

# Nysted Offshore Wind Farm Project Description and Environmental Assessment

Removal of remaining part of A02 foundation

Prepared 17/11 2023  
Reviewed 17/11 2023  
Accepted 21/11 2023

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# Table of Contents

<b>1.</b>	<b>Background and purpose of the document</b> .....	<b>3</b>
<b>2.</b>	<b>Introduction and purpose</b> .....	<b>4</b>
<b>3.</b>	<b>Scope of work</b> .....	<b>5</b>
3.1	Technical solution.....	5
3.2	Equipment and method.....	6
<b>4.</b>	<b>Health &amp; Safety</b> .....	<b>7</b>
<b>5.</b>	<b>Environment &amp; Biodiversity</b> .....	<b>7</b>
5.1	Potential Environmental impacts.....	7
5.1.1	Underwater noise.....	7
5.1.2	Airborne noise.....	8
5.1.3	Suspension of concrete particles/debris.....	8
5.1.4	Disturbance of seabed.....	8
5.2	Environmental Impact Assessment.....	9
5.2.1	Benthic flora and fauna.....	9
5.2.2	Marine mammals.....	10
5.2.3	Fish and fish populations.....	10
5.2.4	Birds.....	11
5.3	Natura 200 and Annex IV species.....	11
5.4	Environmental assessment in relation to the Water Framework Directive (WFD).....	14
5.5	Environmental assessment in relation to the EU Marine Strategy Framework Directive (MSFD).....	16
5.6	Cumulative effects.....	19
5.7	Mitigation measures.....	19
5.8	Conclusion.....	19
<b>6.</b>	<b>References</b> .....	<b>20</b>
	<b>Appendix A</b> .....	<b>21</b>

## 1. Background and purpose of the document

In 2022 in Nysted Offshore Wind Farm (NHP) turbine A02 collapsed, and the Danish Energy Agency has 11<sup>th</sup> May 2022 approved the decommissioning of the collapsed turbine. It was stated that the removal of the construction would not require an EIA assessment. The approval expired 11<sup>th</sup> May 2023.

The turbine and a large part of the gravitation foundation was removed summer of 2022. A full removal of all components of the foundation was not possible at that time with the available equipment for heavy lifting, and therefore the base plate and the ballast chamber and approximately 1.5 meters of the shaft was not retrieved.

It has been evaluated that the optimal solution is to remove the shaft due to navigational and safety reasons. The remaining part of the shaft has been marked with a marker buoy which will be deployed until the planned work is completed.

This document constitutes a description of the planned work to remove the remaining shaft and an environmental assessment of the planned work, and hereby an application to remove the remaining part of shaft and leave the bottom plate and ballast chambers of the foundation A02 in place.

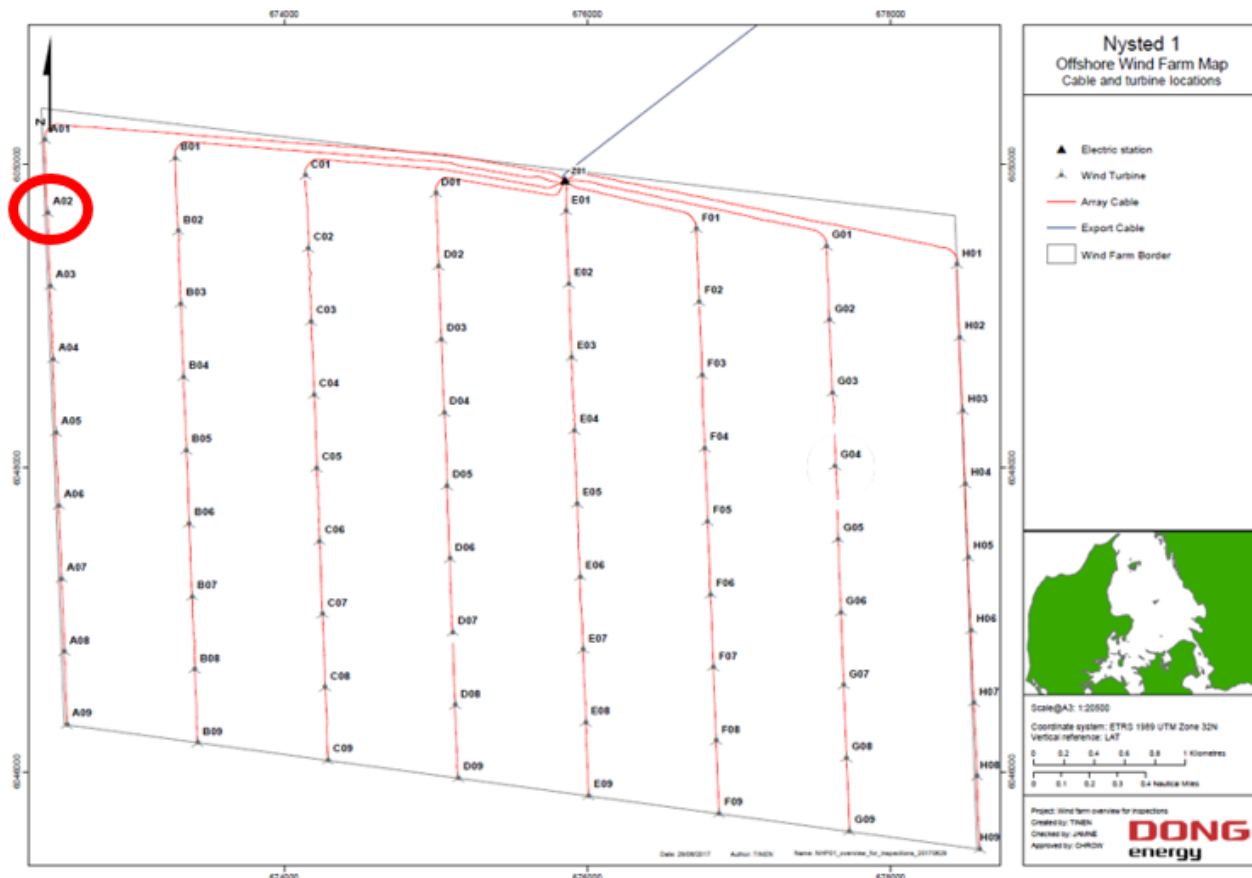
### **Attachment:**

Note: Response to consultation responses from the Danish Environmental Protection Agency's 'Hav- og Vandmiljø' regarding permit for partial decommissioning of foundation A02 in Nysted Offshore Wind Farm.

## 2. Introduction and purpose

NHP south of Lolland near Rødsand was built in 2003. The offshore wind farm has a total of 72 wind turbine generators (WTGs) with a total capacity of 166 MW. On January 12<sup>th</sup> 2022 the wind farm experienced a collapse of the wind turbine generator (WTG) and foundation A02.

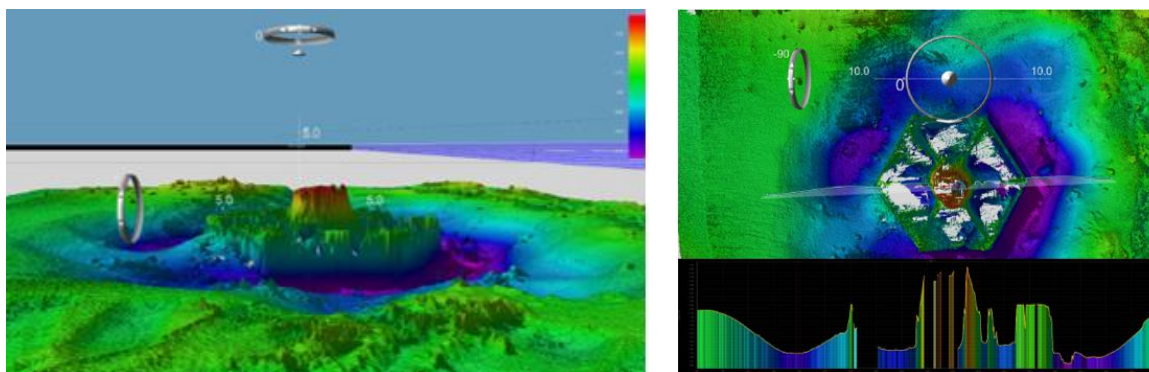
In NHP foundation A02 is situated in the northwestern part of the wind farm site, see Figure 1 below.



**Figure 1 Nysted Offshore Wind Farm. Foundation A02 is situated in the north-western part of the windfarm site.**

Developers are obliged to remove all structures from the seabed when offshore wind farms are decommissioned as the area may already have been appointed for another purpose.

As mentioned, a full removal of all components of foundation A02 was not possible during the 2022 offshore campaign, and thereby the lower part of the foundation i.e., the ballast chamber and approximately 1.5 meters of the shaft remain on the seabed, see **Figure 2**



**Figure 2 Foundation scan 2022**

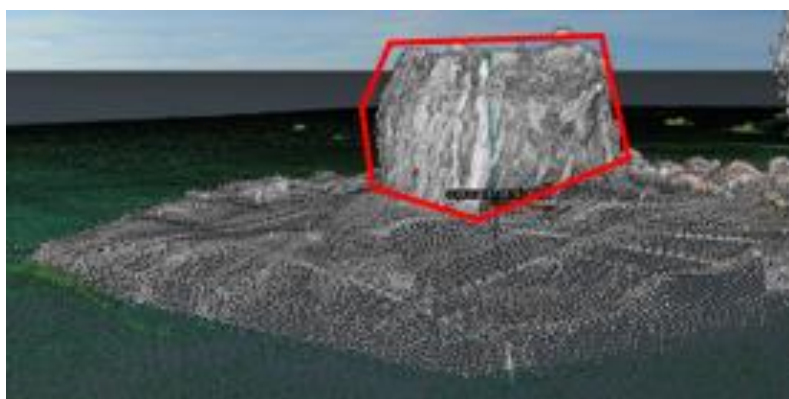
This document is an addition to “Decommissioning plan for Wind Turbine A02 in Nysted Offshore Wind Farm” (doc no 07673566\_A) which describes how the collapsed A02 WTG and foundation was planned to be removed.

### 3. Scope of work

#### 3.1 Technical solution

The planned scope of work will include removal of the concrete shaft while leaving the bottom plate and ballast chambers in the seabed. The remaining of the shaft is removed due to safety of navigation.

As the concrete shaft is removed all rebar from the shaft is cut off, and debris is removed. The concrete shaft will be cut into transportable pieces and 7.5 m<sup>3</sup> (18 tons) of concrete will be removed, i.e., the part indicated with red in below figure. See Figure 3.



**Figure 3 Concrete shaft removal**

The bottom plate (not to be removed) covers an area of 208 m<sup>2</sup>.  
 The total work area (for barge to be anchored and safety zone) is estimated to be 15.000 m<sup>2</sup>.  
 The water depth at foundation A02 is approx. 6,5 meters.

The work is planned to be completed between November 2023-April 2024 with an expected duration of 7-14 days. Timing will be weather dependent.

The water depth after removal of the shaft will be a similar level as the surrounding seabed, but the remaining foundation may in places protrude up to 1 meter above the seabed.

### 3.2 Equipment and method

The concrete removal will be conducted with a crusher jaw (*hydraulisk betonsaks*) mounted on an excavator. The excavator will be standing securely fastened on a flat top barge which is moored in anchors. During the operation the barge might shift position around A02. The machine is multifunctional, and different tools will be fitted in relation to the tasks, the crusher jaws will enable demolition of both concrete and rebar, for removal of the debris the excavator will be fitted with Hema / Rossi poly grabs or classic bucket.

Personnel will transfer to the work site in smaller separate vessels.

Debris will fall into ballast chambers and removed to the extent possible with the grab. The debris will be transported to shore and disposed of in compliance with national and local guidelines.

Crusher jaws can be operated in a systematic pattern and only require local visibility. See Figure 4.



**Figure 4 Crusher jaws**

A crusher jaws will produce minor noise and debris during operations. Regarding this, see attached note “Response to consultation responses from the Danish Environmental Protection Agency’s ‘Hav- og Vandmiljø’ regarding permit for partial decommissioning of foundation A02 in Nysted Offshore Wind Farm”, which contains an assessment of concrete particles/debris and potentially harmful substances.

After completion a multi beam survey will be performed to document that debris has been removed, as agreed with the Danish Maritime Authority.

## 4. Health & Safety

During all phases of a project health and safety is important to take into consideration. For a full Risk Assessment, see Appendix A.

## 5. Environment & Biodiversity

The potential environmental impacts depend on the decision of leaving the remaining foundation of A02 until the actual decommissioning of Nysted Offshore Windfarm or removing all concrete of the foundation as stated in the permission to “Decommissioning plan for Wind Turbine A02 in Nysted Offshore Wind farm”.

Below the most significant environmental impacts are described. The sources of impact will be:

- General activity (above and under water)
- Physical structures (remaining foundation)

The environmental impacts that these activities may cause are:

- Underwater noise
- Airborne noise
- Suspension of Concrete particles/debris

In addition, potential impacts on protected areas, cumulative impacts and mitigations measures are considered.

### 5.1 Potential Environmental impacts

In the below section the potential environmental impacts from the different activities are discussed.

#### 5.1.1 Underwater noise

Underwater noise by vessels and removal of the concrete shaft will increase the noise levels in the water for a limited period. Noise emission from the planned work:

- In air: the engine of the excavator placed on a barge.
- In water: crusher jaw breaking up the concrete into transportable sizes.

The noise from the crusher jaw **in air** as described in INS, 2023, Faster demolition of concrete buildings with less dust and noise: “*The process noise from crushing is not higher than the carrier engine noise. The crusher jaws are causing a noise level less than 70 dBA.*”

It should be noted that it's not possible to translate noise in air to noise in water, but based on the information stated in INS 2023, it's evaluated that the noise from the crusher jaw is comparable to underwater noise produced by vessels. Vessel noise includes propeller and thruster cavitation and a smaller fraction of noise produced by sound transmitted through the hull, including engines, gearing and other mechanical system noises.

A guideline for underwater noise from installation of impact or vibration driven piles is published by the Danish Energy Agency, but there are no available thresholds or guidelines related to construction noise

under water. Further, as no impulsive noises will be produced, assessment of hearing loss (TTS and PTS) is not relevant.

In the case of this work behavioral responses is relevant: Marine mammals will leave the area before the work commence due to vessel activity in the area and will return to the area after stop of the activities (ref. HR1 and Nysted Offshore Wind Farm environmental monitoring and more). Thus, the impact (habitat loss) will be local and temporary.

It's stated in report from DCE, 2021 Thresholds for behavioral responses to noise in marine mammals: *"...a generalized threshold for behavioral response (fleeing) to noise at around 95 dB re 1μPa, VHF-weighted. T."*

*"In this calculation it is assumed that each pile driving will cause a disturbance lasting  $d_{piling}$  and that there will be a smaller disturbed area around the construction vessel for the rest of the time, characterized by the impact range  $r_{general}$ . For clarity, the temporary loss caused by pile driving and general disturbance, respectively, are calculated separately: ... (formula)..."*

*It is evident that in this particular case, the temporary habitat loss caused by the general presence of the construction vessel is insignificant compared to the loss caused by the pile driving and can be ignored in the combined assessment".*

It's concluded that the effects on harbour porpoises from underwater noise will be non/negligible.

### 5.1.2 Airborne noise

Airborne noise by vessels will increase the noise levels above water for a limited period. Noise levels will be temporary and will not significantly affect people on the coastline. Moreover, airborne noise will mainly be noticeable in the immediate vicinity of site of work. Cutting will not produce airborne noise. It is expected that the overall significance of noise is none/low.

### 5.1.3 Suspension of concrete particles/debris

The removal of the concrete shaft will temporarily cause suspension of concrete particles/debris in the water column.

The contractor estimates that less than 0.5 kg pr. m<sup>3</sup> of concrete will not be removed by the grab. This equals 3.75 kg (approx. 20%) concrete particles in total not removed.

At the decommissioning of the foundations at Vindeby Offshore Wind Farm a waste of 3% concrete debris were estimated. Here same method using crusher jaws with removal of debris was used. At Vindeby Offshore Wind Farm a total of 6.000 tons (2.500 m<sup>2</sup>) of material was removed during decommissioning.

See attached note about potentially harmful substances covering this topic in detail.

If the remaining part of foundation A02 is left as it is today no suspension of concrete particles/debris is expected.

### 5.1.4 Disturbance of seabed

There will be no need to dig into the seabed, remove or move sediment in the seabed in connection with the work. The work is carried out only on the foundation's shaft and over the bottom plate. Concrete pieces are removed directly from the shaft and/or collected with the grab from the base plate.



Thus, the removal of the concrete shaft will not disturb or change the existing degree of disturbance in the area as such.

## 5.2 Environmental Impact Assessment

The general prerequisite is that the evaluation is performed considering the environmental impacts until end of lifetime for NHP.

### 5.2.1 Benthic flora and fauna

The benthic ecosystem plays a significant role in the functioning of the marine ecosystem, and both live on hard and soft bottoms. The community is mainly determined by the seafloor structure, depth, and salinity, as well as the openness of the shoreline.

Benthic fauna on soft bottom types is diverse, and many different species, such as clams, snails, crustaceans, oligo- and polychaete worms, as well as priapulid worms inhabit the sediments of the soft seafloor. Benthic fauna can be found living on hard bottom types, such as rock, boulders and stones. Moreover, turbine foundations and scour protection layers have shown to introduce new substrates into the marine environment, which are typically colonized by a host of species including bivalves, anemones, and barnacles. Over time, the area around the turbine foundations can be inhabited by higher trophic level species such as crabs, lobsters, and fish, which are drawn to these areas by increased availability of food, and by the additional habitat/shelter. This attraction of marine life to artificial underwater structures is referred to as the 'reef effect'. These findings are supported by monitoring programs conducted from 2000-2006 in the Danish offshore wind farms Horns Rev 1 and NHP where the wind turbine foundations have introduced changes to the benthic communities from typical infauna communities to hard bottom communities. Thereby, increasing habitat heterogeneity as well as the abundance and biomass of benthic communities within the windfarms.

Introduction of hard substrate in the NHP area in the form of scour protection around turbines and cables has only resulted in a minor increase of benthic flora and fauna, based on the available ROV data from the latest marine survey also conducted in 2023.

The removal of the concrete shaft will reduce a minor amount of hard substrate available but will not otherwise change the current seabed conditions. A temporary suspension of concrete particles/debris from the removal of the concrete shaft is to be expected, but this is expected to be of a minor extent and limited to the work area over the foundations bottom plate. See previous chapter and attached note about potentially harmful substances.

There are no expected significant effects on benthic flora and fauna from the planned work. For an assessment of the potential impact on water quality in relation to The Water Framework Directive (WFD) see Section 5.4.

## 5.2.2 Marine mammals

Marine mammal species in the waters around Nysted are harbour porpoise, grey seal and harbour seal. Both seal species and harbour porpoise are protected under the Habitat Directive for Natura 2000 site (N173). See Section 5.3. Harbour porpoise is also protected through the EU Habitats Directive as an Annex IV species, which means that the porpoise is to be protected in all its distribution.

Underwater noise can interfere with key life functions of marine mammals (e.g., foraging, mating, nursing, resting, migrating) by impairing hearing sensitivity, masking acoustic signals, eliciting behavioural responses, or causing physiological stress.

Underwater noise by vessels and removal of the concrete shaft is expected only to cause local and temporary disturbance effects (scaring effects) since it is likely that marine mammals will move away from the area of the works and thus the works are considered to pose minimal threat to marine mammals.

The effects are considered time-limited events and predicted to be short-term and reversible, with marine mammal activity returning to baseline levels after the vessel has passed and removal of the foundation has ceased. Moreover, underwater noise is expected to be at levels that do not adversely affect the marine environment or cause impairments (damages) to marine mammals.

If foundation A02 is left in its current state only minor underwater noise is expected in relation to operational activities which will be equivalent to the current activities within the offshore windfarm.

## 5.2.3 Fish and fish populations

Fish and fish populations are attracted by presence of offshore windfarms and therefore function as artificial reefs (Degraer et al., 2020) potentially resulting in both benefits and adverse consequences for populations and ecosystems.

As for the Danish offshore wind farms Horns Rev 1 and NHP, which were commissioned in 2002 and 2003, a monitoring programme considering impact on fish and fish populations was carried out in 2000-2006 (The Environmental Group, 2006). During the monitoring (2000-2006) a very small impact on the fish fauna was registered. Moreover, monitoring showed that some species were attracted, while other species demonstrated avoidance behaviour around electromagnetic fields from cables. However, during a follow-up monitoring program (The Environmental Group, 2013) carried out in 2009/2010 on Horns Rev on fish communities, investigations showed fish species were attracted towards the wind turbine foundations resulting in a higher number of species inside the windfarm site compared to the adjacent areas outside the windfarm. Overall monitoring showed that offshore wind farms did not have any negative impact on fish abundance, and several species appears to use the foundations and associated scour protection as refuge areas for hide and forage. The positive effect may be enhanced by exclusion of commercial fishing inside the wind farm area and thus function as a small marine protected area.

The removal of the concrete shaft may lead to temporary disturbance effects (scaring effects) of fish in the area causing fish to leave the area during operations, but it is expected that they will quickly return when the work has ceased. Impairments (damages) caused by construction noise are not to be expected.

If foundation A02 is left in its current state impact on fish and fish populations are expected to be equivalent to the current impact within the offshore windfarm.

#### 5.2.4 Birds

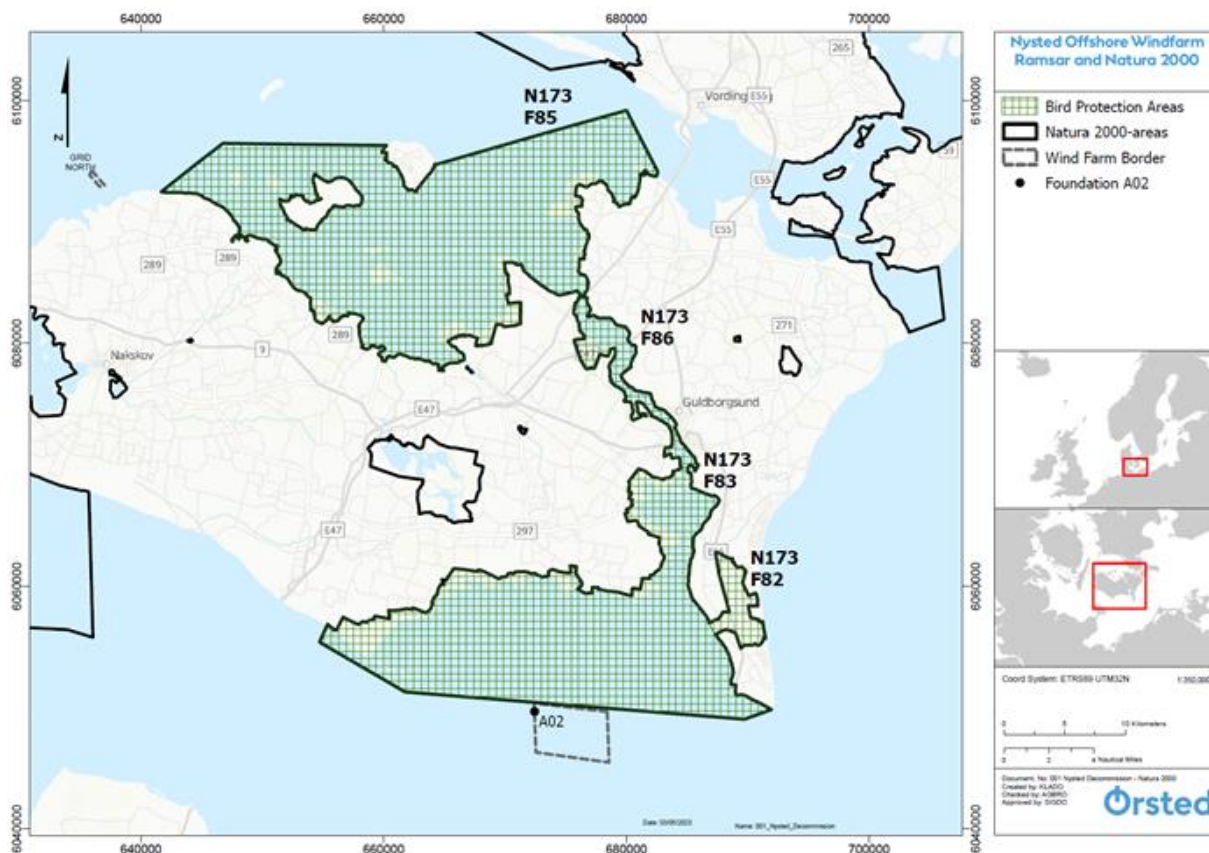
Bird species respond differently to offshore windfarms with behavioral reactions ranging from behavioral responses to physical damage.

The removal of the concrete shaft may lead to temporary disturbance effects (scaring effects) to resting birds in the area. However, any disturbance is expected to be short-term and limited to the area of removal of the foundation. The planned work may cause birds to temporarily leave the area, but it is expected that they will quickly return when the work has ceased. Impairments (damages) caused by construction noise are not to be expected. There is no expected direct loss of habitat due to the limited period of disturbance, and any impact on potential feeding grounds for birds is assessed not to be significant. If foundation A02 is left in its current state impact on bird species is expected to be equivalent to the current impact within the offshore windfarm.

### 5.3 Natura 200 and Annex IV species

Natura 2000 is a network of protected areas covering Europe's most valuable and threatened species and habitats. There is one Natura 2000 site in the vicinity of NHP. The Natura 2000 site N173 "*Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor og Hyllekrog-Rødsand*" consists of habitat protection area H152 and bird protection area F82, F83, F85 and F86. Natura 2000 site is also designated as a Ramsar site R25 (Miljøstyrelsen, 2021). The distance from the site of operation within NHP to the nearest NATURA 2000 site (Habitat Protection, Bird Protection and Ramsar area) is listed in Table 2.

Other marine Natura 200 sites are situated more than 40 km from NHP and the site of operation and is due to scope of work not considered relevant.



**Figure 5 Natura 2000 site N173 “Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor og Hyllekrog-Rødsand” (Miljøstyrelsen, 2021).**

**Table 1: Marine Natura 2000 sites in the vicinity of NHP**

Natura 2000	Protection	Location	Site	Name	Distance to foundation A02
<b>N173</b>	H152	SAC152	DK006X238	Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor, Hyllekrog-Rødsand	< 1 km
<b>N173</b>	F82	SPA82	DK006X082	Bøtø Nor	16 km
<b>N173</b>	F83	SPA83	DK006X083	Kyststrækningen v. Hyllekrog-Rødsand	< 1 km
<b>N173</b>	F85	SPA85	DK006X085	Smålandshavet nord for Lolland	29 km
<b>N173</b>	F86	SPA86	DK006X086	Guldborgsund	23 km
	R25	-	RAMSAR25	Farvandet mellem Lolland og Falster med Rødsand, Guldborg Sund og Bøtø Nor	< 1 km

The Natura 2000 site N173 “Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor og Hyllekrog-Rødsand” covers both terrestrial and marine species. The marine protected species consists of both species, nature types and birds.

**Table 2: Marine protected nature types and species (Miljøstyrelsen, 2021)**

Marine nature types and species protection within H152 Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor, Hyllekrog-Rødsand		
<b>Marine nature types</b>	Sandbanke (1110)	Sandbanks
	Vadeflade (1140)	Mudflats and sand flats
	Lagune (1150)	Coastal lagoons
	Bugt (1160)	Large shallow inlets and bays
	Rev (1170)	Reefs
<b>Species</b>		
	Gråsæl (1364)	Grey seal
	Marsvin (1351)	Harbour porpoise
	Spættet sæl (1166)	Common seal

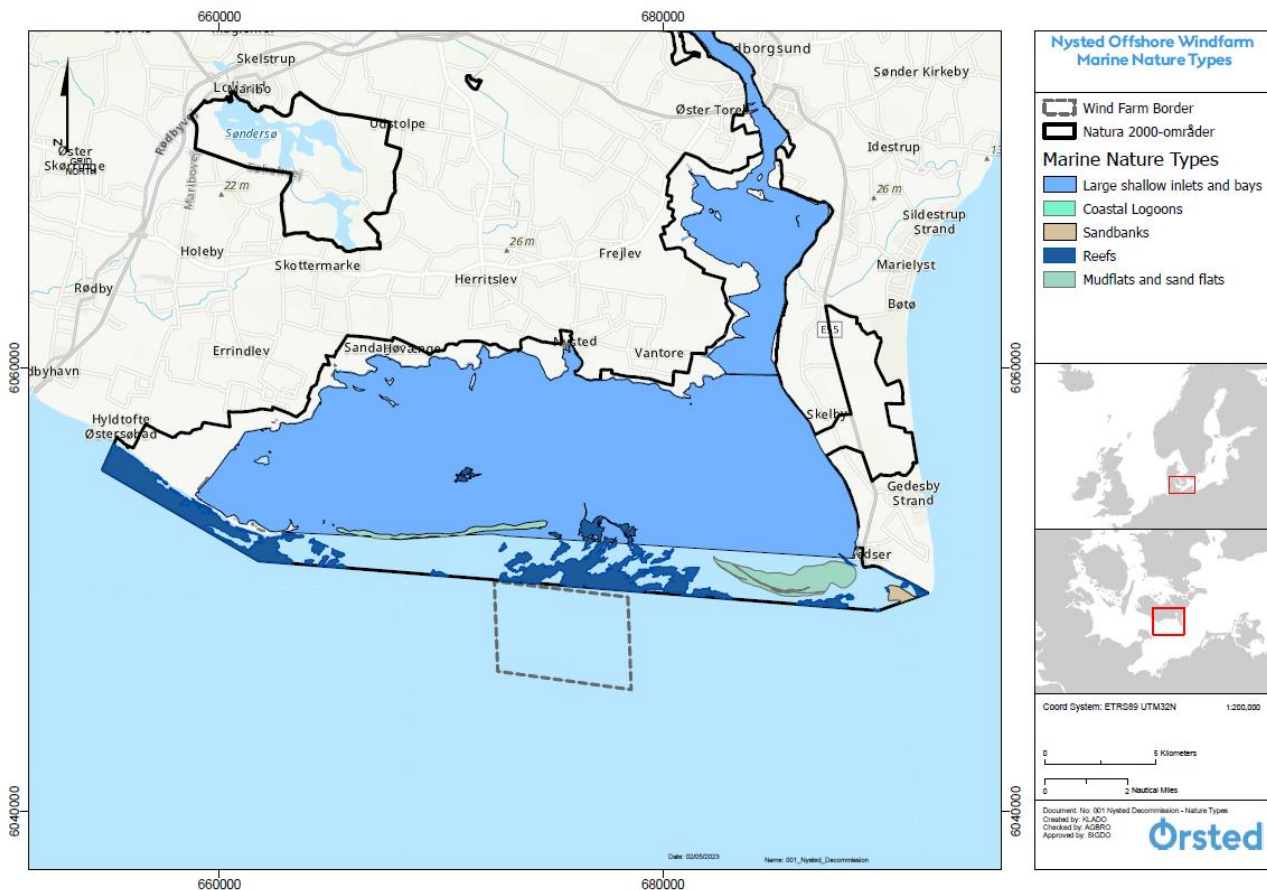
**Table 3: Protected bird species (Miljøstyrelsen, 2021)**

Bird species protected within F83 Kyststrækningen v. Hyllekrog-Rødsand		
<b>Birds</b>		
	Skarv (T)	Common murre
	Knopsvane (T)	Mute swan
	Sædgås (T)	Bean Goose
	Mørknuget knortegås (T)	Brant Goose (Branta bernicla hrota)
	Lille skallesluger (T)	Smew
	Stor Skallesluger (T)	Goosander
	Plettet rørvagtel (Y)	Spotted Crake
	Klyde (Y)	Avocet
	Splitterne (Y)	Sandwich Tern
	Havterne (Y)	Arctic Tern
	Rødrygget tornskade (Y)	Red-backed shrike
	Rørdrum (Y)	Eurasian bittern
	Sangsvane (T)	Whooper swan
	Bramgås (T)	Barnacle Goose
	Hvinand (T)	Common goldeneye
	Havørn (TY)	White-tailed eagle
	Rørhøg (Y)	Marsh harrier
	Blishøne (T)	Eurasian coot
	Dværgterne (Y)	Dwarf Tern
	Fjordterne (Y)	Common Tern
	Mosehornslugle (Y)	Short-eared owl

For migratory birds, the following birds are not present in national or international significant occurrence: Cormorant (T) and Eurasian coot (T) in bird protection area F83.

The planned scope of work will not impact any protected nature types since no work will be carried out within the nearby Natura 2000 site and that the possible sedimentation of concrete particles/debris and underwater

noise in connection with removal of concrete is assessed to not constitute any risk for impacting the marine nature types. Therefore, potential impacts on nature types will not be assessed any further.



**Figure 6 Natura 2000 site N173 “Smålandsfarvandet nord for Lolland, Guldborg Sund, Bøtø Nor og Hyllekrog-Rødsand” with marine nature types and NHP**

The planned scope of work is assessed to potentially cause a temporary impact of birds and marine mammals due to temporary displacement of individuals that might be in the immediate area during the time of the work.

In the case that the remaining concrete of foundation A02 is left until the end of lifetime for NHP no temporary displacement of individuals is expected other than which will be equivalent to the current activities within the offshore windfarm.

#### 5.4 Environmental assessment in relation to the Water Framework Directive (WFD)

The Water Framework Directive (WFD) is a European environmental legislation that aims at maintaining and improving the aquatic environment in the Community. The directive states that all waters of EU Member States (watercourses, lakes, the coastal part of the sea and the groundwater) must be in “good status” by 2027 at the latest.

The directive requires all Member States to protect and improve water quality in all waters so that good status is achieved. Good status is defined by achieving both good chemical and good ecological status.

To achieve good status, EU member states must use water management plans to protect, and where necessary, to restore water bodies. The newest water management plans in Denmark were adopted on the 15<sup>th</sup> of June 2023 for the third planning period (2021-2027).

NHP is located partly within the coastal waters of DKCOAST208 “Femerbælt” and partly within the territorial water of DKCOAST210 “Femerbælt, 12NM” both of which are targeted in the current water management plans. The targets and the current status of the two water bodies can be seen in Table 4.

**Table 4 Targets and current status of DKCOAST208 and DKCOAST210 in the current water management plans (Miljøministeriet, 2023)**

Name	Femerbælt, coastal water	Femerbælt, 12NM, territorial water
ID	DKCOAST208	DKCOAST210
Target ecological status	Good ecological status	N/A
Target chemical status	Good chemical status	Good chemical status
Current ecological status	Moderate ecological status	N/A
Current chemical status	Not good chemical status	Unknown chemical status

The specific parameters and quality elements that define good ecological and good chemical status are defined in the executive order no. 833 of 27<sup>th</sup> of June 2016 on the establishment of environmental targets for watercourses, lakes, coastal waters, transition waters and groundwater<sup>1</sup>.

Removal of the concrete shaft is expected to cause a temporary and time-limited suspension of concrete particles/debris. Please see attached note on potentially harmful substances. It is assessed that a possible release of potentially harmful substances from the removal of the concrete shaft at foundation A02 in Nysted offshore wind farm will not result in exceeding either environmental quality requirements in surface water or biota.

Further, contractors and vessels are obligated to minimise the risk of contamination (e.g., oil spills) during the planned work and thus, it’s not expected that any pollutants or nutrients are emitted, nor will the planned work permanently impact any of the biological quality elements defined for good ecological status.

<sup>1</sup> In Danish: Bekendtgørelse nr. 833 af 27/06/2016 om fastsættelse af miljømål for vandløb, søer, kystvande, overgangsvande og grundvand

## 5.5 Environmental assessment in relation to the EU Marine Strategy Framework Directive (MSFD)

The EU Marine Strategy Framework Directive (MSFD) is a European environmental legislation put in place to protect the marine ecosystem and biodiversity within EU marine waters. The main goal of the MSFD is to achieve Good Environmental Status (GES) of EU marine waters. To help Member States interpret what GES means in practice, the Directive sets out, in Annex I, eleven qualitative descriptors which describe what the environment will look like when GES has been achieved.

In the below (Table 5) the potential environmental impact on the eleven qualitative descriptors (D1-11) is assessed in ensuring that Good Environmental Status can be achieved in the given area. Regarding potentially harmful substances please see note attached.

The general prerequisite is that the evaluation is performed considering the consequences until end of lifetime for the NHP.

**Table 5 Assessment of the potential environmental impact on the eleven qualitative descriptors (D1-11) in the Marine Directive**

Qualitative Descriptors (D1-D11)		Assessment of impact on the descriptors as defined in the Water Framework Directive (WFD)
<b>Descriptor 1 - Biodiversity is maintained</b>	Biodiversity has been maintained. The quality and availability of habitats, as well as the distribution and abundance of species, correspond to the prevailing physiographic, geographical and climatic conditions.	<p>The planned work may affect marine biodiversity since hard-bottom fauna may be removed when the concrete shaft is removed. However, any established hard-bottom fauna on the remaining part of the bottom plate and ballast chambers can be maintained with the possibility of further establishment of hard-bottom fauna.</p> <p>The planned work may therefore result in a physical change in the aquatic environment. However, the impact is very local and biodiversity in the area is assessed to be maintained. Thus, it is assessed that the environmental status of the area in relation to D1 can be maintained overall regardless of technical solution.</p>
<b>Descriptor 2 - Non-indigenous species do not adversely alter the ecosystem</b>	Non-native species introduced by human activities are at levels that do not adversely alter ecosystems.	The planned work is not considered to entail a risk of introducing non-native species because vessels that may be used in connection with the planned work, regardless of scope, in other contexts operate regionally in Denmark or neighboring countries. In addition, all national and international guidelines will be adhered to during any planned operations. Thus, it is assessed that the environmental status of the area in relation to D2 can be maintained overall regardless of technical solution.
<b>Descriptor 3 - The population of commercial fish species is healthy</b>	The populations of all commercially exploited fish and shellfish species are within safe biological limits and show an	The planned work is not considered to entail a risk of affecting commercially exploited fish and/or shellfish species since any work will only constitute a very temporary and local impact within the existing offshore wind area and thus, is limited in both time and space. The bottom plate and ballast chambers will stay for the rest of the lifetime of NHP, and the remaining hard-bottom



	age and size distribution indicative of a healthy population.	substrate here will continue to function as a refuge for fish and shellfish. It is not considered that removal of the shaft will cause any changes either at a population level or age or size distribution. Thus, it is assessed that the environmental status of the area in relation to D3 can be maintained overall regardless of technical solution.
<b>Descriptor 4 - Elements of food webs ensure long-term abundance and reproduction</b>	All elements of the marine food web – to the extent known – are present and occur at normal density and diversity and at levels capable of maintaining the full reproductive capacity of the species and a stable species density.	The planned work is not considered to cause any impact on the marine food web since the work will only constitute a local impact within the existing offshore wind area, and the planned work is very limited in scope both in time and space. The hard substrate on the remaining part of the foundation – bottom plate and ballast chambers - will potentially continue to contribute positively to the area's species diversity. Thus, it is assessed that any work will not affect the environmental status of the area in relation to D4.
<b>Descriptor 5 - Eutrophication is minimised</b>	Anthropogenic eutrophication is minimized, in particular its negative effects, such as biodiversity loss, ecosystem degradation, harmful algae deposits and lack of oxygen on the water floor.	The planned work is not considered to increase level of nutrients that could contribute to eutrophication since no excavation work will be carried out that can release nutrients from the sediment, in particular nitrate and phosphate, which can contribute to the growth of phytoplankton and thus contribute negatively and create imbalance in marine ecosystems. Thus, it is assessed that any work will not affect the environmental status of the area in relation to D5.
<b>Descriptor 6 - The sea floor integrity ensures functioning of the ecosystem</b>	The integrity of the seabed is at a level that ensures that the structure and functions of ecosystems are preserved and that benthic ecosystems in particular are not adversely affected.	The planned work will not affect the integrity of the seabed since only the concrete shaft will be removed, leaving the bottom plate and the ballast chamber. Any impact will be very limited and local in both space/area, and the structure and functions of the ecosystem will be preserved in its current state. The benthic ecosystem will thus not be affected more than the current status. Thus, it is assessed that the planned work will not affect the environmental status of the area in relation to D6.
<b>Descriptor 7 - Permanent alteration of hydrographical conditions does not adversely affect the ecosystem</b>	Permanent alteration of hydrographic characteristics does not adversely affect marine ecosystems.	The planned work is not considered likely to lead to permanent changes in the hydrographic characteristics of the area since the planned work is located within an existing offshore wind farm. Moreover, removal of the concrete shaft is assessed to cause a very limited and local impact in both time and space/area, and thereby not adversely affect the marine ecosystem or impact the hydrographic characteristics. Thus, it is assessed that the planned work will not affect the environmental status of the area in relation to D7

<b>Descriptor 8 - Concentrations of contaminants give no effects</b>	Concentrations of pollutants are at levels that do not give rise to pollutant effects.	Please see note re. potentially harmful substances. It is assessed that removal of the concrete shaft will not affect the environmental status in relation to D8.
<b>Descriptor 9 - Contaminants in seafood are below safe levels</b>	Contaminants in fish and shellfish intended for human consumption do not exceed the levels laid down in Community legislation or other relevant standards.	The planned work is not considered likely to lead to changes in the levels of contaminants in fish and shellfish intended for human consumption since the contractor is subject to strict requirements for the handling of spills and accidents. Furthermore, see note re. potentially harmful substances. It is assessed that any work will not affect the environmental status in relation to D9.
<b>Descriptor 10 - Marine litter does not cause harm</b>	The properties and quantities of marine litter do not harm the coastal and marine environment.	The planned work is not considered likely to result in an increased amount of marine waste since the contractors and vessels will be required to bring all waste ashore and ensure disposal in accordance with the current rules and regulations. Moreover, vessels and contractors are supervised during any marine operation. Thus, it is assessed that any work will not affect the environmental status in relation to D10.
<b>Descriptor 11 - Introduction of energy (including underwater noise) does not adversely affect the ecosystem</b>	The introduction of energy, including underwater noise, is at a level that does not adversely affect the marine environment.	The planned work is not considered to cause underwater noise at a level that could adversely affect the marine environment since the cutting of the concrete will not reach noise levels that are considered to pose a threat to marine mammals or other marine organisms. Removal of the concrete shaft will only impose a very local and temporary increase compared to operational noise levels. See Section 5.2.2.2. Thus, it is assessed that the planned work will not affect the environmental status in relation to D11.

1/ Bekendtgørelse af lov om havstrategi. LBK nr. 1161 af 25/11/2019

2/ EU's Havstrategidirektiv, Direktiv 2008/56/EF af 17. juni 2008 om fastlæggelse af en ramme for Fællesskabets havmiljøpolitiske foranstaltninger (havstrategirammedirektivet)

## 5.6 Cumulative effects

Cumulative effects can be defined as changes to the environment caused by the combined impact of past, present, and future human activities and natural processes. Cumulative effects to the environment are the result of multiple activities whose individual direct impacts may be relatively minor but in combination with others result are significant environmental effects.

The planned work is conducted within an existing offshore wind farm and no other activities are known at the given time of work. Moreover, leaving the bottom plate and ballast chamber for the remaining lifetime of the offshore wind farm is not assessed to cause any cumulative effects since the site is still an active wind farm area with foundations constituting hard substrate for benthic organisms.

## 5.7 Mitigation measures

Mitigation measures will consist of readiness measures in case of e.g., oil spills. No mitigations in relation to adverse negative effects on species or habitats is considered needed, and no mitigation measures are being implemented to avoid impact from concrete particles/debris on the nearby Natura 2000 site, and/or significant noise impact on porpoises due to scope and duration of planned works.

After completion a multi beam survey will be conducted to document that debris has been removed as agreed with the Danish Maritime Authority.

## 5.8 Conclusion

It is evaluated that removal of the concrete at foundation A02 in Nysted Offshore Wind Farm will have non/minor and only temporary impact on flora and fauna, and any impact is expected to be reversible.

Potentially environmental effects from the planned work are considered overall temporary and insignificant. This includes the effects due to underwater noise, airborne noise, concrete particles released and not retrieved during the planned work.

Natura 2000 and annex IV species are habitats are not considered to be affected and it is assessed that a possible release of potentially harmful substances removal from the concrete will not result in exceeding either environmental quality requirements in surface water or biota.

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## Appendix A

		HAZARD IDENTIFICATION												
ID	Main Component	Damping Track Description	Specific hazard and effect	What is at Risk				Risk evaluation no control				Control Measures / Safeguards	Risk evaluation with control	
				People	Environment	Asset	Reputation	Consequence	Frequency	Consequence	Frequency			
1	Option 1: Leave the foundations as is today	Maintain traffic rail part of the foundation	Damage to assets and risk of people suffering injuries	YES	NO	NO	YES	C3	F2	M	1) Safety warning buoy 2) Add warning on electrical sign map 3) Use of barrier to prevent debris to get caught	C3	F1	L
2	Option 1: Leave the foundations as is today	Debris and old rail are getting caught in the remaining track	Minor nuisance and risk of people getting caught	NO	YES	NO	YES	C3	F2	M	1) Use ROW for the track	C3	F1	L
3	Option 1: Leave the foundations as is today	Debris getting hung during removal the debris	Injury to driver during lifting operation	YES	NO	NO	NO	C4	F2	M		C2	F1	L
4				N/A	N/A	N/A	N/A			0				0
6	Option 2: Remove concrete shaft	Workers getting hurt during removal of concrete shaft	People injured because of flying debris when concrete shaft is lifted	YES	NO	NO	NO	C3	F3	M	1) Fence in exclusion zone around the working area 2) If work is artificial planned and exceeded the risk of people getting injured is fairly low	C3	F1	L
7	Option 2: Remove concrete shaft	Environmental impact	Debris floating away during the grinding of the concrete shaft	NO	YES	NO	NO	C1	F2	L	1) If work is artificial planned, risk assessed and exceeded the environmental impact is deemed low	C1	F1	L
8										0				0
10	Option 3: Remove concrete shaft and ballast chamber walls	Workers getting hurt during removal of concrete shaft and ballast chamber walls	People injured because of flying debris when grinding down the ballast chamber walls	YES	NO	NO	NO	C3	F3	M	1) Fence in exclusion zone around the working area 2) If work is artificial planned and exceeded the risk of people getting injured is a bit higher than option 2	C3	F2	L
11	Option 3: Remove concrete shaft and ballast chamber walls	Environmental impact	Debris floating away during the grinding of the concrete shaft and ballast chamber walls	NO	YES	NO	NO	C2	F2	L	1) If work is artificial planned, risk assessed and exceeded the risk environmental impact is a bit higher than option 2	C2	F1	L
12										0				0
15	Option 4: Remove concrete shaft and ballast chamber walls	Workers getting hurt during removal of concrete shaft and ballast chamber walls	People injured because of flying debris when grinding down the ballast chamber walls	YES	NO	NO	NO	C3	F4	M	1) Fence in exclusion zone around the working area 2) If work is artificial planned and exceeded the risk of people getting injured is a bit higher than option 3	C3	F3	M
16	Option 4: Remove concrete shaft and ballast chamber walls	Environmental impact	Debris floating away during the grinding of all concrete including ballast chamber walls	YES	YES	NO	NO	C2	F4	M	1) If work is artificial planned, risk assessed and exceeded the risk environmental impact is a bit higher than option 2	C2	F2	L