Department for Business, Energy & Industrial Strategy

RECORD OF THE HABITATS REGULATIONS ASSESSMENT UNDERTAKEN UNDER REGULATION 5 OF THE OFFSHORE PETROLEUM ACTIVITIES (CONSERVATION of HABITATS) REGULATIONS 2001 (As Amended).

Premier Oil - Tolmount Pile-driving

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Rev 2.0

Author: Phil Bloor

NB. Since this HRA was undertaken the Installation Operator has changed from Premier Oil UK to ODE Asset Management Limited hence a new application has been submitted by the new installation Operator. All other aspects remain unchanged and the Department is content to rely on the HRA as produced to support our determination of CL/1130 including the piling operations for Tolmount installation.

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1 INTRODUCTION

1.1 Council Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive) and Council Directive 2009/147/EC on the conservation of wild birds (the Birds Directive) aim to ensure the long-term survival of certain habitats and species by protecting them from the adverse effects of plans and projects.

1.2 The Habitats Directive provides for the designation of sites for the protection of habitats and species of European importance. These sites are called Special Areas of Conservation (SACs). SACs form part of a network of protected sites across Europe called Natura 2000.

1.3 Before SACs are designated, the Government will undertake a public consultation. Prior to consultation the site is considered to be a draft SAC (dSAC). At the public consultation stage, the site is referred to as a possible SAC (pSAC). When a pSAC is submitted to the European Commission it becomes a candidate SAC (cSAC), at which point it is legally afforded the same protection as a SAC. Following adoption by the European Community the site becomes a Site of Community Importance until formal designation by the Government when the site becomes a SAC. The Southern North Sea SAC became designated as a SAC in February 2019 (JNCC 2019a).

1.4 Any plan or project, which either alone or in-combination with other plans or projects would be likely to have a significant effect on a qualifying site must be subject to an Appropriate Assessment to determine the implications for a site's integrity and conservation objectives. Such a plan or project may only be agreed after ascertaining that it will not adversely affect the integrity of a European Site unless there are imperative reasons of overriding public interest for carrying out the plan or project.

1.5 The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended) transpose the Directives into UK law for activities consented under the Petroleum Act 1998. The Offshore Petroleum Activities (Conservation of Habitats) (Amendment) Regulations 2007 extend certain provisions of the 2001 regulations.

1.6 Regulation 5(1) of the 2001 Regulations provides that: *The Secretary of State shall, before granting any Petroleum Act licence, any consent, any authorisation, or any approval, where he considers that anything that might be done or any activity which might be carried on pursuant to such a licence, consent, authorisation or approval is likely to have a significant effect on a relevant site, whether individually or in-combination with any other plan or project, including but not limited to any other relevant project, make an appropriate assessment of the implications for the site in view of the site's conservation objectives*.

1.7 An application for a Consent to Locate (CL/1095/0) was submitted by Premier Oil E&P UK Limited (hereafter referred to as Premier Oil) to the Department for Business Energy and Industrial Strategy (BEIS) on 22 April 2020.

1.8 Advice received from the Joint Nature Conservation Committee during consultation was that '*noise disturbance from piling has the potential to impact the site* [Southern North Sea SAC] *in relation to Conservation Objective 2: disturbance of the feature'* (JNCC 2020a). BEIS agrees with this advice and as the competent authority will undertake an assessment as required under the Habitats Regulations.

1.9 This is a record of the Appropriate Assessment in the form of a Habitats Regulations Assessment (HRA), undertaken by the Secretary of State for BEIS in respect of proposed pile-driving at the Tolmount gas field that may cause a significant effect on the qualifying features of the Southern North Sea SAC.

1.10 The proposed activities relevant to this assessment are not directly connected with, or necessary to, the management of any European sites but it may affect them. The purpose of this HRA is to determine whether the proposed activities will adversely affect the integrity of any European designated site.

2 PROJECT DESCRIPTION

2.1 The following is a brief summary of the proposed activities relating to the Consent to Locate application CL/1095/0, further details may be found within the application and associated EIA justification (Premier Oil 2020).

2.2 The proposed activities will be undertaken in licence Block 42/28d in the southern North Sea (Figure 1).

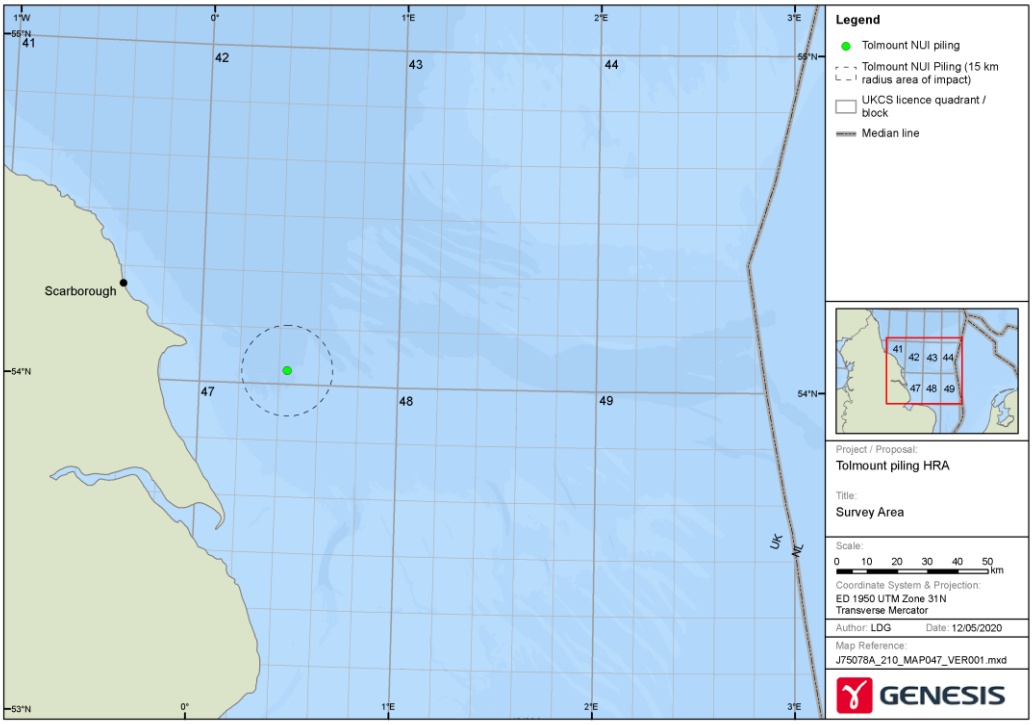


Figure 1: Location of the proposed Tolmount installation.

2.3 The Tolmount field will comprise of a NUI, four wells and an associated 20" gas export pipeline (PL4849) and 3" methanol pipeline (PL4850) between the Tolmount NUI and the Easington terminal.

2.4 The Tolmount NUI is the subject of the Consent to Locate. All other infrastructure and activities associated with the project have been previously been assessed in the Offshore Environmental Statements (ESs) for the Tolmount Area Development (Premier Oil 2017) and the Tolmount to Easington Pipeline (Premier Oil 2018). Future activities relating to the four wells and the pipelines will be subject to further assessment at the time applications are made for necessary licences.

2.5 Prior to the installation of the NUI, a site survey will be conducted to inspect the seabed area ahead of the pilling operations of the Tolmount NUI jacket and topsides installation. Upon completion of this survey, the cargo barge delivering the NUI jacket, piles and topsides to the

Tolmount field will be towed to the NUI location by four tugs. Upon arrival at the proposed Tolmount NUI location, the jacket will be installed (Premier Oil 2020).

2.6 The Tolmount NUI jacket will be installed by the dynamically positioned *Sleipmir* Heavy Lift Vessel and will rest on eight skirt piles (two for each leg). Each pile will be 96" (2.59 m) in diameter, 56 m long and weigh approximately 300 Tonnes. The skirt piles will be driven through pile sleeves offset from the platform leg, all of which will form a pile cluster at each corner of the jacket. Around each pile cluster a mud mat is provided to provide initial on bottom stability prior to piling, which will have an approximate seabed footprint of 34 m^2. Each pile will be hammer-driven to approximately 56 m below the seabed. Pile driving will not be a continuous operation as each pile has to be lifted off a transport barge and pitched into the pile sleeves underwater before driving commences. It is expected that it will take approximately four hours driving to install each pile, with all eight piles installed over a five-day period (Premier Oil 2020).

2.7 Once the jacket and piles have been installed, the NUI topsides will be installed by the Heavy Lift Vessel and welded into place.

2.8 The installation of the NUI will be undertaken over a period of 18 days, during which up to five days may involve pile-driving. Activities are scheduled to take between September 2020 and February 2021.

3 DESIGNATED SITES

3.1 The proposed activities will be undertaken outwith any designated site. The nearest designated site is the Southern North Sea SAC which lies 3 km away (Figure 2).

3.2 Based on the information presented within the application, including the results from the noise modelling undertaken in support of the application and advice received during consultation it has been determined that there is potential of a likely significant effect on the qualifying species (harbour porpoise) of the Southern North Sea SAC. No other qualifying species or habitats have been identified as being potentially impacted by the proposed activities.

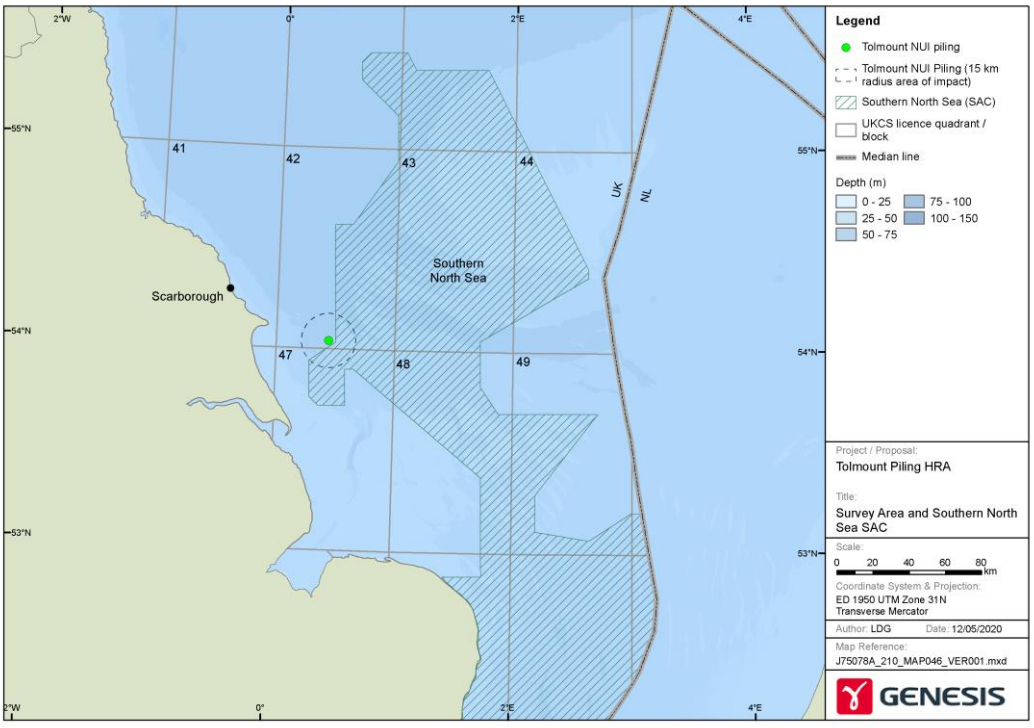


Figure 2: Location of proposed Tolmount NUI installation and Southern North Sea SAC.

3.3 The qualifying site and species relevant to this HRA are:

- Southern North Sea SAC (Harbour porpoise),

Harbour porpoise

3.4 The harbour porpoise (*phocoena phocoena*) is a qualifying species for the:

- Southern North Sea SAC

3.5 The harbour porpoise is the smallest and most abundant cetacean species in UK waters. They occur widely across shelf waters predominantly either individually or in small groups but larger aggregations have been reported (Defra 2015), with group sizes varying with season (Clark

2005). Harbour porpoise have a very broad distribution occurring predominantly over the continental shelf. Higher densities occur in areas of up-wellings and strong tidal currents and in water depths of predominantly between 20 and 40 m (Clark 2005, Whaley 2004). Their distribution may also be strongly correlated with seabed type, with areas of sandy gravel being preferred and this may be linked to prey availability (Clark 2005).

3.6 Harbour porpoise occur widely across the North Sea. Data from the three Small Cetacean Abundance in the North Sea (SCANS) surveys indicate that that there may have been a southward shift in the distribution of harbour porpoise in the North Sea. In the early 1990's harbour porpoise were widespread but appear to have occurred predominantly around eastern Scotland and the northern North Sea to the southern North Sea (Figure 3) (Hammond *et al*. 2013). Since the 1990's harbour porpoise continue to be widespread across the North Sea but densities have increased in the southern and central North Sea. The cause of this apparent change in the distribution of harbour porpoises across the North Sea is unclear but may be related to changes in prey availability (IAMMWG *et al.* 2015).

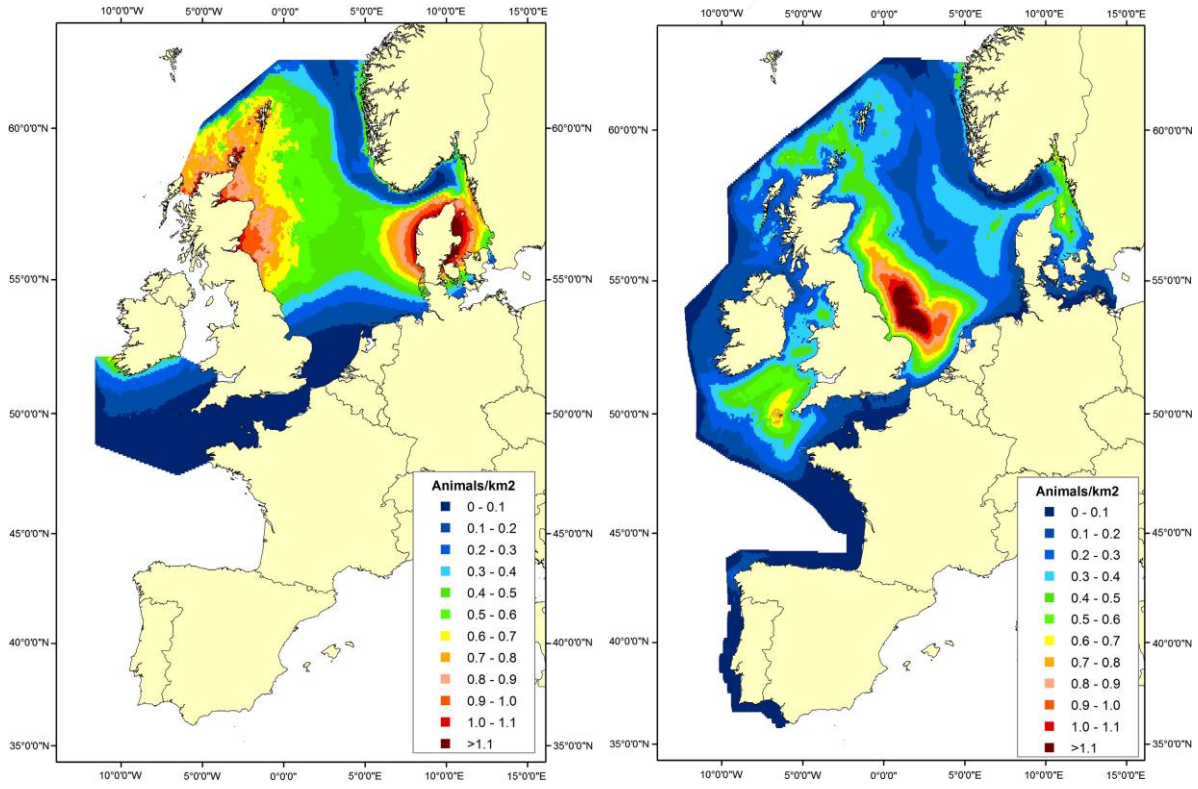


Figure a. Figure b.

Figure 3: a) Predicted surface density for harbour porpoise in 1994. b) Predicted surface density for harbour porpoise in 2005 (Source Hammond *et al.* 2013).

3.7 Following the completion of the most recent SCANS survey (SCANS III), the latest estimated harbour porpoise populations within the whole of the SCANS survey area is 424,245 (CV 313,151 – 596,827). Since 1994 the population of harbour porpoises within the SCANS surveyed area has remained relatively stable (Figure 4) (Hammond *et al*. 1995, Hammond 2006, Hammond *et al.* 2017).

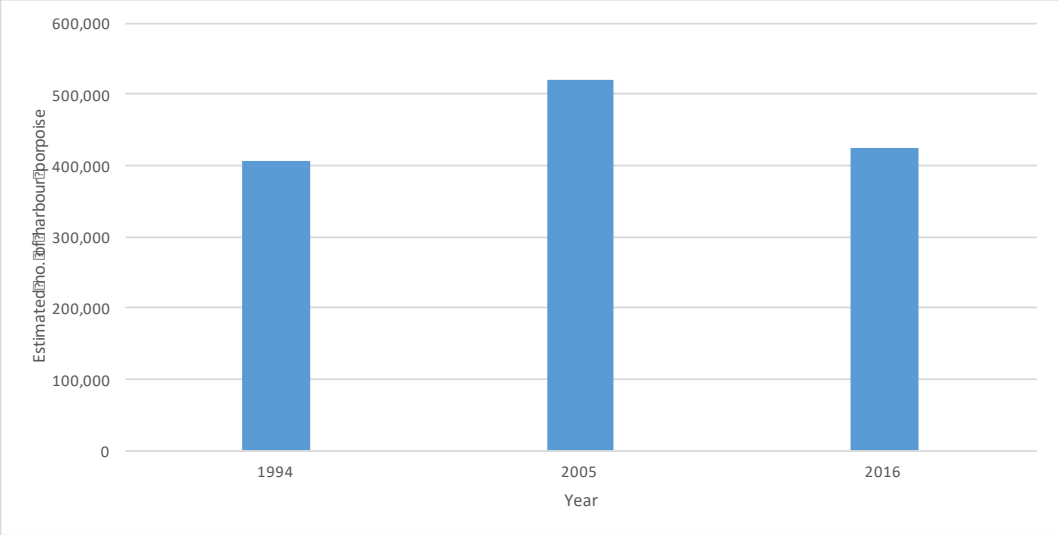


Figure 4: Estimated number of harbour porpoise within the SCANS survey area recorded during SCANS I, II and III surveys (Hammond *et al.* 2017).

3.8 There are three Management Units identified for harbour porpoise in the north-east Atlantic, of which, the Southern North Sea SAC and the Doggersbank SAC lie within the North Sea Management Unit (Figure 5). The harbour porpoise population within the North Sea Management Unit was originally estimated to be 227,298 (176,360 – 292,948) individuals (IAMMWG 2015). However, following the revision of the regional SCANS harbour porpoise population, the population of harbour porpoise within the North Sea Management Unit has also been revised and is now estimated to be 333,808 individuals (JNCC 2017b).

3.9 The SAC selection assessment document estimates that the site holds 18,500 harbour porpoise (98% C.I. 11,864 – 28,899) (JNCC 2017c, 2019a), which was 8.1% of the North Sea Management Unit population at the time the estimate was made (Hammond *et al*. 2013, IAMMWG 2015). Based on the latest North Sea Management Unit population of 308,666 individuals the harbour porpoise population within the SAC may be 26,237 individuals. This estimated population of harbour porpoise is recognised to have been derived from data collected in 2005 and 2016 during a single month and that the harbour porpoise population within the SAC will vary across seasons and years. The population estimated from the Joint Cetacean Protocol (JCP), where abundance and distribution data from multiple sources collected over a period of time have been integrated, is 333,808 individuals (JNCC 2017b). This population estimate has been used for the purposes of this assessment.

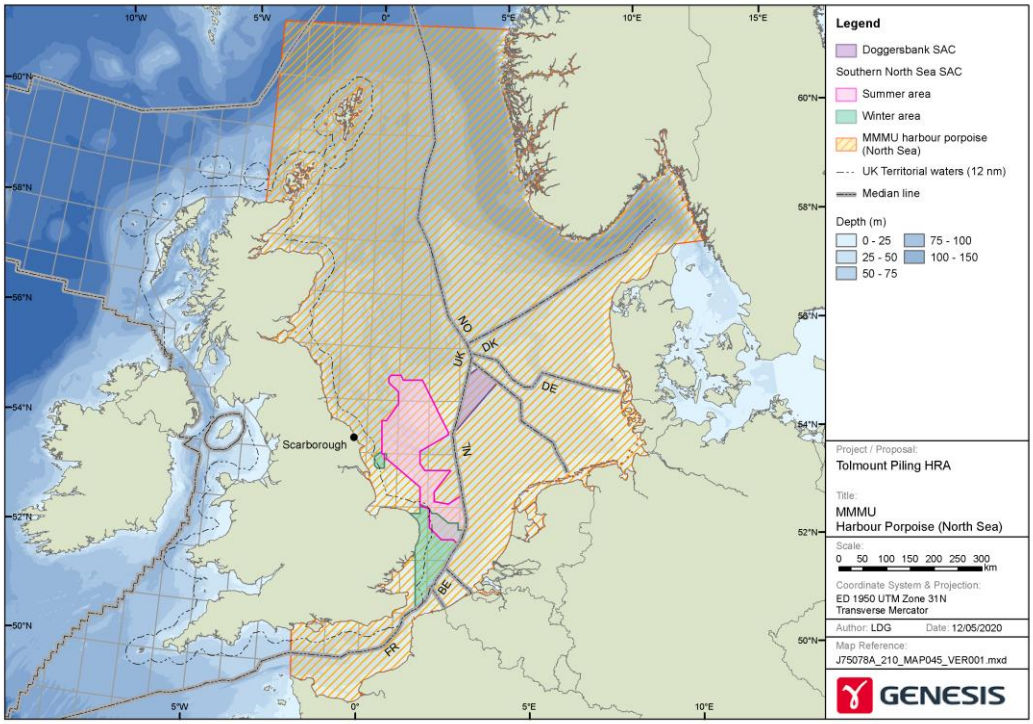


Figure 5: North Sea Management Unit for harbour porpoise as defined by the IAMMWG.

3.10 Harbour porpoise densities vary seasonally and across the Southern North Sea SAC (Evans and Teilmann 2009). Site-specific surveys undertaken by wind farm developers have shown considerable variation in the spatial and temporal distribution of harbour porpoises across years (e.g. Forewind 2013, SMart Wind 2017). Typically, peak abundance has been reported to occur between May and July at sites across the Dogger Bank area and between September and April at sites further south (e.g. Forewind 2014, SMart Wind 2015, EAOWL 2015). Lowest reported abundance occurs between November and February.

3.11 Based on data in the JCP database highest densities in the central and northern area of the SAC occur during the summer period with modelled harbour porpoise densities greater than 3.0 per km^2 occurring widely (Figure 6a). During the winter period the distribution of harbour porpoise in the southern North Sea changes, with reduced densities over the central and northern area but an increase in densities in nearshore waters and the southern part of the SAC (Figure 6b) (Heinänen and Skov 2015).

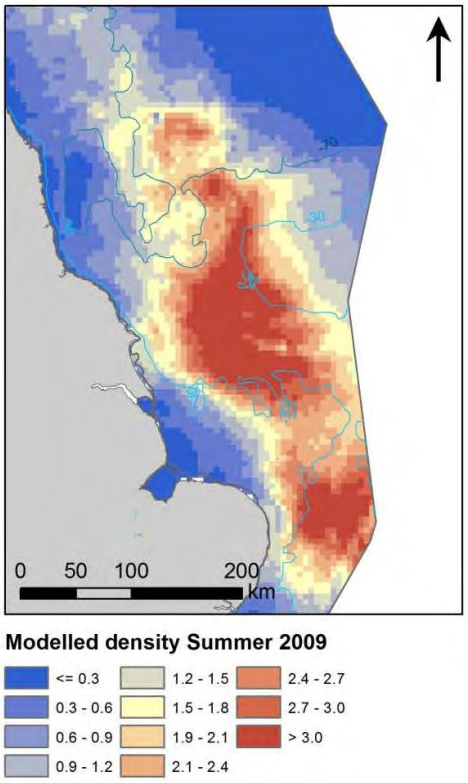


Figure a.

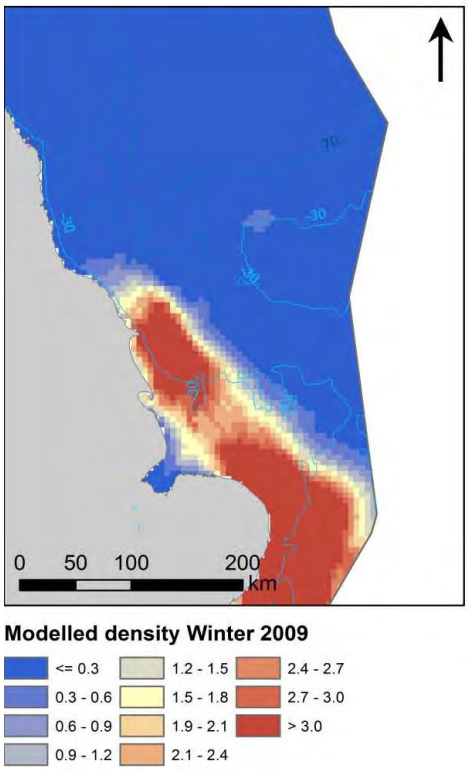


Figure b.

Figure 6: a) Estimated summer densities of harbour porpoise in the southern North Sea. b) Estimated winter densities of harbour porpoise in the southern North Sea. (Source: Heinänen and Skov 2015).

3.12 Surveys undertaken across the southern North Sea, including areas within and encompassing the SAC, have reported lower densities of harbour porpoise than that estimated from JCP data. Densities reported from SCANS III surveys are from between 0.888 ind./km^2 in SCANS block O and 0.607 ind./km^2 in SCANS block L (Hammond *et al.* 2017). Similarly, data obtained across the Dogger Bank area including the Southern North Sea SAC in 2011 recorded a density of 1.88 ind./km^2 (Gilles *et al.* 2012). Data obtained from surveys undertaken at proposed offshore wind farms located within or adjacent to the SAC indicate densities vary across the site and across seasons. Mean densities reported from surveys undertaken by offshore wind farm developers range from 0.11 ind./km^2 at Triton Knoll offshore wind farm including a 1 km buffer to 2.87 ind./km^2 within the Hornsea subzone 3 wind farm area plus a 4 km buffer (TKOWFL 2011, SMart Wind 2017).

3.13 Tagging studies undertaken in Denmark indicate that harbour porpoises are highly mobile and range widely in the North Sea, with individuals tagged in the Skagerrak travelling up to 100 km per day, with a mean distance of 24.5 km per day (Sveegaard 2011). Individuals tagged in Danish waters were recorded off the east coasts of England and Scotland (Sveegaard 2011).

3.14 Harbour porpoise swimming speeds vary with the highest recorded swimming speeds being 4.3 m/s (Otani *et al.* 2000). Mean recorded speeds are typically around 1 m/s (Otani *et al.* 2000, Kastelein *et al.* 2018). When disturbed by noise harbour porpoise can increase swimming speeds with increasing sound levels. Studies using playback experiments of pile-driving sounds have reported increases in swimming speed from an average of 1.2 m/s to 2.0 m/s at sound levels of 154 dB re 1 µPa that were sustained for at least 30 minutes (Kastelein *et al*. 2018).

3.15 Although harbour porpoises may dive to depths of up to 226 m and remain submerged for up to five minutes, they more frequently undertake relatively shallow dives of a short duration, with a mean depth of 14 m and duration of 44 seconds (Santos and Pierce 2003, Otani *et al*. 1998, 2000). Studies undertaken on 14 tagged harbour porpoise in Danish and adjacent waters reported that on average harbour porpoise spend 55% of the time in the upper 2 m of the surface waters. The most frequent dive depths were between 14 m and 32 m, with the maximum depth dived of 132 m. The number of dives per hour increased from an average of 29 dives hr^{-1} between April and August to 43 dives hr^{-1} in October and November when it was presumed that higher levels of foraging activity occurred to compensate for the higher energy requirements required during the cooler winter period (Teilmann *et al*. 2007).

3.16 Harbour porpoise use echolocation to detect and track individual prey and are opportunistic feeders, foraging close to the seabed or near the sea surface, preying on a wide range of fish species including, herring (*Clupea harengus*), whiting (*Merlandius merlangus*), Gadoids spp. sprats (*Sprattus sprattus*), gobi (*Pomatoschistus minutus*) and sandeels (*Ammodytes* spp.), and their prey will vary during and between seasons (DeRuiter 2008, Santos and Pierce 2003, IAMMWG *et al.* 2015). The prey of harbour porpoise may change over time with a reported long-term shift in prey from clupeid species to sandeels and gadoid species (IAMMWG *et al*. 2015), indicating that harbour porpoise may be opportunistic feeders capable of feeding on a variety of species.

3.17 Studies undertaken in Denmark indicate that their local distribution may be correlated with prey availability (Sveegaard 2011). Due to the relatively high metabolic rate of harbour porpoise and the relatively small size of their predominant prey it has been suggested that harbour porpoise require a reliable source of food and frequent food consumption in order to maintain their body weight, with increased consumption in cooler environments (Kastelein *et al*. 1997, Wisniewska *et al*. 2016, 2018).

3.18 Harbour porpoise have a maximum life expectancy of 24 years, with an average life expectancy of around 12 years in UK waters (Lockyer 2003, Learmouth *et al.* 2014). Females become sexually mature at between three and five years old (Lockyer 2003, Learmouth *et al*. 2014). Breeding is thought to occur primarily during the summer months between May and September, particularly in August, with calving 10 months later. Calves are nursed for eight to ten months

but may remain with the mother until a new calf is born (Defra 2015, Lockyer 2003, Weir *et al*. 2007).

3.19 The range at which marine mammals, including harbour porpoise, may be able to detect sound arising from offshore activities depends on the hearing ability of the species and the frequency of the sound. Other factors that can affect the potential impact include ambient background noise, which can vary depending on water depth, seabed topography and sediment type. Natural conditions such as weather and sea state and existing sources of human produced sound can also reduce the auditory range.

3.20 Porpoises are generally considered to be 'high frequency' or 'very high frequency' specialists with a relatively poor ability to detect lower frequency sounds (Southall *et al.* 2007, 2019). Studies undertaken on captive harbour porpoises indicate that porpoises have a functional hearing range of between 250 Hz and 180 kHz with their best hearing between 16 to 140 kHz and their maximum sensitivity between 100 and 140 kHz. It is within the frequency range of 130 to 140 kHz that harbour porpoise echolocate (Miller and Wahlberg 2013).

3.21 Their ability to detect sound below 16 kHz or above 140 kHz falls sharply (Kastelein *et al.* 2012, 2015, Southall *et al*. 2007). Harbour porpoise are therefore most sensitive to sound sources between 16 to 140 kHz and, although potentially audible, they are unlikely to be sensitive to sound either above or below those frequencies.

3.22 Harbour porpoise use echolocation to communicate and detect prey. Reported sound levels produced range from between 166 to 194 re: 1 µPa (rms SPL) and 178 and 205 dB re. 1 µPa (peak – peak SPL), with a mean level of 191 dB re. 1 µPa (peak – peak SPL) and within the peak frequency range of 110 to 150 kHz (Villadsgaard, *et al*. 2007, Miller and Wahlberg 2013, MMO 2015).

Prey species

3.23 Fish are not qualifying species for the Southern North Sea SAC. However, potential impacts on fish that are prey for harbour porpoise could affect the integrity of the sites by reducing their prey base (JNCC and NE 2016).

3.24 Sandeels are one of the main prey items for harbour porpoise and are also an important prey species for predatory fish such as whiting, cod and haddock, some of which may also be prey for harbour porpoise (Greenstreet *et al*. 2006).

3.25 Sandeels are one of the most abundant fish in the North Sea occurring widely over suitable sandy substrates where, once the larvae have settled, they remain in the area (Heath *et al.* 2011). Although widespread, sandeel distribution is highly substrate specific as they depend on seabed habitat comprising a high proportion of medium and coarse sands (particle size 0.25 - <2 mm) with low silt content (Holland *et al*. 2005).

3.26 Between September and April sandeels remain largely buried in the seabed except when spawning during December and January and when feeding during the late spring and summer (Greenstreet *et al.* 2006, Van der Kooij *et al*. 2008).

3.27 Within the Southern North Sea SAC sandeels occur across the site with their main spawning area over the Dogger Bank and a wider nursery area across most of the SAC (Judd *et al.* 2011).

3.28 Harbour porpoise prey on a variety of fish species that could be impacted by the proposed activities including gobies, Sandeel Spp., whiting, herring and sprat (JNCC and NE 2019).

3.29 Fish hearing is based on detecting particle motion directly stimulating the inner ear. However, those with swim bladders are also able to detect pressure waves and can detect a wider range of frequencies and sounds of lower intensity than fishes without swim bladders (Popper 2003). Fish with swim bladders that possess a coupling mechanism between the swim bladder and the auditory system, e.g. herring and sprats, are recognised to be hearing specialists. Fish that have swim bladders but lack a mechanised coupling mechanism or do not have swim bladders, e.g. sandeel spp. are considered hearing generalists and have a relatively lower sensitivity to sound than fish that have swim bladders and a coupling mechanism.

3.30 Studies on the behaviour of fish from noise, largely using play-back experiments, have reported a range of behavioural responses including avoidance behaviour, changes in swimming speed and direction (e.g. Hawkins 2014, Mueller-Blenkle *et al.* 2010) and reduced antipredator responses (Everley *et al.* 2016).

Information Sources

3.31 This HRA draws on a number of information sources relating to the proposed project and the site designation which should be read in conjunction with this report including:

- Premier Oil (2020). EIA Justification.A3011533-S38.
- Natura 2000 – Standard Data Form. Site: UK0030395. Southern North Sea. JNCC (2019b).
- Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs. (England, Wales & Northern Ireland). JNCC, NE and DAERA (2020).
- Harbour Porpoise (*Phocoena phocoena*) possible Special Area of Conservation: Southern North Sea. Draft Conservation Objectives and Advice on Activities. JNCC and NE (2019).
- A potential approach to assessing the significance of disturbance against conservation objectives of the harbour porpoise cSACs. Version 3.0. Discussion document JNCC (2017d).

- Noise assessment and management in harbour porpoise SACs. Briefing note: Use of thresholds to assess and manage the effects of noise on site integrity. JNCC (2017e).

3.32 References to technical papers and other documents are given in the text as necessary.

4 POTENTIAL IMPACTS

4.1 The potential impacts arising from the proposed activities are sound from the pile-driving. No other sources of potential impact that could affect qualifying habitats or species have been identified.

4.2 There is a substantial volume of literature describing the potential effects of sound on marine mammals, and summarised in e.g. Thomsen *et al.* (2006), Southall *et al.* (2007) and OSPAR (2009).

4.3 There are four main types of potential effect from noise that are recognised within the marine environment:

- *Fatal effects* caused by significant levels of noise in close proximity to the receptor.
- *Physical injury*, specifically hearing impairment, which can be permanent or temporary. These effects can impact on the ability of marine mammals to communicate, forage or avoid predators.
- *Behavioural effects* such as avoidance, resulting in displacement from suitable feeding or breeding areas, and changes in travelling routes.
- *Secondary impacts* caused by the direct effects of noise on potential prey causing a reduction in prey availability.

4.4 The range at which marine mammals may be able to detect sound arising from offshore activities depends on the hearing ability of the species and the frequency of the sound. Harbour porpoise are potentially more sensitive to high frequency sounds than other cetaceans or pinnipeds. Other factors which may affect the potential impact of sound on marine mammals includes ambient background noise, which can vary depending on water depth, seabed topography and sediment type. Natural conditions such as weather and sea state and other existing sources of human produced sound, e.g. shipping, can also reduce the auditory range.

Fatal effects

4.5 If source peak pressure levels from the proposed operations are high enough there is the potential for a lethal effect on marine mammals. Studies suggest that potentially lethal effects can occur to marine mammals when the peak pressure level is greater than 246 or 252 dB re. 1 µPa (Parvin *et al.* 2007). Damage to soft organs and tissues can occur when the peak pressure level is greater than 220 dB re. 1 µPa.

Physical injury

4.6 Underwater sound has the potential to cause hearing damage in marine mammals, either permanently or temporarily. The potential for either of these conditions to occur is dependent on the hearing bandwidth of the animal, the duty cycle of the sound source and duration of the exposure (Southall *et al*. 2019, OSPAR 2009).

Behavioural Change

4.7 Potential changes in behaviour may occur depending on the sound source levels and the species' and individuals' sensitivities. Behavioural changes can include changes in swimming direction, diving duration, avoidance of an area and reduced communication.

4.8 Masking effects may also cause changes in the behaviour as the level of sound may impair the detection of echolocation clicks and other sounds that species use to communicate or detect prey, thus causing them to alter their behaviour.

Secondary Effects

4.9 There is potential for impacts on prey species to affect marine mammals, in particular possible impacts of noise on fish species.

5 NOISE MODELLING

5.1 To assess the potential environmental impacts from the proposed activities the applicant has undertaken noise modelling to assess the potential impacts from pile-driving (Premier Oil 2020).

5.2 Details of the noise data used in the underwater noise assessment and presented in the application are presented in Table 1.

Table 1: Piling of wellhead platform jacket noise modelling assumptions (Source: Premier Oil 2020).

Parameter	Input values
Pile hammer	Impact hammer
Hammer type	Menck MHU3500S hammer
Pile diameter	2.59 metres (m)
Hammer blow rate	30 strikes per minute
Period over which piling will take place per day (hours)	Maximum of 8 hours of piling per 24-hour period
Number of structures to be piled	2 x 56 m piles per corner, 8 piles in total
Soft start period	20 minutes

5.3 Results from the noise modelling undertaken to support the application indicate that the onset of PTS in harbour porpoise could occur in harbour porpoise within 234 m of the pile-driving and strong behavioural disturbance out to 3.1 km (Premier Oil 2020).

5.4 No noise modelling has been undertaken in order to assess the potential impacts on prey species.

6 EFFECTIVE DETERRENT RADIUS / RANGE

6.1 The Effective Deterrent Radius / Range (EDR) has been proposed by the Statutory Nature Conservation Bodies (SNCBs) as a means to measure potential impacts on harbour porpoise within the SAC (JNCC 2017d,e; JNCC, NE and DAERA 2020). The EDR is an empirically derived generic distance within which deterrence, i.e. displacement, of harbour porpoise is predicted to occur. The EDR are based on published studies that have monitored the effects on harbour porpoise from various activities and reflects the overall loss of habitat if all animals vacate the area (e.g. Defra 2015). It is an area of displacement as opposed to disturbance, which may be greater.

6.2 The published precautionary EDR are presented in Table 2 (JNCC, NE and DAERA 2020). Relevant to this assessment is the EDR for pin-piles which is published as being 15 km.

Table 2: Precautionary Effective Deterrent Ranges (EDR) (Source: JNCC, NE and DAERA 2020).

Activity	Effective Deterrent Range (km)
Monopile	26
Unexploded Ordnance	26
Pin-pile [1]	15
Monopile with noise abatement	15
Conductor piling	15
Seismic survey	12
High Resolution Geophysical Surveys	5

[1] Pin-piles are '*smaller diameter piles that secure jacket structures*' although no definition as what diameter a pin-pile should be has been provided in published advice (JNCC, NE and DAERA 2020).

7 CONSERVATION OBJECTIVES

7.1 Conservation Objectives constitute a necessary reference for identifying site-based conservation measures and for carrying out HRAs of the implications of plans or projects (JNCC and NE 2019). They outline the desired state for any European site, in terms of the features for which it has been designated. If these features are being managed in a way which maintains their nature conservation value, they are assessed as being in a 'favourable condition'. An adverse effect on the integrity of a site is likely to be one which prevents the site from making the same contribution to favourable conservation status for the relevant feature as it did at the time of its designation (English Nature 1997).

7.2 The purpose of an Appropriate Assessment is to determine whether a plan or project adversely affects a site's integrity. The critical consideration in relation to site integrity is whether the plan or project affecting a site, either individually or in-combination, affects the site's ability to achieve its conservation objectives and favourable conservation status (JNCC 2015).

Southern North Sea SAC

7.3 The Southern North Sea SAC was designated as a SAC in 2019. The site covers an area of 36,951 km^2 and is designated for harbour porpoise.

7.4 Harbour porpoise are also protected throughout European waters under the provisions of Annex IV and Article 12 of the Habitats Directive, which are outwith the scope of this assessment. Harbour porpoise in UK waters are considered part of a wider European population and the mobile nature of this species means that the concept of a 'site population' is not thought to be appropriate for this species. Site based conservation measures therefore aim to complement wider ranging measures that are in place for the harbour porpoise (JNCC and NE 2019).

7.5 The Conservation Objectives for harbour porpoise are designed to ensure that human activities do not, in the context of maintaining site integrity:

- kill, or injure harbour porpoise (directly or indirectly),
- prevent their use of significant parts of the site (disturbance / displacement),
- significantly damage relevant habitats, or
- significantly reduce the availability of prey.

Southern North Sea SCI Conservation Objectives

To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters
In the context of natural change, this will be achieved by ensuring that:

1. Harbour porpoise is a viable component of the site;
2. There is no significant disturbance of the species; and
3. The condition of supporting habitats and processes, and the availability of prey is maintained..

Source: JNCC and NE 2019

7.6 Harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it. The first Conservation Objective aims to minimise the risk from activities that cause unacceptable levels of impact on harbour porpoise using the site, specifically those that could impact on the Favourable Conservation Status of harbour porpoise (JNCC and NE 2016, 2019).

7.7 The '*integrity of the site*' is not defined in the Conservation Objectives. However, EU and UK Government guidance defines the integrity of a site as ''*the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified*' (EC 2000, Defra 2012). Therefore, the integrity of the site applies to the whole of the site and it is the potential impacts across the whole of the site that are required to be appropriately assessed. Pressures that would affect site integrity include:

- killing or injuring harbour porpoise (directly or indirectly),
- preventing their use of significant parts of the site (disturbance / displacement),
- significantly damaging relevant habitats,
- significantly reducing the availability of prey. (JNCC and NE 2019).

7.8 The second Conservation Objective states that there should be '*…no significant disturbance of the species'* and that '*Disturbance is considered significant if it leads to the exclusion of harbour porpoise from a significant portion of the site'* (JNCC and NE 2019).

7.9 *'Supporting habitats and processes'* relate to the seabed and water column along with the harbour porpoise prey.

7.10 JNCC advise that it is not appropriate to use the site population estimates in any assessments of effects of plans or projects (i.e. Habitats Regulation Assessments), as it is necessary to take into

consideration population estimates at the Management Unit level to account for daily and seasonal movements of the animals (JNCC 2017c; JNCC and NE 2019), .

7.11 There are no formal thresholds at which impacts on site integrity are considered to be adverse. However, a threshold of 1.7% of the relevant harbour porpoise population above which a population decline is inevitable has been agreed with Parties to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), with an intermediate precautionary objective of reducing the impact to less than 1% of the population (Defra 2003, ASCOBANS 2015). This threshold relates to impacts from fisheries by-catch on harbour porpoise where the impact on the harbour porpoise is permanent, i.e. up to 1.7% of the population may be caught as by-catch before a population decline is inevitable. An equivalent level of impact from disturbance, which is temporary and non-lethal, on a population will have a lower level of impact on the population compared to that from a fisheries by-catch.

7.12 The lack of agreed population thresholds either at the Management Unit level or site level, below which evidence demonstrates there would not be an adverse effect, does not prevent objective judgements to be made on site integrity.

7.13 Thresholds to assess and manage the effects of noise on site integrity have been proposed by the JNCC and NE (JNCC 2017d,e; JNCC and NE 2019, JNCC, NE and DAERA 2020). The proposed approach is not based on a population level impact but is instead based on a temporal and spatial level where a proportion of the area (habitat) within the SAC may be affected over a period of time.

7.14 The JNCC and NE advice is that *'noise disturbance within the site should not exclude harbour porpoise from more than 20% of the site on any given day. Over a season, the advice is that an average loss of access to more than 10% of the SAC should be considered significant, recognising that within the SAC the abundance of harbour porpoise per unit habitat is generally higher than the equivalent sized habitat in the rest of the relevant Management Unit. Management of temporary habitat 'loss' to below defined area/time thresholds is therefore designed to ensure that it continues to contribute in the best possible way to the maintenance of the species at FCS.'* (JNCC, NE and DAERA 2020).

7.15 The potential extent of noise causing disturbance that would meet these proposed thresholds and therefore impact on the integrity of the site are presented in Table 3. The results indicate that should the impact occur wholly inside the SAC that, within the 'summer' area a sound source alone or in-combination causing disturbance for one day over an area of 7,390 km^2 would risk impacting site integrity. This is equivalent to a circular radius of noise out to 41.5 km. To exceed the threshold for the 'winter' area, noise in any one day should not extend over an area of more than 2,537 km^2; equivalent to a circular radius of 28.4 km.

7.16 Over the course of a season the total extent of potential disturbance on average per day should, in the 'summer' area, not extend over an area of more than 3,695 km^2; equivalent to a radius of noise of 29.3 km and in the 'winter' area should not extend over an area of more than 1,269 km^2, equivalent to a radius of 20.1 km.

Table 3: Estimated extent sound levels capable of causing displacement disturbance occur in order to impact on site integrity.

Site	Area (km^2)	1 day threshold		Seasonal threshold	
		20% of area (km^2)	Distance to threshold (km)	10% of area (km^2)	Distance to threshold (km)
Southern North Sea SAC	36,951	7,390	48.5	3,695	34.3
'summer' area April - September	27,028	5,406	41.5	2,701	29.3
'winter' area October - March	12,696	2,539	28.4	1,270	20.1

The 'Distance to threshold' presumes sound propagation is circular in shape, i.e. the distance is the equivalent to a radius of circular noise.

7.17 Unlike the daily threshold, the area of the SAC that can be affected over the course of a season is an average over the season. The seasonal average is calculated by summing the proportion of the site impacted (for the relevant season) over the number of days the impact will occur and then averaging across the total number of days within that season, i.e. 183 days in the summer period and 182 days in the winter period. This provides a seasonal average spatial effect.

7.18 This assessment is based on both the potential impact on the North Sea Management Unit population using both the ASCOBANS thresholds and the proposed SNCB threshold approach.

7.19 In order to undertake any meaningful assessment using the threshold approach accurate information on the timing, duration and extent of activities being undertaken is required. Where this information is lacking or where speculative 'worst-case' scenarios are used there is little or no confidence that the results will bear any resemblance to the true extent of impact within the SAC on any single day or across the course of a season. The threshold approach proposed by the SNCBs has not been agreed with the competent authorities. However, the thresholds have been noted within the assessment as a high-level management tool to limit the spatial distribution of noise from offshore activities within a large offshore SAC, such as the Southern North Sea SAC.

7.20 The HRA has been carried out in light of best scientific knowledge with reference to the Conservation Objectives of the SAC and the potential impacts on the integrity of the site (EC 2010).

8 IN-COMBINATION IMPACTS

8.1 Under the Habitats Regulations, it is necessary to consider the in-combination effects of plans or projects on European Sites. These refer to effects, which may or may not interact with each other, but which could affect the same receptor or interest feature (i.e. a habitat or species for which a European site is designated).

8.2 The in-combination assessment includes plans or projects that are:

- Under construction,
- Permitted application(s), but not yet implemented,
- Submitted application(s), not yet determined,
- Projects identified in the relevant Development Plan (and emerging Development Plans),
- Sites identified in other policy documents, as development reasonably likely to come forward.

Renewable energy activity

8.3 A source of potentially significant in-combination underwater noise impact is from pile driving activity occurring during the construction of offshore renewable developments, particularly offshore wind farms.

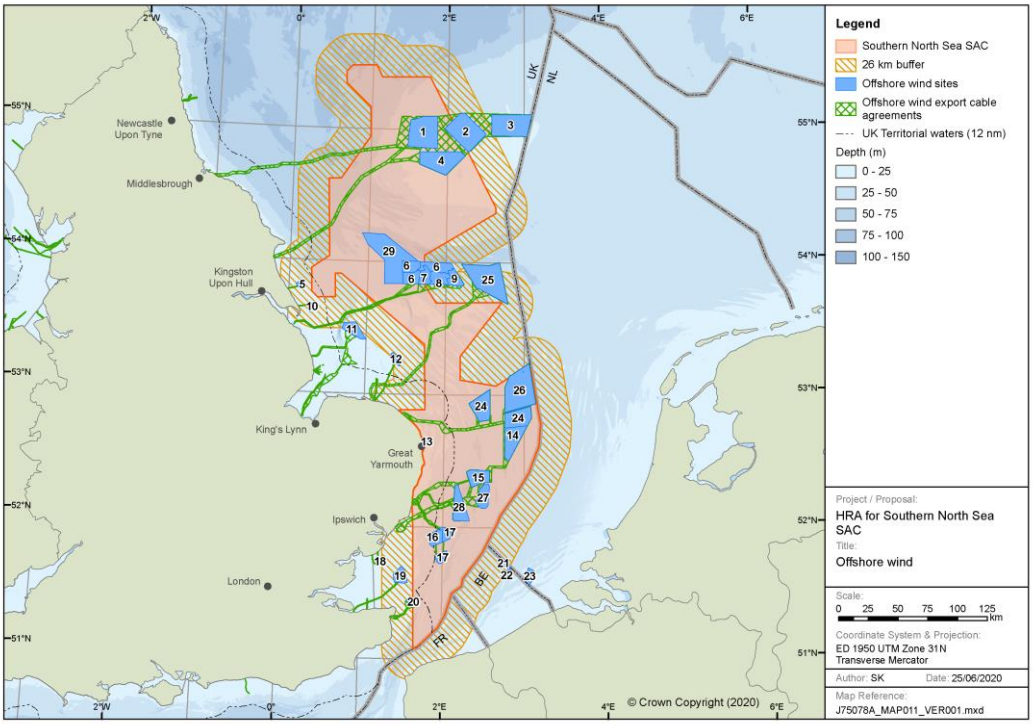
8.4 There are 21 UK offshore wind farms that lie wholly within the Southern North Sea SAC or are within 26 km of the boundary which is identified by the JNCC as an area that harbour porpoises may be displaced from by noise arising from pile-driving activities (JNCC 2017d, JNCC, NE and DAERA 2020). (Table 4 and Figure 7). One wind farm (Triton Knoll) is currently undertaking offshore construction and Hornsea Two has started pre-construction activities offshore. All other wind farms are either operating, consented but not started offshore construction or have submitted applications and are awaiting determination.

8.5 There are further additional wind farms located in Dutch and Belgium waters that could impact on the Southern North Sea SAC when under construction. In the Dutch sector, offshore construction at the Borssele I and II wind farms has largely been completed and no piling is being undertaken. Offshore construction at the Borssele III and IV wind farms started in October 2019 and is on-going. Noise mitigation technology is being used at these wind farms during pile-driving activities.

8.6 In Belgium the SeaMade wind farms: Mermaid and Seastar are under construction and all the monopile foundations have been installed.

Table 4: Offshore wind farms located within 26 km of the Southern North Sea SAC.

Wind farm	Status
Round 1	
Scroby Sands	Operating
Round 2/2.5	
Dudgeon	Operating
Galloper	Operating
Greater Gabbard	Operating
Gunfleet Sands II	Operating
Humber Gateway	Operating
Thanet	Operating
Triton Knoll	Offshore construction started
Westermost Rough	Operating
Round 3	
Creyke Beck A	Onshore construction started
Creyke Beck B	Onshore construction started
East Anglia One	Operating
East Anglia Two	Application submitted
East Anglia Three	Consented
Hornsea Project One	Operating
Hornsea Project Two	Onshore construction started
Hornsea Project Three	Application submitted
Norfolk Vanguard	Application submitted
Teesside A (Sofia)	Consented
Teesside B	Onshore construction started
Belgium	
SeaMade (Mermaind and Seastar)	Offshore construction started
Netherlands	
Borssele I and II	Offshore construction nearly complete
Borssele III and IV	Offshore construction started



1	Dogger Bank - Creyke Beck B	16	Greater Gabbard
2	Dogger Bank - Teesside B (Sofia)	17	Galloper
3	Dogger Bank - Teesside A	18	Gunfleet Sands II
4	Dogger Bank - Creyke Beck A	19	London Array
5	Westermost Rough	20	Thanet
6	Hornsea Project 2	21	THV Mermaid
7	Hornsea 1 (West)	22	Belwind I
8	Hornsea 1 (Centre)	23	Borssele II
9	Hornsea 1 (East)	24	Norfolk Vanguard East
10	Humber Gateway	24	Norfolk Vanguard West
11	Triton Knoll	25	Hornsea Project Three
12	Dudgeon	26	Norfolk Boreas
13	Scroby Sands	27	East Anglia One
14	East Anglia Three	28	East Anglia Two
15	East Anglia One North	29	Hornsea Project Four

Figure 7: Offshore wind farms located within 26 km of the Southern North Sea SAC.

8.7 It is recognised that during construction, pile-driving will likely occur and that, if undertaken simultaneously as the proposed pile-driving at Tolmount, there is the potential to cause an adverse effect in-combination.

8.8 Of the offshore wind farms that are relevant to the in-combination assessment the Hornsea Two development could be undertaking pile-driving in September when Tolmount may be pile-driving Triton Knoll and Hornsea Two offshore wind farms could be pile-driving during the period of the proposed Tolmount pile-driving. The Hornsea two offshore wind farm plans undertake pile-driving between July and October 2020 (Ørsted 2020a). However, BEIS have been informed the pile-driving will not commence before September 2020.

8.9 The Triton Knoll offshore wind farm has a licence to undertake pile-driving over a period of 23 days with completion by 13 June 2020 and will therefore have been completed prior to the start of the pile-driving at Tolmount. However, the construction activities at Triton Knoll will contribute to the in-combination seasonal threshold.

8.10 An application to undertake UXO clearance from between 1 April 2019 to 31 December 2020 has been submitted to the MMO for Hornsea Two offshore wind farm (Ørsted 2018a). The application is for the clearance of up to 100 items of UXO which must be cleared from between July 2019 to 31 December 2019 and between 1 April 2020 and 31 December 2020 (Ørsted 2018b, MMO 2019a). UXO clearance during 2019 removed 26 items of UXO.

8.11 For items of UXO greater than 50 kg, bubble curtains must be used to mitigate against noise when undertaken in water depths of between 5 m and 40 m and when currents are less than 1.5 m/s (MMO 2019a). Bubble curtains were used for 23 of the 26 UXO clearances undertaken at Hornsea Two in 2019.

Cable laying activity

8.12 The Viking Link project is a high voltage direct current (HVDC) electrical interconnector between Denmark and the UK. The 762 km long cable will be laid between Jutland in Denmark and Bicker Fen in Lincolnshire and crosses the Southern North Sea SAC (Figure 8) (NGVL 2018a).

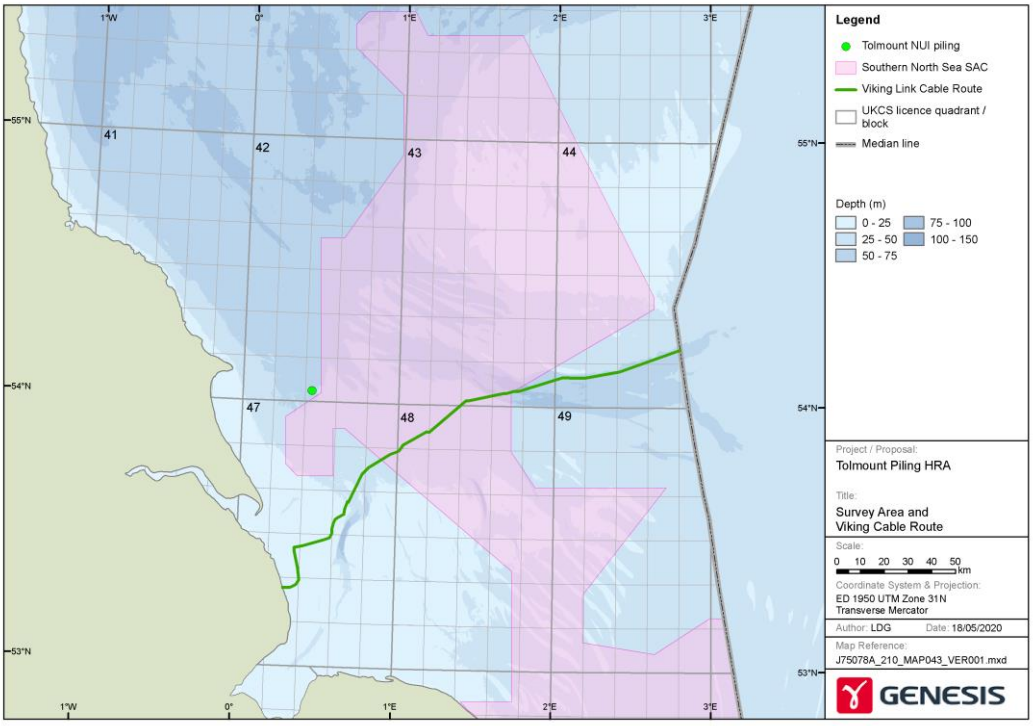


Figure 8: Viking Link Interconnector cable within UK waters and location of proposed Tolmount pile-driving.

8.13 An application was made for the clearance of up to 25 items of UXO between 1 April and 30 September 2019 some, or all, of which may occur within or adjacent to the SAC (NGVL 2018b). Following an HRA, consent was given by the MMO on 5 October 2018 (MMO 2018). Subsequent to consent, a variation to the application has been made for the clearance of 25 items of UXO to be detonated between 1 April 2020 and 1 September 2020 (NGVL 2019a). Consent has been issued but is currently subject to a further variation with a revised planned start date of no sooner than 31 May 2020 (MMO 2020). BEIS have been informed that four items of UXO will be cleared in 2020, with one item within the Southern North Sea SAC and a further three within 26 km of the SAC boundary.

Aggregate extraction and dredging activity

8.14 Existing localised aggregate dredging occurs primarily in the southern half of the SAC, along the east coast (Figure 9). In 2019 there were 29 aggregate production areas and five Exploration and Option areas covering an area of 579.2 km^2. Five of the aggregate areas occur in the 'summer' area of SAC covering 77.7 km^2 and the rest occur in the 'winter' area of the SAC and cover an area 533.8 km^2, with some sites occurring in both the 'winter' and 'summer' areas.

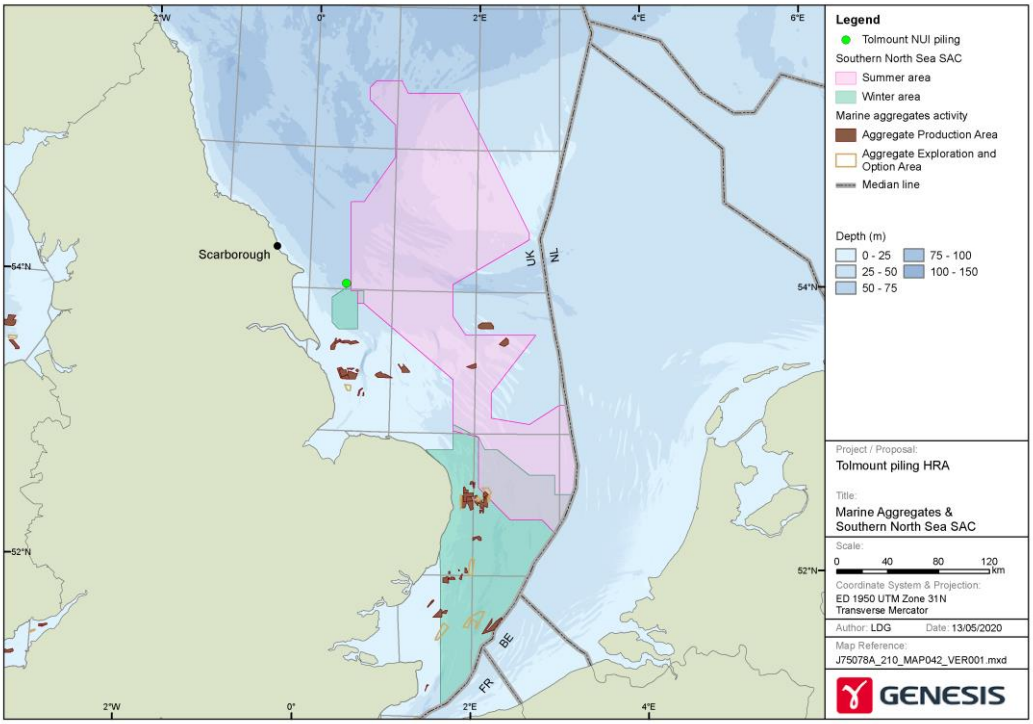


Figure 9: Existing marine aggregate activities in the Southern North Sea SAC.

8.15 Studies have indicated that harbour porpoise may be displaced by dredging operations within 600 m of the activities (Diederichs *et al*. 2010). Noise modelling previously undertaken for

aggregate assessments have predicted significant levels of avoidance at ranges of 500 m from suction dredging (Parvin *et al* 2008 (referenced in Hanson Aggregates Marine Ltd 2013).

8.16 On a precautionary assumption that there is a level of behavioural displacement out to 600 m, there is potential for an area of 1.13 km^2 to be affected at each active dredging location. There are currently three aggregate production areas in the 'summer' area and 26 in the 'winter' area. Although the level of dredging activity within each of the active licence areas is unknown, as a worst-case scenario, with dredging occurring within each dredging area, porpoise may be displaced from an area of 3.39 km^2 in the 'summer' area and 29.38 km^2 in the 'winter' area. Therefore, a very small proportion (0.01% of the summer area and 0.2% of the summer area) of the SAC may be impacted by noise arising from dredging activities.

Oil and gas activity

8.17 There is a long history of oil and gas activities within the boundaries of the Southern North Sea SAC. Since 1965, when the first well was spudded (first drilled), there has been extensive oil and gas development with a total of 117 installations installed within the SAC. The vast majority (94%) of all the installations within the boundary of SAC are located in the 'summer' area of the site (Figure 10) (OGA NDR 2020).

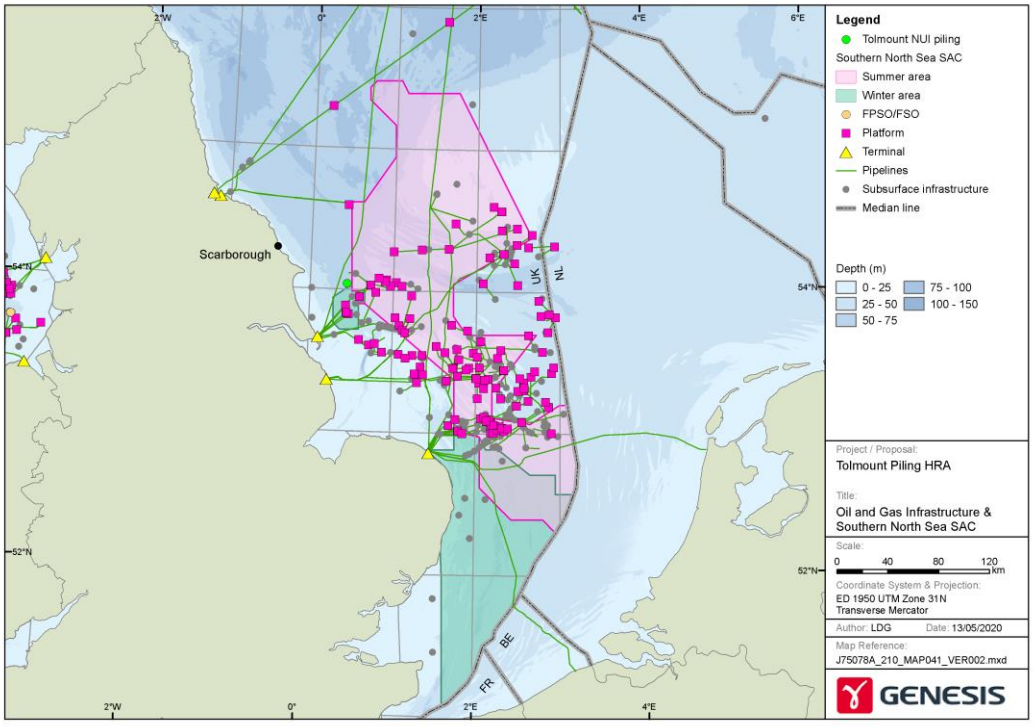


Figure 10: Existing oil and gas infrastructure within the Southern North Sea SAC.

8.18 Seismic surveys have regularly been undertaken within the SAC over the last 50 years, with a total of 23 2D or 3D seismic surveys carried out within the SAC between 2008 and 2017. The majority of surveys during this period took place in the northern half of the SAC, where the most recent oil and gas activity has occurred (Figure 11).

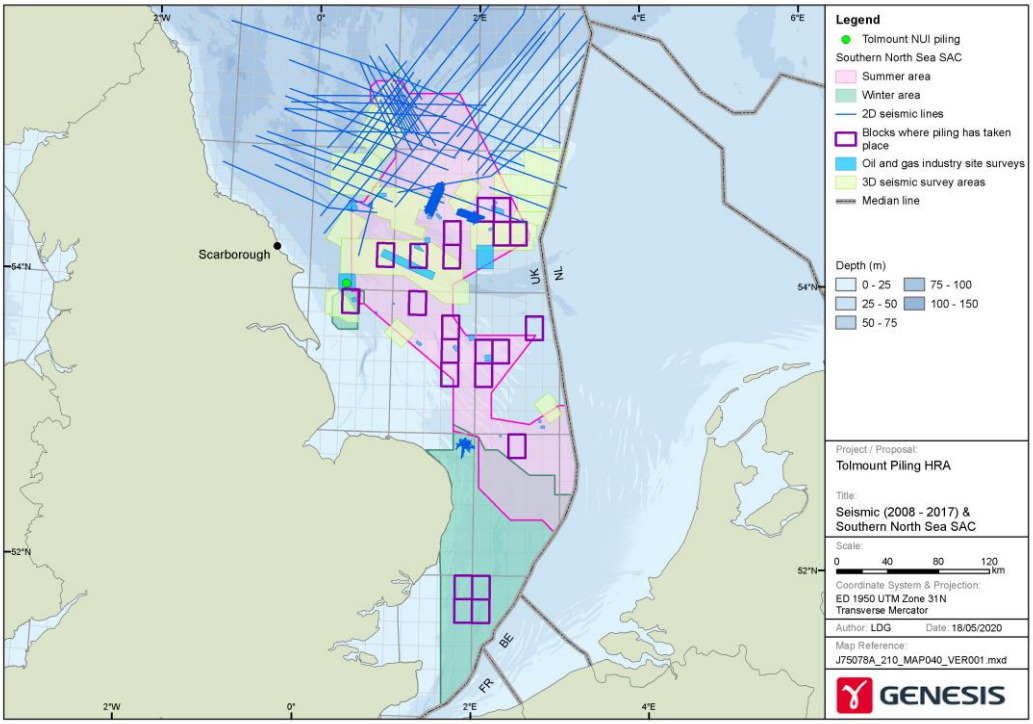


Figure 11: Oil and gas industry related seismic surveys undertaken within the Southern North Sea SAC between 2008 and 2017.

8.19 BEIS are aware of a number of planned oil and gas related activities within the area during the period the proposed pile-driving will be undertaken that could cause an in-combination effect including a seismic survey to be undertaken by ION in licence Blocks UKCS Blocks 35/23, 35/24, 35/25, 35/28, 35/29, 35/30, 36/21 – 36/30, 37/16 – 37/30, 38/16, 38/17, 38/18, 38/21,38/22, 38/23, 38/26, 38/27, 38/28, 41/3 – 41/5, 42/1 - 42/5, 43/1 – 43/5, 44/1 – 44/3 (Table 5).

Table 5: Planned oil and gas activities within or adjacent to the SAC that could cause an in-combination impact.

Applicant	Licence Reference No.	Licence Block(s)	Start and End Dates	Planned Activity
Chrysaor	ML/386/4	49/17	2 October 2019 – 30 June 2020	Removal of Viking GD jacket and risers.
Spirit Energy	ML/411/2	49/11a	23 November 2018 and 31 October 2020	Removal and temporary deposit of risers at Audrey B installation.
Spirit Energy	ML/431/1	49/11a	10 July 2019 – 30 April 2020	Removal and temporary deposit of risers at Audrey B installation.
Tampnet AS	ML/495/0	44/22	26 July 2019 – 30 June 2020	Deposit of two mattresses and telecommunications branching unit.
Chrysaor	ML/546/0	49/21	19 May 2020 – 31 December 2020	WIA using TCP guns and jet cutters
Premier Oil	ML/551/0	42/28d – 47/11	6 March – 30 September 2020	Pipeline seabed preparation and trenching.
Chrysaor	ML/553/0	49/22	31 March -	Decommissioning
Chrysaor	ML/570/0	49/16	8 April – 31 October	Pipeline disconnect
Chrysaor	ML/574/0	49/22	10 April – 31 October 2020	Permanent deposits
Chrysaor	ML/579/0	49/16	1 May – 30 October 2020	Removal of cut pipeline and mattresses. Relocation of existing rock.
Shell	DEP/1709/2	48/8	10 December 2019 – 31 August 2020	Deposits
Perenco	DR/1818/0	42/30	16 January – 31 August	Drilling.
Perenco	DR/1819/0	42/30	16 January – 31 August	Drilling.
ODE Asset management	DEP/1892/0	52/3 – 49/26	19 April -	Deposits
Spirit Energy	GS/1068/0	43/13b	7 April – 31 May	Shallow drilling.
Spirit Energy	GS/1071/0	42/3b	12 April – 1 April 2021 (delayed until October 2020)	Geophysical survey.
Spirit Energy	GS/1070/0	32/38	12 April – 1 April 2021 (delayed until October 2020)	Geophysical survey.
ION	GS/1074/0	Quadrants 35, 36, 37, 38, 41, 42, 43 and 44	1 April – 22 October 2020	Seismic survey
Premier Oil	DRA/808	42/28	1 September 2020 - 16 June 2021	Batch drilling.
Premier Oil	DRA/810	42/28	1 September 2020 - 16 June 2021	Batch drilling.
Premier Oil	DRA/811	42/28	1 September 2020 - 16 June 2021	Batch drilling.
Premier Oil	DRA/812	42/28	1 September 2020 – 16 June 2021	Batch drilling

Shipping

8.20 Impacts from shipping on harbour porpoise within the SAC have been identified as arising from shipping noise and collision impacts. Shipping noise is the predominant anthropogenic source of noise within the marine environment and is reported to have a negative effect on harbour porpoise within the SAC when vessel traffic exceeds 80 vessels per day (JNCC and NE 2016). Shipping has been on-going in the southern North Sea for many hundreds of years and the area is important for shipping, with relatively high numbers of vessels occurring within it. Based on vessel track lines, in 2015 a total of 269,018 vessels track lines were recorded transiting across the SAC; an average of 737 vessels per day (MMO 2017a).

8.21 The level of vessel activity across the 'summer' and 'winter' areas of the SAC differs (Figure 12). There is relatively widespread vessel activity in low densities across the 'summer' area, with 76% of the quadrants having less than seven vessels per week and 17% having less than one vessel per week. Compared with the 'winter' area of the SAC where 14% of the quadrants had, on average, less than seven vessels per week and only 1% had less than one vessel per week. In contrast 11% of the 'winter' area had more than 70 vessels per week compared with none in the 'summer' area. The areas with relatively higher levels of shipping (>24 vessels per day), occur over 4% of the 'winter' area. Therefore, the 'winter' area has relatively localised, higher density, areas of vessel traffic compared with the 'summer' area that has widespread but low density vessel traffic.

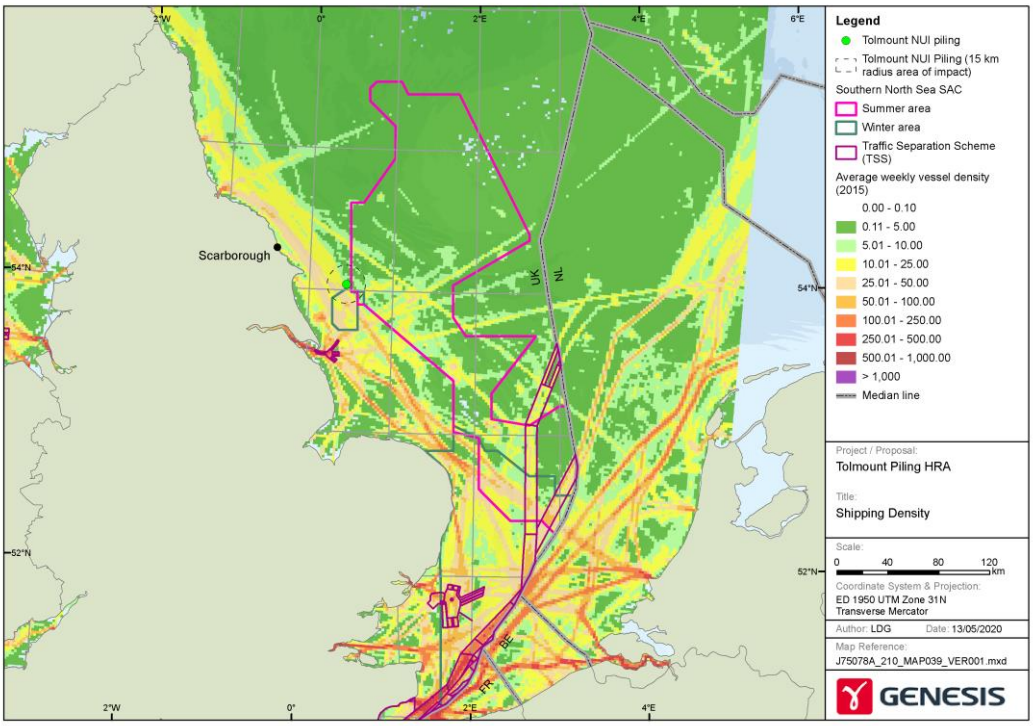


Figure 12: Shipping density within the SAC during 2015.

Fishing activity

8.22 Fishing occurs widely across the southern North Sea and has also been on-going in the area for many hundreds of years. The majority of current fish landings are obtained from areas adjacent to the SAC but there is widespread fishing activity in the southern half and north-eastern edge of the SAC and relatively moderate to high levels of fishing activity along the western edge of the central part of the SAC (Figure 13) (MMO 2017b). Note however, this does not include the activities of non-UK registered vessels that will occur within the site or vessels greater than 15 m in length.

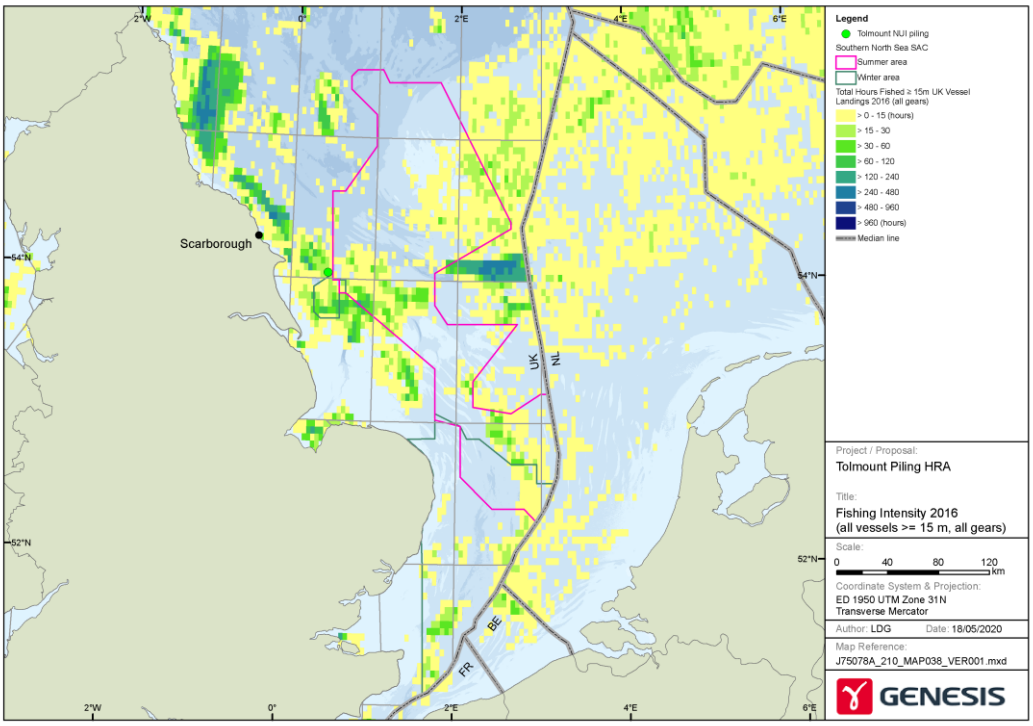


Figure 13: Fishing intensity across the SAC during 2016 by UK registered vessels.

8.23 There is a high risk of an impact from bycatch associated with the fishing industry to harbour porpoise across the North Sea, i.e. there is good evidence of a significant impact. There is a medium risk of an impact from removal of prey (JNCC and NE 2019).

8.24 The bycatch of harbour porpoise in fishing gear is reported to be one of the most significant anthropogenic pressures impacting on the harbour porpoise population (JNCC and NE 2019). It is estimated that between 1,235 and 1,990 harbour porpoise die each year in the North Sea due to bycatch, predominantly in gill nets (ICES 2016, Mitchell *et al*. 2018, OSPAR 2017). This is approximately 0.6% of the North Sea Management Unit population.

8.25 Noise modelling predicts, that the proposed pile-driving will not cause any direct mortality to any harbour porpoise and therefore there will be no in-combination impact between fishing and the proposed activities.

In-combination conclusion

8.26 Following consideration of all known developments that may cause a likely significant effect, BEIS considers that there are plans or projects likely to cause an in-combination likely significant effect. The activities likely to cause an in-combination impact considered within this HRA are:

- UXO clearance at Hornsea Two offshore wind farm,
- UXO clearance along Viking Link Interconnector cable,
- Construction pile-driving at Triton Knoll offshore wind farm,
- Construction pile-driving at Hornsea Two offshore wind farm,
- Planned oil and gas activities including seismic and geophysical surveys.
- On-going routine activities such as shipping, that could contribute to impacts on qualifying species, will also be being undertaken for the duration of the proposed pile-driving.

9 LIKELY SIGNIFICANT EFFECTS TEST

9.1 Regulation 5 of the 2001 Regulations requires the Competent Authority to consider whether a development will have a likely significant effect on a European site, either alone or in combination with other plans or projects. A likely significant effect is, in this context, any effect that may be reasonably predicted as a consequence of a plan or project that may affect the Conservation Objectives of the features for which the site was designated but excluding trivial or inconsequential effects. An Appropriate Assessment is required if a plan or project is likely to have a significant effect on a European site, either alone or in combination with other plans or projects. A judgement of likely significant effect in no way pre-supposes a judgement of adverse effect on site integrity.

9.2 There are no recognised criteria as to what can be considered to be trivial or inconsequential impacts. Where predicted impacts are relatively very small compared to either the population of the management unit or the area of the site or the duration of the impact, it is determined that the impact would not cause a likely significant effect.

9.3 The JNCC have advised BEIS that there will be a likely significant effect on the qualifying features of the Southern North Sea SAC, namely harbour porpoise (JNCC 2020). No other qualifying features for any other designated sites have been identified as being at risk of a likely significant effect.

10 APPROPRIATE ASSESSMENT

10.1 An Appropriate Assessment is triggered when the competent authority, in this case the Secretary of State, determines that a plan or project is likely to have a significant effect on a European site. Guidance issued by the European Commission states that the purpose of an Appropriate Assessment is to determine whether adverse effects on the integrity of the site can be ruled out as a result of the plan or project, either alone or in-combination with other plans and projects, in view of the site's conservation objectives (EC 2000).

10.2 The following sections assess whether there will be an adverse effect on the Southern North Sea SAC.

10.3 A dual approach based on outputs from noise modelling and supported by the use of EDR has been used for harbour porpoise in order to determine whether an adverse effect on the integrity of the Southern North Sea SAC will occur.

Southern North Sea SAC (Harbour porpoise)

Physical Injury

10.4 Noise modelling undertaken indicates that, based on the weighted SEL threshold, there is potential for sound levels from pile-driving to cause the onset of PTS to harbour porpoise out to 234 m of the sound source (Premier Oil 2020a)

10.5 The peak harbour porpoise density across the SAC is estimated to be >3 per km^2 (Figure 6) (Heinänen and Skov 2015). Based on this peak density and the worst-case scenario of PTS occurring out to 234 m of the pile-driving, less than one harbour porpoise could be impacted.

10.6 The North Sea Management Unit harbour porpoise population is 333,808 individuals and therefore the worst-case scenario of one harbour porpoise being impacted is <0.0001% of the Management Unit population.

10.7 The estimated area of potential impact from PTS is within 500 m of the pile-driving and therefore the mitigation measures proposed by the applicant, which includes the use of Marine Mammal Observers (MMO) and Passive Acoustic Monitoring PAM) will ensure that no marine mammals are within the range at which the onset of PTS is predicted to occur.

Disturbance

10.8 Significant disturbance to harbour porpoise is predicted to arise out to 3.1 km from the pile-driving (Premier Oil 2020a).

10.9 Based on a peak site density of 3.0 ind./km^2 an estimated 90 harbour porpoise could be disturbed by the proposed pile-driving. This is equivalent to 0.03% of the North Sea Management Unit harbour porpoise population being disturbed.

10.10 However, at Triton Knoll (the closest wind farm to the proposed pile-driving) densities of harbour porpoise were reported as being 0.11 km^2 (TKOWFL 2011). Similar densities of harbour porpoise are predicted to occur at Tolmount. Based on these densities it is predicted that three harbour porpoise may be significantly disturbed, equivalent to <0.001% of the North Sea Management Unit population.

Threshold Approach

10.11 The JNCC have advised that the assessment for harbour porpoise within the SAC should be undertaken by the proposed threshold approach whereby disturbance should not exceed 20% of the SAC 'summer' or 'winter' areas over the course of one day and on average 10% of an area over the course of a single season (see Section 7).

10.12 Based on information presented within the application, BEIS have estimated the area of the SAC impacted by the pile-driving based on a 15 km EDR to be 200 km^2 of the 'summer' area (Figure 14).

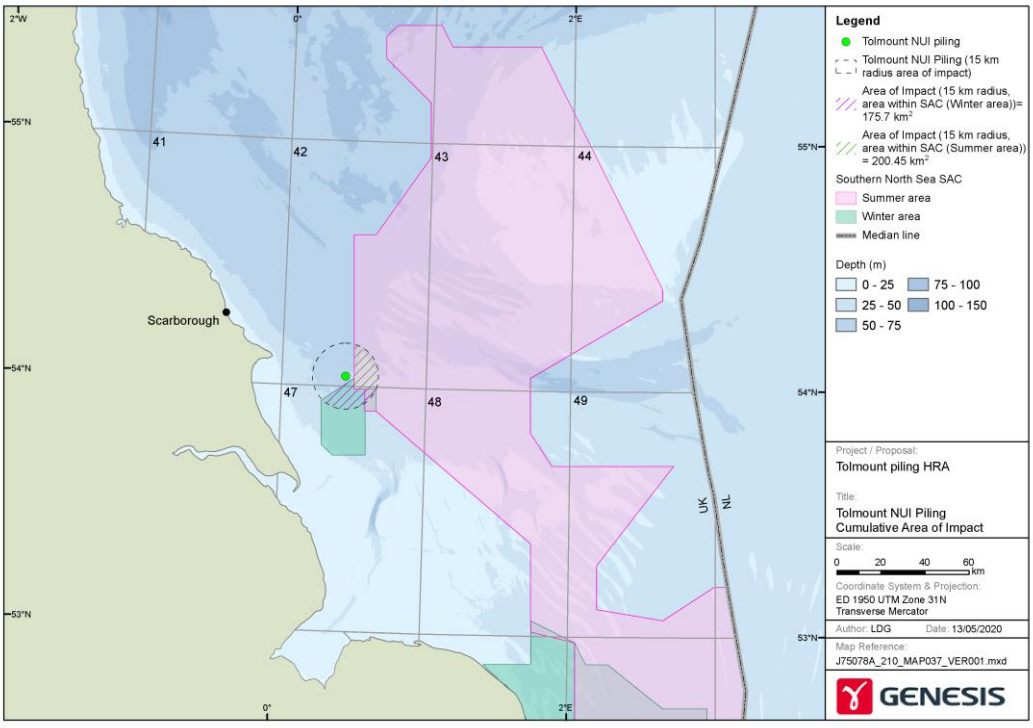


Figure 14: Tolmount NUI and 15 km EDR.

10.13 Pile-driving is expected to last over a period of five days. Consequently noise from pile-driving could affect 0.5% of the SAC as a whole and 0.8% of the 'summer' area. The seasonal threshold is 0.03% (Table 6).

Table 6: Daily and seasonal spatial overlap for Tolmount pile-driving.

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of days pile-driving	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Pile-driving					
'summer'	200	0.8	5	7	0.03

1 – This accounts for two days 'recovery time' following cessation of pile-driving.

Conclusion

10.14 Results from noise modelling indicate that no more than one harbour porpoise is at risk of physical injury from noise arising from the pile-driving. With proposed mitigation discussed in Section 13 there is a very low risk of any harbour porpoise being injured.

10.15 There is a risk of harbour porpoise being displaced or disturbed by the proposed pile-driving at Tolmount. Noise modelling indicates that up to 90 harbour porpoise may be disturbed based on the maximum densities within the SAC. However, site specific densities are predicted to be significantly lower than this. The disturbance will be of short duration and once pile-driving has ceased harbour porpoise will return to the area and therefore the impacts are temporary.

10.16 The results from the threshold approach indicate that up to 0.8% of the 'summer' area may be impacted each day and up to 0.03% of the seasonal threshold. The daily and seasonal thresholds are not exceeded.

10.17 The proposed activities will not affect the supporting habitats and will have a temporary and localised impact on the supporting prey species, e.g. fish. Once the proposed pile-driving has ceased there will be no effect on the distribution, abundance and population dynamics of the species.

10.18 Based on the best available information and supported by results from noise modelling and the draft threshold approach, BEIS is satisfied that the proposed Tolmount pile-driving alone will not have an adverse effect upon the integrity of the Southern North Sea SAC with respect to harbour porpoise.

11 IN-COMBINATION ASSESSMENT

11.1 There is potential for in-combination impacts to arise due to noise from other known or planned activities and the proposed pile-driving.

11.2 Projects identified as having potential to cause an in-combination impact during the summer period are:

- Hornsea Project Two offshore wind farm - UXO clearance,
- Viking Link Inter Connector – UXO clearance,
- Hornsea Project Two offshore wind farm – Pile-driving,
- Triton Knoll offshore wind farm – Pile-driving,
- ION – Seismic survey,

Hornsea Project Two UXO Clearance

11.3 The Hornsea Two offshore wind farm is located within Subzone 2 of the Round 3 Offshore Wind Farm Zone; Zone 4: Hornsea. At its closest point Hornsea Two lies 89 km from shore and covers an area of 462 km^2; of which 298 km^2 of the wind farm site lies within the SAC. In addition to the wind farm area an export cable route crosses the SAC. It is estimated that 36 km of the export cable route is within the SAC (Figure 7).

11.4 Ørsted have a Marine Licence to undertake UXO clearance within the wind farm area and along the export cable route. The licence is for clearance by detonation of up to 100 items of UXO over a two year period: 40 items between July 2019 to 31 December 2019 and 60 items between 1 April 2020 to 31 December 2020 (MMO 2019b). However, there is considerable uncertainty on the number and type of UXO items that may be required to be detonated or where they may be in relation to the qualifying sites relevant to this assessment.

11.5 In order to reduce the potential in-combination effect associated with UXO clearance Ørsted have proposed the following limitations when considering concurrent activities (Ørsted 2020a):

11.6 During the summer 2020 season (April to September, inclusive):

- A maximum of five detonations all within 5 km of each other will occur in any 24-hour period within the SNS or a 26 km buffer surrounding the SAC (during the same 24-hour period);

  and

- UXO detonations (within the SNS SAC or a 26 km buffer surrounding the SAC) will not occur during the same 24-hour period as piling at the substations (during the same 24-hour period).

11.7 These measures reduce the potential extent of impacts across the SAC during any one day.

Hornsea Two UXO clearance

11.8 Noise modelling undertaken by Ørsted indicates that the onset of PTS in harbour porpoise could occur within 11.6 km from a detonation of an 800 kg charge (Ørsted 2018c, d).

11.9 Assuming circular propagation of noise, in the event that the onset of PTS extends 11.6 km from the source the onset of PTS could occur over an area of 422.7 km^2. The density of harbour porpoise across the Hornsea Zone plus a 10 km buffer is between 1.72 and 2.22 ind./km^2 (SMart Wind 2015). Based on the higher recorded density, an estimated 425 harbour porpoise are at risk of PTS in the event that an 800 kg UXO is detonated at Hornsea Two. This is 0.13% of the North Sea Management Unit.

11.10 Ørsted have undertaken an assessment based on the proposed SNCB threshold approach with an EDR of 26 km (Ørsted 2020a).

11.11 The worst-case scenario of five detonations to be undertaken within a 5 km radius will impact a maximum area of 2,303 km^2 within the SAC, equivalent to 8.53% of the 'summer' area (Ørsted 2020a).

11.12 In the event that up to 60 UXO detonations are undertaken during the 'summer' period with five detonations per day, the seasonal average is 0.65%. In the event that only one detonation per day occurs (the 'worst-case' seasonal scenario) the seasonal average is 2.5% (Table 7).

Table 7: Seasonal spatial overlap for Hornsea Two UXO detonations without bubble curtains.

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of detonations	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Single UXO detonation per day					
'summer'	2,009	7.4	60	62	2.5
Five UXO detonations per day					
'summer'	2,303	8.5	60	14	0.6

1 – This accounts for two days 'recovery time' following cessation of UXO clearance.

11.13 The potential impact from UXO detonations using the threshold approach is unrealistically worst-case:

- It assumes that there will be 60 detonations all of which will be undertaken during the summer period; this figure is speculative and considered to be a maximum.
- The assessment presumes that all 60 detonations have the same maximum area of effect within the SAC. It is highly unlikely that five items of UXO are positioned such that they could cause the maximum area of impact.

- The maximum area of impact can only occur on one day. It is therefore unrealistic and self-evidently not possible to have the same level of impact over the course of a season.
- This assessment is based on the presumption that bubble curtains are not being used to reduce the risk of injury and extent of disturbance (See Section 13, Mitigation). During 2019 Ørsted cleared 26 items of UXO within the project area and used bubble curtains for 23 of them; therefore on 88% of occasions bubble curtains have been used. This significantly reduces the potential area of displacement or disturbance.

11.14 The use of bubble curtains for pile-driving reduces the EDR from 26 km to 15 km (JNCC, NE and DAERA 2020) and although not stated in the recent guidance a similar level of effect for UXO clearance has been considered for the purposes of this assessment. However, it is recognised that there is a paucity of evidence to support either the 26 km or 15 km EDR for UXO clearance.

11.15 The reduction in the EDR to 15 km reduces the daily threshold to between 2.6% and 4.6% depending on the number of detonations per day and the seasonal threshold to between 0.35% and 0.88% (Table 8).

Table 8: Seasonal threshold for Hornsea Two UXO detonations with bubble curtains.

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of detonations	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Single UXO detonation per day					
'summer'	707	2.6	60	62	0.88
Five UXO detonations per day					
'summer'	1,257 [2]	4.6	60	14	0.35

1 – This accounts for two days 'recovery time' following cessation of UXO clearance.

2 – Estimated based on all five detonations being within a 5 km radius of each other.

12 Hornsea Project Two Pile-driving

12.1 Between July and October 2020 Ørsted are planning to undertake pile-driving at two substations associated with the Hornsea Two wind farm: A Reactive Compensation Station (RCS) and an Offshore Substation (OSS). BEIS are aware that pile-driving is unlikely to commence before September 2020.

12.2 The Reactive Compensation Station will have four pin-piles installed over a period of between one and three days, the Offshore Substation has eight pin-piles and will take between two and five days to be installed. In total there will be between three and eight days of piling noise undertaken during the summer period.

12.3 For the purposes of this assessment noise modelling undertaken by BEIS for the Review of Consents for the installation of 3.5 m diameter piles using a 2,300 kJ hammer at Hornsea Two wind farm has been used.

12.4 The results from the modelling indicate that the onset of PTS could occur out to 585 m and encompass an area of 1.1 km^2. Levels of noise predicted to cause disturbance could occur out to 26.8 km and cover an area of 2,251 km^2.

12.5 Based on the results from noise modelling and a peak density of 2.22 ind./km^2 an estimated two harbour porpoise are at risk of PTS from the pile-driving and 1,683 harbour porpoise may be disturbed or displaced.

12.6 Ørsted have undertaken an assessment based on the proposed SNCB threshold approach with an EDR of 26 km (Ørsted 2020a).

12.7 The results of the assessment based on a 15 km EDR for pin-pile driving at the Reactive Compensation Station indicate that up to 38 km^2 of the SAC may be impacted. Pile-driving at the Offshore Substation could impact 530 km^2 of the SAC. A maximum daily area of the SAC impacted is 2.0% and the average is 1%. The seasonal average has been calculated based on the average area of the SAC impacted over the course of the season by pile-driving and for activities to last the maximum number of eight days (Ørsted 2020a). The seasonal average arising from pile-driving is 0.05% (Table 9).

Table 9: Estimated extent of seasonal disturbance on harbour porpoise from proposed pile-driving at Hornsea Two offshore wind farm within the SAC.

SAC area	Mean area of SAC impacted per day (km^2)	Mean Daily Threshold (%)	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Pin-pile driving Hornsea 2 substations				
'summer'	284	1.0	10	0.05

1 – This accounts for two days 'recovery time' following cessation of pile-driving.

12.8 Ørsted have committed to not undertake UXO clearance and pile-driving during the same 24 hr period. Therefore, the impacts of the two activities are not additive on a daily basis but are for the seasonal threshold (Ørsted 2020a).

Viking Link Interconnector

12.9 The Viking Link Interconnector is a HVDC cable between Denmark and the UK. The total cable length in the marine environment is 620 km, of which 64 km is within the Southern North Sea SAC (NGVL 2018a). Prior to installing the cable a UXO clearance campaign is planned to be undertaken no sooner than 31 May 2020 and end in September 2020 (NGVL 2019a, MMO 2020).

12.10 The Marine Licence application is for the clearance of no more than 25 items of UXO across the entire length of cable. The exact number of UXO items to be cleared nor their locations are unknown. However, BEIS have been made aware that one item of UXO has been identified within the SAC and a further three items have been identified within 26 km of the SAC boundary. Licence conditions state that no more than one item of UXO can be cleared in any 24 hr period (MMO 2017c, 2018).

12.11 Results from noise modelling presented in the application indicate that the onset of PTS could occur out 8.5 km and cover an area of 226.98 km^2 for a UXO with a 260 kg charge weight and estimated up to 200 harbour porpoises to be at risk of PTS, this is equivalent to 0.06% of the North Sea Management Unit population (NGVL 2018a, MMO 2017c). However, this is without mitigation, which includes the use of Acoustic Deterrent Devices (ADD) and where appropriate the use of bubble curtains that will reduce the risk of harbour porpoise being within the area when UXO are detonated (NGVL 2019b). The estimated number of individuals potentially displaced or disturbed from UXO clearance based on the outputs from noise modelling is not available.

12.12 NGVL have estimated the number of harbour porpoise displaced based on the 26 km EDR and estimate up to 1,886 harbour porpoise may be disturbed from clearance of UXO, this is equivalent to 0.56% of the North Sea Management Unit population (NGVL 2018a)

12.13 NGVL have undertaken an assessment using the draft SNCB threshold approach. The assessment is based on the detonation of UXO having an EDR of 26 km and all 25 items of UXO being wholly within the SAC (NGVL 2019a). The worst-case scenario for a single detonation within the SAC is that it will impact an area of 2,124 km^2 during any 24 hr period and consequently affect 7.8% of the 'summer' area and over the course of the season affect 1.2% of the seasonal threshold (Table 10).

12.14 In the event that bubble curtains are used the daily threshold is reduced to 2.6% and the seasonal threshold to 0.38%.

Table 10: Worst-case scenario seasonal threshold for Viking Link Interconnector UXO detonations with and without bubble curtains.

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of detonations	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Single UXO detonation per day without bubble curtains					
'summer'	2,124	7.8	25	27	1.15
Single UXO detonation per day with bubble curtains					
'summer'	707	2.6	25	27	0.38

1 – This accounts for two days 'recovery time' following cessation of UXO detonations.

12.15 The maximum number of detonations permitted under the Marine Licence is 25 and was approved prior to the completion of the UXO clearance surveys. Consequently, the exact number and locations of UXO that may need to be cleared were unknown. Subsequent to the Marine Licence being issued NGVL have undertaken surveys and identified one item of UXO within the SAC and a further three within 26 km of the boundary. Consequently the worst-case scenario will not occur. A revised assessment based on known UXO clearance is presented in Table 11. The results show that based on known survey results the seasonal threshold does not exceed 0.25%. In the event that bubble curation are used for all four detonations the seasonal threshold is reduced to 0.38%.

Table 11: Likely seasonal threshold for Viking Link Interconnector UXO detonations with and without bubble curtains

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of detonations	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Single UXO detonation per day without bubble curtains					
'summer'	2,124	7.8	4	6	0.25
Single UXO detonation per day with bubble curtains					
'summer'	707	2.6	4	6	0.08

1 – This accounts for two days 'recovery time' following cessation of UXO detonations.

12.16 This assessment is precautionary in that it is based on the maximum area of impact within the SAC for all four detonations and it is known that for three items of UXO this cannot be the case as they lie outwith the SAC and for the one item of UXO within the SAC to have the maximum impact it must occur along a length of no more than 6.9 km of cable route (Figure 15).

12.17 NGVL have committed to using bubble curtains when conditions are suitable for their use (NGVL 2019b). Based on the 88% usage of bubble curtains by Ørsted during 2019 in the region it is likely that NGVL will also use bubble curtains during UXO clearance along the cable route. In the event that this occurs the daily threshold is reduced to 2.6% and the seasonal threshold to 0.08% (Table 11).

12.18 BEIS have been made aware that Ørsted and NGVL will be using the same vessel when operating bubble curtains; both projects cannot operate bubble curtains at the same time. A realistic worst-case in-combination scenario is for only one project to undertake UXO clearance during any one day.

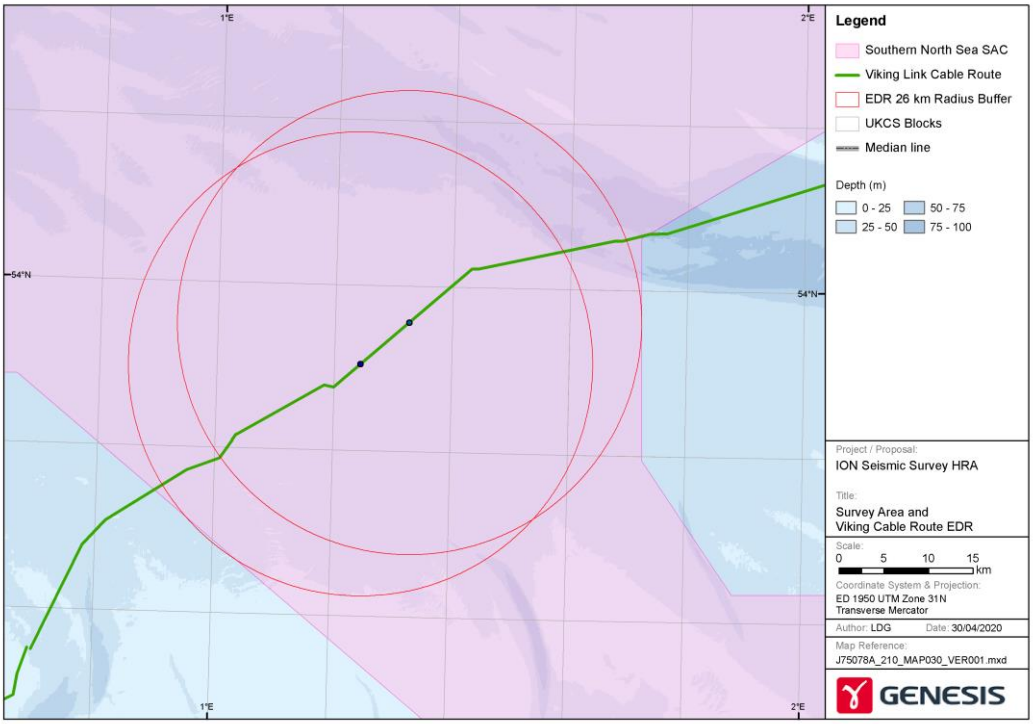


Figure 15: Locations where maximum area of impact within the SAC could occur from Viking Link Interconnector UXO clearance.

Triton Knoll

12.19 The Triton Knoll offshore wind farm is a Round 2 offshore wind farm. At its closest point the Project site lies 32 km off the coast of Lincolnshire and covers an area of approximately 145 km^2 (TKOWFL 2011). The project lies wholly outwith the SAC but partially within 26 km of the SAC boundary.

12.20 Offshore construction requiring pile-driving is anticipated to last no more than 23 days and be completed by 13 June 2020.

12.21 Results from the noise modelling undertaken for BEIS indicate that there is potential for sound levels arising from pile-driving to cause the onset of PTS from between 1.56 km and 2.54 km depending on the hammer energy used to install the pile and the location of the pile-driving within the wind farm area. Noise capable of causing the onset of PTS may extend over an area of between 7.8 km^2 and 20.5 km^2 (BEIS 2018).

12.22 The harbour porpoise density across the Triton Knoll wind farm area is estimated to be 0.11 ind./km^2 (TKOWL 2011). Based on this site specific density, between one and two harbour porpoise are predicted to be at risk of PTS at the start of pile-driving activity; this is equivalent to no more than 0.0005% of the North Sea Management Unit population.

12.23 Displacement of harbour porpoise may extend from between 16.1 km and 16.9 km and cover an area of between 689.9 km^2 and 934.5 km^2 depending on the pile-driving location and the hammer energy used to install the pile. Based on results using a dose response curve and a zonal specific mean density of 0.11 ind./km^2, the estimated number of harbour porpoise predicted to be displaced is between 27 and 39 individuals; 0.008% and 0.01% of the North Sea Management Unit population. Within the SAC it is estimated that no harbour porpoise will be displaced by pile-driving during construction of the wind farm (BEIS 2018).

12.24 Based on the draft threshold approach the maximum area of the Southern North Sea SAC that could be impacted based on a 26 km EDR is 0.18% and the seasonal threshold is 0.02% (Table 12).

Table 12: Daily and seasonal spatial overlap for Triton Knoll pile-driving.

SAC area	Maximum area of SAC impacted (km^2)	Daily Threshold (%)	No. of days pile-driving	Estimated duration of impact (days) [1]	Seasonal Threshold (%)
Pile-driving					
'summer'	47.86	0.18	23	25	0.02

1 – This accounts for two days 'recovery time' following cessation of pile-driving.

Oil and gas industry activities

12.25 There are currently 23 planned or consented oil and gas related activities that could have the potential to cause an in-combination impact including seismic two surveys (Table 5).

ION Seismic survey

12.26 An application to undertake a 3D seismic survey by GX Technology / ION Geophysical Corporation (hereafter ION) was submitted to the Department for Business Energy and Industrial Strategy (BEIS) on 23 March 2020.

12.27 The proposed regional survey will be undertaken across the Southern North Sea in quadrants 35, 36, 37, 38, 41, 42, 43 and 44 off of the east coast of England. The planned survey is located within UKCS Blocks 35/23, 35/24, 35/25, 35/28, 35/29, 35/30, 36/21 – 36/30, 37/16 – 37/30, 38/16, 38/17, 38/18, 38/21,38/22, 38/23, 38/26, 38/27, 38/28, 41/3 – 41/5, 42/1 - 42/5, 43/1 – 43/5, 44/1 – 44/3. The Permit area covers approximately 22,980 km^2, with the Survey Area covering 13,269 km^2 (Figure 16) (ION 2020a, b).

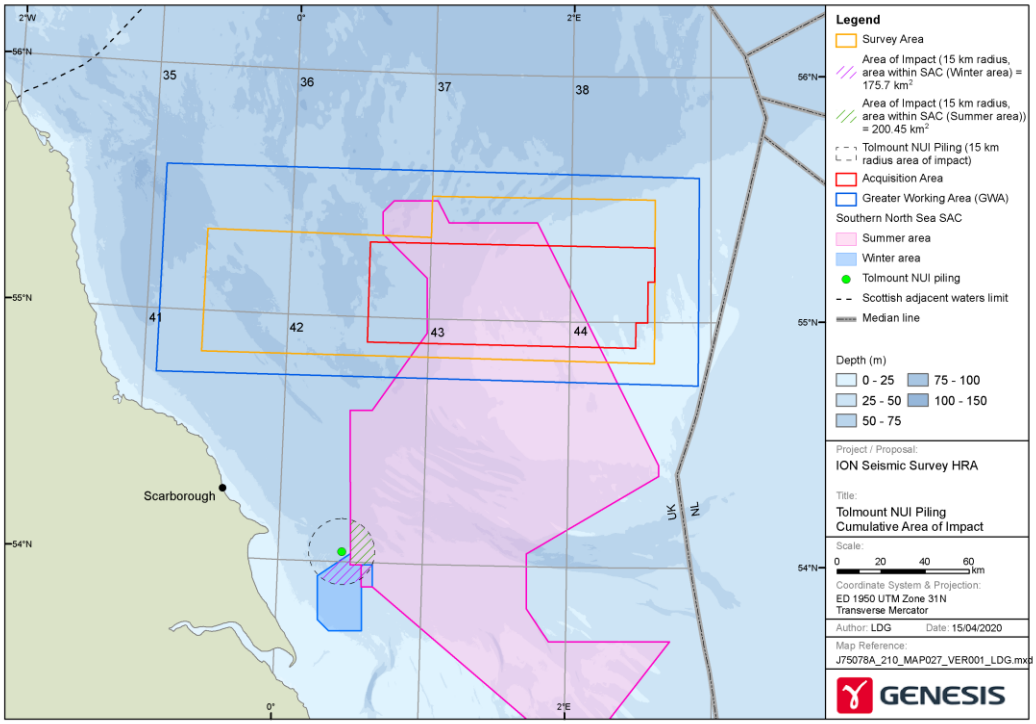


Figure 16: Location of proposed Tolmount pile-driving and ION Seismic survey.

12.28 The survey was scheduled to take place between 1 April and 22 October 2020 and expected to last up to 165 days (ION 2020c). However, since the application was made the start date has been delayed and will now start no sooner than 1 June 2020.

12.29 The total length of line to be surveyed is between 15,392 km and 36,109 km and will be undertaken over either 198 and 128 survey lines (ION 2020c). The total length of survey line wholly within the SAC is not presented in the application but has been calculated by BEIS to be a maximum of 11,513 km, with a maximum length of any single line within the SAC of 89 km.

12.30 Noise modelling undertaken by ION indicates that, based on the weighted SEL threshold, there is potential for sound levels from the proposed seismic survey to cause the onset of PTS to harbour porpoise out to 320 m of the sound source.

12.31 The peak harbour porpoise density across the SAC is estimated to be >3 per km^2 (Figure 6) (Heinänen and Skov 2015). Based on this peak density and the worst-case scenario of PTS occurring out to 320 m of the survey, an estimated one harbour porpoise could be affected at the start of the seismic survey.

12.32 The North Sea Management Unit harbour porpoise population is 333,808 individuals and therefore the worst-case scenario of one harbour porpoise being impacted is <0.0001% of the Management Unit population.

12.33 The estimated area of potential impact from PTS is within 500 m of the airgun array and therefore within the radius which, if marine mammals are detected during a pre-shooting search, the commencement of the firing of the airguns must be delayed by a minimum of 20 minutes, as per the JNCC guidance (JNCC 2017a). Harbour porpoise will avoid the area of potential injury and move away from the seismic survey vessel as it approaches. Consequently, apart from when the operation of the airgun initially commences, there is a very low risk of physical injury to any harbour porpoise.

12.34 The largest distance any noise likely to cause disturbance is estimated to propagate out to is 12 km from the airguns, covering an area of 452 km^2 (ION 2020a). Based on a peak site density of 3.0 ind./km^2 an estimated 1,356 harbour porpoise could be disturbed by a seismic survey. This is equivalent to 0.4% of the North Sea Management Unit harbour porpoise population being disturbed.

12.35 BEIS have undertaken an HRA for the proposed ION seismic survey (BEIS 2020). In order to undertake the HRA BEIS calculated the daily and seasonal thresholds based on the draft threshold approach.

12.36 The maximum realistic area within the SAC that will be impacted per day is estimated to be 2,136 km^2. This is equivalent to impacting 5.8% of the SAC as a whole and 7.9% of the 'summer' area per day.

12.37 Based on the daily average impact the seasonal threshold would be 4.5% of the SAC (Table 13).

Table 13: Estimated extent of seasonal disturbance on harbour porpoise from proposed ION seismic survey within the SAC.

SAC area	Area impacted per day (km^2)	Daily Threshold (%)	Estimated duration of impact (days)	Seasonal Threshold (%)
Worst-case (Maximum daily impact - 122 days in summer period)				
'summer'	2,136	7.9	122	5.3
Realistic worst-case (Mean daily impact 122 days in summer period)				
'summer'	1,805	6.7	122	4.5

Other oil and gas applications

12.38 Chrysaor Production (U.K.) Limited have applied for a Marine Licence to remove the Viking GD jacket and associated piles and risers (ML/384/4). The work will be undertaken between 1 May 2018 and 30 June 2020 and require the use of heavy-lift vessels. In addition there is contingency to undertake dredging activities. Noise from both the vessels used during decommissioning and dredging (if undertaken) could cause localised displacement of harbour porpoise. The effects are predicted to be limited to within 600 m of the proposed activities and temporary. The small

scale and temporary nature of the disturbance is not predicted to contribute in any significant way to an in-combination impact.

12.39 Spirit Energy have applied for two Marine Licences to undertake decommissioning activities at the Audrey B installation, located within the Southern North Sea SAC (ML/411/2 and ML/431/1). The work is to be undertaken between 23 November 2018 and 31 October 2020 and entails the removal and temporary deposit of risers on to the seabed. Noise arising from this activity will be primarily from the vessel(s) undertaking the work. Vessel noise will be localised and temporary and will not contribute in any significant way to the current levels of shipping and noise within the SAC.

12.40 Chrysaor Production (U.K.) Limited have applied for a Marine Licence to remove mattresses and move rock within the SAC as part of their ongoing decommissioning activities at the LOGGS complex. (ML/570/0). Work will be undertaken between 1 May and 31 October 2020. The work will require the use of vessels and a small electric dredger to reposition the rock. The predominant noise source will be vessel noise which could cause a localised area of disturbance and not contribute in any significant way to the current levels of shipping occurring within the SAC.

12.41 Premier Oil have submitted an application to prepare seabed prior to installing two pipelines (a 20" production pipeline and 3" methanol pipeline) from the Tolmount field to Easington terminal (ML/551/0). The proposed activities will be undertaken between 1 March and 30 September 2020. Activities include pre-cut trenching operations, dredging and post-lay trenching operations. Noise from dredging operations is predicted to impact on a localised area and cause localised level of displacement out to no more than 600 m (See Para. 8.15). The impacts from disturbance will be temporary with any harbour porpoise returning to the area once the activities have been completed. The small scale and temporary nature of the disturbance is not predicted to contribute in any significant way to an in-combination impact.

12.42 An application to deposit two mattresses and a telecommunications branching unit has been made by Tampnet AS (Licence Ref. No. ML-495). The proposed activities occur within the Southern North Sea SAC and are to be undertaken between 18 July 2019 and 30 June 2020. The only sound arising is from the vessel(s) that will be used to undertake the work. Vessel noise does have the potential to cause a localised area of disturbance for harbour porpoise within the SAC. The additional vessel(s) required to undertake the work is not considered likely to contribute significantly to the current levels of shipping occurring within the SAC and therefore not cause an in-combination impact.

Shipping

12.43 There is potential for an in-combination impact with the proposed pile-driving and existing vessel activity.

12.44 The impacts of shipping on harbour porpoise within the SAC were assessed by BEIS in the Review of Consents HRA (BEIS 2018). The assessment estimated that across the SAC an average of 737 vessel movements were undertaken each day and at any one time harbour porpoises may be being displaced across an area of 369 km^2 within the SAC. Based on an average density of 0.71 ind./km^2 harbour porpoise across the SAC, an estimated 262 harbour porpoise may be temporarily displaced; 0.08% of the North Sea Management Unit population.

12.45 The number of vessels operating in the 'summer' area during the summer period each year is unknown and therefore it is not possible to calculate the potential daily or seasonal areas of impact required for the threshold approach. Although it is recognised that there will be localised areas of displacement surrounding vessels, the impacts will be very temporary with harbour porpoise predicted to remain in the areas following the departure of the vessel. Consequently, there will be no daily or seasonal disturbance equivalent to those arising from other activities.

In-combination scenarios

12.46 The in-combination assessment has been undertaken using outputs from both noise modelling and the threshold approach.

12.47 Due to the number of current and planned activities being undertaken within or adjacent to the SAC and the level of uncertainty surrounding them, there are a number of potential in-combination scenarios. This section assesses the potential levels of in-combination impact that could arise.

12.48 The timelines for each of the activities identified as having the potential to cause an in-combination impact are presented in Figure 17. Four projects have been identified as having the potential to cause an in-combination impact during September 2020:

- Hornsea Project Two UXO clearance,
- Hornsea Project Two construction pile-driving,
- ION seismic Survey,
- Viking Links UXO clearance.

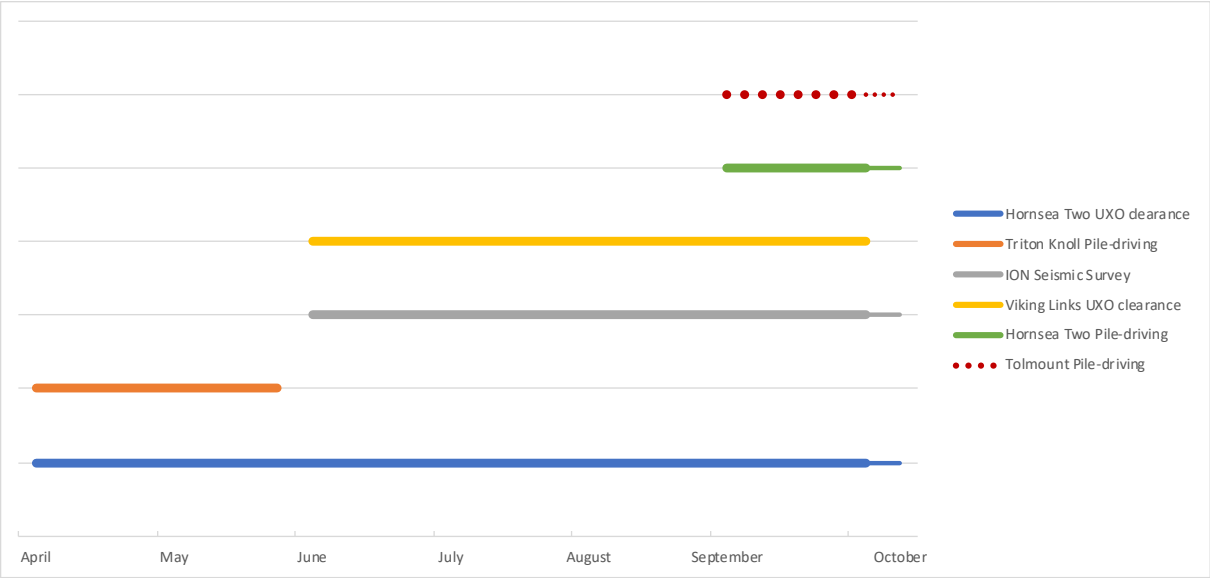


Figure 17: Timeline of activities within the Southern North Sea SAC that may have an in-combination impact.

Note: the above figure presents the timeline during which an activity could be undertaken The total duration of each activity may be considerably shorter than the timeline itself.

In-combination Impacts on Southern North Sea SAC: Harbour porpoise.

Noise modelling

12.49 This section assesses the potential in-combination impacts based on the results from noise modelling undertaken for each of the applications.

Physical Injury

12.50 Based on the results from the noise modelling a total of 631 harbour porpoise could be at risk of PTS from proposed activities affecting the Southern North Sea SAC (Table 14). Consequently, it is estimated that up to 0.19% of the North Sea Management Unit could, in theory, be impacted.

Table 14: Estimated number of harbour porpoise at risk of PTS from proposed activities in Southern North Sea SAC without mitigation.

Activity	PTS
Tolmount Pile-driving	<1
ION Seismic Survey	1
Triton Knoll Pile-driving	2
Hornsea Pile-driving	2
Viking Link Interconnector UXO clearance	200
Hornsea UXO clearance	425
Total	**631**

12.51 For UXO clearance at Hornsea Two and Viking Link Interconnector, both Ørsted and NGVL have committed to incorporating mitigation measures in order to reduce the risk of injury (Ørsted 2018d 2020a, NGVL 2019a, b). Mitigation that may reduce the risk of injury include the use of MMO and the use of ADDs. Under certain conditions both developers may also use 'scare charges' and bubble curtains to help reduce the extent of injurious noise. Although the use of mitigation may reduce the risk of auditory injury it is recognised that it is not possible to totally prevent it and both developers have applied for European Protected Species (EPS) licences for both disturbance and injury.

Disturbance

12.52 The number of harbour porpoise predicted to be disturbed by the proposed Tolmount pile-driving is less than 90 individuals.

12.53 An estimated is 1,356 individuals may be disturbed by the proposed ION seismic survey. Although, the mobile nature of the seismic survey will cause a wider area to be disturbed and consequently increase the number of harbour porpoise potentially affected.

12.54 Due to the nature of the sound arising from the detonation of UXO, i.e. a number of single discrete events undertaken over an extended period of time with each blast lasting for a very short duration, harbour porpoise are not predicted to be significantly displaced from an area. Should they occur, any changes in behaviour are predicted to be very short-lived. Existing guidance suggests that disturbance behaviour is not predicted to occur from UXO clearance if undertaken over a short period of time (JNCC 2010a). It is also recognised that frequent UXO clearance in a single area could cause displacement and disturbance and this has been calculated for Viking Link based on a 26 km radius of disturbance (NGVL 2018a) but not been undertaken for clearance of UXO at Hornsea Two.

12.55 The potential impacts from displacement or disturbance will be temporary. If displaced, harbour porpoise will be able to relocate elsewhere and evidence from studies indicate that they will return to the area within 24 hrs of the noise ceasing.

In-combination threshold approach

12.56 There are a number of potential scenarios that could be used for assessing the in-combination impacts using the threshold approach:

- 'Theoretical worst-case'. This scenario presumes that Pile-driving at Tolmount will occur at the same time as UXO clearance by both Ørsted and NGVL. Bubble curtains are not used and up to six items of UXO are cleared in a single day. This scenario is theoretically possible under the licence conditions. However, BEIS believe this is highly unlikely to arise on the basis that both Ørsted and NGVL have committed to using bubble curtains whenever possible and recent experience in the area indicates a very high usage of bubble curtains during UXO clearance. Furthermore, UXO clearance at both projects will not occur on the same day. BEIS does not believe that this theoretical worst-case scenario will arise and therefore has not considered it further in this assessment.
- 'Realistic worst-case'. This scenario is based on pile-driving at Tolmount occurring at the same time as the maximum daily length of line within the SAC from the proposed ION seismic survey. It presumes that there is only one developer clearing UXO during any one day and that the UXO is cleared on that day without the use of a bubble curtain. This scenario is a realistic worst-case in that it is known that a small proportion of UXO cleared in the area during 2019 did not use bubble curtains and therefore it is likely that during at least one day in the summer period of 2020 this will occur. However, it is thought unlikely that both projects will clear UXO on the same day, in particular as only four items of UXO that could impact on the SAC have been identified by Viking Link project. BEIS is of the opinion that the realistic worst-case is the most appropriate scenario for assessing the daily threshold based on the currently available information.
- 'Realistic-case'. This scenario is based on the estimated average length of line surveyed within the SAC by the proposed ION seismic survey. It assumes that bubble curtains will be used by both developers when undertaking UXO clearance and that only one developer will clear UXO during any one day. Therefore there is no in-combination impact from UXO clearance in any one day. BEIS is of the opinion that this is the most likely and realistic scenario for assessing the seasonal threshold based on the currently available information.

12.57 Based on the realistic worst-case scenario the daily threshold will not be exceeded during September 2020, with a realistic worst-case scenario indicating a maximum area of impact of 17.2% of the 'summer' area (Table 15).

Table 15: In-combination daily thresholds (%).

Activity	September 2020	
	Realistic worst-case	Likely worst-case
Tolmount Pile-driving	0.8	0.8
ION Seismic Survey	7.9	6.7
Hornsea Two UXO detonation (5/day)	8.5	4.6
Triton Knoll Pile-driving	0	0
Total %	**17.2**	**12.1**

The realistic worst-case scenario presumes:

- No use of bubble curtains.
- Only one developer will clear UXO during any single day and therefore there is no daily in-combination UXO impact between Hornsea Two and Viking Link. Hornsea Two has the larger of the predicted daily impacts and is therefore used
- Maximum extent of ION seismic survey covered in one day

Likely worst-case is based on:

- The use of bubble curtains for UXO clearance.
- Only one developer will clear UXO during any single day and therefore there is no daily in-combination UXO impact between Hornsea Two and Viking Link. Hornsea Two has the larger of the predicted daily impacts and is therefore used.
- An estimated average daily length of ION seismic survey line within SAC of 75.2 km.

12.58 Under both the realistic and likely worst-case in-combination scenarios the seasonal threshold is not exceeded (Table 16). In the event that activities are delayed or not undertaken the in-combination seasonal threshold during 2020 may be reduced.

Table 16: In-combination seasonal thresholds %

Activity	Summer seasonal threshold (%)	
	Realistic worst-case	Likely worst-case
Tolmount Pile-driving	0.02	0.02
ION Seismic Survey [1]	5.3	4.5
Hornsea Two UXO detonation (1/day) [2]	2.5	0.88
Hornsea Two Pile-driving	0.05	0.05
Viking Link UXO detonation (1/day) [2]	0.25	0.08
Triton Knoll Pile-driving	0.02	0.02
Total	**8.1**	**5.6**

1 - Based on an estimated average daily length of survey line within SAC of 75.2 km

2 - Realistic worst-case is based on no use of bubble curtains, likely worst-case presumes use of bubble curtains.

12.59 There are varying levels of confidence in the extent and duration of impacts from each of the activities that could occur within the Southern North Sea SAC which affect the results of this assessment; a summary is presented in Table 17. Any changes in any of the Projects' schedules or scopes of work could affect the threshold based assessment.

Table 17: Confidence in extent and duration of potential impacts from planned activities within or adjacent to the Southern North Sea SAC between April and September 2020.

Project	Confidence	Comment
Tolmount pile-driving	Very High	High level of certainty activities will be undertaken during 'summer 2020'. High level of certainty in the area of SAC that could be impacted. High level of certainty from published evidence on the extent and duration of impacts.
ION Seismic Survey	High	High to Moderate certainty activities will be undertaken during 'summer' 2020. Moderate to Low certainty on when activities will commence. Very High level of certainty that the survey will be undertaken along known pre-determined survey lines. High level of certainty from published evidence on the extent and duration of impacts.
Hornsea Two UXO Clearance	Moderate	Very High certainty activities will be undertaken during 'summer' 2020. Very High confidence of regular usage of bubble curtains to mitigate noise impacts. Low certainty on the location and number of UXO required to be detonated. Low certainty on the number of UXO to be cleared per day, ranging anywhere from between one and five. Daily and Seasonal thresholds are based on two opposing scenarios. Both cannot happen. Very limited evidence on the extent of displacement from UXO clearance. No evidence supporting a 26 km EDR, nor the 15 km EDR used with bubble curtains.
Hornsea Two pile-driving	High	High certainty activities will be undertaken during 'summer' 2020 but might not commence until after September 2020. High level of certainty in the area of SAC that could be impacted. High level of certainty from published evidence on the extent and duration of impacts.
Viking Link UXO clearance	High	High certainty activities will be undertaken during 'summer' 2020 but might not commence until after September 2020. Very High certainty in the location and number of UXO required to be detonated. Very limited evidence on the extent of displacement from UXO clearance. No evidence supporting a 26 km EDR, nor the 15 km EDR used with bubble curtains.
Triton Knoll pile-driving	Very High	Very High certainty activities will be undertaken during 'summer' 2020. High level of certainty in the area of SAC that could be impacted. High level of certainty from published evidence on the extent and duration of impacts.

In-combination assessment Southern North Sea SAC conclusions

12.60 Results from noise modelling indicate that up to 631 harbour porpoise could, in theory, be at risk of physical injury in the form of PTS from all planned activities within or adjacent to the SAC. This is 0.19% of the Management Unit population and therefore below the level of 1.7% at which a population level effect is predicted to occur. Mitigation measures that are conditions to licences significantly reduce the risk of any harbour porpoise receiving sound levels capable of causing the onset of PTS.

12.61 The results from the threshold approach indicate that the daily threshold will not be exceeded under either the realistic or likely worst-case scenarios.

12.62 The seasonal threshold will not be exceeded under any scenario.

12.63 Based on the best available information and supported by results from noise modelling and the draft threshold approach, BEIS is satisfied that the proposed Tolmount pile-driving in-combination with other plans will not have an adverse effect upon the integrity of the Southern North Sea SAC with respect to harbour porpoise.

13 MITIGATION

13.1 The following section presents a summary of the planned mitigation submitted by the Applicant that will reduce the risk of an adverse effect occurring.

13.2 Premier Oil have committed to following the JNCC guidelines *Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise* (JNCC 2010b). This will include:

- Use the visual monitoring protocol i.e., use trained marine mammal observers (MMOs);
- Set an exclusion zone of 500 m for the MMO; should a marine mammal be detected within the exclusion zone then work should be delayed until such a time the exclusion is clear and soft start can proceed;
- Use the acoustic monitoring protocol i.e. make use of passive acoustic monitoring (PAM) devices to detect mammals;
- Use the soft start protocol.

14 CONCLUSIONS

14.1 The Secretary of State has carefully considered all of the information available in order to undertake a Habitats Regulations Assessment. He considers the proposed Tolmount pile-driving to have the potential to cause a Likely Significant Effect alone and in-combination with other plans or projects on the qualifying species of the Southern North Sea SAC.

14.2 The Secretary of State has undertaken an Appropriate Assessment in respect of the site's Conservation Objectives to determine whether the project, either alone or in-combination with other plans or projects, will result in an adverse effect on integrity.

14.3 The Secretary of State has undertaken a robust assessment using all of the information available to him.

14.4 Having considered all of the information available to him the Secretary of State has concluded that the proposed Tolmount pile-driving will not have an adverse effect on the integrity of any of the designated sites either alone or in-combination with other plans or projects.

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