environment in the event that the limit value in accordance with para. 1 is exceeded.

(4) Extinguishing foam that is incurred on activation of the fire-fighting system shall not be discharged into the marine environment via the drainage system. To avoid this, drainage systems connected to helicopter landing decks shall be equipped with bypass systems to ensure that the extinguishing foam that is incurred is automatically discharged into a collection tank, bypassing the light liquid separators.

Sec. 13
Diesel generators

(1) Diesel generators used on offshore platforms shall be certified in accordance with MARPOL Annex VI Tier III in terms of their emission values or in accordance with emissions standards that are verifiably at least equivalent.
(2) The installation of permanent diesel generators on wind turbines is not permissible.
(3) Low-sulphur fuel shall be used to operate diesel generators if possible.

Sec. 14
Scour and cable protection

(1) If scour and cable protection measures are implemented, the project developer shall limit the introduction of hard substrate to the minimum level required to establish protection for the respective installation.
(2) Only fillings consisting of natural stone or inert and natural materials shall be used as scour protection. The use of plastic or materials similar to plastic is not permissible.
(3) Fillings consisting of natural stone or inert and natural materials shall always be used as cable protection. The use of cable protection systems containing plastic is only permissible in exceptional cases and shall be minimised.

Subdivision 2
General regulations pertaining to the safety and efficiency of shipping and air traffic

Sec. 15
Identification

(1) Until they are removed from the sea area, the project developer shall equip the installations with facilities that guarantee the safety of shipping and air traffic in accordance with the applicable Federal Waterways and Shipping Administration regulations and the technical state of the art. Adherence to the technical state of the art is assumed if the following regulations are adhered to during the planning, implementation and normal operation of the visual and radio identification of the offshore wind farm facilities:
   1. ‚Richtlinie Offshore-Anlagen zur Gewährleistung der Sicherheit und Leichtigkeit des Schiffsverkehrs' (Directive on offshore installations to ensure the safety and efficiency of shipping), version 3.0 of 1 July 2019[6)],
   2. ‚WSV-Rahmenvorgaben Kennzeichnung Offshore-Anlagen' (WSV framework specifications for marking offshore installations), version 3.0 of 1 July 2019[7)] and
   3. ‚IALA Recommendation O-139 on The Marking of Man-Made Offshore Structures', edition 2 of 13 December 2013 and ‚IALA Recommendation A-126 On The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services', edition 1.5 of 24 June 2011 of the International Association of Marine Aids to Navigation and Lighthouse Authorities[8)].

(2) On construction of further offshore wind farms immediately adjacent to the site, the project developer shall adapt the identification for

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[6)] Official note: published by and available from the Directorate-General of Waterways and Shipping, Am Propsthof 51, 53121 Bonn, Germany.
[7)] Official note: published by and available from the Directorate-General of Waterways and Shipping, Am Propsthof 51, 53121 Bonn, Germany.
[8)] Official note: published by and available from: International Association of Marine Aids to Navigation and Lighthouse Authorities, IALA-AISM HEADQUARTERS, 10 rue des Gaudines, 78100, St Germain en Laye, France.

securing shipping and air traffic according to the overall development situation in the traffic area in accordance with para. 1 in coordination with the developers of the adjacent projects.

Subdivision 3
Special regulations pertaining to the safety and efficiency of shipping traffic

Sec. 16
Maritime surveillance

The project developer shall carry out maritime surveillance for the site according to the state of the art and shall implement the measures required for avoiding collisions. Adherence to the state of the art is assumed if the specifications of the implementing directive ‚Maritime Surveillance – Offshore Wind Parks' issued by the Federal Ministry of Transport and Digital Infrastructure, status April 2014[9)], are adhered to.

Sec. 17
Design

(1) The project developer shall design and construct the installation in such a way that a ship's hull is damaged as little as possible in the event of a collision. The requirements of the ‚Standard Design – Minimum requirements concerning the constructive design of offshore structures within the Exclusive Economic Zone (EEZ)'[10), 11)] shall be taken into consideration.

(2) The site should be developed coherently. The installations to be constructed should be integrated into the development situation of the area in which the site is located.

Sec. 18
Traffic control during the construction phase

(1) To secure the area surrounding the construction site and to avoid collisions with ships, the project developer shall deploy a traffic control vehicle in the area of the construction site throughout the entire construction phase as of the start of installation or, if necessary, as of the start of required construction preparation measures. This vehicle shall implement traffic control measures as required. The traffic control vehicle shall be used exclusively for this purpose. The requirements of number 6.2.1 of ‚Richtlinie Offshore-Anlagen zur Gewährleistung der Sicherheit und Leichtigkeit des Schiffsverkehrs', version 3.0 of 1 July 2019[12)], shall be adhered to.

(2) Until the regular identification enters operation, the installations shall be provisionally identified visually and by radio by the project developer pursuant to numbers 6.2.2 and 6.2.4 of ‚Richtlinie Offshore-Anlagen zur Gewährleistung der Sicherheit und Leichtigkeit des Schiffsverkehrs', version 3.0 of 1 July 2019.

(3) The construction site shall be identified as a general hazard area pursuant to number 6.2.3 of ‚Richtlinie Offshore-Anlagen zur Gewährleistung der Sicherheit und Leichtigkeit des Schiffsverkehrs', version 3.0 of 1 July 2019, by laying lighted cardinal buoys.

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9) Official note: published by and available from the Federal Ministry of Transport and Digital Infrastructure, Invalidenstraße 44, 10115 Berlin, Germany.

10) Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

11) Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

12) Official note: published by and available from the Directorate-General of Waterways and Shipping, Am Propsthof 51, 53121 Bonn, Germany.

Sec. 19
Requirements for vehicles and equipment

All vehicles and equipment that are used, including the traffic control vehicle, shall

1. comply with the Ordinance on the 1972 International Regulations for Preventing Collisions at Sea of 13 June 1977 (Federal Law Gazette I p. 813), last amended by article 22 of the law of 13 October 2016 (Federal Law Gazette I p. 2258), in terms of their identification and traffic behaviour,
2. comply with the standard of safety required for the federal flag or a verifiably equivalent standard of safety in terms of their equipment and crew.

Subdivision 4
Special regulations pertaining to the safety and efficiency of air traffic

Sec. 20
Helicopter winch operation

(1) A winch operating area can be set up on an offshore platform for emergencies (rescue area). Its use is essentially limited to the prevention of danger to the life and limb of persons (emergency) or to necessary official measures. Exceptional use of the rescue area is permissible if a technical incident has the potential to subsequently lead to an emergency and the following conditions are fulfilled in parallel:
   1. intervention from land is not possible or countermeasures initiated have remained unsuccessful,
   2. the hazard potential has to be reduced within a short period of time to prevent the occurrence of an emergency,
   3. there are temporarily no more suitable options available for accessing the offshore platform.

   Routine access to the offshore platform by persons by means of helicopter winch operation is not permitted.

(2) The winch operating area on a wind turbine shall be designed, identified and operated by the project developer in accordance with the regulations of the ‚Gemeinsamen Grundsätze des Bundes und der Länder über Windenbetriebsflächen auf Windenergieanlagen' (General principles of the Federation and the Länder relating to winch operating areas on wind turbines) of 18 January 2012 (Federal Gazette No. 16, p. 338) or in accordance with the successor regulations for the German Exclusive Economic Zone.

Sec. 21
Helicopter landing deck

(1) If a helicopter landing deck is established on an offshore platform of the offshore wind farm, the regulations of Annex 14 Volume II to the Convention on International Civil Aviation of 7 December 1944 (Federal Law Gazette 1956 II p. 412), last amended by the Protocol of 6 October 2016 (Federal Law Gazette 2018 II pp. 306, 307) are to be complied with, or the provisions of the successor regulations for the German Exclusive Economic Zone.

(2) The project developer shall ensure the safe operation of the helicopter landing deck through structural and operational measures.

Sec. 22
Flight corridors

(1) The project developer shall provide at least two flight corridors, each consisting of an inner corridor and two flanking outer corridors, for the establishment of which the following regulations or, after its entry into force, the provisions of the ‚Standard Offshore-Luftfahrt für die deutsche ausschließliche Wirtschaftszone' (Offshore aviation standard for the EEZ)), shall be compiled with. The flight corridors shall

always be kept free of any development above the surface of the water. In justified exceptional cases, the construction of obstacles in the flight corridor or the establishment of a flight corridor despite the presence of obstacles can be approved by the Federal Maritime and Hydrographic Agency with the consent of the Federal Ministry of Transport and Digital Infrastructure. By submitting a risk assessment prepared by an aviation expert, the project developer shall verify to the Federal Maritime and Hydrographic Agency that the obstacles pose no hazard to the safe operation of the helicopter landing deck. Flight corridors shall not be established beyond the boundaries of the German Exclusive Economic Zone.

(2) When planning a flight corridor to or from an offshore platform, the respective corridor axis shall be aligned such that arrivals or departures with tailwind can be avoided, crosswind conditions can be minimised and safe take-off is possible. A flight corridor shall be planned in linear form along its entire length; overlaps with adjacent flight corridors are not permissible. The respective corridor axis begins at the centre point of the FATO.

(3) The length of the flight corridor shall be determined along the respective corridor axis at the level of the FATO. This distance starts at the inner edge according to para. 4 sentence 1 and ends at the point at which a straight line, which also starts at this point and ascends with a constant slope of 4.5 percent, reveals one of the following vertical distances from the corridor axis; the higher of the two following elevation values applies in this case:
   1. An elevation of 152 metres or
   2. An elevation corresponding to the sum of the highest obstacle in the area relevant to approach or departure and a safety margin of at least 61 metres.

(4) The boundaries of the inner corridor consist of
   1. a horizontal inner edge with the width of the FATO, starting at the outer edge of the FATO and running perpendicular to the corridor axis,
   2. two side edges that diverge with a divergence of 15 percent up to a width of 200 metres,
   3. a horizontal outer edge that is perpendicular to the corridor axis at a fixed height relative to the FATO.

(5) The width of each outer corridor is at least 200 metres. If the obstacle backdrop along the flight corridors consists of wind turbines, the width of both outer corridors is three times the rotor radii of the largest wind turbines adjacent to the flight corridor, but at least 200 metres.

(6) The landing and take-off baselines correspond to the course of the respective corridor axis.

Sec. 23
Tower illumination

(1) If the helicopter landing deck is to be operated at night, the project developer shall equip its own wind turbines along the flight corridors with tower illumination pursuant to the ‚WSV-Rahmenvorgaben Kennzeichnung Offshore-Anlagen'[13]. Provisions shall be implemented to ensure the activation and deactivation of the tower illumination together with the other aeronautical lighting of the helicopter landing deck.

(2) Insofar as third-party flight corridors of third parties are located in the site or directly adjacent to it, the project developer shall tolerate the installation of tower illumination on the wind turbines concerned and shall enable remote access for the purpose of controlling the tower illumination. As the operator of the tower illumination, the third party shall be granted access to the wind turbines concerned for the purpose of regular operation, maintenance during the normal hours of operation and business and

[13] *Official note: published by and available from the Directorate-General of Waterways and Shipping, Am Propsthof 51, 53121 Bonn, Germany.*

for fault rectification unless other agreements concerning maintenance and operation, including fault rectification, have been reached. The costs incurred for installation, operation, fault rectification and maintenance of the tower illumination shall be borne exclusively by the third party as the operator of these systems. The specification concerning the freedom of flight corridors from obstacles applies accordingly to the flight corridors of neighbouring projects at the site.

Sec. 24
Identification of air traffic obstacles

The project developer shall identify the installations as air traffic obstacles as well as other obstacles in the vicinity of the helicopter landing deck according to the specifications of the ‚Standard Offshore-Luftfahrt, Teil 5: Kennzeichnung von Luftfahrthindernissen in der AWZ' (Offshore aviation standard, Part 5: Identification of air traffic obstacles in the EEZ) of 17 August 2020[14)] or the successor regulation for the German Exclusive Economic Zone.

Subdivision 5
Security of territorial and alliance defence

Sec. 25
Security of territorial and alliance defence

(1) The erected installations shall be identified with sonar transponders in suitable corner positions. Sec. 15 para. 2 shall apply mutatis mutandis.

(2) The use of acoustic, optical, optronic, magnetosensory, electrical, electronic, electromagnetic or seismic sensors in measuring devices on unmanned underwater vehicles or on stationary underwater measuring facilities shall be limited to the necessary extent, and Navy Command shall be notified of this in good time but at least 20 working days in advance.

Subdivision 6
Health and safety

Sec. 26
Principle

(1) The project developer shall ensure that the German regulations on health and safety at work can be adhered to during the planning, construction, operation and dismantling of each installation.

Sec. 27
Fire and explosion protection

(1) Implementation of the specifications for and the requirements of structural, technical installation and organisational fire and explosion protection and the escape concept shall be coordinated such that escaping in good time is possible.

(2) The project developer shall verify that it was provided with expert advice in designing the implementation of the requirements in accordance with para. 1. The requirements of art. 3 para. 3 Work place ordinance of 12 August 2004 (Federal Law Gazette I p. 1328), last amended on 19 June 2020 apply accordingly.

(3) At least two redundant access and exit options that are suitable for the purposes of escape and rescue, and which are to be used by different transport systems, shall be planned for an offshore platform.

Sec. 28
Intervention into the subsoil

Prior to the execution of work requiring intervention into the subsoil, the project developer shall ensure that possible hazards to employees due to explosive ordnance are determined and any necessary

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[14)] Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

occupational safety measures are implemented. Sentence 1 shall also be applied if previously unknown explosive ordnance is found during the planning or construction of the wind turbines, the offshore platforms or the internal wind farm cabling.

Sec. 29
Monitoring of adherence to the health and safety regulations

To monitor the obligations arising from sections 26 to 28, the project developer shall provide the responsible authority and its officers with the information required for monitoring and shall submit the necessary documents. In order to undertake monitoring tasks, officers of the responsible authorities may enter premises, installations and facilities during the normal hours of operation and business. The transport of the officers of the responsible authorities to the offshore installations or the costs of transporting them shall be borne by the project developer.

Sec. 30
Other obligations

The obligations of the project developer to ensure health and safety at work in its capacity as an employer remain unaffected.

Subdivision 7
Compatibility with existing and planned cables, pipelines and wind turbines

Sec. 31
Compatibility with existing and planned submarine cables and pipelines

(1) When planning and carrying out work in the vicinity of existing third-party submarine cables or pipelines, the safety of these submarine cables and pipelines shall be taken into consideration. The internal wind farm submarine cables' intersecting with third-party submarine cables or pipelines shall be avoided if possible.

(2) Essentially, no influences whatsoever shall be exerted on the seafloor in a protected area of 500 metres to either side of third-party submarine cables or pipelines. Deviations from sentence 1 shall be agreed with the owner of the cable or pipeline.

Sec. 32
Distance from wind turbines of neighbouring sites

The wind turbines to be installed at the site shall adhere to a distance of at least five times the respectively larger rotor diameter from the wind turbines of neighbouring sites.

Sec. 33
Infeed at the grid connection point

No more than the awarded bid quantity shall be fed in at the grid connection point.

Subdivision 8
Other obligations of the project developer

Sec. 34
Design

(1) The planning, construction, operation and dismantling as well as the design and equipment of the installations shall correspond to the technical state of the art or alternatively the scientific and technical state of the art. This is assumed for the areas regulated there if the following standards are adhered to:

1. ‚Standard Design – Minimum requirements concerning the constructive design of offshore structures within the Exclusive Economic Zone (EEZ)'[15],

[15] *Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.*

2. ‚Mindestanforderungen an die Baugrunderkundung und -untersuchung für Offshore-Windenergieanlagen, Offshore-Stationen und Stromkabel' standard (Minimum requirements for the subsoil survey and investigation for offshore wind turbines, offshore stations and electricity cables)[16],
3. VGB/BAW standard: ‚Korrosionsschutz von Offshore-Bauwerken zur Nutzung der Windenergie' (Corrosion protection of offshore structures for using wind energy) Parts 1 to 3[17].

(2) The project developer shall, as a minimum, design the systems whose failure or malfunction may jeopardise the integrity of the installations, the safety of traffic or the marine environment in such a way that, in the event of failure or malfunction, both monitoring and full access are also possible from shore.

Sec. 35
Determination, documentation and reporting of objects and erected installations

(1) Prior to the start of installation planning and implementation, the project developer shall determine all cables, pipelines, wrecks, unexploded ordnance, cultural and material assets as well as other objects existing at the site and shall implement all resulting protective measures if necessary. The discovery of objects shall be immediately documented and reported to the planning approval authority. If unexploded ordnance is found during installation planning or construction, the project developer shall implement corresponding protective measures. Explosive ordnance and its further handling shall be reported to the Maritime Safety and Security Centre in Cuxhaven. Any locations in which objects have been found shall be taken into consideration when selecting sites or routes.

(2) The precise positions of all installations that have actually been built shall be measured by the project developer within six months after the completion of construction and submitted to the Federal Maritime and Hydrographic Agency.

Division 2
Special specifications for site N-3.7

Sec. 36
Special provisions pertaining to the protection of the marine environment

(1) The developer of the project at site N-3.7 shall coordinate in advance the time at which pile driving work is carried out with the project developers of offshore wind farms to be completed at the same time in the Exclusive Economic Zone in the North Sea.

(2) The planning approval authority may issue the project developer with time specifications concerning the execution of pile driving work insofar as is necessary, despite prior coordination, to adhere to the noise protection concept values.

Sec. 37
Special provisions pertaining to the safety and efficiency of shipping traffic

Along with the planning documents, the project developer shall submit a report, which checks the site-related quantitative risk analysis underlying the determination of suitability in this ordinance on the basis of current shipping traffic figures, to the planning approval authority as a basis for the

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[16] Official note: published by and available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

[17] Official note: published by and available from VGB Powertech, Deilbachtal 175, 45257 Essen und Bundesanstalt für Wasserbau, Kußmaulstraße 17, 76187 Karlsruhe.

approval decision. The planning approval authority may order any additional corrective and reduction measures then required, such as the provision of additional towing capacity by the project developer. This shall have no bearing on other obligations to update expert opinions pursuant to Sec. 48 para. 4 sentence 3 or pursuant to Sec. 57 para. 2 to 5 of the Offshore Wind Energy Act.

Sec. 38
Special provisions pertaining to the safety and efficiency of air traffic

The developer of the project at site N-3.7 shall keep the flight corridors of the following neighbouring projects free of developments:

1. Gode Wind 01, defined by the site established through a 352 metre wide strip on both sides of the route between WGS-84 coordinates N54.024821° E007.008792° and N54.057500° E007.060667°,
2. Gode Wind 02, defined by the site established through a 352 metre wide strip on both sides of the route between WGS-84 coordinates N54.055717° E007.038377° and N54.087197° E007.092050°, and
3. Gode Wind 03, in the form in which planning approval is issued.

Division 3
Special specifications for site N-3.8

Sec. 39
Special provisions for protecting the marine environment

(1) The developer of the project at site N-3.8 shall coordinate in advance the time at which pile driving work is carried out with the project developers of offshore wind farms to be completed at the same time in the Exclusive Economic Zone in the North Sea.

(2) The planning approval authority may issue the project developer with time specifications concerning the execution of pile driving work insofar as is necessary, despite prior coordination, to adhere to the noise protection concept values.

Sec. 40
Special provisions pertaining to the safety and efficiency of shipping traffic

Along with the planning documents, the project developer shall submit a report, which checks the site-related quantitative risk analysis underlying the determination of suitability in this ordinance on the basis of current shipping traffic figures, to the planning approval authority as a basis for the approval decision. The planning approval authority may order any additional corrective and reduction measures then required, such as the provision of additional towing capacity by the project developer. This shall have no bearing on other obligations to update expert opinions pursuant to Sec. 48 para. 3 sentence 3 or pursuant to Sec. 57 para. 2 to 5 of the Offshore Wind Energy Act.

Sec. 41
Special provisions pertaining to compatibility with the cable route defined in the Site Development Plan

The route corridor defined in the Site Development Plan 2019[18)] for connecting the transformer platform and the converter platform shall be kept free of any development. No internal farm submarine cables may be routed within this route corridor. The internal farm submarine cables may not intersect the route corridor.

[18)] Official note: available from the Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Straße 78, 20359 Hamburg, Germany, and archived in the German National Library.

Division 4
Special specifications for site O-1.3

Sec. 42
Special provisions pertaining to the protection of marine mammals

(1) The developer of the project at site O-1.3 shall coordinate in advance the time at which pile driving work is carried out with the project developers of offshore wind farms to be completed at the same time in the Exclusive Economic Zone in the Baltic Sea.

(2) The planning approval authority may issue the project developer with time specifications concerning the execution of pile driving work insofar as is necessary, despite prior coordination, to adhere to the noise protection concept values.

Sec. 43
Special provisions pertaining to the protection of avifauna

(1) In the context of risk management, as of the commissioning of wind turbines, the project developer shall continuously record at least the following data in a suitable manner during migration in the autumn and spring for the European bird species that migrate over the site and for which there is a significantly increased risk of collision with wind turbines:
1. Migration rates and migration intensities,
2. The vertical distribution of migration and
3. The weather conditions and visibilities.

(2) With reference to cranes, a significantly increased risk of collision due to the wind turbines is to be assumed during events involving very high migration intensities over site O-1.3. Data collection pursuant to para. 1 shall be combined with surveillance of the resting places in southern Sweden for autumn migration, in the Rügen-Bock region and on the Darss for spring migration in order to obtain information regarding the start of migration.

(3) Particularly for predatory birds, geese, wading birds and songbirds, a significantly increased risk of collision due to the wind turbines is to be assumed during events involving very high migration intensities over site O-1.3 under the following circumstances:
1. During the night or
2. During the day with visibilities of less than 500 metres.

The wind turbines shall be equipped with suitable devices that also enable the real-time recording of migration intensities under the above-mentioned circumstances.

(4) The wind turbines shall be shut off and turned away from the wind as long as it is recognisable due to the data collection in accordance with paragraph 1 that the risk of collision for the bird species listed in para. 2 and 3 is significantly increased. Shut-off can be forgone insofar as other equally suitable reduction measures are implemented.

(5) Together with the application for plan approval, the project developer shall submit to the planning approval authority a concrete concept for data collection pursuant to paragraph 1 as well as for the implementation and success monitoring of the shut-off or other suitable measures pursuant to para. 4.

Sec. 44
Special provisions pertaining to the safety and efficiency of shipping traffic

(1) Along with the planning documents, the project developer shall submit a report, which checks the site-related quantitative risk analysis underlying the determination of suitability in this ordinance on the basis of current shipping traffic figures, to the planning approval authority as a basis for the approval decision. The planning approval authority may order any additional corrective and reduction measures then required, such as the provision of additional towing capacity by the project developer.

This shall have no bearing on other obligations to update expert opinions pursuant to Sec. 48 para. 4 sentence 3 or pursuant to Sec. 57 para. 2 to 5 of the Offshore Wind Energy Act.

(2) The site's safety zone shall be identified as a general hazard area pursuant to number 6.2.3 of ‚Richtlinie Offshore-Anlagen zur Gewährleistung der Sicherheit und Leichtigkeit des Schiffsverkehrs', version 3.0 of 1 July 2019, by laying lighted cardinal buoys.

Sec. 45
Special international military provisions

The airspace structure located over the project area shall be taken into consideration.

Sec. 46
Special provisions pertaining to compatibility with existing and planned locations of transformer platforms

The wind turbines to be installed at the site shall adhere to a distance of at least 500 metres from the location defined in the Site Development Plan 2019 for the grid operator's converter platform.

Part 3
Determination of the capacity to be installed

Sec. 47
Determination of the capacity to be installed

(1) The capacity to be installed at site N-3.7 is 225 megawatts.

(2) The capacity to be installed at site N-3.8 is 433 megawatts.

(3) The capacity to be installed at site O-1.3 is 300 megawatts.

Part 4
Concluding provisions

Sec. 48
Entering into force

This ordinance enters into force on the day following its announcement.

6 Access to further information

6.1 General information concerning the procedure

Further general information concerning the procedure of the preliminary investigation of sites and the determination of suitability as well as the documents for the suitability assessment and the Strategic Environmental Assessment are available on the BSH website under the following link:

Site N-3.7:
https://www.bsh.de/EN/TOPICS/Offshore/Offshore_site_investigations/Procedure/N-03-07/N-03-07_node.html

Site N-3.8:
https://www.bsh.de/EN/TOPICS/Offshore/Offshore_site_investigations/Procedure/N-03-08/N-03-08_node.html

Site O-1.3:
https://www.bsh.de/EN/TOPICS/Offshore/Offshore_site_investigations/Procedure/O-01-03/O-01-03_node.html

6.2 Publication of the results of the preliminary investigation of sites

All of the results of the site investigations are available in the BSH offshore site investigation data output portal under the following link:

https://pinta.bsh.de

6.3 Information concerning the Federal Network Agency's invitation to tender

https://www.bnetza.de

6.4 Site coordinates

Further information concerning the coordinates of sites N-3.7, N-3.8 and O-1.3 is available in the BSH GeoSeaPortal:

https://www.geoseaportal.de