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).

***BP Endurance Field Integrated Site Survey***

***Issued September 2020***
**Rev 2.2**

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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 to undertake a Marine Survey by BP Exploration Operating Company Limited (hereafter BP) was submitted to the Department for Business Energy and Industrial Strategy (BEIS) on 21 August 2020.

1.8 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 a proposed BP Endurance Field Integrated Site Survey that may cause a significant effect on the qualifying features of the Southern North Sea SAC.

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

# 2 SURVEY DESCRIPTION

2.1 The following is a brief summary of the proposed surveys, further details may be found within the application (BP 2020a, b).

2.2 The proposed surveys will be undertaken at two locations the Southern North Sea. Survey Area One is located in UKCS Blocks 42/25, 43/21, 43/26 and Survey Area Two 43/27 and 43/28. The Greater Working Area covers 160 km$^2$ in Area One and 48 km$^2$ in Area Two. Data will be collected over an area of 14 km by 8 km (112 km$^2$) in Area One and 7 km by 5 km (35 km$^2$) in Area Two (Figure 1).

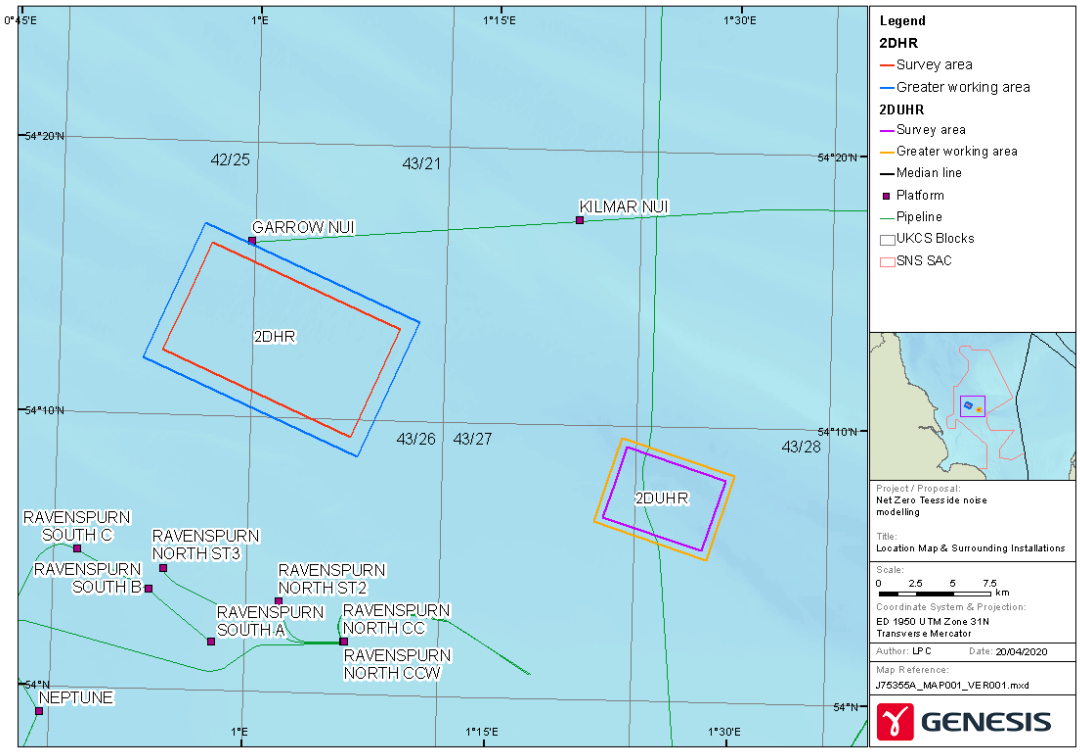



**Figure 1: Location of the proposed BP Endurance Surveys showing survey and greater working areas .**

(Note: A variation to the application has removed the requirement of a 2DUHR and a stacked sparker will be used instead (BP 2020b)).

2.3 The surveys are scheduled to take place between 1 September and 31 October 2020 and expected to last a total of 14 days (BP 2020a,b).

2.4 Three surveys will be undertaken:

- A 2DHR (Two Dimensional High Resolution) survey in Survey Area One. Thirteen survey lines will be undertaken over a period of three days.
- A 4D Test Line survey in Survey Area One. Four survey lines will be undertaken in one day.

- Geophysical survey using a sub-bottom profiler stacked sparker. A total of 51 survey lines will be undertaken over a period of six days in Survey Area Two.

2.5 In addition to the above surveys a sub-bottom profiler (pinger) will be used in both survey areas simultaneously as the airguns. A single-beam echo-sounder, multibeam echosounder, side-scan sonar and a magnetometer will also be used.

2.6 Details of the sound sources from the equipment to be used in each of the Survey Areas are presented in Table 1 (BP 2020a).

**Table 1: Survey parameters.**

| Array Parameter | Area One | | Area Two | Area One & Two |
|---|---|---|---|---|
| Survey | 2DHR Survey | 4D Test Lines Survey | Geophysical | 2DHR and Geophysical |
| Duration (days) | 3 | 1 | 6 | 9 |
| Source | 4 x 40 cu. in | 4 x 40 cu. in | Sub-bottom profiler (Sparker) | Sub-bottom profiler (Pinger) |
| Total volume (cu. In). | 160 | 320 | - | - |
| Sound pressure (dB re 1 µPa (0-p)) | 245.5 | 251.5 | 213 | 214 |
| Sound pressure (dB re 1 µPa (p-p)) | 251.5 | 257.5 | | - |
| Sound exposure level – (dB re 1 $\mu Pa^2s$) | 214.3 | 220.9 | 176 | 170 |
| Peak frequency (Hz) | 90 | 60 | 900 | 3,500 |
| Source point interval (m) | 6.25 | 6.25 | 1 | 0.2 |
| Towed depth (m) | 2.0 | 5.0 | 0.5 – 1.5 | - |
| Vessel speed (knots) * | 4 – 4.5 | 4 – 4.5 | 4 – 4.5 | 4 – 4.5 |

* Within the application BP reported the vessel speed as being at 3 knots (BP 2020a). Subsequent communication has confirmed that the vessel speed during surveys will be between 4 and 4.5 knots (BP 2020b, BP *Pers. Comm.* 2020).

### *Multi-beam echosounders*

2.7 Multi-beam echosounders are used to measure water depth and use multiple (>100) transducers to send out a relatively broad swath of sound covering a large, fan-shaped area of the seabed beneath the vessel. The sound source level, operating frequencies, firing rate and pulse duration vary depending on the depth of the area under investigation. Maximum source levels for the most powerful, deep-water systems are 236-238 dB re 1 µPa-m (zero-peak) and operate at frequencies typically between 10 – 200 kHz. In relatively shallow water depths typically found in the southern North Sea, multi-beam echosounders operate at a relatively lower sound source

and at higher frequencies of between 200 to 500 kHz, that are outwith the hearing range of most marine species (Figure 2) (SCAR 2002, Danson 2005, IHO 2005, Lurton 2016).

### *Side-scan sonar*

2.8 Side-scan sonar involves the use of an acoustic beam to obtain an accurate image over a narrow area of seabed to either side of the instrument. The frequencies used by side-scan sonar are relatively very high (100-500 kHz) and predominantly outside of the hearing range of harbour porpoise (Figure 2).

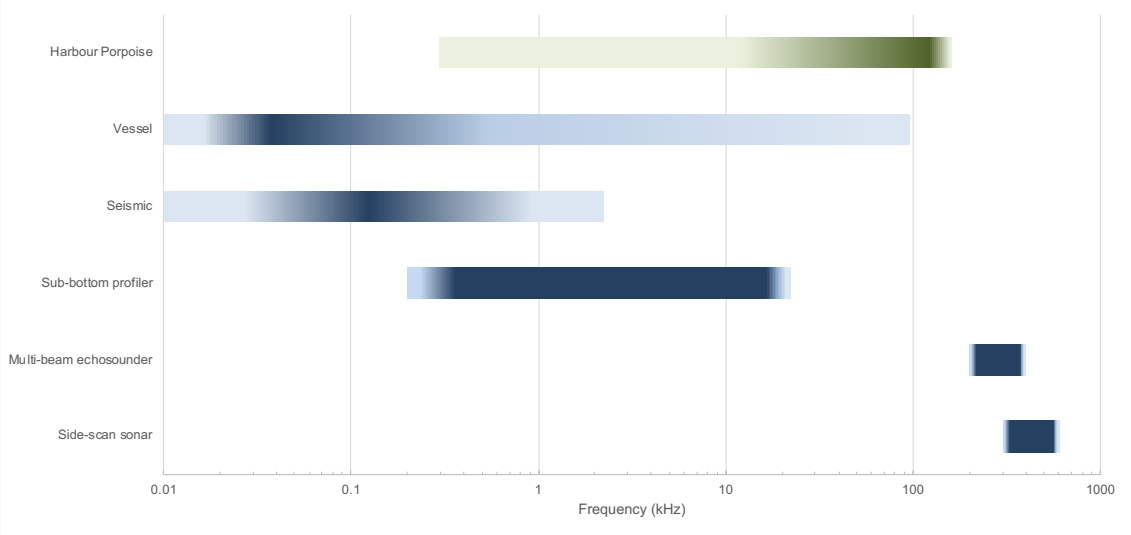



**Figure 2: Sound frequencies produced by proposed survey equipment and harbour porpoise hearing frequencies.**

2.9 The proposed surveys will be undertaken along predetermined lines. Within Survey Area One the lines will be approximately 2,000 m apart during the 2DHR survey (Figure 3). Within Survey Area Two the lines will be between 150 m and 500 m apart depending on the line direction (Figure 4). The airguns used in Survey Area One may be kept on during the line turns, which will last between 30 and 60 minutes depending on their location (BP 2020b).

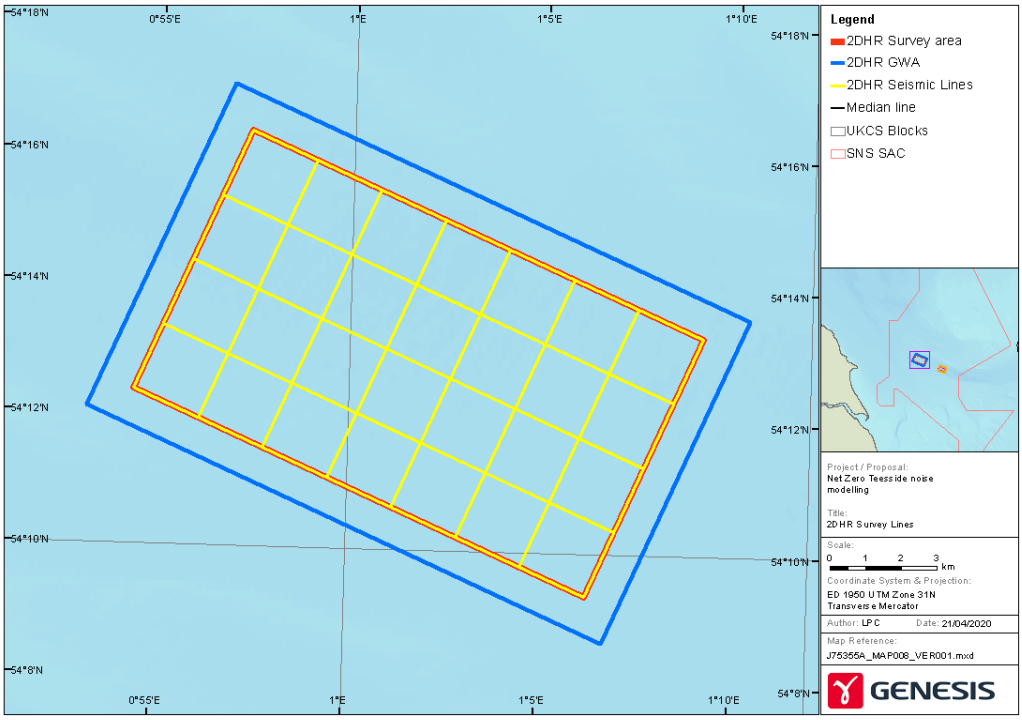



**Figure 3: Survey Area One and proposed 2DHR and 4D Test Line survey lines.**

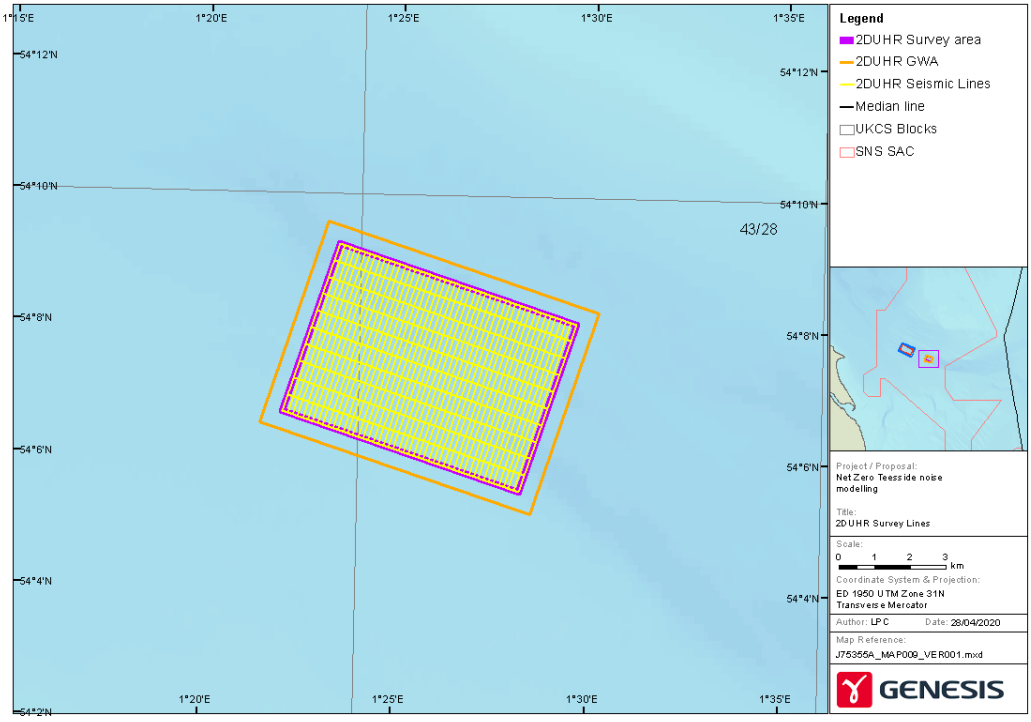



**Figure 4: Survey Area Two and proposed survey lines.**

(Note: A variation to the application has removed the requirement of a 2DUHR and a stacked sparker will be used instead (BP 2020b)).

# 3 DESIGNATED SITES

3.1 The proposed surveys are being undertaken in waters within or adjacent to a number of European designated sites and it is recognised that potential impacts that could cause a likely significant effect could occur to a number of qualifying species both within and outwith designated sites.

3.2 Based on the information presented within the application, including the results from the noise modelling undertaken in support of the application, One SAC has been identified as having qualifying species at risk of a likely significant effect from the proposed survey (Figure 5).

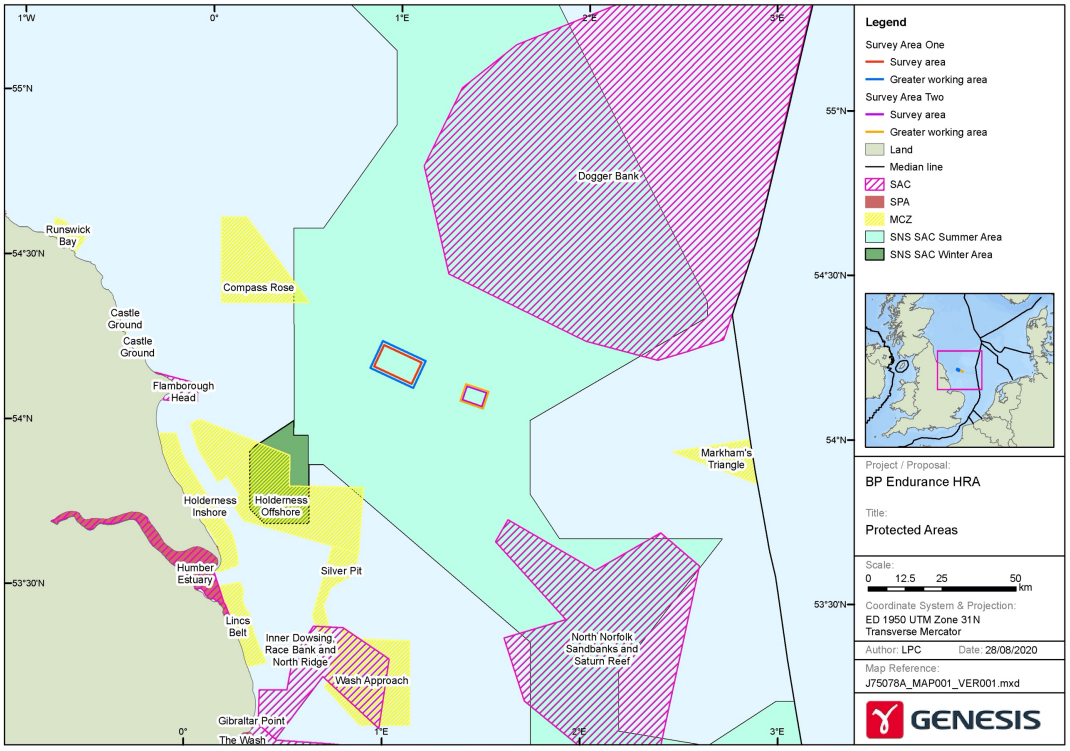



**Figure 5: Location of proposed BP Endurance surveys and designated sites.**

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

- Southern North Sea SAC (Harbour porpoise),

3.4 The proposed Greater Working Areas and Survey Areas overlap with the Southern North Sea SAC.

### *Qualifying features*

3.5 Based on the information presented within the application and advice received from consultation (JNCC 2020a) it has been determined that the HRA should consider alone and in-combination the potential direct and indirect impacts on:

- Harbour porpoise.

### *Harbour porpoise*

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

- Southern North Sea SAC,

3.7 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).

3.8 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 (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).

3.9 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 6) (Hammond *et al*. 1995, Hammond 2006, Hammond *et al.* 2017).

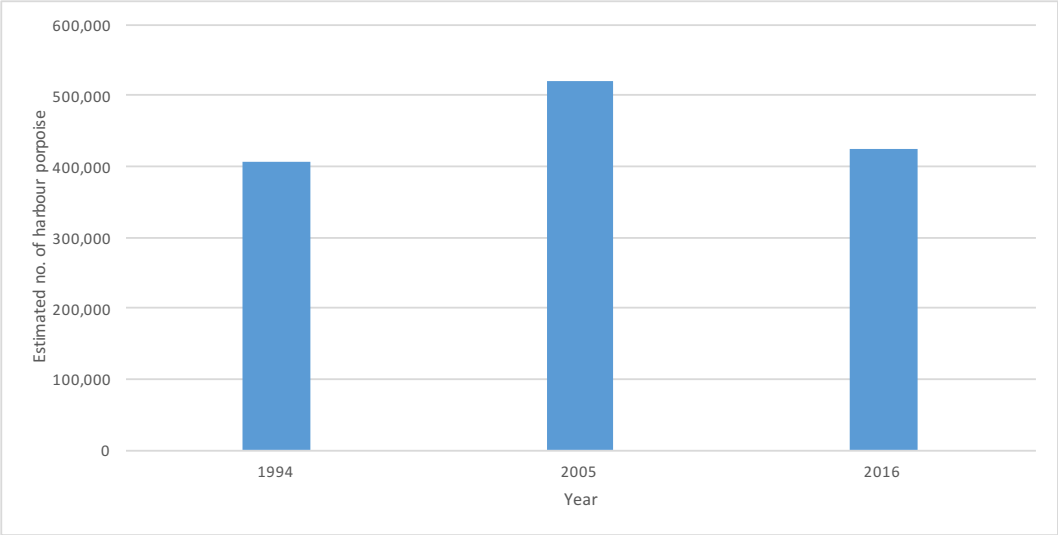



**Figure 6: Estimated number of harbour porpoise within the SCANS survey area recorded during SCANS I, II and III surveys (Hammond *et al.* 2017).**

3.10 There are three Management Units identified for harbour porpoise in the north-east Atlantic, of which, the Southern North Sea SAC lies within the North Sea Management Unit. The harbour porpoise population within the North Sea Management Unit was originally estimated to be 227,298 (176,360 – 292,948) (IAMMWG 2015). 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.

3.11 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).

3.12 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 across nearly all wind farm surveyed areas occurs between November and February,

although the poorer survey conditions that occur predominantly during the winter months may be a contributing factor in the lower number of harbour porpoise recorded during this period.

3.13 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. 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 (Heinänen and Skov 2015).

3.14 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 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).

3.15 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).

3.16 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).

3.17 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).

3.18 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.

3.19 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).

3.20 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).

3.21 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.

3.22 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).

3.23 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.

3.24 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*

3.25 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 site by reducing their prey base. Harbour porpoise prey on a variety of fish species that could be impacted by the proposed survey including gobies, Sandeel Spp., whiting, herring and sprat (JNCC and NE 2019).

3.26 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).

3.27 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).

3.28 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).

3.29 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).

3.31 Sandeels are not considered to have sensitive hearing (Popper *et al.* 2014). Studies undertaken using airguns indicate that sandeels have distinct but weak reactions to seismic airguns with initial startle responses reducing in frequency with on-going noise, and no increased mortality was detected (Hassel *et al.* 2004).

3.32 There are limited studies assessing potential impacts on eggs and larvae. Results indicate that there is potential for increase in mortality when larvae are exposed to an airgun sound source with peak sound pressure levels of 220-242 dB re 1 $\mu Pa^2$ (unknown measure), but only within 5 m of the airgun (Popper *et al*. 2014).

### *Information Sources*

3.33 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:

- BP (2020a). The Net Zero Teesside Project UKCS Block 42 and 43. Environmental Justification report. 21 August 2020.
- BP (2020b). Application GS/1124/0 (Version 2). Application to carry out a Marine Survey. 21 August 2020.
- 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 (2020b).
- Harbour Porpoise (*Phocoena phocoena*) possible Special Area of Conservation: Southern North Sea. Conservation Objectives and Advice on Activities. JNCC and NE (2019).

3.34 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 survey are sound from the airguns, sub-bottom profilers and the physical presence of the vessel (Figure 2). No other sources of potential impact that could affect qualifying habitats or species have been identified.

4.2 The airguns used in the seismic surveys are pneumatically-driven impulsive transducers that generate high intensity, low frequency, short duration sound pulses at regular intervals of typically between every 10 to 15 seconds. The seismic source geometry is designed to focus the output from the array vertically downwards minimising any horizontally propagating sounds (OGP/IAGC 2004). The level of sound generated by an airgun array depends on various factors including gun volume, array design, the number of airguns, spacing and air pressure. Field measurements of the sound emitted by airgun arrays used by the oil and gas industry show that levels of source intensity expressed as peak SPL range from 235 to 259 dB re 1µPa- m (Richardson *et al*. 1995, OSPAR 2009). The frequency range of emitted energy is typically in the 5 Hz to 500 Hz range and strongest from 10 to 120 Hz, but with some energy in the 500 Hz to 1 kHz range (Richardson *et al*. 1995, Hermannsen *et al.* 2015).

4.3 Sub-bottom profiling is used to determine the stratification of soils beneath the sea floor. Various types of instrument may be used, such as pingers, boomers, sparkers and chirpers, depending on the required resolution and seabed penetration. They produce sound source levels of between 196 and 225 dB re 1 µPa -1 m $_{(rms\ SPL)}$ and at frequencies ranging from between 0.5 and 300 kHz and are therefore audible to marine mammals (Figure 2) (BOEM 2016, King 2013, Danson 2005).

4.4 Chirpers are frequency modulated sub-bottom profilers capable of providing high penetration and high resolution data. They have largely replaced the use of sparkers and boomers when undertaking many surveys. They produce sound levels of between 189 and 214 dB re 1 µPa – m (rms SPL) at frequencies of between 2 and 24 kHz. They cover a relatively broad range of frequencies that are detectable by marine mammals.

### *Marine Mammals*

4.5 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).

4.6 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.

4.7 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 with harbour porpoise more sensitive to relatively high frequencies compared with many other marine mammals. 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*

4.8 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*

4.9 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*

4.10 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.

4.11 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*

4.12 There is potential for impacts on prey species to affect harbour porpoise, in particular possible impacts of noise on fish species.

# 5 NOISE MODELLING

5.1 To assess the potential environmental impacts from the proposed survey the applicant has undertaken noise modelling using outputs derived from a Gundalf airgun model and a directional propagation model (BP 2020a).

5.2 Results from the modelling indicate the extent at which the onset of a Permanent Threshold Shift (PTS), Temporary Threshold Shift (TTS) or disturbance could occur from the airguns during the proposed survey on marine mammals.

5.3 The modelling indicates that there is a risk of PTS to harbour porpoise from the airgun array to be used during the 4D Test Line survey within 570 m, based on the cumulative SEL metric. For the 2DHR airgun array the onset of PTS could arise within 110 m of the airgun array (Table 2) (BP 2020a).

5.4 The results from the modelling indicate that there is a risk of behavioural effects, e.g. displacement and disturbance to a harbour porpoise within an area of 8.5 km, based on the use of a 360 cu. in. airgun during the 4D Test Line survey and within 5 km of the 180 cu. in. airgun array proposed for the 2DHR survey (Table 2) (BP 2020a).

5.5 The potential area over which disturbance to harbour porpoise is predicted to arise at any one point during the surveys is estimated to be between 65 $km^2$ and 147 $km^2$. Overall, the surveys within Survey Area One are predicted to impact over an area of 380 $km^2$ and 590 $km^2$, depending on which of the two surveys is being undertaken (BP 2020a).

5.6 Injury to fish is expected to arise from between 40 m and 150 m of the airguns depending on species group and the airgun array. There are no data available to assess the potential area of disturbance to fish species.

5.7 No noise modelling has been undertaken for the use of the sub-bottom profilers as at the time of application the applicant had proposed the use of an airgun array for use in the Survey Area Two. This has now been replaced by the use of a sparker sub-bottom profiler. The pinger sub-bottom profiler is to be used simultaneously as the airguns and predicted to have a smaller range of impact; consequently the noise arising from it was not modelled.

**Table 2: Predicted extent of potential auditory injury (PTS) and disturbance from the proposed surveys (Source BP 2020a).**

| Survey | PTS | | Disturbance | | |
|---|---|---|---|---|---|
| | Distance (m) | Area ($m^2$) | Distance (km) | Area ($km^2$) | Total area ($km^2$) |
| 4D Test Line survey | 570 | 3,581 | 8.5 | 147 | 590 |
| 2DHR survey | 110 | 691 | 5.0 | 65 | 380 |

# 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; 2020b). 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 3 (JNCC 2020b). Relevant to this assessment are the EDRs for seismic surveys and high resolution geophysical surveys. The JNCC have advised that due to the relatively small size of the airguns to be used during the surveys that the EDR to be used in this assessment should be 10 km (JNCC *Pers. comm.* 2020). A 5 km EDR has been used for Survey Area Two where a sparker sub-bottom profiler will be operated.

**Table 3: Precautionary Effective Deterrent Ranges (EDR) (Source: JNCC 2020b).**

| 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 2020b).

6.3 The SNCBs recognise that future data may require the suitability of the EDR to be reconsidered if it is found to be inappropriate (JNCC 2020b).

# 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.

### *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 Draft 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 2020b). 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 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 2020b).

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 4. 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 4: 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.

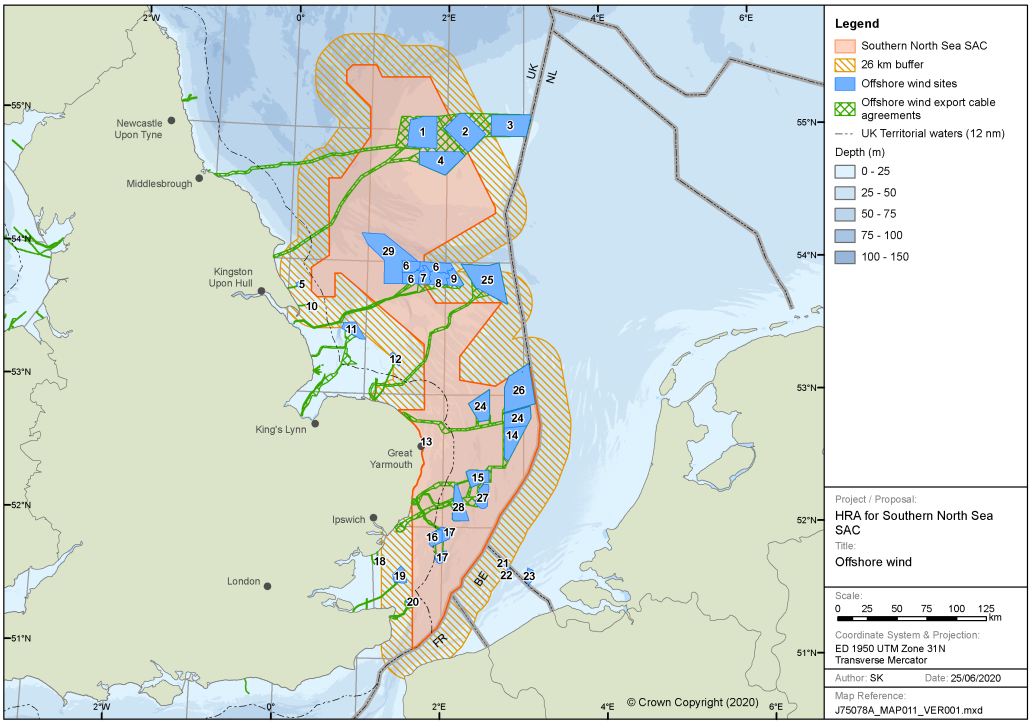
8.4 There are 21 UK offshore wind farms that lie wholly within the Southern North Sea SAC or are within 26 km of the boundary which is identified by the JNCC as an area that harbour porpoises may be displaced from by noise arising from pile-driving activities (JNCC 2017d, JNCC 2020b). (Table 5 and Figure 7). One wind farm (Triton Knoll) is currently undertaking offshore construction but has completed pile-driving and Hornsea Two has started pre-construction activities offshore, including the clearance of unexploded ordnance (UXO). 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 during construction impact on the Southern North Sea SAC. 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. However, all the monopile foundations have been installed.

**Table 5: 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 | Consented |
| Teesside A (Sofia) | Consented |
| Teesside B | Onshore construction started |
| Thanet Extension | Application submitted |
| **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 Of the offshore wind farms that are relevant to the in-combination assessment the Hornsea Two offshore wind farm could be pile-driving during the period of the proposed survey in September 2020.

8.8 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 is therefore completed. However, the construction activities undertaken at Triton Knoll will have contributed to the in-combination seasonal threshold.

8.9 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.

8.10 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.

8.11 Ørsted have confirmed that the UXO clearance campaign has been completed, although there is potential for further items of UXO to be found during the current on-going seabed preparation activities. Consequently, there is potential for further items of UXO to be cleared during September 2020. Ørsted have also confirmed that they believe bubble curtains were used during all UXO clearance activities undertaken during 2020 (Ørsted *pers. comm*. 2020).

### *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).

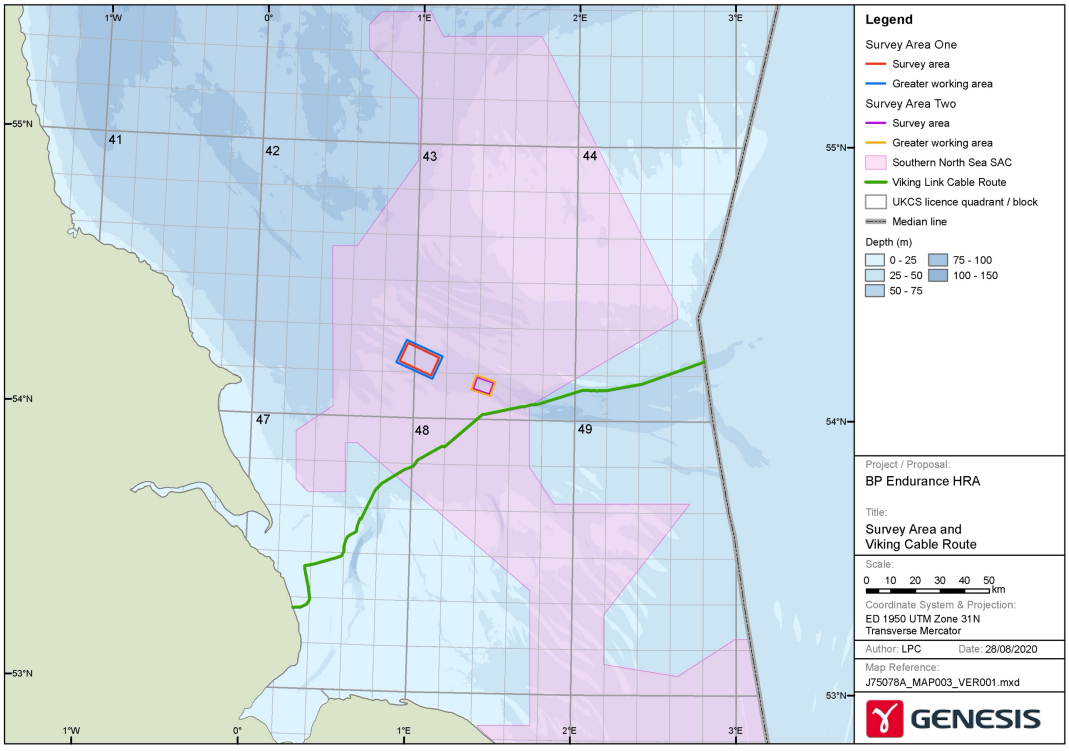



**Figure 8: Viking Link Interconnector cable within UK waters.**

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, 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.

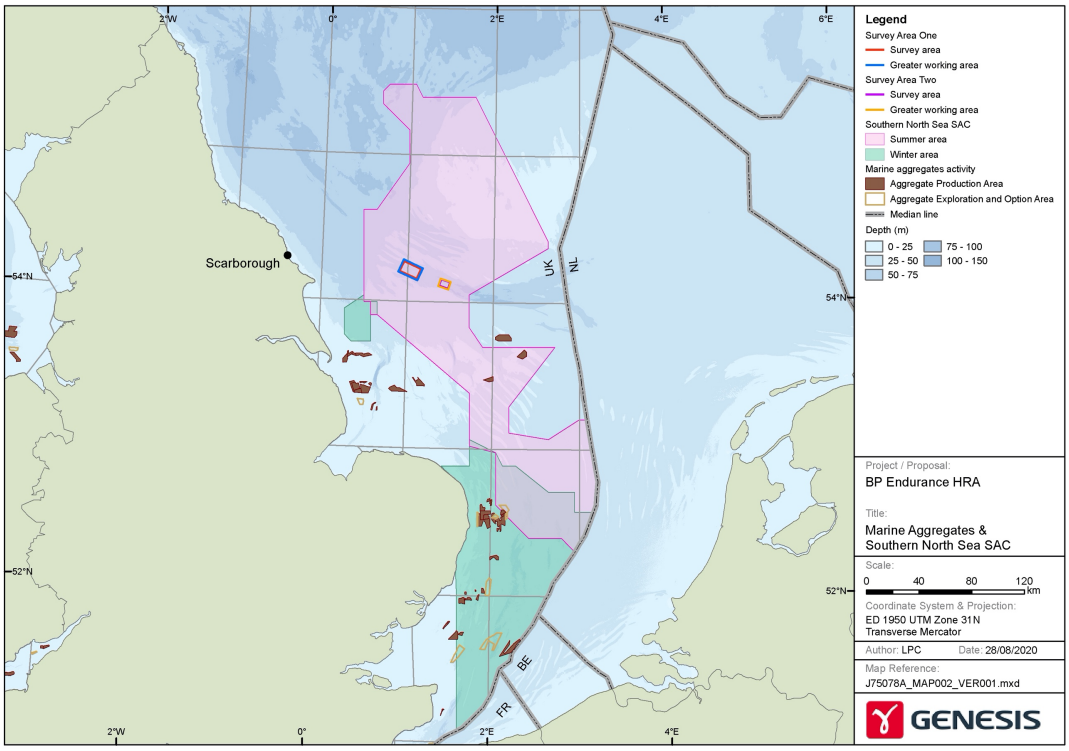



**Figure 9: Existing marine aggregate activities in the Southern North Sea SAC.**

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).

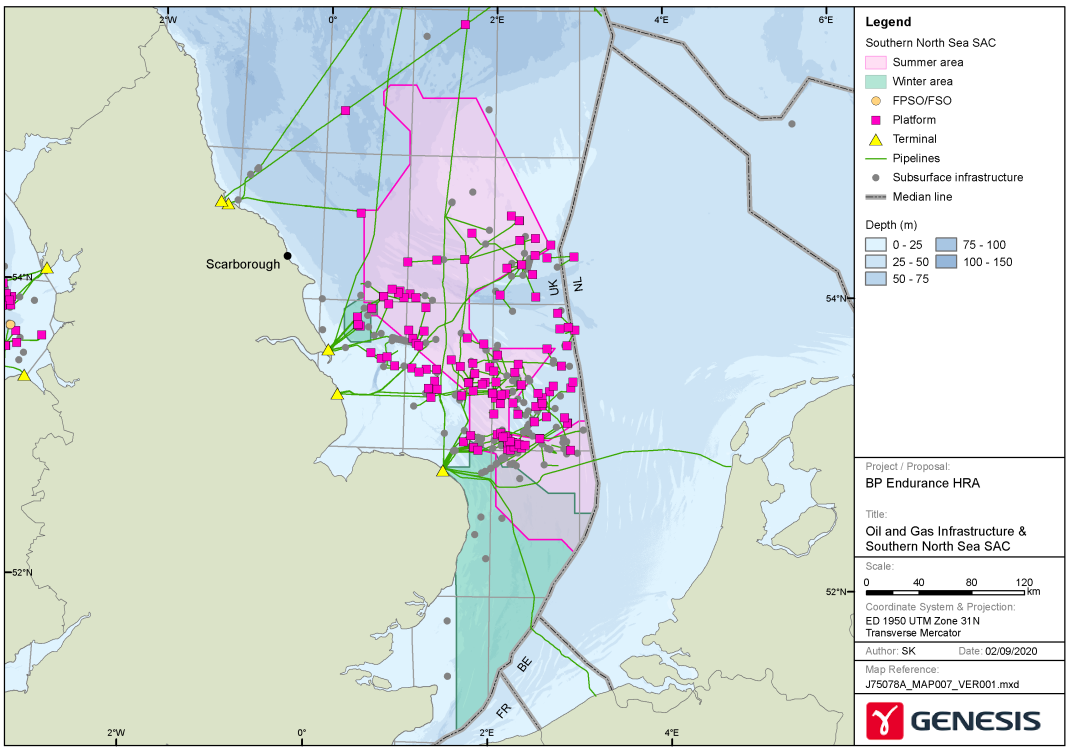



**Figure 10: Existing oil and gas infrastructure within the Southern North Sea SAC.**

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).

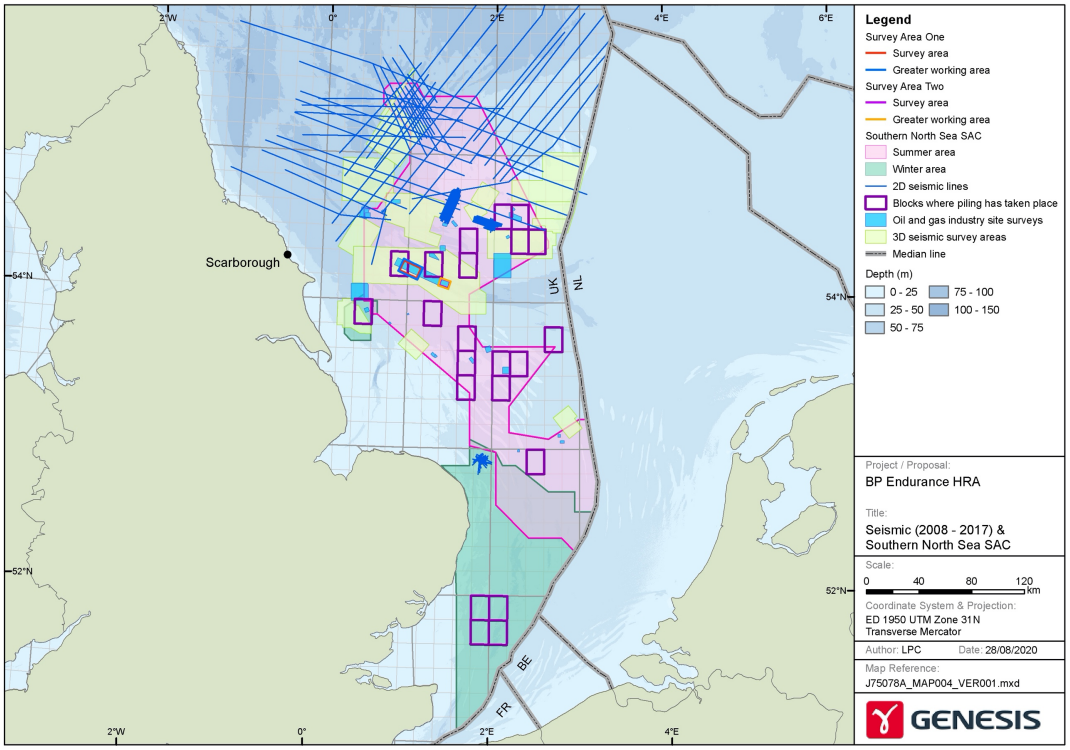



**Figure 11: Oil and gas industry related seismic surveys undertaken within the Southern North Sea SAC between 2008 and 2017.**

8.19 BEIS are aware of a number of planned oil and gas related activities within the area during the period the proposed survey will be undertaken that could cause an in-combination effect including a seismic survey and the use of explosives during seabed clearance activities (Table 6).

**Table 6: 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 |
|---|---|---|---|---|
| Spirit Energy | ML/411/2 | 49/11a | 23 November 2018 and 31 October 2020 | Removal and temporary deposit of risers at Audrey B installation. |
| Chrysaor | ML/546/0 | 49/21 | 19 May 2020 – 31 December 2020 | WIA using TCP guns and jet cutters |
| Premier | ML/551/0 | 42/28d – 47/11 | 6 March – 30 September 2020 | Pipeline seabed preparation and trenching. |
| Chrysaor | ML/570/3 | 49/16 | 8 April – 31 October 2020 | 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. |
| Chrysaor | ML/612/1 | 49/21 | 22 July 2020 – 31 May 2021 | Well Intervention |
| Chrysaor | ML/619/0 | 49/16 | 5 August – 31 October 2020 | Decommissioning at Saturn (Annabelle) |
| Tullow | ML/628/0 | 53/3c | 17 September – 31 October 2020 | Seabed clearance at Horne and Wren field |
| Tullow | ML/629/0 | 50/26a | 17 September – 31 October 2020 | Seabed clearance at Orwell field |
| Tullow | ML/630/0 | 44/19a | 17 September – 31 October 2020 | Seabed clearance at Cameron (Thames) field |
| Premier | DEP/1837/0 | 42/28d – 47/11 | 6 March – 30 September | Pipelaying operations and associated seabed deposits. |
| Chrysaor | GS/1065/0 | 48/25 | 30 March - | Geophysical survey |
| Chrysaor | GS/1066/0 | 49/12 | 30 March - | Geophysical survey |
| 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. |
| Petrofac | GS/1073/0 | 53/4 | 24 March 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 | CL/1095 | 42/28 | 15 May-(life) | Construction activities including pile-driving for 2 days. |
| Premier | DRA/808 | 42/28 | 1 June 2020 – 16 June 2021 | Batch drilling. |
| Premier | DRA/810 | 42/28 | 1 June 2020 – 16 June 2021 | Batch drilling. |
| Premier | DRA/811 | 42/28 | 1 June 2020 -16 June 2021 | Batch drilling. |
| Premier | DRA/812 | 42/28 | 1 June 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 2017c). 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.

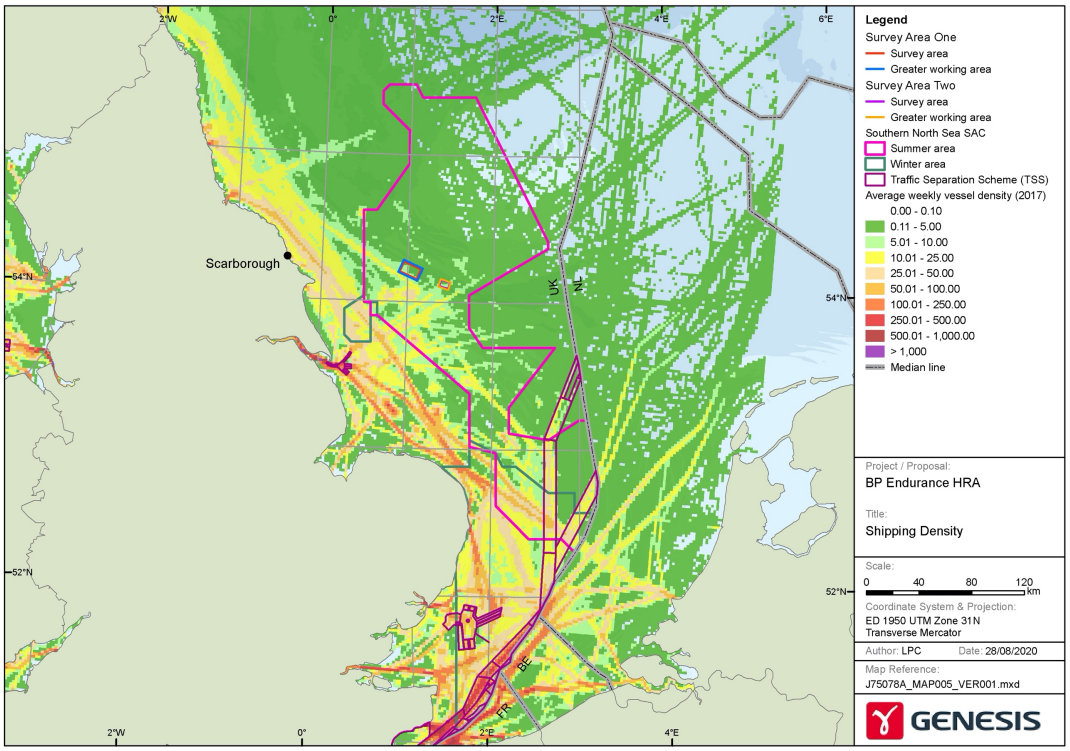



**Figure 12: Shipping density within the SAC during 2015.**

## *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.

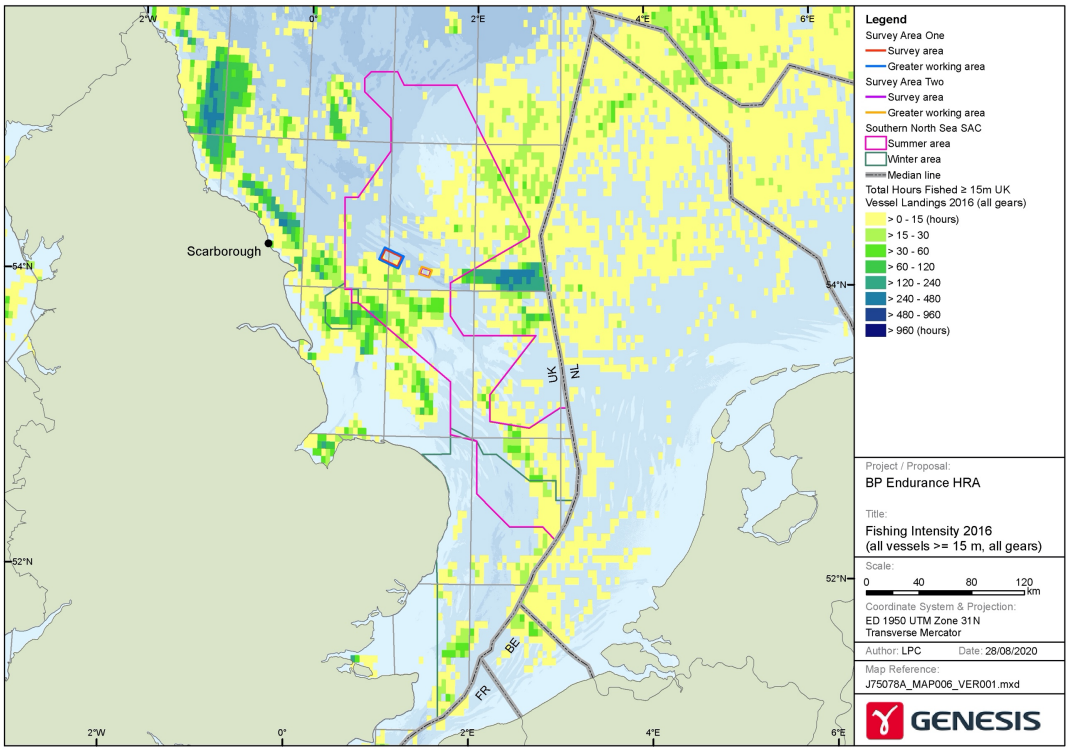



**Figure 13: Fishing intensity across the SAC during 2016 by UK registered vessels.**

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 surveys will not cause any direct mortality to any harbour porpoise and therefore there will be no in-combination impact between fishing and the survey.

### *In-combination conclusion*

8.26 Following consideration of all known developments that could 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 the use of explosives during seabed clearance and a seismic survey.
- 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 surveys.

# 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 was determined that the impact would not cause a likely significant effect.

9.3 This section addresses this first step of the HRA, for which BEIS has considered the potential impacts of the survey both alone and in combination with other plans and projects on each of the interest features of the relevant European sites to determine whether or not there will be a likely significant effect.

### *Harbour porpoise*

9.4 Harbour porpoise are a qualifying species for the Southern North Sea SAC.

9.5 Within the Southern North Sea SAC harbour porpoise are known to occur throughout the site, with particular concentrations in the northern 'summer' area over which the proposed surveys overlap. Noise modelling undertaken indicates that there is potential for auditory injury to occur within 570 m of the sound source and disturbance or displacement effects to occur 8.5 km from the 4D Test Line airguns and extend, during the course of the survey, over an area of 590 $km^2$ (BP 2020a).

9.6 Based on the predicted extent of potential impacts, it is concluded that there is potential for a likely significant effect on harbour porpoise from the proposed survey within or adjacent to the Southern North Sea SAC; the potential impacts on harbour porpoise are therefore considered further in the Appropriate Assessment.

### *Likely significant effects test - conclusions*

9.7 Based on the information presented within the application relating to the proposed activities and the advice received during consultation it is concluded that it is not possible to exclude a likely significant effect on the following designated sites and qualifying species:

- Southern North Sea SAC: Harbour porpoise,

9.8 For all other designated sites and associated qualifying habitats or species it is concluded that there will not be a likely significant effect from the proposed surveys either alone or in-combination with other plans or projects.

# 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 any of the European sites identified as having qualifying species for which no likely significant effect could not be ruled out from the project alone and in-combination.

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

10.4 The assessment of the potential impacts from the seismic survey is based on the results from noise modelling undertaken by the applicant. This approach takes into account project specific factors that can affect the level of sound produced and its propagation within the water column. From this it is possible to estimate the number of harbour porpoise that may be affected and the overall duration of the potential impacts. Based on the study published by ASCOBANS (2015) an annual reduction in the population of 1.7% could cause a population level decline (Para. 7.11). However, a similar level of impact from disturbance is predicted to not cause a population level of decline.

10.5 Following advice received a second approach to the assessment has also been undertaken based on recommendations by the JNCC. This approach is based on the use of a generic EDR for all seismic survey activities irrespective of their location and airgun size. Following published evidence and advice received from the JNCC, for the purposes of this assessment a 10 km EDR has been used for the seismic survey and a 5 km EDR for the geophysical equipment (JNCC 2020b; JNCC *Pers. Comm.* 2020). The extent and duration of the survey is then measured against draft thresholds above which an adverse effect on site integrity could arise, as described in Section 6.

## *Southern North Sea SAC (Harbour porpoise)*

### *Physical Injury*

10.6 Noise modelling undertaken indicates that, based on the weighted SEL threshold, there is potential for sound levels to cause the onset of PTS to harbour porpoise out to between 380 m and 590 m depending on the sound source.

10.7 The peak harbour porpoise density across the SAC is estimated to be >3 per km$^2$ (Heinänen and Skov 2015). Based on this peak density and the worst-case scenario of PTS occurring out to 590 m of the survey, an estimated three harbour porpoise could be affected at the start of the seismic survey.

10.8 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 <0.0009% of the Management Unit population.

10.9 The estimated area of potential impact from PTS is predominantly 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.

10.10 There is a low risk of harbour porpoise being physically impacted by the proposed seismic survey. In the extremely unlikely event the onset of PTS does occur, it would only affect a very small proportion of the relevant population.

### *Disturbance*

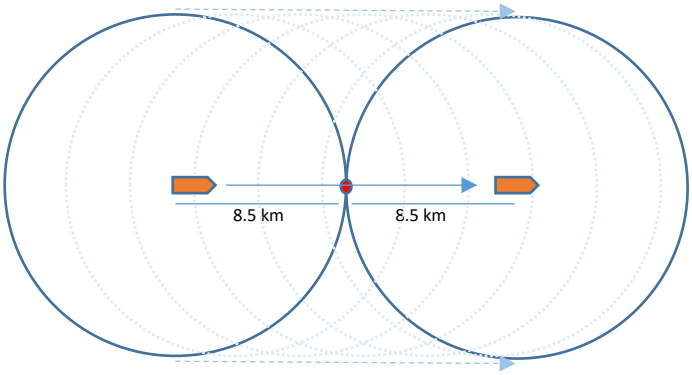
10.11 The largest distance any noise likely to cause disturbance is estimated to propagate out to is 8.5 km from the airguns used during the 4D Test Line survey, covering an area of 147 km$^2$ at any point. Assuming that disturbance occurs entirely within the SAC, then approximately 0.35% of the SAC as a whole and 0.5% of the 'summer' area could be affected by the proposed seismic survey at any one time.

10.12 Based on a peak site density of 3.0 ind./km$^2$ an estimated 441 harbour porpoise could be disturbed by 4D Test Line survey. This is equivalent to 0.13% of the North Sea Management Unit harbour porpoise population being disturbed.

10.13 For the smaller airgun array used during the 2DHR survey the estimated area of disturbance is smaller, extending to 5.0 km and encompassing an area of 65 km$^2$. At any one time the 2DHR survey could cause disturbance to 195 porpoises; equivalent to 0.058% of the North Sea Management Unit population.

10.14 A survey vessel will transit across an area and over the duration of a survey the total number of harbour porpoises disturbed will be greater. The applicant has confirmed that the survey vessel will be travelling at between 4.0 and 4.5 knots (7.4 – 8.4 km/h) (BP 2020b). As the vessel undertakes a survey, disturbance in any area will last two hours in any one location (Figure 14). For the 2DHR surveys the duration of impact at any one point is 72 minutes. Once the vessel has left the area, sound levels will reduce to background levels. The disturbance effects are

therefore transient and once the vessel has moved away from an area there is, in effect, no disturbance on those porpoises previously impacted.




● = Location of harbour porpoise in order for maximum duration of disturbance to occur.

Maximum extent of disturbance from seismic survey at 145 dB re 1 µPa at 1 m – 8.5 km.

Total distance of impact – 17 km.

Vessel speed – 8.4 km/h.

Total duration of disturbance impact = 2.0 hrs.

**Figure 14: Diagram showing potential maximum duration of disturbance to harbour porpoise from the proposed 4D Test Line survey.**

10.15 The Applicant has estimated the total area that could be impacted for the duration of each of the surveys (Table 2). The total area potentially impacted ranges from 380 km$^2$ during the 2DHR and 590 km$^2$ for the 4D Test Line survey and therefore between 1,140 and 1,770 porpoises have been estimated to be impacted by each of the surveys. The worst case scenario is that an estimated total of 2,910 porpoise could be disturbed by both surveys undertaken in Survey Area One, equivalent to 0.9% of the North Sea Management Unit population. However, the 4D Test Line survey and the 2DHR surveys will be undertaken over the same area and therefore, depending on the length of time between the two surveys, the density of porpoises within the area may be lower at the time the second survey commences and the total number of individuals disturbed may therefore also be lower. Furthermore, this estimate is based on the highest density of porpoises modelled within the SAC and not from survey data which has reported lower densities within the SAC (See Para. 3.14).

10.16 No noise modelling has been undertaken by the applicant on the use of a Sparker sub-bottom profiler. However, previous modelling has indicated that disturbance from a sub-bottom profiler is limited and extends to 235 m from a similar sparker sub-bottom profiler (BEIS 2018). Consequently, a similar extent of localised impact may be predicted to arise here.

10.17 Studies undertaken in the Danish sector of the Central North Sea reported disturbance out to 12 km from a 3,570 cu. in. airgun, although the duration of the disturbance is not reported (Sarnocińska *et al*. 2020). Similar studies undertaken in the Moray Firth using a 470 cu in airgun with source levels estimated to be 242–253 dB re 1 µPa @ 1 m (peak to peak), reported a decrease in the relative densities of harbour porpoises within 10 km of the airgun and an increase in densities at greater distances. However, porpoises continued to occur at sites within the impacted area during the seismic survey and there was a decline in the level of displacement over the ten day period that surveys were undertaken, indicating an increasing level of acclimation during the surveys. Once the surveys had ceased the number of detections returned to baseline levels within a day (Thompson *et al.* 2013, Pirotta *et al.* 2014). Therefore, any displacement effects caused by the proposed surveys are predicted to be temporary, with porpoises returning to the area impacted within approximately 24 hrs.

### *Threshold Approach*

10.18 The JNCC have advised that the assessment for harbour porpoise within the SAC should be undertaken by the threshold approach, whereby disturbance should not exceed 20% of the SAC 'summer' or 'winter' areas an any one day and on average 10% of an area over the course of a single season (see Section 7). To calculate the extent of noise within the SAC using the threshold approach the extent of disturbance from a moving sound source over the course of 24 hrs and the season is required. This assessment has been undertaken by BEIS as part of this HRA.

10.19 The JNCC have advised BEIS that the EDR to be used for this assessment should be 10 km for all surveys. This is precautionary as data supporting the use of a 10 km EDR is based on the use of a 470 cu. in. airgun which is larger than either of the airgun arrays proposed for these surveys.

#### *Daily Threshold*

10.20 In order to calculate whether the daily threshold of 20% of the seasonal area is impacted an accurate estimate of the level of activity within the SAC is required.

10.21 The 2DHR and the 4D Test Line survey will be undertaken in Survey Area One which covers a Greater Working Area of 160 $km^{2.}$ The Survey Area is smaller and covers an area of 112 $km^2$ and therefore overlaps 0.3% of the SAC as a whole and 0.4% of the 'summer' area.

10.22 Within Survey Area 2 no equipment using airguns will be used. The Greater Working Area is 48 $km^2$ and the survey area is 35 $km^2$; less than 0.1% of the SAC and 0.1% of the 'summer' area.

10.23 Noise arising from the proposed seismic survey will be transient as the vessel moves along the pre-determined survey lines. The extent of displacement (deterrence) over the period of one day will therefore be greater than if the survey vessel was stationary.

10.24 When undertaking the surveys the vessel will be travelling at no greater than 4.5 knots (8.4 km/h). Consequently, the maximum length of line that could, in theory, be surveyed over the course of a single day is 202 km. Assuming a 10 km EDR, the total area impacted over the course of 24 hrs would be 4,354 km$^2$ (Figure 15). This presumes that airguns are operating continuously throughout a 24 hr period. Although this is an unrealistic scenario, BP have advised that airguns will be operating for the duration of each line turn if the line-turn is less than 40 minutes (BP 2020a, b). The duration of each line turn is not known and therefore airguns could, in theory, be operating throughout a 24 hr period.

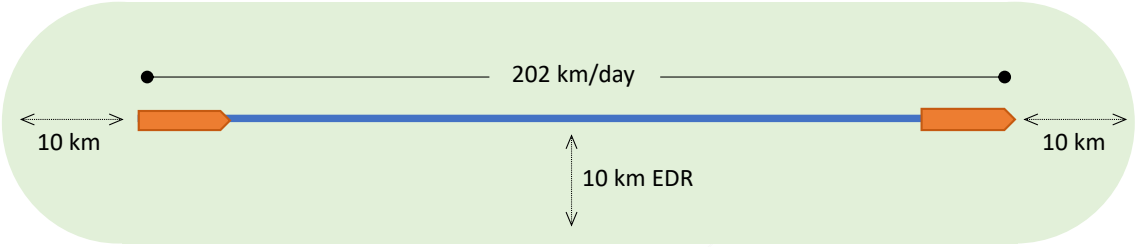



**Figure 15: Worst-case theoretical area of impact from a 4D Test Line survey travelling at 4.5 knots using 10 km EDR.**

10.25 Based on the configuration of the planned survey route in Survey Area One (Figure 3), the maximum length of a single survey line is 14 km. The spacing between each of the lines is between 150 m and 2,000 m. Within Survey Area One the maximum number of lines that could be completed in one day is 13, although only five lines extend the full 14 km, with the others crossing the same area. Within Survey Area Two the longest survey line is 8 km (Figure 4).

10.26 It is not known how long each of the line-turns will be during which the airguns may be operating. For the purposes of this assessment it is presumed that the line-turns will extend an additional 2 km beyond the Survey Area boundary and the airguns are not switched off.

10.27 The JNCC have advised that an EDR of 10 km should be used for all airguns to be used during these surveys, irrespective of their size. BEIS agrees that the use of a 10 km EDR is both precautionary and appropriate for the 4D Test Line survey which has an airgun array with a capacity of 320 cu. in and is therefore closest in size to the 470 cu. in. airgun array upon which the 10 km EDR is based.

10.28 On the basis of the information provided by the Applicant and the advice received from the JNCC the maximum area of impact within the SAC from the proposed 2DHR is estimated to be

1,369 km$^2$ and the 4D Test Line survey is slightly smaller at 1,064 km$^2$ (Figure 16) [1] [2]. This is equivalent to between 5.1% and 3.9% of the 'summer' area for each of the surveys respectively.

10.29 The maximum daily impact from the Geophysical survey using the sparker sub-bottom profiler in Survey Area 2 is 255 km$^2$, equivalent to 0.9% of the 'summer' area.

10.30 The daily threshold will not be exceeded by the proposed surveys.

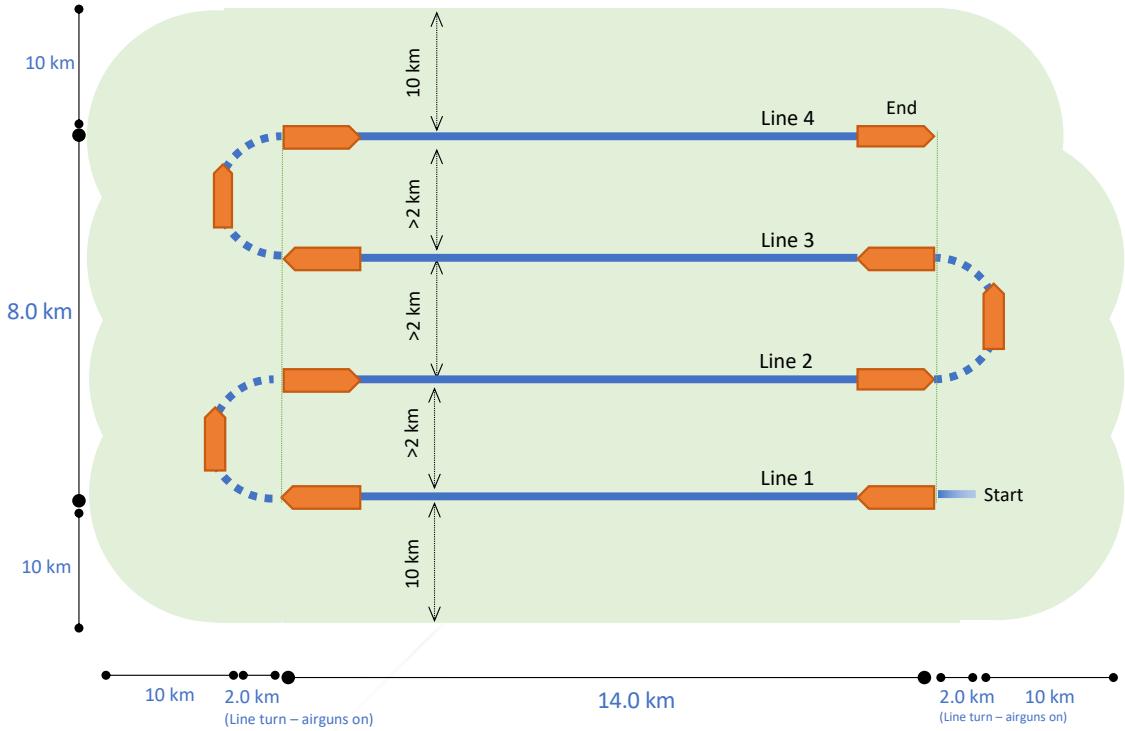



**Figure 16: Area of impact over one day from proposed 4D Test Line survey.**

### *Seasonal Threshold*

10.31 The surveys are planned to be undertaken sequentially over a total duration of ten days (6 days for Geophysical survey, 3 days for 2DHR and 1 day 4D Test Line survey). The proposed earliest start is early September 2020.

[1] The area of potential impact from the 2DHR survey is larger than the 4D Test Line survey as survey lines run both horizontally and vertically across the survey area (see Figure 3) and therefore there is an additional 2 km either end of the survey line for line turns. The 4D Test Line survey will only be along four lines running horizontally as shown in Figure 16.

[2] Note that the figures for Survey area One are slightly larger than those presented in the Application (Survey Area One = 1,092 km$^2$) (BP 2020a). Based on the information presented it is not known how these were calculated but the differences between the figures used in this HRA and those in the application make no material difference to the conclusions of this assessment. For Survey Area Two the difference in the figures presented in the Application and in this HRA are due to changes in the equipment proposed to be used from a small airgun to a sub-bottom profiler.

10.32 In order to assess the seasonal spatial overlap it is presumed that all surveys will be undertaken during the summer period and that once started they will be undertaken for 24 hrs each day without a break. This is precautionary as the maximum possible length of line that could be surveyed will not occur every day. A 'recovery period' is included in this assessment to account for the delay in porpoises returning to an area following displacement.

10.33 Based on the maximum daily impacts from each of the surveys the seasonal threshold would be 0.23% of the SAC and therefore the seasonal threshold will not be exceeded (Table 7).

**Table 7: Estimated extent of seasonal disturbance on harbour porpoise from proposed Endurance survey within the SAC.**

| SAC area | Area impacted per day ($km^2$) | Daily Threshold (%) | Estimated duration of impact (days) * | Seasonal Threshold (%) |
|---|---|---|---|---|
| *4D Test Line Survey (Area One)* | | | | |
| 'summer' | 1,064 | 3.9 | 3 | 0.06 |
| *2DHR Survey (Area One)* | | | | |
| 'summer' | 1,369 | 5.1 | 5 | 0.14 |
| *Geophysical Survey (Area Two)* | | | | |
| 'summer' | 255 | 0.9 | 7 | 0.03 |

* Includes 2 day 'recovery period' for airguns and 1 day for sub-bottom profiler.

10.34 There is potential for the prey species of harbour porpoise to be impacted by the proposed surveys. Studies on the impacts to fish from seismic surveys indicate that any disturbance to fish is temporary and localised (Peña *et al*. 2013; Slotte *et al*. 2004; Wardle *et al*. 2001). Should fish be displaced, harbour porpoise will either relocate to areas where prey species are present or remain until the seismic vessel has moved further away and the fish return to the area. Any potential impacts will be very localised and temporary and any effects will be inconsequential.

### *Conclusion*

10.35 Results from noise modelling indicate that no more than three harbour porpoise are at risk of physical injury from noise arising from the proposed survey. With the mitigation discussed in Section 13 there is a very low risk of any harbour porpoise being injured.

10.36 There is a risk of harbour porpoise being displaced or disturbed by the proposed survey. Noise modelling indicates that up to 441 harbour porpoise may be disturbed at any one time; this is 0.13% of the North Sea Management Unit population and therefore below the predicted level of disturbance that could cause a population level effect. The disturbance will be of short duration as the vessel transits through the Survey Area. Once the vessel has passed, any changes in behaviour due to disturbance will cease quickly after the vessel has moved away and any porpoises that may have been displaced are predicted to return to the area within 24 hrs.

10.37 The results from the threshold approach indicate that up to 5.1% of the 'summer' area may be impacted for a period of five days and up to 0.23% of the seasonal threshold. The daily and seasonal thresholds are not exceeded.

10.38 The proposed surveys 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 survey has moved away or ceased there will be no effect on the distribution, abundance and population dynamics of the species.

10.39 Based on the best available information and supported by results from noise modelling and the draft threshold approach, BEIS is satisfied that the proposed survey 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 seismic survey.

11.2 Projects identified as having potential to cause an in-combination impact 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,
- Tolmount – Pile-driving,
- Tullow Seabed Clearance – Explosive usage,
- Spirit Energy – Ossian rig site survey,
- Spirit Energy - Bonnie Brae rig site 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 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).

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 No assessment has been made by Ørsted on the estimated number of harbour porpoise that could be displaced or disturbed by UXO clearance based on noise modelling outputs.

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

11.12 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).

11.13 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 8).

**Table 8: 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.

11.14 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 maximum 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. 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.

11.15 The use of bubble curtains for pile-driving reduces the EDR from 26 km to 15 km (JNCC 2020b) 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.

11.16 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 9).

**Table 9: 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.

11.17 Ørsted have confirmed that they have completed their main UXO clearance for 2020, although they are continuing seabed clearance and preparation and could locate further UXO during August and September. They have also stated that they believed all detonations were undertaken with the use of a bubble curtain (Ørsted *Pers. comm.* 2020).

## 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 will not 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 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 10: Estimated extent of seasonal disturbance on harbour porpoise from proposed pile-driving at Hornsea 2 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. 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 11).

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 11: 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 12. The results show that based on known survey results the seasonal threshold does not exceed 0.25%. In the event that bubble curtains are used for all four detonations the seasonal threshold is reduced to 0.08%.

**Table 12: 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.

12.17 NGVL have committed to using bubble curtains when conditions are suitable for their use (NGVL 2019b). Based on the reported 100% usage of bubble curtains by Ørsted in 2020 and 88% usage in 2019, it is highly likely that NGVL will also use bubble curtains during UXO clearance along the cable route.

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 scenario is for only one project to undertake UXO clearance during any one day.

### *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. Construction activities that could cause an impact on harbour porpoise within the SAC have been completed. However there is a seasonal in-combination impact.

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 threshold approach the maximum daily impact is 0.18% of the 'summer' area and the seasonal threshold is 0.02% (Table 13).

**Table 13: 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 The currently planned or consented oil and gas related activities that could have the potential to cause an in-combination are presented in Table 6.

12.26 BEIS have identified three projects that could cause an in-combination impact within the SAC. They are:

- ION Seismic survey,
- Tolmount Pile-driving,
- Tullow Seabed Clearance.

#### *ION 3D Seismic Survey*

12.27 An application to undertake a 3D seismic survey by GX Technology / ION Geophysical Corporation (hereafter ION) was submitted to BEIS on 23 March 2020.

12.28 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 17) (ION 2020a, b).

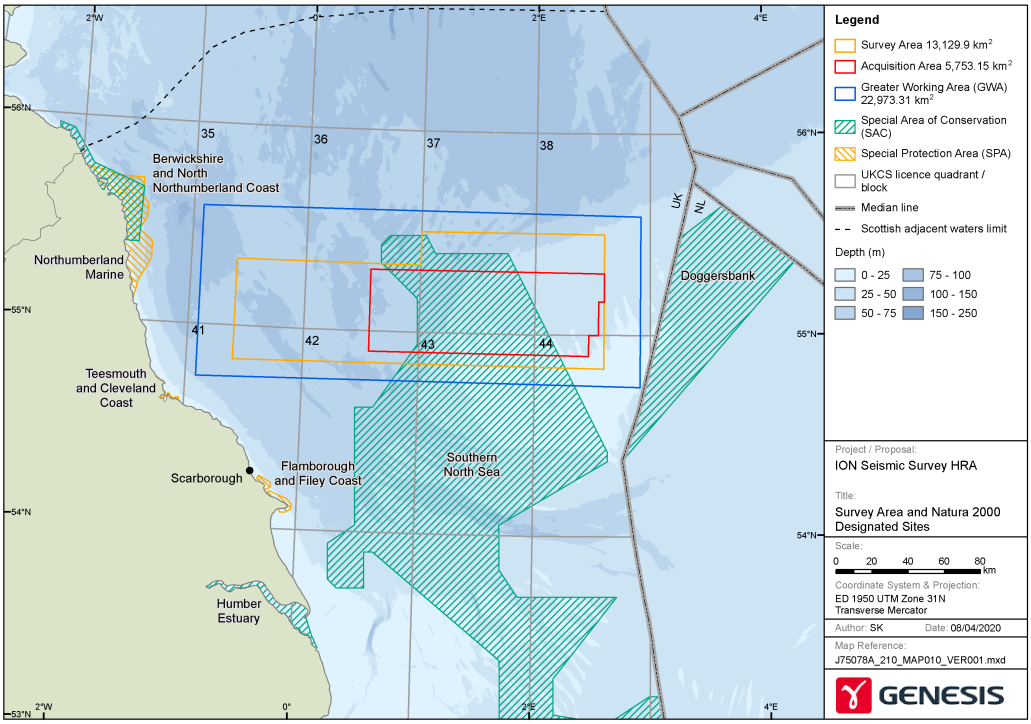



**Figure 17: Location of ION seismic survey.**

12.29 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 during August 2020.

12.30 The total length of line to be surveyed is between 15,392 km and 36,109 km and will be undertaken over either 198 or 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 (BEIS 2020a).

12.31 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.

12.32 The peak harbour porpoise density across the SAC is estimated to be >3 per km$^2$ (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.

12.33 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$^2$ (BEIS 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.

12.34 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 threshold approach.

12.35 Based on the pre-determined survey lines the maximum area within the SAC that could be impacted in any one 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. This maximum extent of impact could only occur during one day as all other survey lines within the SAC are shorter and subsequently the daily impacts will be less.

12.36 The mean daily impact accounts for not all survey lines having the same level of impact within the SAC and averages out the length of line surveyed each day within the SAC over the period of 46 days within the 'summer'; on this basis the daily impact is 6.7%. This level of impact is more likely to arise each day during the 'summer' period and is therefore considered a realistic worst-case scenario.

12.37 Based on the daily average impact, the seasonal threshold would be 1.7% of the SAC (Table 14).

**Table 14: 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 - 46 days in summer period)* | | | | |
| 'summer' | 2,136 | 7.9 | 46 | 2.0 |
| *Realistic worst-case (Mean daily impact 46 days in summer period)* | | | | |
| 'summer' | 1,805 | 6.7 | 46 | 1.7 |

Assuming a survey start date of no earlier than 15 August 2020.

### *Tolmount Pile-driving*

12.38 Premier Oil submitted a Consent to Locate application to install the Tolmount normally unmanned installation (NUI) at the Tolmount field, located approximately 3 km from the perimeter of the Southern North Sea SAC boundary. Part of the works require pile-driving eight 2.59 m diameter piles to anchor the jacket legs into the seabed. Installation of the NUI was planned to be undertaken in May (or possibly June) 2020 (Premier Oil 2020). The works have now been delayed until September 2020 and therefore there will be an in-combination impact.

12.39 Noise modelling undertaken to support the application indicates that the onset of PTS could occur in harbour porpoise within 234 m of the pile-driving and strong behavioural disturbance out to 3.1 km (Premier Oil 2020). Site specific data on the density of harbour porpoise in the area is not readily available. 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 less than one harbour porpoise is predicted to be at risk of PTS and three may be displaced.

12.40 Based on the thresholds and a 15 km EDR it is estimated that sound from pin pile-driving could affect 200 $km^2$ of the 'summer' area of the SAC. Pile-driving is expected to last over a period of five days (Premier 2020). 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 15).

**Table 15: 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 includes two days 'recovery time' following cessation of pile-driving.

### *Tullow Seabed clearance*

12.41 Tullow Oil have submitted three Marine Licence applications to undertake seabed clearance activities at three locations during September and October 2020 (ML/628/0 ML/629/0 and ML/630/0) (TOSK 2020a,b,c).

12.42 Seabed clearance will be undertaken at the Horne and Wren, Orwell and Cameron fields and entail the removal of three conductors, 33 mattresses and 4 m of pipeline and associated umbilical. The Cameron field lies 3.5 km beyond the boundary of the SAC.

12.43 The conductors are encased in grout used when they were installed. Explosive charges are required to remove each of the conductors before the conductors can removed from the seabed. A maximum of 70 kg of explosives will be used to sever each of the conductors, which will be detonated as a single charge. The explosives will be placed into a charge case and 3 m below the seabed to ensure that the cut is made at the desired depth (TOSK 2020a,b,c).

12.44 It is anticipated that the explosives used during the severance of the conductor will also break the grout. However, in the event that this does not occur further detonations using up to two 8 kg charges will be used to dislodge the grout.

12.45 The earliest start date for the removal work to be undertaken is the 17 September, with the work scheduled to last between three to seven days at each location, depending on weather conditions. The latest end date, accounting for a delayed start date, is anticipated to be 31 October 2020. Conductor removal is planned to be undertaken during late September/early October.

12.46 Noise modelling undertaken in support of the applications indicate that PTS could occur within 2.2 km of the detonations and that up to 14 harbour porpoise could be at risk of the onset of PTS from each of the detonations; a combined total at all three locations of 52 harbour porpoise.

12.47 No assessment, based on noise modelling, has been undertaken to determine the level of disturbance or displacement that could arise. Instead Tullow has used a 26 km EDR to undertake the assessment. On this basis up to 6,372 harbour porpoise could be disturbed using the maximum modelled density of 3.0 ind./km$^2$. Using results from survey data between 1,678 and 5,734 harbour porpoise could be disturbed at each location. Consequently, between 0.5% and 1.9% of the Management Unit population could be impacted by each detonation.

12.48 The results of the threshold assessment based on a 26 km EDR for each of the applications is presented in Table 16. The maximum daily impact could occur at the Horne and Wren field where the use of explosive could impact over 7.4% of the 'summer' area. At both the Orwell and Cameron locations the extent of the impact within the SAC is lower. The combined seasonal summer threshold is 0.19%.

**Table 16: Daily and seasonal spatial overlap for Tullow seabed clearance.**

| SAC area | Maximum area of SAC impacted (km$^2$) | Daily Threshold (%) | No. of days detonation | Estimated duration of impact (days) [1] | Seasonal Threshold (%) |
|---|---|---|---|---|---|
| *Horne and Wren* | | | | | |
| 'summer' | 2,006 | 7.4 | 1 | 3 | 0.12 |
| 'Winter' | 346 | 2.7 | 1 | 3 | 0.04 |
| *Orwell* | | | | | |
| 'summer' | 735 | 2.7 | 1 | 3 | 0.04 |
| *Cameron* | | | | | |
| 'summer' | 470 | 1.7 | 1 | 3 | 0.03 |

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

BEIS have calculated the area of impact within the SAC based on the coordinates presented within each of the applications. The area of impact within the SAC and consequently the daily thresholds differ from those presented in the applications. For both the Horne and Wren and Cameron fields that area calculated by BEIS is greater than calculated by the applicant. The BEIS calculations have been used in this assessment (BEIS 2020b *in prep.*)

The seasonal threshold is not presented in any of the Tullow applications. It has therefore been calculated by BEIS for each activity.

### *Pegasus West geophysical surveys*

12.49 Spirit Energy submitted an application to undertake a pipeline route survey and a platform site survey at the Pegasus West field. The surveys were to be undertaken in Blocks 43/12, 43/13, 43/18, 43/19 and 43/24 and located within the Southern North Sea SAC. The surveys were to be undertaken sometime between April 2020 and April 2021 and last no more than 28 days in total (Spirit Energy 2020a). Subsequent to the application being made, Spirit Energy have confirmed that these surveys are now not being undertaken (Spirit Energy *Pers. comm*. 2020).

### *Other oil and gas applications*

12.50 Other oil and gas applications for activities planned to be undertaken between April and September 2020 are summarised below.

12.51 An application to undertake a rig site survey at the Ossian prospect within UKCS Blocks 36/28, 42/2a and 42/3a has been made by Spirit Energy (Spirit Energy 2020b). The survey entails the use of a two-dimensional High Resolution Seismic (2D-HR) and a two-dimensional Ultra High Resolution Seismic (mini-gun) (2D-UHR) plus a sub-bottom profiler and side-scan sonar. The work is planned to be undertaken between 12 April 2020 and 1 April 2021 and last over a period of six days. Note BEIS have recently been advised that the planned activities may not now start until September/October 2020.

12.52 The survey lies 22.6 km from the closest boundary of the Southern North Sea SAC and therefore will not impact on harbour porpoise within the SAC.

12.53 An application to undertake a rig site survey at the Bonnie Brae prospect located within UKCS Blocks 42/3 and 42/8 has been made by Spirit Energy. The survey covers an area of 42 square kilometres (inner working area) and 144 square kilometres (greater working area which also includes Block 42/7) across UK waters (Spirit Energy 2020c). The survey entails the use of a two-dimensional High Resolution Seismic (2D-HR) and a two-dimensional Ultra High Resolution Seismic (mini-gun) (2D-UHR) plus a sub-bottom profiler and side-scan sonar. The work is planned to be undertaken between 12 April 2020 and 1 April 2021 and last over a period of six days. Note BEIS have recently been advised that the planned activities may not now start until September/October 2020.

12.54 The Greater Working Area for the Bonnie Brae survey lies 10.3 km from the closest boundary of the Southern North Sea SAC and the Inner Working Area lies 14.3 km from the boundary. Consequently, the area where airguns will be operating lies beyond the distance at which impacts on harbour porpoise within the SAC are predicted to occur.

12.55 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.

12.56 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.

12.57 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. 8.16). 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 cause an in-combination impact.

### *Shipping*

12.58 There is potential for an in-combination impact with the proposed surveys and existing vessel activity.

12.59 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.

12.60 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*

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

12.62 The timelines for each of the activities identified as having the potential to cause an in-combination impact are presented in Figure 18. There is potential for the greatest daily impact to occur in September.

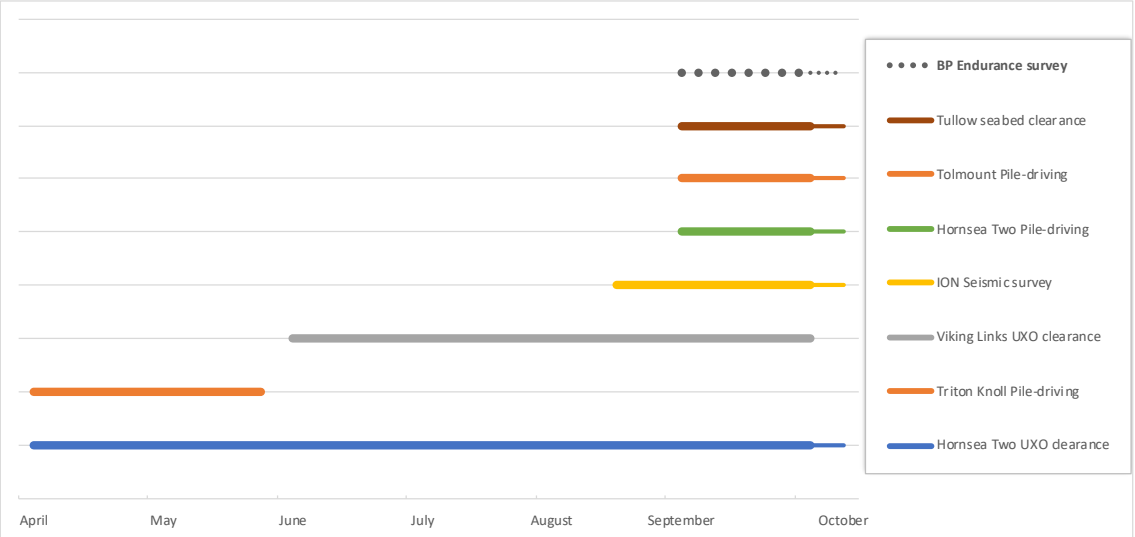



**Figure 18: Timeline of activities within the Southern North Sea SAC that could have an in-combination impact.**

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

### *Noise modelling*

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

#### *Physical Injury*

12.64 Based on the results from the noise modelling an estimated total of 675 harbour porpoise could be at risk of PTS from proposed activities affecting the Southern North Sea SAC (Table 17). Consequently, it is estimated that up to 0.2% of the North Sea Management Unit could, in theory, be impacted.

**Table 17: Estimated number of harbour porpoise at risk of PTS from proposed activities in Southern North Sea SAC without mitigation.**

| Activity | PTS |
|---|---|
| ION Seismic Survey | 1 |
| Tolmount Pile-driving | <1 |
| Triton Knoll Pile-driving | 2 |
| Hornsea Pile-driving | 2 |
| BP Endurance survey | 3 |
| Tullow Seabed Clearance | 42 |
| Viking Link Interconnector UXO Clearance | 200 |
| Hornsea UXO Clearance | 425 |
| **Total** | **675** |

12.65 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.

12.66 Tullow have committed mitigation during the use of explosives including following the relevant JNCC guidance (JNCC 2010), use of MMO's, PAM and ADD's (TOSK 2020a,b,c).

12.67 The mitigation measures presented within the applications will significantly reduce the risk of physical auditory injury to harbour porpoises.

### *Disturbance*

12.68 The total number of harbour porpoise predicted to be disturbed by the proposed Endurance surveys is 2,910 individuals. In addition to the proposed Endurance survey there could be up to 1,356 harbour porpoise disturbed by the consented ION seismic survey.

12.69 Due to the nature of the sound arising from the detonation of explosives, 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 2010). 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.

12.70 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*

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

- 'Potential worst-case'. This scenario is based on:
    - The maximum daily length of line and area impacted within the SAC from the proposed Endurance surveys.
    - The maximum area of impact within the SAC from the proposed Tullow seabed clearance, i.e. conductor removal at the Horne and Wren field.
    - The maximum area of impact possible within the SAC arising from the ION seismic survey.
    - The maximum area of impact from pile-driving at the Tolmount field.
    - There are five UXO detonations per day all within a 5 km radius at Hornsea Two.
    - It presumes that only one developer is clearing UXO during any one day .
    - All UXO is cleared with the use of a bubble curtain.
    - Pile-driving at Hornsea Two will not occur on the same day UXO clearance.

12.72 This scenario is a precautionary potential worst-case in that for it to arise the maximum area of potential impact from the projects must occur on the same day. The probability of all these occurring on one day during September is approximately 1 in 8,100,000 and therefore very remote and unrealistic.

- 'Realistic worst-case'. Scenario 1 is based on:
    - The maximum daily length of line and area impacted within the SAC from the proposed Endurance surveys in Survey Area One.
    - No overlap with the proposed Endurance surveys using airguns and seabed clearance using explosives at the Horne and Wren field on the same day.
    - The estimated average daily length of line surveyed within the SAC by the proposed ION seismic survey.

- The maximum area of impact from pile-driving at the Tolmount field.
- One detonation per day from the Hornsea Two project impacting the maximum possible area (Ørsted have completed their main UXO clearance campaign).
- UXO clearance will not occur on the same day at both Hornsea Two and Viking Links.
- Pile-driving at Hornsea two will not occur on the same day UXO clearance.
- Bubble curtains will be used by developers when undertaking UXO clearance.

- 'Realistic worst-case'. Scenario 2 is based on:
  - The maximum daily length of line and area impacted within the SAC from the proposed Endurance surveys.
  - The estimated average daily length of line surveyed within the SAC by the proposed ION seismic survey.
  - The maximum area of impact from pile-driving at the Tolmount field.
  - No UXO detonation at Hornsea Two on the same day as Endurance surveys (Ørsted have completed their main UXO clearance campaign).
  - UXO clearance will not occur on the same day at both Hornsea Two and Viking Links.
  - Surveys using airguns in Survey Area One will not occur on the same day as UXO clearance at Hornsea Two.
  - Pile-driving at Hornsea two could occur on the same day as the use of explosives for seabed clearance at Horne and Wren field and the BP Endurance surveys in Survey Area One.
  - Bubble curtains will be used by developers when undertaking UXO clearance.

12.73 These scenarios are the most realistic worst-case scenarios as all these activities have a higher probability (albeit still a very remote possibility) of occurring on the same day; each scenario having approximately 1 in 9,000 chance of occurring.

12.74 Based on the potential worst-case scenario the daily threshold could be exceeded during September 2020 (Table 18).

12.75 Based on the likely worst-case scenarios the daily thresholds are either not exceeded, or slightly exceeded under Scenario 2 during September 2020 (Table 19 and Table 20).

12.76 There is considerable uncertainty over the timing of some of the planned activities during September 2020. In particular, it is not known if any further UXO is to be cleared within the SAC at Hornsea Two or at Viking Links. Ørsted have stated that the main UXO clearance at Hornsea Two has been completed (Ørsted *Pers. comm*. 2020). It is therefore unlikely that further UXO

will be identified and extremely improbable that up to five detonations will be cleared within a 5 km radius of each other, as per the potential worst-case scenario. It is therefore realistic and suitably precautionary to assess based on there being only one detonation during any one day in September impacting over the maximum possible area within the SAC.

12.77 There will be only one day during which the Tullow seabed clearance activities will cause the maximum impact, which is when detonation for conductor removal is undertaken at the Horne and Wren field.

12.78 The aim of the noise management is to keep below the thresholds as much as possible (JNCC 2020e) and therefore, although there is a risk of the daily threshold being exceeded under certain scenarios the probability of it occurring is small. Consequently, a licence condition will require BP to liaise with both Tullow and Ørsted in order to further minimise the risk of the use of airguns in Survey Area One occurring on the same day as explosive detonation carried out by Tullow at the Horne and Wren field or UXO clearance is undertaken by Ørsted at Hornsea Two.

**Table 18: Potential worst-case in-combination daily threshold (%).**

| Activity | Apr | May | Jun | Jul | Aug | Sept |
|---|---|---|---|---|---|---|
| **BP Endurance** [1] | **0** | **0** | **0** | **0** | **0** | **5.1** |
| Tullow Seabed Clearance at Horne and Wren [2] | 0 | 0 | 0 | 0 | 0 | 7.4 |
| ION Seismic Survey [3] | 0 | 0 | 0 | 0 | 7.9 | 7.9 |
| Tolmount Pile-driving [4] | 0 | 0 | 0 | 0 | 0 | 0.8 |
| Hornsea Two UXO detonation (5/day) [5] | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 | 4.6 |
| Viking Link UXO detonation (1/day) [6] | 0 | 0 | 0 | 0 | 0 | 0 |
| Triton Knoll Pile-driving [7] | 0.18 | 0.18 | 0.18 | 0 | 0 | 0 |
| Hornsea Two pile driving [8] | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total %** | **4.8** | **4.8** | **4.8** | **4.6** | **12.5** | **25.8** |

1 Based on maximum possible area of impact within the SAC of 1,369 $km^2$.
2 Based on maximum area of impact within the SAC from Horne and Wren seabed clearance of 2,006 $km^2$.
3 Based on maximum possible area of impact within the SAC of 2,136 $km^2$.
4 Based on maximum possible area of impact within the SAC of 200 $km^2$.
5 Based on maximum number of five detonations undertaken within a 5 km radius of each other, encompassing the widest area within the SAC and the use of bubble curtains impacting an area of 1,257 $km^2$.
6 Based on only one developer clearing UXO on any single day as both projects are using the same bubble curtain vessel. Impacts from Hornsea two are greater than those from Viking and therefore Hornsea Two has been used in this assessment.
7 Based on maximum possible area of impact within the SAC of 47.86 $km^2$.
8 Pile-driving and UXO clearance at Hornsea Two will not occur on the same day and therefore is not additive. UXO clearance has the greater of the two daily impacts and has therefore been used.

**Table 19: Likely worst-case in-combination daily threshold – Scenario 1 (%).**

| Activity | Apr | May | Jun | Jul | Aug | Sept |
|---|---|---|---|---|---|---|
| **BP Endurance [1]** | **0** | **0** | **0** | **0** | **0** | **5.1** |
| Tullow Seabed Clearance at Orwell [2] | 0 | 0 | 0 | 0 | 0 | 2.7 |
| ION Seismic Survey [3] | 0 | 0 | 0 | 0 | 6.7 | 6.7 |
| Tolmount Pile-driving [4] | 0 | 0 | 0 | 0 | 0 | 0.8 |
| Hornsea Two UXO detonation [5] | 4.6 | 4.6 | 4.6 | 4.6 | 2.6 | 2.6 |
| Viking Link UXO detonation (1/day) [6] | 0 | 0 | 0 | 0 | 0 | 0 |
| Triton Knoll Pile-driving [7] | 0.18 | 0.18 | 0.18 | 0 | 0 | 0 |
| Hornsea Two pile-driving [8] | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total %** | **4.78** | **4.78** | **4.78** | **4.6** | **9.3** | **17.9** |

1 Based on maximum possible area of impact within the SAC of 1,369 km$^2$.
2 Based on maximum area of impact within the SAC from Orwell field seabed clearance of 735 km$^2$.
3 Based on estimated average daily length of survey line within SAC and an impacted area of 1,805 km$^2$.
4 Based on maximum possible area of impact within the SAC of 200 km$^2$.
5 Based on one detonation per day with the use of a bubble curtain during August and September as the main UXO clearance campaign has been completed. Impacting an area within the SAC of 707 km$^2$.
6 Based on only one developer clearing UXO on any single day as both projects are using the same bubble curtain vessel. Impacts from Hornsea Two within the SAC are greater than those from Viking and therefore Hornsea Two has been used in this assessment.
7 Based on maximum possible area of impact within the SAC of 47.86 km$^2$.
8 Pile-driving and UXO clearance at Hornsea Two will not occur on the same day and therefore is not additive. UXO clearance has the greater of the two daily impacts and has therefore been used.

**Table 20: Likely worst-case in-combination daily threshold – Scenario 2 (%).**

| Activity | Apr | May | Jun | Jul | Aug | Sept |
|---|---|---|---|---|---|---|
| **BP Endurance [1]** | **0** | **0** | **0** | **0** | **0** | **5.1** |
| Tullow Seabed Clearance at Horne and Wren [2] | 0 | 0 | 0 | 0 | 0 | 7.4 |
| ION Seismic Survey [3] | 0 | 0 | 0 | 0 | 6.7 | 6.7 |
| Tolmount Pile-driving [4] | 0 | 0 | 0 | 0 | 0 | 0.8 |
| Hornsea Two UXO detonation [5] | 4.6 | 4.6 | 4.6 | 4.6 | 0 | 0 |
| Viking Link UXO detonation (1/day) [6] | 0 | 0 | 0 | 0 | 0 | 0 |
| Triton Knoll Pile-driving [7] | 0.18 | 0.18 | 0.18 | 0 | 0 | 0 |
| Hornsea Two pile-driving [8] | 0 | 0 | 0 | 0 | 0 | 2.0 |
| **Total %** | **4.78** | **4.78** | **4.78** | **4.6** | **6.7** | **22.0** |

1. Based on maximum possible area of impact within the SAC of 1,369 km$^2$
2. Based on maximum area of impact within the SAC from Horne and Wren seabed clearance of 2,006 km$^2$.
3. Based on estimated average daily length of survey line within SAC and an impacted area of 1,805 km$^2$.
4. Based on maximum possible area of impact within the SAC of 200 km$^2$.
5. Based on no detonations being undertaken on the same day as airguns are operating in Survey Area One.
6. Based on only one developer clearing UXO on any single day as both projects are using the same bubble curtain vessel. Impacts from Hornsea two are greater than those from Viking and therefore Hornsea Two has been used in this assessment.
7. Based on maximum possible area of impact within the SAC of 47.86 km$^2$.
8. Based on maximum area of impact from pile-driving being undertaken at Hornsea Two.

12.79 Under both the potential and realistic worst-case in-combination scenarios the seasonal threshold is not exceeded (Table 21). In the event that activities are delayed the in-combination seasonal threshold during the summer period of 2020 may be further reduced.

**Table 21: In-combination seasonal thresholds (%).**

| Activity | Summer seasonal threshold (%) | |
|---|---|---|
| | Potential worst-case | Realistic worst-case |
| **BP Endurance** [1] | **0.23** | **0.23** |
| Tullow Seabed Clearance [2] | 0.16 | 0.16 |
| ION Seismic Survey [3] | 2.00 | 1.70 |
| Tolmount Pile-driving [4] | 0.03 | 0.03 |
| Hornsea Two UXO detonation[5] | 0.88 | 0.88 |
| Viking Link UXO detonation (1/day) [6] | 0.38 | 0.08 |
| Triton Knoll Pile-driving [7] | 0.02 | 0.02 |
| Hornsea Two pile-driving [8] | 0.05 | 0.05 |
| **Total** | **3.78** | **3.18** |

1 Based on maximum area and duration of impact.
2 Based on maximum area and duration of impact.
3 Potential worst-case is based on maximum area of impact possible occurring every day. realistic worst-case is based on the estimated average extent of impact per day over the longest possible period of time.
4 Based on maximum area of impact and duration.
5 based on maximum 60 detonations over the 'summer' period and only one detonation per day each impacting over the maximum possible area.
6 Potential worst-case based on consented 20 UXO detonations. Likely worst-case based on known number of UXO to be cleared following completion of UXO survey campaign. All detonations impact over maximum possible area.
7 Based on maximum area and duration of impact.
8 Based on maximum area and duration of impact.

12.80 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 22. Any changes in any of the Projects' schedules or scopes of work would affect both the daily and seasonal threshold based assessments.

**Table 22: 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 |
|---|---|---|
| BP Endurance Surveys | High | High to Moderate certainty activities will be undertaken during 'summer' 2020.<br>Moderate certainty on when activities will commence.<br>Very High level of certainty that the survey will be undertaken along known pre-determined survey lines.<br>Moderate to Low level of certainty from published evidence on the extent and duration of impacts from small airgun arrays. |
| Tullow Seabed Clearance | Moderate | Moderate certainty activities will be undertaken during 'summer' 2020.<br>Moderate to Low certainty on when activities will commence.<br>Very limited evidence on the extent of displacement from detonations. No evidence supporting a 26 km EDR. |
| ION Seismic Survey | High | High certainty activities will be undertaken during 'summer' 2020.<br>High to Moderate certainty on when activities will commence.<br>Very High level of certainty that the survey will be undertaken along known pre-determined survey lines.<br>High level of certainty from published evidence on the extent and duration of impacts from large airgun arrays. |
| Tolmount pile-driving | High | High certainty activities will be undertaken during 'summer' 2020.<br>High level of certainty in the area of SAC that could be impacted.<br>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.<br>Very High confidence of regular usage of bubble curtains to mitigate noise impacts.<br>Low certainty on the location and number of UXO required to be detonated.<br>Low certainty on the number of UXO to be cleared per day, ranging anywhere from between one and five.<br>Daily and Seasonal thresholds are based on two opposing scenarios. Both cannot happen.<br>Very limited evidence on the extent of displacement from UXO clearance. No evidence supporting either a 26 km EDR without bubble curtains or 15 km EDR with the use of bubble curtains. |
| Viking Link UXO clearance | High | Very High certainty activities will be undertaken during 'summer' 2020.<br>Very High certainty in the location and number of UXO required to be detonated.<br>Very limited evidence on the extent of displacement from UXO clearance. No evidence supporting either a 26 km EDR without bubble curtains or 15 km EDR with the use of bubble curtains. |
| Triton Knoll pile-driving | Very High | Very High certainty activities will be undertaken during 'summer' 2020.<br>High level of certainty in the area of SAC that could be impacted. |

| Project | Confidence | Comment |
|---|---|---|
| | | High level of certainty from published evidence on the likely extent and duration of impacts. |
| Hornsea Two pile-driving | High | Moderate certainty activities will be undertaken during 'summer' 2020.<br>High level of certainty in the area of SAC that could be impacted.<br>High level of certainty from published evidence on the likely extent and duration of impacts. |

### *In-combination assessment Southern North Sea SAC conclusions*

12.81 Results from noise modelling indicate that up to 675 harbour porpoise could, in theory, be at risk of physical auditory injury in the form of PTS from all planned activities within or adjacent to the SAC. This is 0.2% 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 secured through licence conditions significantly reduce the risk of any harbour porpoise receiving sound levels capable of causing the onset of PTS.

12.82 The results from the threshold approach indicate that the daily thresholds could be exceeded under the potential worst-case scenario. Under realistic worst-case scenarios either the threshold will not be exceeded (Scenario 1) or potentially only marginally exceeded (Scenario 2). The applicant will be required to liaise with both Tullow and Ørsted to ensure that the proposed Endurance surveys using airguns in Survey Area One does not occur on the same day as either proposed seabed clearance detonation is undertaken at the Horne and Wren field, or if this is the case, that Ørsted are not undertaking UXO clearance on the same day. This does not affect planned activities in Survey Area Two where airguns will not be used.

12.83 This does not affect the already consented UXO clearance activities being undertaken by Ørsted at Hornsea Two; the activities for which have previously been assessed and approved.

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

12.85 Based on the best available information and supported by results from noise modelling and the draft threshold approach, BEIS is satisfied that the proposed BP Endurance surveys in-combination with other plans or projects 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 BP have committed to following the JNCC guidelines for *minimising the risk of injury to marine mammals from geophysical surveys* (JNCC 2017a, BP 2020a). This will include:

- A minimum of 20 minutes soft-start undertaken every time the airguns are switched on.
- Use of JNCC accredited marine mammal observers (MMOs) to conduct watches for marine animals during daylight hours with good visibility. MMOs will monitor during the pre-source start search and soft start phase as a minimum.
- A proven PAM system to be utilised to conduct acoustic monitoring for marine mammals during hours of darkness and during the daylight hours. PAM will be undertaken during the pre-source start search and soft start phase during poor visibility periods as a minimum.
- Observations will be undertaken for at least 30 minutes prior to the soft-start and there will be a minimum of a 20 minute delay from the time of the last marine mammal detection within the 500 m mitigation zone and the commencement of the soft-start.
- If line changes are anticipated to be longer than 40 minutes in duration, the airgun array will be switched off at the end of the survey line. A full pre-source start search and soft start will be conducted prior to the start of the next survey line. For line turns expected to be less than 40 minutes, the shot point interval will be increased (not exceeding 5 minutes) and decreased in uniform stages during the final 10 minutes of the line turn.

13.3 In addition to the mitigation proposed by the applicant, a licence condition will require the applicant to liaise with Tullow and Ørsted in order to minimise the risk of surveys using airguns being undertaken by the applicant within Survey Area One occurring on the same day as the explosive detonation is undertaken at the Horne and Wren field as part of the proposed seabed clearance activities by Tullow and UXO clearance is undertaken by Ørsted at Hornsea Two. This will be secured by BEIS by a condition attached to the licence.

# 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 BP Endurance surveys 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 BP Endurance surveys will not have an adverse effect on the integrity of any European designated site either alone or in-combination with other plans or projects.

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Date: 3 September 2020

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