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)

Dogger Bank SAC Oil and Gas Decommissioning Strategic HRA

DRAFT 3.0
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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 planned and future oil and gas decommissioning activities that could impact on the qualifying features of the Dogger Bank Special Area of Conservation (SAC) / Site of Community Importance (SCI).

1.2 There are a number of oil and gas fields within (or immediately adjacent to) the Dogger Bank SAC, the majority of which have been present prior to the site being submitted to the European Commission in August 2011 and designated as an SAC in September 2017 (JNCC 2018a).

1.3 Decommissioning of oil and gas industry related infrastructure in the SAC is predicted to increase in future years and decommissioning programmes have and will continue to be submitted for activities that could affect the designated site relevant to this assessment. It is recognised that operators will in the future be undertaking decommissioning activities within the site and this strategic assessment considers the potential for likely significant or adverse effects arising from future decommissioning activities.

1.4 Information used to inform this HRA has been supplied by operators following a request for information by BEIS. Therefore, this HRA is based on the best available information at this time. However, it is also recognised that there is uncertainty over what activities might be required in order to undertake future decommissioning and future Decommissioning Programmes likely to cause a significant or adverse effect on a European qualifying site will be subject to their own HRA. These will be undertaken at the time the application is made and be based on the best available evidence at that time.

1.5 As part of the assessment, potential in-combination impacts from all predicted future oil and gas related decommissioning activities within the SAC have been assessed to determine whether there is potential for likely significant or adverse effects on the integrity of the site. This assessment includes potential future activities that are not subject of any submitted projects or plans. By doing so it does not pre-empt the requirement to undertake an HRA when future plans or projects are submitted. It does not pre-determine any decision regarding future decommissioning programmes or projects. However, where possible, it does provide a strategic overview of potential in-combination impacts from forecasted activities.

1.6 BEIS is the competent authority for applications submitted under the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 (S.I. 2001/1754) (As Amended) and future decommissioning programmes submitted to the Department will be subject to the requirements of the regulations. This document presents the finding of the assessment undertaken by BEIS.

Habitats Regulations Assessment

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

1.8 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 SAC 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.

1.9 Possible SACs (pSACs), candidate SACs (cSACs) and potential SPAs (pSPAs) are afforded the same levels of protection by the UK Government as sites that have already been designated. Sites designated under the Ramsar Convention are also afforded the same level of protection as a designated site.

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

1.11 The Offshore Habitats Regulations transpose the Directives into UK law for offshore activities consented under the Petroleum Act 1998 and the Energy Act 2008.

1.12 Regulation 5(1) of the Offshore Habitats 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'*.

1.13 Under the Convention on Wetlands, signed in Ramsar, Iran (1971) sites regularly supporting 20,000 water birds 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 Ramsar sites are, as a matter of policy, afforded the same protection as European designations SPAs and SACs (ODPM 2005).

1.14 Decommissioning programmes may cause a likely significant or adverse effect on the qualifying features of European designated sites and therefore, as the competent authority, BEIS is required to appropriately assess plans or projects in view of the site's conservation objectives.

1.15 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.

1.16 This HRA assesses potential impacts from activities for which the BEIS Secretary of State is the competent authority. It does not assess impacts from other activities alone, but where appropriate does take those activities into consideration when addressing in-combination impacts.

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

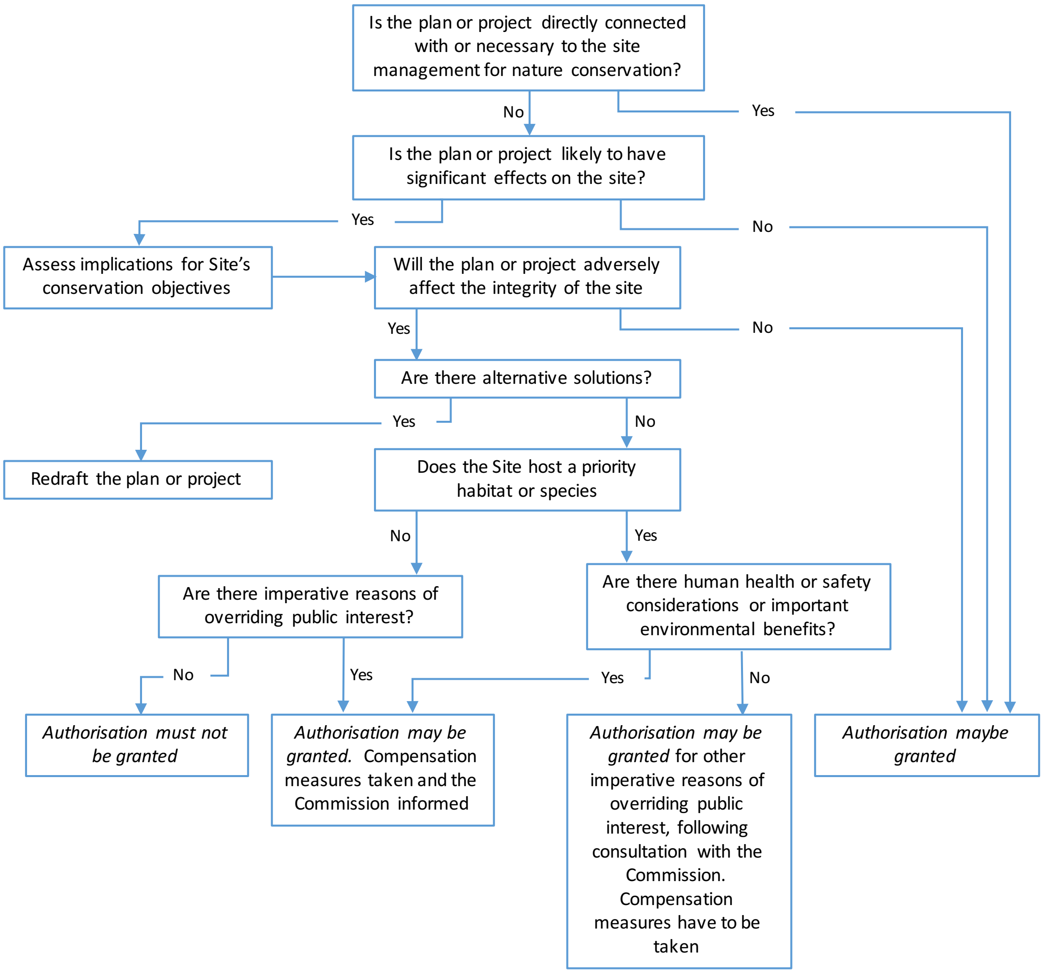

Figure 1: Summary of Habitat Regulations Assessment process (Source EC 2000).

2 POTENTIAL DECOMMISSIONING

2.1 Information on the potential decommissioning activities that may occur within, or adjacent, to the SAC has been provided by some operators following a request for information by BEIS in Q1 2018. The information received has been used to support this HRA.

2.2 Information was received from:

- ConocoPhillips,
- Perenco UK,
- INEOS UK,
- Faroe Petroleum.

2.3 No information was received from:

- Premier Oil E&P UK Limited,
- Neptune E&P UK Limited,
- Wintershall.

ConocoPhillips

ConocoPhillips is the licensed operator for six oil and gas fields within the SAC comprising eight platforms and 22 pipelines (

2.4 Table 1). There are six surface installations and two subsea installations that could impact on the SAC at the time that they are decommissioned.

2.5 Production at the installations ceased in 2018 and a decommissioning programme or programmes is due to be submitted to BEIS in 2020; although some preparatory works including pipeline flushing, topside cleaning and well abandonment may commence earlier (OGA 2018).

2.6 The ConocoPhillips' assets within the SAC that will be subject to future decommissioning activities are:

- Kelvin TM
- Munro MH
- Katy KT
- Hawksley EM
- McAdam MM
- Murdoch MA
- Murdoch MC
- Murdoch MD

Table 1: ConocoPhillips installations considered in the HRA.

Installation(s)	Block	Summary
Kelvin TM	44/18B	The Kelvin TM comprises a three legged Normally Unmanned Installation (NUI) and a single production well. Gas is exported via a 12.5 km pipeline to the Murdoch complex. A subsea valve skid is located at the Kelvin end of the pipeline and dewatering skid is located at the Murdoch end. Field Approval was in March 2006, with first production in 2007. Production ceased in May 2018.
Munro MH	44/17b	The Munro MH platform is a three legged NUI through which gas from the Munro field is exported via a 5 km pipeline to the subsea Hawksley manifold and onto the Murdoch platform. First production was in March 2005 and at the time of the approval of the Field Development Plan, field life expectancy was approximately ten years. Production ceased in May 2018,
Katy KT	44/19b	The Katy KT development is three legged NUI platform with two subsea protection structures (a Tee assembly at Katy and a pigging manifold at Kelvin) and a single production well. Gas is exported via a 14 km 10" gas production pipeline with a piggy-backed 2" methanol pipeline connecting the Katy platform to the existing Kelvin Subsea Tee, which is tied-back to the Murdoch Complex.

Installation(s)	Block	Summary
		The field was approved in February 2012 with first production in 2013. Production ceased in May 2018.
Hawksley EM	44/17a	The Hawksley EM is a subsea manifold development with a single well and wellhead protection structure . Gas is exported to the Murdoch complex via a 21.5 km export gas line Field approval was in June 2001 with first production in 2002. Production ceased in 2018.
McAdam MM	44/22a	The McAdam is a subsea manifold development comprising two wells, a wellhead, protected with a wellhead protection structure. Field approval was in June 2001, with first production in 2003. Production ceased in May 2018.
Murdoch MA, MC, MD	44/22a	The Murdoch complex comprises three surface installations (MA, MC and MD). All three installations are four legged manned platforms. A total of ten wells have been drilled from the Murdoch MD platform. Gas from a number of existing gas fields are exported to the Murdoch complex, where they are co-mingled and exported to Theddlethorpe gas terminal onshore. Fields tied back to the Murdoch complex are: • Boulton, • Boulton H, • Caister (Bunter), • Caister (Carboniferous) • Hawksley, • Katy, • Kelvin • Ketch, • McAdam. • Munro, • Murdoch, • Schooner, • Watt. Field approval was in April 1992 and production ceased in August 2018. Third party fields tied back to the host discharging installation include: Schooner, Ketch (both Faroe Petroleum (ROGB Limited), Rita, Hunter (both Premier Oil E&P UK Limited), Cavendish (INEOS UK SNS Limited)

Perenco UK

2.7 Perenco UK is the licensed operator for the Tyne development within the SAC. The development comprises a single installation and five wells. (Table 2).

2.8 A draft decommissioning plan has been submitted by the operator to BEIS in July 2018.

Table 2: Perenco UK installations considered in the HRA

Installation(s)	Block	Summary
Tyne	44/18	The Tyne development comprises a single four legged NUI a subsea template and five wells. Gas is exported via a 56 km 20" pipeline, with piggy-backed MEG line, to the Trent platform, where the gas is mingled and exported to Bacton terminal onshore. Field approval was in April 1995 with first production in November 1996. Production ceased in November 2015.

INEOS UK

2.9 INEOS is the licensed operator for the Cavendish development located within the SAC. The development comprises a single installation (Table 3).

Table 3: INEOS installations considered in the HRA.

Installation(s)	Block	Summary
Cavendish	43/19a	The Cavendish development comprises a single installation, three wells. Gas is exported via a 47.1 km pipeline, with piggy-backed MEG line, to the Murdoch platform. Field approval was in August 2005 with first production in July 2007. Production ceased in August 2018.

Neptune E&P UK Limited

2.10 Neptune is the licensed operator for the Cygnus A and Cygnus B developments located within the SAC (Table 4).

Table 4: Neptune installations considered in the HRA.

Installation(s)	Block	Summary
Cygnus A	44/12	The Cygnus A development comprises three platforms, a subsea cable end module, SSIV manifold, ETS Wye manifold and an AWHP jacket. Up to ten wells may be drilled. Gas is exported via a 51 km, 24” pipeline to the Trent platform. Field approval was in August 2012, with first production in December 2016.
Cygnus B	44/12	The Cygnus B development is a single un-manned installation tied back to the Cygnus A field via a 7.3 km intrafield pipeline. Field approval was in August 2012, with first production in December 2016

Wintershall

2.11 Wintershall is the licensed operator for the Wingate development located within the SAC. (Table 5).

Table 5: Wintershall installations considered in the HRA.

Installation(s)	Block	Summary
Wingate	44/24b	The Wingate development comprises a single four legged NUI platform and up to six wells. Gas is exported via a 20 km 12” pipeline and associated 2” chemical line to the D-15a platform located in the Dutch North Sea. Field approval was in September 2010, with first production in October 2011.

Faroe Petroleum

2.12 Faroe petroleum is the licensed operator of the Schooner and Ketch developments which tie back to Murdoch complex. While the associated platforms are outside the SAC, the connecting pipelines include a 2.3 km length of pipeline from Schooner to Murdoch and 2.73 km length of pipeline from Ketch to Murdoch within the SAC. Both pipelines have piggy-backed MEG lines attached to them.

Premier Oil E&P UK Limited

2.13 Premier oil are the operator for two single well subsea developments within the SAC, both of which are tied back to the Murdoch complex.

Table 6: Premier installations considered in the HRA.

Installation(s)	Block	Summary
Rita RH	44/22c	The Rita development is a subsea single subsea well tied back to the Hunter field by an 8 km 8" gas pipeline and to Murdoch K and the CMS northern lobe pigging skid by a 6km 10" gas pipeline linking to Murdoch complex by a 22 km 12" gas pipeline. The field was developed in 2008.
Hunter HK	44/23	The Hunter development is a subsea single well with wellhead tied to Murdoch K by an 8" gas pipeline. Murdoch K is tied back to the CMS Northern lobe pigging skid by a 6 km 10" gas pipeline and into the Murdoch complex by a 22 km 12" gas pipeline. Field discovery was 1992 with development in 2005 and shut in while Rita produced in 2017.

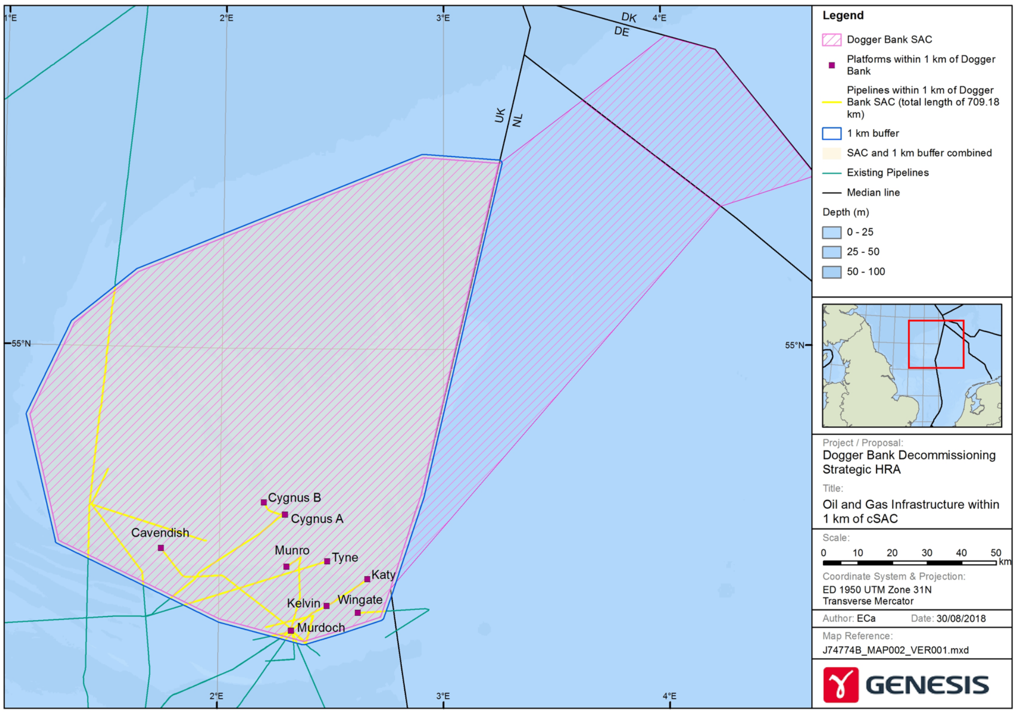

Figure 2: Existing oil and gas surface infrastructure and associated pipelines within the Dogger Bank SAC.

2.14 Within the SAC (and 1 km buffer[1]) there are 13 surface installations with up to 40 wells (Table 7) that will be subject to decommissioning. In addition to the surface infrastructure there are three subsea installations: Hawksley EM, McAdam MM and Hunter. Associated with each of the gas fields there are items of equipment on the seabed. These include subsea manifolds, valves and T-pieces (Figure 3, Table 8).

2.15 In total there is 457.7 km of oil and gas pipeline within the SAC, some with piggy-backed umbilical's and fibre optic cables (Table 9).

[1] Assets within 1 km of the SAC boundary have been considered within this HRA as potential impacts arising from future decommissioning activities could theoretically extend to within 1 km of the boundary.

Table 7: Surface platforms in the Dogger Bank SAC.

Installation		Area (m^2)	Number of wells	Number of piles
Kelvin TM	Three legged NUI	*242*	4	3
Munro MH	Four legged NUI	*306*	2	4
Katy TM	Three legged NUI	242	3	3
Murdoch MA	Four legged NUI	*306*	3	4
Murdoch MC	Three legged NUI	*242*	2	3
Murdoch MD	Six legged NUI	*1,000*	0	6
Cavendish	Four legged NUI	*306*	3	4
Tyne	Four legged NUI	306	5	4
Cygnus AUQ	Four legged accommodation platform	400	5	4
Cygnus AWHP	Four legged well head platform	562	-	4
Cygnus APU	Six legged production platform	1,000	-	6
Cygnus BWHP	Four legged well head platform	687.5	5	4
Wingate	Four legged NUI	*306*	6	4
	Total	5,905.5	38	53

Italics are estimates based on known footprint areas for similar installations

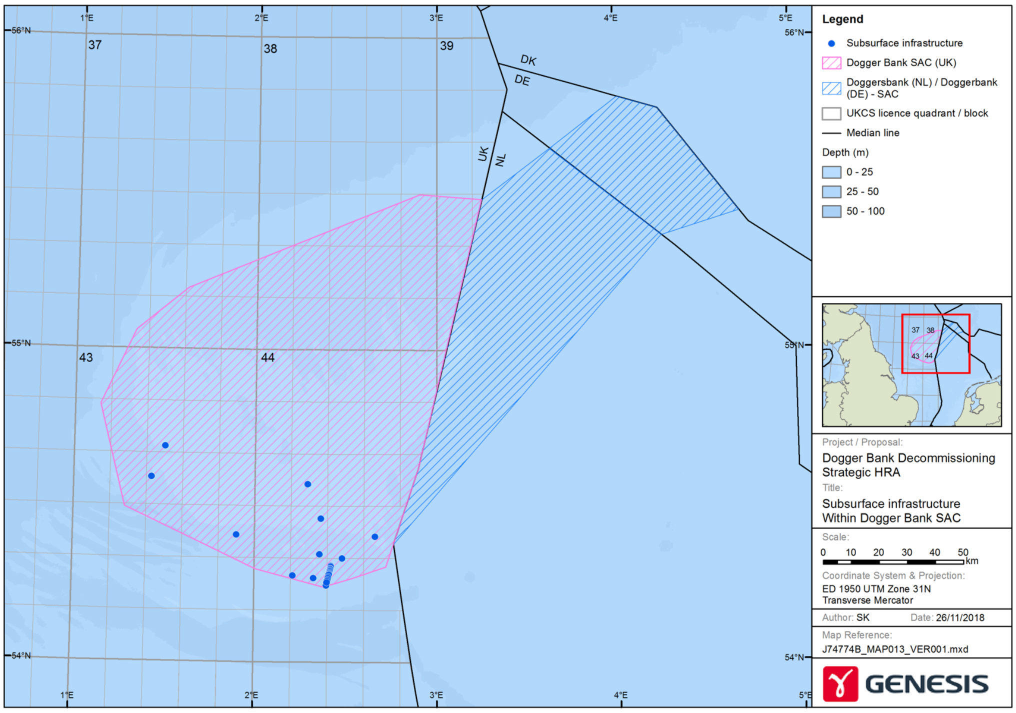

Figure 3: Location of existing oil and gas associated subsea equipment within the Dogger Bank SAC.

Table 8: Existing subsea infrastructure subject to potential decommissioning within the Dogger Bank SAC.

Structure.	Type	Estimated area (m^2)
Hunter	Wellhead Manifold	42
Rita	Wellhead Manifold	42
Hawksley EM	Subsea Satellite Wellhead Structure	105
Hawksley EM to McAdam MM	Pipeline Tee piece	15
McAdam MM	Subsea Satellite – Template Wellhead Protection Structure	165
Cavendish pigging skid	Valve	18
Murdoch K KM	Subsea Wellhead Structure	105
Murdoch CMS III pigging skid (Northern Lobe)	Valve	30
Boulton HM	Subsea Satellite Wellhead Structure	165
CMS pigging skid Southern Lobe or Southern Pigging Skid or Cavendish Pigging Skid or Murdoch Subsea Pigging Skid local to MD	Valve	30
Murdoch pigging skid (Kelvin) or Kelvin subsea pigging skid local to MD end of Kelvin pipeline	Valve	55
Cavendish	Manifold	42
Katy KT pipeline tee structure	Tee piece	40
Kelvin pigging manifold assembly and Kelvin subsea pigging skid local to TM	Manifold	68
Kelvin tee structure	Tee piece	50
Cygnus A crossing	Pipe junction	42
Cygnus A SSIV	SSIV	42
Cygnus WYE manifold at Esmond Transportation System (ETS) pipeline export system	Manifold	42
Hunter/Murdoch pipeline protection structures b01 – b18	Protection	291.6
	Total	1,389.6

Note – Information on the footprint from subsea infrastructure not always being presented in the relevant applications or is contradicted by other sources. Consequently, only an estimate of the physical footprint within the SAC can be made. Where no information is available an estimate is made based on similar types of equipment within the SAC:

- Well Heads (and protection), Templates, Manifolds, Jacket and Crossing area based on Cygnus SSIV manifold (GDF Suez 2011).
- T – Piece area based on Katy Tee (ConocoPhillips 2011).
- Pigging skid area based on Kelvin development (ConocoPhillips 2006).

Table 9: Pipelines within the Dogger Bank SAC

Pipeline No.	Pipeline	Diameter (Inches)	Distance (km)
PL253	Esmond to Bacton	24	27.14
PL255	Esmond to Forbes	10	11.37
PL258 & 264	Esmond to Gordon & BHP	12	34.74
PL261	Esmond to Forbes	2	11.37
PL1220/PL1221	Tyne to Trent	20	41.86
PL1222 & 1223	Schooner to Murdoch Gas line + MeOH lines	16	2.28
PL1436 & 1437	Murdoch MD to Boulton BM gas line + MeOH lines	10	3.95
PL1570	Shearwater to Bacton (Seal)	34	76.72
PL1612 & 1613	Ketch to Murdoch gas line + MeOH lines	18	2.73
PL1922 & 1925	Hawksley EM to Murdoch MD gas + MeOH lines	12	11.76
PL1923 & 1926	Murdoch K KM to Murdoch MD gas + MeOH lines	10	4.81
PL1924 & 1927	Boulton H HM to Murdoch MD gas + MeOH lines	10	1.63
PL2109 & 2110	Munro MH to Hawksley EM + MeOH lines	10	4.94
PL2137/3005	Hunter Export to Murdoch K	10	7.4
PL2284 & 2285	Cavendish Export Pipeline + MeOH lines + Fibre optic cable	10	47.17
PL2431 & PL2430	Kelvin to Murdoch gas and MeOH lines	-	12.43
PL2528	Rita to Hunter Export and MeOH lines	8	14.09
PL2850 & 2851	Wingate to D15-A Pipeline + MeOH lines	12	7.09
PL2894 & 2895	Katy to Kelvin gas line + MeOH lines	10	14.07
PL3086	Cygnus A to Cygnus B gas Pipeline	12	7.6
PL3088	Cygnus to ETS gas Pipeline	24	40.15
PL929 & 930	Theddlethorpe to Murdoch MD	26	2.77
PL935 & 936	Murdoch MD to Caister CM gas line	16	4.54
PLU2138	Hunter Umbilical	4	7.4
PLU2431	3 in. Kelvin Methanol	3	12.42
PLU2529	Hunter to Rita Umbilical	4	14.09
PLU3087	Cygnus A to Cygnus B Umbilical MEG	7.5	7.8
UM5	Watt QM to Murdoch MD Umbilical	0	1.63
UM6	Hawksley EM to McAdam MM Umbilical	0	11.76
UM7	McAdam MM to Murdoch MA Umbilical	0	5.2
UM8	Murdoch KM to Murdoch MD Umbilical	0	4.81
		Total	457.7

3 DECOMMISSIONING METHODS

3.1 The exact methods to be used to decommission existing infrastructure within the SAC are unknown and will be subject to an assessment at the time the decommissioning plans are submitted to the competent authority.

3.2 In the absence of project specific information, a number of assumptions have been made in this HRA based on existing experience of decommissioning oil and gas installations and the associated infrastructure.

3.3 The assumptions made are:

- All platforms will be fully removed. None of the installations within the SAC are thought to have jackets weighing greater than 10,000 tonnes and therefore under the OSPAR agreement 98/3 and guidance note on decommissioning produced by BEIS all installations will be fully removed (BEIS 2018).
- All platforms will be removed using a heavy lift vessel. The use of a heavy lift vessel for the removal of platform jackets and topsides is industry standard practice. This will be preceded by topside preparatory work. This may require another vessel such as an accommodation work (walk to work) vessel or drill rig undertaking simultaneous operations.
- All wells will be plugged and abandoned. This is in line with Government requirements.
- Following cleaning all buried pipelines will be left *in situ*. Pipeline ends and spool pieces will be removed.
- Mattresses, grout bags and existing rock dump will be left *in situ*. This provides a worst-case scenario for the physical impact on the seabed. It is possible that where the conditions allow mattresses and grout bags will be removed. However, this will be decided on a project specific basis and the worst-case scenario is that all existing mattresses, grout bags and rock dump are left in place.
- Post decommissioning debris clearance will be undertaken.

3.4 Decommissioning activities are proposed to be undertaken over a period of at least ten years. However, the timing of the activities at each installation may occur over any time and will be subject to regulatory approval.

3.5 The proposed activities could cause physical loss of habitat through the removal of infrastructure and smothering, in particular the placement of rock for vessel or rig stabilisation and burial of existing pipelines. Surface laid pipelines left *in situ*. may cause ongoing obstruction on the sandbank feature but are not additional impacts. Physical impacts to qualifying features may occur during decommissioning activities and these may be temporary, where the habitat may recover overtime or permanent. The use of anchors during the locating of the heavily lift vessel or the drill rig used for well abandonment and the lowering of spud cans may cause physical impacts.

4 DESIGNATED SITE

4.1 The future decommissioning activities subject to this HRA will occur within the Dogger Bank SAC and it is recognised that potential impacts that have potential to cause a likely significant effect could occur to the qualifying features of the site (Figure 4).

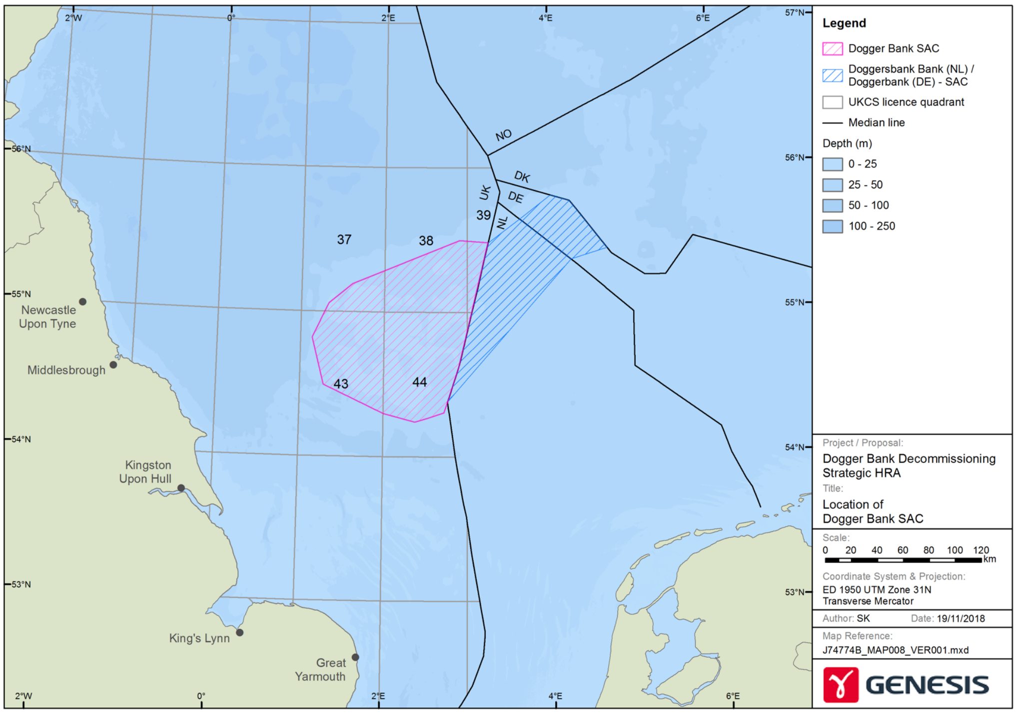

Figure 4: The Dogger Bank SAC.

4.2 The Dogger Bank SAC covers an area of 12,331 km^2 and lie entirely within UK territorial waters. The Dogger Bank is an extensive sandbank which was formed by glacial processes before being submerged through sea level rise and the site was formally classified as a SAC in September 2017 on account of its Sandbanks which are slightly covered by sea water all the time [Habitat code 1110]**.** The basis for the classification is set out in a Natura 2000 Standard Data Form (JNCC 2017a).

4.3 The total area of sandbank habitat classified within the Dogger Bank SAC is, for the purposes of this assessment, 12,331 km^2, (JNCC 2017a).

5 CONSERVATION OBJECTIVES

5.1 Conservation Objectives outline the desired state for any European site, in terms of the interest features for which it has been designated. A feature is in unfavourable condition either where evidence indicates one or more of its attributes need to be restored or where restoration is not considered to be possible through human intervention. Conversely, a feature is in favourable condition where evidence indicates none of the attributes are being adversely affected (JNCC 2018b).

5.2 Favourable Conservation Status is defined in Article 1(e) of the Habitats Directive as:

> *Conservation status of a natural habitat means the sum of the influences acting on a natural habitat and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species within the territory referred to in Article 2;*

5.3 The conservation status of a natural habitat will be taken “as favourable" when:

> *its natural range and areas it covers within that range are stable or increasing. The specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable as defined in (i).*

5.4 The Dogger Bank SAC is currently classified as being in unfavourable condition (JNCC 2018b)

5.5 There are no set thresholds at which impacts on site integrity are considered to be adverse. This is a matter for interpretation on a site-by-site basis, depending on the designated feature and nature, scale and significance of the impact.

5.6 The European Court of Justice has defined ‘*adverse effect on site integrity*’ as a plan or project that is ‘*liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of sites of Community importance*’ (Sweetman 2013).

5.7 When assessing potential small scale impacts on Annex I habitats it is the relative importance of the area affected in terms of the rarity, location, distribution, vulnerability to change ecological structure which is most influential (Chapman & Tyldesley 2016).

5.8 The integrity of a site is defined as being ‘*the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*’ (ODPM Circular 06/2005).

5.9 Conservation Objectives have been used by the Department BEIS to consider whether the proposed activities have the potential for causing an adverse effect on a site's integrity, either alone or in-combination.

5.10 The Conservation Objectives of each site are required in order to undertake an Appropriate Assessment. The following Conservation Objectives have been produced by the JNCC for the Dogger Bank SAC (JNCC 2018b).

> For the feature to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status of Annex I Sandbanks which are slightly covered by seawater all the time.
>
> This contribution would be achieved by maintaining or restoring, subject to natural change:
>
> - The extent and distribution of the qualifying habitat in the site;
> - The structure and function of the qualifying habitat in the site; and
> - The supporting processes on which the qualifying habitat relies.

5.11 The 'extent' refers to the whole distribution of the qualifying feature within the site, which in the case of the Dogger Bank SAC is 12,331 km^2. A reduction in the extent of the sand bank feature has potential to impact on the physical and biological functioning of sedimentary habitat types. It is not clear that current impacts within the SAC, including those arising from the oil and gas industry, impact on the extent and distribution of the sandbank feature. However, the JNCC advise that based on expert judgement, the objective is restore the sandbank feature due to impacts from cabling and the oil and gas industry (JNCC 2018d).

5.12 The 'structure' refers to the physical structure of a habitat type together with the biological structure. The physical structure refers to the finer scale topography and sediment composition and distribution. The biological structure refers to the 'key and influential species' and 'characteristic communities' (JNCC 2018d). Based on expert judgement the objective is to restore the structure of the site on the basis of there being impacts from oil and gas related activities within the site. However, it is not clear what the impacts from deposits on the seabed have on structure and function of the site (JNCC 2018d).

5.13 The 'function' of the site refers to the ecological processes within the site. '*The natural range of sandbank communities within the site should be conserved to ensure the functions they provide support the health of the feature and the provision of ecosystem* *services to the wider marine environment*' (JNCC 2018d). The functions identified within the site include:

- Nutrition – The site provides feeding grounds where prey is made available for a variety of species of commercial importance.
- Bird and whale watching - the site provides some supporting function for wider marine bird and mammal populations
- Climate Regulation - the range of sedimentary habitats and associated communities in the site perform known ecological processes common to sandbanks such as deposition and burial of carbon in seabed sediments through bioturbation, living biomass and calcification of benthic organisms.

5.14 The JNCC advise that the objective for the, function, of the site should be to restore it.

5.15 The 'supporting processes' have been identified as being the hydrodynamic regime, water and sediment quality. It is unclear whether the physical presence of subsea infrastructure impacts on the movement of sediment across the sandbank. Based on the Environmental Quality Standards (EQS) there is no evidence to suggest that water or sediment quality across the Dogger Bank is below the standards. However, there is potential for contamination from produced water and drill cuttings. Based on expert judgement a maintain objective has been advised by the JNCC (JNCC 2018d).

5.16 It is noted that the JNCC consider that the activities listed below are capable of significantly affecting, the qualifying features of the site:

- Demersal fishing,
- Oil and gas industry,
- Aggregates,
- Cabling,
- Renewable energy.

5.17 The JNCC advise that these activities should be managed to restore Annex I Sandbanks which are slightly covered by seawater all the time, by reducing or removing associated pressures (JNCC 2018b).

5.18 In support of 'restore' objective, the JNCC state that '*some of the sandbank's extent is currently considered to be lost due to the presence of large-scale and widespread infrastructure associated with offshore oil and gas and cabling activities, which have resulted in changes to the substratum of the site'* (JNCC 2018d).

5.19 The purpose of this Appropriate Assessment is to determine whether future decommissioning activities associated with the oil and gas industry adversely affects the site's integrity. The critical consideration in relation to site integrity is whether the plan or project affecting a site, either individually or in combination, affects the site's ability to achieve its conservation objectives and favourable conservation status (JNCC 2016).

5.20 The Appropriate Assessment 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).

6 SCOPE OF THE ASSESSMENT

6.1 Based on the likely activities predicted to occur it has been determined that the HRA should consider alone and in-combination the potential direct and indirect impacts on:

- Sandbanks which are slightly covered all of the time.

Sandbanks

6.2 Sandbanks which are slightly covered by seawater all the time are an Annex I habitat under the Habitats Directive and are described as *Sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20 m below Chart Datum*. They occur widely in UK coastal and offshore waters. There are twenty designated sites in UK waters for which this habitat is a primary feature and a further 17 sites in which the habitat occurs but not identified as a primary reason for site selection (JNCC 2014a). There are five SACs in UK offshore waters for which this habitat is a primary feature, if which the Dogger Bank SAC is the largest (JNCC 2017b).

6.3 Annex I Sandbanks are defined by their physiographic nature rather than by a specific biological community (JNCC 2013). There has been no significant change in recent geological times and although there may have been localised declines the overall geographic spread and distribution of offshore sand banks have not been reduced (JNCC 2013).

6.4 The total area of sandbank habitat identified in UK offshore waters, i.e. beyond 12 nm is reported to be 57,835 km^2, of which 14,077 km^2 lies within designated sites (JNCC 2013).

6.5 The Dogger Bank is the largest sand bank feature in UK waters and comprises more than 70% of the UKs Annex I sandbank resource. Water depths across the site range from between 13 m and 58 m and the site is exposed to substantial wave energy that prevents the colonisation of the sand by vegetation on the shallower parts of the bank (JNCC 2017b).

6.6 The majority of sediments across the Dogger Bank are classified as sand to muddy sand, with patches of courser sediments. Patches of courser sediments occur across the site, with notable larger areas towards the western and southern edges. The underlying substrate comprise predominantly of clay material. Sand waves and mega ripples occur across the south-west and east central areas of the site (JNCC 2018d). The presence of mega ripples and sand waves indicates that some sediment transport arises from tidal currents. However, this maybe limited with the majority of sediment transport driven by storm waves (Van der Molen 2002).

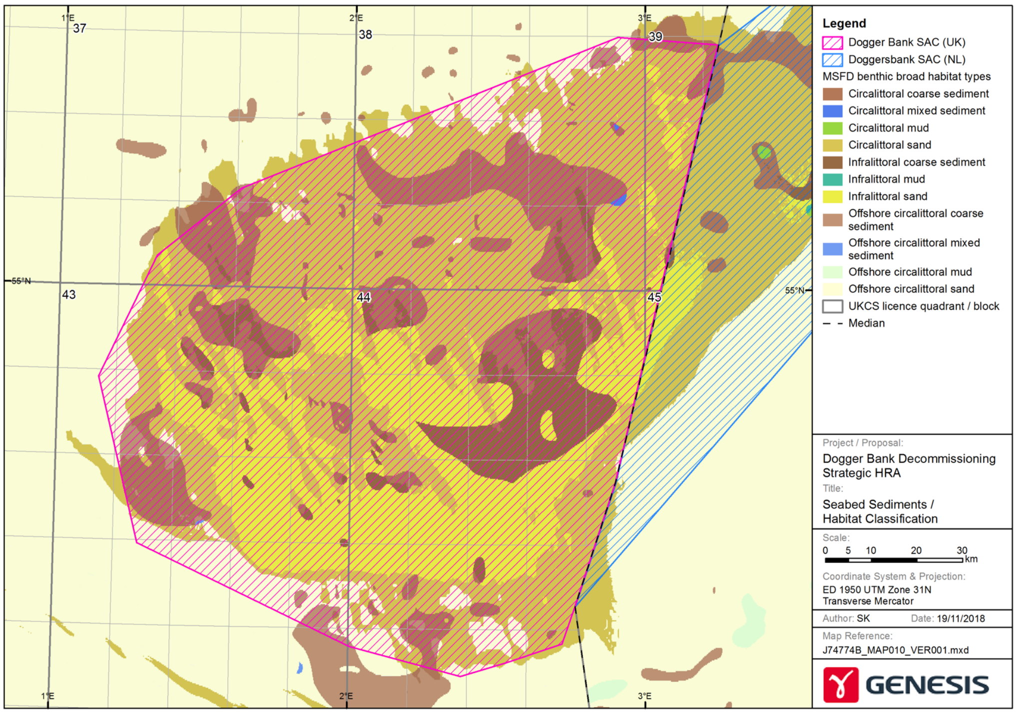

Figure 5: Sand bank habitats within the Dogger Bank SAC.

6.7 The average seabed current is reported to be between 0.2 and 0.3 ms^{-1} and therefore unlikely to erode or resuspend sediments. Suspended sediments across the Dogger Bank are reported to be relatively low with recorded concentrations across the Dogger Bank Zone being between 1 – 2 mg/l (Forewind 2013, Stanev *et al*. 2008).

6.8 Background concentrations of trace metals within the sediments across the Dogger Bank vary but the majority of the sites sampled report levels close to, or very near to, the OSPAR background concentrations that are described as being “the concentration of a contaminant at a ‘pristine’ or ‘remote’ site based on contemporary or historical data (Table 10 and Table 11) (OSPAR 2005, 2009). Consequently, the seabed sediments across the Dogger Bank SAC are largely uncontaminated, although patches of elevated contamination do occur.

Table 10: Heavy and trace metal concentrations within or adjacent to the Dogger Bank SAC.

Site	No. of stations	Year	Heavy and Trace Metals (µgl^{-1})								
			Ba	Cd	Cr	Cu	Ni	Pb	Va	Zn	Hg
Caister	5	2015	25.3 – 290.0	<0.1	7.1 – 9.3	2.5 – 2.8	4.2 – 5.2	3.8 – 7.2	11.5 – 16.8	8.2 – 17.0	<0.01
Cavendish	11	2003		<0.2	8.3 - 24	<2 - 1.4	2.3 - 4.7	3.3 - 7.1		6.0 - 23.0	<0.06 - 0.04
Cygnus	10	2008	174 - 222	<1 - 1.2	13.8 - 31.5	<5 - 14.2	<5 - 14.0	6.9 - 9.6	17.9 - 37.1	11.2 - 45.8	<0.01
Cygnus - Macadam	8	2008	146 - 236	<1 - 1.2	10.8 - 26.3	7 - 12.8	<5 - 10.7	6.8 - 8.7	12.6 - 43.9	11.2 - 31.8	<0.01
Esmond	10	2003		<0.2	3.6 - 94	<2 - 4.9	<2 - 17	1.7 - 8.5		<10 - 40	<0.06
Esmond	11	1998	160 - 233	<1 - 1.2	14 - 25	3 - 18	4 - 17	12 - 21	16 - 47	16 - 91	<0.01
Forbes	6	1998	184 - 210	<1	16 - 23	3 - 5	1 - 8	11 - 15	13 - 22	10 - 13	<0.1
Gordon	6	2003		<0.2	16 - 96	<2 - 4.2	4 - 18	4 - 12		25 - 130	<0.06 - 0.11
Gordon	6	1998	180 - 196	<1 - 1.2	27 -56	4 - 6	6 - 11	13 - 15	11 - 45	12 - 21	<0.01
Humphrey Exploration Well	9	2005	135 - 160	0.2 - 0.8	7 - 47	3 - 12	4 - 8	7 - 15	9 - 73	14 - 41	<0.01 - 0.02
Hunter	5	2005	151 – 198	0.1 – 0.2	9 – 20.6	3.6 – 7.5	4.9 – 7.5	6.7 – 8.5	11.2 – 21.2	9.8 – 22.2	-
Kelvin	-	2004	228	-	9.5	-	6.0	8.5	13.1	20.1	NA
Kelvin	-	2006	18	<0.1	5.8	3.5	7.9	11.8	8.7	15.1	<0.01
Mimas	9	2005	180	0.3	19	5	12	12	50	44	<0.1
Munro Exploration Well	34	2002	151 - 223	<1	<5 - 46	<5	<5	6 - 17	8 - 63	8 - 43	<0.01 - 0.02
Murdoch Hub	11	2015	20.4 – 121.0	<0.1	6.9 – 16.5	2.7 – 11.8	4.4 – 17.7	3.2 – 8.4	14.4 – 37.4	6.4 – 29	<0.01 – 0.3
Pegasus Pipeline	20	2017	105 – 524	<0.2 – 0.7	9.0 – 52.5	3.8 – 44.5	3.0 – 30.5	4.6 – 23.8	19.1 – 77.8	13.9 – 103.1	<0.01 – 0.01
Tethys	9	2005	246	0.3	13	6	5	11	23	26	<0.01
Wingate	7	2007	7 - 18			<2.0	<2.0		7 - 8	5 - 6	
Wingate	7	2009	44 - 355			0.9 – 2.3	2.3 - <4.0		8.8 – 11.4	7.2 – 12.8	
Creyke Beck	15	2012		<0.03 – 0.13	8.0 - 119	1.39 – 36.3	1.45 – 50.9	3.56 – 23.6			<0.002 – 0.017
Teesside	14	2012		<0.03 – 0.71	10 – 112	3.27 – 160	2.79 – 52.4	6.38 – 12.6		8.07 – 46.3	<0.002
Background concentrations											
CEFAS 2001				0.43		3.96	9.5			20.87	0.16
OSPAR 2005, 2009				0.20	60	20	30	25		90	0.05
Fugro 2010			303								
Apparent Effect Threshold				3.0 (N)	62 (N)	39 (OMQ)	110 (EL)	40 (OB)	57 (N)	410 (L)	0.41 (M)
Apparent Effect Threshold correspond with the lowest concentration at which no toxic effects were observed on tested fauna: B = Bivalve, N = *Neanthes*, M = Microtox, O = oyster, I = Infauna community, L = Larval bioassay (Buchman 2008).											

Table 11: Total Hydrocarbon Concentrations and PAH recorded from surveys within and adjacent to the Dogger Bank SAC.

Field	No. of stations	Year	THC (µg.g-1)	PAH
Caister	5	2015	6.4 – 10.6	0.055 – 0.131
Cavendish	11	2003	<1.0	-
Cygnus A	10	2008	1.5 – 5.2	<0.01 – 0.032
Cygnus B	10	2008	1.7 – 11.4	<0.01
Cygnus - Macadam	8	2008	0.5 – 14.3	0.05
Esmond	10	2003	<1.0	-
Esmond	11	1998	<1.0	-
Forbes	6	1998	0.7 – 1.6	0.002 – 0.006
Gordon	6	2003	<1.0	-
Gordon	6	1998	<1.0	-
Humphrey Exploration Well	9	2005	0.5 – 15.2	<0.003
Hunter	5	2005	0.04 – 0.2	0.008 – 0.03
Kelvin	-	2004	0.06 – 0.17	0.002 – 0.011
Kelvin	-	2006	1.3 – 2.4	-
Mimas	9	2005	<1 – 11.0	<0.013
Murdoch Hub	11	2015	1.3 – 7.1	0.005 – 0.099
Pegasus pipeline route	20	2017	0.7 – 12.2	<0.001 – 0.395
Tethys	9	2005	<1.0	<0.01
Wingate 2007	7	2007	1.0 – 1.5	-
Wingate 2009	7	2009	0.9 – 2.2	-
Creyke Beck	15	2012	-	<0.003 – 0.032
Teesside	14	2012	-	<0.003 – 0.035
Background concentrations				
		CEFAS 2001	0.3 – 2.5	-
		NSTF 1993	24.0	0.002
		UKOOA 2001	4.3 (mean) or 9.41 (mean)	0.002

6.9 Biological communities across the SAC vary depending on the substrate. The dominant biotope associated with the Dogger Bank is Ss.SSa.IFiSa.NcirBat (*Nephtys cirrosa* and *Bathyporeia* spp. in infralittoral sand). This biotope occurs in sediments subject to physical disturbance, as a result of wave action and occasionally strong tidal currents (EMU 2010, JNCC 2015). The species diversity and numbers of individuals are relatively low compared to less disturbed habitats. However, as a consequence to the dynamic nature of the environment disturbed communities recover relatively quickly and may be considered 'mature', often within a few days or weeks since the disturbance (MarLIN 2018).

6.10 There are four main communities across the Dogger Bank described by the JNCC (JNCC 2018d):

- The Bank community – characterised by the presence of *Bathyporeia-Tellina* community, this community occurs across the bank from the north to south-east.
- The North-eastern community – The most diverse community within the Dogger Bank SAC occurs across the northern part of the site. Species present in shallower waters include Velvet anemone (*Cerianthus lloydii*) and the pea urchin *Echinocyamus pusillus.* The brittle star *Amphiura filiformis*, the bivalve *Abra prismatica* and the polychaete *Scoloplos armiger* are more common in the deeper waters.
- The south-western patch – This is a sub-group of the Bank community, occurring in the shallower waters along the western side of the site. It is an area of relatively low species abundance and diversity, with polychaete *Bathyporeia elegans* the most abundant species.
- The Southern Amphiura community – This community occurs in the deeper waters to the south of the site. *Amphiura filiformis* (Brittle star) are dominant and the polychaete bristle worm *Spiophanes bombyx* is abundant.

6.11 Available data from the relevant developments that may be subject to future decommissioning activities is presented in Table 12. The dominant species and communities reported at each development are typical of the wider communities reported across the Dogger Bank.

Table 12: Reported predominant species and biotopes at relevant fields within the Dogger Bank SAC.

Field	Predominant species	Biotope	Reference
Cavendish	*Owenia fusiformis, Bathyporeia elegan, Spiophanes bombyx, Tellina fabula.*	-	GDF Suez 2011 INEOS 2019
Cygnus A	*Owenia fusiformis, Tellina fabula, Bathyporeia elegans, Nephtys cirrosa.*	-	GDF Suez 2011
Cygnus - Macadam	*Owenia fusiformis, Tellina fabula, Bathyporeia elegans, Nephtys cirrosa.*	-	GDF Suez 2011
Katy	*Fabulina fabula, Scoloplos armiger, Spiophanes bombyx, Magelona filiformis.*	-	ConocoPhillips 2011
Kelvin	*Magelona Spp. Fabulina fabula, Echiurus echiurus.*	SS.SSa.IMuSa.FfabMag	ConocoPhillips 2006
Monroe	*Nephtys cirrosa Bathyporeia spp.*	*IGS.NcirBat*	GDF Suez 2011
Murdoch	*Echinocyamus pusillus, Ophelia borealis, Abra prismatica.*	SS.SMx.OMx	ConocoPhillips 2006 ConocoPhillips 2016
Wingate	*Fabulina fabula, Bathyporei guilliamsoniana, Polinices pulchellus*	SS.SSa.IMuSa.FfabMag	Wintershall 2010

6.12 Sandbanks can be highly motile and so the introduction of solid structures to this environment can create localised artificial habitats, scouring and sediment deposits. Removal of the sandbank features, including the substratum, would result in some localised temporary loss of its ecological communities. The structure and diversity of sandbank communities are determined by environmental characteristics such as sediment particle size distribution, seabed slope and water depth. Any change in these environmental parameters (e.g. by removing or smothering part of the feature) could result in a loss of habitat and a possible shift in community organisation. The potential pressures and the possible sources of those pressures on sandbanks from oil and gas related activities have been identified by the JNCC and are presented in Table 13 (JNCC 2018e).

Table 13: Potential pressures on sandbanks from oil and gas activities (Source JNCC 2018e).

Pressure	Justification
Abrasion/disturbance of the substrate on the surface of the seabed	Impacts on the seabed may occur due to anchors form vessels or jack-up legs. Rock protection may be placed. Temporary excavation pits may be required to access buried structures at or below seabed.
Changes in suspended solids	Physical disturbance of the seabed from anchors and jacket legs. Removal of structures may lead to temporary increases in suspended solids and siltation.
Habitat structure changes – removal of substratum (extraction)	Clearing redundant foundation and well templates of any overlying cuttings material to enable removal operations.
Hydrocarbon and PAH contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	Primary concern are PAHs. Accidental discharges of oil or oil/water mixtures. TBT and copper wash from ship coatings. Cuttings from drilling operations. Old cuttings piles may contain organic-phase drilling fluids and may be disturbed during decommissioning.
Introduction of other substances (solid, liquid or gas).	Operational and accidental discharges of chemicals, crude oil and produced water containing substances such as oil components, PAH alkyl phenols and heavy metals.
Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.	Any overlying cuttings material to enable removal operations.
Physical change to another seabed type	Habitat change will occur due to placement of structures on the seabed including scour protection. Additional rock may be placed on the seabed during decommissioning to cover exposed structures to provide stable berm for the placement of jack-up legs.
Siltation rate changes (low), including smothering (depth in vertical sediment overburden)	Anchors can cause localised and temporary increases in suspended sediments. The settling out of suspended sediments is only expected to cause negligible increases in siltation. Excavation around jacket legs from the seabed and excavation at pipeline ends will physically disturb the sediment in a local area.
Synthetic compound contamination (incl. pesticides, antifoulants, pharmaceuticals). Includes those priority substances listed in Annex II of Directive 2008/105/EC.	The primary chemicals of concern are PAH in vessel fuel. Drill cuttings may contain hydrocarbons and be released into the marine environment due to remobilisation of residues of oil still found in the cuttings piles.
Transition elements and organo-metal (e.g. TBT) contamination. Includes those priority substances listed in Annex II of Directive 2008/105/EC.	The primary chemicals of concern are PAH in vessel fuel. Drill cuttings may contain hydrocarbons and be released into the marine environment due to remobilisation of residues of oil still found in the cuttings piles.
Underwater noise changes	Sources of underwater noise from decommissioning activities include vessel movements, well plug and abandonment, pipeline and jacket cuttings, pipeline rock placement, lifting and removal operations, helicopter traffic.
Above water noise	Noise can arise from many activities including machinery, vessels, explosives and people.

Pressure	Justification
Barrier to species movement.	Obstructions to species' movements can be caused by physical barriers or prolonged exposure to noise, light, visual disturbance or changes in water quality. The scale of impact will depend on scale of activity and the location and will need to be considered on a case-by-case basis.
Collision above water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery and structures).	Bird collision with vessels occurs and it is documented to be higher at night on lighted ships near coastal areas.
Collision below water with static or moving objects not naturally found in the marine environment (e.g. boats, machinery and structures).	Collision with propellers or other parts of the hull causing collision injury or death. Marine mammals collide with large ships and vessels travelling at greater than 14 knots.
Introduction of light	Light associated with construction, maintenance, operational lighting, plus navigation and operational lighting on vessels and structures. Removal of structures should reduce light levels. Lit vessels may cause a collision risk to birds.
Introduction of non-indigenous species	Aquatic organisms may be transferred to new locations as biofouling and can be harmful and invasive in locations where they do not naturally occur. The oil and gas industry provides a direct and indirect pathway for alien species through vessel movements and structures.
Litter	Marine litter can be released into the marine environment by shipping.
Vibration	Activities resulting in vibration are for example trenching for cable laying, dredging, explosives, oil and gas drilling and pile-driving. Vibration may occur during decommissioning of oil and gas installations depending on the methods used to remove the installations.
Visual disturbance	Vessels, vehicles and people movement can create visual stimuli which can evoke a disturbance response in mobile species such as marine mammals and seabirds. Removal of structures will remove any visual disturbance to bird species.
Water flow (tidal current) changes – local, including sediment transport considerations.	Structures placed in the marine environment immediately interact with the local current regime. Removal of structures during decommissioning will allow local currents to return to those of the surrounding environment, unaffected by interaction with structures.

6.13 The sensitivity of Annex I sandbanks in the UK offshore waters to oil and gas related activity is reported to be low because they act only over a small portion of the known occurrences of the habitat (JNCC 2013). However, their sensitivity to localised impacts may be higher depending on the scale of the impact. Consequently, the sensitivity of sandbanks to oil and gas activities is dependent on the extent of the activity. The JNCC (2018b) state that '*A human activity is considered capable of affecting, other than insignificantly, a feature where the feature is known to be sensitive to associated pressures*.

6.14 Studies undertaken to assess the sensitivity of Marine Conservation Zone (MCZ) and Marine Protected Area (MPA) features on a broad range of pressures have identified that subtidal sand had a low to medium sensitivity from physical disturbance of the substrate. Similarly, the habitat is identified as being highly sensitive to change to another seabed type (Tillin *et al.* 2010, Tillin & Tyler-Walters 2015). The sensitivity is determined by the magnitude of the pressures and set against a benchmark. The studies recognise that the sensitivity of a habitat to a pressure may also vary depending on the frequency and duration of the pressures and their spatial extent. The temporal and spatial aspects of the pressure and spatial scale of the feature being exposed to the pressure should be considered when determining the sensitivity of habitat to a pressure (Tillin *et al.* 2010).

7 POTENTIAL IMPACTS

7.1 Potential impacts arising from the removal of infrastructure, the use of anchors by vessels and rock dumping could cause physical loss and physical impacts to Sandbank habitats within the SAC.

7.2 The potential impacts arising from the planned activities identified in the likely work programmes that could affect qualifying features of the Dogger Bank SAC are:

- Physical loss of habitat due to rig stabilisation and scour protection.
- Physical loss of habitat due to accommodation work vessel stabilisation and scour protection.
- Physical loss of habitat due to rock placement at cut pipeline ends.
- Physical impact of habitat due to temporary location of heavy lift vessel.
- Physical impacts to the seabed from spud cans, anchor wires and anchors.
- Physical impacts to the seabed from the cutting of jacket piles for platform removal.
- Physical impacts to the seabed from the removal of the T-pieces, template/ manifolds/ pigging skids.
- Physical impacts from excavation and cutting pipeline ends.
- Physical impacts from well conductor removal.
- Physical impacts from over-trawl surveys.
- Contamination of habitat from disturbance of drill cuttings,
- In-combination impacts.

7.3 The physical loss of habitat is presumed to be a permanent loss of habitat which is unable to recover. A physical impact is categorised as a temporary impact where recovery occurs after the activity causing the impact has ceased.

7.4 No other sources of potential impact likely to cause a significant effect have been identified.

Physical loss of habitat

7.5 The following section identifies the potential physical loss of habitat from oil and gas decommissioning activities within the Dogger Bank SAC.

Physical loss of habitat due to rig stabilisation and scour protection

7.6 Prior to the removal of platforms and abandonment of wells a drill rig and jack-up accommodation vessels will be positioned at each location. Both drill rigs and jack-up vessels require a stable seabed to ensure the spud-cans do not penetrate into the seabed and risk either the rig or vessel becoming destabilised. Where the seabed is unstable the stability required is achieved based on soil stability limits and ensuring scour does not undermine vessel stability. In order to achieve this a rock berm may be required under each of the legs. Where and how often rig stabilisation may be required within the SAC is dependent on the seabed conditions at each location which is determined at the time by a site specific assessment. A worst-case scenario would be that rock is required for rig stabilisation at each of the 13 surface installations located within the SAC (Table 7). However, this is highly precautionary as stabilisation is not predicted to be required at all locations. For example, it is currently considered that no rock dump for stabilisation will be required at either the Murdoch MC or Murdoch MD installations, although contingency rock dump will be applied for at the time of decommissioning (ConocoPhillips 2018).

7.7 The extent of rock required around each spud has been estimated to be 100 m^2 (INEOS 2018). However, post-drilling surveys undertaken at two appraisal wells drilled by the Noble Ronald Hoope jack-up rig, as part of the Cygnus field development, reported the average area of rock required for rig stabilisation at these locations to be 1,200 m^2 at each spud can location, i.e. an area of rock with a radius of 20 m is placed on the seabed for each spud can (GDF Suez 2011).

7.8 For the purposes of this assessment a number of assumptions have been made:

- Contingency rock dump is required at Kelvin TM, Munro Katy T and Murdoch MA and this is maximum area of 1,200 m^2 at each spud can.
- The estimated rock that may be required at spud can for the Cavendish development is 1,200 m^2 as opposed to the estimated 100 m^2 reported by the operator (INEOS 2018).
- There are four spud cans for each drill rig used for well abandonment or jack up accommodation vessel for installation removal. This is precautionary as drill rigs used in this area have frequently had only three spud cans, but could have four.
- The accommodation vessels may have up to four spud cans (e.g. GDF Suez 2011)
- There is one movement of jack-up rig and one accommodation vessel at each location. It is unlikely that accommodation vessels will be used at all locations.

- Rig stabilisation is required at all locations unless BEIS has been specifically informed that it is not required.

7.9 In the unlikely event that rock is deposited for both rig and accommodation vessel stabilisation at all installations, unless it has been confirmed that it will not be required, a total area of 76,800 m^2 (0.077 km^2) of rock is estimated to be required causing a potential loss of 0.0006% of the Dogger Bank SAC (Table 14).

Table 14: Estimated rock dump required for either jack-up rig or accommodation platform stabilisation during future decommissioning and well abandonment activities within the Dogger Bank SAC.

Installation	Number of wells	Estimated area of rock dump for drilling rig (m^2)	Estimated area of rock dump for possible accommodation vessel (m^2)
Kelvin TM	4	*4,800*	*4,800*
Munro	2	*4,800*	*4,800*
Katy T	3	*4,800*	*4,800*
Murdoch MA	3	*4,800*	*4,800*
Murdoch MC	2	0	*0*
Murdoch MD	0	0	*0*
Cavendish	3	4800 [1]	*4,800*
Tyne	5	0 [2]	*0*
Cygnus AUQ	5	4,800 [3]	*4,800*
Cygnus AWHP	0	0	*4,800*
Cygnus APU	0	0	*4,800*
Cygnus BWHP	5	4,800 [3]	*4,800*
Wingate	6	0 [4]	*0*
Total area drill rig or accommodation vessel		33,600	43,200
Total area for both rig and accommodation vessel			76,800

Italics are potential contingency amounts of rock dump based on estimated 4,800 m^2 at each location.
1 = INEOS (2018) estimated 100 m^2 at each spud can.
2 = Perenco (2018) reported no requirement for stabilisation material based on site survey data.
3 = Estimated based on recorded area of 1,200 m^2 at each spud can at wells 44/12a-C and 44/12a-d (GDF Suez 2011) and their being four spud cans for each drill and accommodation platform.
4 = Based on the lack of any rig stabilisation required during field development (Wintershall 2010).

7.10 The use of rock for rig stabilisation is infrequent, up until at least 2006 no rock had been required for any previous activities within the SAC by ConocoPhillips (ConocoPhillips 2006) and no stabilisation material is predicted to be required for the removal of any subsea installations (ConocoPhillips 2018) though it is frequently applied for as contingency for safety reasons. Of the five wells drilled at the Cygnus field, three were reported to require rig stabilisation (GDF Suez 2011). Where rig stabilisation material has been previously placed within the SAC during the drilling of wells, evidence indicates that the rock may, overtime, be covered by a thin layer of sand (GDF Suez 2011).

Physical loss of habitat due to rock placement at cut pipeline ends

7.11 There is a total of 31 pipelines and umbilicals associated with the oil and gas industry within the SAC and one fibre optic cable (Table 9). Not all of them lie totally within the SAC and therefore the ends of these pipelines will not have a physical impact on the SAC when decommissioned. Of the 31 pipelines within the SAC it is calculated that there are 44 pipeline ends within the SAC that may be cut and left, with potential for rock deposited on the ends to reduce the risk of snagging by fishing vessels. Of the 44 pipeline ends located within the SAC, eight have already been cut and abandoned at the decommissioned Gordon, Esmond and Forbes fields, leaving 36 still to be cut and buried at the time of decommissioning.

7.12 The base case is that rock will be placed at the ends of all pipelines that are cut and left *in situ*. This may not always be the case as pipelines from Schooner to Murdoch may be buried by existing mattresses and those from Ketch to Murdoch may be totally trenched and buried and therefore not require additional material (Faroe Petroleum 2018a, b); this therefore represents a worst-case scenario. It is estimated that approximately between 25 and 85 tonnes of rock may be placed at the end of each cut pipeline (ConocoPhillips 2018, Perenco 2018). The area of seabed that may be impacted by the burial of pipeline ends will vary but based on previous areas of impact for similar activities it is estimated that 18 m^2 of seabed may be impacted at each cut pipeline end (ConocoPhillips 2015). Based on this estimate it is predicted that 648 m^2 (0.0006 km^2) of seabed could be impacted by rock dump required to protect the cut pipeline ends.

Physical Impact to Habitat

7.13 The physical impacts to habitat arise predominantly from disturbance to the seabed from a number of different activities associated with decommissioning. Unlike the physical loss of habitat where the impacts are considered to be permanent, the physical impacts are recognised to be temporary impacts with potential for the seabed to recover once the cause of the impact is removed. The following sections estimate the potential physical impacts within the SAC from decommissioning activities.

Physical impact of habitat due to temporary location of heavy lift vessel

7.14 The installations within the SAC may be removed using a heavy lift vessel (HLV) as either a single lift or in two pieces, with the topsides removed followed by the jackets. Heavy lift vessels may be anchored in place with typically eight anchors during the removal of each platform and, in the event that the jackets and topsides are removed separately, the anchors may be required to be moved twice during each removal operation.

7.15 The area of seabed estimated to be impacted by an anchor has been variously reported as being 5.8 m^2, 24 m^2 and 40 m^2 (Perenco 2018, ConocoPhillips 2018, GDF Suez 2009, INEOS 2018). Studies undertaken within the SAC have shown that the use of an AC-14 anchor, a type typically used by an HLV, can cause an anchor mound with a diameter of approximately 5.3 m, in medium to dense sandy sediments (BMT Cordah Ltd (2006) in Wintershall 2010). Therefore, for the purposes of this assessment, the area of seabed impacted by each anchor is based on the evidence from the survey undertaken and is predicted to be approximately 17 m^2. Based on this estimate the total area of seabed impacted by up to eight anchors is 136 m^2.

7.16 The length of chain estimated to impact on the seabed is reported to be between 400 m and 975 m, with a chain width of 0.076 m (Perenco 2018, ConocoPhillips 2018). Therefore, for the purposes of this assessment the estimated area of impact from each anchor chain is predicted to be approximately 74 m^2 (975 m x 0.076 m). The total area of seabed impacted by up to eight anchor chains is estimated to be 593 m^2.

7.17 The combined area of seabed estimated to be impacted by up to eight anchors and their associated chains is predicted to be 729 m^2 at each location an HLV is positioned.

7.18 All but one of the installations presented in Table 7 for which information is available predicts the use of an HLV during decommissioning. The exception being at the Tyne platform (Perenco 2018). Therefore, there is potential for the use of an HLV at 12 installations within the SAC. Consequently, up to 8,748 m^2 (0.008 km^2) of seabed could be disturbed during decommissioning activities within the SAC due the use of anchors and chains deployed by an HLV.

7.19 In the event that there is a requirement for two movements by an HLV when removing the jacket and topsides the total area of seabed impacted from decommissioning activities is doubled to 17,496 m^2 (0.017 km^2) (Table 15).

Table 15: Estimated area of impact in the Dogger Bank from HLV anchors and associated chains.

Impact	Area of impact (m^2)
Area of each anchor (m^2)	17
Area of eight anchors (m^2)	136
Area of each chain (m^2)	74
Area of eight chains (m^2)	593
Estimated area of impact for each HLV (m^2)	729
Total area for 12 installations (single lift) (m^2)	8,748
Total area for 12 installations (two lifts) (m^2)	17,496

7.20 A study commissioned by ConocoPhillips aimed to assess the longevity of anchor mounds along the Munro to Hawksley pipeline, within the SAC. Ten anchor locations were examined one month after the anchors had been removed and, although there was evidence that the sediments had been disturbed, there was no evidence of any anchor mounds or chain disturbance, indicating that any impacts from anchors or chains within the SAC are likely to be temporary (ConocoPhillips 2006).

7.21 The potential impact on the seabed from anchors and chains will cause a temporary impact over a relatively small area of 0.017 km^2, equivalent to 0.0001% of the SAC.

Physical impacts to the seabed from temporary deployment of spud cans

7.22 Spud cans are the footings upon which a jack-up rig or accommodation work vessel is supported. The area of impact from spud cans varies depending on the size of the vessel. Reported sizes of the spud can footprint varies depending on the jack-up to be used, typically they range in diameter from between 12 m and 14 m, although the largest can have a diameter of up to 20 m (Ensco 2018a). The four legged Seafox 1 jack has a spud can footprint of 22 m^2 and the three legged Ensco 92 has a spud can footprint of 196.3 m^2 (Seafox 2018, ConocoPhillips 2018, Ensco 2018b), both of which have been used in the Southern North Sea. Based on a typical three legged drill rig with an impacted area of 196.3 m^2 for each spud can, the total area of seabed impacted by the deployment of drill rig spud cans is 589 m^2. Assuming that each accommodation work vessel has four legs the area of impact from spud cans will be 785 m^2. However, the area of spud cans varies and this is based on a spud can size used for a three legged vessel, which may be larger than those for four legged vessel.

7.23 Jack-up accommodation work vessels may be used for well abandonment operations and, if required, for additional accommodation. Assuming the worst-case scenario that both a drill rig and accommodation work vessel is required at each of the 13 installations located within the SAC, a total area of seabed predicted to be physically impacted by the presence of spud cans is 17,862 m^2 (0.018 km^2.). This total estimated area of impact will occur over a number of years as decommissioning takes place and the seabed is predicted to recover following the removal of spud cans.

Physical impacts to the seabed from the cutting of piles

7.24 The removal of the piles associated with jackets and subsea infrastructure will require the cutting of the piles approximately 3 – 4 m below the seabed (ConocoPhillips 2018, INEOS 2019). The number of piles at each platform varies but overall a total of 53 piles will need to be cut below the seabed in order to remove the 13 surface platforms (Table 7). In addition to the surface infrastructure subsea manifolds and other subsea infrastructure are frequently piled, usually with four piles. For the purposes of this assessment it is assumed that all subsea infrastructure presented in Table 8 has four piles. Consequently, an additional 64 piles may be removed during the decommissioning of subsea infrastructure. Although the piles are significantly smaller than those used to support surface infrastructure the area of seabed estimated to be impacted is considered the same as that arising from the removal of larger surface infrastructure piles. This provides a worst-case scenario for the removal of 117 piles.

7.25 The process may require excavation of the seabed around each of the piles and this will cause a physical impact to the seabed. If required, it is estimated that an excavation of between 6 m and 14 m diameter may be required around each pile (ConocoPhillips 2018, INEOS 2019). Based on the larger area of estimated impact an area of seabed 154 m^2 may be disturbed at each pile location.

7.26 The total area of seabed estimated to be impacted by the removal of 117 piles within the SAC is 18,018 m^2 (0.018 km^2); this is equivalent to 0.0001% of the SAC. As has been suggested by surveys looking at the longevity of anchor mounds, impacts on the seabed from the removal of piles will be temporary with excavated areas being filled relatively quickly following cessation of activities.

Physical impacts from removal of subsea manifolds and other items of subsea equipment

7.27 There are nineteen known items of subsea equipment placed on the seabed that may be subject to future decommissioning plans (Table 8). The exact size of all the items on the seabed is unknown but based on sizes that are known it is estimated that 1,389.6 m^2 of seabed is currently impacted by subsea manifolds and other items of equipment. The removal of relatively small items of equipment is predicted to be undertaken by lifting using vessels that do not require to be anchored on the seabed or jack-ups. However, as a worst-case scenario this assessment assumes that any vessel used to remove equipment from the seabed will use up to eight anchors and impact an area of seabed similar to that from a HLV (see Table 15). On this highly precautionary assumption it is estimated that 729 m^2 of seabed will be impacted at each of the 19 locations, impacting a total area of 13,851 m^2 (0.01 km^2).

Physical impacts from excavation and cutting pipeline ends

7.28 The removal of the pipeline ends and spool pieces will require areas of seabed to be cleared in order to access the equipment. Where sediments are soft, this is typically undertaken using jetting equipment (although mechanical trenching equipment may be used) and the removal of the pipeline ends and the tie in spools that connect pipelines to the platforms will cause disturbance to the seabed. The length of pipeline ends and spools to be removed will differ at each location. The reported length of pipelines to be removed range from between 28 m and 60 m (e.g. Perenco 2018, Faroe Petroleum

2018a, INEOS 2018). For the purposes of this assessment it is assumed that up to 100 m of pipeline end and spool piece will be removed from each pipeline within the SAC and a corridor of approximately 10 m wide will be impacted. This is a greater length of pipeline than predicted and therefore a precautionary worst-case scenario for the extent of physical impacts to the habitat from pipeline removal.

7.29 There are a total of 36 pipeline ends (including umbilicals that aren't known to be piggy-backed on to existing lines) located within the SAC that may be decommissioned. If a hundred metres of each line is removed at each of the 36 pipeline ends and the impacts to the seabed occur along a 10 m corridor then an area of 1,000 m^2 of seabed may be impacted at each pipeline end. Consequently, it is estimated that a total area of 36,000 m^2 (0.004 km^2) of seabed could be temporarily disturbed by the removal of the end of pipelines within the SAC.

Physical impacts from removal of well conductors

7.30 A total of 38 well conductors will be removed during decommissioning activities within the SAC. It is estimated that the removal of each conductor will impact on approximately 3.14 m^2 of seabed (ConocoPhillips 2018). Consequently, approximately 119.3 m^2 (0.0001 km^2) of seabed may be disturbed by the removal of the conductors.

Physical impacts from over-trawl surveys

7.31 Over-trawl surveys will be undertaken following completion of the decommissioning operations, to identify any snagging risks and, in some cases, to recover debris.

7.32 Over-trawl surveys will be undertaken within a 500 m radius of each installation. The total area of impacted seabed within a 500 m radius of the thirteen installations to be removed is approximately 0.78 km^2.

7.33 The total length of pipelines that may be subject to future over-trawl surveys is 373.2 km [2] (Table 16). The reported width of the corridor across which the over-trawl survey may be undertaken varies from 50 m to 200 m (Faroe Petroleum 2018a, ConocoPhillips 2018, INEOS 2019). Based on the maximum reported corridor width of 200 m, it is estimated that 75.2 km^2 of seabed may be impacted by over-trawl surveys over the course of decommissioning activities within the SAC.

7.34 A combined total area of 76.0 km^2 of seabed is estimated to be disturbed during over-trawl surveys; this is equivalent to 0.62% of SAC.

[2] Note the total length of pipeline subject to future over-trawl surveys (373.2 km) is lower than the total length of line within the SAC (457.7 km) as some pipelines that are present have already been decommissioned and therefore have already been subject to an over-trawl survey, which is not predicted to be repeated.

7.35 The exact nature of surveys will be determined on a case-by-case basis, taking account of environmental sensitivities and any comments received from the fishermen's representative bodies. This is a worst-case scenario as it is likely that no over-trawl surveys are required to be undertaken along buried pipelines except where decommissioning is carried out on pipelines away from pipeline ends, which is not expected to occur regularly.

Table 16: Pipelines and umbilicals within the SAC across which future over-trawl surveys may be undertaken during decommissioning.

Pipeline No.	Pipeline	Distance (km)
PL929 & 930	Theddlethorpe to Murdoch MD	2.77
PL935 & 936	Murdoch MD to Caister CM gas line	4.54
PL1220/PL1221	Tyne to Trent	41.86
PL1222 & 1223	Schooner to Murdoch Gas line	2.73
PL1436 & 1437	Murdoch MD to Boulton BM gas line	3.95
PL1570	Shearwater to Bacton (Seal)	76.72
PL1612 & 1613	Ketch to Murdoch gas line	2.73
PL1922 & 1925	Hawksley EM to Murdoch MD gas line	11.76
PL1923 & 1926	Murdoch K KM to Murdoch MD gas line	4.81
PL1924 & 1927	Boulton H HM to Murdoch MD gas line	1.63
PL2109 & 2110	Munro MH to Hawksley EM	4.94
PL2137/3005	Hunter Export to Murdoch K	7.40
PL2284 & 2285	Cavendish Export Pipeline	47.17
PL2430 & 2431	Kelvin to Murdoch MD gas line	12.43
PL2528	Rita to Hunter Export	14.09
PL2850 & 2851	Wingate to D15-A Pipeline	7.09
PL2894 & 2895	Katy to Kelvin gas line	14.07
PL3086	Cygnus A to Cygnus B gas Pipeline	7.28
PL3088	Cygnus to ETS gas Pipeline	40.15
PLU2138	Hunter Umbilical	7.40
PLU2431	3 in. Kelvin Methanol	12.42
PLU2529	Hunter to Rita Umbilical	14.09
PLU3087	Cygnus A to Cygnus B Umbilical	7.80
UM5	Watt QM to Murdoch MD Umbilical	1.63
UM6	Hawksley EM to McAdam MM Umbilical	11.76
UM7	McAdam MM to Murdoch MD Umbilical	5.20
UM8	Murdoch KM to Murdoch MD Umbilical	4.81
	Total	373.2

Physical impacts from disturbance of cuttings piles

7.36 Cuttings piles can occur in areas where drilling activity is undertaken. They arise from the discharge of the drill cuttings onto the seabed at the drilling location and can be contaminated with hydrocarbons, drilling fluids and other drilling chemicals. Following OSPAR decision 2000/3 drill cuttings contaminated with oil based drilling chemicals are required to be skipped and shipped for onshore disposal, discharge of reservoir hydrocarbons during drilling is also regulated by The Offshore Petroleum Activities (Oil Pollution Prevention and Control Regulations 2005 (as amended). During production the cuttings pile may remain largely undisturbed forming a stable pile at the drilling location. However, during decommissioning cuttings piles may be disturbed by the abandonment of the well and the removal of the infrastructure. Should this occur there is potential for contaminated cuttings to be dispersed into the water column and causing contamination across a wider area.

7.37 Monitoring undertaken at Cavendish, Hawksley, Munro, Murdoch and McAdam all recorded no evidence of any cuttings piles from drilling activities and therefore there is a very low risk of any cuttings piles occurring at other sites within the SAC (ERT 2009, INEOS 2019).

7.38 Evidence from monitoring seabed sediments at many locations within the SAC also indicates that there are relatively low levels of contamination within the seabed sediments. Concentrations of heavy and trace metals are largely below the apparent effect concentrations and for the majority of metals below background concentrations. The exception being cadmium which occurs more frequently above background levels but still below the apparent effect concentrations (Table 10).

7.39 Hydrocarbon concentrations are variable but still predominantly below the mean baseline thresholds (Table 11).

7.40 Consequently, although there may be some localised disturbance of contaminated seabed sediments, it is predicted that any disturbance of slightly elevated levels of contamination will be rapidly dispersed and diluted.

Potential impacts – Summary

7.41 Based on the above it is recognised that there is potential for impacts arising from future decommissioning activities to cause physical impact and loss of habitat to the qualifying features of the SAC.

7.42 The total estimated area of potential loss of habitat within the SAC is 0.078 km^2. This will be from potential contingency stabilisation material associated with rig and accommodation vessels of 0.077 km^2 and from burying cut pipeline ends of 0.0006 km^2.

However, this is considered highly precautionary as rig stabilisation is not required at all locations and therefore it is predicted that that the area of physical loss will be smaller.

7.43 The total area of physical impact arising from decommissioning activities is estimated to be 76.07 km^2. However, 76.0 km^2 is estimated to arise from over-trawl surveys and the remaining 0.07 km^2 from all other activities (Table 17).

Table 17: Estimated area of seabed impact arising from the proposed decommissioning activities in the SAC.

Impact	Activity	Total area of seabed impacted (km^2)
Physical loss of habitat	Rock for rig stabilisation	0.077
	Rock at cut pipeline ends	0.0006
Physical impact on seabed	Anchors and chains from HLV	0.017
	Impacts from drill rig spud cans	0.018
	Cutting of jacket piles	0.018
	Removal of subsea equipment	0.01
	Cutting and removal of pipelines	0.004
	Removal of well conductors	0.0001
	Over-trawl surveys	76.0
Total area of physical loss of habitat		0.078
Total area of physical impact on habitat		76.07

8 IN-COMBINATION IMPACTS

8.1 Under the Habitats Regulations there is a requirement for the competent authority to consider the in-combination effects of plans or projects on European Sites when undertaking an HRA. In-combination effects 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 development, is considered to be captured within the baseline. For some on-going activities, e.g. fishing, shipping 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 qualifying features of the sites. However, it is recognised that they may be having an effect on the qualifying features of the sites.

Fishing

8.4 Demersal fishing has the potential to cause physical damage to sandbank features within the SAC and may be having an on-going effect on the characteristic communities of the site and is capable of causing a significant effect on the qualifying features of the site (JNCC 2018b, d).

8.5 Fishing occurs widely across the Dogger Bank and has also been on-going for many hundreds of years. The predominant fishing activity within the SAC is beam and demersal trawling undertaken mainly by UK, Dutch and Danish registered vessels targeting demersal species such as plaice, megrim and sole (Brown & May Marine 2013).

8.6 The level of fishing across the Dogger Bank SAC varies with less than 30 hours per year occurring within each of the oil and gas licence blocks (Figure 6). Based on VMS data for UK registered vessels, in 2016 fishing occurred over 8,701 km^2 within the SAC. That is fishing occurred over 70.5% of the SAC, the vast majority of which was demersal fishing and therefore would impact on the seabed. This does not take into consideration non-UK vessels which may contribute a significant proportion of fishing within the site.

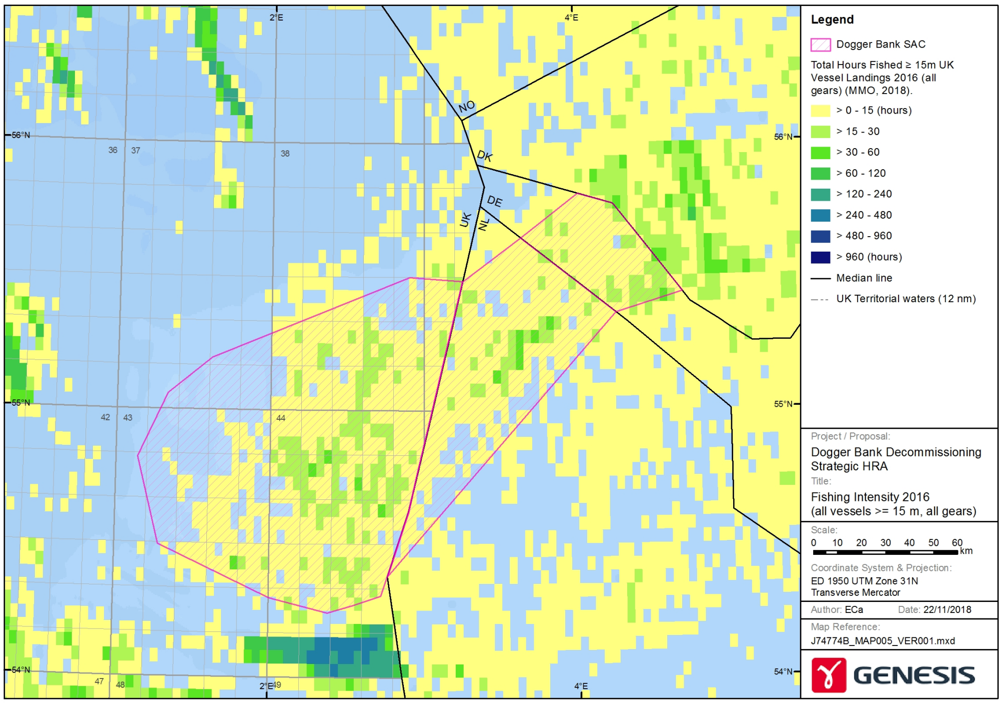

Figure 6: UK Fishing effort during 2016 within the Dogger Bank SAC.

Renewable energy

8.7 There are four consented offshore wind farms located within the SAC: Creyke Beck A and B and Teesside A and B (Figure 7).

8.8 The Dogger Bank Creyke Beck A and B offshore wind farms were consented on 17 February 2015 but have not yet started construction (Infrastructure Planning 2015a).

8.9 The Creyke Beck A offshore wind farm covers an area of 515 km^2. The consented development comprises up to 200 wind turbines, four offshore HVAC collector platforms, one HVDC offshore converter platform and two accommodation platforms. Up to five meteorological masts may be installed (Infrastructure Planning 2015a, Forewind 2013).

8.10 The Creyke Beck B offshore wind farm covers an area of 599 km^2. The consented development comprises up to 200 wind turbines, four offshore HVAC collector platforms, one HVDC offshore converter platform and two accommodation platforms. Up to five meteorological masts may also be installed.

8.11 The offshore construction start dates for any of the developments are not currently known.

8.12 The Dogger Bank Teesside A and B offshore wind farms were consented on 4 August 2015 but have not yet started construction (Infrastructure Planning 2015b).

8.13 The Teesside A offshore wind farm covers an area of 560 km^2 and the Teesside B offshore wind farm covers an area of 593 km^2. Both developments comprise up to 200 wind turbines, four offshore HVAC collector platforms, one HVDC offshore converter platform and two accommodation platforms. Up to five meteorological masts may be installed (Infrastructure Planning 2015b, Forewind 2014).

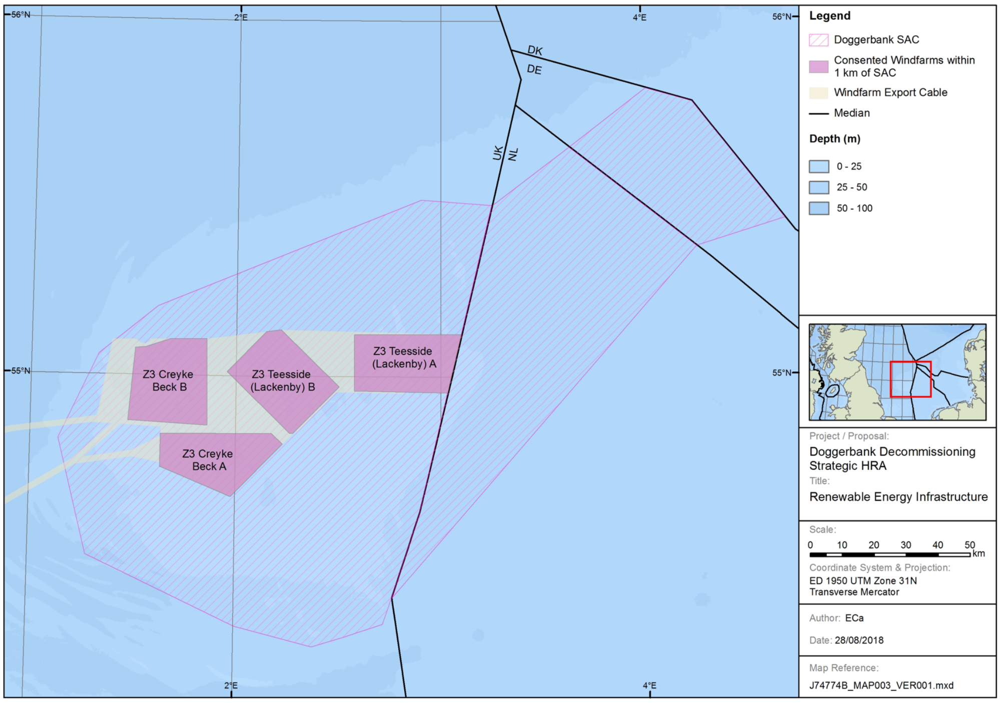

Figure 7: Consented offshore wind farms within the Dogger Bank SAC.

Should all four consented wind farms be constructed an estimated 2.5 km^2 of seabed may be physically lost by the presence of turbines and a further 0.5 km^2 due to associated infrastructure (Table 18 and

8.14 Table 19). The area of the Dogger Bank SAC is 12,331 km^2 and the potential loss of 3.0 km^2 of habitat is 0.02% of the site. The habitats within wind farm areas are predominantly subtidal sands and gravels and are widespread habitats across the SAC (Forewind 2013, 2014).

Table 18: Potential area of seabed physically lost by the physical presence of wind farm turbines in the Dogger Bank SAC (Source Forewind 2013, 2014).

Wind farm	Turbine		
	Turbine Number and size (MW)	Footprint per turbine (m^2)	Total footprint area (km^2)
Creyke Beck A	120 x 10	4,739	0.568
Creyke Beck B	120 x 10	4,739	0.568
Teesside A	120 x 10	5,675	0.681
Teesside B	120 x 10	5,675	0.681
Total	480	20,828	2.498

Note. This is based on the largest monopiled foundations that have the largest footprint and therefore greatest area of impact. Consequently, to not exceed the maximum capacity of the wind farm the number of turbines may be less than the maximum number consented.

Table 19: Potential area of seabed lost by the physical presence of wind farm infrastructure in the Dogger Bank SAC (Source Forewind 2013, 2014).

Wind farm	Infrastructure	Number	Area per platform including scour (m^2)	Total area (km^2)
Creyke Beck A	HVAC collector	4	14,367	0.057
	Accommodation	2	21,242	0.042
	HVDC converter	1	21,242	0.021
	Met masts	5	4,350	0.022
Creyke Beck B	HVAC collector	4	14,367	0.057
	Accommodation	2	21,242	0.042
	HVDC converter	1	21,242	0.021
	Met mast	5	4,350	0.022
Teesside B	HVAC collector	4	9,025	0.036
	Accommodation	2	17,400	0.035
	HVDC converter	1	17,400	0.017
	Met mast	5	4,657	0.023
Teesside B	HVAC collector	4	9,025	0.036
	Accommodation	2	17,400	0.035
	HVDC converter	1	17,400	0.017
	Met mast	5	4,657	0.023
	Total	48	219,366	0.506

8.15 There is potential for temporary seabed disturbance caused by trenching and laying of cables within the wind farm area and the along the export cable route.

8.16 For each of the four wind farms located within the SAC a total of 950 km of HVAC inter array cabling will connect the wind turbines to the offshore collector platforms and a further 320 km of HVAC inter-platform cables will connect the collector platforms to the converter platform (Forewind 2013, 2014).

8.17 The export cables will be laid in two trenches from each of the wind farms to shore. The total length of cable corridor for Creyke Beck A within the SAC is 30.4 km and for Creyke Beck B the cable corridor within the SAC is 26 km. As there will be two trenches for the export cables the combined total of export cable trench within the SAC for both Creyke Beck A and B is 112.8 km[3]. Similarly, for Teesside A and B the combined total of export cable is 336.6 km[4] (Table 20).

8.18 On the basis that the trenching and burying of both export and inter-array cables will impact on a 10 m wide corridor it is estimated that a combined total area of 55.3 km^2 of seabed may be disturbed by trenching (Table 20). The impacts from cable trenching are recognised to be temporary as the seabed will overtime recover and there will be no loss of habitat.

8.19 Cable protection, typically using rock, gravel or concrete mattresses, may be required along a total of 2.89 km^2 of seabed at Creyke Beck A and 2.77 km^2 at Creyke Beck B [5]. Additional cable protection will be required at cable crossings. It is estimated that the total footprint of cable crossings will be 0.04 km^2 at Creyke Beck A and none at Creyke Beck B (Forewind 2013).

8.20 Cable protection may be required along a total of 4.7 km^2 of seabed at Teesside A and 4.6 km^2 at Teesside B [6]. Additional cable protection will be required at cable crossings. It is estimated that the total footprint of cable crossings will be 0.245 km^2 at both Teesside A and B (Forewind 2014).

8.21 The total area predicted to be impacted by rock dump required for cable protection, including cable crossings, is estimated to be 15.0 km^2 (Table 20).

[3] Creyke Beck A 2 x 30.4 km + Creyke Beck B 2 x 26.0 = 112.8.
[4] Teesside A 2 x 62.7 + Teesside B 2 x 105.6 = 336.6.
[5] Note this includes protection along export cable route that may be outwith the SAC.
[6] Note this incudes cable protection along export cable route that may be outwith the SAC.

Table 20: Estimated area of seabed impacted within the SAC from cable laying activities associated with consented offshore wind farms.

Wind farm	Export cable			Inter array / platform cables		
	Length (km)	No. of cable trenches	Area of seabed impacted (km^2)	Length (km)	Area of seabed impacted (km^2)	Cable Protection (km^2)
Creyke Beck A	30.4	2	0.61	1,270	12.7	2.9
Creyke Beck B	26.0	2	0.52	1,270	12.7	2.8
Teesside A	62.7	2	1.25	1,270	12.7	4.7
Teesside B	105.6	2	2.1	1,270	12.7	4.6
Total	224.7	8	4.48	5,080	50.8	15.0

8.22 In total an estimated 0.4% of the seabed within the SAC may be physically disturbed and 0.12% may be physically lost by cable protection across the SAC.

Aggregate extraction and dredging activity

8.23 Aggregate extraction areas 466/1, 485/1 and 485/2 lie within the boundary of the SAC. Applications were made to extract aggregates from these licensed areas in 2013. No further information has been found on these sites and it is thought that no aggregate extraction activities are currently taking place within the SAC.

8.24 It is recognised that dredging within the SAC would cause significant disturbance to the subtidal sandbank communities but as the sediment is left *in situ*, no long-term loss of substrate will occur which would allow re-colonisation once extraction activities have ceased (Forewind 2013).

Existing oil and gas activity

8.25 Since the original wells were drilled in 1964 there has been existing oil and gas industry activity within the SAC. This historical activity may have caused permanent loss of habitat within the site and temporary impacts to the seabed.

Physical loss of habitat due to existing subsea infrastructure.

8.26 Within the SAC there is subsea equipment on the seabed (Figure 3). The majority of the items may be subject to future decommissioning programmes and their impact has been addressed in Paragraph 7.27 and Table 8.

Physical loss of habitat due to existing presence of rock dump used for rig stabilisation

8.27 Since 1964 a total of 171 wells (including 40 side-tracks) have been drilled in the Dogger Bank SAC (Figure 8) (Appendix A). Of the 171 wells drilled, 38 are currently in operation and their potential impacts on the SAC are addressed in Section 7. A total of 122 wells, including 23 side-tracks, have been plugged and abandoned and therefore no further activity will occur at these locations. Eleven wells have been suspended and may require additional rig activity when they are plugged and abandoned.

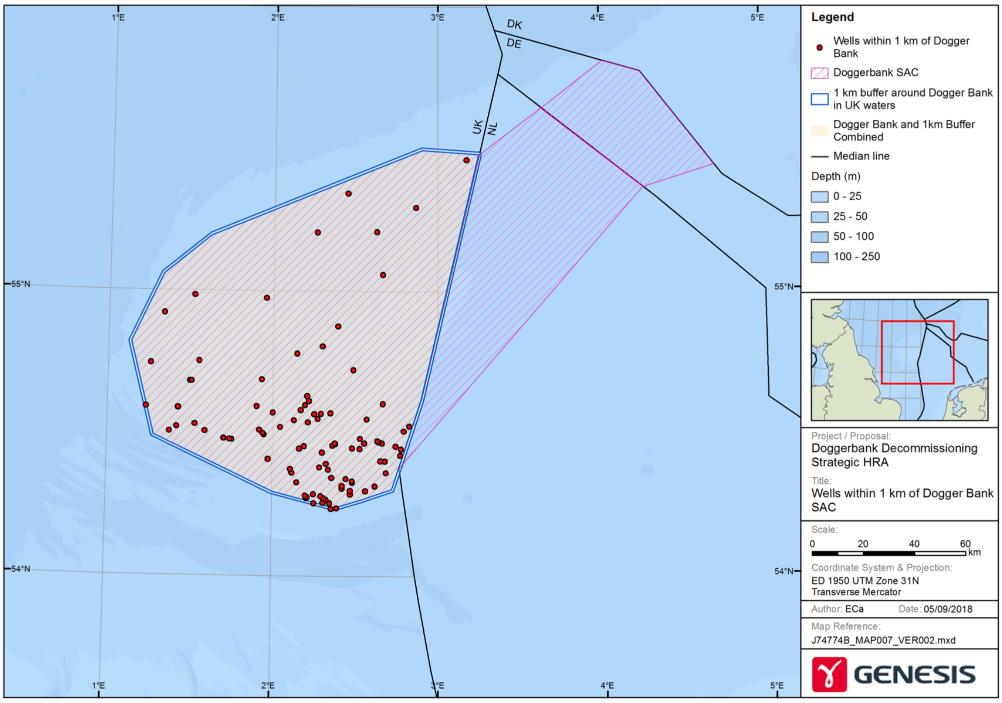

Figure 8: All wells drilled within the Dogger Bank SAC since 1964.

8.28 There may be historical impacts on the site if rock was required for rig stabilisation. The volume of rock required historically for rig stabilisation at existing wells within the SAC is unknown. A worst-case scenario occurs if rock has been required for rig stabilisation at all 108 historical well abandonment operations (including well suspensions). In the event that rock has been required at all well locations an estimated 0.52 km^2 of seabed may have been impacted by rock placement from well abandonment activities (Table 21).

Table 21: Estimated worst-case area of rock placement for rig stabilisation for existing well abandonment operations.

Activity	Number	Area of seabed impacted (km^2) [2]
Plugged and Abandoned wells	99 [1]	0.47
Suspended wells	11	0.05
Total	110	0.52

1 – The total of 97 well abandonment operations is the total number of plugged and abandoned wells minus their side-tracks i.e. 122 – 23. As the abandonment of side tracks is undertaken at the same time as the abandonment of the main well and does cause any additional impact.

2 – The area of seabed impacted is based on an estimated area of rock dump of 4,800 m^2 at each rig location (See Section 7.8).

8.29 This worst-case scenario is unrealistic as it is known that rig stabilisation is not always required when jack-up rigs are used for well abandonment operations within the SAC.

Physical loss of habitat due to existing presence of pipelines and associated rock dumping

8.30 Existing infrastructure within the SAC may be left *in situ* following the decommissioning of fields. This includes existing pipelines and umbilicals and associated rock dump previously placed on the seabed for pipeline burial or at existing assets to reduce the risk of scour. It may not be technically possible to remove pipelines and rock and therefore their impact on the seabed is likely to be effectively permanent. However, it is recognised that many of the pipelines are trenched and buried and therefore not predicted to have an impact on the structure or function of the Dogger Bank sandbank. Existing rock can become buried overtime, although unlike in more mobile sand bank habitats this process may be less frequent. For the purposes of this assessment, it is assumed that all known existing rock placed within the SAC remains exposed on the seabed and therefore potentially impacting upon the habitat.

8.31 The total length of existing pipelines and piggy-backed umbilicals within the SAC is approximately 457.7 km (Table 9), all of which, with the exception of the 34” Shearwater to Bacton export line, are reported to be buried. Therefore, a total of 76.72 km of pipeline is known to be on the seabed within the SAC. Assuming, as a worst-case scenario, that the physical presence of a surface laid pipeline has a physical effect on the seabed within 5 m either side of the line, an estimated 0.77 km^2 of the seabed could be impacted by the physical presence of existing pipelines.

8.32 Rock has been placed along existing pipelines to ensure their burial and reduce the risk of hazardous free spans that could endanger fishing and cause damage to pipelines. The reported extent of existing rock along pipelines that occur within the SAC is presented in Table 22. These figures are for the entirety of the pipeline and not just that which occurs within the SAC.

8.33 A total 24 km of pipeline out of a total of 371 km of pipeline is known to have rock protection along it. Therefore, on average, 66 m of rock is placed along every 1 km of pipeline to reduce the risk of free spans occurring, i.e. 6.5% of the length of pipelines has required rock to be placed on it. In the absence of any additional data from existing pipelines within the SAC an estimate of the extent of existing rock within the SAC as a whole is based on the average extent of rock placed along known pipelines that are, at least, partially within the SAC. On this basis it is estimated that within the SAC a total length of 30.2 km of rock has been placed along the existing pipelines within the SAC[7].

8.34 Assuming that the rock placed along pipelines impacts 5 m either side of the pipeline then an estimated 0.3 km^2 of seabed could be impacted by existing rock along pipelines within the SAC; this is equivalent to 0.003% of the SAC.

[7] This is based on there being 457.7 km of pipeline and umbilical within the SAC and 6.6% of it is protected by rock deposits.

Table 22: Existing pipelines within or partially within the SAC that have reported rock-dump along them.

Pipeline	Pipeline	Length of total line (km) [1]	Reported length of existing rock (m) [2]
PL0935	Caister CM to Murdoch MD 16" Gas Line	11.0	459
PL0936	Murdoch MD to Caister CM 3" MeOH Line		
PL1220	Tyne to Trent	56	34
PL1436	Boulton BM to Murdoch MD 10" Gas Line	11.5	727
PL1437	Murdoch MD to Boulton BM3" MeOH Line		
PL1922	Hawksley EM to Murdoch MD 12" Gas Line	21.7	6,371
PL1925	Murdoch MD to Hawksley EM 3" MeOH Line		
PL1923	Murdoch K KM to Murdoch MD 10" Gas Line	5.4	686
PL1926	Murdoch MD to Murdoch K KM 3" MeOH Line		
PL1924	Boulton HM to Murdoch MD 10" Gas Line	16.9	7,262
PL1927	Murdoch MD to Boulton HM 3" MeOH Line		
PL2109	Munro MH to Hawksley EM 10" Gas Line	5.0	18
PL2110	Hawksley EM to Munro MH3" MeOH Line		
PL2430	Kelvin TM to Murdoch MD 12" Gas Line	12.5	657
PL2431	Murdoch MD to Kelvin TM 3" MeOH Line		
PL2894	Katy KT to PL2430 Tee 12" Gas Line	14.0	439
PL2895	PL2431 Tee to Katy KT 3" MeOH Line		
UM5	Murdoch MA to Watt QM Umbilical	8.5	2,293
UM6	McAdam MM to Hawksley EM Umbilical	12.9	3,699
UM7	Murdoch MA to McAdam MM Umbilical	9.0	422
UM8	Murdoch MA to Murdoch K KM Umbilical	5.7	460
PL0929	Murdoch MD to TGT 26" Gas Line	180.9	518
PL0930	TGT to Murdoch MD 4" MeOH Line		
	Total	371	24,045

1 = This is the total length of each pipeline and not just that which is within the SAC.

2 = This is the total length of existing rock along the entire pipeline and not just within the SAC.

8.35 It is not possible to predict any remedial works that may be necessary to deal with future free-spans. Where pipelines are left *in situ* free-spans can develop as a result of natural sediment relocation. Although, their number, location and extent cannot be predicted, surveys along existing lines indicate that the majority of the lines remain buried. For example, a pipeline survey undertaken in 2017 along 56 km of the Trent to Tyne pipeline confirmed that the pipeline was buried and reported no free-spans (Perenco 2018). Monitoring will be required to be carried out along all pipelines that are abandoned and left *in situ* to determine the future status of the lines, including the development of potentially hazardous free-spans. If rock placement is required in order to remediate free-spans, assessments in accordance with the Habitat Regulations will be undertaken at the time.

Physical loss of habitat due to existing presence of mattresses and grout bags.

8.36 Mattresses and grout bags are used to ensure areas of pipelines and other subsea equipment are protected and to reduce the risk of snagging by fishing gear. No new mattresses or grout bags are planned to be placed on the seabed and it is proposed to leave those present *in situ* with minimal disturbance. Therefore, there will be no additional impacts arising from the decommissioning activities.

8.37 The number of existing mattresses along the decommissioned Esmond pipelines and the Hunter development are unknown. However, it is known that there is at least 21,714 m^2 (0.02 km^2) of existing mattresses along existing pipelines that occur, at least partially, within the SAC (Table 23).

Table 23: Known quantity and estimated area of mattresses along existing pipelines.

Pipeline No.	Pipeline	No. of mattresses [1]	Area of mattresses (m) [2]
PL0929 / 0930	Murdoch MD to TGT and MeOH	28	504
PL0935 / 0936	Caister CM to Murdoch MD and MeOH	25	450
PL1220	20" gas export line from Tyne to Trent	55	1,032
PL1222 / 1223	Schooner to Murdoch and MeOH	21	384
PL1436 / 1437	Boulton BM to Murdoch MD and MeOH	37	1,666
PL1612 / 1613	Ketch to Murdoch and MeOH	73	1,830
PL1922 / 1923	Hawksley EM to Murdoch MD and MeOH	99	782
PL1924 / 1927	Boulton HM to Murdoch MD and MEOH	112	2,016
PL1926	Murdoch MD to Murdoch K and MeOH	51	918
PL2109 / 2010	Munro MH to Hawksley EM and MeOH	50	900
PL2430 / 2431	Kelvin TM to Murdoch MD and MeOH	65	1,170
PL2284 / 2285	Cavendish Gas Export and MeOH	40	720
PL2850	Wingate to D15-A Pipeline	30	540
PL2894 / 2895	Katy KT to PL2430 and MeOH	37	666
PL 3886 / 3888	Cygnus A to Cygnus B and Cygnus to ETS gas pipelines	260	4,680
UM5	Murdoch MA to Watt QM Umbilical	48	864
UM6	McAdam MM to Hawksley EM Umbilical	25	450
UM7	Murdoch MA to McAdam MM Umbilical	71	1,278
UM8	Murdoch MA to Murdoch K KM Umbilical	48	864
	Total	1175	21,714

Sources: INEOS 2018, ConocoPhillips 2018, Perenco 2018, Faroe Petroleum 2018a, Wintershall 2010, GDF Suez 2011.

Note – the number of mattresses recorded is for the entire length of the pipelines and therefore mattresses may be outwith the SAC and the impact within the SAC will therefore be lower.

Future oil and gas developments

8.38 There is one application for a new field development within the SAC. The Pegasus development comprises a single well tied back to the existing Cygnus field via a 56.8 km buried pipeline (Spirit Energy 2018). The estimated area of physical loss of habitat within the SAC from the planned development is 0.06 km^2 and the area of physical disturbance is 1.18 km^2 (Spirit Energy 2018).

Existing subsea cables within the Dogger Bank SAC

8.39 There are five subsea telecommunication cables passing through the Dogger Bank SAC. The combined total length of telecommunications cable within the SAC is 373.9 km, of which 198.6 km of cable is active and 175.3 km is disused. Assuming a maximum cable diameter of 50 mm the total area permanently impacted by existing cables is 0.018 km^2.

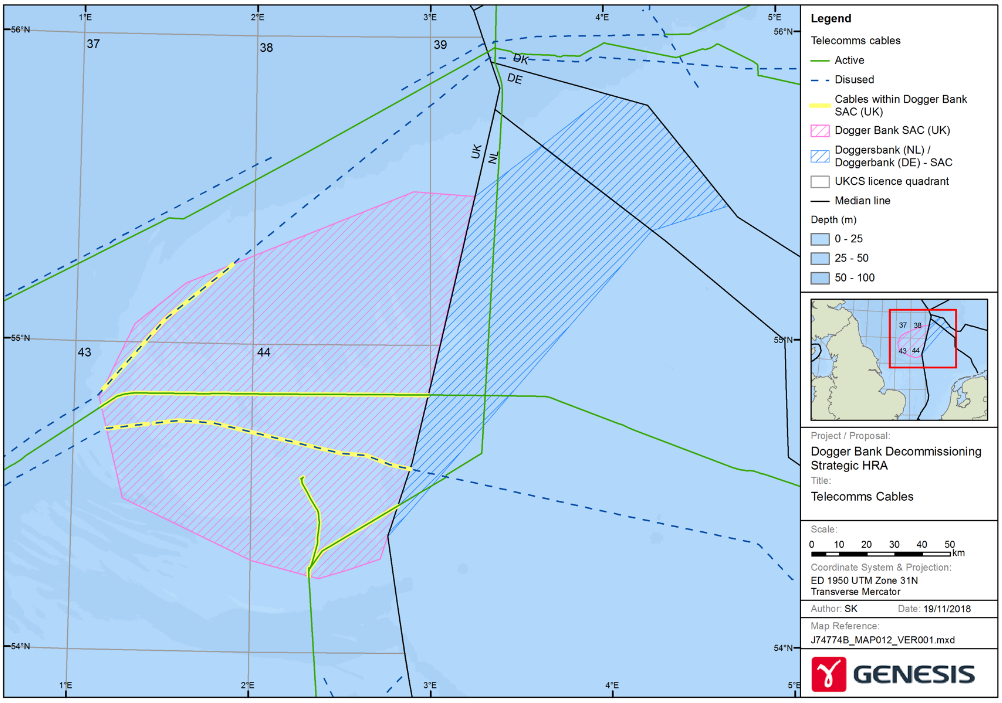

Figure 9: Telecommunication cables within the Dogger Bank SAC

In-combination potential impacts – Summary

8.40 Based on the above it is recognised that there is potential for in-combination impacts to occur from proposed activities within the SAC that could cause physical impacts and loss of habitat to the qualifying features of the SAC.

8.41 The total area of physical loss of habitat arising from existing or planned activities within the SAC is estimated to be 19.7 km^2, a total of 0.16% of the SAC (Table 24).

8.42 The total area of temporary seabed disturbance within the SAC is largely unknown owing to uncertainties over the extent demersal fishing occurs within the site. However, it is estimated that between 56.5 km^2 and 8,757 km^2 of seabed could be impacted each year, which is between 0.46% and 70.0% of the SAC (Table 25).

Table 24: Estimated area of seabed physically lost from in-combination impacts.

Activity	Total area of seabed impacted (km^2)
Renewables – Wind turbines and Infrastructure	3.0
Renewables – Cable protection	15.0
Existing oil and gas pipelines	0.77
Existing rock dump for rig stabilisation	0.52
Existing rock dump along pipelines	0.33
Existing Mattresses	0.02
Future Infrastructure (Pegasus)	0.06
Aggregate Extraction	0 [1]
Subsea cables	0.02
Total area of physical loss (km^2)	19.7
Proportion of SAC impacted	0.16%

1 - note that it is recognised that there are existing aggregate extraction sites located within the SAC. However, it is thought that they are currently inactive and therefore not contributing to the in-combination impacts.

Table 25: Estimated area of seabed within the SAC physically impacted.

Activity	Total area of seabed impacted (km^2)
Fishing	Unknown but occurred over 8,701 km^2 of the SAC in 2016.
Renewables – Cable laying	55.3
Future Infrastructure (Pegasus)	1.18
Aggregate Extraction	unknown
Total area of physical impact (km^2)	56.5 – 8,757
Proportion of SAC impacted	0.46% – 71.0%

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 decommissioning activities alone and in combination with other plans and projects on each of the interest features of the relevant European sites to determine whether there will be a likely significant effect.

Sandbanks

9.3 Results from the assessment of potential impacts presented in Section 7 indicates that there is a risk of physical impacts or loss of habitat occurring that could cause a likely significant effect on sandbank features arising from:

- Physical loss of habitat due to rig and accommodation vessel stabilisation and scour protection.
- Physical loss of habitat due to rock placement at cut pipeline ends.
- Physical impact of habitat due to chains and anchors from temporary location of heavy lift vessel.
- Physical impacts to the seabed from spud cans.
- Physical impacts to the seabed from the cutting of jacket piles.
- Physical impacts to the seabed from the removal of the T-piece, manifolds and other subsea structures.
- Physical impacts from excavation and cutting pipeline ends.
- Physical impacts from well conductor removal.
- Physical impacts from over-trawl surveys.
- In-combination impacts.

9.4 BEIS considers that the potential future decommissioning, when considered alone and in-combination may have a likely significant effect on the Dogger Bank SAC because:

a. Physical impacts may occur to sandbank habitats through the use of heavy lift and accommodation vessel(s) chains and anchors, drill rig spud cans and anchor, excavation and cutting of jacket piles and pipelines and the removal of well conductors, manifolds and other subsea structures as noted above.

b. Physical loss of habitat may occur due to the placement of rock for rig and accommodation vessel stabilisation and scour protection and the protection of the pipeline ends.

c. Physical loss of habitat from existing infrastructure that will remain *in situ*, e.g. surface pipelines.

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).

Dogger Bank SAC

Sandbanks which are slightly covered by seawater all the time: Physical loss of habitat.

10.2 The '*loss of large scale topography would constitute loss of the sandbank feature extent. Loss of characterising sandbank biological assemblages or sandbank sediments from an area of the feature would constitute loss of sandbank habitat and a reduction in overall feature extent'* (JNCC 2018d).

10.3 Sandbanks are highly mobile, so the presence of solid structures in this environment can create an artificial habitat, localised scouring and sediment deposits and consequently a physical loss of habitat. Removal of the sandbank features may result in some localised loss of its ecological communities. The structure and diversity of sandbank communities are determined by environmental characteristics such as sediment particle size distribution, seabed slope and water depth. Any change in these environmental parameters (e.g. by removing or smothering part of the feature) could result in a loss of habitat and a possible shift in community organisation.

10.4 Unlike the sandbank habitats located elsewhere in the Southern North Sea, the Dogger Bank sandbank is a relatively stable sandbank. Tidal currents are not strong enough to cause sediment transport and what sediment transport that does occur are largely retained on the sandbank feature (JNCC 2018d).

10.5 Physical loss of sandbank habitat will arise from the placement of rock used for stabilising rigs or accommodation vessels and burying the ends of the pipelines. It is recognised that there is potential for future remediation of free-spans along exposed pipelines, although, it is not possible to determine the extent that this may occur. However, based on historical levels of rock dump along the existing pipelines it is likely that future deposits will be relatively localised. This is based on information provided for fourteen pipelines that occur within the SAC (ConocoPhillips 2018). Along a total length of 323.6 km of pipeline the total area of rock required for the remediation of free spans covers an area of 310.5 m^2 (0.0003 km^2). Consequently, based on existing data from pipelines within or adjacent to the SAC the extent of rock required for remediation has been relatively very small. There is no reason why this level of remediation should increase in the future. Any future remediation requiring rock dumping or other deposits will require an assessment to be undertaken under the Habitats Regulations.

10.6 Rock required for the stabilisation of the drill rig and accommodation vessel required during the removal of installations and well abandonment, impacts 0.077 km^2 of seabed (Table 14).

10.7 Placement of rock to protect the cut ends of the pipelines is estimated to impact on an area of 0.0006 km^2 (Table 17).

10.8 This is recognised to be a realistic worst-case scenario as experience to date has been that rig stabilisation material is not required at all locations, with the Cygnus field requiring the most extensive rig stabilisation in order to avoid destabilisation of a drilling rig (ConocoPhillips 2018, GDFSuez 2009).

10.9 One reportable free-span is known to be present along pipelines within the SAC (ConocoPhillips 2018). The free-span is a 10 m length of line located along the Katy KT to Katy Tee (PL2894 and PL2895). The estimated area of seabed impacted by rock remediation at the free-span is 105.4 m^2 (0.0001 km^2)

10.10 The total area of habitat estimated to be lost due to the proposed placement of rock within the Dogger Bank SAC is 0.078 km^2 (Table 17). It is considered to be a worst-case and unlikely scenario as it includes potential rock placement for stabilising material to be used for both a rig and accommodation vessel at all locations. Stabilisation of the accommodation vessel or rig is a critical safety issue and therefore contingency rock placement is often requested for each rig location. However, previous experience has demonstrated that at the majority of rig locations there is minimal, if any, requirement for rock to be placed for rig stabilisation.

10.11 The total area of sandbank habitat within the Dogger Bank SAC is 12,331 km^2. Consequently, approximately, as a worst-case, 0.0006% of the qualifying sandbank habitat within the SAC may be impacted due to the proposed rock deposits. However, it is likely to be significantly less than this. The potential loss of 0.0006% of the sandbank habitat within the site does not constitute the loss of large scale topography that would affect the sandbank feature.

10.12 Rock placed onto a sandbank feature will change the habitat from a mobile sand feature to an immobile rock habitat. Overtime some of the rock may potentially bury or be partially buried by sand deposition. The extent that this occurs will depend on the local currents at each location. Evidence from post drilling surveys undertaken at the Cygnus field reported no evidence of rock previously placed for rig stabilisation and concluded that the rock had been most likely become buried (GDF Suez 2009). This evidence suggests that the placement of rock in soft sediment areas has little or no impact on sediment dispersion and deposition (Pidduck *et al*. 2017). Consequently, it is predicted that the placement of rock that is subsequently buried will not impact on the physical functioning of the sedimentary habitat types within the site. Furthermore, buried rock is predicted not to have an impact on the biological communities within the site that are typical for fine sand and muddy sand habitats (Pidduck *et al*. 2017). Therefore, buried rock is predicted to have little, if any, influence on the biological assemblages or sandbank sediments.

10.13 The removal of existing infrastructure will reduce the area of seabed permanently impacted. It is estimated that the decommissioning of existing infrastructure will remove a total of 6,539.5 m^2 of infrastructure (Table 7 and Table 8).

Conclusion

10.14 The potential impacts from future decommissioning activities associated with the oil and gas industry within the Dogger Bank SAC could cause a loss of habitat within the SAC. However, the extent of potential habitat loss is estimated to be relatively very small compared to the extent of habitat within the SAC and it is predicted that less than 0.0006% of the site may be impacted. Overtime it is predicted that a proportion of the rock placed on the seabed will be buried and not cause an ongoing long-term loss of habitat.

10.15 Based on the best available information BEIS is satisfied that potential future decommissioning activities relating to existing oil and gas infrastructure will not have an adverse effect upon the integrity of the Dogger Bank SAC.

Sandbanks which are slightly covered by seawater all the time: Physical disturbance

10.16 There is potential for physical disturbance to the seabed from future decommissioning activities.

10.17 It is estimated that a total area of disturbance could occur over an area of 76.07 km^2 during the period future decommissioning activities are undertaken (Table 17). A significant proportion of this potential seabed disturbance will arise from over-trawl surveys undertaken following decommissioning.

10.18 Sediment disturbance will occur during decommissioning. Seabed sediments in the Southern North Sea are subject to physical impacts from winter storms and strong tidal currents and are therefore in a dynamic environment where up to 30 cm of the surface sandy sediments occurring in less than 40 m of water are regularly impacted (ICES 2001).

10.19 Localised sediment plumes will occur during decommissioning. Although there is little information on the extent sediment plumes may occur from decommissioning activities, studies undertaken for cable and aggregate industries indicate that sediment plumes remain relatively localised with elevated sediment levels occurring largely within a few kilometres of the activities (e.g. Hill *et al.* 2011, BERR 2008). The modelling of sediment plumes arising from drilling and cable trenching has been undertaken for the planned offshore wind farms located on the Dogger Bank (Forewind 2014). The results from the modelling indicated sediment concentrations above back ground levels at the seabed could extend out 40 km from the planned activities. However, this was based on the installation of 24 monopiles and trenching 216 km of export cable within 30 days. Decommissioning oil and gas infrastructure will be undertaken over a period of many years and therefore any sediment disturbance will occur over a longer period of time. Any impacts on the sandbank feature will be temporary with sediment concentrations returning to background levels within a relatively short period of time.

10.20 There is potential for contamination (or re-contamination) to arise from dispersal of sediments. Results from the monitoring of sediments across the SAC indicate that there is relatively little contamination from either heavy or trace metals or hydrocarbons with the majority of samples reporting levels similar to background levels (Table 10 and Table 11). Consequently, there will be limited contamination across the SAC from disturbance of sediments, with the majority of sediments that are disturbed not having elevated levels of contamination.

10.21 Once decommissioning activities have ceased, sediment levels are predicted to return to background levels within a few weeks (Hill *et al.* 2011).

10.22 Impacts on the seabed will persist for varying times depending on the rate of local sediment movement. Measurements suggest this may be as short as only a few days in high energy environments such as the Bristol Channel and North Norfolk Banks but can be as long as several years for more stable deposits (Cooper *et al*. 2005, Hitchcock & Bell 2004, Kenny & Rees 1996). Surveys undertaken at the Murdoch and Caister fields reported evidence of spud can depressions up to 1.3 m deep (ConocoPhillips 2016). It is not known when these may have been made but they are not thought to have occurred in recent years. Evidence from monitoring studies of anchor mounds in the Dogger Bank indicate that within four weeks of the anchors being removed there was no sign of any mounds present (ConocoPhillips 2006). Consequently, it is predicted that sandbanks will progressively recover although the length of time this may take depends on the local conditions of the site. However, the physical impacts on the sandbank feature will be localised and temporary.

10.23 The four main biological communities identified within the SAC are recognised to have a low sensitivity to disturbance (MarLIN 2018). The main species and communities reported from the relevant developments that may be subject to future decommissioning are presented in Table 12. The species and communities recorded are typical of the wider communities recorded across the SAC and recognised to be relatively tolerant of smothering and with a high to very high ability to recover (MarLIN 2018). The potential impacts on the associated communities within the Dogger Bank SAC are predicted to be temporary with biological communities rapidly returning once activities have ceased.

10.24 The over-trawl surveys that may be undertaken following decommissioning will impact the seabed surface causing abrasion and shallow disturbance. It is estimated that 76.0 km^2 of seabed may be impacted by over-trawl surveys. These surveys will be undertaken over a period of many years, so each year the actual area of seabed impacted will be considerably smaller. The estimated extent of the impact is relatively large compared with other decommissioning activities but relatively small compared with the extent of seabed likely to be impacted each year by other industries, e.g. fishing activities within the SAC.

10.25 Each year fishing by UK registered vessels occurs across an area within the SAC estimated to be 8,701 km^2. Although the physical impact on the sea bed will be smaller than this, it is clear that the level of impact from over-trawl surveys will be considerably smaller than that arising from existing ongoing fishing within the SAC.

10.26 Following cessation of activities benthic communities within the sandbank features will rapidly recolonise due to their mobile nature. Studies have shown that meiofaunal communities have partially recovered from sediment disturbance within a few tidal cycles and the ability of subtidal sandbank benthic communities to recover from sediment disturbance is high (Elliot *et al.*1998). However, the time taken for recovery to occur does vary depending on the level of disturbance, the type of community and type of seabed. Communities occurring in sandy or mud habitats are more resilient to impacts than those occurring in predominantly gravel habitats (Pidduck *et al*. 2017, Rijnsdorp *et al.* 2018). Studies have shown that impacts from trawling on sub-tidal sandbanks may not be detectable within a few days of being undertaken and are therefore temporary with the communities recovering (Depestele *et al*. 2015). Therefore, the relatively small temporary increase in the area of seabed impacted by over-trawl surveys will cause a short-term temporary impact to the seabed.

Conclusion

10.27 The physical disturbance to the seabed and associated communities from the proposed decommissioning associated with existing oil and gas infrastructure within the Dogger Bank SAC will cause a localised area of physical disturbance to the SAC. The area at potential risk of being impacted is relatively small compared to the extent of habitat within the SAC and it is predicted that no more than 0.6% of the site may be temporarily impacted. This includes the potential disturbance of 75.2 km^2 of seabed disturbance from over-trawl surveys, if over-trawl surveys are not undertaken the physical disturbance to the seabed will impact over an area of 0.07 km^2 (0.0005% of the SAC) and will occur over an extended period of many years as each field becomes decommissioned.

10.28 The features at risk of being impacted are widespread and not sensitive to physical disturbance and evidence from existing studies (e.g. Depestele *et al*. 2015, Elliot *et al.*1998, Pidduck *et al*. 2017, Rijnsdorp *et al.* 2018) indicate that any physical impact is temporary, with the habitat and benthic communities recovering once decommissioning activities are completed.

10.29 Based on the best available information BEIS is satisfied that physical disturbance arising from potential future decommissioning activities will not have an adverse effect upon the integrity of the Dogger Bank SAC.

In-combination Assessment

Sandbanks which are slightly covered by seawater all the time: Physical impact In-combination

10.30 BEIS recognises that there is existing oil and gas related infrastructure, including deposits made prior to the site being designated, that may not be technically possible to remove at the time of decommissioning. This includes existing buried pipelines, rock deposits and mattresses. Items remaining on the seabed could cause a permanent impact on the habitat within the SAC.

10.31 Future consented offshore wind farm developments within the Dogger Bank SAC could cause a permanent physical loss of habitat within the site. After fifty years they will be decommissioned and all physical structures, including cables and associated rock deposits will be removed (Forewind 2014).

10.32 There are existing licensed aggregate extraction sites within the SAC. It is not known whether extraction has been undertaken at these sites or is planned to in the future. However, in the event future extraction activities do take place they have the potential to cause an in-combination impact. Any future applications to extract from these sites would be subject to an HRA.

10.33 There are four subsea cables crossing the SAC, these are likely to remain within the site and cause a physical impact on the seabed.

10.34 The overall area of impact predicted to arise from existing and future activities within the SAC is estimated to be 19.7 km^2, of which 1.72 km^2 will is from existing oil and gas infrastructure that will not be subject to future decommissioning plans (Table 24). This is equivalent to 0.16% of the SAC.

10.35 The combined area of potential loss of habitat arising from future oil and gas decommissioning, other industries future plans or projects or from existing oil and gas infrastructure not subject to decommissioning is 20.48 km^2 (0.78 km^2 + 19.7 km^2) (Table 17 and Table 24).

10.36 The greatest area of impact arises from the proposed offshore wind farms, which it is estimated will impact an area of 18.0 km^2 (Table 24). The remaining 2.48 km^2 will be from existing oil and gas infrastructure, cables and future oil and gas decommissioning.

10.37 The physical loss of habitat will be localised and are not predicted to affect the currents that maintain the structure of the sandbanks. In soft substrates there is potential for localised scour to arise around areas where rock has been placed and also for rock to become buried (Pidduck *et al.* 2017). Where rock and other hard substrate remains on the seabed there will be localised changes in the biological communities in areas where the substrate has changed but these will not affect the overall community structure within the SAC.

10.38 The offshore wind farms have previously been subject to assessment under the Habitats Regulations both alone and in-combination with other plans or projects (BEIS 2015a, b). The conclusions of each assessment relating to the Dogger Bank SAC were that *'The SoS is therefore satisfied that the Project (alone and when considered in combination with all relevant plans and projects) will not have an adverse effect upon the integrity of the Dogger Bank SCI'*. Natural England confirmed that the projects alone would not cause an adverse effect on the integrity of the site and the Examining Authority concluded that there would be no adverse impact on the Project alone and in combination with other projects and plans due to the small scale of impact, which would be managed through license conditions.

10.39 The conclusions were based on the physical loss of habitat from the wind farms being a 'long-term temporary impact', in that all infrastructure associated with the offshore wind farms, including rock and mattresses will be removed at the time of decommissioning; which will be in excess of fifty years (BEIS 2015a). On this basis the in-combination impact from offshore wind farms on the Dogger Bank SAC will be temporary, albeit for potentially over fifty years.

Conclusion

10.40 The potential impacts from future decommissioning activities associated with the oil and gas industry in-combination with other plans or projects within the Dogger Bank SAC will cause a loss of habitat within the SAC. However, the extent of potential habitat loss is estimated to be relatively small compared to the extent of habitat within the SAC and it is predicted that less than 0.1% of the site may be lost over the next fifty years. Following the decommissioning of the planned offshore wind farms the overall area of the site will impacted will be 0.01%. Overtime it is predicted that where soft sediments arise rock and mattresses will become largely buried and therefore not have an impact on the habitat or biological communities within the SAC.

10.41 Based on the best available information BEIS is satisfied that potential future decommissioning activities relating to existing oil and gas infrastructure in-combination with other plans or projects will not have an adverse effect upon the integrity of the Dogger Bank SAC.

Sandbanks which are slightly covered by seawater all the time: Physical disturbance In-combination

10.42 Activities being undertaken within the SAC that could cause an in-combination impact of physical disturbance within the SAC are presented in Table 25. The estimated area of seabed disturbed from planned activities ranges from between 56.5 km^2 and 8,757 km^2, depending on the extent of impact arising from fishing within the SAC. The estimated area of disturbance from potential decommissioning activities is 76.07 km^2, of which 76.0 km^2 is from over-trawl surveys (Table 17). The combined total area of seabed estimated to be disturbed from future oil and gas decommissioning and other plans or projects is between 56.57 km^2 and 8,833 km^2, depending on the extent fishing and over-trawl surveys are conducted within the site. This extent of seabed disturbance will not occur over a period of a single year, or even a few years, instead the impacts will occur over many years as projects are gradually carried out.

10.43 There is potential for contamination (or re-contamination) to arise from dispersal of sediments. Results from surveys undertaken across the SAC indicate that there is very little contamination from either heavy or trace metals or hydrocarbons, with the majority of samples reporting levels similar to background levels (Table 10 and Table 11). Consequently, there will be limited contamination across the SAC from disturbance of sediments.

10.44 The impacts on the habitat and the communities from physical disturbance are predicted to be temporary with mobile sediments recovering areas of seabed that may be physically impacted and the benthic communities within the SAC being recognised as tolerant to disturbance and capable of rapidly recolonising areas of disturbed seabed. Future decommissioning will be undertaken over a number of years and therefore the area of seabed impacted each year will be smaller than the total estimated.

Conclusion

10.45 The potential impacts from the proposed decommissioning activities within the Dogger Bank SAC in-combination with other plans or projects will cause physical disturbance within the SAC. However, the extent of physical disturbance is estimated to be relatively small compared to the extent of habitat within the SAC and the impacts to the habitat and associated communities will be temporary. There will be no long-term or permanent impact on the features of the site due to physical disturbance of the seabed.

10.46 Based on the best available information BEIS is satisfied that the planned decommissioning activities will not have an adverse effect upon the integrity of the Dogger Bank SAC in-combination with other plans or projects.

11 APPROPRIATE ASSESSMENT - CONCLUSIONS

11.1 BEIS has undertaken a Habitats Regulations Assessment in respect of the Conservation Objectives of relevant European sites to determine whether future oil and gas decommissioning projects either alone or in combination with other plans and projects will have an adverse effect upon the integrity of the relevant sites. In this case the Dogger Bank SAC.

11.2 Based on the predicted level of decommissioning and predicted scale of impacts, along with evidence from existing studies of the likely potential effects on the qualifying features, it is concluded that the planned activities will not cause a likely significant effect on any qualifying features connected with the designated site either alone or in-combination with other plans or projects. It will therefore not have an adverse effect on the integrity of Dogger Bank SAC.

11.3 Having concluded that there will be no likely significant effect and no adverse effect on the integrity of the Dogger Bank SAC no further assessment is required.

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13 Appendix A

All wells (including side-tracks) drilled in the Dogger Bank SAC

Well name	Quad	Block	Original operator	Spud date	Well status
38/29- 1	38	29	Texaco Britain Ltd	26/12/1964	P & A
44/02- 1	44	2	Shell UK E&P Ltd	05/04/1965	P & A
43/03- 1	43	3	Rycade	19/06/1966	P & A
44/11- 1	44	11	BHP Petroleum Ltd	24/07/1966	P & A
38/18- 1	38	18	BP Exploration Ltd	15/06/1967	P & A
38/22- 1	38	22	Texaco Britain Ltd	11/10/1967	P & A
44/07- 1	44	7	BP Exploration Ltd	15/12/1967	P & A
44/19- 1	44	19	BP Exploration Ltd	29/02/1968	P & A
44/19- 2	44	19	BP Exploration Ltd	12/04/1968	P & A
44/14- 1	44	14	Phillips Petroleum UK	09/05/1969	P & A
38/25- 1	38	25	BP Exploration Ltd	21/05/1969	P & A
43/20- 1	43	20	BHP Petroleum Ltd	29/05/1969	P & A
43/07- 1	43	7	BP Exploration Ltd	03/09/1969	P & A
43/08- 1	43	8	Hamilton	26/12/1969	P & A
43/15-B1	43	15	BHP Petroleum Ltd	16/04/1970	P & A
43/08- 2	43	8	BHP Petroleum Ltd	01/05/1970	P & A
43/13a-C1	43	13	BHP Petroleum Ltd	14/05/1982	P & A
43/13a-C2	43	13	BHP Petroleum Ltd	20/06/1982	P & A
43/13a-C3	43	13	BHP Petroleum Ltd	21/08/1983	P & A
38/24- 1	38	24	BP Exploration Ltd	24/08/1983	P & A
43/08a-A3	43	8	Hamilton	25/10/1983	P & A
43/15a-B2	43	15	BHP Petroleum Ltd	26/11/1983	P & A
43/12- 1	43	12	Eni Tns Ltd	24/02/1984	P & A
44/22- 1	44	22	Conoco (U.K.) Ltd	15/07/1984	P & A
43/13a-C4	43	13	BHP Petroleum Ltd	22/10/1984	P & A
43/13a-C5	43	13	BHP Petroleum Ltd	20/11/1984	P & A
43/13a-C6	43	13	BHP Petroleum Ltd	08/12/1984	P & A
43/13a-C7	43	13	BHP Petroleum Ltd	18/12/1984	P & A
43/13a-C8	43	13	BHP Petroleum Ltd	29/12/1984	P & A
44/22- 2	44	22	Conoco (U.K.) Ltd	26/03/1985	P & A
44/22- 3	44	22	Conoco (U.K.) Ltd	10/05/1985	P & A
43/15a-B3	43	15	BHP Petroleum Ltd	02/06/1985	P & A
43/15a-B4	43	15	BHP Petroleum Ltd	19/06/1985	P & A

Well name	Quad	Block	Original operator	Spud date	Well status
43/08a- 4	43	8	Hamilton	04/08/1985	P & A
43/08a- 5	43	8	Hamilton	15/08/1985	P & A
44/22- 4	44	22	Conoco (U.K.) Ltd	20/06/1987	P & A
44/22- 6	44	22	Conoco (U.K.) Ltd	15/03/1988	P & A
44/22- 6Z	44	22	Conoco (U.K.) Ltd	10/04/1988	P & A
44/12- 1	44	12	Marathon Oil (UK) Ltd	24/07/1988	P & A
43/20b- 2	43	20	Premier Oil Exploration	27/07/1988	P & A
44/23- 8	44	23	Conoco (U.K.) Ltd	14/10/1988	P & A
44/19- 3	44	19	Calenergy Gas (UK) Ltd	16/10/1988	P & A
43/19- 1	43	19	BP Exploration Ltd	26/10/1988	P & A
43/02- 1	43	2	BP Exploration Ltd	16/12/1988	P & A
44/11- 2	44	11	Marathon Oil (UK) Ltd	29/04/1989	P & A
43/08a- 6	43	8	Hamilton	16/08/1989	P & A
43/19- 2	43	19	BP Exploration Ltd	13/12/1989	P & A
43/19- 2A	43	19	BP Exploration Ltd	27/12/1989	P & A
44/17- 1	44	17	Conoco (U.K.) Ltd	15/01/1990	P & A
44/11- 3	44	11	Marathon Oil (UK) Ltd	12/07/1990	P & A
43/13b- 4	43	13	Gaz De France	22/03/1991	P & A
44/19- 4	44	19	Calenergy Gas (UK) Ltd	28/07/1991	P & A
44/16- 1	44	16	Lasmo North Sea Plc	03/08/1991	P & A
44/06- 1	44	6	BP Exploration Ltd	15/09/1991	P & A
44/18- 1	44	18	BP Exploration Ltd	11/10/1991	P & A
44/17- 2	44	17	Conoco (U.K.) Ltd	23/10/1991	P & A
44/16- 1Z	44	16	Lasmo North Sea Plc	20/11/1991	P & A
44/22a-D1	44	22	Conoco (U.K.) Ltd	05/12/1991	Comp.
43/15b- 3	43	15	Conoco (U.K.) Ltd	18/12/1991	P & A
43/15b- 3A	43	15	Conoco (U.K.) Ltd	31/12/1991	P & A
44/22a-D2	44	22	Conoco (U.K.) Ltd	10/02/1992	P & A
44/23a- 10	44	23	Total	20/02/1992	Susp.
44/22a-D2Z	44	22	Conoco (U.K.) Ltd	13/04/1992	Comp.
44/22a-D3	44	22	Conoco (U.K.) Ltd	02/06/1992	Comp.
44/21b- 8	44	21	Unocal	24/06/1992	P & A
44/22a-D4	44	22	Conoco (U.K.) Ltd	30/07/1992	P & A
44/18- 2	44	18	BP Exploration Ltd	17/10/1992	Susp.
44/16- 2	44	16	Lasmo North Sea Plc	01/11/1992	P & A
44/22a-D5	44	22	Conoco (U.K.) Ltd	06/11/1992	P & A

Well name	Quad	Block	Original operator	Spud date	Well status
44/18- 2Z	44	18	BP Exploration Ltd	25/05/1993	Susp.
44/14- 2	44	14	BP	25/09/1993	P & A
44/08- 1	44	8	Agip (U.K.) Ltd	31/12/1993	P & A
44/08- 1Z	44	8	Agip (U.K.) Ltd	01/04/1994	P & A
43/05- 1	43	5	BHP Petroleum Ltd	30/04/1994	P & A
44/17- 3	44	17	Conoco (U.K.) Ltd	01/05/1994	P & A
44/18- 3	44	18	BP	11/05/1994	P & A
44/18- 4	44	18	BP Exploration Ltd	22/06/1994	P & A
44/18- 4A	44	18	BP Exploration Ltd	28/06/1994	P & A
44/13- 1	44	13	BP	24/12/1994	P & A
44/22a-D6	44	22	Conoco (U.K.) Ltd	10/05/1995	Comp.
44/18-T1	44	18	BP Exploration Ltd	14/10/1995	Comp.
44/18-T2	44	18	Arco British Ltd	01/01/1996	P & A
44/22c- 9	44	22	Conoco (U.K.) Ltd	28/02/1996	P & A
43/19a- 4	43	19	Amoco (UK)	24/04/1996	P & A
44/18-T3	44	18	Arco British Ltd	28/04/1996	P & A
43/19a- 4Z	43	19	Amoco (UK)	04/07/1996	P & A
44/18-T3A	44	18	Arco British Ltd	03/11/1996	P & A
43/10- 1	43	10	BP	06/03/1997	P & A
44/18a- 5	44	18	Arco British Ltd	30/03/1997	P & A
44/18-T5	44	18	Arco British Ltd	04/05/1997	P & A
39/16- 1	39	16	Amerada Hess Ltd	12/06/1997	P & A
44/22a-D7	44	22	Conoco (U.K.) Ltd	24/07/1997	P & A
44/18-T1Z	44	18	Arco British Ltd	21/08/1997	P & A
44/17a- 4	44	17	Conoco (U.K.) Ltd	19/12/1997	P & A
44/22a-D8	44	22	Conoco (U.K.) Ltd	17/01/1998	Comp.
44/22a-D9	44	22	Conoco (U.K.) Ltd	11/03/1998	Comp.
44/17a- 5	44	17	Conoco (U.K.) Ltd	12/03/1998	P & A
44/21b- 11	44	21	Amerada Hess Ltd	12/11/1998	P & A
44/15a- 1	44	15	BP	30/12/1998	Comp.
44/17a- 6	44	17	Conoco (U.K.) Ltd	09/04/2002	P & A
44/17a- 6Z	44	17	Conoco (U.K.) Ltd	17/05/2002	P & A
44/17a- 6Y	44	17	Conoco (U.K.) Ltd	06/06/2002	Comp.
44/17c-M1	44	17	Conoco (U.K.) Ltd	18/11/2002	P & A
44/17c-M1Z	44	17	Conoco (U.K.) Ltd	21/12/2002	Comp.
44/17b- 7	44	17	Gdf Britain Ltd	16/02/2004	Susp.

Well name	Quad	Block	Original operator	Spud date	Well status
44/17b- 7Z	44	17	ConocoPhillips	20/06/2005	Comp.
44/17c-M2	44	17	ConocoPhillips	02/07/2005	Comp.
44/23b- 11	44	23	ConocoPhillips	31/07/2005	P & A
44/23a- 12	44	23	Caledonia	22/09/2005	Comp.
44/23a- 12Z	44	23	Caledonia	18/10/2005	Comp.
44/22a-D10	44	22	ConocoPhillips	09/11/2005	Comp.
44/16- 3	44	16	ConocoPhillips	02/01/2006	P & A
44/12- 2	44	12	Gdf Britain Ltd	02/02/2006	Comp.
44/19a- 5	44	19	Wintershall	12/03/2006	P & A
44/23b- 13	44	23	ConocoPhillips	26/04/2006	P & A
43/19a-C1	43	19	Rwe	19/09/2006	Comp.
43/19a-C2	43	19	Rwe	26/01/2007	P & A
43/19a-C3	43	19	Rwe	28/05/2007	Comp.
44/18b-K1	44	18	Conoco Phillips	15/07/2007	P & A
44/19b- 6	44	19	Conoco Phillips	15/07/2007	P & A
43/19a-C2Z	43	19	Rwe	21/07/2007	Comp.
44/18b-K1Z	44	18	ConocoPhillips	09/08/2007	Comp.
44/24b- 7	44	24	Wintershall	19/06/2008	P & A
44/22c- 12	44	22	Eon Ruhrgas	06/07/2008	Comp.
44/24b- 7Z	44	24	Wintershall	02/09/2008	Susp.
43/13a- 5	43	13	Star Energy	23/09/2008	P & A
44/22a-D11	44	22	ConocoPhillips	30/09/2008	P & A
44/22c- 12Z	44	22	Eon Ruhrgas	23/10/2008	Comp.
44/22a-D11Z	44	22	ConocoPhillips	07/11/2008	Comp.
44/12a- 3	44	12	Gdf Suez E&P Ltd	05/12/2008	P & A
44/12a- 4	44	12	Gdf Suez E&P Ltd	21/02/2009	P & A
44/11a- 4	44	11	Gdf Suez E&P UK Ltd	18/02/2010	P & A
44/12a- 5	44	12	Gdf Suez E&P UK Ltd	30/04/2010	P & A
43/19a-C2Y	43	19	Rwe	01/09/2010	Comp.
43/13b- 6	43	13	Centrica	22/10/2010	P & A
43/13b- 6Z	43	13		08/12/2010	P & A
44/19b- 7	44	19	Tullow Exploration Ltd	28/04/2011	Comp.
44/19b- 7A	44	19	Tullow	10/05/2011	Susp.
44/24b-A2	44	24	Wintershall (U.K.) Ltd	26/10/2011	P & A
44/24b-A2Z	44	24		23/12/2011	P & A
44/24b-A2Y	44	24		07/02/2012	Comp.

Well name	Quad	Block	Original operator	Spud date	Well status
44/19b-K1	44	19	ConocoPhillips	19/07/2012	P & A
44/18-T6	44	18		18/09/2012	P & A
44/19b-K1Z	44	19	ConocoPhillips	16/10/2012	Comp.
44/24b-A3	44	24		27/07/2013	P & A
44/24b-A3Z	44	24		06/11/2013	Comp.
44/12a- 6	44	12	Gdf Suez E&P UK Ltd	09/03/2014	P & A
44/24b-A4	44	24	Wintershall (U.K.) Ltd	04/07/2014	P & A
43/13b- 7	43	13	Centrica	14/07/2014	Susp.
44/12a-A1	44	12	Gdf Suez E&P UK Ltd	07/09/2014	Susp.
44/12a-A2	44	12	Gdf Suez E&P UK Ltd	13/09/2014	Comp.
44/12a-A3	44	12	Gdf Suez E&P UK Ltd	19/09/2014	P & A
44/24b-A4Z	44	24		28/09/2014	Comp.
44/12a-A4	44	12	Gdf Suez E&P UK Ltd	30/09/2014	P & A
44/16a- 4	44	16	Gdf Suez E&P UK Ltd	12/03/2015	P & A
44/16a- 4Z	44	16		11/04/2015	P & A
44/19a- 8	44	19	Wintershall (U.K.) Ltd	07/05/2015	P & A
44/12a-A3Z	44	12		09/06/2015	Comp.
44/24b-A5	44	24		16/06/2015	Comp.
44/12a-A4Z	44	12		17/08/2015	Comp.
44/24b-A5Z	44	24		17/09/2015	Comp.
44/11a-B1	44	11	Gdf Suez E&P UK Ltd	29/10/2015	Susp.
44/11a-B2	44	11	Gdf Suez E	03/11/2015	Susp.
44/11a-B3	44	11	Gdf Suez E&P UK Ltd	12/11/2015	Comp.
44/11a-B4	44	11	Gdf Suez E&P UK Ltd	20/11/2015	Comp.
44/11a-B5	44	11	Gdf Suez E&P UK Ltd	26/11/2015	Comp.
44/24b-A6	44	24	Wintershall (U.K.) Ltd	23/02/2016	Susp.
44/23g- 14	44	23	Wintershall (U.K.) Ltd	26/05/2016	P & A
44/11a-B2Z	44	11		17/06/2016	Comp.
44/11a-B1Z	44	11	Neptune	29/03/2018	Comp.
44/12b- 7	44	12	Neptune	29/10/2018	Drilling

P&A = Plugged and Abandoned
Susp. = Suspended
Comp. = Completed