

Aflandshage Offshore Wind farm

Section for ESPOO consultation

WAHA01-GEN-PRO-05-000021 HOFOR WIND A/S

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1 Introduction

The City of Copenhagen has decided, that Copenhagen should be the first CO₂-neutral capital in 2025. In order to reach this ambitious goal, a green transition of the capitals energy production is necessary. As part of this transition, the Greater Copenhagen Utility (HOFOR) will develop a total capacity of 460 MW (megawatt) of wind power – 410 of which should be provided by two new offshore wind farms in Oresund.

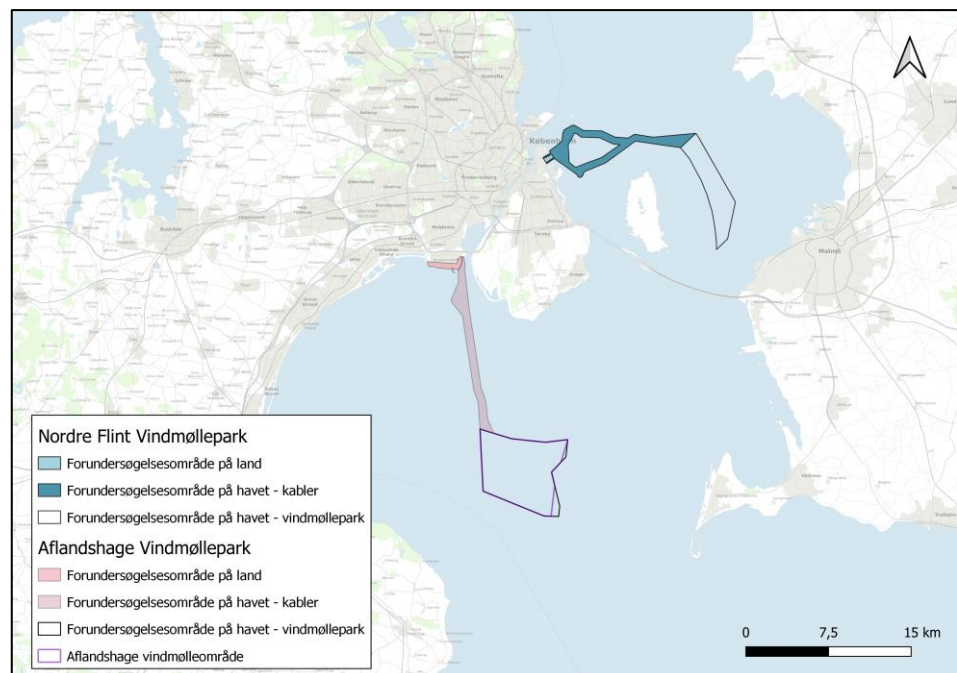
HOFOR has worked in parallel with the development of two wind farms, Nordre Flint and Aflandshage, for several years. HOFOR received license for pre-investigations for both wind farms on the 6th of March, 2019, and submitted Environmental Impact Assessment (EIA) reports for both wind farms on the 21st of December, 2020.

This EIA material concerns Aflandshage Wind Farm. The EIA material for Aflandshage is now sent for public consultation (from November 2021 to January 2022), while dialogue with authorities about EIA material for Nordre Flint is still ongoing. The EIA material for Nordre Flint is expected to be sent for public consultation in 2022.

Aflandshage Offshore Wind farm is to be located in Oresund approx. 8 km from Stevns and approx. 10 km south of Amager. Its total capacity will be up to 300 MW.

Nordre Flint Offshore Wind farm is to be located in Oresund approx. 12 km east of Copenhagen and approx. 4 km from Malmø. It will have a total capacity of up to 160 MW. The project areas for both wind farms are shown on Figure 1.1.

Figure 1.1: The project areas for the two planned offshore wind farms – Aflandshage offshore wind farm and Nordre flint offshore wind farm – producing a total of up to 410 MW each year.



An EIA report containing the environmental assessment of the project for the Aflandshage offshore wind farm has been prepared. This note presents a summary of the overall findings and conclusions with a special focus on transboundary impacts.

1.1 Environmental assessment material

EIA reports, background reports, responses to public/ESPOO consultations and more for the environmental assessment of Aflandshage offshore wind farm can be found on the Danish Energy Agency's website: <https://ens.dk/ansvarsomraa-der/vindenergi/havvindmoeller-og-projekter-i-pipeline>

A series of background reports have been prepared during the environmental assessment of Aflandshage offshore wind farm. The following background reports are of particular importance regarding the cross-border effects of the project:

- Offshore and Onshore Technical Project Description. Aflandshage offshore wind farm. Prepared by NIRAS for HOFOR Wind A/S. 11th of October 2021 (partly in Danish)
- Visualization report. Aflandshage offshore wind farm. Prepared by NIRAS for HOFOR Wind A/S. 11th of October 2021 (in Danish)
- Aflandshage offshore wind farm. Background report for benthic flora and fauna. HOFOR Wind A/S. NIRAS, 11th of October 2021 (in Danish)
- Aflandshage/Nordre Flint offshore wind farms. Background report for coastal morphology, dumping, hydraulics etc. HOFOR Wind A/S. NIRAS, 11th of October 2021 (in Danish)
- Aflandshage offshore wind farm. Background report for marine mammals. HOFOR Wind A/S. NIRAS, 11th of October 2021 (in Danish)
- Assessment of the potential impacts of the construction of two offshore wind farms in Oresund on birds. Report requisitioned by HOFOR. Aarhus University. DCE – Danish Centre For Environment And Energy. 2021 (in Danish)
- Navigational Risk Assessment of Aflandshage and Nordre flint offshore wind farms. HOFOR Wind A/S. DNV-GL, 30th of September 2021
- Aflandshage and Nordre Flint offshore wind farms. Hazard identification and qualitative risk assessment of maritime safety. NIRAS. DNV.GL, 7th of December 2020
- Aflandshage/Nordre Flint offshore wind farms. Background report for radar and radio links. HOFOR Wind A/S. NIRAS, 11th of October 2021 (in Danish)

1.2 Responses to the introductory Espoo hearing

Between the 18th of October and the 25th of November 2019, the Danish Energy Agency conducted an introductory Espoo hearing of the neighbouring countries regarding the environmental assessment of Aflandshage offshore wind farm. A total of 21 responses were received. These responses, along with any comments from the Danish Energy Agency, can be found in the hearing note, see Appendix 1: Energistyrelsen. Notat vedrørende ESPOO høringen af Aflandshage Havvindmøllepark. 4. december 2020).

Sweden and Germany indicated that they are interested in participating in the Danish EIA process of the project.

Lithuania have indicated that they are interested in receiving the EIA report and the results of the planned remedial measures in order to avoid any significant impacts on the water exchange between the North and the Baltic Seas.

Finland has noted that it should be ensured that there are no long term negative impacts on bird and marine species or habitats following the construction of the offshore wind farm. Additionally, they noted that migrating birds and bats should be considered when planning the wind farm. They are also interested in receiving the final EIA report.

Poland has noted that the EIA report should include an overview of maritime traffic routes in Oresund. Poland are also interested in receiving the final EIA report.

Estonia are interested in receiving the results from the bat surveys.

2 The EIA process

Constructing offshore wind farms requires an environmental impact assessment (EIA). Therefore, an EIA should be conducted and the public and any relevant authorities need to be consulted in order to get permission to construct the wind farm.

The Danish Energy Agency are the authority for the offshore construction activities and Hvidovre Municipality are the authority for the land based activities. The two authorities have decided that the Danish Energy Agency will coordinate the EIA process and therefore all consultation responses from the public and relevant authorities should be sent to them.

Before the initiation of the EIA process, the Danish Energy Agency collected ideas and suggestions from the public and relevant authorities in the period from October to December 2019. Furthermore they contacted the neighbouring countries of Sweden, Finland, Estonia, Germany, Latvia, Lithuania, Russia and Poland and asked to receive any comments.

The EIA authority has delimited the contents and extent of the EIA of Aflandshage offshore wind farm based on the responses from the consultations as well as project information from HOFOR Wind A/S.

NIRAS has assisted HOFOR Wind A/S in completing the environmental surveys and prepared the EIA report for the wind farm.

The Danish Energy Agency and Hvidovre Municipality will initiate an 8 week public hearing of the final EIA report along with the municipality's draft for a § 25 permit¹ for onshore construction as well as the Danish Energy Agency's draft for a construction permit according to § 25 of the sustainable energy act. During this period, the public and any institutions can comment on the project. Further information on where to send the comments will be available on the Danish Energy Agency and Hvidovre Municipality websites. Neighbouring countries that have expressed their interest in commenting will also be consulted again.

The Danish Energy Agency will prepare a review of the received responses from the consultations. If the project is approved, the Danish Energy Agency will pre-

¹ Permit for onshore construction according to § 25 of the EIA act also known as a "§25 permit".

pare the § 25 permit according to the sustainable energy act. Afterwards, an offshore construction permit according to the sustainable energy act should be requested.

Following the second public phase Hvidovre Municipality will assess whether the § 25 permit needs to be changed based on the consultation responses from the public and relevant authorities.

The construction work can be initiated once a § 25 permit for onshore construction according to the EIA act and an offshore construction permit according to the sustainable energy act has been received from Hvidovre Municipality and the Danish Energy Agency accordingly.

3 Project description

Aflandshage offshore wind farm is situated in Oresund in the waters between Stevns and the southern tip of Amager. Stevns is the closest point on land (roughly 8 km away), see Figure 3.2.

The technical facilities of Aflandshage offshore wind farm include:

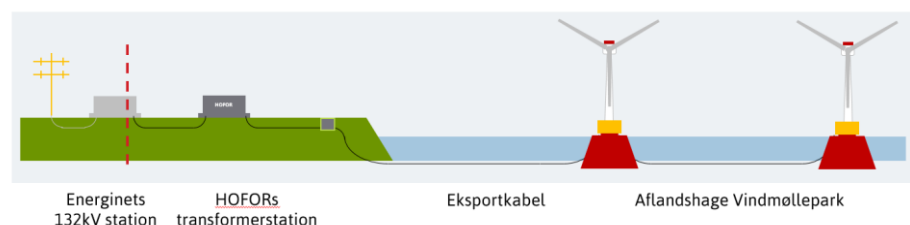
- Wind turbines with a total capacity of up to 300 MW. The wind turbines are placed offshore in a wind farm project area of roughly 42 km² as shown in Figure 3.2.
- A transformer station either placed on Avedøre Holme within the project area or offshore within the wind turbine area.
- High voltage cables for transporting the power generated by the wind turbines. The offshore cables are placed within a cable corridor and the onshore cables are placed within the project area on land.

Detailed seabed surveys of the seabed directly under the wind turbine foundations are required prior to their construction. This includes surveys of the seabed composition, marine archaeological surveys and removal of any unexploded ordnance.

The wind farm will be connected to the existing power grid at Energinets 132 kV substation at Avedøreværket.

Figure 3.1 shows a principal sketch of the project.

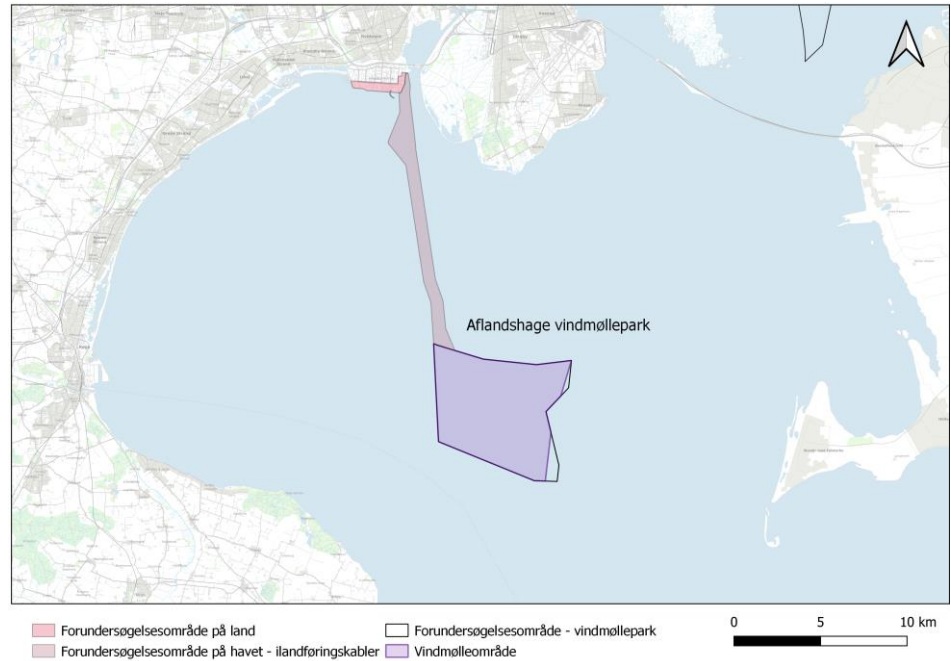
Figure 3.1: Principal sketch of Energinets 132 kV substation, an onshore transformer station owned by HOFOR Wind A/S, the grid connection cables and Aflandshage offshore wind farm.



The project area offshore has a total size of 56.5 km² of which 42 km² is the wind farm area designated for the wind turbines, inter array cables between the turbines and a potential offshore substation. Furthermore, the cable corridor for up to

six parallel grid connection cables from the wind farm to Avedøreværket where the wind farm is connected to the existing high voltage grid, takes up roughly 12.5 km².

Figure 3.2: The project area and wind farm area for Aflandshage offshore wind farm. This includes offshore and onshore areas.

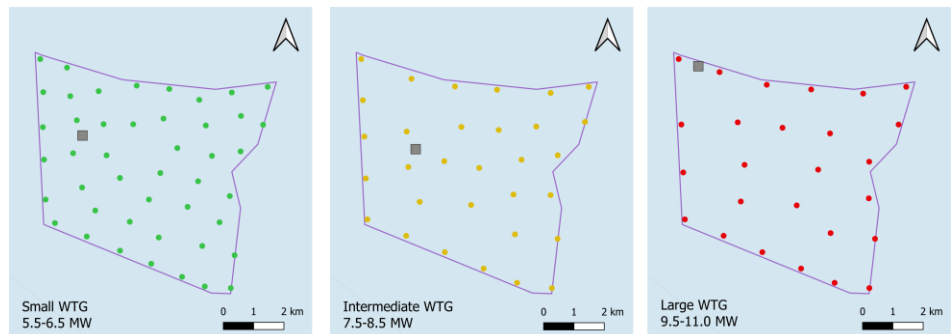


The power generated by the wind farm is transported onto the existing high voltage power grid at Energinets existing 132 kV substation at Avedøreværket.

3.1 Wind turbines

Three different project alternatives have been examined for the wind farm, with either small, intermediate or large wind turbines, each with different layouts presented in Figure 3.3. The three layouts are all examined and assessed in the report.

Figure 3.3: Layouts for the wind farm with the three projects. The grey square shows the placement of a possible offshore substation.



In the project with the small wind turbines, up to 45 5.5-6.5 MW wind turbines with a total height of 210 meters and a rotor diameter of up to 176 meters are constructed. The layout is shown in figure Figure 3.3.

In the project with the intermediate wind turbines, up to 31 7.5-8.5 MW wind turbines with a total height of 212 meters and a rotor diameter of up to 184 meters are constructed. The layout is shown in figure Figure 3.3.

In the project with the large wind turbines, up to 26 9.5-11.0 MW wind turbines with a total height of 220 meters and a rotor diameter of up to 200 meters are constructed. The layout is shown in figure Figure 3.3.

In all three project alternatives, the free space below the lower wing tip and the sea surface at the highest astronomical tide will be 20 meters or more.

The wind turbines are supported by foundations fixed to the seabed. The final choice of foundation type will be made based on the conditions of the area including seabed composition, water depth, waves, currents and winds. The foundations will be the same for all wind turbines. It is expected that the foundations will be of one of the following types:

- Steel monopile foundations
- Concrete gravity base structures (GBS)

Monopile foundations are the most common type of foundations. Monopiles consist of a tubular steel structure which is driven into the seabed.

For firmer sediment conditions where driving monopiles into the seabed might be impractical, or in areas with larger ice loads, GBS foundations are often chosen instead. This could be the case for Aflandshage offshore wind farm.

3.2 Substation

It is necessary to construct a new substation to transform the power from the wind farm. This substation is either placed onshore on Avedøre Holme or offshore on a platform in the wind farm. The possible location on Avedøre Holme is shown on Figure 3.4. If the substation is placed offshore, a possible placement of the platform housing the substation is shown on Figure 3.3 for each of the three alternatives. The decision whether the substation will be placed onshore or offshore will be made when a final layout is chosen and the more detailed planning of the wind farm has begun.

If the substation is placed on an offshore platform, it will be a closed gas insulated switchgear (GIS) and it will not produce any noticeable noise.

If the substation is constructed onshore, it will be constructed partly as a closed gas insulated switchgear (GIS) and partly with technical installations outside. The building containing the onshore substation installations will be at least 200 m² and have a height of up to 7 meters.

Figure 3.4: Overview of the possible placement of the on-shore substation on Avedøre Holme. ©SDFE, WMS-tjeneste, Ortofoto 2020.



As the final placement is chosen, it will be apparent whether a new local plan or municipal plan amendment is necessary in order for substation construction on-shore to commence.

3.3 Cables

The wind turbines are connected to the substation with high voltage cables whether the substation is placed onshore or offshore. The submarine cables will be installed into the seabed and the onshore cables are installed into the ground. Off-shore, the cables will be placed 25 meters apart and onshore they are significantly closer together.

In the project with the small wind turbines, the power will be transmitted to the substation via up to six 33 kV or 66 kV submarine cables, while in the other two alternatives, the power will be transmitted via three or four 66 kV cables accordingly. If the power is transformed onshore, it will be conducted to the connection point onshore via a single 132 kV cable.

3.4 Expected construction programme

Figure 3.5 shows the expected construction programme for the small wind turbine project. If either of the other projects are chosen, the construction programme will be shorter as fewer wind turbines need to be constructed.

The preliminary seabed surveys, including geotechnical surveys, are conducted during the first half of 2023. The results from these surveys are used in the detailed design of the wind farm. Construction work is planned to start during the second half of 2024. The offshore wind farm is expected to be fully built and operational in late 2025.

Figure 3.5: Indicative time schedule for offshore construction of the 5.5-6.5 MW option. Time schedules for GBS and monopile foundations are shown in green and blue accordingly.

Time schedule Small WTG 5.5-6.5 MW (GBS and Monopile)	2023				2024				2025				2026			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preliminary geotechnical surveys	■	■														
Installation of foundations for turbines	■	■					■	■	■							
Trenching and installation of export cables							■	■	■	■						
Installation of inter-array cables									■	■	■					
Installation of turbines											■	■	■	■		
Commissioning													■	■		

4 Impacts on the environment

The following section briefly describes the most notable impacts of the project on the environment and surroundings identified by the EIA.

The only major impacts are related to the landscape and visual impacts of the nearest adjacent shores. The severity of this impact is independent of wind turbine sizes.

No other major impacts have been identified with regards to any of the other environmental factors. Some of the assessments are based on different mitigative project basis's or described mitigation measures.

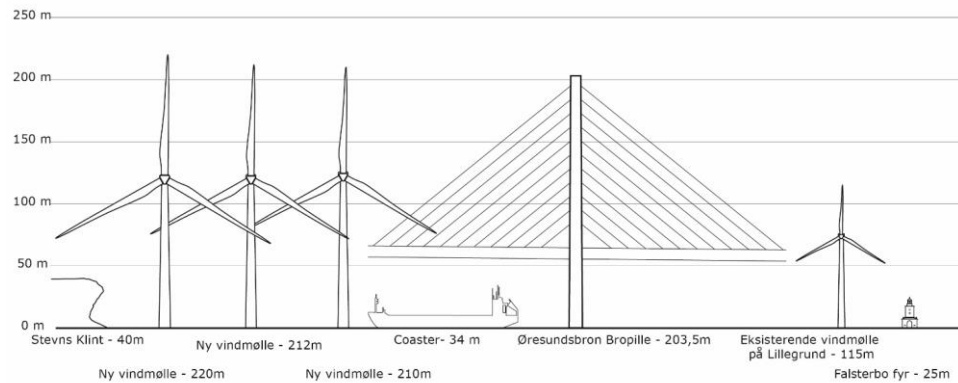
4.1 Landscape and visual conditions

The offshore wind farm is located 8-10 km from the nearest coastal areas, namely Stevns, the southern tip of Amager and Falsterbo in Sweden. In these areas, the impact of the offshore wind farm in the operation stage, estimated to last between 30 and 35 years, is considered to be *major*. In Køge bay and the coastal landscape surrounding Klagshamn in Sweden, the impact is assessed as *moderate*. In coastal areas further away, the visual impact is assessed as *minor* or *negligible*.

A more detailed description of the visual impact on the Swedish coastal landscapes is given in section 6.2.

To give an impression of the size of the wind turbines, the dimensions of the proposed small, intermediate and large wind turbines are shown, compared to Stevns Klint, the Oresund bridge, a tanker ship, the existing wind turbines at Lillegrund and Falsterbo lighthouse, on Figur 4.1.

Figur 4.1: Comparison between the three proposed wind turbine sizes to Stevns Klint, the Oresund bridge, a tanker ship, the existing wind turbines at Lillegrund and Falsterbo light-house



In clear weather, the offshore wind farm will be visible from all the surrounding coastal areas.

The wind turbines at Aflandshage offshore wind farm will not be visible from Danish or Swedish coastal areas in misty weather, as the distance to the coast is more than 5 km in all directions. Even with moderate visibility of up to 10 km, the wind farm will only be visible from the north-eastern part of Stevns.

The severity of the impact is assessed identically regardless of wind turbine size. The layout of the small wind turbine option will be more impactful than the option with large wind turbines because of the larger number of turbines. However, the difference between the two is not big enough to change the assessed impact.

The activities in the wind turbine area during construction and decommissioning will be visible from the closest coastal areas namely Falsterbo in Sweden, Stevns and the southern part of Amager and to a lesser degree from Køge Bay, Bunkeflostrand and Klagshamn.

Construction of the wind farm is expected to be ongoing over a period of roughly 15-18 months. Because the activities during decommissioning, where the wind turbines are deconstructed, are similar to the ones during construction, they are assessed as having a similar impact. Overall, it is assessed that the visual impact during construction and decommissioning of the wind farm will be *minor to moderate*.

4.2 Nature

In this section, the impacts of Aflandshage offshore wind farm on the surrounding nature, animals and plants are described. Overall, it is assessed that the project can be completed without significant impacts on nature, animals and plants.

4.2.1 Benthic flora and fauna

It is assessed that Aflandshage offshore wind farm will not have any significant impacts on plants and animals on/in the seabed.

Wind turbine foundations will take up part of the seabed after construction. This area consists mainly of sandy bottom and after the construction, animals and plants connected to this habitat type will no longer be able to live there. The impact is assessed as *moderate* but not *major* as the total reduction in inhabitable sandy bottom will be local and limited.

The project area contains areas with patchy distribution of eelgrass, sago pondweed, seagrass and different macroalgae. During the construction of foundations and cable digging, sediment will be suspended into the surrounding water. This sediment reduces the amount of light the plants receive at the seafloor and thus their growth could be reduced if the construction work is taking place during their growth period. The suspension of sediment is limited and of short duration. Therefore it is assessed that the impact on the growth of plants and algae during the construction and decommissioning stage will be *minor* and negligible. During the operation stage there will be no impact.

Suspended sediment will often deposit on the seabed in areas with calm seabed conditions. The deposition of sediment into plants and sedentary animals is assessed as temporary, limited and negligible. When sediment is deposited in areas with burrowing animals, these animals will simply dig through it to the surface. The impact is thus assessed as *minor* and negligible and only takes place during the construction and decommissioning stages.

Technical installations (wind turbine foundations etc.) on the seafloor will cause small changes in the hydrography both within and outside of the project area. These changes can cause small changes in the habitats of benthic plants and animals, but without fundamentally changing the type of habitats. These impacts are assessed as *minor*.

These technical installations will function as new habitats for animals and plants. The wind turbine foundations will form habitats for mussels, algae and other sedentary organisms and the composition of the species community will resemble that of a rocky reef. It is debatable whether this creation of these new habitats can be seen as a positive impact or not; on the positive side, the construction of foundations on the seafloor will contribute to widen the distribution of rocky reef-like species communities in inner danish waters. As these changes in habitats are assessed as being minor and local, the impact thereof is assessed as *minor*.

4.2.2 Marine mammals

Harbour porpoise, harbour seal and grey seal are the most common marine mammals in Oresund and Køge Bay and in inner danish waters in general. All three species are present in or around the project area for Aflandshage Offshore Wind farm but the project area is not a particularly important breeding area for the species. Neither the data from the preliminary surveys or any other available data points towards the project area being a particularly important feeding ground for the animals either. Resting areas for seals at Måkläppen in southern Skåne and on Saltholm roughly 10 and 18 km from the project area accordingly as well as a seal colony on Saltholm does however indicate that the project area must be of some importance as a seal feeding ground.

The most severe noise impact on marine mammals will come from the pile driving involved in installing monopile foundations. The effects of noise on marine mammals will be most pronounced near the source of the noise and decrease with in-

creasing distance from the driving. The underwater noise can disturb the underwater communication signals of the animals as well as their echolocation and can lead to behavioural changes such as the animals ceasing feeding behaviour or fleeing the area. The effects are more severe closer to the source of the noise and can result in temporary hearing damage (TTS) and in the immediate vicinity of the noise source, the noise can be powerful enough to cause permanent hearing loss (PTS) and tissue damage if no mitigation measures are used.

Mitigation measures are necessary as part of the construction work in order to protect marine mammals from the underwater noise. By following the guidelines and using mitigation measures the impact on marine mammals from underwater noise is assessed as *minor*.

Communication sounds from grey seals and harbour seals can be masked by the noise from the construction works both above and underwater. The communication between seals is however mainly expected to happen close to the resting areas. The distance to the nearest resting area at Måkläppen (where both species are present) is more than 10 km from the project area for Aflandshage Offshore Wind farm. It cannot be ruled out that some masking of the communication sounds of the seals will take place. However it will be to a very limited extent due to the large distance. The noise will only affect the seals during the actual pile driving which will be of short duration. The impact of underwater noise on the communication of grey seals and harbour seals is assessed as *minor*.

Overall, it is assessed that the impact of the project on marine mammals is *minor* if mitigation measures are used to reduce the impact on their hearing during noisy pile driving activities.

4.2.3 Fish

The most characteristic fish species in the waters in and around the project area are well known and commercially important species: Atlantic cod, European plaice, Atlantic herring, European sprat, European eel, European flounder, common dab and turbot as well as seasonal guests such as garfish and lumpsucker. Some numerous but not commercially important fish species include different species of gobies, short-horn sculpin, European eelpout, sea stickleback, three-spined stickleback and hooknose. These species include both benthic and pelagic fish.

Fish can potentially be impacted during the construction and decommissioning stages by increased amounts of suspended sediment, underwater noise, temporary habitat changes and habitat loss caused by construction of wind turbines as well as the introduction of new hard bottom. In the construction stage the fish can also potentially be impacted by magnetic fields.

Fish and their larvae and eggs are vulnerable to suspended sediment in the water column where it can impact the oxygen acquisition and clog their digestive systems causing increased mortality. Furthermore, suspended sediment can cause the fish to flee the area and impact their feeding behaviour. This is especially true for fish that are reliant on their vision in order to successfully feed. Finally, suspended sediment can stick to suspended fish eggs and can cause them to sink to the bottom where the larvae inside are suffocated if the oxygen concentrations at the bottom is too low. The impact from suspended sediment will however be of short duration and will only impact locally in areas where excavations are required during the construction stage. Thus the impact is assessed as *minor*.

Most fish species can detect the noise from pile driving of monopiles during the construction stage and from ship traffic etc. but in varying degrees. Fish very close to the noise sources might display behavioural changes, experience temporary or permanent hearing loss or suffer lethal damage. Fish larvae and eggs are most likely to suffer lethal damage from being close to the noise sources. They can suffer lethal damage if they are within 1,5 meters of the pile driving as they are unable to escape the noise. Several studies have shown that many fish species that suffer temporary hearing damage are able to regain their hearing. The impact on fish from noise during the construction stage is assessed as *moderate*.

The impact on fish of temporary habitat changes caused by changes to the seafloor during construction is assessed as *minor*.

Habitat loss caused by the construction of wind turbines as well as the introduction of new seafloor elements (such as wind turbine foundations and scour protection) during the operational stage is assessed and having a limited impact on fish. This impact is assessed as *minor*.

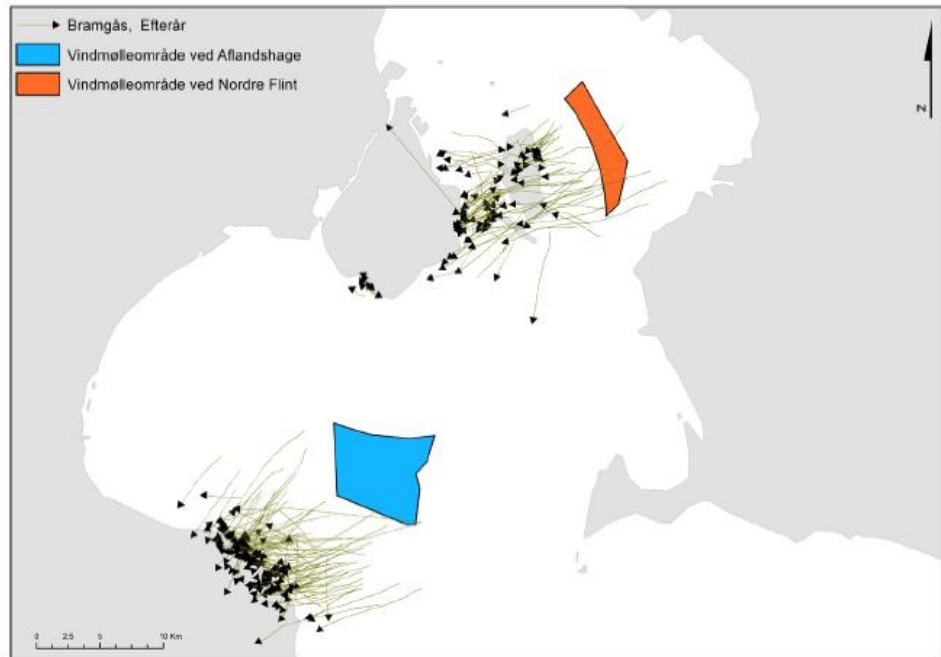
Conducting high voltage cables in the seabed will generate electromagnetic fields. It is assessed that these electromagnetic fields will not impact the fish in the area.

4.2.4 Birds

Each year, millions of birds migrate over the Oresund area. In the spring they are heading towards the breeding grounds in Scandinavia and Russia and in the fall they are heading to the wintering grounds in Denmark and further south. Aflandshage Offshore Wind farm is located in one of the important migration corridors between Stevns on Zealand and Falsterbo in the southwestern Skåne. Figure 4.2 shows the fall migration routes of migrating barnacle geese over Denmark. The wind farm is most likely to potentially impact the migration routes of barnacle geese, greylag geese, great cormorant, common eider and white-tailed eagle.

Køge Bay and the waters in the project area between Stevns, Amager and Falsterbo represent important resting and wintering grounds for several bird species including long-tailed duck, common eider, common scoter and red-breasted merganser.

Figure 4.2: The migration route of barnacle geese during the fall migration (logged via radar and laser range finder).



During the construction and decommissioning stages, migratory as well as resting and feeding birds can be temporarily displaced by the noise and disturbance around the construction work at sea. Furthermore, the feeding of the birds can be disrupted by suspended sediment and temporary changes to the seafloor.

The impact on birds during the construction and decommissioning stages is temporary and is assessed to be *minor* and without any significant impact on the bird populations.

During the operational stage, the wind farm can act as a barrier for migrating birds which can choose to fly the longer route around the wind farm instead of through it. This can lead to increased energy expenditure for the birds.

Furthermore, the wind farm poses as a collision risk for the birds. Bird-wind turbine collisions are especially likely in the following situations:

- During the seasonal migrations between breeding and wintering grounds.
- During local daily migratory movements between resting and feeding grounds and between breeding and feeding grounds.
- When birds are attracted to the wind turbines.
- When the birds hunt prey while flying.

Overall, the total number of yearly collisions is assessed as very low compared to the size of the populations migrating through Oresund and resting near the wind farm. The proportion of yearly collisions compared to the resting bird populations is also assessed as negligible. Overall the impact on bird populations by collisions with wind turbines in Aflandshage Offshore Wind farm is assessed as *negligible* whereby the overall impact of collisions is assessed as *minor*.

4.2.5 Bats

The fall migration of bats across Oresund takes place in August/September from, among others, the Falsterbo peninsula and other points on the Swedish and Danish southern coastlines. A similar northwards fall migration takes place in April/May across Oresund from the German and Polish coasts as well as from Zealand.

Bat species, which are observed as regularly migrating (and in larger numbers) across Oresund, include soprano pipistrelle, Nathusius' pipistrelle and common noctule. Other species are also expected to migrate and up to 13 of the Swedish and Danish bat species can be spotted near select departure points on the Swedish coasts. Surveys near Bornholm in 2015 have shown that Daubenton's bat, Nathusius's pipistrelle and the common noctule all migrate across the sea.

Furthermore, local bat populations can also hunt off the coast in Oresund and to a lesser extent in the project area for Aflandshage Offshore Wind farm.

Offshore noise and disturbances from ship traffic during the construction and decommissioning stages can potentially impact the migrating or hunting bats. Onshore construction activities can also impact the bats that hunt there. These impacts are however assessed as *negligible*.

During the operation stage the wind turbines pose as a collision risk for the bats. The impacts thereof is assessed as *minor* to *moderate*. This assessment is based on the fact that it is unknown whether any larger migratory routes pass through the Aflandshage Offshore Wind farm. Because of this, the impact of collisions on migratory bats during the operation stage is, in the worst case, assessed as *moderate*.

All of the aforementioned bat species that can be found at sea in the project area have stable populations and favourable conservation statuses. Wind farms pose a collision risk to bats as many bat species chose to fly upwards along the wind turbine towers in order to hunt near the nacelle independently of their normal preferred hunting altitude. Because of this, these bat species are more likely to collide with the turbine blades. On a population level however, this risk is only problematic if the wind farm is located in the main migration routes of the bats i.e. near the departure points on the coasts where the bats initiate their migration, as well as in the preferred offshore feeding grounds for the bats. The bats will mainly fly through Aflandshage Offshore Wind farm twice each year with their seasonal migrations and the proportion of bats in Denmark and Sweden that hunt this far offshore is estimated to be very limited. Surveys near offshore wind turbines have shown that the bats only migrate across sea for a period of a few days and thus will only be exposed to the wind turbines over a very short duration.

4.2.6 Terrestrial nature

Overall, it is assessed that the project can be completed without significant impacts on terrestrial nature, flora and fauna.

The potential onshore substation and onshore cables are not located inside or near areas protected by § 3 of the nature protection act.

The terrestrial part of the project area provides habitat for the European green toad, a rare species listed as critically endangered on the Danish red list. If the onshore substation is chosen, it, along with any related cables, is placed within an

area which is an important terrestrial and breeding area for the European green toad.

By applying appropriate mitigation measures during installation and decommissioning, the impact of the project on the European green toad is assessed as *minor*.

4.3 Natura 2000 and annex IV species

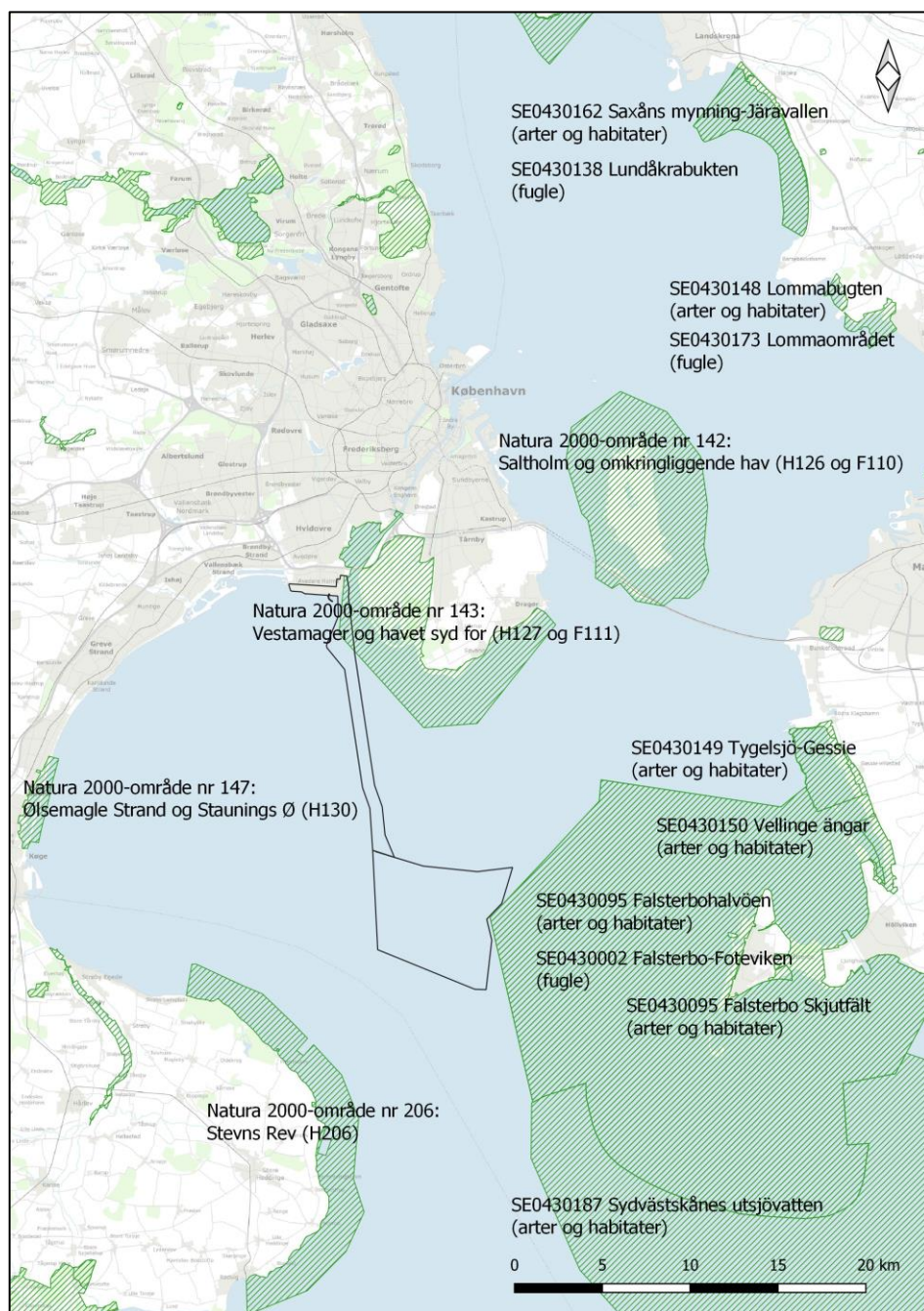
This section summarises the assessment of impacts of Aflandshage Wind Farm on Denmark's nature protection obligations under EU's two nature protection directives (the Habitats Directive and the Birds Directive). The directives impose EU's member states to protect a list of species and habitat types that are rare, threatened or characteristic for the member states. In Denmark, the Habitats and Birds Directives are implemented in national legislation.

4.3.1 Natura 2000 sites

Natura 2000 sites are nature protection/conservation areas appointed for protection of species and habitat types covered by EU's two nature protection directives. For each Natura 2000 site, there is a list with habitat types, species and birds which the site is designated to protect. The purpose of a Natura 2000 site is to secure a favorable conservation status for the designated species and habitat types. A project must – in itself or in connection with other plans or projects – not negatively impact designated species or habitat types for Natura 2000 sites.

Figure 4.3 depicts the project area for Aflandshage Wind Farm in relation to nearby Natura 2000 sites. As visualized on the map, the cable corridor transects Natura 2000 site no. 143: Vestamager og havet syd in the section near the landing area. Furthermore, the project area borders the Swedish Natura 2000 site Falsterbo-Foteviken/Falsterbohalvön.

Figure 4.3: Project area for Aflandshage Wind Farm and nearby Natura 2000 sites in Denmark and Sweden. Only marine Natura 2000 sites are named on the map. ©SDFE



The described and assessed Danish Natura 2000 sites are:

- Natura 2000 site no. 143: Vestamager og havet syd for
- Natura 2000 site no. 142: Saltholmen og omkringliggende hav
- Natura 2000 site no. 147: Ølsemagle Strand og Staunings Ø (H130)
- Natura 2000 site no. 206: Stevns Rev

The following Swedish Natura 2000 sites are included:

- SE0430095 Falsterbohalvön
- SE0430002 Falsterbo-Foteviken

- SE0430187 Sydvästkånes utsjövatten
- SE0430173 Lommaområdet

Based on a thorough review of the designations and conservation objectives of the relevant Natura 2000 sites, it is assessed that installation, operation and maintenance, and decommissioning of Aflandshage Wild Farm could impact marine habitat types, marine mammals (harbour porpoise, harbour seal and grey seal) as well as several bird species.

Habitat types

The impact on marine habitat types will primarily occur during construction and decommissioning due to work in the sea floor and the resulting spread of sediment.

A minor part of the project area for the export cables overlaps with Natura 2000 site 143 (Vestamager og havet syd herfor) as well as an area with two protected habitat types, 'inlets and bays' and 'sandbanks'. If the cables are placed in areas with marine habitat types, direct physical impact will occur during installation of the cables in the sea floor. The physical impact will affect a very small part of the total area of protected habitat types within the Natura 2000 site, and it is assessed that the benthic/bottom dwelling flora and fauna will be completely re-established within a period of 3 to 9 years. Although the impact on marine habitat types is temporary, it is assessed that the physical impact on 'inlets and bays' and 'sandbanks' is considered an adverse effect, which in principle cannot be permitted. However, it is possible to avoid adverse effects on the marine habitat types by placing the cables in the western part of the cable corridor. In that case, protected habitat types will still be impacted by shading effects caused by an increase in suspended sediment and sedimentation, but it is assessed that this will not cause adverse effects on habitat types in Natura 2000 site no. 143. Thus, offshore cables can be installed without hindering that favorable conservation status can be reached for the designated habitat types in the site.

An increased levels of suspended sediment and sedimentation will also impact the marine habitat type 'biogenic reef', which is found in the part of the Swedish Natura 2000 site SE0430095 Falsterbohalvöen that borders the wind farm area. Neither sedimentation nor suspended sediment will have an extent that could lead to adverse effects of the habitat type 'biogenic reef' within Natura 2000 site SE0430095.

Marine mammals

Harbour porpoise, harbour seal and grey seal are designated species for several Natura 2000 sites close to the project area of Aflandshage Wind Farm. The most severe impact on marine mammals will be caused by underwater noise from pile driving during installation of monopile foundations.

The assessments of impacts are based on an extensive review of existing information on marine mammals in the nearby Nature 2000 sites, field surveys carried out in relation to the project, and modelling of the extent of the underwater noise in accordance with the current Danish guidelines for pile driving of wind turbine foundations. According to these guidelines, underwater noise must be reduced to a level where there will be no permanent hearing loss in harbour porpoises and seals. Therefore, the project will not cause direct harm to the designated marine mammals in the Natura 2000 sites, but will only cause behavioural changes and

temporary hearing loss in the marine mammals that stay in the vicinity of the area during pile driving of monopile foundations.

Noise propagation from installation will extend into the following Natura 2000 sites:

- Natura 2000 site no. 206: Stevns Rev
- SE0430095 Falsterbohalvön
- SE0430187 Sydvästskånes utsjövatten

Harbour porpoises and seals staying in or in close proximity to these sites may be exposed to noise from pile driving of monopiles that exceeds the critical load for behavioural changes and temporary hearing loss. The conducted assessments show that impacts from pile driving on marine mammals within or nearby Natura 2000 sites are temporary (in total 1.5 months, during pile driving) and reversible. Thus, it is assessed that underwater noise from pile driving will not cause adverse effects on either harbour porpoise, harbour seal or grey seal, regardless of whether they are located within or outside the nearby Natura 2000 sites.

4.3.2 Birds

Wind turbines pose a collision risk and a potential barrier to migration routes of birds. In addition, the presence of the wind farm may cause birds living in connection with the project area at sea to be displaced from the area. Operation of the wind farm constitutes the most potentially severe impact on designated birds in the nearby Natura 2000 sites. Furthermore, birds living in connection with the project area at sea may also be temporarily displaced from the area during construction and decommissioning.

Extensive calculations have been made on the impacts extend on birds caused by the operation of the wind farm. Based on these, impacts have been assessed on designated birds in the nearby Natura 2000 sites due to displacement, collision and barrier effect.

The conducted investigations, analyses and calculations shows that Aflandshage Wind Farm will neither cause displacement, collision risk or barrier effect to an extend that will cause adverse effects on designated bird species in the relevant Natura 2000 sites. This applies to breeding, resting, molting and migrating birds. Therefore, it is assessed that the wind farm will not cause adverse effects on designated bird populations in the relevant Natura 2000 sites, or prevent favourable conservation status for these species.

4.3.3 Annex IV species

In the project area for Aflandshage Wind Farm, the following species occur, which are protected in accordance with Annex IV of the Habitats Directive:

- Harbour porpoise
- All species of bats
- European green toad

Species included in Annex IV of the Habitats Directive are protected inside as well as outside Natura 2000 sites.

Projects cannot cause harm to or destroy breeding or resting areas for Annex IV species in their natural distribution areas.

4.3.3.1 *Harbour porpoise*

Harbour porpoise is, as previously mentioned, a designated species for several of the nearby Natura 2000 sites, but it is also covered by the protection legislations that applies to species in Annex IV of the Habitat Directive. Although there has been an increase in the occurrence of harbour porpoises within and around the project area for Aflandshage Wind Farm in recent years, the project area is not a particularly important area for the species. Underwater noise from pile driving of monopiles will impact harbour porpoises. However, calculations show that regardless of whether pile driving takes place in the summer or winter months, only few individuals will be affected by the noise. As the noise from pile driving will occur for a total period of approximately 1.5 months, and as only a very limited number of harbour porpoises will be affected by underwater noise levels, it is estimated that underwater noise will not give rise to short or long term implications for the conservation status of the belt sea or Baltic sea populations of harbour porpoise. Thus, it is assessed that the area's ecological function for harbour porpoise will not be impacted by the project.

4.3.3.2 *Bats*

Migrating or foraging bats can occur within the project area in both the marine and terrestrial environment. The project does not involve the removal of suitable resting, breeding or wintering grounds for bats. There is a risk that bats, to a limited extent, can collide with wind turbines, especially during their spring and fall migration. The species, which could potentially be impacted by the project, are all common in Denmark and all species have a favourable conservation status. It is therefore assessed that a few deceased bats will not affect the species on a population level, and that the areas ecological function for bats will not be impacted by the project.

4.3.3.3 *European green toad*

With the implementation of mitigation measures, it is assessed that the project during construction, operation or decommissioning will not affect the area's ecological functionality for European green toad.

4.4 **Surface water and groundwater**

This section summarises the assessments of impacts of Aflandshage Wind Farm on the water quality in the ocean, lakes, streams and groundwater. Collectively, the project's impact on surface water and groundwater is assessed as *minor*.

4.4.1 **Ocean**

During construction in the seabed, sediment is spilled, some of which is temporarily dissolved in the water column. Sediment can contain nutrients and environmentally hazardous substances that, when dissolved during construction and decommissioning, can be released to the aquatic environment.

Sediment contains nutrients and it cannot be excluded that these may occur in temporarily increased concentrations. The effect will be local as the high level of water exchange in the area will cause a rapid dilution.

The content of environmentally hazardous substances (heavy metals, PAH and PCB) in the sediment is low, and the sediment can generally be considered as unpolluted as confirmed by sampling and analyses. However, it can be expected that in and near the existing dumping site in the northern part of the project area, higher concentrations of environmentally hazardous substances can occur in the sediment, and although no excavation will be carried out at the dumping site, it cannot be excluded that sediment spill from neighbouring areas may cause a local and short-term increase in the concentration of environmentally hazardous substances in the water column in the area around the dumping site.

It is assessed that the release of nutrients and environmentally hazardous substances during construction and decommissioning will be *minor* and negligible.

4.4.2 Lakes and streams

The terrestrial part of the project area does not contain protected streams. The many canals serve only as drainage of the dammed area. In situations where cables could potentially cross canals, for example after the cable landing at Avedøre Holme, these will cross the canal by controlled underdrilling, so that the water in the canals is not affected.

4.4.3 Groundwater

There are no groundwater interests at Avedøre Holme. The nearest public water well is more than 3 km away from the project area, and the nearest area of particular value for drinking water interests is roughly 10 km away.

During construction and decommissioning, there may be a need for temporary groundwater drawdown in relation to installation of the onshore transformer station. There may also be a need for short-term dry keeping of cable trenches due to precipitation and/or high groundwater levels. If groundwater drawdown is required, it must be conducted in accordance with HOFOR's Requirements Specification, which contains guidelines that ensure that the need for groundwater drawdown is reported to the local environmental authority and that a permit for discharge of waste water cf. § 28 of the Environmental Protection Act is obtained before the discharge is initiated. By following the guidelines in the requirements specification it is ensured that the pumped groundwater after prior treatment complies with threshold values for environmentally hazardous substances so that water discharge will constitute no impact or a minor and temporary impact.

4.5 Water area management plans and marine strategy

This section summarizes the project's impact in relation to EU's Water Framework Directive and EU's Marine Strategy Framework Directive, both of which aim to protect the quality of water bodies within the EU.

4.5.1 Water area management plans

In accordance with the provisions of the Water Framework Directive, Aflandshage Wind Farm must not impede the fulfillment of EU's objectives for the ecological and chemical conditions in nearby water bodies. In addition, the project must not worsen the condition of the bodies of water.

The relevant Danish and Swedish water areas are shown in Figure 4.4 and Figure 4.5, respectively.

Figure 4.4: Danish coastal water areas: 201: 201 – Køge Bugt og 211 – Østersøen 12 sm. ©SDFE

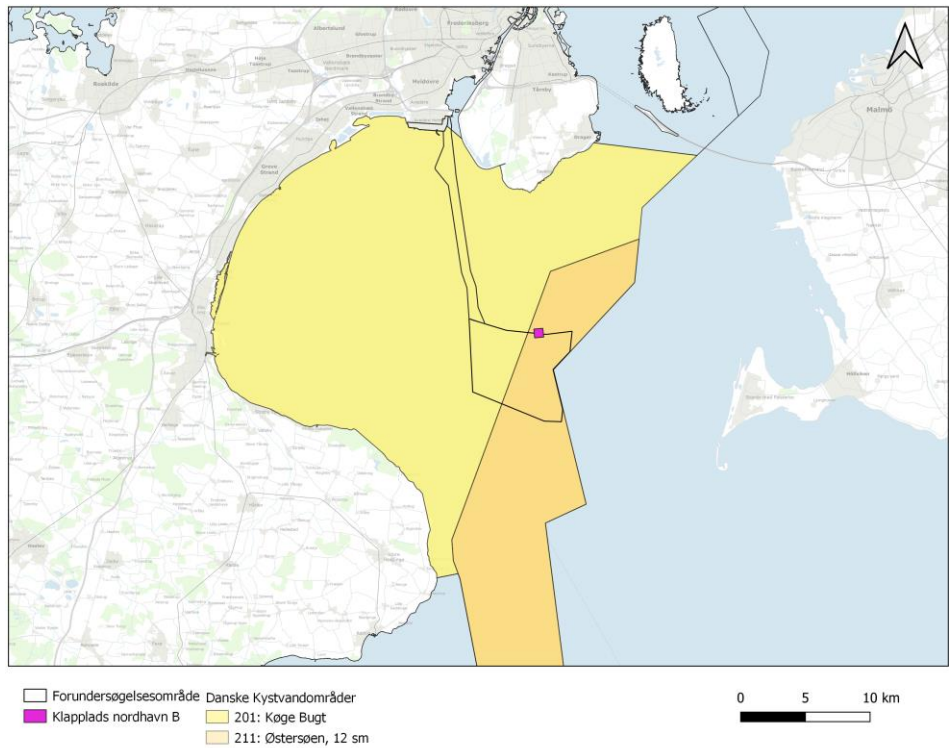
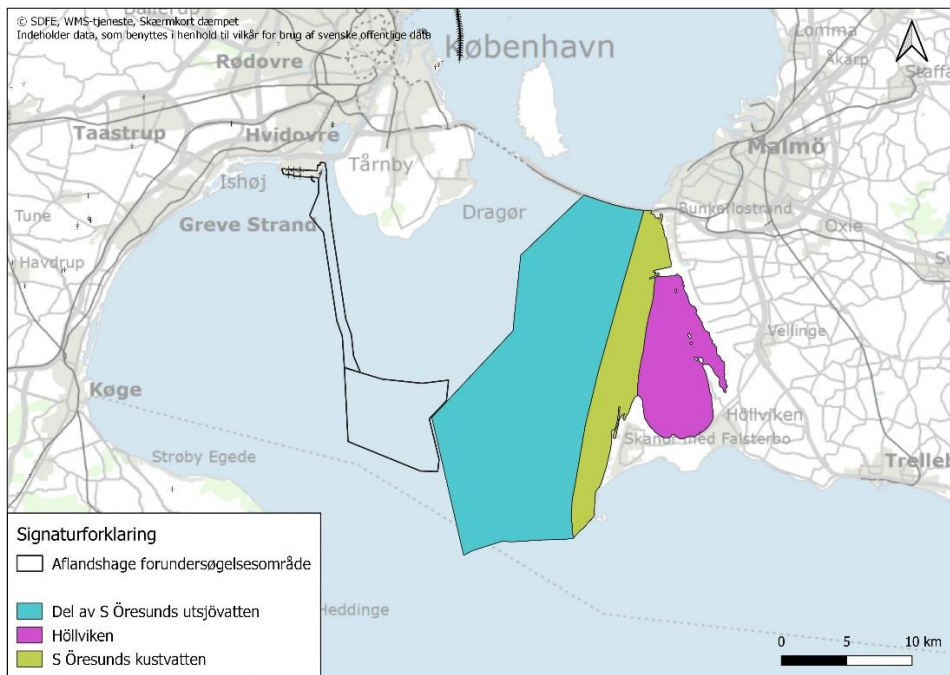


Figure 4.5: Swedish coastal water areas: Del av S Öresunds utsjövatten, S Öresunds kustvatten og Höllviken.



It is assessed that neither construction nor operational activities will significantly impact the existing ecological and chemical condition, and thus will not hinder the achievement of objectives in the relevant coastal water areas or worsen the conditions therein.

4.5.2 Marine strategy

EU's Marine Strategy Framework Directive aims to ensure good environmental status in all European marine areas by 2020. The directive provides the following eleven descriptors for assessing the environmental status in a marine area:

- Biodiversity (D1)
- Non-indigenous species (D2)
- Commercial fish and shellfish (D3)
- Food webs (D4)
- Eutrophication (D5)
- Sea-floor integrity (D6)
- Hydrographical conditions (D7)
- Contaminants (D8)
- Contaminants in seafood (D9)
- Marine litter (D10)
- Energy incl. underwater noise (D11)

It must be noted that the marine strategy does not cover the status of phytoplankton, macroalgae, seed plants and benthic animals, as well as the chemical condition in water areas stretching more than one nautical mile from the baseline and 12 nautical miles for chemical condition, as these factors are covered by the water area management plans. This applies for the majority of the project area. The other elements in the marine strategy such as fishes, underwater noise and marine litter are not covered by the water area management plans, and are hence covered by the marine strategy throughout the marine area, including within the one nautical mile from the baseline.

In Denmark, the current condition of open sea areas are described in the report "Danmarks Havstrategi II 2018-2024", while for Sweden it is described in "God Havsmiljö 2020"

For Aflandshage Wind Farm it is assessed that D1: Biodiversity, D2 Non-indigenous species, D4: Food webs, D6: Sea-floor integrity, D7: Hydrographic conditions and D11: Energy incl. underwater noise are of particular relevance for assessing potential impacts of the project on environmental goals for the Baltic Sea.

Collectively, it is assessed that construction, operation and decommissioning of Aflandshage Wind Farm will not have significant impact on any of the 11 descriptors, and thus will not delay or hinder achievement of good environmental status in the offshore area within which the wind farm is placed and in the Baltic Sea in general.

Potential cumulative effects during construction cannot be excluded if there is a temporal overlap of other noisy activities in the vicinity of the wind farm. In order to complete an assessment of additional cumulative effects from underwater noise and the significance for descriptor 11 and associated environmental goals, it will take further quantification, which can only be carried out when and if such noisy activities are identified.

With the exception of underwater noise during construction, it is generally assessed that any impacts from other projects in cumulation with Aflandshage Wind Farm will not delay or hinder the achievement of good environmental status in the offshore area within which the wind farm is placed and in the Baltic Sea in general.

4.6 Land-use and soil contamination

This section summarizes the assessments for land-use and soil contamination in the seabed and on land.

4.6.1 Marine raw material resource areas

No raw material resources (sand or gravel) have been detected within the marine part of the project area. However, within a small part of the area there is a probable occurrence of raw materials, and both the wind turbine area and the cable corridor contain smaller areas with presumed ("speculative") occurrence of raw material resources. The impact of the project on the possibility of utilizing raw material resources is assessed as *minor*.

In the northern part of the project area, there is an overlap between the wind turbine area and a small dumping site for dredged sediment.

4.6.2 Contamination of the seabed

The wind farm will be placed in an area which primarily consists of uncontaminated sediment. Analysis of sediment samples taken from the project area indicates that the level of contamination is below the threshold value. The wind turbine layouts have been designed so that there will be no construction activities within the dumping site in the northern part of the project area. Thus, the release of contaminants from construction is assessed as *negligible*.

4.6.3 Contaminated soil

The land based part project area contains areas with known soil contamination (V2-mapped areas) as well as areas with probable soil contamination assessed based on previous land-use (V1-mapped areas). HOFOR has requirement specifications that ensures that contaminated soil is handled in accordance with the provisions of the Soil Contamination Act and the Environmental Protection Act. Following the existing policy provisions, the project can be completed without significant impacts regarding management of contaminated soil. Any potential groundwater drawdown or temporary dry keeping of excavated areas during construction can potentially mobilize the contamination in the soil. It is however assessed that it would only affect small amounts of water during the short construction periods and in a small local impact area. Furthermore, the entire area contains of deposited slag etc. and thus no uncontaminated areas are affected. The degree of impact is assessed as *minor*.

Since the entire area holds a site classification, all work relating to soil during construction must be reported to Hvidovre municipality.

4.7 Air quality and climate

This section summarizes the impact of the project on air quality and climate.

4.7.1 Air quality

During construction, a total of approximately 2,230 tons of nitrogen oxides and 60 tons of particles will be emitted. Corresponding emissions are expected during decommissioning of the wind farm. The largest part of the emission will occur in relation to the offshore construction work and in areas with good air mixing. Emission of nitrogen oxides and particles during construction will be insignificant for the air quality in city areas. It is assessed that the project will not have an impact on air quality.

4.7.2 Climate

The most important purpose of the wind farm is to contribute to the green transition in Copenhagen by displacing the use of fossil fuels and thereby reducing CO₂ emissions. When comparing electricity production from wind turbines and electricity production from natural gas, the savings in CO₂ emissions will be 393,000 tons per year, corresponding to 13.8 million tons in the wind farm's lifetime of 35 years. However, savings in CO₂ emissions cannot be calculated precisely, as it depends on the future electricity consumption and the future composition of energy sources for electricity production.

Emission of CO₂ during construction is estimated to approximately 479,930 tons and the emission during decommissioning is expected to be of similar magnitude, i.e. a total emission of approximately 0.9 million tons.

Overall, the wind farm will make a positive contribution to reducing CO₂ emission by displacing the use of fossil fuels (coal, oil, gas).

4.8 Cultural heritage

This section summarizes the assessments of the project's impact on cultural heritage. Collectively, it is assessed that the project can be completed without significant impacts on ancient and historic sites, cultural environments and cultural-historical elements.

4.8.1 Archaeology

Since the ending of the last ice age, the project area has been characterized by changing water levels and human activity. It is thus possible that archaeological findings and historic sites and elements such as Stone Age settlements and shipwrecks can be discovered during construction.

The area which comprises Avedøre Holme today was created by land reclamation around a number of small, uninhabited islands and islets in the 1960s. There is no knowledge of the existence of significant archaeological findings in the project area on Avedøre Holme.

In the marine project area, the Viking Ship Museum has mapped marine areas of archaeological interest and possible ancient and historic sites and monuments.

The marine areas of archaeological interest are designated by the museum as exclusion zones, where there is reasonable indication of the existence of ancient and historic objects that are protected by the Museum Law. Prior to potential construction work in the seabed in the areas of archaeological interest, the Viking Ship Museum must conduct preliminary marine archaeological studies and secure relevant ancient and historic objects.

4.8.2 Cultural environments and cultural history

The cultural historical sites closest to Aflandshage Wind Farm is Kongelundsfortet and Dragør Fort on Amager, Stevns Lighthouse, Udkiggen ved Eskadrille 543 and Højereup Gl. Kirke on Stevns as well as FASTERBO Lighthouse on Skanör in Skåne. All sites are located 10 km or further from the wind farm. The wind farm will be visible from all mentioned sites.

It is assessed that the experience at Falsterbo Lighthouse and Stevns Lighthouse will be *moderately* impacted by the wind farm. For all other mentioned cultural historical sites, the impact on the experience will be *minor*.

4.8.3 Stevns Klint as a UNESCO World Heritage Site

Aflandshage Wind Farm is constructed roughly 8 km from Stevns Klint which is inscribed as a UNESCO World Heritage Site. It was assessed during the delineation of the contents of the EIA report, that the project would not impact Stevns Klint. The wind farm is constructed more than 6 km away from the buffer zone defined when Stevns Klint was inscribed as a world heritage site. This buffer zone was instated for several reasons including preserving the view to and from Stevns Klint.

4.9 Population, people and health

This section summarizes the assessment of the impact of Aflandshage Wind Farm on the human population and health, which for the project is assessed to include noise, landscape experience, cultural heritage and recreational values, recreational fisheries, boating and tourism. Collectively, it is assessed that the project can be completed without significant consequences for the population, people and health.

4.9.1 Noise

Calculations of noise from construction work onshore and offshore have been performed. Calculations of noise during operation have been performed for the offshore wind turbines and for the transformer station on land. The calculations show that the level of noise at the nearest housing will be low, and that all noise thresholds will be maintained with a good margin.

Given the large distances between housing and the wind farm and transformer station, it can be concluded that the population will not experience an increased impact of noise, and there will be no impact on human health.

4.9.2 Landscape experience, cultural heritage and recreational values

People's experience of the coastal and cultural landscape, natural and public amenity values in the area, as well as recreational values of the landscape can be impacted by the visual changes that Aflandshage Wind Farm entails. These impacts are described in the section on Landscape and visual conditions and in the section on Cultural heritage. There are no other impacts on the recreational conditions on land than the altered view.

There will be no shade cast from the wind farm onto the coast in the areas used for housing or recreational activities in Denmark or Sweden. Shade cast on land may occur during early or late hours (sunrise and sunset). The duration of these periods will be very short, i.e. a few minutes.

Previously, reflections from rotor blades could cause nuisance, but since newer wind turbines have very few straight surfaces, and since they must be treated with anti-reflective material, there will be no impact from reflections.

No direct health impact due to changes in visual conditions is assessed. If this is to have an impact on health, it will be of indirect character, for example as a consequence of reduced life quality or a restriction in people's use of the recreational areas.

Studies suggest that people's use of the recreational areas has a beneficial effect on health, but there are no known studies that show that a changed landscape image will change the recreational value and thus the effect on health.

Although parts of the population in the area may feel bothered by the changed visual conditions, there will be no risk of an impact on human health, as it is only a visual impact from the wind farm.

4.9.3 Recreational fisheries

Fishing with fixed gear (fish traps, nets, hook lines, pots), rod fishing from land, smaller boats or larger tour boats, as well as fishing during underwater hunting has been assessed.

During construction, there will be increased ship traffic to and from the project area for a short period, and work zones with access restrictions will be established. The construction phase for Aflandshage Wind Farm will only lead to a minor restriction on people's opportunities to fish from smaller boats with either rod or fixed gear. There will be a minor impact on the possibility for fishing, but it will not impact human health.

Operation of the wind farm will not limit the possibility for fishing. The fish in the area will not be impacted during operation, neither by noise from the turbines or electrical fields around the cables, which will be below the background concentration.

4.9.4 Boating

During construction, several work zones with access restrictions will be established in the wind turbine area. During the installation of the export cables, the possibility of boating will be limited within the cable corridor. However, this limitation will be very brief.

During operation, the wind farm will be open to traffic, but the presence of the wind turbines could potentially create limitations for boating. An alternative sailing route has been designated west of the wind farm for those who are currently sailing through the offshore area of the wind farm on their way north or south through Oresund.

Collectively, it is assessed that the impact on boating will be small and human health will not be impacted.

4.9.5 Tourism

The visual impact of Aflandshage Wind Farm is not assessed to be of great importance for tourism in the area. It is assessed that the extent of tourism in the area is not due to the coastal landscape or beaches. However, it is assessed that

the attractions represented by Copenhagen and Malmø as well as other larger cities will be decisive of tourism extent. Similarly, it is assessed that the tourism at Stevns Klint is largely due to the attractions associated with Stevns Klint. Thus, it is assessed unlikely that tourists will avoid the area around Stevns Klint, Højrup Kirke and Stevns Fyr when the wind farm has been constructed. It can thus not be compared with the choice between a beach with or without an offshore wind farm.

4.10 Material goods

This section summarizes the assessment of the impact of Aflandshage Wind Farm on material goods, which for the project is assessed to include commercial fisheries, maritime traffic, air traffic as well as radar and radio chains.

4.10.1 Commercial fisheries

The part of Oresund, where Aflandshage Wind Farm is to be placed is used to a limited extent by Danish and Swedish commercial fisheries. Commercial fishery in the area takes place using passive gear, i.e. nets, fish traps and hooks, as it is not permitted to use active gear such as trawl.

Construction of Aflandshage Wind Farm, including the offshore cabling, may potentially impact the fisheries negatively by possibly limiting fishing possibilities in the area.

There will only be a minor and temporary impact on fisheries using nets, traps and hooks during both construction and decommissioning, and there will be no impact during operation.

The impact on trap-net fishery, which within the project area only occurs in the northern part of the cable corridor, will be significant for a few fishermen during both construction and decommissioning in the worst case scenario, if the cables are placed so that trap-net fishing is impossible to carry out.

The impact on trap-net fishery as a whole is assessed as *moderate*. Similarly, the impact on individual trap-net fishermen during operation will be *major* if restrictions regarding the placement of the trap-nets are introduced, but *moderate* for trap-net fishery as a whole. If no restrictions are introduced, there will be no impact on trap-net fishery during operation.

4.10.2 Maritime traffic and safety of navigation

The offshore project area is placed west of the two most significant shipping lanes in Oresund, but close to the southbound lane. Smaller lanes are passing through the project area, just as some maritime traffic to and from the Port of Copenhagen passes along or crosses the cable corridor.

Construction and presence of the wind farm will increase the sailing risk. In connection with the preliminary studies for Aflandshage Wind Farm, possible risks to safety of navigation was identified during construction and operation of the wind farm. Additionally, a number of specific measures have been suggested to reduce or eliminate these risks. If the measures are realized, the wind farm is assessed to have a *minor* impact on maritime traffic and safety of navigation during construction, operation and decommissioning.

The Danish Maritime Authority determines the final requirements for maintaining safety of navigation in Danish waters during construction operation of the wind farm.

4.10.3 Air traffic

In connection with the preliminary studies for Aflandshage and Nordre Flint Wind Farms, HOFOR Vind A/S in collaboration with Københavns Lufthavne A/S and Naviar have conducted a detailed risk assessment regarding aviation security, regularity and capacity in Copenhagen Airport Kastrup. Comments have also been obtained from the Danish Ministry of Defence Estate Agency regarding existing military use and air traffic within or in proximity to the project area.

The offshore project area is located outside of protection zones and direct approach routes to Copenhagen Airport Kastrup, Copenhagen Airport Roskilde and Malmö Airport Sturup in Sweden.

Wind turbines with a height of 150 m or more entail a risk for air traffic, civil as well as military, since 150 m is the general minimum flight altitude. The wind farm must therefore be marked in accordance with current rules. This is a crucial prerequisite for maintaining flight safety in the area around the wind farm.

The wind farm must also be incorporated in flight maps and the safety height for flying, which currently is 1600 feet (480 meter) above the wind turbine area, must likely be increased to 1800 feet. The Danish Civil Aviation and Railway Authority makes the final decision on this, when the project alternative has been chosen.

Regarding the radar and navigation systems of Copenhagen Airport Kastrup, several changes are identified, where supplementing radars must be set up and changes in the airport procedures must be incorporated, so that the existing aviation safety can be maintained while the capacity can be increased in the future and the regularity maintained. HOFOR Vind A/S will be responsible for realising the necessary changes in collaboration with Københavns Lufthavne A/S and Naviair. The changes are a prerequisite for the construction of the wind farm.

With implementation of the stated measures, the total impact of Aflandshage Offshore Wind farm is assessed as *negligible*.

4.10.4 Radar and radio chains

Experience from other wind farms shows that radars, air navigation facilities and radio chains can be impacted by shade effects and reflections from wind turbines. Wind turbines can impact ship and land based radar systems as well as radars used to monitor air traffic. The cause of the interference is the structure of the wind turbines, their great height and rotor movements, which can reflect the radar signals. Further, signals for telecommunication and data transmission can be deteriorated if the wind turbines are placed in line-of-sight of radio chains or within respect zone of the air navigation facilities.

Danish and Swedish radar facilities are investigated in relation to the impact of wind turbines.

The wind farm may lead to a deterioration in the ability of coastal radars to intercept vessels. It is assessed that there will be a need to reconstruct or adjust the current Danish coastal radar systems, to install new radar systems (so called gap-fillers), or to replace existing systems in order to reduce the impact to an acceptable level. However, the impacts of coastal radar system can only be assessed when the size and type of the turbines have been chosen.

5 Cumulative effects

Collectively, it is assessed that Aflandshage Wind Farm will not cause significant cumulative effects in relation to other current or planned projects in the area.

However, cumulative visual impacts will occur to a certain extent, just as there may be cumulative impacts from pile driving of monopile foundations, as well as in relation to air traffic safety and coverage of radar systems in areas between wind farms.

5.1 Landscape and visual conditions

There will be cumulative visual impacts of Aflandshage Wind Farm in relation to Lillegrund Wind Farm, Avedøre Power Station, the Øresund Bridge, and Nordre Flint Wind Farm.

Lillegrund is a Swedish wind farm, located northeast of Aflandshage Wind Farm. It varies how Lillegrund will appear in the landscape in relation to Aflandshage Wind Farm. From several places, it will occur in the same view as Aflandshage Wind Farm, while from other places it will not occur in the same view, but in the overall, visual experience of the coastal landscape. This applies for both the Danish and the Swedish coast.

Avedøre Power Station appears in connection with existing wind turbines around Avedøre Holme as a visually significant facility. Seen from the southern part of Køge Bay to the north, the Avedøre Power Station and the wind turbines at Avedøre Holme will appear in connection with parts of Aflandshage Wind Farm, just as the facility will be part of the overall, visual experience of the coastal landscape.

In particular, from the coasts at Stevns and along the southern and southwestern part of Køge Bay, the Øresund Bridge will appear in connection with Aflandshage Wind Farm. From other coasts in Denmark and Sweden, the Øresund Bridge will be part of the overall visual experience of the coastal landscape but not in direct connection with the wind farm.

Nordre Flint Wind Farm will be located just north of the Øresund Bridge. Only from Stevns will the wind farm be part of the same views as Aflandshage Wind Farm, but in several places, it will be part of the overall visual experience of the coastal landscape of Oresund. This applies especially for the Swedish coast as well as the eastern coast of Amager, from where both wind farms will be visual, albeit from different directions.

5.2 Marine mammals and fishes

Cumulative effects on marine mammals and fishes will only occur during pile driving of wind turbine foundations during construction. In the event of coincident pile driving activities for construction of Nordre Flint Wind Farm, a separate assessment of the total impact from underwater noise may be required.

5.3 Air traffic

Collectively, Aflandshage and Nordre Flint Wind Farms will lead to limited impacts on air traffic – and it is assessed that the impacts can be resolved. Measures to ensure air traffic safety is assessed collectively for the two wind farms and with consideration for the existing conditions in the area.

5.4 Radar systems

Aflandshage and Nordre Flint Wind Farms are located relatively close to each other, and cumulative effects may occur for especially radar systems lying between the two wind farms. Possible mitigation measures are determined when a final decision has been made regarding size and placement of wind turbines.

5.5 Deficiencies

It is assessed that there are no significant deficiencies in the knowledge and data for the assessments in this environmental impact assessment.

5.6 Surveillance

It is assessed that there are no requirement for surveillance of environmental impacts in relation to the construction, operation and decommissioning of Aflandshage Wind Farm.

6 Transboundary impacts

In accordance with the Espoo Convention and its implementation in Danish legislation (BKI no. 71 of 04/11/1999), a consultation has been conducted with neighboring countries about Aflandshage Wind Farm. The Espoo Convention sets the framework for when neighboring countries must be informed and consulted on projects that may have transboundary effects.

The wind farm will border Swedish territorial waters, and the distance from the Swedish coast to the nearest wind turbine will be approximately 12 km.

The potential transboundary impacts are assessed for the following environmental issues:

- Benthic flora and fauna
- Marine mammals
- Fishes
- Birds
- Bats
- Natura 2000 sites
- Annex IV species
- Nature and wildlife reserves
- Water area management plans and marine strategy
- Maritime traffic and safety of navigation
- Commercial fisheries
- Landscape and visual conditions
- Cultural environment and cultural history
- Boating conditions
- Air traffic safety
- Radar systems

The assessments of transboundary impacts are summarized below. For a more detailed explanation, please refer to the following background reports:

- Visualiseringsrapport (Visualization report). Aflandshage Vindmøllepark. Prepared by NIRAS for HOFOR Vind A/S. 11th of October 2021
- Aflandshage Vindmøllepark. Background report for seabed, flora and fauna. HOFOR Vind A/S. NIRAS, 11th of October 2021
- Aflandshage/Nordre Flint Wind Farms. Background report for coastal morphology, dumping, hydraulics etc. HOFOR Vind A/S. NIRAS, 11th of October 2021
- Aflandshage Vindmøllepark. Background report for marine mammals. HOFOR Vind A/S. NIRAS, 11th of October 2021
- Vurdering af den potentielle påvirkning af fugle ved opstilling af to vindmølleparker i Øresund (Assessment of the potential impact on birds by installation of two wind farms in Øresund). Report requested by HOFOR. Aarhus University. DCE – Nationalt Center for Miljø og Energi. 2021
- Navigational Risk Assessment of Aflandshage and Nordre flint offshore wind farms. HOFOR Vind A/S. DNV-GL, 30th of September, 2021
- Aflandshage og Nordre Flint vindmølleparker. Hazard identification and qualitative risk assessment of sailing safety. NIRAS. DNV.GL, December 7th 2020
- Aflandshage/Nordre Flint vindmølleparker. Background report on radar systems and radar chains. HOFOR Vind A/S. NIRAS, 11th of October 2021

6.1 Total assessment of transboundary impacts

Collectively, Aflandshage Wind Farm will cause significant visual impacts around Falsterbo, including the impact on the experience of Falsterbo Fyr as a cultural historical element.

Without mitigation measures, hearing loss in marine mammals due to underwater noise from pile driving cannot be excluded. With mitigation measures, the transboundary impact from underwater noise on marine mammals is assessed to be *minor*.

Major impacts on Swedish radar systems included in the surveillance systems of VTS Øresund may occur, but these impacts must be mitigated by implementing the necessary mitigation measures.

Apart from the beforementioned factors, it is assessed that Aflandshage Wind Farm will not cause significant transboundary impacts.

6.2 Landscape and visual conditions

This section describes the transboundary visual impact of Aflandshage Wind Farm. It is assessed that at the coastal landscape at Falsterbo, the impact will be *Major*. At the coastal landscape at Klagshamn, the visual impact will be *moderate*.

It is not deemed possible to perform any mitigation measure which could reduce the visual impact of the project in areas where the impact is assessed as major. This is because of the extent of the wind farm along with the large size of the individual turbines.

The visual impact is assessed as greater if the option with the small wind turbines is chosen, compared to if the option with large turbines is chosen, because a greater number of turbines are constructed. As more turbines are constructed, the

technical impression upon the landscape is increased as well as the visual complexity of the wind farm.

6.2.1 The coastal landscape at Bunkeflostrand and south of Klagshamn

The coastal landscape at Bunkeflostrand, Klagshamn and south of Klagshamn is designated as nature and wildlife reserves. These landscape are in the intermediate zone when measured from Aflandshage Offshore Windfarm.

The coastal landscape is sparsely developed with small farms along the road parallel to the coast and a few smaller towns near the coast. Bunkeflostrand is located immediately south of Malmø, and consists of close, low buildings. Further south, Klagshamn is located. Klagshamn is a small harbour town founded as part of the limestone industry in the early 19th century. South of Klagshamn the developed area is further from the coast and thus is not assessed as part of the coastal landscape.

The impression of the landscape is very simple and the wide views are central to the character of the landscape. Because of the flat terrain, the coastline is only experienced close to the coast but the presence to the shore and ocean can be felt at all times, even when the shore is not visible.

The coastal landscape is designated as nature and wildlife reserves where both nature and landscape are important. Because of this designation, the national importance and high landscape value of the area is connected to the landscape character and visual conditions.

The high landscape value makes it vulnerable to changes in or around it which would deteriorate the character of the landscape including its visual character. The distance to Aflandshage Offshore Wind Farm is assessed to, to some degree, reduce this vulnerability. The vulnerability of the landscape is thus assessed as medium.

From Bunkeflostrand it is assessed that the visibility of Aflandshage Offshore Wind Farm will only impact the existing conditions in a minor way, as it is primarily visible behind Lillegrund Wind Farm.

From Klagshamn, it is assessed that there is no impact on the landscape north of the damn, but on the tip of the damn there is assessed to be a considerable cumulative impact with the existing and planned technical facilities in and around Ore-sund. Therefore, Aflandshage Offshore Wind Farm will add to the collective technical impression of the visual character of the coastal landscape in a major way.

The visual impact on the coastal landscape is therefore assessed as being *minor* at Bunkeflostrand and *moderate* at Klagshamn and along the coastline to the south.

Figure 6.1 shows the wind farm from Brunkeflostrand, south of Malmø, where the distance to the nearest wind turbine will be roughly 20 km. Aflandshage Offshore Wind Farm is seen visible behind Lillegrund Wind Farm and this gives it a more complex impression. However, it only adds a minor impact to the existing impression on the landscape.

Figure 6.1: Visualisation of Aflandshage Offshore Wind Farm as seen from Bunkeflostrand in clear weather. The visualisation shown is for the 26 large turbines with a height of 220 meters. In the foreground of Aflandshage Wind Farm, the Swedish Lillegrund Wind Farm is seen.



Figure 6.2 depicts the westward view from the port of Klagshamn. The existing Lillegrund Wind Farm closest to the shore is seen in the right part of the picture. Aflandshage Wind Farm is visibly further away, compared to Lillegrund Windfarm. The distance to the nearest turbine at Aflandshage will be 18 km. The two wind farms collectively contribute to the technical impression on the view.

Figure 6.2: Visualisation of Aflandshage Offshore Wind Farm as seen from Klagshamn in clear weather. The visualisation shown is for the 31 intermediate turbines with a height of 212 meters. The existing Lillegrund Wind Farm is seen in the right part of the picture.



Overall, it is assessed that the visual impact on the coastal landscape will be *minor* at Bunkeflostrand and *moderate* at Klagshamn and along the coast to the south.

6.2.2 Falsterbo coastal landscape

The coastal landscape at Falsterbo consists of the western part of the Falsterbo peninsula, also known as Falsterbonæsset which is clearly oriented towards Öresund.

The landscape at the western parts of Falsterbonæsset are characterized by the large flats of marine headland, sandy beaches and dunes in particular, which creates a hilly terrain. South of the headland, the peninsula is extended by a hooked sandy spit. The character of the coastal landscape to the north, west and on the sandy spit is given a very natural impression and is characterized by large beach meadows with wetlands and dunes along the coast. On the southern part of Falsterbo, the landscape is affected by golf courses which are scattered throughout the dunes and small beach houses are scattered throughout the coastal landscape.

The old towns of Skanör-Falsterbo are located centrally on the peninsula and date back to middle ages. Skanör harbor is located on the central part of the coast and functions both as a cultural and beach environment. The harbour contains small boats and has, historically, been central for the herring fisheries in Öresund. Today, the area is largely of recreational importance with restaurants, marina, beach park and more.

The coastal landscape has a simple and open character where the relationship with Öresund to the west and the Baltic sea to the south is important. The southward and westward views are without technical impressions while the view to the north

is affected by the Swedish wind farm Lillegrund as well as the Oresund bridge which is seen as a landmark on the horizon.

The coastal landscape is designated as nature and wildlife reserved,

The coastal landscape is designated as nature and wildlife reserves where both nature and landscape are important. Because of this designation, the national importance and high landscape value of the area is connected to the landscape character and visual conditions.

The high landscape value makes it vulnerable to changes in or around it which would deteriorate the character of the landscape including its visual character. The vulnerability of the landscape from visual impacts from Aflandshage Wind Farm is thus assessed as high.

Figure 6.3 shows the wind farm as seen from the Falsterbo peninsula where the distance to the nearest wind turbine is roughly 13 km. The coastal landscape on the southernmost part of the peninsula is affected by a golf course and the wide southwards and westwards views of Oresund are not given a technical impression by any nearby technical facilities. Aflandshage Wind Farm will take up a large part of the view. The impact on the experience of the landscape is assessed as *major*.

Figure 6.3: Visualisation of Aflandshage Offshore Wind Farm seen from the Falsterbo peninsula near Falsterbo lighthouse in clear weather. The visualisation shown is for the 26 large turbines with a height of 220 meters.



Aflandshage Wind Farm will be very visible in the coastal landscape at Falsterbo, which has a high landscape/natural value. Due to the distance, the wind farm will have a visually dominating effect. At the northern part of Falsterbo peninsula, it will impact a landscape already characterized by technical facilities in the view to

the north, and it is hence assessed that it contributes considerably to the total visual impact of the landscape. At the southern part of Falsterbo peninsula, it will impact a coastal landscape which is currently not considerably characterized by technical facilities. From the entire Falsterbo coastal landscape, the wind farm's visibility is assessed to have great importance for the visual character of the landscape. Collectively, the visual impact of the wind farm on Falsterbo coastal landscape is assessed as *major*.

6.3 Cultural environment and cultural history

Falsterbo Lighthouse is appointed as a 'culture track' and part of an overall cultural environment. The lighthouse has a great visual relation to Oresund.

The experience of Falsterbo Lighthouse as a point of orientation from the surrounding coasts and waters will to some extent be impacted by Aflandshage Wind Farm, which as a large and distinctive technical element will partly draw the eye, especially from the water side, and partly cover long views. Thus, it is assessed that the impact on this cultural historical object is *minor*.

From the lighthouse itself, the view of the low coastal meadow will to a large degree be disturbed by the wind farm, which as a distinct and shielding element prevents the long views and adds a technical impression to the area. Together with Lillegrund Wind Farm and Nordre Flint Wind Farm, Aflandshage Wind Farm will cause the northern and western views to be of strong, technical character. Thus, it is assessed that the impact on the views from the cultural historical object is *moderate*.

During night-time Falsterbo Lighthouse will be impacted by the light markings from Aflandshage Wind Farm, as the many lights will disturb and downscale the experience of the lighthouse as a luminous and indicative element in the landscape. The light markings of the wind farm impact both the visual and the functional experience of Falsterbo Lighthouse. The impact is assessed as *moderate*.

In addition to Falsterbo Lighthouse, two cultural environments are appointed in the area, Skanör-Falsterbo and Skanörs Ljung.

The values in relation to Skanör-Falsterbo cultural environment is especially connected to the two old districts of Skanör and Falsterbo. The relation to Oresund is not crucial for the experience of the cultural environment.

The values in relation to Skanör Ljung cultural environment is connected to the large, heather-covered heathland. The relation to Oresund is not relevant for the experience of the cultural environment.

6.4 Benthic flora and fauna

Construction activities may potentially have an impact outside of the offshore project area and into Swedish waters, as suspended sediment may be carried by the ocean current and unintentionally affect the Swedish seabed areas, including Natura 2000 site Falsterbo peninsula. The establishment of the wind farm may also lead to small changes in hydrography and current conditions in the area outside the offshore project area. According to model calculations of spread of sediment, a maximum sediment concentration of approximately 100-200 mg/l will occur in Swedish waters, and the duration of sediment concentrations above 10 mg/l

will be less than 2 days. A deposition between 0-1 mm of suspended sediment is expected. Impacts on hydrography and current conditions are negligible.

The impact of suspended material and sedimentation on the seafloor, flora and fauna in Swedish waters, including Swedish habitat areas, caused by construction activities is assessed as *minor* due to the extent and short duration of the impact.

For other parameters (habitat changes and occupation of the seafloor) the impact in Swedish waters is assessed as *negligible* or *minor*. This applies for construction, operation and decommissioning.

6.5 Marine mammals

The largest impact of noise on marine mammals (harbour porpoise, harbour seal and grey seal) will be caused by pile driving of monopiles, if this foundation type is chosen. The effect of noise on marine mammals will be most pronounced near the source and will decrease with increasing distance to the area of pile driving. The underwater noise may mask the communication sounds and echolocation of the animals as well as cause behavioural changes, for example by causing the animals to abandon foraging behaviour or causing them to flee the area. Temporary hearing loss (TTS) may occur closer to the source of the noise, and very close to the source, permanent hearing loss (PTS) and tissue damage on tissue other than the hearing organs may occur.

Without mitigation measures, it cannot be excluded that pile driving of monopiles may lead to permanent hearing loss in some individuals if they are near the area of pile driving and do not have time to escape. The construction work must comply with the requirements of the Danish guidelines for installation of monopiles. It is required that the tolerance limit for permanent hearing loss for porpoises and seals is not exceeded. There will be a need for reducing the noise from pile driving so that the tolerance limit for permanent hearing loss (PTS) for the most noise sensitive species (harbour porpoise) is not exceeded. This can typically be achieved by establishing bubble curtains around the site of construction. Further, there will be a need to deter marine mammals from the near proximity of the construction site, when driving is initiated. There will also be a need for a soft-start procedure of the piledriving, where the noisy activities are slowly escalated, so the animals can escape from the source of noise. Mitigation measures do not prevent pile driving from causing temporary hearing loss (TTS) and behavioural changes in marine mammals. Model calculations of impact areas have been performed. With mitigation measures such as bubble curtains the impact of underwater noise on marine mammals in Swedish waters is assessed as *minor*.

The project area for the wind farm borders Sweden's economic zone, and impacts of underwater noise may occur in Swedish waters. Sweden does not have guidelines for calculations of underwater noise in connection with pile driving, but in previous Swedish projects, calculations of underwater noise has been performed following US guidelines. Hence, underwater noise modelling following US guidelines is also included in the environmental impact assessment. These calculations more or less show the same noise impacts as calculations performed following Danish guidelines, and thus, the assessments based on calculations following Danish guidelines also applies for calculations performed following US guidelines.

Additional noise sources from construction, operation and decommissioning are not assessed to give rise to hearing loss or significant disturbance of marine mammals in Swedish waters. The impact is assessed as *minor*.

Måkläppen at Falsterbo Reef is a resting area for harbour seal and grey seal. The species are expected to forage in the offshore wind farm area to some extent and can potentially be disturbed in their foraging during construction. The project area is not particularly important foraging area for seals and the impact on their foraging during construction is assessed as *minor*.

The impact of additional parameters (noise and disturbance from maritime traffic, sediment spill, noise from operating wind turbines, habitat changes due to introduction of hard bottom substrate and electromagnetic fields) is assessed as *negligible* or *minor*.

It is a prerequisite for construction that the underwater noise is reduced to a level where PTS does not occur in marine mammals, cf. the guidelines from the Danish Energy Agency (2016). Reduction of underwater noise can be done by, for example, using for bubble curtains. In addition, it should be noted that the assessments of impacts from underwater noise during pile driving presumes attenuation of underwater noise, implementation of softstart procedures, as well as deterrence prior to pile driving initiation, cf. the underwater noise models described in section 6.1.4 of the EIA as well as in the technical report on underwater noise (NIRAS, 2021a).

As no significant impacts have been identified, mitigation measures in relation to marine mammals will not be necessary.

6.6 Fish

Like marine mammals, fish such as herring and sprat can suffer temporary or permanent hearing loss caused by noise from monopile driving. The impact is assessed as *moderate* in Danish waters. The transboundary impact will have a very limited spatial distribution in Swedish waters and the impact is therefore assessed as *minor*.

For additional parameters (suspended material, sedimentation, noise and disturbance from maritime traffic, and temporary habitat changes due to disturbance of the seabed), the total impact is assessed as *negligible* or *minor*. This applies for both Danish and Swedish waters during construction, operation and decommissioning.

Thus, the project will not cause significant transboundary impacts on fish populations in Swedish waters near the project area.

6.7 Birds

Oresund is an important area for migrating birds, the migration corridor between Stevns on Zealand and Falsterbo in southwestern Skåne being one of the most important. It is especially migrating barnacle geese, greylag geese, common eiders, cormorants and white-tailed eagles which could potentially be impacted by the wind farm.

Furthermore, Køge Bay and the waters in the project area between Stevns, Amager and Falsterbo are an important resting and wintering area for a number of birds, including long-tailed duck, common eider, common scoter and red-breasted merganser.

During construction and decommissioning, migrating, resting and foraging birds may be temporarily displaced due to disturbance and noise from the offshore construction work. Further, the birds' ability to forage at sea may be temporary reduced due to sediment spill and temporary habitat changes. The impact on birds during construction and decommissioning is temporary and is collectively assessed as *minor* and without significance for the bird populations.

During operation, the wind farm may act as a barrier for migrating birds, which instead of flying through the wind farm can choose to fly a longer route around it. This can lead to an increased energy expenditure for the birds.

Furthermore, the wind farm poses as a collision risk for the birds. Bird-wind turbine collisions are especially likely in the following situations:

- During the seasonal migrations between breeding and wintering grounds.
- During local daily migratory movements between resting and feeding grounds and between breeding and feeding grounds.
- When birds are attracted to the wind turbines.
- When the birds hunt prey while flying.

Overall, the total number of yearly collisions is assessed as very low compared to the size of the populations migrating through Oresund and resting near the wind farm. None of the collision estimates exceeds 2% of the calculated PBR for the migrating bird populations. PBR is acronym for potential biological removal and describes the percentage of the number of individuals a population can tolerate losing without affecting the population. The proportion of yearly collisions compared to the resting bird populations is also assessed as negligible. Overall the impact on bird populations by collisions with wind turbines in Aflandshage Offshore Wind farm is assessed as *negligible* whereby the overall impact of collisions is assessed as *minor*.

For all types of impacts (displacement, noise and disturbance from construction activities, sediment spill, collision risk and barrier effect), the projects total impact on birds is assessed as *negligible* or *minor* during construction, operation and decommissioning. Thus, this also applies for the project's impact on birds outside Denmark's borders.

Collectively, Aflandshage Wind Farm is assessed to cause no significant trans-boundary impacts in relation to birds.

6.8 Bats

There are autumn migrations of bats across Oresund in August-September from Falsterbo peninsula among others, as well as other points on the Swedish and southern Danish coastline. Similarly, spring migration in April-May takes place northwards over the Baltic Sea from the German and Polish coasts, as well as across Oresund from Zealand.

Bat species, which are observed as regularly migrating (and in larger numbers) across Oresund, include soprano pipistrelle, Nathusius' pipistrelle and common noctule. Other species are also expected to migrate, and up to 13 of the bat species registered in Sweden and Denmark can occur with increased activity at special departure points at the Swedish coasts. Investigations near Bornholm have thus shown Daubenton's bat, Nathusius' pipistrelle and common noctule migrating across the sea.

Further, local bats foraging at sea are also occurring in Oresund and to a lesser extent in the project area for Aflandshage Wind Farm.

Noise and disturbance from maritime traffic during construction and decommissioning can potentially impact bats migrating or foraging at sea. The impact of noise and disturbance is assessed as *minor*.

During operation, there is a risk of bats colliding with wind turbines. The impact during operation is collectively assessed as *minor* to *moderate* in relation to collisions, since it cannot be rejected that relatively large migration events passes through Aflandshage Wind Farm.

Other than that, the project's impact on bats is assessed as *negligible* or *minor*. This applies for both Danish and Swedish conditions during construction, operation and decommissioning.

6.9 Natura 2000 sites

The European Birds and Habitats directives are incorporated into Swedish legislation in chapter 7 sections 27-29 of 'Miljöbalken' (Miljöbalk (1998:808)).

The Swedish Natura 2000 sites SE0430095 Falsterbohalvön, SE0430002 Falsterbo-Foteviken, SE0430187 Sydvästskånes utsjövatten and SE0430173 Lommaområdet are included in the assessment of the possible impacts of the project.

Based on the designations and conservation objectives of the relevant Swedish Natura 2000 sites, it is assessed that construction, operation and decommissioning of Aflandshage Wind Farm may potentially impact marine habitat types, marine mammals (harbour porpoise, harbour seal and grey seal) as well as several species of birds.

6.9.1 Habitat types

The potential impact on marine habitat types may primarily occur during construction and decommissioning, where work in the seabed is conducted.

An increased levels of suspended sediment and the following increased deposition may also impact the marine habitat type 'biogenic reef', which is mapped in the part of the Swedish Natura 2000 site SE0430095 Falsterbohalvön that borders the project area. Neither sediment spill nor dissolved sediment in the water column will have an extend which will cause adverse effects on the habitat type 'biogenic reef' within Natura 2000 site SE0430095.

6.9.2 Marine mammals

Regarding marine mammals, the most important transboundary impact may occur during construction as a consequence of underwater noise from driving of mono-pile foundations. The noise distribution from pile driving will extend into the Swedish Natura 2000 sites SE0430095 Falsterbohalvön and SE0430187 Sydvästskånes utsjövatten, and there will be a partial overlap between these Natura 2000 sites and areas, where tolerance limits will be exceeded for behavioural changes and temporary hearing loss. The noise impact on marine mammals in nearby Natura 2000 sites caused by pile driving will be short-term and reversible, and it is therefore assessed that underwater noise during construction will not lead to adverse effects on either harbour porpoise, harbour seal or grey seal within nearby Natura

2000 sites. This applies provided that the specified mitigation measures are implemented as stated in the guidelines for installation of monopiles, see section 6.5. Gravity base structure foundations will not generate underwater noise, which can lead to temporary hearing loss or hearing damage in marine mammals.

6.9.3 Birds

Operation is collectively the most severe potential impact on birds on the designation for nearby Natura 2000 sites. This is due to the collision risk with wind turbines and a potential barrier effect on the birds' migratory movements. In addition, the presence of the wind farm may cause displacement of birds living in connection to the offshore project area.

It is assessed that the operation of Aflandshage Wind Farm will not cause a significant negative impact on breeding, resting, moulting or migrating bird populations on the designation of nearby Swedish bird conservation areas, and hence will not cause adverse effects on birds on the designation of relevant Swedish Natura 2000 sites. See also section **Error! Reference source not found..**

It is also assessed that Aflandshage Wind Farm will not cause adverse effects on birds on the designation of Swedish Natura 2000 sites as a result of displacement or collision risk during construction and decommissioning or as a result of barrier effects.

6.10 Annex IV species

Annex IV species in Swedish areas, which can be impacted by Aflandshage Wind Farm, include harbour porpoise and all species of bats occurring in and near the project area.

6.10.1 Harbour porpoise

Harbour porpoise is, as described, included on the designation for several of the nearby Swedish Natura 2000 sites, but is as an annex IV species also covered by a special protection outside of Natura 2000 sites. It will primarily be porpoises from the stable belt sea population that may be found in the waters in and around the project area for Aflandshage Wind Farm, but it cannot be excluded that individuals from the threatened Baltic Sea population also occur. By implementing the stated mitigation measures for reducing noise impacts from pile driving, it is assessed that underwater noise will neither give rise to short-term nor long-term consequences for the conservation status of the belt sea and Baltic sea populations of harbour porpoises. It is therefore assessed that the area's ecological function for harbour porpoise will not be impacted by the project.

6.10.2 Bats

All species of Danish and Swedish bats are annex IV species. Bats may especially be impacted during operation of the wind farm, where there is a risk for collision between migrating bats and wind turbines. The species, which could potentially be impacted by the project, are all commonly occurring and all species have a favourable conservation status. It is therefore assessed that a few deceased bats will not affect the species on a population level, and that the areas ecological function for bats will not be impacted by the project.

6.11 Nature and wildlife reserves

The project area for Aflandshage Wind Farm borders the western boundary of the waters of Falsterbohalvön. The waters of Falsterbohalvön is among others designated as a nature reserved due to the area's great importance for birds and seals. In the previous sections, the project's impact on nature conservation interests, which the reserve has been designated to protect, is described. See sections 6.5, **Error! Reference source not found.**, **Error! Reference source not found.**, 6.9 and 6.10.

6.12 Water exchange in the Baltic Sea

The assessment of the impact on the hydrographical conditions is based on the technical report on coastal morphology, sediment and water quality (NIRAS, 2021b), and uses the scenario with gravity base structures for the small turbines, since this would result in the biggest potential impact on the hydrography in the area.

Changes in wave and current conditions around Aflandshage Offshore Wind Farm is modelled as local and minimal. The impact on water exchange in the area is also assessed as being many times smaller than the natural variation (NIRAS, 2021b). Based on this, it is assessed that the naturally occurring separation and mixing of water masses in the area will not be impacted by the presence of the wind turbines.

Erosion and suspension of sediment in the water column that arise due to the wind turbine foundations, will be of very limited extent and within the natural variation. If suspended sediment in the water column occurs, it will only be very locally around the turbines. A potential release of any present sediment-bound compounds will have no impact on the water quality in the area.

Collectively, it is assessed that Aflandshage Offshore Wind Farm will not cause changes in the hydrography in the area, and that there will be no derived impact on the water quality. Thus, the impact on hydrography during operation will be *negligible*.

6.13 Water area management plans and marine strategy

The following section summarizes transboundary impacts in relation to EU's Water Framework Directive and EU's Marine Strategy Framework Directive.

6.13.1 Water area management plans

According to the Water Framework Directive, Aflandshage Offshore Wind Farm is not allowed to hinder the achievement of the goals for ecological and chemical conditions set out by EU in the nearby water areas.

The Swedish water area "Del av S Öresunds utsjövatten" borders the project area of Aflandshage Wind Farm. The goal for the water area is good chemical quality.

According to the information given in the management plans (Vattenmyndigheterna, 2016) designed for the Swedish water areas, it appears that good chemical quality has not been achieved due to the presence of brominated diphenyl ethers (PBDE) and mercury in fish.

The quality criteria for mercury and PBDE set out by the EU, are estimated by the Swedish water area authorities to be exceeded in all Swedish surface water bodies

due to atmospheric deposition. Apart from the contents of these two chemicals, the water area meets the criteria for good chemical quality as the criteria for none of the other prioritized chemicals set out by EU are exceeded.

Overall, it is assessed that neither the construction or decommissioning activities will affect the existing ecological or chemical conditions significantly and thus will not hinder the achievement of the goals for good water quality in all parameters in the water area "Del av S Öresunds utsjövatten".

6.13.2 Marine strategy

The current conditions in the Swedish marine areas can be found in the report: "God Havsmiljö 2020 Marin strategi för Nordsjön och Östersjön Del 1" (Havs- och vattenmyndigheten, 2012a). For this project, D1: Biodiversity, D2: Non-indigenous species, D4: Foodwebs, D6: Sea-floor integrity, D7: Hydrographical changes and D11: Energy incl. underwater noise have been identified as especially relevant descriptors regarding potential impacts of the project on the environmental goals of Ostersoer (Miljø- og Fødevarerministeriet, 2019).

According to the descriptions and assessments in the EIA report regarding all 11 descriptors, it has been assessed that the construction, operation and decommissioning of Aflandshage Offshore Wind Farm will not significantly impact any of the 11 descriptors, which are, as described in the EU marine strategy framework directive, used to assess the environmental conditions of a marine area. This is true for both Danish and Swedish waters. Thus, the project will not delay or hinder the achievement of the goals for good environmental conditions in the project area or in Ostersoer in general.

Potential cumulative effects during construction cannot be excluded if there is a temporal overlap of other noisy activities in the vicinity of the wind farm. In order to complete an assessment of additional cumulative effects from underwater noise and the significance for descriptor 11 and associated environmental goals, it will take further quantification, which can only be carried out when and if such noisy activities are identified.

With the exception of underwater noise during construction, it is generally assessed that any impacts from other projects in cumulation with Aflandshage Wind Farm will not delay or hinder the achievement of good environmental status in the offshore area within which the wind farm is placed and in the Baltic sea in general.

6.14 Population, people and health

There will be no transboundary impacts on health, as only visual impacts on the recreational, cultural and landscape values have been assessed to possibly affect areas on the Swedish coast. The impacts thereof are assessed in sections 6.2 and 6.3.

6.15 Maritime traffic, Air traffic and radar

No transboundary effects have been identified for air traffic and thus the impact of the project will be *negligible*.

Maritime traffic in Oresund is present in both Danish and Swedish waters. The impact of the project on maritime traffic safety is assessed as *minor* during both construction, operation and decommissioning. This is true for both Swedish and Danish waters.

Impacts on the radar facilities that monitor the maritime traffic in Oresund are possible, both in Danish and Swedish facilities, for instance at radar facilities at Falsterbo, Flintrennen, Klagshamn and Limhamn. It is assessed that there can be possible major impacts on the functionality of these radar facilities. These impacts should be documented as part of the detailed later planning of the final project and HOFOR Vind A/S and the owners of the radar facilities in question should come to an agreement, regarding the installation of the necessary mitigation measures before the wind farm is constructed. This also includes any relevant Swedish radar facilities that impacted.

6.16 Commercial fisheries

The project area for Aflandshage Offshore Wind Farm borders the international border to Sweden in Oresund, and the distance to the Swedish coast is roughly 12 km. Because of this, Aflandshage Wind Farm could impact Swedish commercial fisheries.

Danish and Swedish fishermen are responsible for the vast majority of fishing in Oresund. The Swedish ports closest to the project area for Aflandshage Wind Farm, are Skanör, Limhamn, Malmö and Lomma. The collective Swedish catch in the southern part of Oresund (ICES 39G2-Øresund) is very limited and compares to roughly a quarter of the Danish catch (6.5 tons or 342,000 Swedish Kronor yearly). The Swedish catch of eel makes up more than 90 % of the collective value of the catch. According to VMS registrations of larger vessels (vessels larger than 12 m) in the southern part of Oresund, there has been almost no fishing activity by Swedish vessel in or around the project area.

Therefore, it is assessed that Aflandshage Offshore Wind Farm will not cause transboundary impacts on the Swedish commercial fishery, neither during construction, operation or decommissioning. Thus, the impact is assessed as *negligible*.

It is assessed that the temporary disturbances and access limitations during the construction period, which will affect the limited Danish fishery in the area, will not noticeably increase the fishing activities in Swedish waters as a result of the Danish fishers moving their activities there. Thus the impact thereof is assessed as *negligible*.

7 References

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