Issued 12 August 2016

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)

Project Title*: *South-west (Inshore) 2D Seismic Survey

August 2016

CONTENTS

1 INTRODUCTION

1.1 This is a record of the Habitats Regulations Assessment (HRA) undertaken by the Department for Business Energy and Industrial Strategy (BEIS) in respect of the proposed South-west (inshore) 2D seismic survey (hereafter termed "the survey"). BEIS is the competent authority for applications submitted under the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (S.I. 2001/1754) (As Amended).

1.2 WesternGeco. ("the applicant" hereafter), on behalf of the Oil and Gas Authority (OGA), has submitted an application to the former Department of Energy and Climate Change (DECC) for consent under the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (As Amended) to undertake a 2D regional seismic survey in nearshore waters off the south-west of England and the west coast of Wales.

HABITATS REGULATIONS ASSESSMENT

1.3 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 species and habitats by protecting them from adverse effects of plans and projects.

1.4 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). The Birds Directive provides for the classification of sites for the protection of rare and vulnerable birds and for regularly occurring migratory species. These sites are called Special Protection Areas (SPAs). SACs and SPAs are collectively termed European sites and form part of a network of protected sites across Europe. This network is called Natura 2000. A Site of Community Importance (SCI) is a site in the process of receiving approval; it has received approval from the European Commission (EC) but has still to be formally designated as a SAC by the UK Government.

1.5 Possible SACs (pSAC) and Candidate SACs (cSACs) and potential SPAs (pSPAs) are afforded the same levels of protection by UK Government as if they were designated. Sites designated under the Ramsar Convention are also afforded the same protection as a designated site.

1.6 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 a Habitats Regulations Assessment to determine the implications for a site's Conservation Objectives. Such a plan or project may only be agreed after ascertaining

that it will not adversely affect the integrity of a SAC/pSAC or SPA/pSPA unless there are imperative reasons of overriding public interest for carrying out the plan or project. Draft sites, i.e. those that have not been subject to any formal consultation, are not subject to the Appropriate Assessment process

1.7 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.

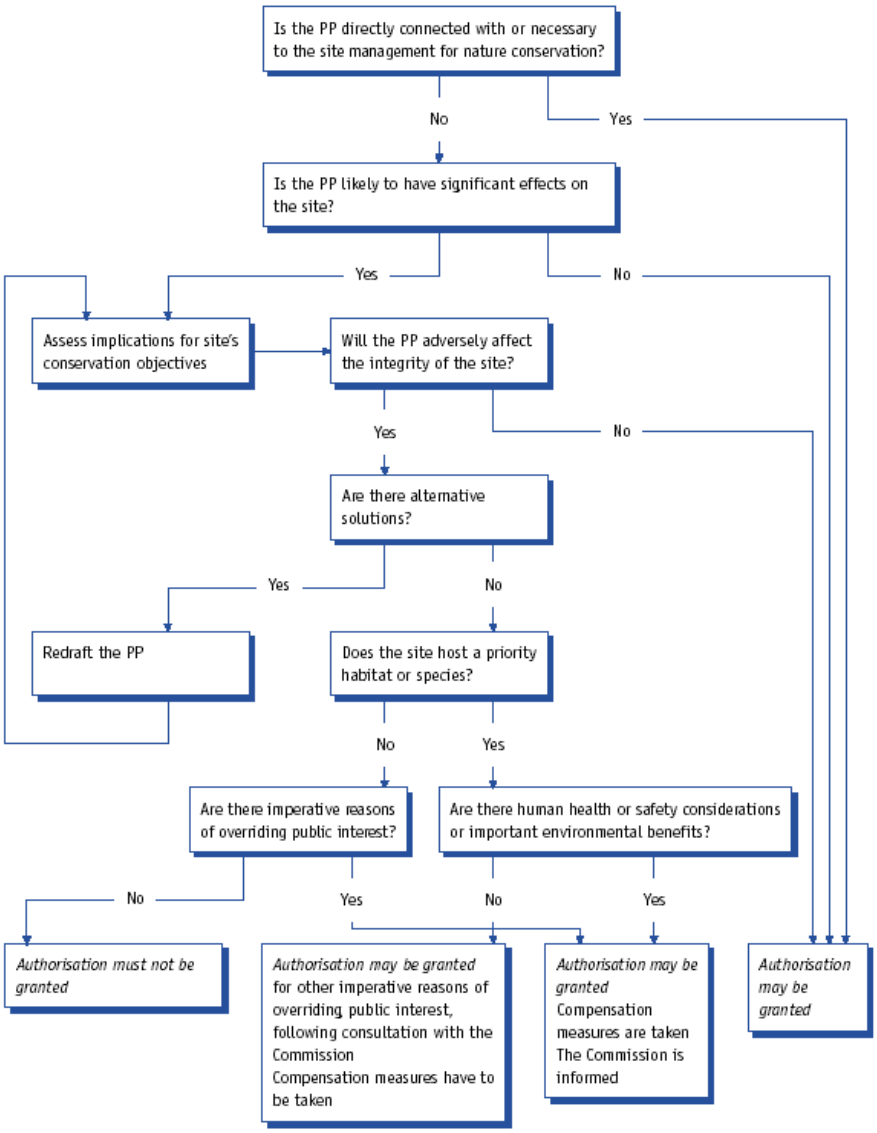
1.8 Regulation 5(1) of the 2001 Regulations provides that: *The Secretary of State shall, before granting any Petroleum Act licence, any consent, any authorisation, or any approval, where he considers that anything that might be done or any activity which might be carried on pursuant to such a licence, 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*.

1.9 The proposed 2D seismic survey may affect qualifying sites and so an Appropriate Assessment is required. This HRA is undertaken in accordance with Council Directive 92/43/EEC 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") to satisfy the Appropriate Assessment requirement.

1.10 Under the Convention on Wetlands, signed in Ramsar, Iran (1971) sites regularly supporting 20,000 waterbirds and/or support 1% of the individuals in the population of one species or subspecies of water bird, receive specific designation known as Ramsar designation. Under UK guidance sites are, as a matter of policy, afforded the same protection as European designations SPAs and SACs (ODPM 2005).

1.11 The conclusions have been informed by the analysis and information contained in the Environmental Assessment submitted by the applicant in support of the application for consent, and the subsequent advice received to the application from the JNCC and NRW (Genesis 2016). So far as is possible, the key information in these documents is summarised and referenced here, but not duplicated.

1.12 A summary of the HRA process is presented in Figure 1.



pp = plan or project

Figure 1: Summary of Habitat Regulations Assessment process (source EC 2001).

2 SURVEY DESCRIPTION

2.1 The following is a brief summary of the proposed seismic survey; further details may be found in the application.

2.2 The proposed survey will be undertaken in nearshore waters within 12 nm of the coast and adjacent waters from the Bristol Channel, northwards into Cardigan Bay and Liverpool Bay (Figure 2). The survey is part of a wider regional 2D seismic survey covering the Celtic Sea and western waters of the English Channel (Figure 3). The survey is scheduled to take place between September and November 2016 and is expected to require up to 90 working days in the field.

2.3 The proposed survey will be undertaken by a seismic survey vessel towing, a single 8,500 m streamer at a speed of approximately 4.5 knots. A total of twenty-four airguns will be used with a total volume of between 5,000 and 6,000 cubic inches (cu. in.), and the airguns will fire every 8 to 10 seconds (Genesis 2016).

2.4 The proposed survey will cover an area of 16,088 km^2 within 12 nm of the coast. The actual working area is 24,865 km^2.

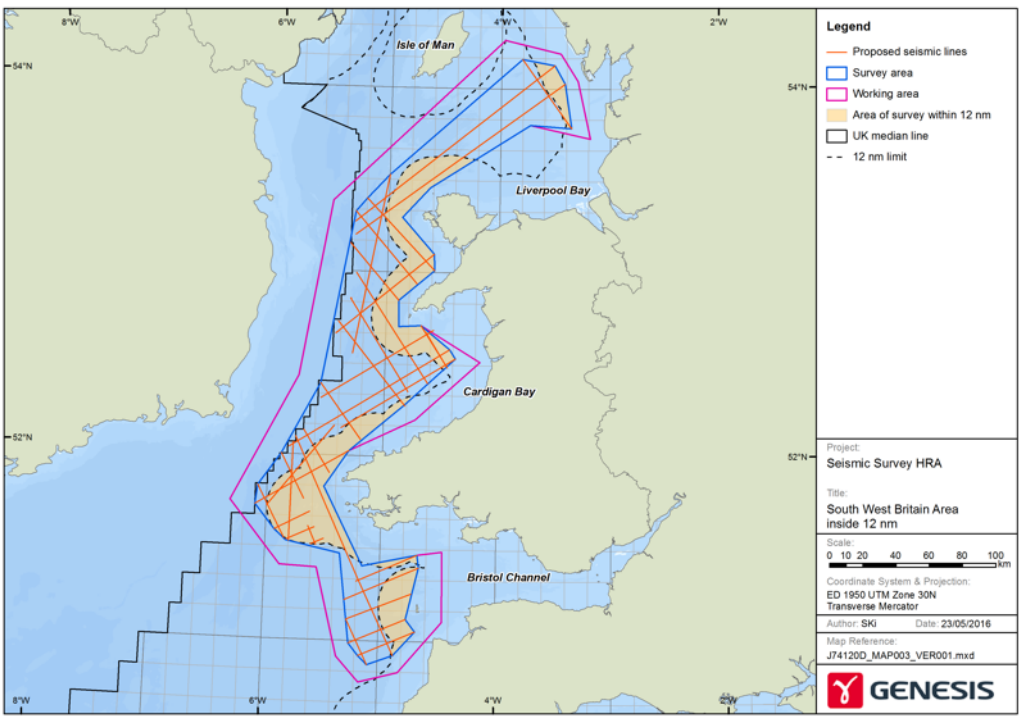


Figure 2: Location of the proposed 2D seismic inshore surveys being undertaken in the Celtic and Irish Seas during 2016.

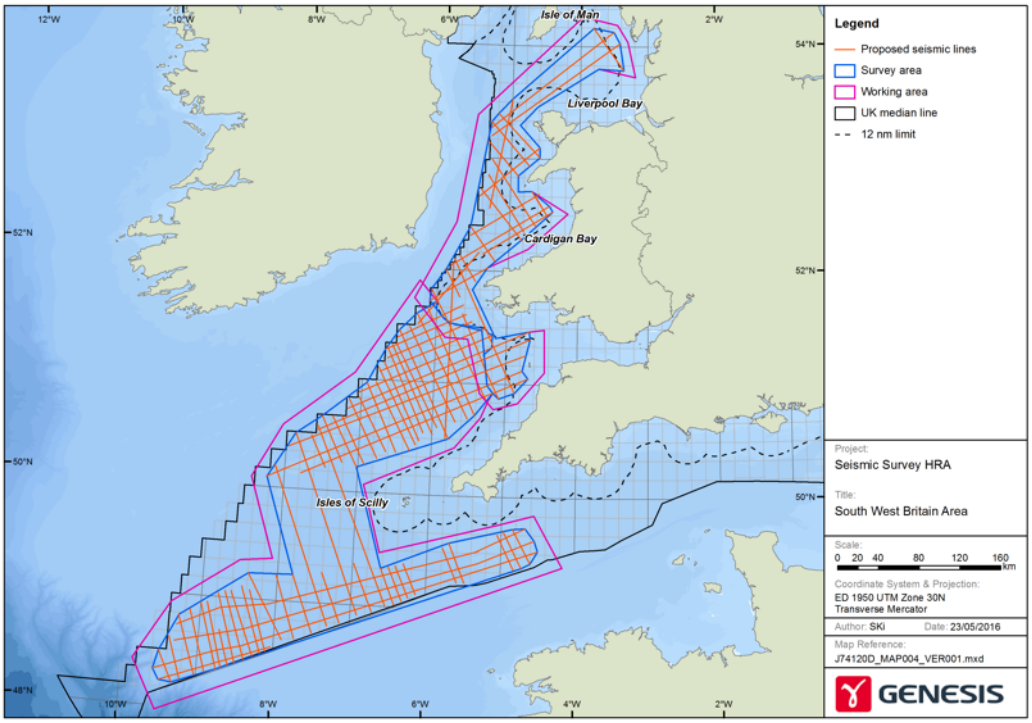


Figure 3: Area of the proposed 2D seismic inshore and offshore surveys being undertaken in the Southwest Approaches and Irish Sea during 2016.

2.5 The specifications for the seismic array as used in the applicant's noise modelling are presented in Table 1.

2.6 The peak Sound Pressure Level (SPL) is 259 dB re 1 µPa at 1 m.

Table 1: Seismic array parameters as used in the applicant's noise modelling.

Array Parameter	Array Value
Model	Delta3
Number of airguns	24
Total volume (cu. In).	5,085.0 (83.3 litres)
Sound pressure downwards	259 dB re 1 µPa (0-p)
RMS pressure (bar-m)	240 dB re 1 µPa (rms)
Sound exposure level vertically downwards	230 dB re 1 $\mu Pa^2 s$
Pulse rate	0.1 Hz (1 pulse every 10 seconds)
Towed depth (m)	6

3 DESIGNATED SITES

3.1 The proposed seismic survey is 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. Based on the information presented within the application and the results from the noise modelling undertaken in support of the application a total of 17 SACs/pSAC and 20 SPA have been identified as having qualifying species at risk of a likely significant effect from the proposed nearshore seismic survey (Figure 4, Table 2 and Figure 5, Table 3).

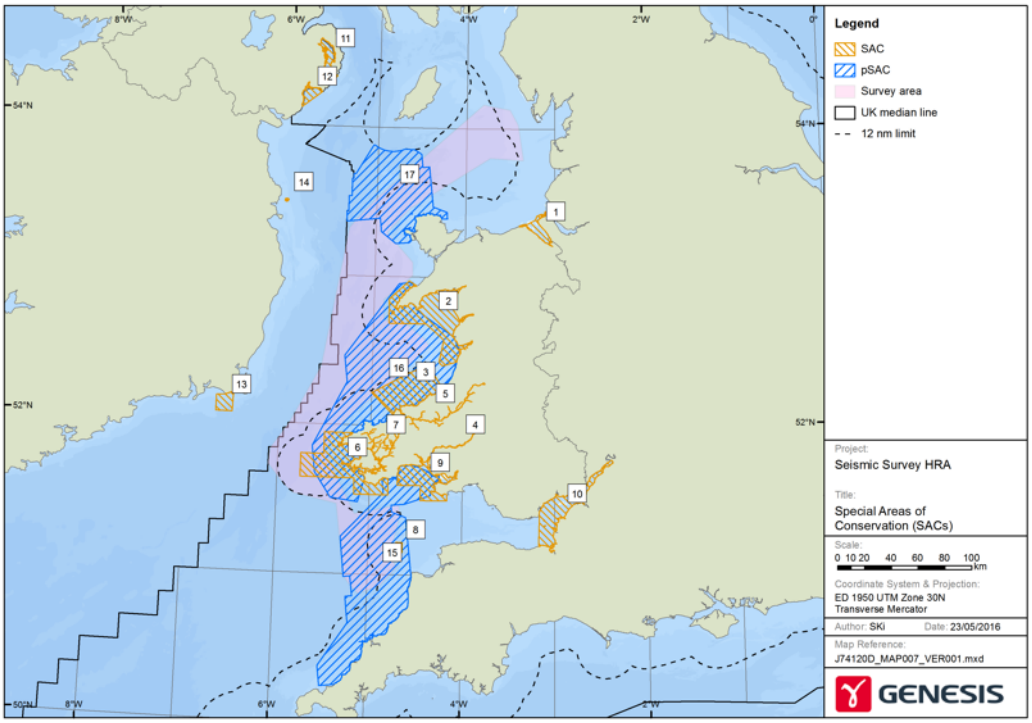


Figure 4: SAC/pSACs identified as having qualifying species with potential for a likely significant effect from the proposed seismic survey.

Table 2: SAC/pSAC sites with potential for a likely significant effect and their distance from nearest proposed survey line and working area.

Site	Approximate distance from closest		Map Label
	Survey line	Working area	
SACs			
Dee Estuary / Aber Dyfrdwy	43 km	32 km	1
Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau	0 km	0 km	2
Cardigan Bay / Bae Ceredigion	0 km	0 km	3
Afon Tywi / River Tywi	48 km	40 km	4
Afon Teifi / River Teifi	21 km	10 km	5
Pembrokeshire Marine / Sir Benfro Forol	0 km	0 km	6
Afonydd Cleddau / Cleddau Rivers	n/a	n/a	7
Lundy	5 km	0 km	8
Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd	15 km	2 km	9
Severn Estuary / Môr Hafren	104 km	90 km	10
Strangford Lough	98 km	75 km	11
Murlough	88 km	75 km	12
Saltee Islands	39 km	25 km	13
Lambay Island	50 km	35 km	14
pSACs			
Bristol Channel Approaches / Dynesfeydd Môr Hafren	0 km	0 km	15
West Wales Marine / Gorllewin Cymru Forol	0 km	0 km	16
North Anglesey Marine / Gogledd Môn Forol	0 km	0 km	17

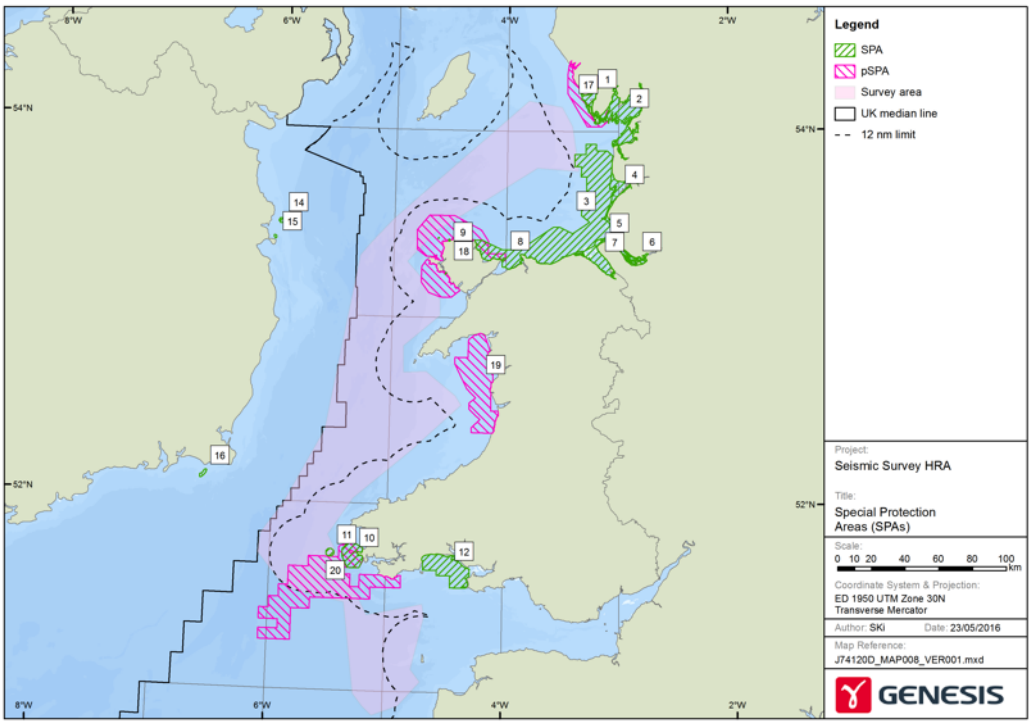


Figure 5: SPA/pSPAs identified as having qualifying species with potential for a likely significant effect from the proposed seismic survey.

Table 3: SPA/pSPA sites with potential for a likely significant effect and their distance from nearest proposed survey line and working area.

Site	Approximate distance from:		Map Label
	Survey line	Working area	
SPAs			
Duddon Estuary	12 km	5 km	1
Morecambe Bay	13 km	5 km	2
Liverpool Bay / Bae Lerpwl	0 km	0 km	3
Ribble and Alt Estuaries	19 km	7 km	4
Mersey Narrows and North Wirral Foreshore	41 km	32 km	5
Mersey Estuary	52 km	42 km	6
The Dee Estuary	45 km	38 km	7
Ynys Seiriol / Puffin Island	40 km	35 km	8
Ynys Feurig, Cemlyn Bay and The Skerries	7 km	3 km	9
Skokholm and Skomer	6 km	2 km	10
Grassholm	0 km	0 km	11
Bae Caerfyrddin / Carmarthen Bay	19 km	8 km	12
Isles of Scilly	45 km	26 km	13
Lambay Island	51 km	34 km	14
Ireland's Eye	52 km	37 km	15
Saltee Islands	51 km	34 km	16
pSPAs			
Morecambe Bay and Duddon Estuary	7 km	0 km	17
Anglesey Terns / Morwenoliaid Ynys Môn	0 km	0 km	18
Northern Cardigan Bay / Gogledd Bae Ceredigion	5 km	0 km	19
Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	0 km	0 km	20

3.2 A list of the sites' qualifying features and species sourced from JNCC (2016), NRW (2016a) and NPWS (2016) is presented in Appendix A.

4 NOISE MODELLING

4.1 In order to inform the EIA application the applicant has undertaken noise modelling to assess the potential impacts arising from the proposed seismic survey on the qualifying species occurring at the qualifying sites that could be impacted.

4.2 Noise modelling has been undertaken at three locations covering the geographical extent of the proposed survey within 12 nm of the coast and at locations in close proximity to qualifying sites (Figure 6, Table 4).

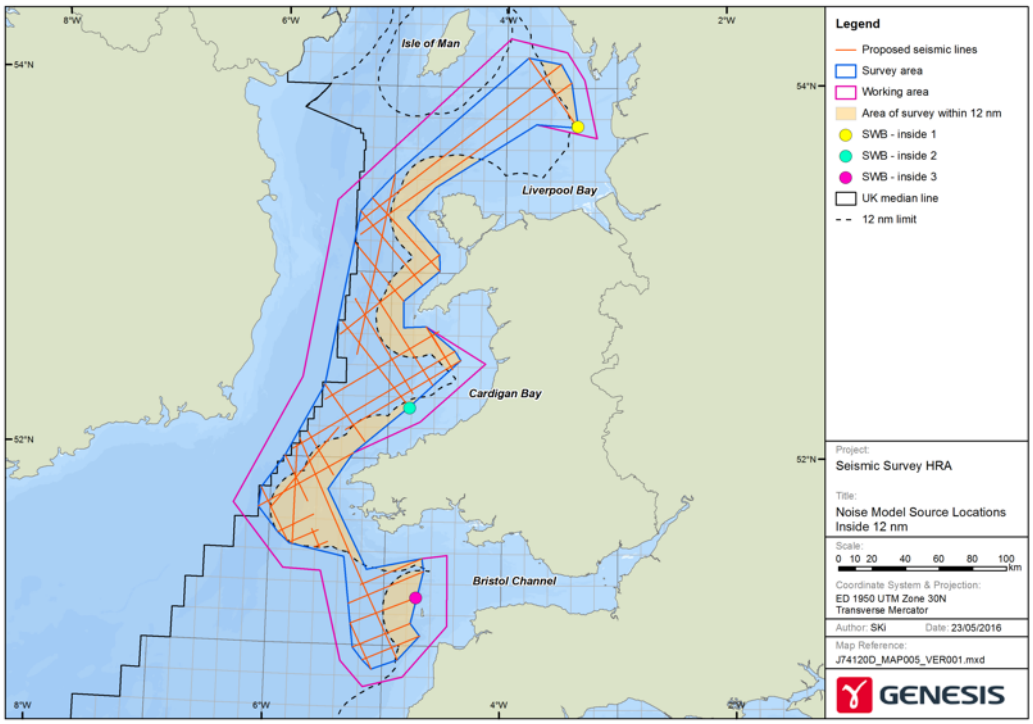


Figure 6: Locations where underwater noise modelling of the proposed 2D seismic survey has been undertaken within 12 nm of the coast.

Table 4: Locations where noise modelling has been undertaken by the applicant.

Location No.	Location name
1	Liverpool Bay
2	Cardigan Bay
3	Bristol Channel

4.3 Details of the modelling undertaken are presented in the application (Genesis 2016).

5 SCOPE OF THE ASSESSMENT

5.1 Based on the information presented within the application it has been determined that the HRA should consider alone and in-combination the potential direct and indirect impacts on:

- Harbour Porpoise,
- Bottlenose dolphin,
- Grey seal,
- Harbour seal,
- Otter,
- Seabirds and sea duck,
- Fish.

Harbour porpoise (*Phocoena phocoena*)

5.2 The harbour porpoise (*Phocoena phocoena*) is a qualifying species for three pSACs that could be impacted by the proposed survey: Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC, West Wales Marine / Gorllewin Cymru Forol pSAC and North Anglesey Marine / Gogledd Môn Forol pSAC. The proposed survey will occur within all three sites.

5.3 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).

5.4 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 (Sveegaard 2011).

5.5 Although the harbour porpoise has a very broad distribution across the UKCS, 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, Heinänen and Skov 2015, Saana 2006, Whaley 2004). Their distribution may also be strongly correlated with seabed type, with area of sandy gravel being preferred and this may be linked to the availability of suitable prey (Clark 2005).

5.6 Modelling the distribution of harbour porpoise in UK waters has indicated that harbour porpoise avoid areas of relatively high levels of shipping of more than 50 vessels per day (Heinänen and Skov, 2015).

5.7 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). Harbour porpoise are opportunistic feeders, foraging close to the seabed or near the sea surface, preying on a wide range of fish species including, herring, cod, whiting and sandeels and their prey will vary during and between seasons (Santos and Pierce 2003). Studies undertaken in Denmark indicate that their local distribution may be correlated with prey availability (Sveegaard 2011).

5.8 Harbour porpoise live for a maximum of between 15 – 20 years. Females become sexually mature at around three to four years old (Lockyer 2003). 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). Within the Irish Sea Calves occur throughout the region (Baines and Evans 2012).

5.9 Data from ESAS and other databases indicate harbour porpoise to be widespread across all UK waters, with the exception of the English Channel (Reid *et al*. 2003). Recent evidence indicates that there may have been an increase in the density of harbour porpoises in waters south-west of the UK since the early 1990's (Figure 7) (Hammond *et al*. 2013).

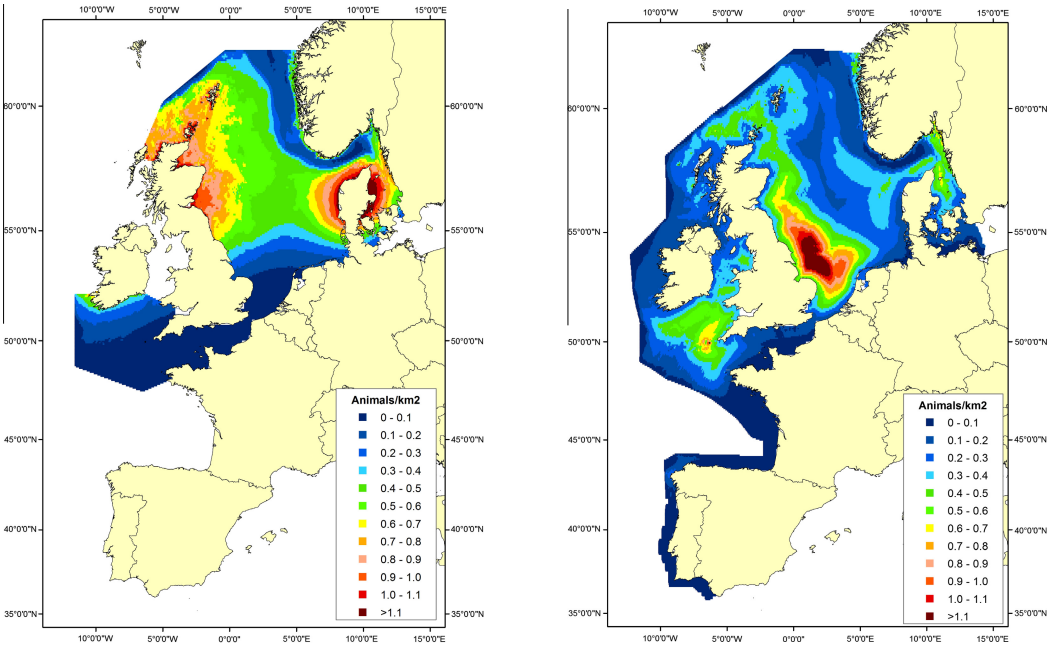


Figure a. Figure b.

Figure 7: a) Predicted density surface for harbour porpoise in 1994. b) Predicted density surface for harbour porpoise in 2005 (Source Hammond *et al.* 2013).

5.10 Results from the SCANS surveys undertaken in 2005 estimated a regional population of 375,352 individuals (CI 256,304 – 549,713) throughout the North Sea and adjacent waters (Hammond *et al.* 2013).

5.11 The population within the area of the proposed inshore survey covers the SCANS survey areas O and P. Within surveyed area O, which covers the Irish Sea, the SCANS II survey estimated a population of 15,230 harbour porpoise at a density of 0.335 ind/km^2. Within SCANS survey area P, which covers the Celtic Sea and the Southwest Approaches, the population of harbour porpoise was estimated to be 72,389 individuals at a density of 0.53 ind/km^2 (Hammond *et al.* 2013). However, these population estimates are recognised as being based on data from a single survey collected during a single month and that the harbour porpoise population within will vary across seasons and years.

5.12 The proposed seismic survey will be within the Celtic and Irish Seas Management Unit for harbour porpoise that has an estimated population of 104,695 (CI 56,774 – 193,065) individuals of which 47,229 (CI 25,611 – 87,098) occur in UK waters. (IAMMWG 2015).

5.13 Data from surveys and results from modelling indicate that harbour porpoise densities in the Celtic and Irish Seas are not uniform and vary both temporally and spatially across the proposed survey area. Harbour porpoise occur regularly around North and West Anglesey, the south-west coast of the Llŷn Peninsula, southern Cardigan Bay and in the Bristol Channel off the south coast of Wales (Baines and Evans 2012) (Figure 8).

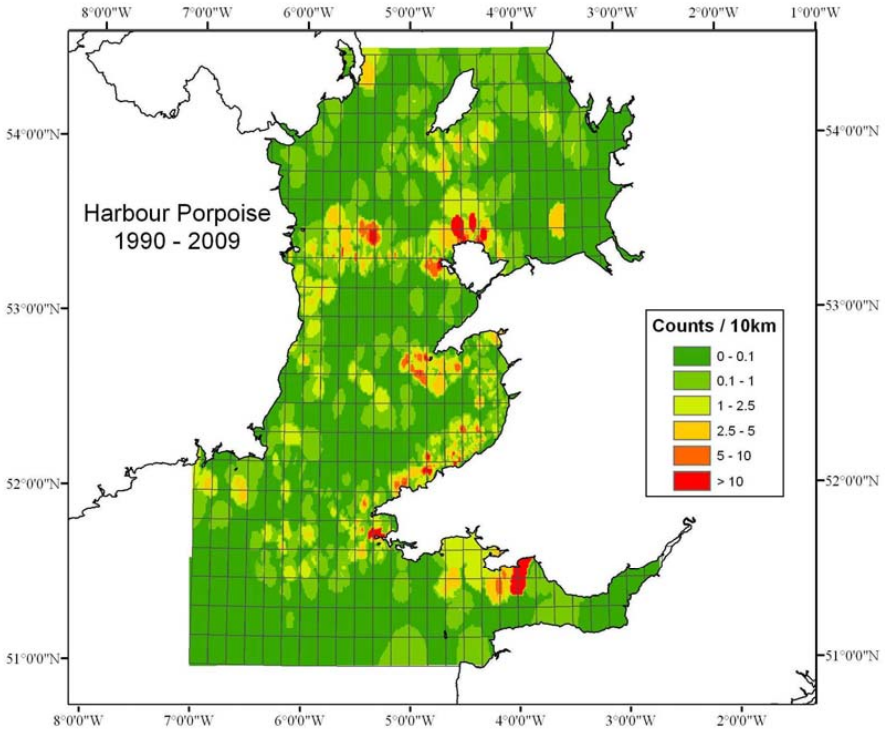


Figure 8: Harbour porpoise distribution in Irish and Celtic Seas (Source: Baines and Evans 2012).

5.14 During the summer, the highest densities of >3.0 ind/km^2 occur in Cardigan Bay, around St David's Head and between the Isle of Man and Anglesey. (Figure 9). During the winter period modelling indicates highest densities occur predominantly off the north Cornwall and north Devon coasts, although historically relatively high densities have also been recorded to the North of the Isle of Man and, to a lesser extent, in Cardigan Bay (Figure 10) (Heinänen & Skov 2015).

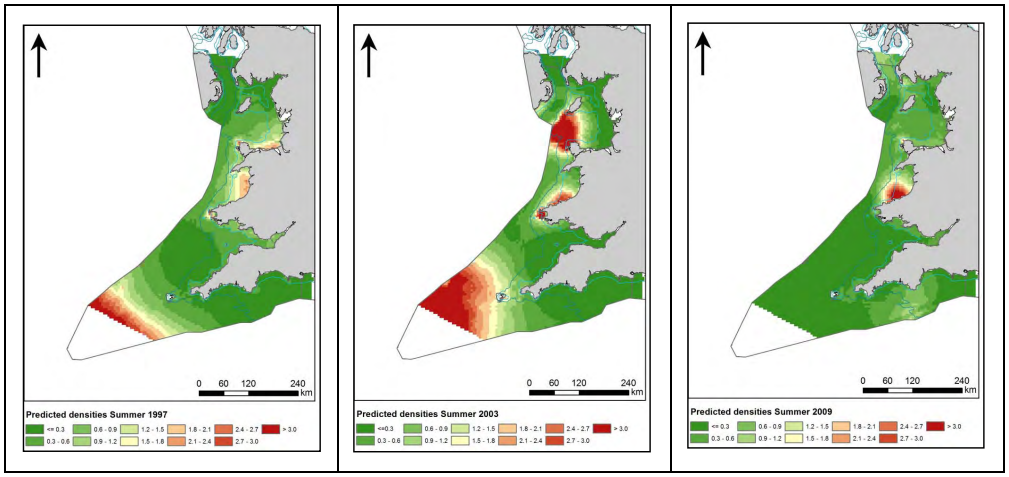


Figure 9: Estimated summer densities of harbour porpoise in the Celtic and Irish Seas across three years (Source: Heinänen & Skov 2015).

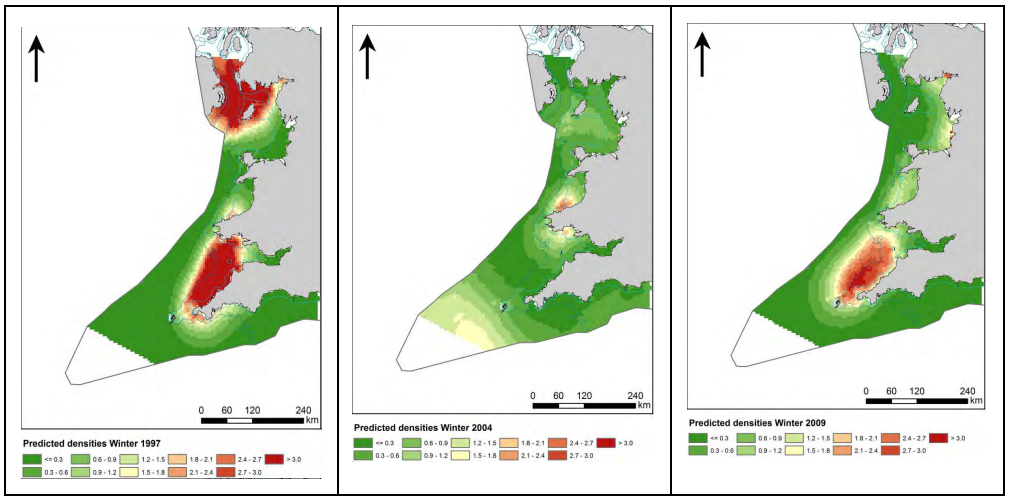


Figure 10: Estimated winter densities of harbour porpoise in the Celtic and Irish Seas (Source: Heinänen & Skov 2015).

5.15 Porpoises are generally considered to be 'high frequency' hearing specialists with a relatively poor ability to detect lower frequency sounds (Southall *et al.* 2007). Studies undertaken on captive harbour porpoise indicate that they have a functional hearing range of between 250 Hz and 180 kHz, with their best hearing frequencies between 16 to 140 kHz and their maximum sensitivity between 100 and 140 kHz. Their ability to detect sound at frequencies below 16 kHz or above 140 kHz falls sharply (Kastelein *et al.* 2012, 2015, Southall *et al*. 2007).

5.16 Harbour porpoise are therefore most sensitive to sound sources between 16 to 140 kHz and, although audible, they are relatively less sensitive to sound either above or below those frequencies.

Bottlenose Dolphin (*Tursiops truncatus*)

5.17 The bottlenose dolphin (*Tursiops truncatus*) is a qualifying species for the Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC. The proposed survey will occur within the boundaries of both SACs (Figure 4).

5.18 Within UK nearshore waters most sightings of bottlenose dolphin are from the Moray Firth and the Aberdeenshire coast and Cardigan Bay. Smaller numbers have been recorded elsewhere particularly around Devon and Cornwall and North Uist (Reid *et al*. 2003).

5.19 Within UK nearshore waters, bottlenose dolphins are fairly sedentary and occupy distinct geographical areas and with the exception of the south coast of England, no distinct seasonal movements have been recorded. However, overall greatest numbers of bottlenose dolphin are recorded between July and October (Reid *et al.* 2003).

5.20 Within the area of the proposed survey bottlenose dolphin occur in Cardigan Bay and off the north coast of Wales (Figure 11).

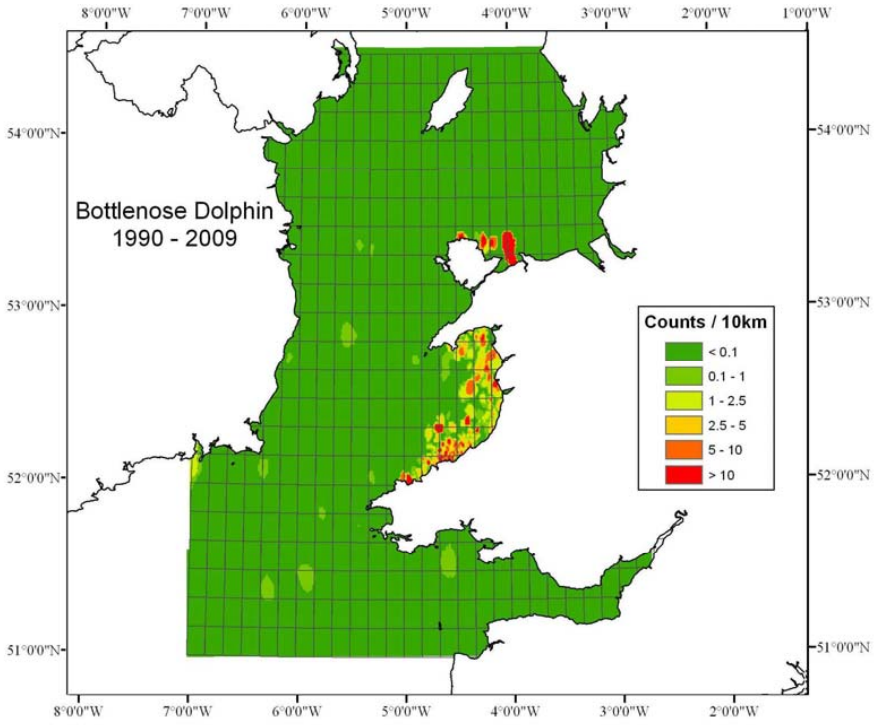


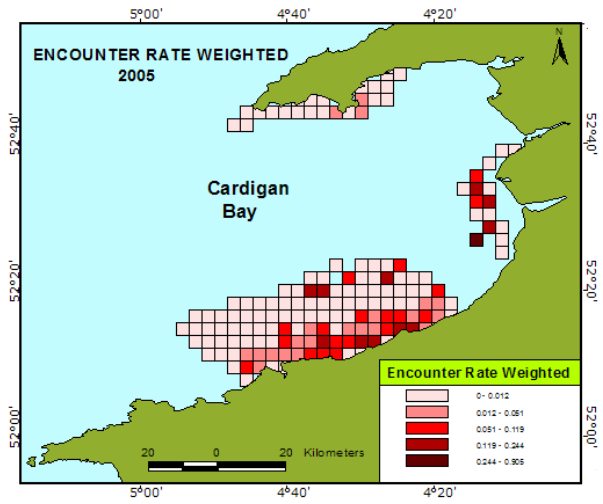
Figure 11: Bottlenose dolphin distribution in Irish and Celtic Seas (Source: Baines and Evans 2012).

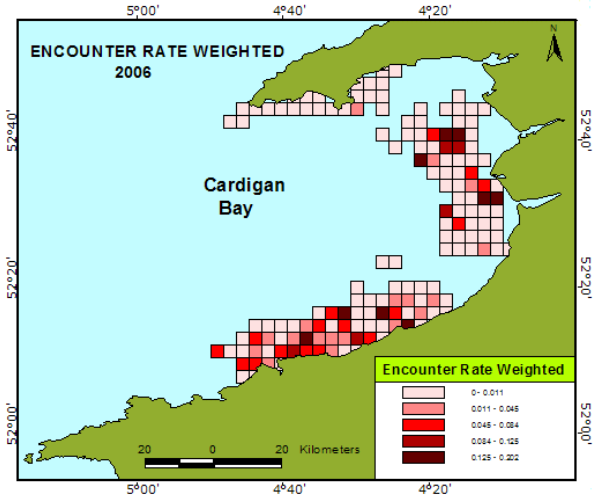
5.21 Within Cardigan Bay, most sightings of bottlenose dolphin occur within 10 miles of the coast and particularly within 2 miles, favouring shallow sloping waters between 5 m and 10 m deep (Figure 12) (Pesante *et al*. 2008). However, in recent years they have

occurred more regularly in deeper waters of between 25 and 30 m and further offshore. Areas of strong tidal currents near headlands and estuaries are particularly favoured habitats (Pesante *et al.* 2008).

5.22 Bottlenose dolphin are generalist and opportunistic feeders, feeding on a broad range of prey species with main prey items having been reported to be cod, saithe and whiting with some salmon, haddock and cephalopods (Santos *et al*. 2001). Individuals in Cardigan Bay have been recorded feeding on common sole, red gurnard and salmonids (Norrman *et al.* 2015).

5.23 Results from the SCANS surveys undertaken in 2005 estimated a regional bottlenose dolphin population of 16,485 individuals (CI 7,463 – 32,431) throughout the North Sea and adjacent waters including the Celtic and Irish Seas (Hammond *et al.* 2013).





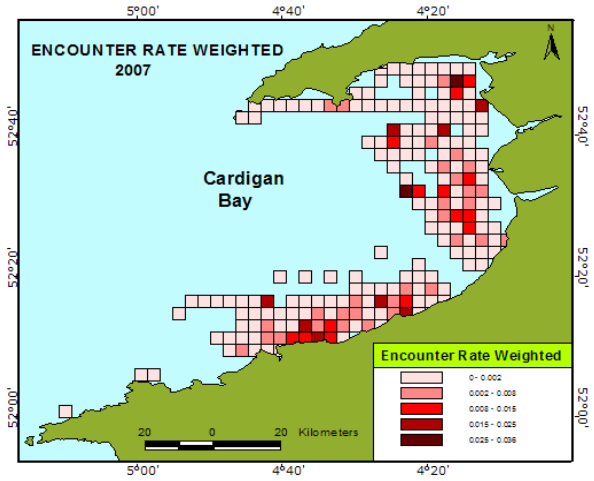


Figure 12: Bottlenose dolphin distribution within Cardigan Bay between 2005 and 2007 (Source Pesante *et al.* 2008).

5.24 The population within the area of the proposed inshore survey covers the SCANS survey areas O and P. Within surveyed area O, which covers the Irish Sea, the SCANS II survey estimated a population of 235 individuals at a density of 0.0052 ind/km^2. Within SCANS II survey area P, which covers the Celtic Sea and the Southwest Approaches, the population of bottlenose dolphin was estimated to be 7,665 individuals at a density of 0.0388 ind/km^2 (Hammond *et al.* 2013).

5.25 The proposed survey may impact on two different management unit populations for bottlenose dolphins, although the majority of the survey will be undertaken in the Irish Sea management unit some survey will be undertaken in Offshore Channel, Celtic Sea and South-west England management unit (IAMMWG 2015). The estimated bottlenose dolphin population in the Irish Sea is 397 individuals and in the wider offshore area the population is estimated to be 4,856 individuals (Table 5).

Table 5: Estimated bottlenose dolphin management unit populations.

Management Unit	Abundance	95% CI
Irish Sea	397	362 - 412
Offshore Channel, Celtic Sea and South-west England	4,856	1,658 - 14, 398

5.26 Within Cardigan Bay (including Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC) the distribution of bottlenose dolphin is not uniform, with most occurring within the two SACs. Recent estimates of the bottlenose dolphin population within Cardigan Bay as a whole are very variable with estimates from between 126 and 379 individuals, of which between 101 and 250 occur within Cardigan Bay / Bae Ceredigion SAC (Feingold *et al*. 2011, JNCC 2015,

Norrman *et al.* 2015, Pesante *et al*. 2008). The population within Cardigan Bay varies across years with up to 50% difference reported between years, indicating that bottlenose dolphins regularly move out of the Cardigan Bay area for extended periods of time (Pesante *et al*. 2008). Recent evidence indicates a decline in the overall population within Cardigan Bay with dolphins permanently leaving the area. The reasons for the decline are unknown but may be due decrease in food availability or increased anthropogenic disturbance (Norrman *et al.* 2015).

5.27 The density of bottlenose dolphin within Cardigan Bay has been estimated to be 0.25 ind/km^2 between May and July and 0.29 ind/km^2 during August and September (Baines *et al.* 2002).

5.28 Most sightings in nearshore waters of Cardigan Bay occur between April and November with numbers peaking in July and August and decreasing thereafter with the lowest number of sightings between October and April; particularly during March (Bristow & Rees 2001). Within Cardigan Bay / Bae Ceredigion SAC the most frequently recorded behaviour is related to foraging activity in particular around New Quay Bay where there is an increase in activity around the Llanina Reef (Peña 2014).

5.29 Calving can occur throughout the year but peak calving activity occurs between July and September (Norrman *et al*. 2015).

5.30 Outwith Cardigan Bay, bottlenose dolphins occur widely along the south and north coasts of Wales and within the East Irish Sea (Norrman *et al.* 2015, Reid *et al*. 2003, Goold *et al.* 2005). Observations along the coast of North Wales and in Liverpool Bay indicate strong connectivity with the population within Cardigan Bay with up to 78% of those photographed in the Irish Sea previously having been recorded in Cardigan Bay (Norrman *et al*. 2015, Pesante *et al*. 2008). However, a small proportion of the population is site faithful with 7% of individuals only ever have been recorded within the Cardigan Bay / Bae Ceredigion SAC and 3% only being recorded within the Pen Llŷn a`r Sarnau/ Lleyn Peninsula and the Sarnau SAC (Norrman *et al*. 2015).

5.31 Sound arising from the proposed seismic survey has the potential to significantly affect bottlenose dolphins due to permanent or temporary physical hearing damage and or displacement and disturbance. The proposed survey occurs within two SACs and sound arising from the airguns will occur in areas where there is the potential for bottlenose dolphins to be present. The proposed survey could therefore impact bottlenose dolphins or their prey within and outwith the Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC.

Grey seal (*Halichoerus grypus*)

5.32 The grey seal (*Halichoerus grypus*) is an Annex II primary or non-primary qualifying species for the:

- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Lambay Island SAC,
- Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC,
- Cardigan Bay / Bae Ceredigion SAC,
- Lundy SAC and Great Saltee SAC.

5.33 The proposed survey area occurs within the Pembrokeshire Marine / Sir Benfro Forol SAC, Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC, Cardigan Bay / Bae Ceredigion SAC and Lundy SAC.

5.34 Grey seals occur widely across the Irish Sea with the majority of activity around Anglesey, Pembrokeshire and south-east Ireland (Jones *et al.* 2013) (Figure 13). Haul out sites occur along remote beaches, islands and offshore rocks. Their distribution offshore comprises predominantly of short-range return trips from haul-out sites to local foraging areas. However, longer movements between distant haul-out sites also regularly occur. Foraging trips from haul-out sites usually last between two and five days with most trips within 40 km of the haul out site, although they can go further and individuals often make repeated trips to the same region offshore (SMRU 2004, SCOS 2014).

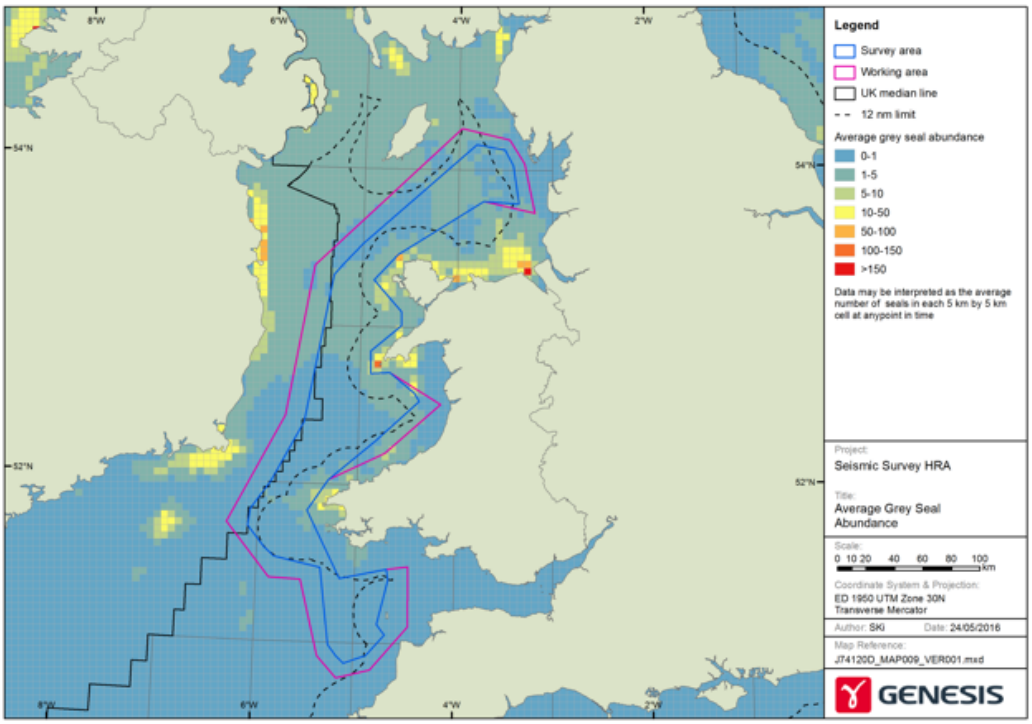


Figure 13: Distribution of grey seals within the Celtic and Irish Seas.

5.35 Unlike grey seals elsewhere in the UK, pupping within Cardigan Bay occurs at secluded coves and bays, in particular sea caves, as opposed to the large

congregations found elsewhere (CCW 2009a). Grey seals breed in the region between September and October when they will spend a greater proportion of time onshore compared with other times of year. Following pupping the females will remain onshore for approximately two weeks (SCOS 2014). Following breeding, females moult between November and December, followed by the males between January and April (Hanley *et al.* 2012, Kiely *et al*. 2000).

5.36 Grey seals forage on a range of fish species with gadoids and flatfish being dominant prey items in the Irish (Kiely *et al*. 2000).

5.37 The grey seal population in the Irish Sea is estimated to be between 5,198 and 6,976 individuals, of which an estimated 5,000 occur along the west coast of Wales and 300 along the coast of North Wales (Baines *et al.* 1995, Kiely *et al*. 2000).

5.38 Sound arising from the proposed seismic survey has the potential to significantly affect grey seals due to permanent or temporary physical hearing damage and or displacement and disturbance. Consequently, the proposed survey could affect grey seals or their prey both within and outwith designated sites.

Harbour seal (*Phoca vitulina*)

5.39 The harbour seal (*Phoca vitulina*) is an Annex II primary or non-primary qualifying species for:

- Lambay Island SAC,
- Strangford Lough SAC,
- Murlough SAC.

5.40 The proposed survey area does not occur within the SACs for which harbour porpoise is a qualifying species.

5.41 Harbour seals are scarce in the west and south-west of Britain with an estimated regional population of 35 individuals. Estimated populations of between 38 and 47 individuals occur at Lambay Island SAC and 479 at Murlough and Strangford Lough SACs (NPWS 2013, DECC 2013).

5.42 Harbour seals occur in sheltered bays, inlets and enclosed estuaries and foraging trips are not as extensive as those of grey seals, remaining largely in nearshore waters. Breeding in the region takes place between May and July and pups are nursed for a few weeks.

5.43 Harbour seals are opportunistic feeders preying on a wide range of fish species including sandeels, gadoids, flatfish, scorpion fish, sandy benthic fish, pelagic fish and also cephalopods (SCOS 2014).

5.44 The known distribution of harbour seals in the Irish Sea is limited with few tracking studies having been undertaken. However, studies of harbour seals originating from

Strangford Lough indicate that they occur primarily within the coastal waters of Northern Ireland and do not regularly occur in waters further offshore (Figure 14).

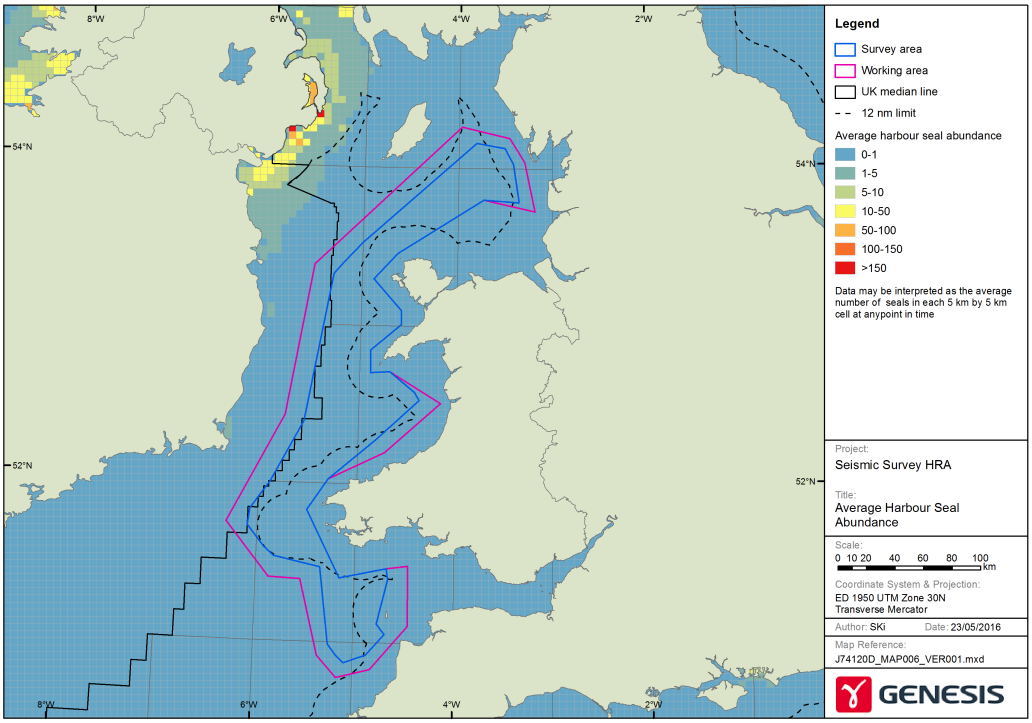


Figure 14: Distribution of harbour seals from Northern Ireland within the Irish Sea.

5.45 Sound arising from the proposed seismic survey has the potential to effect harbour seals due to displacement or disturbance. Consequently, the proposed survey could affect harbour seals or their prey outwith the designated sites.

Otter (*Lutra lutra*)

5.46 The otter (*Lutra lutra*) is an Annex II primary or non-primary qualifying species for:

- Afon Teifi / River Teifi SAC,
- Afon Tywi / River Tywi SAC,
- Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC.

5.47 Though not strictly a marine mammal, there are coastal populations around the UK. Populations in coastal areas utilise shallow, inshore marine areas for feeding but also require fresh water for bathing and terrestrial areas for resting and breeding holts. Coastal otter habitat ranges from sheltered wooded inlets to more open, low-lying coasts but they remain within close proximity of the shore (JNCC 2016).

5.48 Coastal otters remain close to shore with the majority of activity occurring within the intertidal zone and within 150 m of the coast (Watson 1986). Studies undertaken on coastal otters in Pembrokeshire indicate that they have a broad diet with over 30 different prey types having been identified, the majority of which are marine fish.

However, a significant proportion of their diet is also made up of fresh water fish species (Gareth *et al*. 2010).

5.49 Otters in coastal habitats may experience acoustic disturbance from the proposed seismic survey.

Seabirds

5.50 A total of 20 SPAs/pSPAs have been identified as have qualifying species at risk from the proposed seismic survey in nearshore waters. This initial assessment is based on mean maximum breeding seabird foraging ranges following Thaxter *et al.* (2012) and wintering or passage species regularly occurring in the marine area (Table 6 and Appendix A).

5.51 A total of 25 species of seabird (including Divers, Grebes and Duck) from relevant (p)SPAs have been identified as being at potential risk of an adverse effect and therefore considered within this assessment (Table 6).

Table 6: Qualifying seabird species for SPA/pSPAs included in this assessment.

Species	SPA/Ramsar
Eider	Morecambe Bay, Ribble and Alt Estuaries
Common scoter	Liverpool Bay / Bae Lerpwl, Bae Caerfyrddin / Carmarthen Bay
Goldeneye	Morecambe Bay, Ribble and Alt Estuaries
Red-breasted merganser	Morecambe Bay, Ribble and Alt Estuaries
Red-throated diver	Liverpool Bay / Bae Lerpwl, Northern Cardigan Bay / Gogledd Bae Ceredigion
Fulmar	Lambay Island, Saltee Islands
Manx shearwater	Skokholm and Skomer, Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro
Storm petrel	Skokholm and Skomer, Isles of Scilly
Gannet	Grassholm, Saltee Islands
Cormorant	Morecambe Bay, Ribble and Alt Estuaries, Mersey Narrows and North Wirral Foreshore, The Dee Estuary, Ynys Seiriol / Puffin Island, Lambay Island, Ireland's Eye, Saltee Islands
Shag	Isles of Scilly, Lambay Island, Saltee Islands
Great-crested grebe	Morecambe Bay, Ribble and Alt Estuaries, Mersey Estuary
Little tern	Morecambe Bay, Ribble and Alt Estuaries, The Dee Estuary
Sandwich tern	Duddon Sands, Morecambe Bay, Ribble and Alt Estuaries, The Dee Estuary, Anglesey Terns / Morwenoliaid Ynys Môn
Common tern	Morecambe Bay, Ribble and Alt Estuaries, Mersey Narrows and North Wirral Foreshore, The Dee Estuary, Anglesey Terns / Morwenoliaid Ynys Môn
Roseate tern	Anglesey Terns / Morwenoliaid Ynys Môn
Arctic tern	Anglesey Terns / Morwenoliaid Ynys Môn
Little gull	Mersey Narrows and North Wirral Foreshore
Kittiwake	Skokholm and Skomer, Lambay Island, Ireland's Eye,

Species	SPA/Ramsar
	Saltee Islands
Lesser black-backed gull	Morecambe Bay, Ribble and Alt Estuaries, Skokholm and Skomer, Isles of Scilly, Lambay Island, Saltee Islands
Herring gull	Morecambe Bay, Ribble and Alt Estuaries, Lambay Island, Ireland's Eye, Saltee Islands
Great black-backed gull	Isles of Scilly
Puffin	Skokholm and Skomer, Lambay Island, Saltee Islands, Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro.
Razorbill	Skokholm and Skomer, Lambay Island, Saltee Islands
Guillemot	Skokholm and Skomer, Lambay Island, Ireland's Eye, Saltee Islands

5.52 It is recognised that seabirds from other SPA colonies may also occur in the proposed survey area, particularly outwith the breeding period. However, it is not possible to determine which designated sites these birds may originate from and consequently the sites cannot be considered within this assessment.

5.53 Seabirds occur widely across the Celtic and Irish Seas throughout the year. The breeding season for seabirds varies between species but broadly extends from between April and August, with the core breeding period between May and July during which time their distribution offshore is constrained by the requirement to return to their breeding sites. Following breeding, seabirds disperse away from their colonies to their wintering areas; either west into the Atlantic or southwards. Guillemots and razorbills disperse from the colonies during July and August. Adults become flightless during their post-breeding moult and the males are accompanied by flightless chicks. The highest numbers of flightless birds initially occur near the breeding colonies during July and early August. However, the birds rapidly disperse and can travel 50 km per day away from the coastal waters (Camphuysen 2002). From September onwards the number of Auks in nearshore waters decreases.

5.54 The behaviour of seabirds towards vessel activity varies across species. Gannets, shags, guillemots, razorbills and puffins are moderately tolerant of vessels (Furness and Wade 2012), but will largely avoid vessels at close distances by flying, swimming or diving. Evidence from offshore activities indicates that these species are not significantly impacted by vessel disturbance with Furness and Wade (2012) indicating a moderate sensitivity for Auk species towards vessel disturbance. Theoretical modelling undertaken to assess the potential disturbance effect from vessels over a range of distances concluded that '*the numbers of potentially affected [individuals] and frequency that individuals would experience such active disturbance are both so low that it is not plausible that it could significantly affect populations*' (McDonald *et al*. 2012). However, some species, e.g. red-throated divers and common scoter are less

tolerant of vessels and will avoid them at greater distances. Studies undertaken on red-throated diver indicate that there is total displacement of red-throated divers within 100 m of a vessel and varying degrees of displacement at distances up to 1,000 m. Some displacement could occur beyond 1,000 m but such effects cannot be reliably quantified or attributed to vessels (Norman and Ellis 2005). Common scoters are also known to avoid vessels with a significant increase in the number of birds being flushed within 2 km from a vessel (Kaiser 2002).

5.55 At sea, seabirds forage either predominantly by surface feeding, e.g. Gulls and Petrels; surface diving, e.g. Auks or plunge diving, e.g. Terns and Gannets. Surface feeders and plunge diving species are largely aerial and spend relatively short periods of time, if any, below the sea surface, e.g. plunge diving gannets spend on average 4.7 (±2.8) seconds below the sea surface (Yan *et al.* 2009). Surface feeders spend relatively longer periods of time on the sea surface. In shallow waters guillemots spend on average 46.4 (±27.4) seconds below the sea surface and shags 61 seconds (Thaxter *et al.* 2009, Wanless *et al.* 1993). Red-throated divers will dive for up to 60 seconds and common scoter up to 37 seconds (Black *et al*. 2015, Kaiser *et al.* 2006). Consequently, surface diving seabirds (e.g. cormorant, shag, guillemot, razorbill, puffin, common scoter and red-throated diver) are at more risk of impacts from underwater noise than other species of seabird present in the proposed survey area. See Table 10 for the dive durations for a range of relevant species.

5.56 Seabirds forage on a wide range of fish species. Sandeels are the dominant prey item in many areas (e.g. Monaghan 1992; Daunt *et al.* 2008). However, other fish species, particularly juvenile gadids (cod, whiting, haddock and Norway pout) may also be important components of their diets (Anderson *et al.* 2014).

5.57 It is recognised that the noise from the proposed survey could affect seabirds that dive below the sea surface when foraging and also their prey within and outwith designated sites. There is also a risk of disturbance to seabirds from the physical presence of the seismic survey vessel.

Sea lamprey (*Petromyzon marinus*) and River lamprey (*Lampetra fluviatilis*)

5.58 Both sea lamprey and river lamprey are diadromous fish included on Annex II of the Habitats Directive. They are a qualifying species for the:

- Dee Estuary / Aber Dyfrdwy SAC,
- Cardigan Bay / Bae Ceredigion SAC,
- Afon Tywi / River Tywi SAC,
- Afon Teifi / River Teifi SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC,
- Severn Estuary / Môr Hafren SAC.

5.59 Sea lamprey spend their adult life in the sea or estuaries but spawn and spend the juvenile part of their life cycle in fresh water rivers. Adult sea lamprey migrate from the

sea to the rivers during late spring and the young (ammococetes) return to the sea from September onwards. River fish traps placed within the River Dee indicate that May and June are the peak months for sea lampreys to migrate up rivers within the region (Environment Agency and Cefas, 2012).

5.60 River lampreys occur in coastal waters, estuaries and rivers. After one to two years in estuaries river lampreys stop feeding in the autumn and move upstream from the river mouth between October and December (Maitland 2003). Within the River Dee, peak numbers occur in March and April with a smaller peak between October and November (Environment Agency and Cefas, 2012).

5.61 Very little is known about the distribution of lampreys offshore but being parasitic, lampreys will occur wherever their host goes. They have a broad range of host species including marine mammals, basking sharks and other fish species so could occur over a very wide geographical area. However, they will likely occur within the area of the seismic survey during their migration to and from the estuaries.

5.62 Sea lampreys have poor hearing ability. Studies indicate that sea lamprey respond to sound at frequencies of between 20 Hz and 100 Hz (Lenhardt & Sismour 1995) and show low sensitivity to low frequency sounds (Maes *et al*. 2004).

Allis shad (*Alosa alosa*) and Twaite shad (*Alosa fallax*).

5.63 Allis shad and twaite shad are qualifying species for

- Afon Tywi / River Tywi SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC,
- Severn Estuary / Môr Hafren SAC.

5.64 Allis shad and twaite shad are members of the herring family. Both species of shad spend most of their life cycles in the marine environment only entering freshwater rivers between April and June to spawn. There has been a significant decline in the Allis shad population and there are now no known spawning sites within the UK (Maitland and Hatton-Ellis 2003). A smaller decline in the population of twaite shad has also occurred but the species still breeds in the rivers Severn, Wye, Usk and Tywi (Maitland and Hatton-Ellis 2003). Both species are scarce in the Irish Sea (Lockwood 2005).

5.65 Both species of Shad possess swim bladders and have a relatively higher sensitivity towards noise than many other species of fish.

Atlantic salmon (*Salmo salar*).

5.66 The Atlantic salmon is a qualifying species for the Afon Teifi / River Teifi SAC.

5.67 Salmon spawn in freshwater rivers during late autumn and early winter where the young (smolt) remain for between one to three years, after which they migrate to the marine environment. The migration of the smolt down river occurs between April and

June and once in the marine environment they disperse rapidly travelling up to 30 km/day. During migration the post smolt swim primarily within 1 to 2 m of the sea surface (Thorstad *et al*. 2012).

5.68 Following a period of between one to five years adult salmon return to rivers to spawn; this occurs from between June and October, with peak migration in August and September. Their migration into the river can be delayed if conditions are not suitable for their upstream migration (Thorstad *et al.* 1998). Their distribution in the marine environment during migration to their spawning rivers is poorly known but they are thought to follow the coast line when in the vicinity of their natal rivers (Sturlaugsson and Thorisson 1997).

5.69 Salmon have moderately sensitive hearing ability. Although they possess a swim bladder it is not coupled to the inner ear and therefore not as effective at detecting noise compared to hearing specialists that do have links between their swim bladder and inner ears.

6 POTENTIAL IMPACTS

6.1 The potential impacts arising from the proposed survey are sound from the airguns and the physical presence of the vessel. No other sources of potential impact that could affect qualifying habitats or species have been identified.

Marine Mammals

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

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

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

6.4 The range at which marine mammals may be able to detect sound arising from offshore activities depends on the hearing ability of the species and the frequency of the sound. Pinnipeds (seals) are potentially more sensitive to low frequency sounds than bottlenose dolphin or harbour porpoise. Other factors potentially affecting 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

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

Physical injury

6.6 Underwater sound has the potential to cause hearing damage in marine mammals, either permanently or temporarily. The potential for either of these conditions to occur is dependent on the hearing bandwidth of the animal, the duty cycle of the sound source and duration of the exposure (Southall *et al*. 2007, OSPAR 2009).

Behavioural Change

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

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

6.9 Changes in behaviour arising from noise impacts may be detectable, e.g. a significant displacement from an area.

Secondary Effects

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

6.11 To assess the relevance of potential impacts, the applicant has undertaken noise modelling at three different locations within the proposed survey area for cetaceans, pinnipeds, fish and diving seabirds. The results from the modelling indicate the extent at which Permanent Threshold Shift (PTS) and Temporary Threshold Shift (TTS) and disturbance could occur from the seismic airguns during the proposed survey. The results from the modelling for cetaceans and pinnipeds are presented in Table 7, Table 8 and Table 9 and for fish and birds in Table 10 and Table 11.

Table 7: Maximum distances and impacted areas where M-weighted SEL thresholds (dB re 1 µPa^{2}s) eliciting PTS in marine mammals are exceeded.

Species	PTS Injury Threshold	Maximum distance (m)			Maximum area (km^2)		
		Modelled location			Modelled location		
		Liverpool Bay	Cardigan Bay	Bristol Channel	Liverpool Bay	Cardigan Bay	Bristol Channel
LFC	198	29	27	26	0.003	0.0023	0.0021
MFC	198	6	6	6	0.0001	0.0001	0.0001
HFC	198	5	5	5	0.0001	0.0001	0.0001
Pinnipeds	186	99	97	83	0.3	0.024	0.022

LFC = Low frequency cetacean, e.g. minke whale.

MFC = Mid-frequency cetacean, e.g. bottlenose dolphin.

HFC = High frequency cetacean, e.g. harbour porpoise.

Table 8: Maximum distances and impacted areas where M-weighted SEL (dB re 1 µPa^{2}s) thresholds eliciting TTS in marine mammals are exceeded.

Species	TTS Injury Threshold	Maximum distance (m)			Maximum area (km^2)		
		Modelled location			Modelled location		
		Liverpool Bay	Cardigan Bay	Bristol Channel	Liverpool Bay	Cardigan Bay	Bristol Channel
LFC	183	299	271	271	0.28	0.23	0.23
MFC	183	39	36	34	0.0048	0.0041	0.0036
HFC	183	29	23	23	0.0026	0.0017	0.0017
Pinnipeds	171	1,699	2,999	2,999	9,069	28,255	28,255

LFC = Low frequency cetacean, e.g. minke whale.

MFC = Mid-frequency cetacean, e.g. bottlenose dolphin.

HFC = High frequency cetacean, e.g. harbour porpoise.

Table 9: Maximum distances and impacted areas where disturbance thresholds are exceeded (Unweighted rms SPL (dB re 1 µPa)) for marine mammals.

Species	Disturbance Thresholds	Maximum distance (km)			Maximum area (km^2)		
		Modelled location			Modelled location		
		Liverpool Bay	Cardigan Bay	Bristol Channel	Liverpool Bay	Cardigan Bay	Bristol Channel
All Cetaceans	140	22	63	62	900	5,881	4,916
	160	5	10	11	64	210	190
Pinnipeds	150	9	22	20	231	932	754
	170	2	3	3	19	38	40

Potential impact on harbour porpoise

6.12 The results from the modelling indicate noise levels that have the potential to cause auditory injury (PTS) to harbour porpoise occur out to 5 m from the airguns (Table 7) and TTS impacts to 29 m (Table 8). There is potential for levels of noise at which disturbance could occur to extend from between 5 km and 63 km from the airguns, depending the location and the disturbance threshold (Table 9).

6.13 Outputs from the noise modelling undertaken by the applicant indicate that sound capable of causing a level of disturbance to harbour porpoise will occur within the Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC, West Wales Marine / Gorllewin Cymru Forol pSAC and the North Anglesey Marine / Gogledd Môn Forol pSACs (Figure 15, Figure 16, Figure 17).

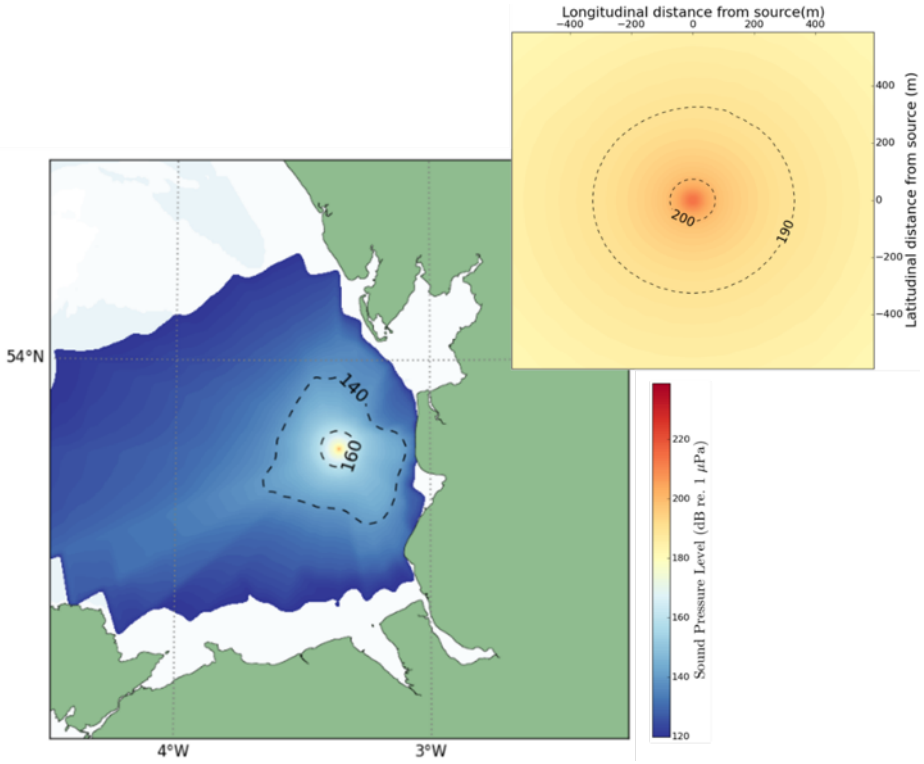


Figure 15: Predicted area of potential disturbance on bottlenose dolphin and harbour porpoise within Liverpool Bay from the proposed seismic survey.

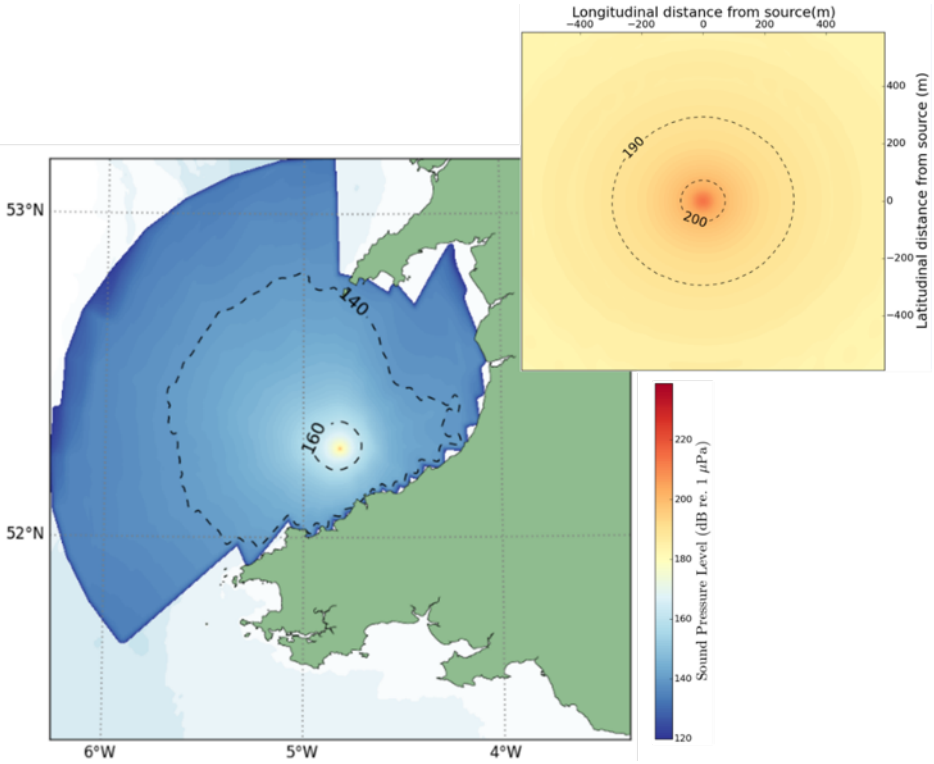


Figure 16: Predicted area of potential disturbance on bottlenose dolphin and harbour porpoise within Cardigan Bay from the proposed seismic survey.

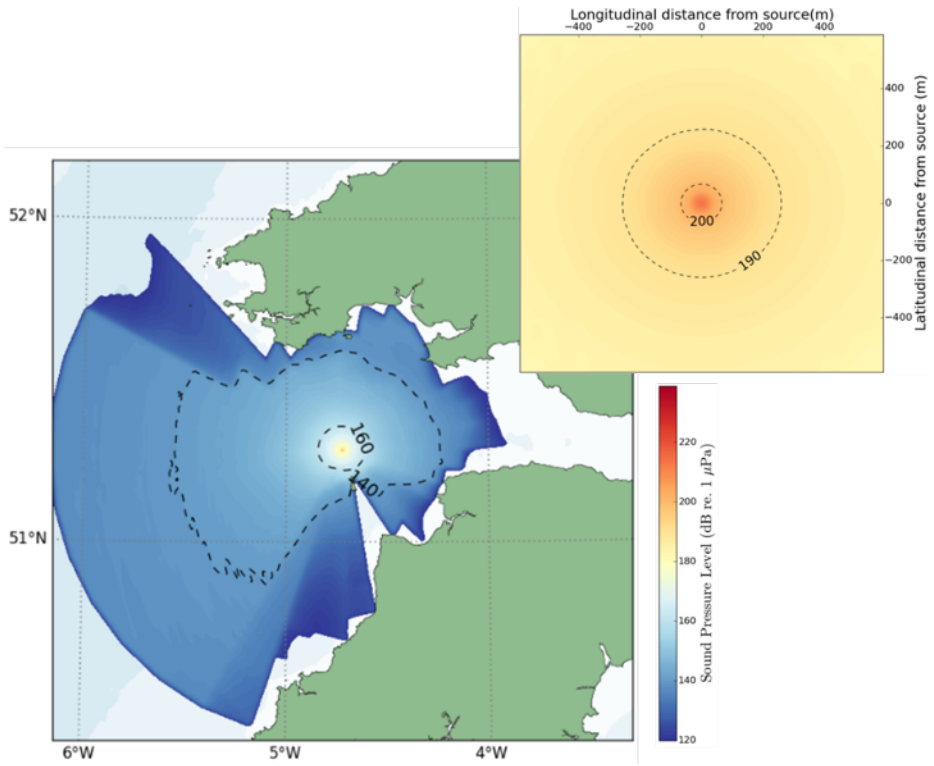


Figure 17: Predicted area of potential disturbance on bottlenose dolphin and harbour porpoise within the Bristol Channel from the proposed seismic survey.

Potential area of impact on bottlenose dolphin

6.14 The results from the modelling indicate that noise levels that have the potential to cause auditory injury (PTS) to bottlenose dolphins occur out to 6 m from the airguns (Table 7) and TTS impacts to 39 m (Table 8). There is potential for levels of noise at which disturbance could occur to extend from between 5 km and 63 km from the airguns, depending the location and the disturbance threshold (Table 9).

6.15 Outputs from the noise modelling undertaken by the applicant indicate that sound capable of causing a level of disturbance to bottlenose dolphins will occur throughout Cardigan Bay (Figure 16).

Potential area of impact on grey and harbour seals

6.16 The results from the modelling indicate that noise levels that have the potential to cause auditory injury (PTS) to seals occur out to 99 m from the airguns (Table 7) and TTS impacts to 2,999 m (Table 8). Depending the location and the disturbance threshold used, there is potential for levels of noise at which disturbance could occur to extend from between 2 km and 22 km from the airguns and encompass an area of up to 932 km^2 (Table 9).

Potential impacts on otter

6.17 Noise modelling has not been undertaken for assessing the potential impacts on otters. Otters occur in tidal waters within close proximity of the shore and will not be physically impacted by the proposed seismic survey. However, it is predicted that noise levels capable of causing potential disturbance to otters could occur.

Seabirds

6.18 Noise modelling undertaken for seabirds indicates that there is potential for physical injury to occur to a bird underwater within 65 m the proposed seismic survey (Table 10).

6.19 There are no data available to assess potential area of disturbance to seabirds below the sea surface. However, birds that are disturbed will be able to remain on the sea surface and therefore avoid any noise related disturbance. Some species, e.g. red-throated diver and common scoter may also be displaced by the presence of the seismic vessel.

6.20 Densities of seabirds in the proposed survey area will be highly variable depending on both the location and the period during which the survey will be undertaken. BEIS note that the proposed survey will be undertaken from August onwards and therefore be outwith the main breeding period and at a time when many breeding seabirds will have dispersed or migrated away from the (p)SPAs.

Table 10: Predicted distance at which physical injury could occur to diving seabirds from the proposed seismic survey.

Species	Dive duration (Seconds)	Number of airgun pulses	Maximum distance (m)		
			Liverpool Bay	Cardigan Bay	Bristol Channel
Razorbill	24 [-1]	3	23	20	20
Puffin	40 [-2]	4	32	24	23
Gannet	42 [-3]	5	37	26	27
Shag	60 [-4]	6	41	29	31
Red-throated diver	60 [-5]	6	41	29	31
Eider	78 [-6]	8	47	33	34
Guillemot	119 [-7]	12	57	48	42
Cormorant	152 [-8]	16	65	56	49
1 - Wanless *et al.* 1988, 2 - Thaxter *et al*. 2009, 3 - Yan *et al.* 2009, 4 - Wanless *et al.* 1993, 5 – del Hoyo *et al.* 1992, 6 - Ponganis 2015, 7 - Thaxter *et al*. 2009, 8 - Wanless *et al.* 1993.					

6.21 It is also noted that in the event that the survey is undertaken during November then there will be increasing numbers of wintering waterbirds, e.g. red-throated diver and common scoter, that are qualifying species for designated sites that overlap with the proposed survey area, e.g. Liverpool Bay / Bae Lerpwl SPA (Figure 5).

Fish

6.22 The results from the modelling indicate that noise levels that have the potential to cause mortality to fish species with swim bladders could occur from between 265 m and 310 m for depending on the location. For fish without swim bladders, mortality could occur from between 130 m and 140 m from the seismic survey (Table 11).

Table 11: Maximum distances at which mortality to fish, eggs and larvae could occur.

Location	Distance (m)		
	Fish: swim bladder involved in hearing [-1] Allis shad Twaite Shad,	Fish: no swim bladder [-2] Sea Lamprey, River lamprey Plaice, lemon sole	Eggs and Larvae
1: Liverpool Bay	310	130	310
2: Cardigan Bay	285	140	285
3: Bristol channel	265	136	265

1 - 213 Unweighted peak SPL (dB re 1 µPa)

2 - 207 Unweighted peak SPL (dB re 1 µPa)

6.23 There are no data available to assess potential area of disturbance to fish species.

7 CONSERVATION OBJECTIVES

7.1 Conservation objectives outline the desired state for any European site, in terms of the interest features for which it has been designated. If these interest 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 integrity 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 There are no set thresholds at which impacts on site integrity are considered to be adverse. This is a matter for interpretation on a case-by-case basis, depending on the designated feature and nature, scale and significance of the impact. Conservation Objectives have been used by BEIS to consider whether the proposed survey has the potential for having an adverse effect on a site's integrity, either alone or in-combination.

7.3 The Conservation Objectives of each site are required in order to undertake an assessment. The generic Conservation Objectives for English, Welsh, Northern Ireland and Irish European designated sites are provided in Appendix B. Site specific Conservation Objectives for those sites considered in the Appropriate Assessment are presented in Appendix C.

7.4 The HRA has been carried out in light of best scientific knowledge with reference to the Conservation Objectives of the qualifying sites 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.

8.3 For the purposes of this assessment, on-going impacts from current activities have not been included within the in-combination assessment where the influence of the projects upon a receptor, that may also be predicted to be significantly affected by the plan or project, is considered to be captured within the baseline. For some on-going

activities, e.g. fishing, shipping, aggregate extraction and dredging disposal it is technically not possible to determine what the baseline conditions would be without the influence the impacts from these on-going activities have on the current marine mammal and seabird populations or their prey.

Renewable Energy

8.4 A source of potentially significant in-combination underwater noise is from pile driving activity during construction of offshore developments, particularly offshore wind farms. There are a number of offshore wind farms located in the Irish Sea including the constructed Gwynt y Mor, Rhyl Flats, Burbo Bank, West of Duddon Sands and Walney wind farms. There are also a number of consented wind farms that have not started construction including the Walney extension as well at the Burbo Bank Extension, which is currently under construction (Figure 18).

8.5 BEIS are not aware of any other offshore renewable energy projects that are planned to commence or are currently under construction that are anticipated to overlap with the proposed survey and therefore only the potential impact from construction at Burbo Extension is considered within the in-combination assessment.

Aggregate Extraction

8.6 Existing aggregate extraction occurs at three locations within the Irish Sea and seven within the Bristol Channel (TCE 2014a) (Figure 18). Between 1998 and 2012 a total of 7.1 million tonnes of aggregate was extracted from the Irish Sea and 22.5 million tonnes from the Bristol Channel (TCE 2014b). Although there is some inter-annual variation in the amount of dredging being undertaken the volume of dredging being undertaken in the Irish Sea over a fifteen year period has remained relatively constant with an overall increase of 0.1 km^2 between 1998 and 2012. In the Bristol Channel the area dredged has decreased by a total of 8 km^2 over the same period (TCE 2014b).

8.7 The are no known plans for new aggregate extraction areas to commence activities during the proposed survey period.

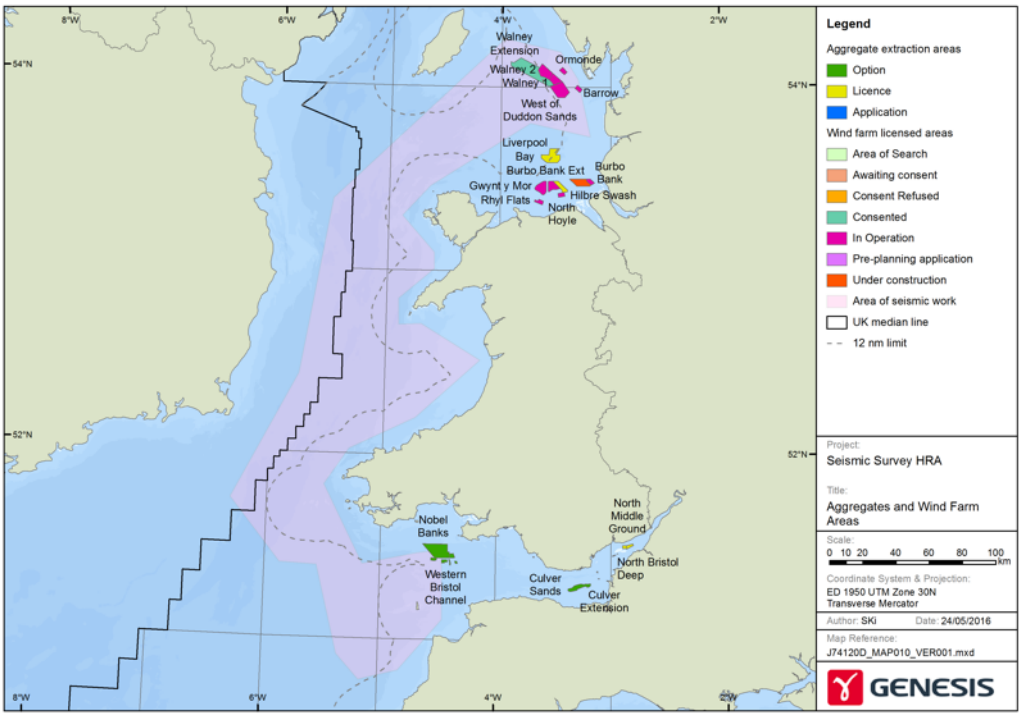


Figure 18: Aggregate Extraction Areas and Wind Farm Licence Areas in the vicinity of the proposed survey.

Oil and Gas Industry

8.8 There is extensive existing oil and gas industry related infrastructure within the East Irish Seas including the: North Morecambe, South Morecambe, Hamilton and Douglas complexes (Figure 19).

8.9 BEIS are not aware of any planned oil and gas related exploration, construction or decommissioning activities within the area during the period the proposed survey will be undertaken that could cause an in-combination effect. However, the nearshore survey is part of a wider seismic survey planned to be undertaken in the southwest approaches and Irish Sea, which is subject to a separate application.

8.10 BEIS have not been informed, nor are aware, of any geophysical surveys planned to be undertaken in nearshore waters during the proposed survey period.

8.11 BEIS recognises that delays in planned seismic surveys can increase the overall duration but not the extent of noise within an area. Aside from the offshore component of this seismic survey programme, BEIS are not aware of any other similar surveys in the area of potential impact.

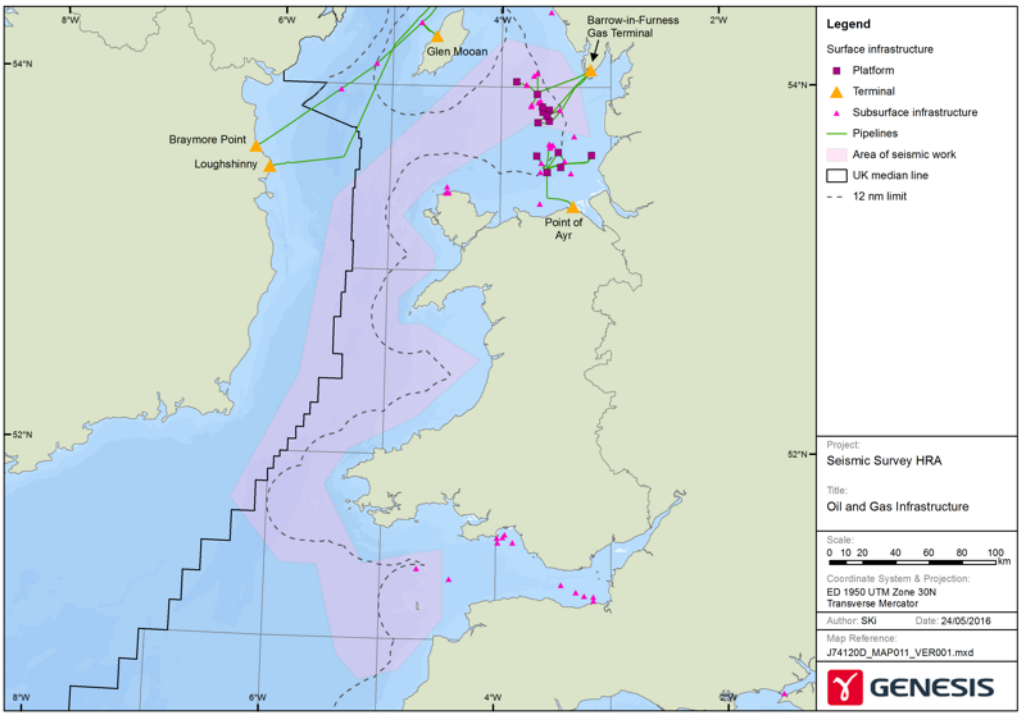


Figure 19: Oil and Gas Infrastructure in the vicinity of the proposed survey area.

8.12 For the purposes of this assessment BEIS considers that there is potential for a likely significant effect to occur in-combination with the construction activities being undertaken at the Burbo Bank Extension offshore wind farm. No other plans or projects have been identified that are a likely to cause an in-combination likely significant effect.

Burbo Bank Extension Offshore Wind Farm

8.13 The Burbo Bank Extension offshore wind farm comprises up to 69 turbines located in the Irish Sea, approximately 7 km north of Hoylake. The project was consented in September 2014.

8.14 Construction is reported as being planned to be undertaken over a three month period between Q2 and Q3 2016 and entails potentially installing piles of between 3 m and 8 m diameter into the seabed. Modelling of noise arising from piling undertaken in support of the wind farm application indicates sound levels capable of causing physical injury to cetaceans could occur out to 50 m from the piling location and cover an area of 0.04 km^2 and up to 490 km^2 for seals. Disturbance to marine mammals could cover an area of between 1,600 km^2 for bottlenose dolphin, 1,900 km^2 for seals and 2,900 km^2 for harbour porpoise (DONG 2013a).

8.15 BEIS note the HRA and a report prepared by the Planning Inspectorate on the implications for European Sites (RIES) conclude that there will be no Likely Significant Effect on bottlenose dolphin or grey seal from the construction of the offshore wind

farm (PINS 2014). A conclusion agreed with by NRW on the basis of the relatively short duration of piling (anticipated to be three months) and the proposed mitigation measures. There was no HRA assessment undertaken for harbour porpoise as at the time there were no designated or proposed SACs for harbour porpoise in the area of potential impact.

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 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.

Habitats

9.3 Habitats listed in the SAC citations (Appendix A) will not be impacted by the proposed seismic survey and are not considered to be at risk of a likely significant effect. They are therefore not considered further in this Appropriate Assessment.

Seabirds

9.4 Seabirds that feed on or near the sea surface, e.g. fulmar, gulls and terns are at very low risk of any impact from underwater noise. Any periods below the sea surface are of relatively short duration and the risk of an impact occurring is considered very low.

9.5 Noise modelling undertaken by the applicant on eight species of seabird listed in the SPA citations that forage below the sea surface, indicates that the area within which there is the potential of a physical impact is very localised and extends no further than 65 metres from the airguns for any species that remain below the sea surface for periods of over 2 minutes. For species that are below the sea surface for less than 30 seconds the potential extent of physical impact is less than 23 m from the airgun (Table 10).

9.6 The physical presence of the seismic vessel will cause displacement of seabirds on the sea surface in advance of the vessel and a significant majority of them will move away from the approaching vessel. Consequently, there is a very low risk of any seabird occurring within the range at which physical injury is predicted to occur.

9.7 Although it is not possible to model the area within which there is potential for disturbance from noise arising from the airguns, it is recognised that seabirds that forage below the sea surface may be disturbed over a potentially wider area. Should this occur it is predicted that birds will remain on the sea and may avoid being underwater until the seismic vessel has moved away from the area or the birds will temporarily relocate away from the seismic survey.

9.8 The physical presence of the vessel will cause localised disturbance as birds avoid the vessel. The range at which a seismic vessel may displace birds varies across species. Red-throated divers and common scoter are known to avoid the physical presence of vessels with birds showing avoidance behaviour up to 2 km from a vessel (Kaiser 2002). However, the impact from disturbance is relatively localised and temporary and will have no measurable effect on the individuals impacted.

9.9 There is potential for the prey species of seabirds to be impacted by the proposed survey. 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, seabirds 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.

9.10 Based on the noise modelling undertaken and the very localised area of potential risk of physical harm and recognising that any displacement impacts would be of short duration it is concluded that seabirds from the qualifying SPAs are not at risk of a likely significant effect and are not considered further in this Appropriate Assessment.

Fish

9.11 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 include allis and twaite shads and are recognised to be hearing specialists. Those without, e.g. sea lamprey and river lamprey, are considered to have a relatively low sensitivity to noise. Most fish with swim bladders are able to detect sound within the 100 Hz to 2 kHz range, those without swim bladders are unlikely to detect sound above 400 Hz (Popper 2014).

9.12 Results from the noise modelling indicate that noise levels capable of causing lethal effects on fish with swim bladders could occur out to 310 m from the airgun and for fish

without swim bladders impacts could occur to 140 m (Table 11). The area of impact within which physical injury could occur is therefore relatively very small. However, the area within which disturbance could occur may be significantly greater. Modelling undertaken for piling operations at offshore wind farms within the Irish Sea indicate disturbance to fish could occur out to 15 km for 'hearing specialists' and 4 km for 'non-hearing specialists' (e.g. DONG 2013a). Although the sound profile from piling is different from that of a seismic survey it does indicate that there could be disturbance arising from the proposed survey significantly beyond the area of physical injury for which modelling has been undertaken by the applicant.

9.13 Based on the results from the noise modelling and noise assessments from other studies, BEIS considers that there is potential for a likely significant effect on sea lamprey and river lamprey at sites within 5 km of the proposed survey area and on allis shad, twaite shad and Atlantic salmon at sites within 15 km of the proposed survey area. Consequently, it is concluded that there are three designated sites for which river lamprey and sea lamprey are qualifying species that could be affected by the proposed survey, two sites for allis and twaite shad and one for Atlantic salmon:

River lamprey and Sea lamprey:

- Cardigan Bay / Bae Ceredigion SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC.

Allis shad and Twaite shad:

- Pembrokeshire Marine / Sir Benfro Forol SAC
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC

Atlantic salmon:

- Afon Teifi / River Teifi SAC.

9.14 BEIS recognises that Atlantic salmon are migratory and individuals could occur within the proposed survey area from designated sites for which they are qualifying species. However, it is not considered that any impacts on these sites would have a likely significant effect due to the low likelihood of any occurring within the range at which physical impacts could occur, the distance from the survey and the predicted short duration of any potential effects.

Harbour porpoise

9.15 Results from noise modelling indicate that there is potential for levels of noise to cause physical injury or disturbance and displacement to harbour porpoise. The proposed seismic survey will occur within three pSACs for which harbour porpoise is a qualifying

species. Consequently, BEIS considers that there is potential for a likely significant effect on the following designated sites:

- Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC,
- West Wales Marine / Gorllewin Cymru Forol pSAC,
- North Anglesey Marine / Gogledd Môn Forol pSAC.

Bottlenose dolphin

9.16 Results from noise modelling indicate that there is potential for levels of noise to cause physical injury or disturbance to bottlenose dolphin. The proposed seismic survey will occur within two designated sites for which this species is a qualifying species. Consequently, BEIS considers that there is potential for a likely significant effect on the following designated sites:

- Cardigan Bay / Bae Ceredigion SAC,
- Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC.

Grey seal

9.17 Results from noise modelling indicate that there is potential for levels of noise to cause physical injury or disturbance and displacement to grey seals.

9.18 Grey seals are a qualifying species at a number of designated sites within or adjacent to the proposed survey area. They are known to routinely forage within 40 km from their haul out sites and although will occur further offshore they do so less frequently. Results from tagging studies undertaken in the Irish Sea indicate that grey seals occur infrequently far offshore. Noise modelling undertaken by the applicant indicates that there is potential for disturbance or displacement effects to occur 22 km from the airguns (Table 9).

9.19 The proposed survey will occur within the boundaries of three European sites and therefore could cause an adverse effect on the grey seals within those sites. Based on the results from the noise modelling and the distance from other designated sites it is concluded that there will not be a likely significant effect on grey seals from Lambay Island and Great Saltee SACs. The European sites considered in the Appropriate Assessment are:

- Cardigan Bay / Bae Ceredigion SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Lundy SAC.

Harbour seal

9.20 Results from noise modelling indicate that there is potential for levels of noise to cause physical injury or disturbance and displacement to harbour seals.

9.21 Harbour seals are a qualifying species at three designated sites within or adjacent to the proposed survey area. Harbour seals are known to routinely forage closer to shore than grey seals and results from tagging studies undertaken in Northern Ireland indicate that they occur infrequently far offshore (Figure 14). For the purposes of this assessment it is assumed based on the evidence available that harbour seals forage routinely out to 40 km from their haul out sites. Noise modelling undertaken by the applicant indicates that there is potential for disturbance or displacement effects to occur 22 km from the airguns.

9.22 Based on the distance that potential disturbance or displacement is predicted to occur (22 km) and the furthest distance from shore harbour seals most frequently occur (40 km). BEIS considers that there is low risk of any disturbance to occur that could cause a likely significant effect on any of the designated sites for which harbour seal is a qualifying feature. Consequently, no further assessment on the potential impacts to harbour seal are considered.

Otter

9.23 Results from noise modelling indicate that there is potential for levels of noise to cause disturbance to otters.

9.24 There are no studies assessing the hearing ability of European otter to underwater noise. However, work undertaken on sea otters indicate that they have poor underwater hearing capability, particularly at low sound frequencies, compared to other marine mammals (Ghoul and Reichmuth 2012). Consequently, otters are not predicted to be sensitive to underwater sound arising from the air guns.

9.25 Any otters disturbed by the airguns may be temporarily displaced to onshore and freshwater habitats where, due to their broad diets, they will be able to effectively forage until the proposed seismic survey has been completed or moved away so that disturbance no longer occurs.

9.26 Any possible disturbance impacts will be temporary and no likely significant effect is predicted to occur on otters from any of the sites for which they are a qualifying species. Consequently, no further assessment on the potential impacts to otters are considered.

Likely significant effects test - conclusions

9.27 Based on the information presented within the application relating to the proposed activities and the associated noise modelling undertaken it is concluded that it is not possible to exclude a Likely Significant Effect on the following designated sites and qualifying species:

• Cardigan Bay / Bae Ceredigion SAC:	*Bottlenose dolphin,* *Grey seal,* *River lamprey,* *Sea lamprey.*
• Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC:	*Bottlenose dolphin*, *Grey seal.*
• Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC:	*Harbour porpoise.*
• West Wales Marine / Gorllewin Cymru Forol pSAC:	*Harbour porpoise.*
• North Anglesey Marine / Gogledd Môn Forol pSAC:	*Harbour porpoise.*
• Lundy SAC:	*Grey seal.*
• Pembrokeshire Marine / Sir Benfro Forol SAC:	*Grey seal,* *River lamprey,* *Sea lamprey,* *Allis shad,* *Twaite shad.*
• Afon Teifi / River Teifi SAC:	*Atlantic salmon.*
• Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC:	*River lamprey,* *Sea lamprey,* *Allis shad,* *Twaite shad*.

9.28 For all other designated sites and associated qualifying species it is concluded that there will not be a Likely Significant Effect from the proposed seismic survey 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 section assesses 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.

Cardigan Bay / Bae Ceredigion SAC, Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC

Bottlenose Dolphin

10.3 It is considered, based on the information presented in the application, that all bottlenose dolphins within Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC are at risk of being adversely affected by noise arising from the proposed survey (Figure 20).

10.4 Bottlenose dolphins can travel extensive distances and the population within Cardigan Bay is a single population occurring within two SACs and the wider area. This assessment considers any potential impacts on bottlenose dolphins in the context of all relevant sites within the area of potential impact from the proposed seismic survey, which encompasses Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC.

10.5 The Conservation Objectives for the two SACs are presented in Appendix C.

10.6 The population of bottlenose dolphin within Cardigan Bay is estimated to be between 328 and 379 individuals, of which up to 250 are reported as occurring within the Cardigan Bay / Bae Ceredigion SAC (JNCC 2015, Pesante *et al.* 2008). The management unit population, which covers the whole of the Irish Sea is 397 (95% CI 362 – 418) individuals (IAMMWG 2015) and is the population level used in this assessment, although other figures are presented for information.

10.7 Bottlenose dolphins occur widely across Cardigan Bay, with generally higher encounter rates in waters within 10 km of the coast (Pesante *et al.* 2008). For the purposes of this assessment a precautionary assumption has been made that there is a homogeneous distribution of bottlenose dolphins across the impacted area and that all bottlenose dolphins within the Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC are at risk of being impacted by the seismic survey.

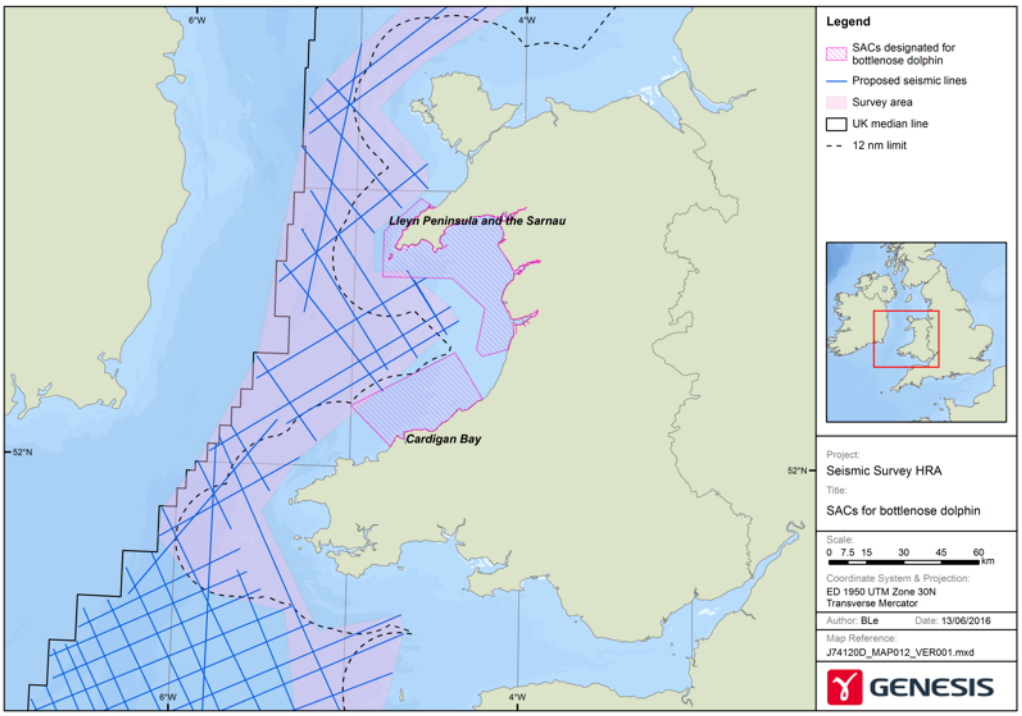


Figure 20: Location of SACs for which bottlenose dolphin is a qualifying species in relation to proposed seismic survey.

Physical Injury

10.8 Results from noise modelling presented within the application indicate that there is a risk of physical injury in the form of PTS within 6 m of sound source and a temporary threshold shift could occur within 39 m of the sound source (Table 7 and Table 8). It is predicted that bottlenose dolphins will move away from the seismic survey before they are in range at which the onset of TTS or PTS will occur. Observations of bottlenose dolphins during seismic surveys indicate a significant avoidance response when airguns are in use, with the median distance at which bottlenose dolphins occurring of 1,500 m (Stone 2015). Consequently, the risk of any bottlenose dolphin being within the range at which the onset of PTS or TTS could occur is very low. Furthermore, standard mitigation measures as recommended in the JNCC guidance (JNCC 2010), e.g. the presence of MMOs and soft start procedures, will be in place to ensure no marine mammals are present within 500 m of the survey vessel at the commencement of any survey.

Disturbance and Displacement

10.9 There is significant difference in the area of potential displacement and disturbance between two disturbance thresholds of 140 and 160 dB re 1 µPa rms. The lower the disturbance threshold the greater the area of potential impact (Table 9). Based on the outputs from the noise modelling the total area of impact at any one location will be

6,091 km^2, of which 96.6% of the predicted disturbance (5,881 km^2) will occur within the lower disturbance threshold of 140 dB re 1 µPa rms and 3.4% of the area (210 km^2) will be within the 160 dB re 1 µPa rms disturbance area (Table 9).

10.10 Based on the presumption that there will be a homogenous distribution of bottlenose dolphins within the area of disturbance, it is estimated that 3.4% of the bottlenose dolphin population will occur within the area of potentially significant disturbance of 160 dB re 1 µPa rms and 96.6% will occur within the area of lower area of disturbance of 140 dB re 1 µPa rms.

10.11 The probability of a behavioural response occurring and the animal moving away from the sound source will vary based on the noise level received and on the individual dolphin. It is recognised that it is unrealistic to assume that all bottlenose dolphins within the area of impact will be displaced; a proportion of dolphins will remain in the area. Based on the best available evidence from other studies using dose-response curves (e.g. Thompson *et al*. 2011) or probabilistic disturbance thresholds (e.g. Wood *et al.* 2012), this assessment estimates that up to 60% of the dolphins within 160 dB re 1 µPa rms disturbance zone and 10% with the 140 dB re 1 µPa rms may be displaced.

10.12 Based on the noise modelling outputs and dose response curves, an estimated 60% of the bottlenose dolphins will be displaced over 3.4% of the total area of disturbance and 10% of dolphins will be displaced from 96.6% of the total area. Out of a management unit population of 397 individuals, this equates to approximately eight dolphins being affected in the area of potentially higher disturbance and 38 dolphins being displaced from the area of lower disturbance. An estimated total of 46 bottlenose dolphins, 11.6% of the management unit population, may be displaced from the area impacted by the seismic survey (Table 12).

Table 12: Total number of bottlenose dolphins estimated to be affected by the proposed seismic survey.

Disturbance threshold (dB re 1 µPa rms)	No. of dolphins impacted	% displaced	Number displaced	Total displaced
Irish Sea Management Unit population = 397				
140	383	10	38	46
160	14	60	8	
Regional Cardigan Bay dolphin population = 379				
140	366	10	37	45
160	13	60	8	
Regional Cardigan Bay dolphin population = 328				
140	317	10	32	39
160	11	60	7	
Cardigan Bay / Bae Ceredigion SAC dolphin population = 250				
140	241	10	24	29
160	9	60	5	

10.13 When undertaking surveys, the vessel will be travelling between 4.5 and 5 knots (8.3 – 9.6 km/h). Within Cardigan Bay noise capable of causing disturbance is predicted to occur out to 63 km from the survey vessel (Table 9). Consequently, as the vessel moves, disturbance in any one area will last approximately 15 hours based on the maximum area noise likely to cause disturbance is predicted to occur and the vessel travelling at its slowest operating speed. Once the vessel has left the area, noise levels will reduce to ambient background levels.

10.14 There is potential for repeated levels of noise capable of causing displacement or disturbance to occur within Cardigan Bay as the survey vessel undertakes the survey along pre-determined survey lines within the area (Figure 2 and Figure 21). The duration of any potential impact depends on the length of seismic survey line occurring within the area and the speed of the vessel.

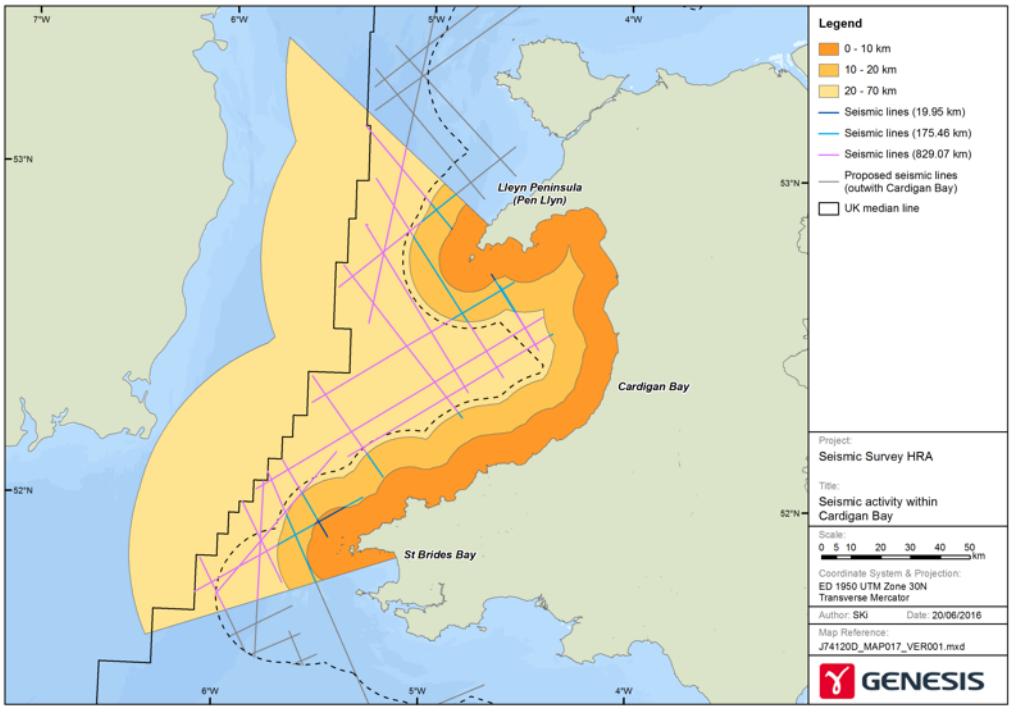


Figure 21: Seismic survey lines that could impact on bottlenose dolphins within Cardigan Bay.

10.15 The majority of bottlenose dolphins within Cardigan Bay occur within 10 km of the coast (Pesante *et al.* 2008). Based on the modelling outputs, higher levels of disturbance or displacement (i.e. 140 dB re 1 µPa rms), could occur out to 10 km from the survey vessel and lower levels (i.e. 140 dB re 1 µPa rms) out to 63 km. Consequently, any seismic survey activity within approximately 20 km of the coast could cause a relatively high level of displacement and activities within approximately 70 km of the coast could cause a lower level of disturbance or displacement to bottlenose dolphins occurring within 10 km of the Cardigan Bay coast.

10.16 A total of 20 km of seismic survey line will occur within 10 km of the Cardigan Bay coast, a further 175 km of line will occur within 10 km and 20 km and 829 km will occur between 20 and 70 km of the coast. A total of 1,024 km of seismic survey line will occur within 70 km of the Cardigan Bay coast, i.e. will occur within range of causing a level of disturbance or displacement to dolphins within 10 km of the coast based on worst-case modelling results (Table 13).

Table 13: Length of survey line and duration of survey within Cardigan Bay.

	Distance from coast			Total
	0 – 10 km	10 – 20 km	20 – 70 km	
Length of line (km)	19.95	175.46	829.07	1,024.48
Duration within area (hrs) [1]	2.4	21.1	99.9	123.4

[1] Based on a vessel speed of 8.3 km/h

10.17 Based on the length of survey line and the speed at which the seismic survey vessel will be operating the duration of an impact on bottlenose dolphins within 20 km of the coast is estimated to last approximately 23.5 hrs, i.e. one day. Lower levels of displacement and disturbance effects are predicted to occur over a wider area for approximately 99.9 hrs, i.e. 4.1 days. The total duration of displacement or disturbance effects on bottlenose dolphins within 10 km of the Cardigan Bay coast from the proposed seismic survey is estimated to last approximately 5 days.

10.18 It is unknown whether all the survey lines predicted to cause an impact will occur sequentially, or whether the vessel may also undertake activities outwith the area of potential impact. If so, the estimated five days of potential impact could be intermittent and occur over a longer period of time with periods when there are no impacts on the bottlenose dolphins.

10.19 Any displacement will cause bottlenose dolphins to move away from the area. The potential effect on the bottlenose dolphin will depend on the fitness of the individual dolphin and whether they are displaced from areas that are unsuitable for them.

10.20 The distribution of bottlenose dolphins within Cardigan Bay is not restricted to the SACs, with dolphins from the SACs occurring over a wide geographical area including all of the west and north Wales coasts (Pesante *et al.* 2008). Within the SACs their distribution is not uniform, with higher numbers occurring in nearshore waters than offshore (Figure 12). Core areas occur in nearshore waters around New Quay and Ynys Lochtyn (Beddia 2007).

10.21 There is a significant correlation with the distribution of bottlenose dolphins within Cardigan Bay and both water depth and seabed bathymetry with a preference for water depths of between 5 to 10 m and seabed slopes of less than 1%. Approximately 95% of the seabed in Cardigan Bay has a slope of less the 1%. Consequently, any dolphins displaced during the proposed survey period will be able to relocate to other areas of suitable habitat known to be used by bottlenose dolphins.

10.22 Prey availability is a significant factor in determining the movement and site fidelity of bottlenose dolphin in Cardigan Bay (Pesante *et al*. 2008). Bottlenose dolphins are opportunistic feeders and prey on a wide variety of fish species. Noise modelling of fish with swim bladders, e.g. haddock, whiting and gurnard indicate a potential for a localised area of physical impact to within 310 m of the survey vessel, although there is potential for a wider area of disturbance to prey species. Studies undertaken during seismic surveys on fish indicate the potential for a localised and temporary change in fish behaviour during seismic surveys with normal behaviour returning within 30 minutes of the airguns stopping (McCauley *et al* 2000, Pickett *et al*. 1994, Wardle *et al*. 2001). However, some studies have also shown the potential for wider areas of effect

to occur, with behavioural responses extending to between 1 and 5 km from the sound source. Fish move into deeper waters or are potentially displaced during the survey but quickly return to pre-survey levels shortly after the seismic has either moved away or stopped (McCauley *et al.* 2000, Peña *et al*. 2013, Slotte *et al*. 2004).

10.23 Although prey for bottlenose dolphins may be displaced by the proposed seismic survey the extent of displacement, if any, will be relatively localised. Bottlenose dolphins are not restricted in their habitat usage nor their prey and so will be able to adapt to any temporary changes in prey distribution or behaviour during the relatively short period impacts are predicted to occur within the SAC.

10.24 Bottlenose dolphins communicate via an array of clicks and whistles and can effectively communicate with each other between 2 and 25 km apart depending on type of vocalisation and the surrounding marine environment (Janik 2000, Quintana-Rizzo *et al.* 2006). The proposed survey could cause a masking effect on bottlenose dolphins during which time dolphins may increase the source level of their communications and alter the frequency and modulations of whistles to reduce the effect of the survey noise (Papale *et al.* 2015). However, there is still potential for social communication and hunting ability to be impaired during the period the proposed survey is undertaken within the SAC.

10.25 Studies undertaken in Cardigan Bay indicate that bottlenose dolphins spend a relatively small proportion of their time socialising, ranging from between 0 and 3% compared to between 15.9 and 73.3% of their time feeding (Beddia 2007). Should the level of noise cause a masking effect that impedes their ability to forage or communicate it is predicted that dolphins will either relocate to other areas or remain until the level of sound reduces below that which could cause a masking effect. When not foraging, bottlenose dolphins in Cardigan Bay can spend up to 75% of their time travelling (Beddia 2007) and therefore the physical movement away from the area of impact is not predicted to cause any impact on the fitness of an individual. The potential reduction in their ability to detect prey will be temporary occurring over a relatively short duration, estimated to be at worse approximately five days.

In-combination

10.26 There is potential for an in-combination impact with the planned construction of the Burbo Bank Extension during 2016. Piling activities during construction could impact on bottlenose dolphin.

10.27 During site specific surveys no bottlenose dolphins were recorded and the assessment concluded that they were rare in the area of the wind farm, with most sightings in the Irish Sea occurring off the North wales coast (DONG 2013b).

10.28 There was no likely significant effect on bottlenose dolphin from the wind farm and they were not considered within the Appropriate Assessment (DECC 2014).

10.29 Although there is potential for noise from the seismic survey to overlap with noise arising from the piling operations the lack of any sightings within the area of the planned wind farm and the wider area indicate that very few if any bottlenose dolphins will be impacted by either activity and that there will not be any in-combination impact arising from the two projects.

10.30 No other projects have been identified as having the potential to cause an in-combination impact on bottlenose dolphin.

Conclusions

10.31 It is predicted that there is a very low risk of any physical injuries to bottlenose dolphins arising from the proposed seismic survey. However, all bottlenose dolphins within the Cardigan Bay / Bae Ceredigion SAC, Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC and the wider area are at risk of being displaced or disturbed. Based on noise modelling outputs and dose response curves it is estimated that 11.6% of the bottlenose dolphin population may be displaced. Displaced dolphins will relocate to other areas with suitable habitat and are predicted to return once the sound levels are below that at which displacement occurs. This is estimated to be no more than 15 hours at any one point but would be longer and last up to approximately five days should the survey be undertaken in adjacent lines and the areas of potential disturbance overlap. However, displacement effects will be temporary and predicted to be of relatively short duration.

10.32 Disturbance to marine mammals could cause them to change behaviour and there is potential for masking effects to arise. This will reduce their ability to forage or communicate and will cause either displacement or possible reduced feeding and socialising behaviour. The effects will be temporary as dolphins will be able to return to foraging and socialising once the survey has moved away or ceased and no long term changes in behaviour will occur.

10.33 The duration and effect of any impact on bottlenose dolphins is predicted to be temporary and short-term and although the proposed seismic survey will cause a level of displacement and disturbance it is not predicted to cause any direct or indirect mortality to bottlenose dolphins and therefore will not impact on the population or effect its ability to maintain itself in the long-term.

10.34 The displacement of bottlenose dolphins will cause a temporary change in the range of bottlenose dolphins both within and outwith the SACs. However, any impact will be temporary and the dolphins will return once the noise levels have reduced or ceased. Therefore the proposed survey will not cause any reduction in the natural range of the species in the foreseeable future.

10.35 The proposed survey will not affect the supporting habitats and may 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.

10.36 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Cardigan Bay / Bae Ceredigion SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC with respect to bottlenose dolphins.

North Anglesey Marine / Gogledd Môn Forol pSAC

West Wales Marine / Gorllewin Cymru Forol pSAC

Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC

10.37 There are three possible SACs for which harbour porpoise is a qualifying species. Consultation on all three pSACs was completed on 3 May 2016.

10.38 The North Anglesey Marine / Gogledd Môn Forol pSAC is located north-west of the Isle of Anglesey extending into the Irish Sea (Figure 22) and encompasses an area of 3,235 km^2. The site holds relatively high densities of harbour porpoise across the whole area during the summer (JNCC and NRW 2016a).

10.39 The West Wales Marine / Gorllewin Cymru Forol pSAC is located southwards from the western end of the Llŷn Peninsula across Cardigan Bay to Pembrokeshire (Figure 22) and encompasses an area of 7,334 km^2. The site holds relatively high densities of harbour porpoise across the whole area during the summer and in the south-east of Cardigan Bay during the winter (JNCC and NRW 2016b).

10.40 The Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC is located from Carthen Bay in south Wales, across the Bristol Channel to north Cornwall (Figure 22) and encompasses an area of 5,851 km^2. The site holds relatively high densities of harbour porpoise across the whole site during the winter and within Carmarthen Bay during the summer (JNCC and NRW 2016c).

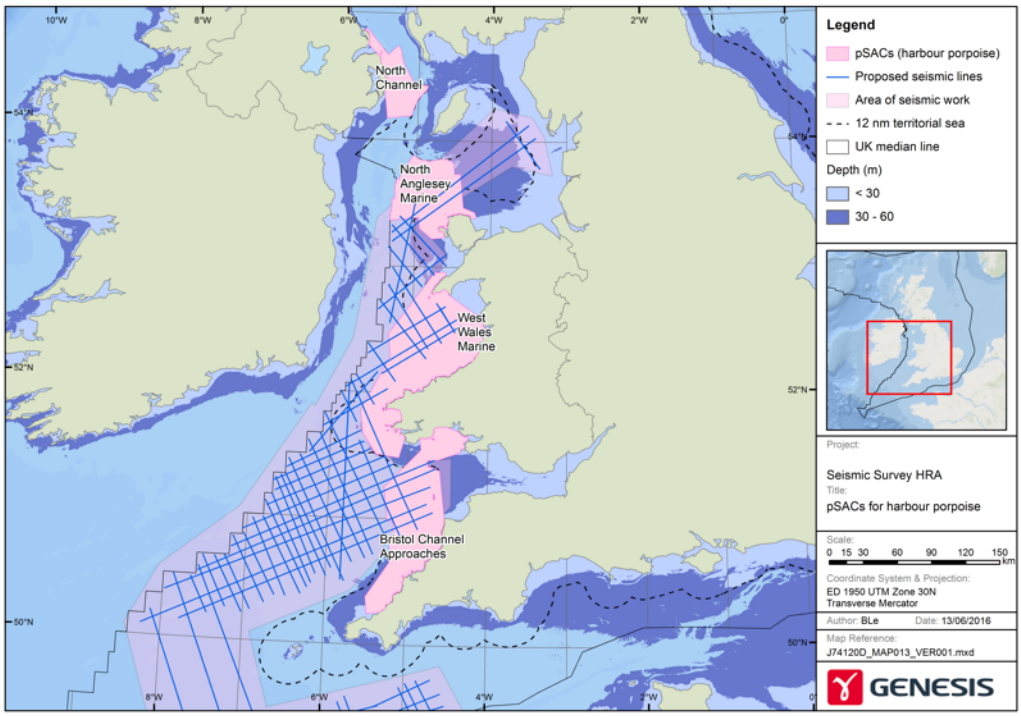


Figure 22: Location of pSACs for which Harbour porpoise is a qualifying species in relation to proposed seismic survey.

10.41 The proposed seismic survey will occur within all three pSACs and it is considered, based on the information presented in the application, that harbour porpoise within the Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC, West Wales Marine / Gorllewin Cymru Forol pSAC and North Anglesey Marine / Gogledd Môn Forol pSAC are at risk of being adversely affected by noise arising from the proposed survey.

10.42 The draft Conservation Objectives for all three pSACs are presented in Appendix C

10.43 The Harbour porpoise population within all three sites is reported as being in favourable condition (JNCC and NRW 2016a, b, c).

10.44 Harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it. Killing, injuring or significantly disturbing harbour porpoise have the potential to affect species viability within the site (e.g. JNCC and NRW 2016a).

10.45 Within the draft Conservation Objectives *no significant disturbance of the species* is described as *any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time*. Although there is no definition of what is a significant portion or significant period. The aim is to ensure that the site *contributes, as best it can, to maintaining the Favourable Conservation Status of the wider harbour porpoise population. As such, how the impacts within the site translate into effects on the Management Unit population are of greatest concern* (e.g. JNCC and NRW 2016a). It is therefore not appropriate to use the site population

estimates (if available) in any assessments of effects of plans or projects (i.e. Habitats Regulation Assessments), as these need to take into consideration population estimates at the management unit level, to account for daily and seasonal movements of the animals.

10.46 *Supporting habitats and processes* relates to the seabed and water column along with harbour porpoise prey.

10.47 There are no set thresholds at which impacts on site integrity are considered to be adverse and significant. This is a matter for interpretation on a site-by-site basis, depending on the qualifying feature and the nature, scale and significance of the impact source. Conservation Objectives have been used to consider whether the proposed survey has the potential for having an adverse effect on a site's integrity, either alone or in-combination with other plans or projects.

Physical Injury

10.48 Noise modelling undertaken to support the application indicates that, based on the M-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 5 m from the sound source (Table 7) and TTS from between 23 m and 29 m depending on the location of the survey (Table 8). Harbour porpoise will avoid the area of potential injury and move away from the seismic survey vessel as it approaches. Consequently, there is a very low risk of any harbour porpoise occurring within the range at which the onset of PTS or TTS is predicted to occur.

Disturbance and Displacement

10.49 The area of potential impact that could cause a level of disturbance to harbour porpoise varies depending on the location of the survey and the disturbance threshold used (Table 9). The greatest extent of any disturbance is predicted to occur out to 63 km from the sound source and cover an area of 5,881 km^2. Assuming that disturbance occurs entirely within the pSAC, then between 2.9% and 84% of a pSAC could be affected depending on the threshold level at which disturbance or displacement is predicted to occur (Table 14).

Table 14: Proportion of pSAC for harbour porpoise potential affected by the proposed seismic survey at any one location.

Site	Area (km^2)	Area of Displacement (km^2)		% of site affected	
		Threshold dB re 1 µPa rms		Threshold dB re 1 µPa rms	
		140	160	140	160
North Anglesey Marine / Gogledd Môn Forol pSAC	3,235	900	64	27	2.0
West Wales Marine / Gorllewin Cymru Forol pSAC	7,334	5,881	210	80	2.9
Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC	5,851	4,916	190	84	3.2

10.50 It is recognised that harbour porpoise are potentially more sensitive to noise than other odontocetes and consequently are at risk greater level of displacement (Southall *et al.* 2007). Based on the level of displacement from seismic surveys presented in Wood *et al.* (2012), it is assumed that up to 100% of the porpoises within area of 160 dB re 1 µPa rms and 90% within the area of 140 dB re 1 µPa rms may be displaced.

10.51 There are no site specific harbour porpoise populations and therefore it is not possible to estimate the number of individuals that could be displaced within the pSACs or the management unit area. However, it is predicted that a significant proportion of the harbour porpoise population may be displaced during the proposed seismic survey.

10.52 Data obtained by marine mammal observers during seismic surveys show a significant decrease in the number of harbour porpoise detections when airguns are operating, indicating that harbour porpoise are displaced from an area during a seismic survey (Stone 2015). However, there is not total displacement during a survey, with the median closest distance harbour porpoises being detected increasing from approximately 750 m to 1,200 m (Stone 2015).

10.53 Studies undertaken in the Moray Firth during 10 days of 2D seismic surveys using a 470 cu in airgun with peak-to-peak source levels estimated to be 242-253 dB re 1 µPa @ 1 m, 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).

10.54 Studies undertaken at offshore wind farms with regard to effects from piling, suggest that harbour porpoise return to areas displaced relatively shortly after cessation of activities. Results from Horns Rev offshore wind farm indicated that harbour porpoises were present in an area within 48 hrs of piling operations having stopped (Tougaard *et al.* 2006). Similarly, in the Moray Firth, harbour porpoise returned within 2 to 3 days following the installation of two jacket based wind turbines (Thompson *et al*. 2010). At the Greater Gabbard offshore wind farm porpoises returned within four weeks following cessation of piling (GWFL 2011). Consequently, any displacement effects are predicted to last for a short duration.

10.55 Although the impacts on harbour porpoises from displacement are unknown, displaced harbour porpoise will relocate elsewhere. Studies have shown an increase in the number of porpoise occurring in areas beyond the area of disturbance during seismic surveys (Pirotta *et al.* 2014). Harbour porpoise occur widely across the pSACs and the Irish and Celtic Seas and are therefore not constrained by specific habitat preferences. Harbour porpoise are known to forage widely and prey on a wide selection of fish species (Sveegaard 2011); they are therefore adaptable and capable of relocating to other areas.

10.56 Although prey for harbour porpoise may be displaced by the proposed seismic survey the extent of displacement, if any, will be relatively localised. Harbour porpoise are not restricted in their habitat usage nor their prey and so will be able to adapt to any temporary changes in prey distribution or behaviour during the relatively short period impacts are predicted to occur.

10.57 The proposed survey could cause a masking effect on harbour porpoise during which time they may increase the source level of their communications and alter the frequency and modulations of whistles to reduce the effect of the survey noise. However, there is still potential for social communication and hunting ability to be impaired during the period the proposed survey is undertaken within the pSACs. The potential reduction in their ability to detect prey will occur over a relatively short duration estimated to be approximately 15 hours, until the seismic survey has passed, although it is recognised that this could be greater if there is an adjacent survey line with overlapping noise impacts.

10.58 There is a high degree of certainty that harbour porpoise will be displaced by seismic surveys. However, the impacts will be temporary and only last during period the seismic survey is being undertaken and and will return to the area once the survey has finished.

In-combination

10.59 There is potential for an in-combination impact with the planned construction of the Burbo Bank Extension during 2016. Piling activities during construction could impact on harbour porpoise.

10.60 During site specific surveys undertaken between 2005 and 2009 a total of 22 harbour porpoise were were within in the wind farm survey area indicating the site is not a significant area for harbour porpoise. (DONG 2013b).

10.61 Noise modelling undertaken to assess the potential impact from construction of the offshore wind farm indicates there is potential for disturbance or displacement of harbour porpoise out 44 km from the piling activities (DONG 2013a). There will therefore be potential for overlapping noise impacts to occur from the construction of the wind farm and the proposed seismic survey. However, noise capable of causing disturbance from piling activities at the offshore wind farm (measured as 75 dBht) will not occur within the North Anglesey Marine / Gogledd Môn Forol pSAC and therefore although there is potential for an in-combination impact and displacement of harbour porpoises outwith the pSAC there will not be an in-combination impact within the site. Displaced harbour porpoise may relocate to within the pSAC or elsewhere within the Irish Sea until the seismic survey is beyond the area at which disturbance effects are predicted to occur and the construction piling at the offshore wind farm is completed.

10.62 No other projects have been identified as having the potential to cause an in-combination impact on harbour porpoise.

Conclusion

10.63 There is a very low risk of physical injuries to harbour porpoise occurring from the use of airguns during seismic surveys within or adjacent to the pSACs. There is potential for displacement or disturbance to occur over a wide area. The duration of the survey is such that any effects will not last for a significant period of time and porpoises will return to the area once the survey is completed and therefore the harbour porpoise will remain a viable component of the sites and not be significantly disturbed over the long term. The proposed seismic survey will not impact on the supporting habitats and processes relevant to harbour porpoises and their prey.

10.64 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC, West Wales Marine / Gorllewin Cymru Forol pSAC and North Anglesey Marine / Gogledd Môn Forol pSAC with respect to harbour porpoise.

Cardigan Bay / Bae Ceredigion SAC, Lundy SAC, Pembrokeshire Marine SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC

Grey seal

10.65 It is considered, based on the information presented in the application, that grey seals from Cardigan Bay / Bae Ceredigion SAC, Lundy SAC, Pembrokeshire Marine SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC are at risk of being impacted by noise arising from the proposed survey (Figure 23).

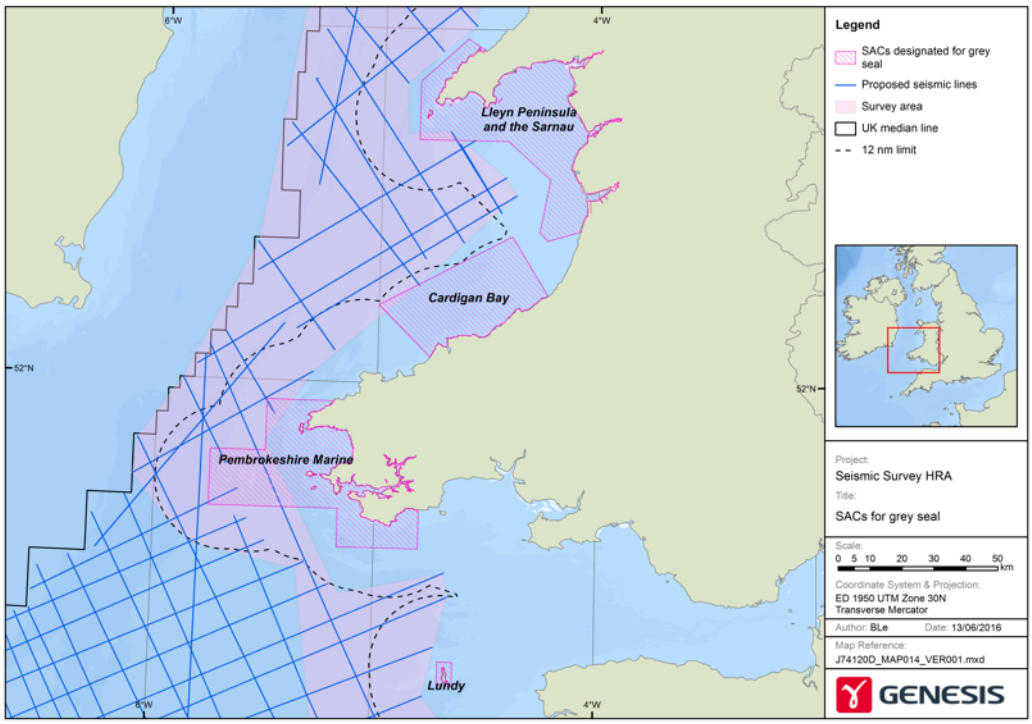


Figure 23: Location of SACs for which grey seal is a qualifying species in relation to proposed seismic survey.

10.66 As grey seals occur widely and regularly travel between SACs, the assessment considers any potential impacts on this feature in the context of all relevant sites at risk of being affected by the proposed survey within the South-west England and Wales and the Celtic and Irish Sea seal management unit, which encompasses Cardigan Bay / Bae Ceredigion SAC, Lundy SAC, Pembrokeshire Marine SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC.

Physical Injury

10.67 Results from noise modelling presented within the application indicate that there is a risk of physical injury in the form of PTS within 99 m of sound source and a temporary threshold shift could occur within 2,999 m of the sound source (Table 7 and Table 8).

10.68 The potential area within which the onset of PTS is predicted to occur is very localised area and Marine Mammal Observers (MMO) will be employed to ensure that the risk of

any grey seals being present within 99 m of the vessel when airgun firing commences is very low.

10.69 The area within which the onset of TTS is predicted to occur is greater and displacement or disturbance to grey seals in Cardigan Bay could extend up to 22 km from the sound source and cover an area of 932 km^2 (Table 9). Studies undertaken on seals indicate that the impact from TTS is temporary with hearing thresholds recovering within 24 hours (Kastak *et al.* 2005). Similar studies on harbour porpoise have also indicated a rapid recovery from TTS with normal hearing capabilities returning within 4 and 96 minutes depending on the exposure level and duration (Kastelein *et al.* 2012). Consequently, any temporary effects arising from TTS will cease very shortly after the airguns stop operating or the seals relocate away from the sound source.

Disturbance and Displacement

10.70 Relevant density data to provide estimates on the number of grey seals that could potentially be impacted in Cardigan Bay are not available. However, for the purposes of this assessment is assumed, based on the outputs from the noise modelling, that all grey seals within the SACs have the potential to be impacted.

10.71 It is likely that grey seals that receive levels of sound capable of causing disturbance will avoid the area. However, the duration of the impact for individual seals will be relatively short (Table 13) as the seismic vessel will move outwith the area, and the seals are capable of temporarily relocating to areas away from the sound source.

10.72 Studies undertaken on seals indicate that they are not significantly impacted by seismic surveys. Harris *et al*. (2001) reported no significant difference in the number of ringed seals recorded when air guns were operating compared to when they were not. Other studies have indicated a level of displacement and potential increase in haul out behaviour when airguns have been operating but have also shown that the behaviour of seals quickly return to normal once the airguns have ceased operating (Thompson *et al.* 1998). Similar results have been reported from studies undertaken on harbour seals impacted by piling activities, where it has been shown that displacement effects can occur out to 25 km from the sound source but within 2 hours of the cessation of piling the distribution of seals returns to pre-piling scenarios (Russell *et al.* 2016).

10.73 It is estimated that noise capable of causing some level of disturbance will occur out to 22 km from the vessel. When undertaking surveys, the vessel will move away from an area at least 4.5 knots (8.3 km/h) and therefore the maximum duration of disturbance noise in any one area is less than six hours.

10.74 The potential impacts on individual grey seals will vary, depending on individuals' sensitivities and habituation to noise. Furthermore, studies suggest that the response to noise may depend on whether the sound is sudden and causes a startle response

or is more gradual and allows habituation to occur and therefore avoids a startle response. Where sound levels are increased more gradually, i.e. by soft-start, a reduced level of displacement is likely (Götz and Janik 2011).

10.75 The potential effect of any displacement or disturbance may vary depending on the season. The period of main sensitivity is predicted to be during the pupping season, September and October; when the majority of grey seals are near to the coastal haul-out sites. During this period, females will spend between 18 to 20 days mainly ashore and both males and females stop foraging for up to 50 days, during which time they survive off fat reserves.

10.76 The impacts from the proposed seismic survey may cause temporary displacement or disturbance behaviour that could reduce the ability of grey seals to forage. Grey seals are opportunistic feeders and can, if prey availability changes, adapt to foraging on alternative prey. Noise modelling indicates a relatively localised effect on potential prey species but in the unlikely event that grey seals are unable to forage in the wider area then they will be able to survive the short period of time during which the survey will be causing an impact without food, surviving off their existing fat reserves.

In-combination

10.77 There is potential for an in-combination impact with the planned construction of the Burbo Bank Extension during 2016. Piling activities during construction could impact on grey seals.

10.78 During 31 site specific surveys undertaken between 2005 and 2009 a total of 23 grey seals were recorded within in the wind farm survey area (DONG 2013b).

10.79 Noise modelling undertaken to assess the potential impact from construction of the offshore wind farm indicates noise from piling could cause a disturbance effect on grey seals out to 34 km and will therefore potentially overlap with noise from the proposed seismic survey (DONG 2013a). However, noise capable of causing disturbance from piling activities at the offshore wind farm (measured as 75 db ht) will not occur within any of the SACs for which grey seal are a qualifying species. Consequently, although there is potential for an in-combination impact and displacement of grey seals outwith the SACs for which they are qualifying species, there will not be an in-combination impact within any of the designated sites. Displaced grey seals may relocate elsewhere within the Irish Sea until the seismic survey is beyond the area at which disturbance effects are predicted to occur and the construction piling at the offshore wind farm is completed.

10.80 No other projects have been identified as having the potential to cause an in-combination impact on grey seals.

Conclusion

10.81 It is predicted that there is a very low risk of any physical injuries to grey seals arising from the proposed seismic survey. However, all grey seals within the SACs and the wider area are at risk of being displaced or disturbed. Displaced grey seals will relocate to other areas and are predicted to return shortly after the sound levels are below that at which displacement occurs. Disturbance to grey seals may occur but results from noise modelling indicate that sound levels capable of causing disturbance will occur for less than six hours at any one point and the impacts will be temporary and predicted to be of relatively short duration.

10.82 The duration and effect of any impact on grey seals is predicted to be temporary and although will cause a level of displacement and disturbance it will not cause any direct or indirect mortality to grey seals and therefore will not impact on the population or effect its ability to maintain itself in the long-term.

10.83 The displacement of grey seals will cause a temporary change in the range of grey seals within the SAC. However, any impact will be temporary and the seals will return once the noise levels have reduced or ceased. It will therefore not cause any reduction in the natural range of the species in the foreseeable future.

10.84 The proposed survey 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.

10.85 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Cardigan Bay / Bae Ceredigion SAC, Lundy SAC, Pembrokeshire Marine SAC and Pen Llŷn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC with respect to grey seals.

Pembrokeshire Marine / Sir Benfro Forol SAC, Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC, Cardigan Bay / Bae Ceredigion SAC

River lamprey and Sea lamprey

10.86 Based on the information presented in the application it is considered that river lamprey and sea lamprey within Cardigan Bay / Bae Ceredigion SAC, Pembrokeshire Marine / Sir Benfro Forol SAC, Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC are at risk of being impacted by noise arising from the proposed survey.

10.87 The Conservation Objectives for each of the SACs are presented in Appendix C.

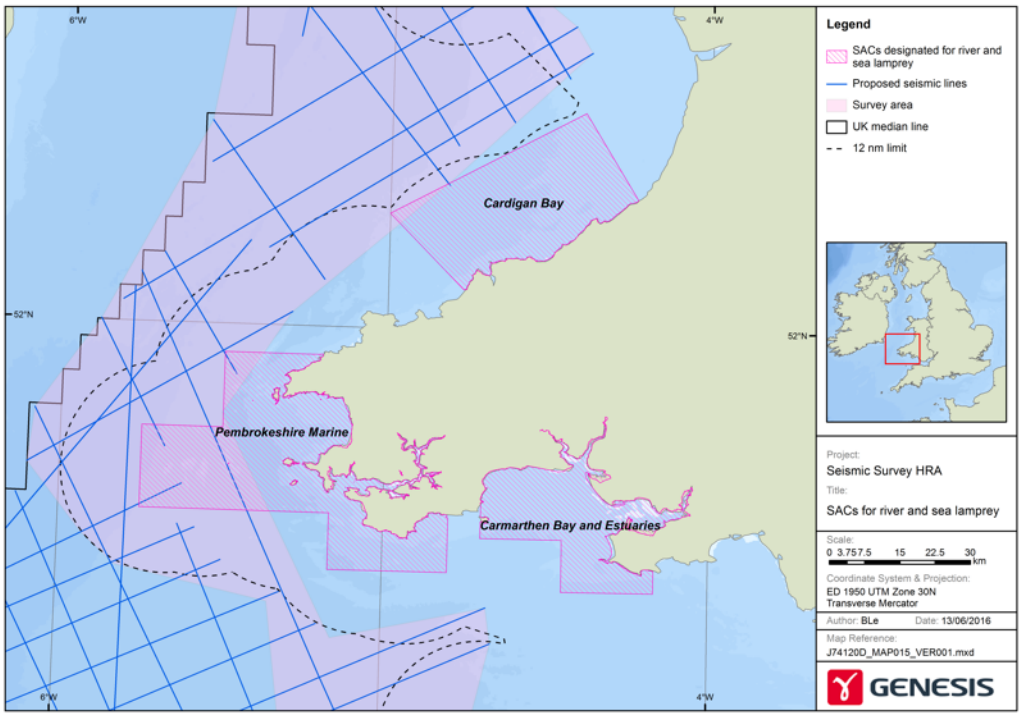


Figure 24: Location of SACs for which sea lamprey and river lamprey is a qualifying species in relation to proposed seismic survey.

10.88 Results from noise modelling presented within the application indicate that there is a risk of physical injury within 140 m of the sound source (Table 11) and it is recognised that there is potential for a wider area of disturbance to lampreys or their host species.

10.89 The population of both sea lamprey and river lamprey within the SACs are unknown and there is little information on their distribution within the sites. Adult river lamprey occur in the mouth of estuaries and rivers and are therefore unlikely to occur in offshore waters. However, Sea lamprey are known to occur in both offshore and coastal waters and will use the marine SACs for migration to and from the freshwater rivers (CCW 2009a). It is therefore likely that highest densities will occur near to the river mouth, particularly during adult migration periods of October and November for river lamprey and May and June for Sea lamprey. However, in the marine environment they occur in both shallow and deeper waters and will therefore have a broad distribution within the marine environment (Maitland 2003).

10.90 Potential disturbance to lamprey could arise due to noise from the airguns. However, lampreys do not possess otoliths or swim bladders and are thought to have poor hearing ability (Popper 2005). They are therefore not predicted to be sensitive from the predominantly low frequency sound arising from airguns. In the event that there is disturbance either to the lampreys or their host species then the temporary short duration of any impacts is not predicted cause any long-term effects.

In-combination

10.91 The location of Burbo Bank Extension offshore wind farm development is such that that there will not be any impacts on sea lamprey or river lamprey for any of the designated sites considered in this assessment.

10.92 No other projects have been identified as having the potential to cause an in-combination impact on sea lamprey or river lamprey.

Conclusion

10.93 It is predicted that there is a very low risk of any physical injuries to sea lamprey or river lamprey arising from the proposed seismic survey. However, there is potential for disturbance to cause displacement of adult lamprey or their host species. Should this occur, the impact is predicted to be of short duration and temporary, no long-term effects will occur.

10.94 The duration and effect of any impact on river lamprey or sea lamprey is predicted to be temporary and although may cause a level of disturbance it will not cause any direct or indirect mortality to lampreys and therefore will not impact on their populations or effect their ability to maintain themselves in the long-term.

10.95 The disturbance of lampreys or their host species may cause a temporary change in their range within the SAC. However, any impact will be temporary and they will return once the noise levels have reduced or ceased. It will therefore not cause any reduction in the natural range of the species in the foreseeable future.

10.96 The proposed survey will not affect the supporting habitats but may 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.

10.97 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Cardigan Bay / Bae Ceredigion SAC, Pembrokeshire Marine / Sir Benfro Forol SAC, Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC with respect to sea lamprey and river lamprey.

Pembrokeshire Marine / Sir Benfro Forol SAC, Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC.

Allis shad and Twaite shad

10.98 Based on the information presented in the application it is considered that allis shad and twaite shad within Pembrokeshire Marine / Sir Benfro Forol SAC and Carmarthen

Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC are at risk of being impacted by noise arising from the proposed survey (Figure 25).

10.99 The Conservation Objectives for each of the SACs are presented in Appendix C.

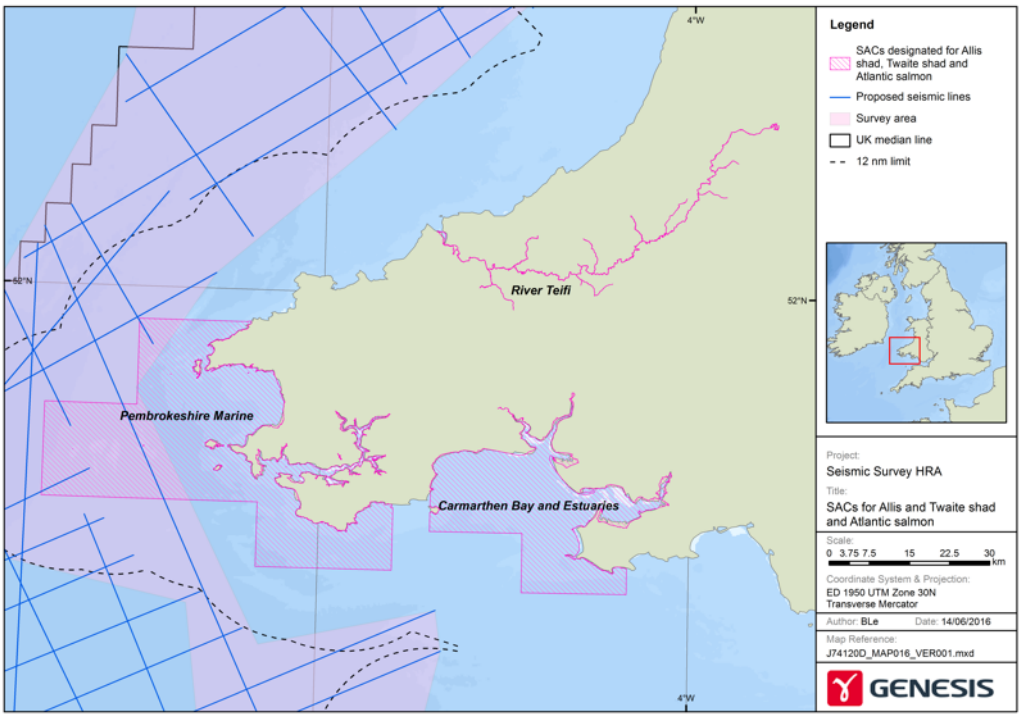


Figure 25: Location of SACs for which allis shad, twaite shad and Atlantic salmon are qualifying species in relation to proposed seismic survey.

10.100 Results from noise modelling presented within the application indicate that there is a risk of physical injury within 310 m of the sound source (Table 11) and it is recognised that there is potential for a wider area of disturbance.

10.101 The population of Allis shad and twaite shad within the SACs is unknown, although counts of 10,000 shad have been reported in the River Tywi and fish must migrate through the Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC to reach the river (CCW 2009c). The migration routes within the SACs are unknown but they enter the freshwater rivers to spawn between April and June and juveniles return during August and September (Aprahamian *et al*. 1998). The proposed survey is planned to start in August and will therefore be outwith the period during which adults are migrating. However, adult shad will still occur in nearshore waters during the period the proposed survey is being undertaken (Hillman 2003).

10.102 Allis shad are not known to spawn in any of the SACs and therefore there will be no impact on juvenile Allis shad during the proposed survey period. During the autumn migration juvenile twaite shad enter the estuaries from August onwards and could occur in the nearshore waters at the proposed survey is being undertaken (Hillman 2003). It is not known what effects noise from the proposed survey may have on the

migration of shad into the marine environment, but it may reduce the number of fish leaving the estuary during the period the survey is being undertaken. Should it occur this will be a temporary impact and fish will continue migration once the survey has moved away from the area. The autumn migration of shad occurs over a period of months and therefore any short-term impacts caused by the delay in migration are not predicted to cause any effect on the shad. Both species occur widely in both inshore and offshore waters (Hillman 2003) and therefore should any displacement or disturbance occur they will be able to temporarily relocate to other suitable areas and no long-term effects are predicted to occur.

In-combination

10.103 The location of Burbo Bank Extension offshore wind farm development is such that that there will not be any impacts on allis shad or twaite shad at any of the designated sites considered in this assessment.

10.104 No other projects have been identified as having the potential to cause an in-combination impact on allis shad or twaite shad.

Conclusions

10.105 It is predicted that there is a very low risk of any physical injuries to allis shad or twaite shad arising from the proposed seismic survey. However, there is potential for disturbance or displacement. Should this occur, the impact is predicted to be of short duration and temporary, no long-term effects will occur.

10.106 The duration and effect of any impact on allis shad or twaite is predicted to be temporary and although may cause a level of disturbance it will not cause any direct or indirect mortality and therefore will not impact on their populations or effect their ability to maintain themselves in the long-term.

10.107 The disturbance to shad may cause a temporary change in their range within the SACs. However, any impact will be temporary and they will return once the noise levels have reduced or ceased. It will therefore not cause any reduction in the natural range of the species in the foreseeable future.

10.108 The proposed survey will not affect the supporting habitats but may have a temporary and localised impact on the supporting prey species. Once the proposed survey has moved away or ceased there will be no effect on the distribution, abundance and population dynamics of the species.

10.109 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Pembrokeshire Marine / Sir Benfro Forol SAC and Carmarthen

Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC with respect to allis shad and twaite shad.

Afon Teifi / River Teifi SAC

Atlantic salmon

10.110 Based on the information presented in the application it is considered that Atlantic salmon, a qualifying species for the Afon Teifi / River Teifi SAC, are at risk of being impacted by noise arising from the proposed survey (Figure 25).

10.111 The Conservation Objectives of the SAC are presented in Appendix C. The conservation status of Atlantic salmon within the SAC is unfavourable (CCW 2012).

10.112 Results from noise modelling presented within the application indicate that there is a risk of physical injury on Atlantic salmon within 310 m of the sound source (Table 11) and it is recognised that there is potential for a wider area of disturbance.

10.113 The proposed seismic survey will be undertaken outwith the period of smolt migration between April and June and therefore will not impact on smolt.

10.114 The risk of potential injury occurring is predicted to be very low due the relatively very localised area within which levels of noise capable of causing injury are estimated to occur and that salmon will be able to swim away from the airgun noise as it approaches and therefore avoid risk of injury.

10.115 Disturbance to adult salmon could occur as they migrate to their natal river between June and October. It is not known whether the potential level of disturbance will impede the salmon from entering their spawning river. However, the duration of any impacts from the seismic survey are predicted to be relatively short with the survey vessel remaining in the area for a limited period of time. It is known that salmon can delay their entry into rivers if conditions are not suitable and therefore a temporary delay caused by disturbance arising from the seismic survey will not cause an effect that will impact on the population or natural range of Atlantic salmon in the long-term or foreseeable future.

In-combination

10.116 The location of Burbo Bank Extension offshore wind farm development is such that that there will not be any impacts on Atlantic salmon for any of the designated sites considered in this assessment.

10.117 No other projects have been identified as having the potential to cause an in-combination impact on Atlantic salmon.

Conclusions

10.118 It is predicted that there is a very low risk of any physical to Atlantic salmon arising from the proposed seismic survey. However, there is potential for disturbance or

displacement. Should this occur, the impact is predicted to be of short duration and temporary, no long-term effects will occur.

10.119 The duration and effect of any impact on Atlantic salmon is predicted to be temporary and although may cause a level of disturbance it will not cause any direct or indirect mortality and therefore will not impact on their populations or effect their ability to maintain themselves in the long-term.

10.120 The disturbance of Atlantic salmon may cause a temporary change in their range within the SAC. However, any impact will be temporary and they will return once the noise levels have reduced or ceased. It will therefore not cause any reduction in the natural range of the species in the foreseeable future.

10.121 The proposed survey will not affect the supporting habitats and there will be sufficiently large habitats to maintain the population on a long-term basis.

10.122 Based on the best available information and results from the noise modelling presented in the application, BEIS is satisfied that the proposed survey (alone and in combination with known relevant plans and projects) will not have an adverse effect upon the integrity of the Afon Teifi / River Teifi SAC with respect to Atlantic salmon.

11 PROPOSED MITIGATION MEASURES

11.1 All seismic surveys relating to oil and gas activities require consent from the competent authority. Every permit issued has, as a condition, a requirement for mitigation measures to be complied with in order to reduce the risk of physical injury to marine mammals, including harbour porpoise. One of the conditions of the permit is to follow the JNCC guidelines *Guidelines for minimising the risk of disturbance and injury to marine mammals from seismic surveys* (JNCC 2010).

11.2 The applicant has provided details of the proposed mitigation measures that will be in place for the duration of the survey (Genesis 2016). These will include:

- If there are cetaceans within 500 m (measured from the centre of the array) then the start of the seismic airguns should be delayed until cetaceans have moved away (at least 30 minutes) following last sighting.
- Soft-start of airgun activation, whereby there is an incremental increase in power over at least 20 minutes. This is believed to allow any marine mammals to move away from the sound source and reduce the likelihood of exposing the animal to sounds which can cause injury.
- During the planning stage, use of best available technique taking into account environmental aspects. For example, the lowest practicable power levels to achieve the geophysical objectives of the survey.
- Avoiding seismic survey during sensitive periods for marine receptors in the area, e.g. migration, breeding, calving or pupping.
- Use of properly qualified, trained and equipped marine mammal observers (MMOs) to detect marine mammals within a “mitigation zone” and potentially recommend a delay to seismic operations. The mitigation zone should be at least 500 m.
- MMOs should carry out a 30 minute pre-data acquisition survey of the mitigation zone and, if an animal is detected, the soft-start of the seismic airguns should be delayed until their passage, or the transit of the vessel, results in the marine mammals being more than 500 m away from the source.
- Avoiding commencing seismic survey at night or in poor visibility when marine mammals cannot reliably be detected.
- Consideration of the use of passive acoustic monitoring (PAM) to detect the presence of marine mammals by listening for their calls. This can be a useful supplement to visual monitoring during periods of poor visibility but is only effective for species that regularly vocalise.

12 APPROPRIATE ASSESSMENT CONCLUSIONS

12.1 BEIS has carefully considered all of the information provided by the applicant. BEIS considers that the survey has the potential to have a likely significant effect on nine European sites when considered alone and in combination with other plans and projects.

12.2 The sites are:

- Cardigan Bay / Bae Ceredigion SAC,
- Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC,
- Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC,
- West Wales Marine / Gorllewin Cymru Forol pSAC,
- North Anglesey Marine / Gogledd Môn Forol pSAC,
- Lundy SAC,
- Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC,
- Pembrokeshire Marine / Sir Benfro Forol SAC,
- Afon Teifi / River Teifi SAC.

12.3 BEIS is confident that, with mitigation measures, there will be no adverse effect on the integrity of any of these sites.

12.4 Mitigation for the survey will be secured and delivered through the consent for a Marine Geological Survey under the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (as amended).

12.5 BEIS has undertaken an Appropriate Assessment in respect of those European sites' Conservation Objectives to determine whether the project, either alone or in combination with other plans and projects, will result in an adverse effect upon the sites' integrity.

12.6 BEIS has determined that the proposed survey will not have an adverse effect upon the sites' integrity either alone or in combination with other plans or projects. BEIS has undertaken a robust assessment using all of the information available.

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14 APPENDIX A: European Designated Sites

SACs	Annex I Primary Qualifying features	Annex I Non-primary Qualifying Habitat	Annex II Primary Qualifying species	Annex II Non-primary qualifying species
Dee Estuary / Aber Dyfrdwy	Mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonising mud and sand, Atlantic salt meadows.	Estuaries, Annual vegetation of drift lines, Vegetated sea cliffs of the Atlantic and Baltic coasts Embryonic shifting dunes, Fixed dunes with herbaceous vegetation (`grey dunes`), Humid dune slacks, Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)	n/a	River lamprey Sea lamprey Petalwort
Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau	Estuaries, Sandbanks which are slightly covered by sea water all the time, Coastal lagoons, Large shallow inlets and Bays, Reefs	Mudfalts and sandflats, Salicornia and other annuals colonising mud and sand, Atlantic salt meadows, Submerged or partially submerged sea caves.	n/a	Bottlenose dolphin Grey seal Otter
Cardigan Bay / Bae Ceredigion	n/a	Sandbanks Reefs Sea caves	Bottlenose dolphin	Sea lamprey River lamprey Grey seal
Afon Tywi / River Tywi	n/a	n/a	Twaite shad	Sea lamprey Brook lamprey River lamprey

SACs	Annex I Primary Qualifying features	Annex I Non-primary Qualifying Habitat	Annex II Primary Qualifying species	Annex II Non-primary qualifying species
				Allis shad Bullehead
Afon Teifi / River Teifi	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation.	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea.*	Brook lamprey, River lamprey, Atlantic salmon, Bullhead, Otter.	n/a
Pembrokeshire Marine / Sir Benfro Forol	Sandbanks Mudflats and sandflats Coastal lagoons Salt marshes and salt meadows Sea caves	n/a	Grey seal	Sea lamprey River lamprey Allis shad Otter Twaite shad
Lundy	Reefs	Sandbanks Sea caves	n/a	Grey seal
Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd	Sandbanks Estuaries, Mudflats and sandflats, Large shallow inlets and bays, Salt marshes and salt meadows, Coastal dunes.	n/a	Twaite shad,	Sea lamprey River lamprey Allis shad Otter
Severn Estuary / Môr Hafren	Estuaries, Mudflats and sandflats, Atlantic Salt meadows.	n/a	Sea lamprey, River lamprey, Twaite shad.	n/a
Strangford Lough	Mudflats, Coastal lagoons, Large shallow inlets and bays, Reefs.	Annual vegetation of drift lines, Perennial vegetation of stony banks, Salicornia and other annuals colonising mud and sand,	n/a	Harbour seal

SACs	Annex I Primary Qualifying features	Annex I Non-primary Qualifying Habitat	Annex II Primary Qualifying species	Annex II Non-primary qualifying species
		Atlantic salt meadows.		
Murlough	Fixed coastal dunes (grey dunes), Atlantic decalcified fixed dunes,	Sandbanks which are slightly covered by sea water all the time Mudflats and sandflats not covered by seawater at low tide Atlantic salt meadows Embryonic shifting dunes (white dunes) Dunes with Salix repens ssp. *argentea*	n/a	Harbour seal
Lambay Islands	Reefs Vegetated sea cliffs of the Atlantic and Baltic coasts	n/a	Grey seal Harbour seal	n/a
Saltee Islands	Reefs	Mudflats and sandflats Inlets and bays Sea caves Sea cliffs	n/a	Grey seal

dSACs	Annex I Primary Qualifying features	Annex I Non-primary Qualifying Habitat	Annex II Primary Qualifying species	Annex II Non-primary qualifying species
Bristol Channel Approaches	n/a	n/a	Harbour porpoise	n/a
West Wales Marine	n/a	n/a	Harbour porpoise	n/a
North Anglesey Marine	n/a	n/a	Harbour porpoise	n/a

SPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
Duddon Estuary	**Breeding** Sandwich Tern *Sterna sandvicensis*	**Passage** Ringed Plover *Charadrius hiaticula* Sanderling *Calidris alba* ***Winter*** Knot *Calidris canutus* Pintail *Anas acuta* Redshank *Tringa totanus*	**Over-winter** Curlew *Numenius arquata*, Dunlin *Calidris alpina alpina,* Sanderling *Calidris alba,* Oystercatcher *Haematopus ostralegus,* Red-breasted Merganser *Mergus serrator,* Shelduck *Tadorna tadorna,* Redshank *Tringa totanus,* Knot *Calidris canutus,* Pintail *Anas acuta*.
Morecambe Bay	**Breeding** Little Tern *Sterna albifrons* Common tern *Sterna hirundo* Sandwich Tern *Sterna sandvicensis* ***Winter*** Bar-tailed Godwit *Limosa lapponica*, Golden Plover *Pluvialis apricaria*	**Breeding** Herring Gull *Larus argentatus* Lesser Black-backed Gull *Larus fuscus* Eider *Somateria mollissima* **Passage** Ringed Plover *Charadrius hiaticula* Sanderling *Calidris alba* ***Winter*** Curlew *Numenius arquata* Dunlin *Calidris alpina alpina* Grey Plover *Pluvialis squatarola* Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus* Pink-footed Goose *Anser brachyrhynchus* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Turnstone *Arenaria interpre*	**Breeding** Herring Gull *Larus argentatus*, Lesser Black-backed Gull *Larus fuscus*, Little Tern *Sterna albifrons*, Sandwich Tern *Sterna sandvicensis* **Over-winter** Great Crested Grebe *Podiceps cristatus*, Bar-tailed Godwit *Limosa lapponica*, Pink-footed Goose *Anser brachyrhynchus*, Shelduck *Tadorna tadorna*, Pintail *Anas acuta*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Knot *Calidris canutus*, Dunlin *Calidris alpina alpina*, Curlew *Numenius arquata*, Golden Plover *Pluvialis apricaria*, Turnstone *Arenaria interpres*, Black-tailed Godwit *Limosa limosa islandica*, Cormorant *Phalacrocorax carbo*, Wigeon *Anas penelope*, Teal *Anas crecca*, Mallard *Anas platyrhynchos*, Eider *Somateria mollissima*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Ringed Plover *Charadrius hiaticula*, Lapwing *Vanellus vanellus*,

SPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
			Sanderling *Calidris alba*, Redshank *Tringa totanus*, Whimbrel *Numenius phaeopus*.
Liverpool Bay / Bae Lerpwl	**Winter** Red-throated diver *Gavia stellata*	**Winter** Red-throated diver *Gavia stellate,* Common scoter *melanitta nigra*	n/a
Ribble and Alt Estuaries	**Breeding** Common Tern *Sterna hirundo* Ruff *Philomachus pugnax* ***Winter*** Bar-tailed Godwit *Limosa lapponica* Bewick's Swan *Cygnus columbianus bewickii* Golden Plover *Pluvialis apricaria* Whooper Swan *Cygnus cygnus*	**Breeding** Lesser Black-backed Gull *Larus fuscus* **Passage** Ringed Plover *Charadrius hiaticula* Sanderling *Calidris alba* ***Winter*** Black-tailed Godwit *Limosa limosa islandica* Dunlin *Calidris alpina alpina* Grey Plover *Pluvialis squatarola* Knot *Calidris canutus* Oystercatcher *Haematopus ostralegus* Pink-footed Goose *Anser brachyrhynchus* Pintail *Anas acuta* Redshank *Tringa totanus* Sanderling *Calidris alba* Shelduck *Tadorna tadorna* Teal *Anas crecca* Wigeon *Anas penelope*	**Breeding** Herring Gull *Larus argentatus*, Lesser Black-backed Gull *Larus fuscus*, Little Tern *Sterna albifrons*, Sandwich Tern *Sterna sandvicensis* **Over-winter** Great Crested Grebe *Podiceps cristatus*, Bar-tailed Godwit *Limosa lapponica*, Pink-footed Goose *Anser brachyrhynchus*, Shelduck *Tadorna tadorna*, Pintail *Anas acuta*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Knot *Calidris canutus*, Dunlin *Calidris alpina alpina*, Curlew *Numenius arquata*, Golden Plover *Pluvialis apricaria*, Turnstone *Arenaria interpres*, Black-tailed Godwit *Limosa limosa islandica*, Cormorant *Phalacrocorax carbo*, Wigeon *Anas penelope*, Teal *Anas crecca*, Mallard *Anas platyrhynchos*, Eider *Somateria mollissima*, Goldeneye *Bucephala clangula*, Red-breasted Merganser *Mergus serrator*, Ringed Plover *Charadrius hiaticula*, Lapwing *Vanellus vanellus*, Sanderling *Calidris alba*, Redshank *Tringa totanus*, Whimbrel *Numenius*

SPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
			phaeopus.
Mersey Narrows and North Wirral Foreshore	***Breeding*** *Common tern Sterna hirundo.* ***Passage*** *Common tern Sterna hirundo,* *Little gull Hydrocoloeus minutus.* ***Winter*** Bar-tailed godwit *Limosa laponicaa.*	***Winter*** Knot *Calidris canutus*	**Over-winter** Cormorant *Phalacrocorax carbo*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Sanderling *Calidris alba*, Knot *Calidris canutus*, Dunlin *Calidris alpina alpina*, Bar-tailed Godwit *Limosa lapponica* and Redshank *Tringa totanus*.
Mersey Estuary	***Winter*** Golden Plover *Pluvialis apricaria.*	**Passage** Ringed Plover *Charadrius hiaticula* Redshank *Tringa totanus* ***Winter*** Dunlin *Calidris alpina alpina* Black-tailed Godwit *Limosa limosa islandica* Pintail *Anas acuta* Redshank *Tringa totanus* Shelduck *Tadorna tadorna* Teal *Anas crecca* Wigeon *Anas penelope*	**Over-winter** Curlew *Numenius arquata*, Black-tailed Godwit *Limosa limosa islandica*, Lapwing *Vanellus vanellus*, Grey Plover *Pluvialis squatarola*, Wigeon *Anas penelope*, Great Crested Grebe *Podiceps cristatus*, Redshank *Tringa totanus*, Dunlin *Calidris alpina alpina*, Pintail *Anas acuta*, Teal *Anas crecca*, Shelduck *Tadorna tadorna*, Golden Plover *Pluvialis apricaria*.
The Dee Estuary	***Breeding*** Common tern *Sterna hirundo* Little Tern *Sterna albifrons* ***Passage*** Sandwich Tern *Sterna sandvicensis* ***Winter*** Bar-tailed godwit *Limosa laponicaa*	***Passage*** Redshank *Tringa tetanus* **Winter** Black-tailed Godwit *Limosa limosa islandica*, Curlew *Numenius arquata*, Dunlin *Calidris alpina alpina*, Grey Plover *Pluvialis squatarola*, Knot *Calidris canutus*,	**Over-winter** Black-tailed Godwit *Limosa limosa islandica*, Shelduck *Tadorna tadorna*, Teal *Anas crecca*, Pintail *Anas acuta*, Oystercatcher *Haematopus ostralegus*, Grey Plover *Pluvialis squatarola*, Bar-tailed Godwit *Limosa lapponica*, Dunlin *Calidris alpina alpina*, Sanderling *Calidris alba*, Curlew *Numenius arquata*, Redshank *Tringa totanus*, Cormorant

SPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
		Oystercatcher *Haematopus ostralegus*, Pintail *Anas acuta*, Redshank *Tringa totanus*, Shelduck *Tadorna tadorna*, Teal *Anas crecca*.	*Phalacrocorax carbo*, Wigeon *Anas penelope*, Mallard *Anas platyrhynchos*, Lapwing *Vanellus vanellus*, Knot *Calidris canutus*.
Ynys Seiriol / Puffin Island	**Breeding** Cormorant *Phalacrocorax carbo*,	n/a	n/a
Ynys Feurig, Cemlyn Bay and The Skerries	***Breeding*** Arctic Tern *Sterna paradisaea* Common Tern *Sterna hirundo* Roseate Tern *Sterna dougallii* Sandwich Tern *Sterna sandvicensis*	n/a	n/a
Skokholm and Skomer	**Breeding** Chough *Pyrrhocorax pyrrhocorax* Short-eared Owl *Asio flammeus* Storm Petrel *Hydrobates pelagicus*	**Breeding** Lesser Black-backed Gull *Larus fuscus*, Manx Shearwater *Puffinus puffinus*, Puffin *Fratercula arctica*	**Breeding** Razorbill *Alca torda*, Guillemot *Uria aalge*, Kittiwake *Rissa tridactyla*, Puffin *Fratercula arctica*, Lesser Black-backed Gull *Larus fuscus*, Manx Shearwater *Puffinus puffinus*, Storm Petrel *Hydrobates pelagicus*.
Grassholm	**Breeding** Gannet *Morus bassanus*	n/a	n/a
Bae Caerfyrddin/ Carmarthen Bay	**Winter** Common scoter *Melanitta nigra*	n/a	n/a
Isles of Scilly	**Breeding** Storm Petrel *Hydrobates pelagicus*	**Breeding** Lesser Black-backed Gull *Larus fuscus*	Great Black-backed Gull *Larus marinus*, Shag *Phalacrocorax aristotelis*, Lesser Black-backed Gull *Larus fuscus*, Storm Petrel *Hydrobates pelagicus*.
Lambay Island	**Breeding** Fulmar *Fulmarus glacialis*	n/a	n/a

SPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
	Cormorant *Phalacrocorax carbo* Shag *Phalacrocorax aristotelis* Greylag Goose *Anser anser* Lesser Black-backed Gull *Larus fuscus* Herring Gull *Larus argentatus* Kittiwake *Rissa tridactyla* Guillemot *Uria aalge* Razorbill *Alca torda* Puffin *Fratercula arctica*		
Ireland's Eye	**Breeding** Cormorant *Phalacrocorax carbo* Herring Gull *Larus argentatus* Kittiwake *Rissa tridactyla* Guillemot *Uria aalge* Razorbill *Alca torda*	n/a	n/a
Saltee Islands	**Breeding** Fulmar *Fulmarus glacialis* Gannet *Morus bassanus* Cormorant *Phalacrocorax carbo* Shag *Phalacrocorax aristotelis* Lesser Black-backed Gull *Larus fuscus* Herring Gull (*Larus argentatus*) Kittiwake (*Rissa tridactyla*) Guillemot (*Uria aalge*) Razorbill (*Alca torda*) Puffin (*Fratercula arctica*)	n/a	n/a

pSPAs	Article 4.1	Article 4.2 – Migratory Species	Article 4.2 – Assemblage
Morecambe Bay and Duddon Estuary	**Breeding** Little tern *Sternula albifrons* Sandwich tern *Sterna sandvicensis* Common tern *Sterna hirundo* **Non-breeding** Whooper swan *Cygnus Cygnus* Little egret *Egretta garzetta* Golden plover *Pluvialis apricaria* Bar-tailed Godwit *Limosa lapponica* Ruff *Calidris pugnax* Mediterranean gull *Larus melancephalus*	**Non-breeding** Pink-footed goose *Anser brachyrhynchus* Common shelduck *Tadorna tadorna* Northern Pintail *Anas acuta* Eurasian oystercatcher *Haematopus ostralegus* Grey plover *Pluvialis squatarola*	**Breeding** Lesser black-backed gull *Larus fuscus graellsii* European herring gull *Larus argentatus argenteus* **Non-breeding** Eurasian curlew *Numenius arquata* Black-tailed godwit *Limosa limosa* Ruddy turnstone *Arenaria interpres* Red knot *Calidris canutus* Sanderling *Calidris alba* Dunlin *Calidris alpina alpina* Common redshank *Tringa tetanus* Lesser black-backed gull *Larus fuscus*
Anglesey Terns / Morwenoliaid Ynys Môn potential	**Breeding** Arctic Tern *Sterna paradisaea* Common Tern *Sterna hirundo* Roseate Tern *Sterna dougallii* Sandwich Tern *Sterna sandvicensis*	n/a	n/a
Northern Cardigan Bay / Gogledd Bae Ceredigion	**Non-breeding** Red-throated diver *Gavia stellata*	n/a	n/a
Skomer, Skokholm and the seas off Pembrokeshire / Sgomer, Sgogwm a moroedd Benfro	**Breeding** Manx Shearwater *Puffinus puffinus*, Puffin *Fratercula arctica*	n/a	n/a

16 APPENDIX B: Generic Conservation Objectives

English SAC Conservation Objectives:

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- *The extent and distribution of qualifying natural habitats and habitats of qualifying species,*
- *The structure and function (including typical species) of qualifying natural habitats,*
- *The structure and function of the habitats of qualifying species,*
- *The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely,*
- *The populations of qualifying species, and,*
- *The distribution of qualifying species within the site.*

English SPA Conservation Objectives:

With regard to the individual species and/or assemblage of species for which the site has been classified ("the Qualifying Features" listed) and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;

Subject to natural change, to maintain or restore:

- *The extent and distribution of the habitats of the qualifying features,*
- *The structure and function of the habitats of the qualifying features,*
- *The supporting processes on which the habitats of the qualifying features rely,*
- *The populations of the qualifying features; and*
- *The distribution of the qualifying features within the site.*

Welsh SAC Conservation Objectives For Annex II Species

To avoid deterioration of the habitats of the qualifying species (listed above) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the qualifying interest.

To ensure for the qualifying species that the following are established then maintained in the long term:

- *Population of the species as a viable component of the site*
- *Distribution of the species within the site*
- *Distribution and extent of habitats supporting the species*
- *Structure, function and supporting processes of habitats supporting the species*
- *No significant disturbance of the species*

For a species feature to be considered to be at Favourable Conservation Status, all of the following must be true:

- *The size of the population must be being maintained or increased*
- *The population must be sustainable in the long term*
- *The range of the population must not be contracting*
- *Sufficient habitat must exist to support the population in the long term*

- *The factors that affect the species, or its habitat, must be under control*

Draft Conservation Objectives for pSAC for harbour porpoise **(JNCC and NRW 2016a, b, c)**

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:

- *The species is a viable component of the site.*
- *There is no significant disturbance of the species.*
- *The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.*
-

Welsh Conservation Objectives for pSPAs **(NRW 2016b, c)**

The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term.

The distribution of the population should be being maintained, or where appropriate increasing.

There should be sufficient habitat, of sufficient quality, to support the population in the long term.

Factors affecting the population or its habitat should be under appropriate control.

Irish Conservation Objectives for SAC (marine mammals): **(NPWS 2011a, NPWS 2013)**

To maintain the favourable conservation condition of (species) in the (site) SAC, which is defined by the following list of attributes and targets

- *Species range within the site should not be restricted by artificial barriers to site use.*
- *The breeding sites should be maintained in a natural condition,*
- *The moult haul-out sites should be maintained in a natural condition,*
- *The resting haul-out sites should be maintained in a natural condition,*
- *The grey seal population occurring within the site should contain adult, juvenile and pup cohorts annually.*
- *Human activities should occur at levels that do not adversely affect the grey seal population*

Irish SPA Conservation Objectives (NPWS 2011b)

To maintain the favourable conservation condition of (species) in the (site), which is defined by the following list of attributes and targets:

- *Breeding population abundance: apparently occupied nests (AONs)*
- *Productivity rate*
- *Distribution: breeding colonies*
- *Prey biomass available*
- *Barriers to connectivity*
- *Disturbance at the breeding site*

17 APPENDIX C: Site Specific Conservation Objectives

Cardigan Bay / Bae Ceredigion SAC (CCW 2009a)

Conservation Objectives for: Bottlenose dolphin, Grey seal, Sea lamprey and River lamprey.

For Species Features:

Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat.

Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

Supporting Habitats and Species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

Pen Llŷn a`r Sarnau / Lleyn Peninsula and the Sarnau SAC (CCW 2009b)

Conservation Objectives for: Bottlenose dolphin and Grey seal.

For Species Features –

Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat.

Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

Supporting Habitats and Species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

North Anglesey Marine / Gogledd Môn Forol pSAC (JNCC and NRW 2016a)

West Wales Marine / Gorllewin Cymru Forol pSAC (JNCC and NRW 2016b)

Bristol Channel Approaches / Dynesfeydd Môr Hafren pSAC (JNCC and NRW 2016c)

Conservation Objectives for: harbour porpoise.

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to maintaining Favourable Conservation Status (FCS) for the UK harbour porpoise.

To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:

- The species is a viable component of the site.
- There is no significant disturbance of the species.
- The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

Pembrokeshire Marine / Sir Benfro Forol SAC (CCW 2009c)

Conservation Objectives for: grey seal, Sea lamprey, River lamprey, Allis shad and Twaite shad.

For Species Features –

Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat.

Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

Supporting Habitats and Species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

Lundy SAC (NE 2015)

Conservation Objectives for: Grey seal.

to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of the qualifying species
- the structure and function (including typical species) of qualifying natural habitats
- the structure and function of the habitats of qualifying species
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- the populations of qualifying species

Carmarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC (CCW 2009d)

Conservation Objectives for: Sea lamprey, River lamprey, Otter and Shad.

For Species Features –

Populations - The population is maintaining itself on a long-term basis as a viable component of its natural habitat.

Range - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

Supporting Habitats and Species - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.

Afon Teifi / River Teifi SAC (CCW 2012)

Conservation Objectives for: Atlantic salmon

- The conservation objective for the water course must be met.
- The population of the feature in the SAC is stable or increasing over the long term
- The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- There is, and will continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a long-term basis.

The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term.
Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions e.g. food supply.
Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future.
Natural factors such as waterfalls may limit the natural range of individual species.
Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be assessed