PremierOil

COMPARATIVE ASSESSMENT SERVICES

CONTRACTOR DOCUMENT COVER SHEET

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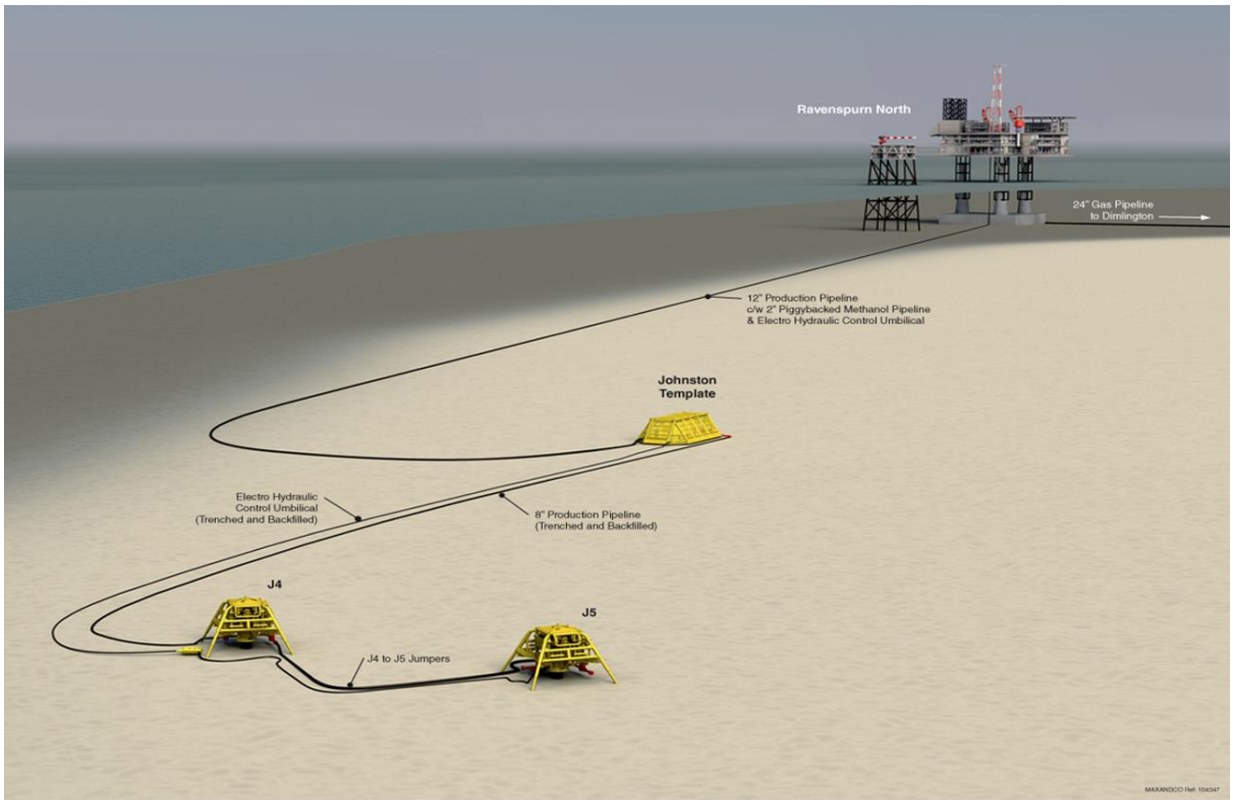

Johnston Decommissioning

Environmental Appraisal

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	Name	Signature	Date
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B03	AB-JO-XGL-LL-SU-RP-0003	Comments Addressed	20/09/2021

Distribution List

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Contents

Terms and Abbreviations

Abbreviation	Text in Full
ALARP	As Low As Reasonably Practicable
AIS	Automatic Identification System
AWMP	Active Waste Management Plan
BEIS	Business, Energy and Industrial Strategy
CA	Comparative Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CoP	Cessation of Production
CSV	Construction Support Vessel
DECC	Department of Energy and Climate Change
DoB	Depth of Burial
DP	Decommissioning Programme
DFPV	Drained, Flushed, Purged and Vented
DSV	Diving Support Vessel
DTI	Department fort Transport and Industry
EA	Environmental Appraisal
EMS	Environmental Management System
EMT	Environmental Management Team
EU	European Union
EUNIS	European Nature Information System

Abbreviation	Text in Full
HSE	Health, Safety and Environment
HSES	Health, Safety, Environment and Security
ICES	International Council for the Exploration of the Seas
IEMA	Institute of Environmental Management and Assessment
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
kg	Kilogrammes
km	Kilometre
KPI	Key Performance Indicator
LAT	Lowest Astronomical Tide
m	Metre
MAIB	Marine Accident Investigation Branch
MARPOL	International Convention for the Prevention of Pollution from Ships
MCDA	Multi Criteria Decision Analysis
MCZ	Marine Conservation Zone
MDAC	Methane Derived Authigenic Carbonate
$\mu g.g^{-1}$	Micrograms per gram
mm	Millimetre
MMO	Marine Management Organisation
MPA	Marine Protected Area
MS	Marine Scotland
N/A	Not Applicable
NCMPA	Nature Conservation Marine Protected Area
NFFO	National Federation of Fishermen's Organisations
NORM	Naturally Occurring Radioactive Material
ODU	Offshore Decommissioning Unit
OGA	Oil & Gas Authority
OGUK	Oil & Gas UK
OPRED	Offshore Petroleum Regulator for Environment & Decommissioning
OPEP	Oil Pollution Emergency Plan
OSPAR	Oslo Paris Convention – Convention for the Protection of the Marine Environment of the North East Atlantic
P&A	Plug and Abandon (Wells)

Abbreviation	Text in Full
Premier	Premier Oil E&P UK EU Limited
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SMRU	Sea Mammal Research Unit
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Areas
SSS	Side Scan Sonar
Te	Tonne
THC	Total Hydrocarbon Concentration
UKBAP	United Kingdom Biodiversity Action Plan
UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators Association
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VMS	Vessel Monitoring System

EXECUTIVE SUMMARY

1 Introduction and Background

The Johnston Field is located in the Southern North Sea (SNS), approximately 84 km southeast of Flamborough Head, England and approximately 106 km west of the UK/Netherlands median line (Figure 1-1). The area comprises a single field with subsea drilling units tied back to the Ravenspurn North platform. The Johnston Field is located within Oil and Gas Authority (OGA) Licensing Blocks 43/27a in the SNS.

On the 31st March 2021, Premier Oil plc and Chrysaor Holdings Limited merged to form Harbour Energy plc. At this point in time, the Premier Oil plc and Chrysaor Holdings Limited companies, including Premier Oil E&P UK EU Limited as Johnston Operator and partial equity holder, are not affected by the completion of the merger, and there are no changes to the company registration details.

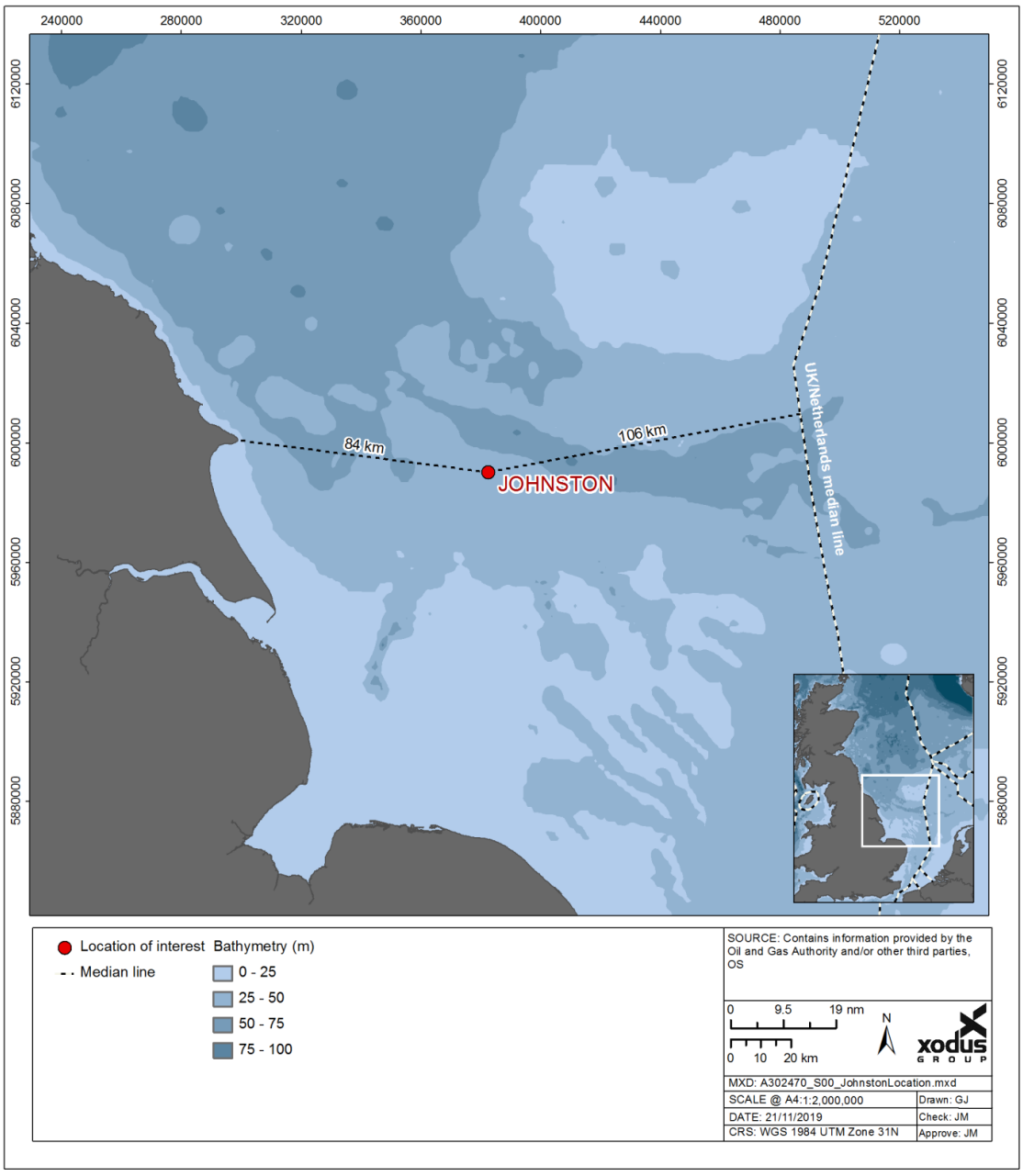

Figure 1-1 Location of Johnston

2 Decommissioning Overview

As part of the planning for decommissioning and to obtain regulatory approval for the proposed activities, a Decommissioning Programme (DP) will be prepared, which is supported by the EA report. The EA report will cover the following:

- The Johnston pipelines and umbilicals; and
- The Johnston Drilling Template.

The DP for the decommissioning of the infrastructure provided above (Premier, 2020) and this supporting EA do not cover well plugging and abandonment (P&A), or the flushing and cleaning operations that will be undertaken prior to the commencement of the decommissioning activities. These activities will be carried out as part of the preparatory work preceding decommissioning, under field operational permits.

Further detail about the infrastructure to be decommissioned is provided in Section 2.

3 Proposed Schedule

The precise timing of the decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements. The high-level Gantt chart featured in Figure 1-2 provides the overall schedule for the programme of decommissioning activities for the Johnston Field operated by Premier Oil.

Prior to commencing decommissioning works, Premier Oil will flush the subsea pipelines and associated with the Johnston Field.

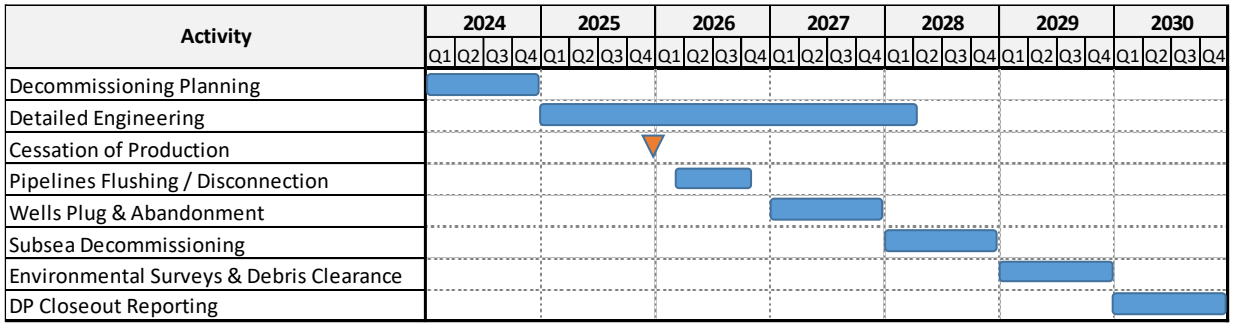

Figure 1-2 Gantt Chart of the project plan

4 Options for Decommissioning

All of the Johnston subsea infrastructure was assessed against the Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines (BEIS, 2018). The recommended Comparative Assessment (CA) process was applied. Equipment was initially organised into groups of items with similar characteristics, this allows for greater efficiency in dealing with the large inventory. The guidance identifies certain equipment which much be fully removed and some categories of pipelines which may be left decommissioned *in situ* subject to CA.

Once the equipment groups designated for full removal were identified, the remaining groups were assessed further. All possible decommissioning options for the remaining groups were coarsely screened. This involves consideration of each option against the primary criteria as specified within the Guidance: Safety; Environment; Technical; Societal and Economic. The options were scored against each criterion as either green, amber or red, pertaining to attractive, acceptable or unattractive respectively. This process eliminated the least favourable options from each equipment group in preparation for detailed evaluation of the remaining options. Those remaining options were then investigated in detail to develop quantitative and qualitative data for each option pertaining to the

primary criteria and sub-criteria (e.g. safety data, environmental impact data, technical considerations, societal impacts and costs). Once this data was prepared in the form of published studies, a detailed evaluation was conducted to determine the final recommended decommissioning option for each item of equipment. This was facilitated by comparing the data for each sub-criterion across the options using a pair-wise analysis to produce a relative score for each sub-criterion that would be summed to produce an overall relative score for each option and thereby identify the emerging recommendation for the group.

The decision-making process underpinning the proposed DP is described in Section 2 and the selected decommissioning options, including those carried forward to CA, are summarised in Table 1-1 below. Table 1-2 depicts the decommissioning options reviewed in the CA Process, with the selected options in bold. Section 2 additionally contains further details about the process and outcomes of the CA.

Table 1-1 Decommissioning Activities for Johnston Infrastructure

Decommissioning Option	Subsea and surface installations / infrastructure
Full Removal	• Johnston Drilling Template • Spools and Jumpers • Protection and Stabilisation
Carried forward to CA	• Buried Rigid Flowlines • Buried Flexible Flowlines & Umbilicals

Table 1-2 CA Decommissioning Options Considered

CA Group No. Note 1	Subsea Infrastructure Description	Decommissioning Options Considered
2	Trenched and Buried Rigid Flowlines	• Full removal via de-burial and cut and lift pipeline sections using a construction support vessel (CSV). • **Cut and remove pipeline ends (trench transitions) and remediate any remaining snag hazard with local gravel or rock placement.**
4	Trenched and Buried Flexible Flowlines / Umbilicals	• **Full removal via reverse reel without de-burying the line first.** • Cut and remove pipeline ends (trench transitions) and remediate any remaining snag hazard with local gravel or rock placement.

Notes:

1. Six CA groups were identified in total and only groups 2 and 4 were carried through to the Johnston CA evaluation. Groups 6, 7, 8, and 11, which were applicable to Johnston, were identified for full removal.

5 Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in Johnston have been summarised in Table 1-3.

Table 1-3 Key Environmental and Social Sensitivities for Johnston Field

Environmental Receptor	Description
Key Conservation interests	
Oslo Paris Convention (OSPAR) (2008) List of Threatened and/or Declining Habitats and Species	
Ocean quahog (*Arctica islandica)*	No evidence *of A. islandica* siphons were observed in any survey sampling.
Conservation sites	
Special Areas of Conservation (SACs)	The Johnston manifold and wellheads are situated within the Southern North Sea SAC, which has been identified for the protection of harbour porpoise – and overlaps with the Dogger bank SAC (JNCC, 2019a). The SNS site includes key winter and summer habitat for harbour porpoises and the overall SNS SAC covers an area over three times the size of Yorkshire, making it the largest SAC in UK and European waters at the point of designation in 2019.
Marine Conservation Zone (MCZ)	The closest MCZ to the Johnston Field is the Holderness Offshore MCZ located 32 km to the south west. The site is designated for a number of protected features including: North Sea glacial tunnel valleys, ocean quahog (*A. islandica*), subtidal coarse sediments, subtidal mixed sediments and subtidal sand (DEFRA, 2019).
Special Protected Areas (SPAs)	The closest SPA is the Greater Wash SPA located approximately 71 km to the south west of the project area. The site is classified for the protection of red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), and little gull (*Hydrocoloeus minutus*) during non-breeding seacon, and for breeding sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*).
Annex I Habitats	No Annex I habitats in any of the site-specific surveys. The reef-forming polychaete worm *Sabellaria spinulosa* was noted to be absent (Gardline, 2008a; 2008b; 2008c).
Conservation Species	
Coastal and Offshore Annex II species most likely to be present in the project area	
Pinnipeds – Harbour and Grey Seals	Pinnipeds are not expected in significant numbers, with densities estimated at approximately 0.53 and 3.5 individuals per 25 km^2 for harbour and grey seals. This is due to the site being approximately 84 km offshore (SMRU and Marine Scotland, 2017).
European Protected Species most likely to be present in the project area	
Harbour porpoise	The harbour porpoise (*Phocoena phocoena)* is a small, highly mobile species of cetacean that is common to all UK waters. As such, harbour porpoise can also be found in the vicinity of the proposed decommissioning area in relative abundance. Particularly large numbers occur in or near the project area during the summer months, with a peak in numbers in July and August (Reid *et al.,* 2003; Hammond *et al.,* 2017). The relative density of harbour porpoise is estimated at 0.6-0.7 animals/km^2 in the project area (Hammond *et al.,* 2017).
Minke whale	Minke whales (*Balaenoptera acutorostrata)* occur both on and beyond the continental shelf edge. When on the continental shelf minke whales predominantly occur in the western waters between Britain and Ireland and throughout the north-western and

Environmental Receptor	Description
	central North Sea (Reid *et al.,* 2003). Sightings in relation to the project area occur mainly in spring and the summer months (Reid *et al.,* 2003). Minke whale density is approximately 0.035-0.040 animals/km^2 in the region comprising Johnston (Hammond *et al.,* 2017).
White-beaked dolphin	The white-beaked dolphin (*Lagenorhynchus albirostris)* is found mostly in continental shelf waters with depths between 50 m and 100 m, and rarely out to the 200m isobath (Reid *et al.* 2003). Distribution of the species has been linked to sea surface temperature, local primary productivity and prey abundance. The species are roughly estimated to have a density of 0.20-0.25 animals/km^2 near the project area (Hammond *et al.,* 2017).
Benthic environment	
Seabed type	An environmental survey was undertaken at the Johnston Field in 2004 and revealed a habitat comprising shelly, silty, fine sand. Small sand ripples were observed in the 3 km by 3 km survey area (Gardline, 2004). Survey data is also available for the Ravenspurn Field which is located ~7 km to the west of the Johnston Field from sediments samples recovered between 1986 and 1993 (Oil & Gas UK, 2019). The survey data showed the sediments to be low in organic content (0.43% - 3.46%) with silt/clay content between 0.24% – 26.48% and an average of 2.4%. Of the 694 stations sampled, five stations recorded >10% fines (Oil & Gas UK, 2019). Debris assessment was undertaken within the Babbage platform area, ~10 km south of Johnston, the seabed sediments recorded were relatively uniform and comprised of very loose to dense slightly silty sand. A thin layer of gravely sand at the base of the Holocene sand was identified during sampling (Gardline, 2008c), which is consistent with the 2004 survey findings at the Johnston Field. These survey results are similar to the habitats described by the mapped seabed data suggesting the surveyed habitat is similar to that observed in the vicinity of the Johnston Field as sublittoral sand typically has up to 15% fines content (JNCC, 2019b).
Benthic Environment	Based on the similar seabed sediments, the community composition at the Johnston Field is expected to be similar to that reported at the Babbage Field. In the Babbage Field the polychaete species *Magelona mirabilis*, *Chaetozone gibber, Ophelia borealis* and *Scoloplos armiger* were the most abundant polychaetes overall but their dominance varied across samples dependent on sediment type. At some locations crustacean species were most abundant, in particular amphipods (*Bathyporeia* spp.), although in terms of number of taxa present polychaetes remained dominant. The presence of a number of rarer species across samples indicated the area is not subject to stress from pollution (Gardline, 2008a; 2008b; 2008c). The community composition at Johnston was relatively diverse and mainly comprised of psammophilous (sand-loving) species. The dominant species were the amphipod *Bathyporeia elegans*, small nemerteans polychaetes *Magelona filiformis* and *Spiophanes bombyx*, juvenile brittle stars, the burrowing polychaetes *Scoloplos armiger* and *Chaetozone christei*, the burrowing/interstitial crustaceans *Megaluropus agilis*, *Perioculoides longimanus* and *Pseudocuma longicornis*, and the bivalves *Abra alba* and *Phaxas pellucidus*. These species are all typically associated with clean sandy SNS substrates (Gardline, 2004).

Fish – spawning and nursery grounds	
Spawning grounds	The project area is located within the spawning grounds of cod (*Gadus morhua)*, herring (*Clupea harengus)*, lemon sole (*Microstromus kitt)*, mackerel (*Scomber scombrus)*, Norway lobster (*Nephrops norvegicus),* plaice (*Pleuronectes platessa)*, sandeel (*Ammodytidae spp.)*, sprat (*Sprattus sprattus)* and whiting (*Merlangius merlangus)* (Coull *et al.*, 1998; Ellis *et al.*, 2012).
Nursery grounds	The following species have nursery grounds in the vicinity of the project: anglerfish (*Lophius piscatorius)*, cod, herring, lemon sole, mackerel, Norway lobster, sandeel, sprat, spurdog (*Squalus acanthias)*, and whiting (Coull *et al.*, 1998; Ellis *et al.*, 2012).
Probability of 0 age group fish aggregation	Aires *et al.* (2014) provided modelled spatial representations of the predicted distribution of 0 age group fish (i.e. less than one year old). The modelling indicates the probability of 0 group fish species occurring in the Johnston Field area is low and largely limited to the following species: sprat and horse mackerel (*Trachurus trachurus).*

Seabirds

According to the density maps provided in Kober *et al.* (2010), the following species could be found within the Johnston Field Area in medium densities include: northern fulmar (*Fulmarus glacialis*), great black-backed gull (*Larus marinus)*, black-legged kittiwake (*Rissa tridactyla),* common guillemot (*Uria aalge),* herring gull (*Larus argentatus*), razorbill (*Alca torda)* and Atlantic puffin (*Fratercula arctica)* for winter months, and black-legged kittiwake, Arctic skua (*Stercorarius parasiticus*), and common tern (*S. hirundo)* during their breeding seasons (Kober *et al.,* 2010).

Seabird Oil Sensitivity Index (SOSI) identifies areas at sea where seabirds are likely to be most sensitive to surface pollution (Webb *et al.*, 2016). Seabird vulnerability in Block 43/27 and its surrounds is extremely high between September and January, based on indirect assessments (Webb *et al.*, 2016). The remainder of the year, seabird vulnerability to oiling is highly variable. The risk of an oil spill from the proposed decommissioning activities at Johnston is negligible, as activities are due to take place after flushing and there are multiple preventative environmental management and vessel management systems in place.

Seabird Oil Sensitivity Index (SOSI)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
43/21	1*	N	5*	5*	5	1	2	4	1	1*	1*	1
43/22	1*	5*	5	5*	2*	2	2	4	2	2*	1*	1
43/23	1*	5*	5	5*	2*	2	2	3	2	2*	1*	1
43/26	1*	2	1	1*	5	1	2	3	1	1*	1*	1
43/27	1*	3	5	1*	1	2	1	3	1	1*	1*	1
43/28	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1
48/1	1*	2	2	2*	5	1	3	2	1	1*	1*	1
48/2	1*	2	1	1*	2	2	2	3	1	1*	1*	1
48/3	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1
Key	1 = Extremely high	2 = Very high			3 = High			4 = Medium		5 = Low	N = No data	
	* in light of coverage gaps, an indirect assessment of SOSI has been made											

<table>
<tr><th>Socio-economic Receptor</th><th>Description</th></tr>
<tr><td colspan="2">Commercial fishing</td></tr>
<tr><td colspan="2">Johnston is located in International Council for the Exploration of the Seas (ICES) Rectangle 37F1 (Scottish Government, 2020).

Demersal species and shellfish are predominantly target by fisheries in the area. In total, 573 Te of fish were caught in 2019, with an equivalent value of £736,277. The total annual landings for Rectangle 37F1 were <0.12% of the total landings within the UKCS for each of the five most recent fishing years (2015-2019 inclusive).

In 2019 fishing effort in ICES rectangle 37F1 was highest in May, together accounting for 17% of the total number of days fished (145 days), but the majority of months experienced disclosive levels of fishing (Scottish Government, 2020).

Trawls were the most utilised gear in rectangle 37F1; in total, trawls contributed 65.6% of total fishing effort in ICES rectangle 37F1, with the remainder made up by traps in 2019 (Scottish Government, 2020).</td></tr>
<tr><td colspan="2">Fishing Landings in ICES Rectangle 37F1
<table>
<tr><th rowspan="2">Species type</th><th colspan="2">2018</th><th colspan="2">2017</th><th colspan="2">2016</th><th colspan="2">2015</th><th colspan="2">2014</th></tr>
<tr><th>Live weight (Te)</th><th>Value (£)</th><th>Live weight (Te)</th><th>Value (£)</th><th>Live weight (Te)</th><th>Value (£)</th><th>Live weight (Te)</th><th>Value (£)</th><th>Live weight (Te)</th><th>Value (£)</th></tr>
<tr><td>Demersal</td><td>135</td><td>276,796</td><td>104</td><td>145,147</td><td>186</td><td>258,955</td><td>224</td><td>276,919</td><td>156</td><td>180,501</td></tr>
<tr><td>Pelagic</td><td>0</td><td>78</td><td>0</td><td>12</td><td>0</td><td>236</td><td>0</td><td>20</td><td>0</td><td>3</td></tr>
<tr><td>Shellfish</td><td>252</td><td>630,484</td><td>254</td><td>537,066</td><td>468</td><td>849,831</td><td>181</td><td>371,540</td><td>111</td><td>304,462</td></tr>
<tr><td>Total</td><td>391</td><td>907,358</td><td>480</td><td>867,669</td><td>655</td><td>1,109,022</td><td>405</td><td>648,479</td><td>267</td><td>484,965</td></tr>
</table></td></tr>
<tr><td colspan="2">Other sea users</td></tr>
<tr><td>Shipping activity</td><td>Johnston is located in an area that experiences high shipping intensity (Oil and Gas Authority, 2016).</td></tr>
<tr><td>Oil and Gas</td><td>The Johnston Field is located in the SNS in an area of extensive oil development with a number of fields located nearby. Oil and gas surface infrastructure within 30 km of the project area is described below [Note 1]:
<table>
<tr><th>Installation</th><th>Type</th><th>Operator</th><th>Distance & direction</th></tr>
<tr><td>Ravenspurn North</td><td>Platform</td><td>Perenco</td><td>7.00 km WSW</td></tr>
<tr><td>Babbage</td><td>Platform</td><td>NEO Energy</td><td>9.24 km SSE</td></tr>
<tr><td>Ravenspurn North ST2</td><td>Platform</td><td>Perenco</td><td>11.37 km WNW</td></tr>
<tr><td>Ravenspurn South A</td><td>Platform</td><td>Perenco</td><td>15.90 km WSW</td></tr>
<tr><td>Ravenspurn North ST3</td><td>Platform</td><td>Perenco</td><td>19.41 km WNW</td></tr>
<tr><td>Ravenspurn South B</td><td>Platform</td><td>Perenco</td><td>20.20 km WNW</td></tr>
<tr><td>Ravenspurn South C</td><td>Platform</td><td>Perenco</td><td>25.38 km WNW</td></tr>
<tr><td>Hoton</td><td>Platform</td><td>Perenco</td><td>27.05 km SSE</td></tr>
<tr><td>Neptune</td><td>Platform</td><td>Perenco</td><td>28.21 km WSW</td></tr>
<tr><td>Kilmar NUI</td><td>Platform</td><td>Alpha Petroleum</td><td>28.47 km NNE</td></tr>
</table></td></tr>
</table>

Socio-economic Receptor	Description
	Garrow NUI Platform Alpha Petroleum 28.78 km NNW Hyde Platform Perenco 29.10 km SSW
Telecommunication	There are no cables in the direct vicinity of the project area. The closest submarine cable to Johnston is the disused Telecom UK-Germany cable, which is located 65 km to the north west (KIS-ORCA, 2019).
Military activities	There are no military restrictions on Block 43/27 (Oil and Gas Authority, 2018).
Renewables	The Johnston Field overlaps with the Hornsea Project 4 Lease Area. The wind farm development in the lease area is at the pre-application stage at the time of writing. Additionally, Hornsea 2 and 1 offshore wind farm developments are located 15.81 km and 33.21 km south east. Construction of Hornsea 1 was completed in 2020 and offshore construction of Hornsea 2 is ongoing.
Wrecks	There are 17 wrecks in the vicinity of the Project Area, with the closest wreck located 5.79 km south west of the Project Area. The majority of the wrecks are unknown, and all are considered to be non-dangerous wrecks. Four of the 17 wrecks are named: Lapwing (possibly) located 6.50 km south east; Linda Louise located 10. 18 km south east; Syrian (possibly) located 17.66 km north west; and Flirt (possibly) located 17.94 km south east of the Project Area. There are no protected wrecks in the vicinity of the project area.

Notes:

1. NUI = Normally Unmanned Installation; ST= Station

6 Impact Assessment Process

This EA Report has been prepared in line with the OPRED Decommissioning Guidelines and also with Decom North Sea's EA Guidelines for Offshore Oil and Gas Decommissioning. The OPRED Decommissioning Guidance states that an EA in support of a DP should be focused on the key issues related to the specific activities proposed; and that the impact assessment write-up should be proportionate to the scale of the project and to the environmental sensitivities of the project area.

The environmental impact assessment has been informed by a number of different processes, including identification of potential environmental issues through project engineer and marine environmental specialist review in a screening workshop, and consultation with key stakeholders (as detailed in Section 4.1).

The impact assessment screening workshop discussed the proposed decommissioning activities and any potential impacts these may pose. This discussion identified ten potential impact areas based on the proposed removal and decommissioning *in situ* activities. Two of the ten potential impacts were screened in for further assessment based on the potential severity and/or likelihood of their respective environmental impact. The ten potential impacts are detailed in Table 1-4 below, together with justification statements for the screening decisions.

Table 1-4 Environmental impact screening summary for Johnston decommissioning

Potential impact	Further assessment?	Rationale
Emissions to air	No	Emissions during decommissioning activities (largely comprising fuel combustion gases) will occur in the context of the CoP. As such, emissions generated by infrastructure, equipment and vessels associated with the maintenance of the Johnston subsea assets will be replaced by those from vessels and equipment required for decommissioning activities, as well as the recycling of decommissioned materials. Reviewing historical EU Emissions Trading Scheme data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be minor relative to those generated during production. The majority of atmospheric emissions for the Johnston decommissioning relate to vessel time or are associated with the recycling of material returned to shore. As the decommissioning activities proposed are of short duration, this aspect is not anticipated to result in significant impacts. The estimated CO_2 emissions to be generated by the vessel operations associated with the selected decommissioning options are 7,648 Te, this equates to 0.01% of the total UKCS vessel emissions (excluding fishing vessels) in 2017 (7,800,000 Te; BEIS, 2019). A further 2,277 Te CO_2 will be generated through the recovery of the project materials. This equates to a total CO_2 production of 9,926 Te associated with the proposed decommissioning activities. The operations CO_2 emissions total has been calculated assuming an anticipated 48 days of operational vessel activity for the duration of the project. This is split across three vessel types (possibly including, but not limited to, a DSV/CSV, trawler and survey vessel). This is a worst-case estimate of vessel days based on extensive overtrawling (which is not expected to be required). Atmospheric emissions in highly dispersive offshore environments do not present significant impacts and are extremely small in the context of UKCS and global emissions. Furthermore, emissions from short-term decommissioning activities are small compared to those previously arising from the asset over its operational life. Considering the above, atmospheric emissions do not warrant further assessment.
Seabed disturbance	Yes	There is potential for decommissioning activities to generate disturbance to the seabed, including activities associated with the removal of the Johnston pipelines and umbilicals, and any remediation required post-decommissioning, including overtrawling. Seabed impacts may range in duration from short-term impacts, such as temporary sediment suspension or smothering, to

Potential impact	Further assessment?	Rationale
		permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire. Additionally, seabed disturbance from the removal of infrastructure has the potential to modify the habitat in a way which might impact upon other sea users which utilise the seabed. Post-decommissioning, the clear seabed will be validated by an independent verification survey over the installation sites and pipeline corridors. The methods used will be discussed and finalised with OPRED. Non-intrusive verification techniques will be considered in the first instance, but where these are deemed inconclusive by the NFFO, seabed clearance is likely to require conventional overtrawl survey methods. Field debris items are anticipated to be located on the surface of the seafloor, or partially buried by surface sediments, and will be recovered with minimal intervention (e.g. using an ROV). The area of potential impact will be superficial, temporary, and largely limited to the dimensions of the debris item being retrieved, which will be determined during the Seabed Clearance Verification survey. As such, seabed disturbance associated with field debris items is considered negligible and has thus been screened out of further assessment. The project area falls within the Southern North Sea SAC, which forms part of the Summer area utilised by the harbour porpoise this site protects. One of the conservation objectives of this Natura site is to ensure '*the condition of supporting habitats and processes, and the availability of prey is maintained*' (JNCC, 2019b). For this reason, it is considered that potential impacts to the benthic environment as a component of the conservation objectives of this site require further assessment. Project-related impacts to seabed habitats and species, and sites designated for their protection, have been addressed in detail in Section 6.1. Impacts to commercial fisheries which may be generated by seabed disturbance are addressed in Section 6.2.
Physical presence of vessels in relation to other sea users	No	The presence of a small number of vessels for decommissioning activities will be short-term in the context of the life of the Johnston Area. A collective 48 days of total vessel time is anticipated for the project area, split across three vessel types (possibly including, but not limited to, a DSV/CSV, trawler and survey vessel). Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. Other sea users will be notified in advance of planned activities through the appropriate mechanisms, meaning those stakeholders

Potential impact	Further assessment?	Rationale
		will have time to make any necessary alternative arrangements during the finite period of operations. Although the Johnston decommissioning project is estimated to require various vessels depending on the selected method of removal, these would not all be on location at the same time. A review of previously submitted decommissioning EAs show that some projects indicate a greater potential issue with short-term vessel presence, but those largely relate to project-specific sensitive locations, which is not the case for this decommissioning project. In consideration of the duration and location of vessel presence in conjunction with employment of standard practices, temporary presence of vessels does not require further assessment.
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	Yes	Trenched and/or buried flexible flowlines will be reverse-reeled for removal and the seabed will be subsequently remediated. All jumpers and spool pieces will be fully removed, as well as the drilling template and protection and stabilisation materials. The only infrastructure to be decommissioned *in situ* are the trenched and buried rigid flowlines. They will have the ends cut and lifted, with remediation. Depth of Burial (DoB) surveys have confirmed the integrity of these flowlines and they are not expected to pose any risk of interaction with other sea users (see Appendix C). However, long-term degradation may compromise the integrity of the buried flowlines and introduce free spans which pose a potential snagging hazard to commercial fisheries which utilise the seabed. Future monitoring work will ensure the integrity of the DoB of these flowlines, but further consideration of the proposed activities are necessary. Further assessment related to potential snagging risks associated with the decommissioning of infrastructure *in situ* is provided in Section 6.2.
Water quality	No	The Johnston substructures will be Drained, Flushed, Purged and Vented (DFPV) using Premier's DFPV management strategies prior to the commencement of any decommissioning activities. Vessel discharges are managed through existing, International Convention for the Prevention of Pollution from Ships (MARPOL) compliant controls, including bilge management procedures and good operating practices. Post-flushing and/or water jetting, residual liquids present during the decommissioning of pipelines and substructures will be treated before being discharged to sea, such that the discharge will comprise treated water. Any residual remaining material will be in trace levels/volumes following the DFPV regime and will not pose any significant risk to water quality. All residual solids will be shipped to shore for disposal.

Potential impact	Further assessment?	Rationale
Underwater noise emissions	No	Vessel presence will be limited in scale (i.e. the size and number of vessels) and duration and, therefore, does not constitute a significant or prolonged increase in noise emissions across the project area. The cutting of flowlines will likely be done with shears, thereby minimising produced underwater noise during this activity. All other noise generating activities associated with the decommissioning of the Johnston Field are considered negligible in the context of ambient noise levels and are likely to be masked by project-related vessel activities. The Johnston Field is located in areas of high shipping activity, therefore the contribution of the decommissioning activities to the overall noise produced by vessels in the area, will be minor. Geophysical surveys may be undertaken to assess post-decommissioned infrastructure decommissioned *in situ*. The need for such surveys will be assessed in future through the process of permit application. Multibeam echosounder survey equipment is likely to be used for imaging and identification of pipeline exposures. The Southern North Sea SAC encompassing the Johnston Field has been designated for the protection of harbour porpoise and this region is characterised as "one of the best areas in the United Kingdom" for habitat quality and importance to this species. None of the proposed project activities include those which have been identified as potential threats to harbour porpoise (including oil and gas extraction or exploration, abiotic marine renewable energy, fishing, marine construction, and water pollution (JNCC, 2019b)). Although decommissioning is considered reverse installation of oil and gas infrastructure (a form of 'marine construction'), it is the seismic surveys associated with the development of oil and gas infrastructure which may have detrimental impacts on hearing sensitive marine species, such as harbour porpoise. Such surveys are not required as part of the Johnston Field decommissioning. There are not anticipated to be significant levels of noise generated by any of the decommissioning activities which may have such an impact. For these reasons, the proposed decommissioning activities do not contravene the conservation objectives set out by the JNCC for the site. These objectives and further discussion on marine mammals in the vicinity of the project can be found in Sections 3.6.1 and 3.6.3, respectively. Therefore, based on the above, impacts from underwater noise associated with the decommissioning of the Johnston Field have been screened out from further assessment.
Resource use	No	Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Any

Potential impact	Further assessment?	Rationale
		opportunities for increasing fuel efficiency and reducing use of resources will be implemented by Premier during the decommissioning programme. The estimated total energy usage for the project is 284,094 GJ. This number accounts for all operations, material recycling, and the loss associated with decommissioning items *in situ*. This is considered very low compared to the resources generated during the production phase of the project. Considering the above, resource use does not warrant further assessment.
Onshore activities	No	The OPRED Guidance states that onshore activities are not in scope of Decommissioning EAs, and this topic does not require further assessment. It should be noted that only licenced contractors which can demonstrate they are capable of handling and processing the material to be brought ashore will be considered for onshore activities. This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact. Premier understands that dismantling sites will also require consents and approvals from onshore regulators such as the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work.
Waste	No	The recycling and disposal of wastes are covered by Premier Oil's Waste Management Strategy, which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous and special waste, and TFSW. The Waste Management Strategy is guided by Premier's HSES Policy and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for each phase of the Johnston Field's end of life in individual Active Waste Management Plans (AWMPs), and ongoing monitoring of waste procedures and performance review against target Key Performance Indicators (KPIs). Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned material. There may be instances where infrastructure returned to shore is contaminated (e.g. by Naturally Occurring Radioactive Material (NORM), hazardous, and/or special wastes) and cannot be recycled. In these instances, the materials

Potential impact	Further assessment?	Rationale
		will require disposal. However, the weight and/or volume of such material is not expected to result in substantial landfill use. On this basis, no further assessment of waste is necessary.
Unplanned events	No	There will be a variety of vessel types and sizes on-site during the decommissioning process. However, a loss of the volume of vessel diesel inventory would be less than the worst-case gas release from loss of well containment. The decommissioning activities detailed in this EA will occur after well P&A, therefore the fuel inventory of a vessel likely to be present during decommissioning has been used as a worst-case unplanned event scenario. A vessel's fuel inventory is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of the full inventory. Any spills from vessels in transit and outside the 500 m safety zone are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Premier will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP. Consequently, any impact from vessel-based fuel inventory release will be less than that already assessed and mitigated against within the OPEP for the operational phase of the Johnston. The worst-case unplanned event during decommissioning activities would be the release of fuel inventory from the largest vessel on site. This is thought to be a CSV or DSV type vessel. The Seven Falcon, a vessel which is comparable to one which may be used during decommissioning has a fuel capacity of 1,335 m^3. As stated previously, the nature of the fuel tank layout is such that this is unlikely to be released all at once. In addition to the mitigation measures outlined in the individual vessel SOPEPs, Premier maintains manned bridges, navigational aids and monitoring of safety zones. Considering the above, the potential impacts from accidental chemical/hydrocarbon releases during decommissioning activities do not warrant further assessment. As previously mentioned, the Johnston Field sit within the Southern North Sea SAC, which has 'marine water pollution' identified as a potential threat to the integrity and/or qualifying features of those sites. However, for the reasons supplied above regarding the management measures and standards currently in place, the potential for marine pollution impacts resulting from accidental events are considered negligible. As such, potential impacts on the conservation objectives of the Southern North Sea SAC through the generation of marine pollution are considered negligible and do not warrant further assessment under this impact pathway. As the methodology for the post-removal flowline return to shore has not been defined in detail, there exists the remote possibility that during transport of those materials, elements may dislodge and

Potential impact	Further assessment?	Rationale
		drop from the transport vessel. Premier will cut and lift the short section of exposed pipeline at the ends; however, these sections are short and will be relatively easy to manoeuvre. Therefore, the likelihood of accidental loss of pipeline materials to the seabed during lift operations is low. Moreover, all subsea installations are considered sound and no issues regarding their integrity have been identified, therefore methods of removal are not anticipated to generate issues which result in material losses to sea. Dropped object procedures are industry-standard. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. Any dropped objects will be reported to OPRED via PON2 notifications and addressed during the debris clearance survey. These will be removed or remediated in agreement with OPRED. In line with the mitigation measures in place, unplanned loss of materials to the sea do not require further assessment.

The initial screening identified two potential environmental and societal impacts which require further assessment within the EA against the proposed decommissioning activities; they include: seabed impacts and impacts to commercial fisheries.

7 Environmental Management

Project activities are limited beyond the main period of preparation for decommissioning and removal of Johnston infrastructure. The focus of environmental performance management for the project is therefore to ensure that the activities that will take place during the limited period of decommissioning happen in a safe, compliant and acceptable manner. The primary mechanism by which this will occur is through Premier's accredited Environmental Management System (EMS) and Health, Safety, Environment and Security (HSES) Policy.

To support this, a project Health, Safety and Environment (HSE) Plan will be developed which outlines how HSE issues will be managed and how the policies will be implemented effectively throughout the project. The plan will apply to all work carried out, whether onshore or offshore. Performance will be measured to satisfy both regulatory requirements including compliance with environmental consents, as well as to identify progress on fulfilment of project objectives and commitments.

Premier also operates a Waste Management Strategy specific to Johnston and will develop an Active Waste Management Plan (AWMP) for the decommissioning project to detail the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the Decommissioning Programme for the Johnston infrastructure. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during the decommissioning.

In terms of activities in the SNS, the Marine Plans (MPs) have been adopted by the UK Government to help ensure sustainable development of English inshore (out to 12 nautical miles) and offshore marine areas (12 to 200 nautical miles). The Johnston Field falls within the East Offshore MP which covers waters from 12 nm to the border of the UK EEZ. This MP has been developed in line with UK, EU and OSPAR legislation, directives and guidance. As part of the conclusions to this assessment (Section 7),

Premier has given due consideration to the East Offshore MP area during Project decision making and the interactions between the Project and Plan.

8 Conclusion

Justification for scoping in and out potential impacts was determined according to the nature of activities and the wider region (Table 1-4). Seabed impacts and physical presence of vessels in relation to other sea users, namely commercial fisheries, were identified as requiring assessment. The spatial and temporal scale of the proposed decommissioning is very contained, and the habitat is naturally mobile, therefore the impact on the seabed is considered **negligible**. The physical presence of vessels associated with the decommissioning will result in a loss of fishing grounds however, as the impact is very short-term, this residual impact is also considered **negligible**. The potential risk associated with snagging hazards arising was early on determined to be minimal.

The Johnston Field is located within the Southern North Sea SAC, with no other MPAs in its vicinity. Therefore, the impacts associated with the proposed decommissioning activities require consideration in relation to the Conservation Objectives of each site to ensure that the activities do not affect site integrity or the ability to achieve Favourable Conservation Status (FCS). Seabed impacts were assessed for their potential to cause Likely Significant Effects (LSEs) to the integrity of this site. The impact assessment concluded that there is limited potential for project-specific or cumulative impacts to harbour porpoise as a qualifying feature of the Southern North Sea SAC, or its habitat use, or the habitat use and availability of its prey. Conclusively, there is no potential for the decommissioning activities to generate LSEs on these or any European or nationally designated protected sites and impacts to protected sites related to seabed impacts have been deemed **negligible**.

This EA has considered the East Offshore MP, adopted by the UK Government to help ensure sustainable development of the marine area. Premier considers that the proposed decommissioning activities are in alignment with its objectives and policies.

Based on the findings of this EA, including the identification and subsequent application of appropriate mitigation measures, and Project management according to Premier's HSES Policy and EMS, it is considered that the proposed Johnston decommissioning activities do not pose any significant threat to environmental or societal receptors within the UKCS.

1 INTRODUCTION

In accordance with the Petroleum Act 1998, Premier Oil E&P UK EU Limited (from hereon, "Premier"), an established United Kingdom Continental Shelf (UKCS) operator, and on behalf of the Section 29 notice holders, is applying to the Department for Business, Energy and Industrial Strategy (BEIS) to obtain approval for decommissioning of the Johnston infrastructure. The Johnston Field is currently in a producing state and Cessation of Production (CoP) is expected at the end of 2025.

The ownership and operation of the Johnston Field is as follows:

- 50.11% owned and operated by Premier, and
- 49.89% by Dana Petroleum Ltd.

On the 31st March 2021, Premier Oil plc and Chrysaor Holdings Limited merged to form Harbour Energy plc. At this point in time, the Premier Oil plc and Chrysaor Holdings Limited companies, including Premier Oil E&P UK EU Limited as Johnston Operator and partial equity holder, are not affected by the completion of the merger, and there are no changes to the company registration details.

This Environmental Appraisal (EA) has been conducted to assess the potential environmental impacts that may result from activities intrinsic to the staged decommissioning of the Johnston Field. This EA supports the Decommissioning Programme (DP) associated with the Johnston Field being submitted to the Offshore Petroleum Regulator for Environment (OPRED), the offshore decommissioning regulator under BEIS, which covers the decommissioning of Johnston (Premier, 2020).

1.1 Project Overview

Johnston sits in the Southern North Sea (SNS), approximately 84 km southeast of Flamborough Head, England and approximately 106 km west of the UK/Netherlands median line (Figure 1-1). The area comprises a single field with subsea drilling units tied back to the Ravenspurn North platform (28.745% Premier non-operated interest). The Johnston Field is located within Oil and Gas Authority (OGA) Licensing Blocks 43/27a in the SNS.

Johnston began commercially producing in November 1994. Produced gas from Johnston is exported to Dimlington subject to the Ravenspurn North Operator Agreement.

Decommissioning at Johnston will cover the decommissioning of subsea infrastructure associated with the Field. There is no surface infrastructure at the Johnston Field. An overview of the field layout is provided in Figure 1-2. Activities associated with the decommissioning of the infrastructure in the Johnston Field are covered by this EA and the DP.

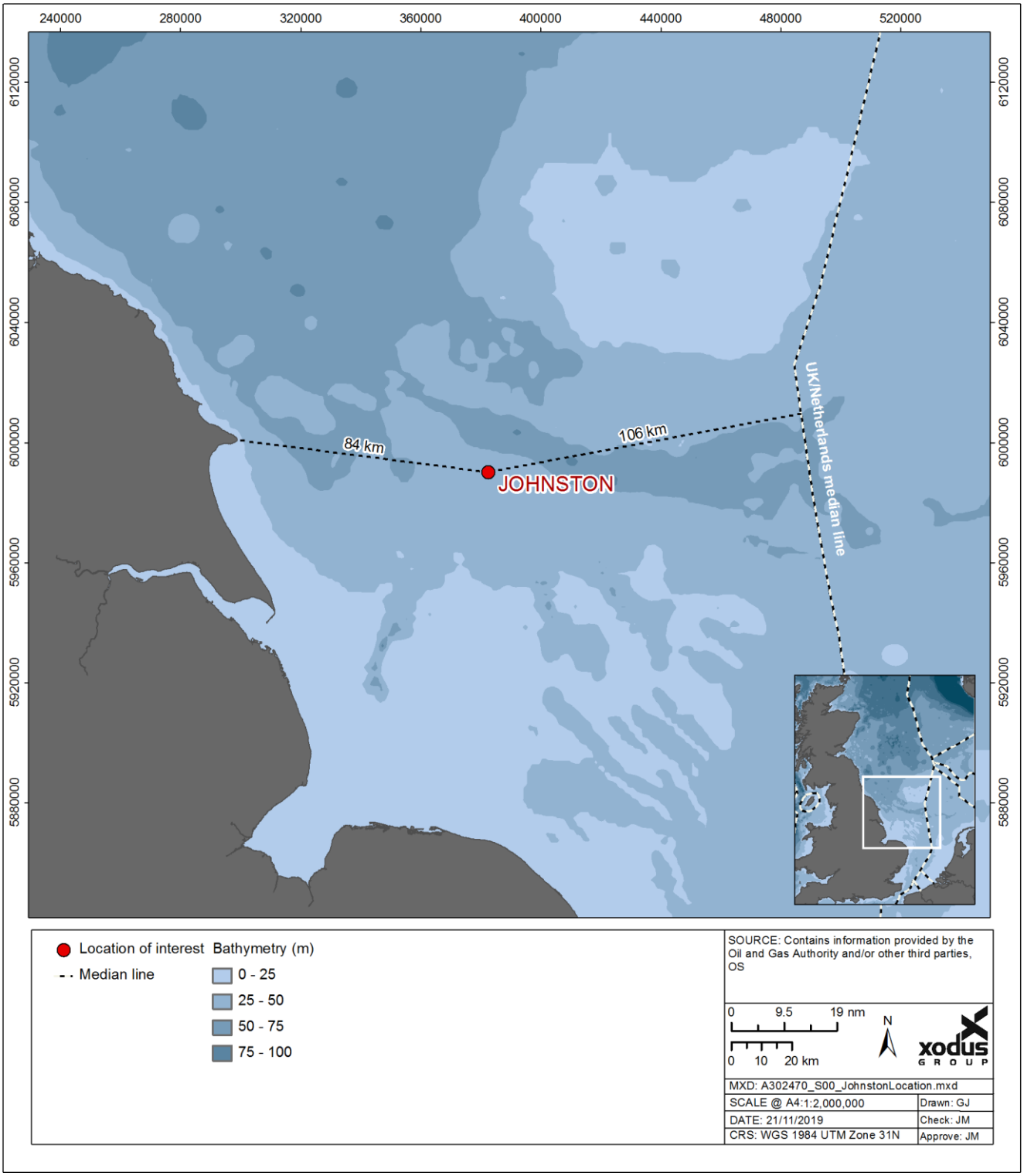

Figure 1-1 Location of Johnston

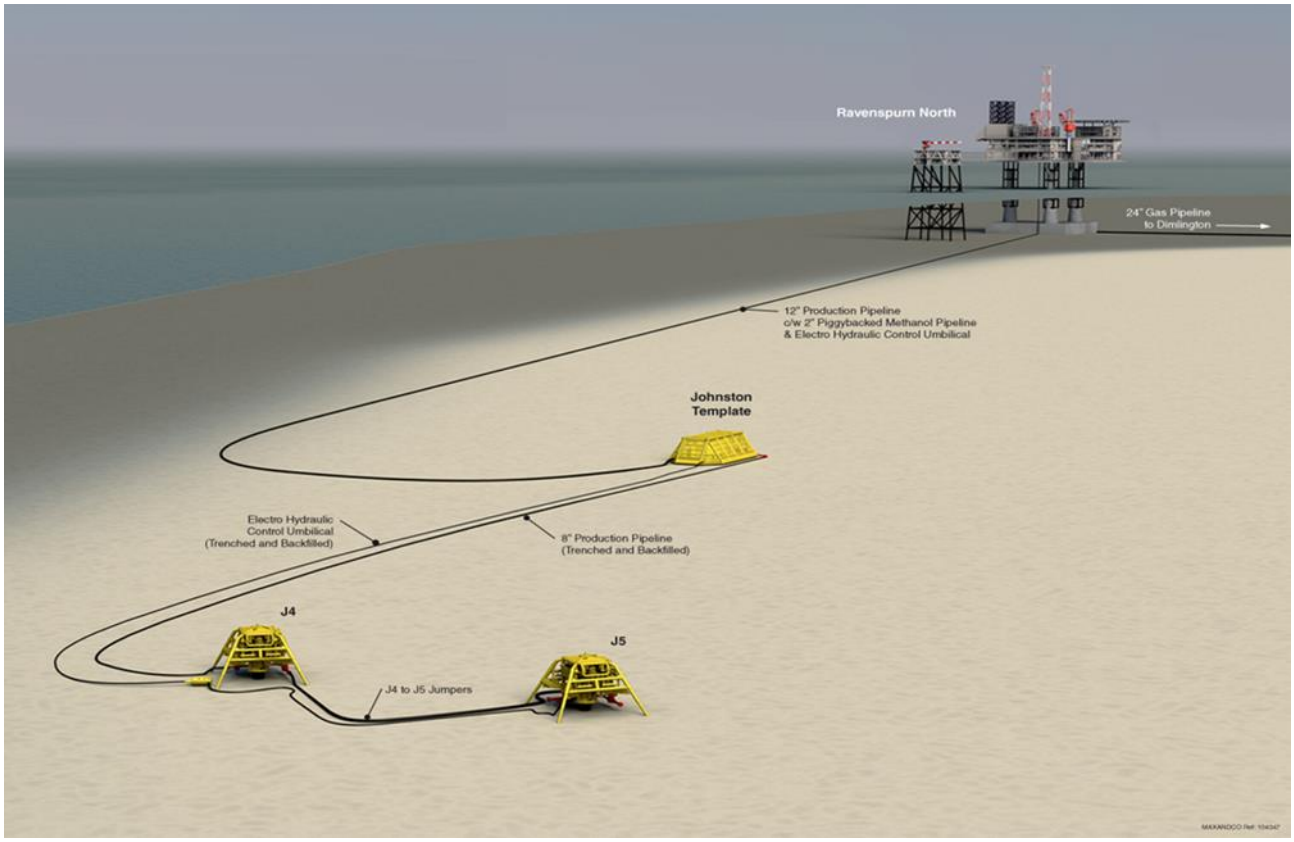

Figure 1-2 Johnston Field Layout

With CoP expected to occur at the end of 2025, the proposed schedule for decommissioning activities associated with the Johnston Field are due to commence in 2026, and will be carried out through the end of 2029, after the post decommissioning environmental and debris clearance surveys are completed.

Well plugging and abandonment (P&A) will be permitted as a standalone activity by Premier. This means that each well will be systematically and permanently closed in accordance with well decommissioning best practice. Similarly, flushing and cleaning operations for subsea flowlines and substructures will also be completed under existing operational permits.

1.2 Purpose of the Environmental Appraisal Report

This EA assesses the potential environmental impacts associated with the proposed Johnston decommissioning activities. The impact identification and assessment process takes into account stakeholder engagement, comparison of similar decommissioning projects undertaken in the UKCS, expert judgement, and the results of supporting studies which aim to refine the scope of the DP. This EA Report documents this process and details, in proportionate terms, the extent of any potential impacts and any necessary mitigation/control measures proposed.

1.3 Regulatory Context

The Petroleum Act 1998 (as amended) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the UKCS. The Act requires the operator of an offshore installation or pipeline to submit a draft DP for statutory and public consultation. The DP must outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place. Responsibility for ensuring compliance with the Petroleum Act 1998 rests with Department of Business, Energy and Industrial Strategy (BEIS), and is managed through the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

Decommissioning is also regulated under the Marine and Coastal Access Act 2009. The UK's international obligations on decommissioning are primarily governed by the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (the Oslo Paris Convention (OSPAR)). OPRED is also the Competent Authority on decommissioning in the UK for OSPAR purposes and under the Marine and Coastal Access Act 2009.

The primary guidance for offshore decommissioning from the regulator (BEIS, 2018), details the need for an EA to be submitted in support of the DP. The guidance sets out a framework for the required environmental inputs and deliverables throughout the approval process. It now describes a proportionate EA process that culminates in a streamlined EA report rather than a lengthy Environmental Statement (ES). The OPRED guidance is supported by Decom North Sea's (Decom North Sea, 2017) Environmental Appraisal Guidelines for Offshore Oil and Gas Decommissioning, which provide further definition on the requirements of the EA report.

In terms of activities in the SNS, the Marine Plans (MP) have been adopted by the UK Government to help ensure sustainable development of English inshore (out to 12 nautical miles) and offshore marine areas (12 to 200 nautical miles). The Johnston Field falls within the East Offshore MP area which covers waters from 12 nm to the border of the UK EEZ. This Plan has been developed in line with UK, EU and OSPAR legislation, directives and guidance. The relevant oil & gas policies with regards to decommissioning include Policy OG1, which states the following:

'Decommissioning and other legacy issues are...highlighted as areas that need significant attention over the period of the marine plans...It is inevitable that there will be further decommissioning activity in the East marine plan areas over the life of the marine plans, though there may be reuse of some facilities for Carbon Capture and Storage and Gas Storage and Unloading. Plan policy OG1 clarifies that, where existing oil and gas production and infrastructure are in place, the areas should be protected for the activities authorised under the production licence consent until the licence is surrendered, (including completion of any relevant decommissioning activity), or where agreement over co-located use can be negotiated. The policy will be implemented by the public authorities responsible for authorising the oil and gas activities and all other developments, including co-located activities'.

As part of the conclusions to this assessment (Section 7), Premier has given due consideration to the East Offshore MP during Project decision making and the interactions between the Project and MP.

1.4 Scope and Structure of this Environmental Appraisal Report

This EA report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with decommissioning of Johnston and to demonstrate the extent to which these can be mitigated and controlled to an acceptable level. This is achieved in the following Sections, which cover:

- The process by which Premier has arrived at the selected decommissioning strategy (Section 2);
- A description of the proposed decommissioning activities (Section 2);
- A review of the potential impacts from the proposed decommissioning activities and justification for the assessments that support this EA (Section 6);
- A summary of the baseline sensitivities and receptors relevant to the assessment area that support this EA (Section 3);
- Assessment of key issues (Section 4); and
- Conclusions (Section 7).

This EA report has been prepared in line with Premier's environmental assessment requirements and has given due consideration to the regulatory guidelines (BEIS, 2018) and to Decom North Sea's

Environmental Appraisal Guidelines for Offshore Oil and Gas Decommissioning (Decom North Sea, 2017).

2 PROJECT SCOPE

2.1 Consideration of Alternatives and Selected Approach

2.1.1 Decision Making Context

The latest guidance (BEIS, 2018) states that subsea installations (e.g. drilling template, wellheads, and risers) must, where practicable, be completely removed for reuse or recycling or final disposal on land. Any piles used to secure such installations in place should be cut below natural seabed level at such a depth as to ensure that any remains are unlikely to become uncovered. Should an Operator wish to make an application to leave in place a subsea installation because of the difficulty of removing it, justification in terms of the environmental, technical or safety reasons would be required. With regards to pipelines (including flowlines and umbilicals), these should be considered on a case-by-case basis. The guidance does provide general advice regarding removal for two categories of pipelines:

- For small diameter pipelines (including flexible flowlines and umbilicals) which are neither trenched nor buried, the guidance states that they should normally be entirely removed; and
- For pipelines covered with rock protection, the guidance states that these are expected to remain in place unless there are special circumstances warranting removal.

The guidance also highlights instances where pipelines could be decommissioned *in situ*. For example, pipelines that are adequately buried or trenched or which are expected to self-bury could be considered as candidates for *in situ* decommissioning. Where an Operator is considering decommissioning pipelines *in situ*, the decision-making process must be informed by 'Comparative Assessment' of the feasible decommissioning options. This Comparative Assessment takes account of safety, environmental, technical, societal and economic factors to arrive at a preferred decommissioning solution.

Finally, the guidance states that mattresses and grout bags installed to protect pipelines should be removed for disposal onshore, if their condition allows. If the condition of the mattresses or grout bags is such that they cannot be removed safely or efficiently, any proposal to leave them in place must be supported by an appropriate Comparative Assessment of the options.

2.1.2 Alternatives to Decommissioning

Options to re-use the Johnston Field infrastructure *in situ* for future hydrocarbon developments have been considered, but to date none have yielded a viable commercial opportunity. The primary reason for this is the absence of remaining hydrocarbon reserves in the vicinity of the infrastructure. No reason to delay decommissioning of the infrastructure in a way that is safe and environmentally and socially acceptable has therefore been identified.

All of the Johnston Field subsea infrastructure was assessed for decommissioning against the *Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines* (BEIS, 2018). The recommended Comparative Assessment (CA) process was applied. For efficiency purposes the Johnston infrastructure was considered together with infrastructure from the Huntington, Caledonia, Hunter and Rita Fields. In accordance with normal practice for the Scoping phase of the CA, equipment was organised into groups of items with similar characteristics, facilitating greater efficiency in processing the latter phases of the CA. The guidance identifies certain equipment which must be fully removed and some categories of pipelines which may be left decommissioned *in situ* subject to CA. Once the equipment groups designated for full removal were identified the remaining groups were assessed further.

All possible decommissioning options for the remaining groups were coarsely screened against the primary criteria as specified within the BEIS (2018) Guidance: Safety; Environment; Technical; Societal;

and Economic. The options were scored against each criterion either green, amber or red, pertaining to attractive, acceptable or unattractive respectively. This process eliminated the least favourable options from each equipment group in preparation for detailed evaluation of the remaining options. Those remaining options were then investigated in detail to develop quantitative and qualitative data for each option pertaining to the primary criteria and sub-criteria (e.g. safety data; environmental impact data; technical considerations; societal impacts; and costs). Once this data had been prepared in the form of published studies, a detailed evaluation was conducted to determine the final recommended decommissioning option for each item of equipment. This was facilitated by comparing the data for each sub-criterion across the options using a Multi Criteria Decision Analysis (MCDA) tool which employs pairwise comparisons of quantitative and qualitative data to produce a relative score for each sub-criterion that can be summed to produce an overall relative score for each option, enabling identification of the emerging recommendation for the group.

2.1.3 Subsea Comparative Assessment

Prior to the eventual recommended decommissioning options being identified, Premier followed the CA evaluation process in which the decommissioning options are assessed against the five main criteria defined in the Guidance (BEIS, 2018), these were equally weighted.

The CA options which have been considered for decommissioning of the Johnston Field are outlined in Table 2-1 below and further details are provided in the Johnston Field Comparative Assessment Report. The selected options are in bold and covered in greater detail in Section 2.2. Only Groups 2 and 4 were carried through the full CA process as all other relevant groups were identified for full removal.

Table 2-1 CA Decommissioning Options Considered

CA Group No. Note 1	Subsea Infrastructure Description	Decommissioning Options Considered
2	Trenched and Buried Rigid Flowlines	• Full removal via de-burial and cut and lift pipeline sections using a construction support vessel (CSV). • **Cut and remove pipeline ends (trench transitions) and remediate any remaining snag hazard with local gravel or rock placement.**
4	Trenched and Buried Flexible Flowlines / Umbilicals	• **Full removal via reverse reel without de-burying the line first.** • Cut and remove pipeline ends (trench transitions) and remediate any remaining snag hazard with local gravel or rock placement.

Notes:

1. Six CA groups were identified in total and only groups 2 and 4 were carried through to the Johnston CA evaluation. Groups 6, 7, 8, and 11, which were applicable to Johnston, were identified for full removal.

2.2 Scope of Proposed Decommissioning Operations

2.2.1 Description of the Infrastructure being Decommissioned

The Johnston Field consists of six gas wells tied back to Ravenspurn North via a seabed template installation. Two of these wells are step outs, J5 well is daisy chained via J4 well.

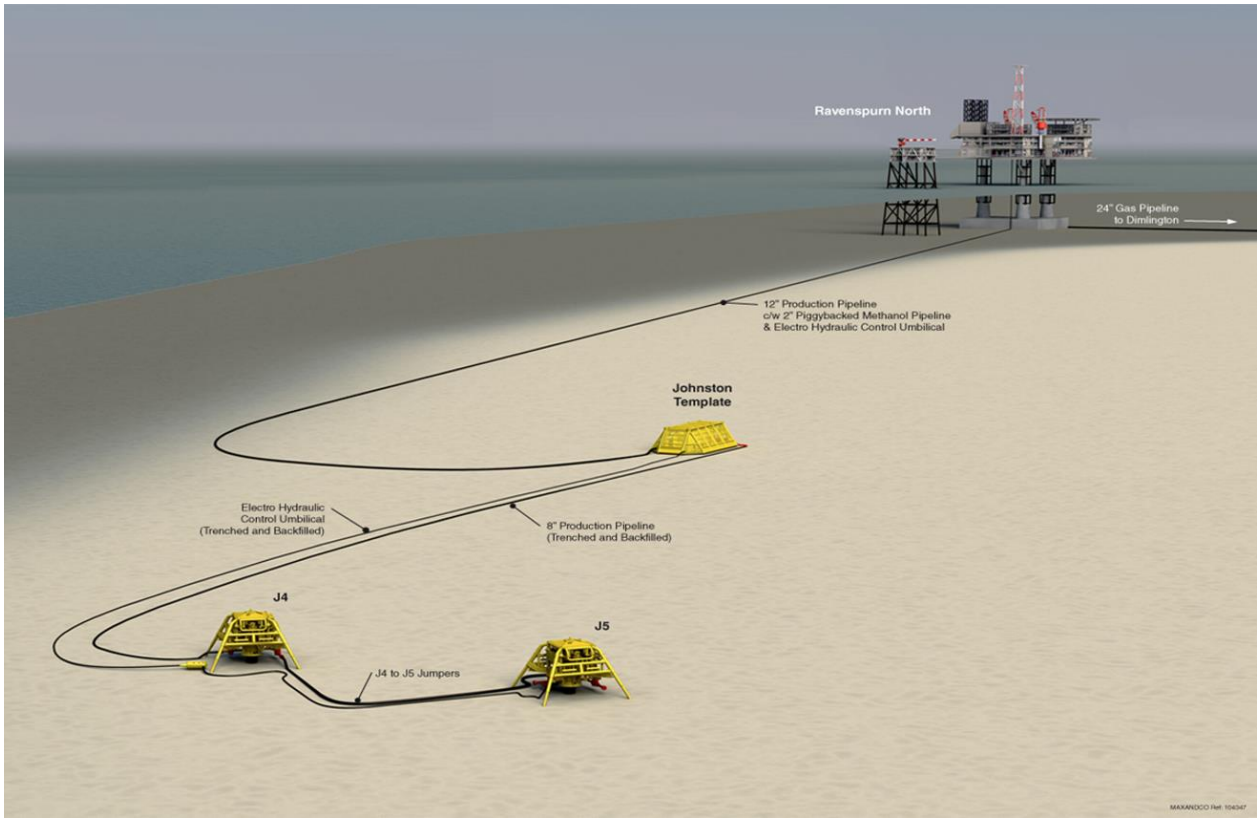

Figure 2-1 Johnston Field Schematic

Wells J4 and J5 are an extension of the original Johnston Field which was initially developed via wells drilled through the Johnston Template.

Table 2-2 Summary of the Equipment to be Decommissioned in the Johnston Field

CA Group No.	Subsea Infrastructure Description	Quantity within the Johnston Field
2	Trenched and Buried Rigid Flowlines	2
4	Trenched and Buried Flexible Flowlines/Umbilicals	3
6	Spools & Jumpers	15
7	Installations	3
8	Protection / Stabilisation	155 Mattresses, 280 Grout Bags
11	Risers [Note 1]	2

Notes:

1. Although the production and methanol risers are part of the subsea infrastructure. as they are physically attached to a third party facility (Ravenspurn North) they are scoped out and shall be removed during platform decommissioning.

2.2.2 Description of Proposed Decommissioning Activities

To facilitate the CA process as efficiently as possible, the infrastructure to be decommissioned was organised into groups. Thereafter, groups of equipment required to be fully removed, in accordance with current guidance, were identified and the remaining groups were assessed against the required criteria, safety, environmental, technical, societal and economic. Through evidence-based evaluation of those remaining groups, final decommissioning recommendations were determined and presented to statutory stakeholders.

The recommended decommissioning approach for the groups of infrastructure located in the Johnston Field are shown below in Table 2-3.

Table 2-3 Recommended Decommissioning Options for Each Group

Group	Equipment Description	Decommissioning Approach
2	Trenched and Buried Rigid Flowlines	Removal of surface laid sections (i.e. ends and transitions) using CSV and remote tooling. Remediation of cut ends with spot rock or gravel cover. Remaining buried pipeline decommissioned *in situ*.
4	Trenched and Buried Flexible Flowlines and Umbilicals	Full removal via reverse reeling operation using a suitable vessel without de-burial of the line first.
6	Spools and Jumpers	Full removal using CSV and remote tooling. Sections are to be cut into manageable lengths and recovered to the vessel for return onshore and recycling / disposal.
7	Structures	Full removal using a DSV or CSV with a suitable crane. Where possible all piles shall be internally cut.
8	Protection / Stabilisation [Note 1]	Full removal using a DSV or CSV. Returned onshore for recycling / disposal. A number of grout bags may be redeployed/repurposed locally as snagging hazard mitigation.
11	Rigid Risers	As these risers are physically attached to a third-party facility, for the purposes of this CA it shall be assumed that they will remain *in situ* until the platform decommissioning.

Notes:

1. The base position is full removal of all mattresses. If difficulties arise during the removal of mattresses, then Premier shall open a dialogue with OPRED to agree an alternative decommissioning approach.

2.3 General Assumptions

All pipework will be flushed to an acceptable level of cleanliness prior to decommissioning activities commencing reflecting current guidance from OPRED and the HSE. This activity will also be permitted, as appropriate. Wells are out of the scope of this EA and will be plugged and abandoned, covered by their own permitting regime.

2.4 Method Statements

Appropriately licensed waste management companies will be identified through a selection process which ensures that the selected facility demonstrates a proven record of: (1) waste stream management throughout the deconstruction process; (2) the ability to deliver innovative re-use/recycling options; and (3) ensures the aims of the waste hierarchy are achieved. Geographic locations of potential disposal yard options may require the consideration of Trans-Frontier Shipment of Waste (TFSW), including hazardous materials. TFSWs will be reviewed by Premier as part of due diligence. Early engagement with the relevant waste regulatory authorities will ensure that any issues with TFSW are addressed. Premier will engage with other companies and industries to identify potential reuse opportunities. Premier believes that such opportunities are best achieved through the tendering and selection of a waste management contractor with the expert knowledge and experience in this area.

2.4.1 Pipelines

The trenched and buried rigid pipelines (Group 2 in the CA) are to be decommissioned by removing the ends and remediating any potential snagging risk. In the Johnston Field there are two trenched and buried rigid flowlines, PL989 and PL990. Once the pipelines are disconnected, the transition and surface laid end sections will be cut and recovered using a CSV. The proposed method of cutting is with remotely operated hydraulic shears. The cut ends within the base of the trench shall be remediated with rock placement. A length of approximately 250 m will be removed from both pipelines at the Ravenspurn North platform end. A further 125 m will be removed from the other end of the PL989 and PL990.

The PL989 is a 12” production pipeline 9.28 km in length, running from the Johnston Template to Ravenspurn North. PL990 is a 2” methanol pipeline and is piggybacked to PL989. Neither pipeline has any spans (i.e. an area of seabed loss below the pipeline which is > 0.8 m in height from the top of the pipeline and > 10 m long) nor any exposures along its length. Both pipelines are stably buried to an average depth of 1.15 m. See Appendix C for a DoB profile of the PL989 and PL990.

The dimensions of the rigid trenched and buried pipelines is in Table 2-4 below.

Table 2-4 Pipelines

ID	Description	OD (mm)	Length (m)
PL989	12” production pipeline	323.9	9,280
PL990	2” methanol pipeline, piggy-backed on PL989	60.3	9,280

2.4.2 Flowlines and Umbilicals

For the trenched and buried flexible flowlines / umbilicals (Group 4 in the CA) the emerging recommended option, as a result of the CA process, is option 2B, Full Removal – Reverse Reel without De-burial. The flowline and umbilicals will be disconnected and then recovered onto a suitable reel vessel. De-burial will occur during the reeling process. The full removal of the trenched and buried flexible flowlines and umbillicals by reverse reeling has the potential to create berms in the sediment. This will be fully addressed in Section 6.1. There is one trenched and buried flexible flowline and two umbilicals in the Johnston Field.

A description of trenched and buried Flowline and Umbilicals is in Table 2-4 below.

Table 2-5 Flowlines and Umbilicals

ID	Description	OD (mm)	Length (m)
PL991	Static umbilical (continuous up to Ravenspurn North J-tube hang off).	108	9,520
PL2105	8” production flowline	260	6,890
PLU2106	Static umbilical	97	6,880

2.4.3 Spools and Jumpers

All spools and jumpers will be fully removed using a CSV where remote tooling will be used to cut sections of spools and jumpers into lengths that are manageable for recovery and transportation. The preferred method of cutting is by using hydraulic shears. Further detail on the spools and jumpers is available in Appendix A.

Table 2-6 Spools and Jumpers

ID	Description	OD (mm)	Length (m)
PL989 Spool 1	12” production	323.9	35.4
PL989 Spool 2	12” production	323.9	61.2
PL990 Spool 1	2” methanol	60.3	76.8
PL990 Spool 2	2” methanol	60.3	25
PL2501	8” production spool	219.1	25
PLU2502	J5 Methanol Jumper	50.8	35
PL3679	J4 Power Jumper	16.51	24
PL3680	J4 Signal Jumper	16.51	24
PL3681	HP Hydraulic Jumper	29.21	24
PL3682	LP Hydraulic Jumper	29.21	24
PL3687	J4 Power Jumper	16.51	10
PL3688	J4 Signal Jumper	16.51	10
PL3689	J4 HP Hydraulic Jumper	29.21	10
PL3690	LP Hydraulic Jumper	29.21	24
PL3697	J5 Signal Jumper	74.93	50
PLU3698	Hydraulic Jumper	29.21	50
PL3710	J5 CIV Hydraulic Jumper	29.21	50

2.4.4 Subsea Installations

Subsea installations shall be fully removed from the seabed. Installations will be lifted from the seabed using a CSV or DSV with a suitably rated subsea crane. There is a single installation, a subsea template, within the Johnston Field which is within scope of this EA.

Additionally, there are two wellhead protection structure (WHPS) which will be removed as part of the well abandonment campaign. Environmental impacts associated with the removal of the well will be

considered as a part of the Well Intervention and Marine License applications, which will be submitted to OPRED, and therefore activities associated with its removal are considered outwith the scope of this EA. However, these installations have been included as a part of the subsea decommissioning inventory for the Johnston Field. A summary of the installations is provided below in Table 2-7.

Table 2-7 Subsea Installations

Infrastructure	Description	Dimensions (m)	Weight (te)
Johnston Subsea Template	Over-trawlable Installation (Tubular Steel Construction) - Piled	25 x 13 x 6.5	221.0
J4 WHPS	Wellhead Protection Structure	7.6 x 7.6 x 5.6	36.0
J5 WHPS	Wellhead Protection Structure	7.6 x 7.6 x 5.6	36.7

2.4.5 Protection / Stabilisation

All protection / stabilisation is to be fully recovered using a DSV or a CSV. Concrete mattresses and (non-biodegradable) grout bags which are recovered will be cleaned and either recycled as aggregate for infrastructure projects or disposed of in landfill sites. For protection / stabilisation which is unable to be recovered due to accessibility or integrity issues Premier will open a dialogue with OPRED about alternative decommissioning methodologies.

- 68 off 5 m x 3 m x 0.3 m concrete protection mattress
- 63 off 6 m x 3 m x 0.15 m concrete protection mattress
- 2 off 6 m x 5 m x 0.3 m concrete protection mattress
- 4 off 6 m x 3 m x 0.3 m concrete protection mattress
- 18 off 5 m x 4 m x 0.3 m concrete protection mattress
- 280 off 25 kg non-biodegradable grout bags (estimated)

2.4.6 Rigid Risers

Two off rigid risers run up and over the concrete storage cells of the Ravenspurn North platform. The battery limit of the risers are from the tie-in flanges at the base of the platform to the ESDV on the platform. As these risers are physically attached to a third-party facility, they are discounted from this decommissioning programme and will remain *in situ* until the platform decommissioning. The risers are therefore also out of scope for this EA.

A summary of the Johnston Field rigid risers is provided below in Table 2-8.

Table 2-8 Rigid Risers

ID	Description	OD (mm)	Length (m)
PL989	12” Production Riser	323.9	87.1
PL990	2” Methanol Riser	60.3	107.2

2.4.7 Clear Seabed Verification

Following the decommissioning of the Johnston Field infrastructure, it is necessary to identify any potential snagging hazards associated with any changes to the seabed. A clear seabed will be validated by an independent verification survey of all of the installation sites and pipeline, flowline or umbilical corridors, as well as any 500-m exclusion zones. The aim of these clean seabed verification actions is to

ensure the seabed is left in a safe condition for future fishing effort, in line with the current Decommissioning Guidance (BEIS, 2018).

Survey techniques which do not make contact with the seabed, such as Side Scan Sonar (SSS) and Remotely Operated Vehicle (ROV), will be implemented to verify the condition of the seabed during the post decommissioning survey. The survey methods will be discussed and finalised with OPRED prior to survey commencement to ensure the survey meets the requirements for clear seabed verification.

Non-intrusive verification techniques will be considered in the first instance, but where these are deemed inconclusive by the National Federation of Fishermen's Organisations (NFFO), seabed clearance is likely to require conventional overtrawl survey methods. Where there is evidence of snagging hazards requiring intervention (e.g. any spans, berms, dropped objects, etc.), then overtrawling will be undertaken to ensure no residual risk of snagging remains post-decommissioning. Should overtrawling be required, it will be conducted by fishing vessel(s) using trawl gear that is appropriate for the area.

Where there is evidence of snagging hazards requiring intervention (e.g. any spans, berms, dropped objects, etc.), then overtrawling will be undertaken to ensure no residual risk of snagging remains post decommissioning. It is expected that such intervention would be limited to areas affected by reverse reeling of flexible flowlines to be removed.

Removal of surface laid flowlines and other subsea infrastructure is not anticipated to generate any snagging hazards. Similarly, field debris will be small and are expected to be on the seabed surface or partially buried, precluding the requirement of intrusive methods of remediation.

2.5 Summary of Material Inventory

This section summarises the inventory of materials associated with the subsea infrastructure to be decommissioned. Comprehensive information about the materials present within the Johnston Field is provided.

The Johnston Field consists of a subsea template with 6 gas wells, two of these wells are step outs, J5 well is daisy chained via J4 well. Wells J4 and J5 are an extension of the original Johnston Field which was originally developed via wells drilled from the Johnston Template. The two step out wells are connected via a control jumper and rigid production spool and tied back to the Johnston Template with a flexible flowline and electro hydraulic control umbilical. The template itself is tied back to Ravenspurn North by a rigid production pipeline and piggybacked methanol pipeline and electro hydraulic control umbilical. The pipelines are connected to the template and platform via rigid tie-in spools whilst the umbilical is secured at the Ravenspurn North J-tube hang off.

Dried gas is exported to the Cleeton facilities then onward via the Cleeton/Ravenspurn South line to the Dimlington terminal.

All pipelines are trenched and buried with concrete mattresses and grout bags used to support and protect surface sections as required.

Table 2-9, Figure 2-2 and Figure 2-3 summarise the total and proportional weight of each component’s constituent materials for the Johnston Field.

Table 2-9 Component Materials of Infrastructure to be Decommissioned

Component Type	Weight (Te)					
	Ferrous – all grades	Non-ferrous	Plastics	Other	Concrete	Total
Pipelines	2392.4	2392.4	85.9	6	1345.5	3867.6
Installations	282.0	282.0	2.9	N/A	403.2	696.9

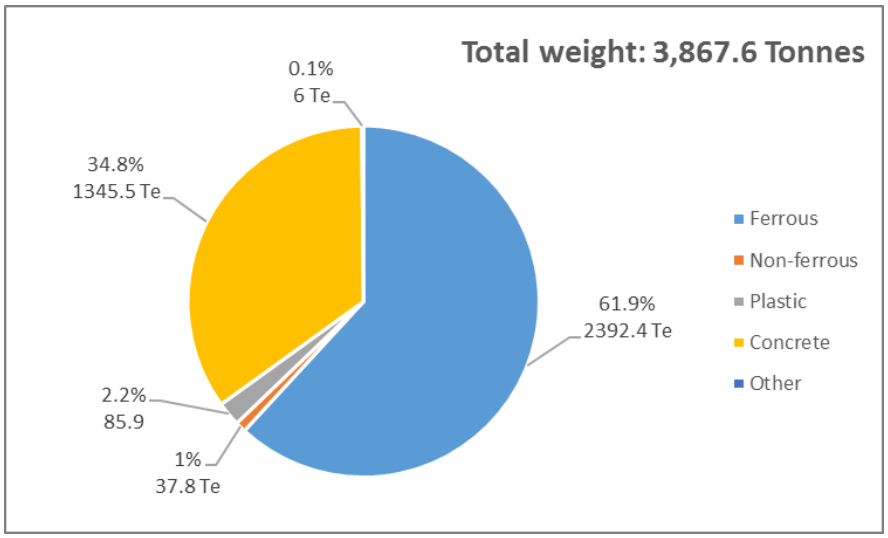

Figure 2-2 Pie chart of estimated inventories (pipelines)

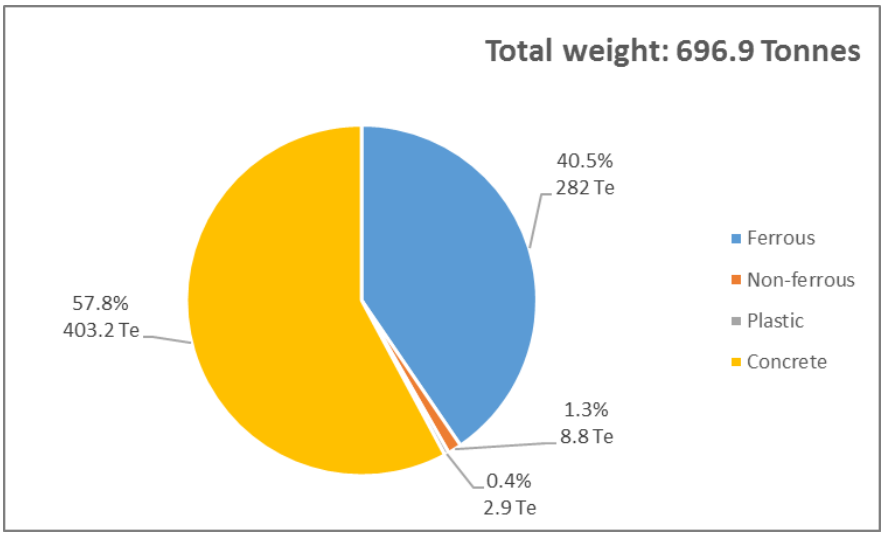

Figure 2-3 Pie chart of estimated inventories (installations)

2.6 Waste Management

The management of waste during decommissioning is a highly regulated activity, which potentially requires compliance with both national and international legislation, depending on the destinations identified for dismantling and treating any wastes generated.

Premier's HSES Policy supports legal compliance and states that Premier will "do all that is reasonably practicable to prevent major accidents, ensure the safety of everyone involved with our operations and minimise environmental impacts."

Premier will meet statutory or supporting legislation requirements, assessing and managing risks and seeking ways to continually improve performance with respect to waste management activities during the Johnston Field decommissioning

Premier's commitments to waste management during decommissioning are to:

1 Manage waste from decommissioning activities in accordance with the applicable regulatory framework and all other obligations required by Premier's HSES Policy;
2 Manage the activities of all contractors and sub-contractors within the decommissioning supply chain that generate and manage waste and ensure their compliance with legal obligations and Premier's HSES Policy;
3 Treat wastes where practicable using the principles of waste hierarchy, with a focus on reuse and recycling of wastes whenever possible;
4 Measure and monitor performance with respect to waste management, including the setting of KPIs for the reuse and recycling of wastes.

2.7 Environmental Management Strategy

Premier is committed to operating responsibly and will never knowingly compromise our health, safety or environmental standards to meet our operational objectives. We will do all that is reasonably practicable to prevent major accidents, ensure the safety of everyone involved with our operations and minimise environmental impacts. Premier's HSES signed policy is shown in Figure 2-4.

Figure 2-4 Premier's HSES signed policy

2.8 Proposed Schedule

The precise timing of the decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements. The high-level Gantt chart featured in Figure 2-5 provides the overall schedule for the programme of decommissioning activities for the Johnston Field operated by Premier.

Prior to commencing decommissioning works, Premier will flush the subsea pipelines and associated with the Johnston Field.

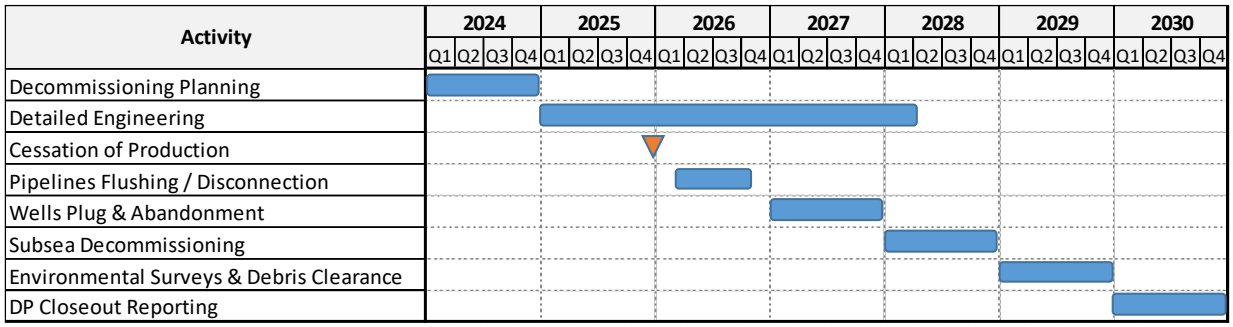

Figure 2-5 Gantt Chart of the project plan

3 ENVIRONMENTAL AND SOCIETAL BASELINE

3.1 Background

Information is provided here on the environmental baseline characteristics around Johnson to help inform an assessment of the features that may be affected by the proposed decommissioning operations or may have a bearing on the nature and extent of relevant impacts. The potential interactions between project activities and environmental receptors are detailed and assessed in Section 4. As the activities associated with the DPs will form a nearly ongoing presence over several years, environmental features and any relevant changes in their characteristics and sensitivities are described across the entire year.

The Project Scope (Section 2) and initial screening (based on the ENVID in Appendix B) suggest that the majority of potentially significant environmental impacts would be felt within relatively close proximity of the proposed development location. Therefore, environmental sensitivities are described on a local scale, with broader scale data only used where appropriate to certain ecological characteristics, such as broadscale habitat classification. Certain activities or events, such as water quality impacts, could potentially have more spatially extensive environmental impacts. In these instances, those environmental sensitivities that may be affected are described on a greater spatial scale.

In this regard, Table 3-1 provides an overview of all the environmental and societal sensitivities in the area. Details have been provided on the receptors most likely to be impacted by the proposed activities in the sections below. It is considered, that the existing survey data is sufficient to broadly characterise the Johnston Field. The Johnston Field is not located within a designated area and the reviewed survey data has not identified the presence of any designated or protected features within the surrounding fields. It should be noted that prior to commencing any decommissioning works, additional survey scopes will be undertaken, and agreement sought from OPRED on the design of the survey coverage and techniques to be deployed. As such, it is expected that the existing survey coverage will be acceptable to support the approval of a Decommissioning Environmental Appraisal for Johnston.

3.2 Summary of Environmental Surveys

The only available survey data that cover the Johnston Field include the rig site survey conducted by Gardline in 2004, on behalf of Caledonia Oil & Gas UK Limited as part of the Johnston Field Extension. An environmental survey was conducted in 2007 in a nearby field between the Babbage A and West Sole Bravo platforms located approximately 10 km to the south of Johnston. The geophysical survey areas covered during the Johnston and Babbage surveys and sample locations in relation to the Johnston Field infrastructure are shown in Figure 3-1 and Figure 3-2, respectively.

3.2.1 Johnston Geophysical Survey Report (Gardline, 2004)

This survey comprised a site survey at the previously proposed 43/27a-H drilling location at Johnston, and a 7 km pipeline route survey to link the drilling location with the existing Johnston template. It also included a debris survey and an inspection survey at the suspended 48/2-1 and 43/27-1 wellheads. The objectives were to identify any seabed obstructions or hazards that may impede the emplacement of subsea infrastructure.

Seabed type and geological information was recorded across these survey areas. The investigations utilised multi-beam echosounder, sidescan sonar, pinger, boomer, magnetometer, vibrocoring and high-resolution seismic equipment. An environmental programme of grab sampling and photography was also undertaken.

3.2.2 Babbage Environmental Baseline Report (Gardline, 2008a; 2008b; 2008c).

An environmental baseline survey (EBS) was completed in conjunction with a geophysical site survey and habitat assessment, which utilised multi-beam echo sounder, side-scan sonar and sub-bottom profiler magnetometer (Gardline, 2008a, 2008b, and 2008c). The objective of the survey was to establish the baseline physio-chemical sediment characteristics and benthic faunal community at and around the proposed Babbage 'A' location prior to the emplacement of a production platform and a selected sampling stations along the proposed Babbage 'A' to West sole Bravo (WSB) platform pipeline route.

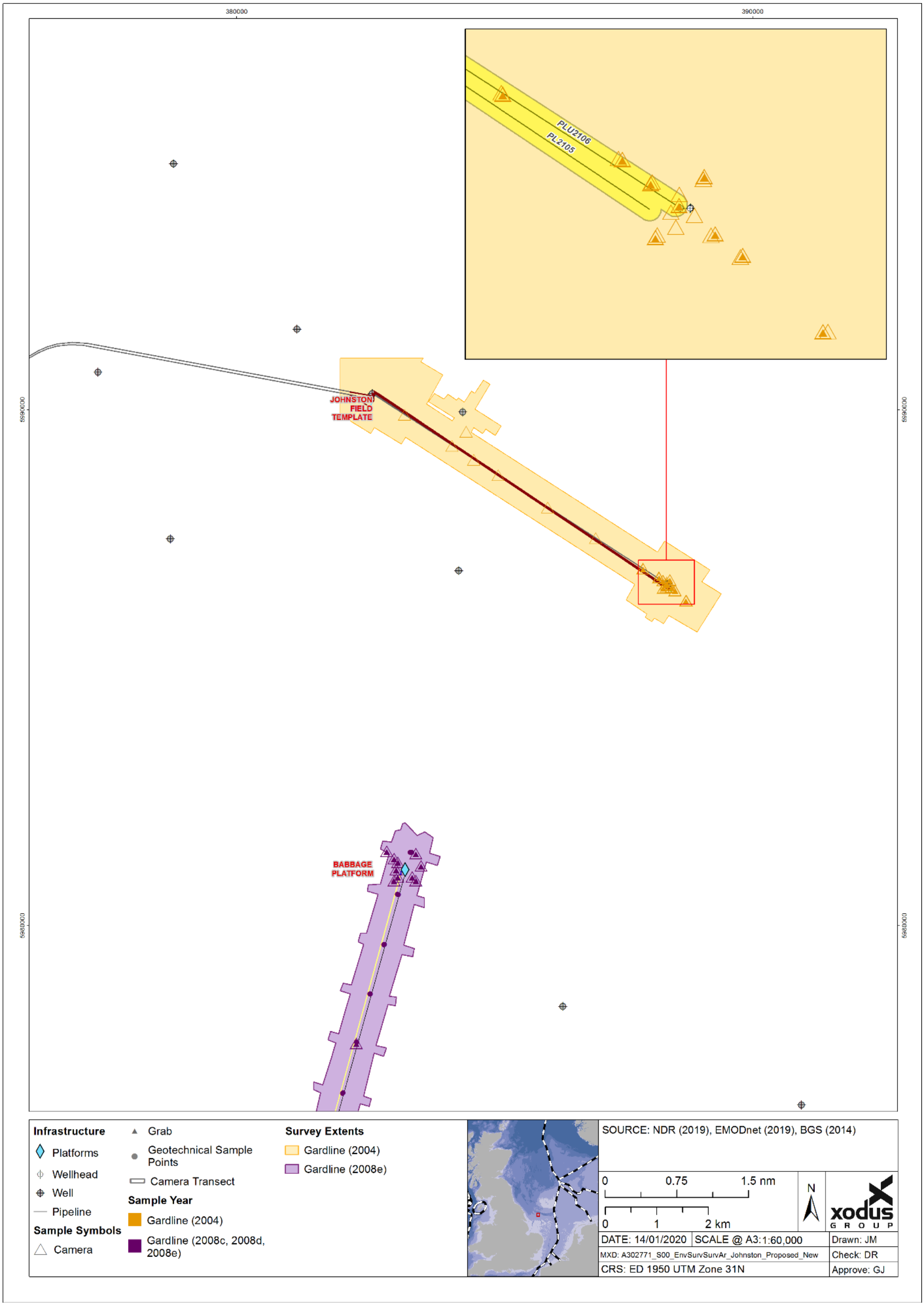

Figure 3-1 Johnston Geophysical Survey Effort and Sample Locations in Relation to Babbage

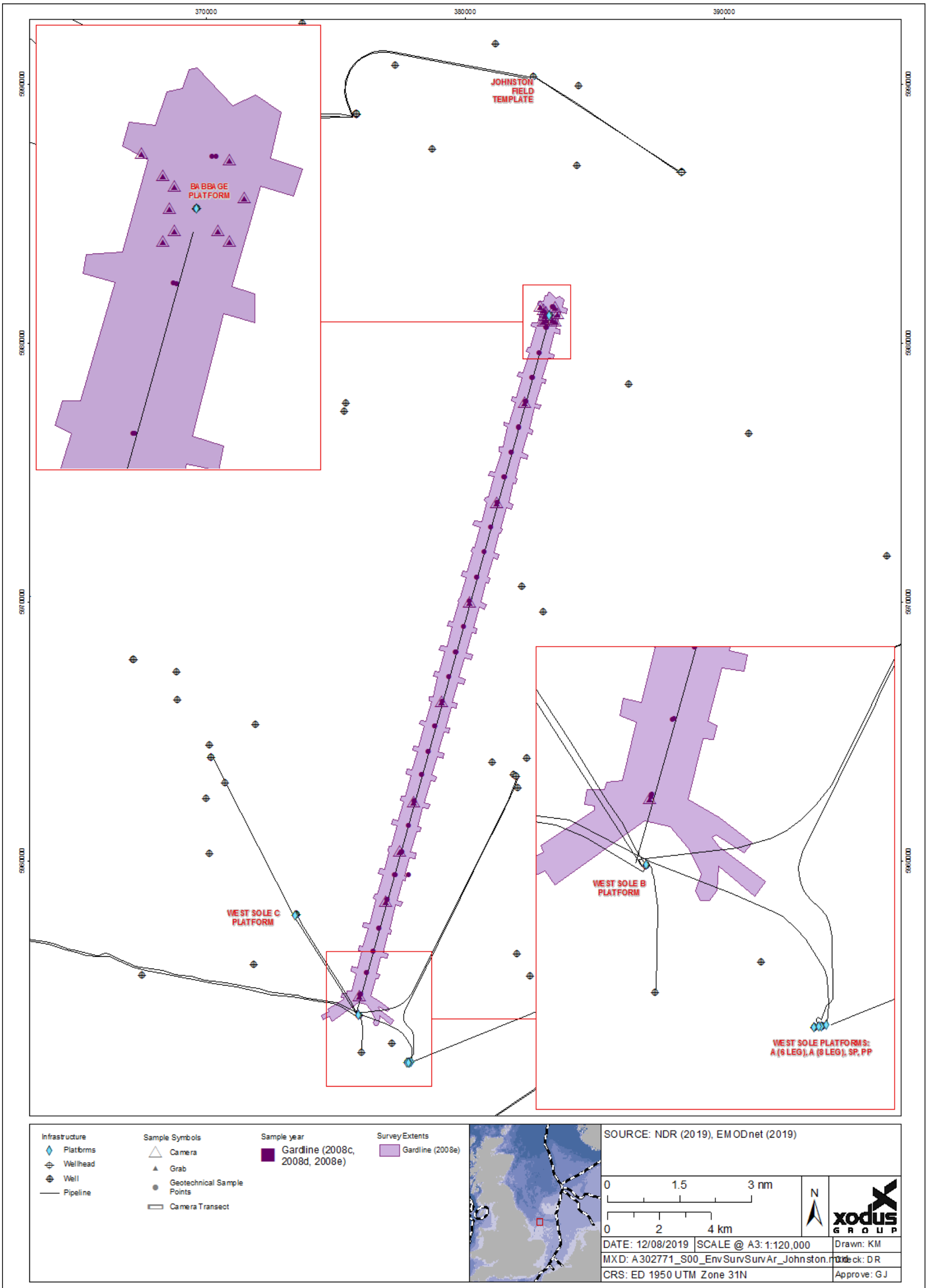

Figure 3-2 Babbage Geophysical Survey Effort and Sample Locations

3.2.3 Additional surveys

Additional seabed survey data from the Ravenspurn North area, dated between 1986 and 1993, are available from the UK Benthos database (Oil & Gas UK, 2019). These provide results from chemical and biological analyses of seabed sediment samples, including organic content, total hydrocarbon content, silt and clay content and faunal counts.

3.3 Summary of Receptors

The baseline environment in the project area is summarised in Table 3-1. For most receptors, the information provided in Table 3-1 is considered sufficient to inform the environmental assessment of potential impacts within this EA. Specific receptors identified during the Environmental Identification (ENVID) workshop and consultation meetings as potentially of specific interest to stakeholders included commercial fisheries, seabed and benthic environment and water quality. These receptors are discussed in more detail in the following Sections.

Table 3-1 Baseline Summary of Environmental and Societal Receptors

Environmental Receptor	Description
Key Conservation interests	
OSPAR (2008) List of Threatened and/or Declining Habitats and Species	
Ocean quahog (*Artica islandica)*	No evidence of ocean quahog (*A. islandica*) siphons were observed in any survey sampling.
Conservation sites	
Special Areas of Conservation (SACs)	The Johnston manifold and wellheads are situated within the Southern North Sea SAC, which has been identified for the protection of harbour porpoise – and overlaps with the Dogger bank SAC (JNCC, 2019a). The SNS site includes key winter and summer habitat for harbour porpoises and the overall SNS SAC covers an area over three times the size of Yorkshire, making it the largest SAC in UK and European waters at the point of designation in 2019.
Marine Conservation Zone (MCZ)	The closest MCZ to the Johnston Field is the Holderness Offshore MCZ located 32 km to the south west. The site is designated for a number of protected features including: North Sea glacial tunnel valleys, *A. islandica*, subtidal coarse sediments, subtidal mixed sediments and subtidal sand (DEFRA, 2019).
Special Protected Areas (SPAs)	The closest SPA is the Greater Wash SPA located approximately 71 km to the south west of the project area. The site is classified for the protection of red-throated diver (*Gavia stellata*), common scoter (*Melanitta nigra*), and little gull (*Hydrocoloeus minutus*) during non-breeding seacon, and for breeding sandwich tern (*Sterna sandvicensis*), common tern (*Sterna hirundo*) and little tern (*Sternula albifrons*).
Annex I Habitats	No Annex I habitats in any of the site-specific surveys. *Sabellaria spinulosa* was noted to be absent (Gardline, 2008a; 2008b; 2008c).
Conservation Species	
Coastal and Offshore Annex II species most likely to be present in the project area	
Pinnipeds – Harbour and Grey Seals	Pinnipeds are not expected in significant numbers, with densities estimated at approximately 0.53 and 3.5 individuals per 25 km^2 for harbour and grey seals. This is due to the site being approximately 84 km offshore (SMRU and Marine Scotland, 2017).

Environmental Receptor	Description
European Protected Species most likely to be present in the project area	
Harbour porpoise	The harbour porpoise (*Phocoena phocoena)* is a small species of cetacean that is common to all UK waters. As such, harbour porpoise can also be found in the vicinity of the proposed decommissioning area in relative abundance. Particularly large numbers occur in or near the project area during the summer months, with a peak in numbers in July and August (Reid *et al.,* 2003; Hammond *et al.,* 2017). The relative density of harbour porpoise is roughly estimated at 0.6-0.7 animals/km^2 in the project area (Hammond *et al.,* 2017).
Minke whale	Minke whales (*Balaenoptera acutorostrata)* occur both on and beyond the continental shelf edge. When on the continental shelf minke whales predominantly occur in the western waters between Britain and Ireland and throughout the north-western and central North Sea (Reid *et al.,* 2003). Sightings in relation to the project area occur mainly in spring and the summer months (Reid *et al.,* 2003). Minke whale density is approximately 0.035-0.040 animals/km^2 in the region comprising Johnston (Hammond *et al.,* 2017).
White- beaked dolphin	The white-beaked dolphin (*Lagenorhynchus albirostris)* is found mostly in continental shelf waters with depths between 50 m and 100 m, and rarely out to the 200m isobath (Reid *et al.* 2003). Distribution of the species has been linked to sea surface temperature, local primary productivity and prey abundance. The species are roughly estimated to have a density of 0.20-0.25 animals/km^2 near the project area (Hammond *et al.,* 2017).
Benthic environment	
Seabed type	An environmental survey was undertaken at the Johnston Field in 2004 and revealed a habitat comprising shelly, silty, fine sand. Small sand ripples were observed in the 3 km by 3 km survey area (Gardline, 2004). Survey data is also available for the Ravenspurn Field which is located ~7 km to the west of the Johnston Field from sediments samples recovered between 1986 and 1993 (Oil & Gas UK, 2019). The survey data showed the sediments to be low in organic content (0.43% - 3.46%) with silt/clay content between 0.24% – 26.48% and an average of 2.4%. Of the 694 stations sampled, five stations recorded >10% fines (Oil & Gas UK, 2019). Debris assessment was undertaken within the Babbage platform area, ~10 km south of Johnston, the seabed sediments recorded were relatively uniform and comprised of very loose to dense slightly silty sand. A thin layer of gravely sand at the base of the Holocene sand was identified during sampling (Gardline, 2008c), which is consistent with the 2004 survey findings at the Johnston Field. These survey results are similar to the habitats described by the mapped seabed data suggesting the surveyed habitat is similar to that observed in the vicinity of the Johnston Field as sublittoral sand typically has up to 15% fines content (JNCC, 2019b).
Benthic Environment	Based on the similar seabed sediments, the community composition at the Johnston Field is expected to be similar to that reported at the Babbage Field. In the Babbage Field the polychaete species *Magelona mirabilis*, *Chaetozone gibber, Ophelia borealis* and *Scoloplos armiger* were the most abundant polychaetes overall but their dominance varied across samples dependent on sediment type. At some locations crustacean species were most abundant, in particular amphipods (*Bathyporeia* spp.), although in terms of number of taxa present polychaetes remained dominant. The presence of a number of rarer species across

Environmental Receptor	Description
	samples indicated the area is not subject to stress from pollution (Gardline, 2008a; 2008b; 2008c). The community composition at Johnston was relatively diverse and mainly comprised of psammophilous (sand-loving) species. The dominant species were the amphipod *Bathyporeia elegans*, small nemerteans polychaetes *Magelona filiformis* and *Spiophanes bombyx*, juvenile brittle stars, the burrowing polychaetes *Scoloplos armiger* and *Chaetozone christei*, the burrowing/interstitial crustaceans *Megaluropus agilis*, *Perioculoides longimanus* and *Pseudocuma longicornis*, and the bivalves *Abra alba* and *Phaxas pellucidus*. These species are all typically associated with clean sandy SNS substrates (Gardline, 2004).
Fish – spawning and nursery grounds	
Spawning grounds	The project area falls within the spawning grounds of cod (*Gadus morhua)*, herring (*Clupea harengus)*, lemon sole (*Microstromus kitt)*, mackerel (*Scomber scombrus)*, Norway lobster (*Nephrops norvegicus),* plaice (*Pleuronectes platessa)*, sandeel (*Ammodytidae spp.)*, sprat (*Sprattus sprattus)* and whiting (*Merlangius merlangus)* (Coull *et al.*, 1998; Ellis *et al.*, 2012).
Nursery grounds	The following species have nursery grounds in the vicinity of the project: anglerfish (*Lophius piscatorius)*, cod, herring, lemon sole, mackerel, Norway lobster, sandeel, sprat, spurdog (*Squalus acanthias)*, and whiting (Coull *et al.*, 1998; Ellis *et al.*, 2012).
Probability of 0 age group fish aggregation	Aires *et al.* (2014) provided modelled spatial representations of the predicted distribution of 0 age group fish (i.e. less than one year old). The modelling indicates the probability of 0 group fish species occurring in the Johnston Field area is low and largely limited to the following species: sprat and horse mackerel (*Trachurus trachurus).*
Seabirds	
According to the density maps provided in Kober *et al.* (2010), the following species could be found within the Johnston Field Area in medium densities include: northern fulmar (*Fulmarus glacialis*), great black-backed gull (*Larus marinus)*, black-legged kittiwake (*Rissa tridactyla),* common guillemot (*Uria aalge)*, herring gull (*Larus argentatus*), razorbill (*Alca torda)* and Atlantic puffin (*Fratercula arctica)* for winter months, and black-legged kittiwake, Arctic skua (*Stercorarius parasiticus*), and common tern (*S. hirundo)* during their breeding seasons (Kober *et al.,* 2010). Seabird Oil Sensitivity Index (SOSI) identifies areas at sea where seabirds are likely to be most sensitive to surface pollution (Webb *et al.*, 2016). Seabird vulnerability in Block 43/27 and its surrounds is extremely high between September and January, based on indirect assessments (Webb *et al.*, 2016). The remainder of the year, seabird vulnerability to oiling is highly variable. The risk of an oil spill from the proposed decommissioning activities at Johnston is negligible, as activities are due to take place after flushing and there are multiple preventative environmental management and vessel management systems in place.	

Seabird Oil Sensitivity Index (SOSI)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
43/21	1*	N	5*	5*	5	1	2	4	1	1*	1*	1
43/22	1*	5*	5	5*	2*	2	2	4	2	2*	1*	1
43/23	1*	5*	5	5*	2*	2	2	3	2	2*	1*	1
43/26	1*	2	1	1*	5	1	2	3	1	1*	1*	1
43/27	1*	3	5	1*	1	2	1	3	1	1*	1*	1
43/28	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1

Environmental Receptor	Description											
48/1	1*	2	2	2*	5	1	3	2	1	1*	1*	1
48/2	1*	2	1	1*	2	2	2	3	1	1*	1*	1
48/3	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1
Key	1 = Extremely high		2 = Very high			3 = High		4 = Medium		5 = Low	N = No data	
	* in light of coverage gaps, an indirect assessment of SOSI has been made											

Societal Receptor	Description
Commercial fishing	
Johnston is located in International Council for the Exploration of the Seas (ICES) Rectangle 37F1 (Scottish Government, 2020). Demersal species and shellfish are predominantly target by fisheries in the area. In total, 573 Te of fish were caught in 2019, with an equivalent value of £736,277. The total annual landings for Rectangle 37F1 were <0.12% of the total landings within the UKCS for each of the five most recent fishing years (2015-2019 inclusive). In 2019 fishing effort in ICES rectangle 37F1 was highest in May, together accounting for 17% of the total number of days fished (145 days), but the majority of months experienced disclosive levels of fishing (Scottish Government, 2020). Trawls were the most utilised gear in rectangle 37F1; in total, trawls contributed 65.6% of total fishing effort in ICES rectangle 37F1, with the remainder made up by traps in 2019 (Scottish Government, 2020).	

Fishing Landings in ICES Rectangle 37F1

Species type	2018		2017		2016		2015		2014	
	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)
Demersal	135	276,796	104	145,147	186	258,955	224	276,919	156	180,501
Pelagic	0	78	0	12	0	236	0	20	0	3
Shellfish	252	630,484	254	537,066	468	849,831	181	371,540	111	304,462
Total	**391**	**907,358**	**480**	**867,669**	**655**	**1,109,022**	**405**	**648,479**	**267**	**484,965**

Other sea users	
Shipping activity	Johnston is located in an area that experiences high shipping intensity (OGA, 2016).
Oil and Gas	The Johnston Field is located in the SNS in an area of extensive oil development with a number of fields located nearby. Oil and gas surface infrastructure within 30 km of the project area is described below [Note 1]:

Installation	Type	Operator	Distance & direction
Ravenspurn North	Platform	Perenco	7.00 km WSW
Babbage	Platform	NEO Energy	9.24 km SSE
Ravenspurn North ST2	Platform	Perenco	11.37 km WNW
Ravenspurn South A	Platform	Perenco	15.90 km WSW

Societal Receptor	Description			
	Ravenspurn North ST3	Platform	Perenco	19.41 km WNW
	Ravenspurn South B	Platform	Perenco	20.20 km WNW
	Ravenspurn South C	Platform	Perenco	25.38 km WNW
	Hoton	Platform	Perenco	27.05 km SSE
	Neptune	Platform	Perenco	28.21 km WSW
	Kilmar NUI	Platform	Alpha Petroleum	28.47 km NNE
	Garrow NUI	Platform	Alpha Petroleum	28.78 km NNW
	Hyde	**Platform**	**Perenco**	**29.10 km SSW**
Telecommunication	There are no cables in the direct vicinity of the project area. The closest submarine cable to Johnston is the disused Telecom UK-Germany cable, which is located 65 km to the north west (KIS-ORCA, 2019).			
Military activities	There are no military restrictions on Block 43/27 (Oil and Gas Authority, 2018).			
Renewables	The Johnston Field overlaps with the Hornsea Project 4 Lease Area. The wind farm development in the lease area is at the pre-application stage at the time of writing. Additionally, Hornsea 2 and 1 offshore wind farm developments are located 15.81 km and 33.21 km south east. Construction of Hornsea 1 was completed in 2020 and offshore construction of Hornsea 2 is ongoing.			
Wrecks	There are 17 wrecks in the vicinity of the Project Area, with the closest wreck located 5.79 km south west of the Project Area. The majority of the wrecks are unknown, and all are considered to be non-dangerous wrecks. Four of the 17 wrecks are named: Lapwing (possibly) located 6.50 km south east; Linda Louise located 10. 18 km south east; Syrian (possibly) located 17.66 km north west; and Flirt (possibly) located 17.94 km south east of the Project Area. There are no protected wrecks in the vicinity of the project area.			

Notes:

1. NUI = Normally Unmanned Installation; ST= Station

3.4 Seabed Habitats and Benthos

The seabed depth previously recorded at the Johnston Field ranges from approximately 38 m to 40.5 m lowest astronomical tide (LAT) in the vicinity of the Johnston Field (Gardline, 2004). The seabed across the survey area, which is shown on Figure 3-1, deepened gently to the north-west with a gradient of 1:500 and was generally featureless. Small sand ripples were observed in the 3 km by 3 km survey area. The vibrocores indicated that the Holocene shelly, silty sand became gravelly towards the base (Gardline, 2004).

Survey data is available for the Ravenspurn Field, located ~7 km to the west of the Johnston Field from sediments samples recovered between 1986 and 1993 (Oil & Gas UK, 2019). The survey data showed the sediments to be low in organic content (0.43% - 3.46%) with silt/clay content between 0.24% – 26.48% fines and an average of 2.4%. Of the 694 stations sampled, five stations recorded >10% fines (Oil & Gas UK, 2019).

Seabed sediments on the nearby Babbage to West Sole route and at Ravenspurn North were predominantly sand or sandy gravel, depending on the exposure of the underlying geology at the seabed

(Gardline, 2008a; 2008b; 2008c). Within the Johnston Field, all samples showed a sediment composition of >93% sand and particles had a mean size ranging from 2.37 µm to 2.48 µm which is considered fine sand (Gardline, 2004).

Debris assessment was undertaken within the Babbage platform area, ~10 km south of Johnston, the seabed sediments recorded were relatively uniform and comprised of very loose to dense slightly silty sand. A thin layer of gravely sand at the base of the Holocene sand was identified during sampling (Gardline, 2006), which is consistent with the 2004 survey findings at the Johnston Field (Gardline, 2004).

These survey results are similar to the habitats described by the mapped seabed data suggesting the surveyed habitat is similar to that observed in the vicinity of the Johnston Field as deep circalittoral sand, under the EUNIS habitat code A5.27, which typically has up to 15% fines content and described as fine sands or non-cohesive muddy sands (JNCC, 2019b).

Based on the similar seabed sediments, the community composition at the Johnston Field is expected to be similar to that reported at the Babbage Field (Gardline, 2008a; 2008b; 2008c). Visible epifauna was generally sparse, but increased at stations with higher proportions of gravel, cobbles and boulders. The main recorded taxa were crustaceans (*Cancer pagarus* and *Liocarcinus depurator*), anemones (*A. digitatum*) and hydroids, starfish and brittle stars (*A. rubens, Ophiura sp*.) (Gardline, 2008a; 2008b; 2008c).

The community composition at Johnston was relatively diverse and mainly comprised of psammophilous (sand-loving) species. The dominant species were the amphipod *B. elegans*, small nemerteans polychaetes *M. filiformis* and *S. bombyx*, juvenile brittle stars, the burrowing polychaetes *S. armiger* and *Chaetozone christei*, the burrowing/interstitial crustaceans *M. agilis*, *P. longimanus* and *P. longicornis*, and the bivalves *A. alba* and *P. pellucidus*. These species are all typically associated with clean sandy SNS substrates (Gardline, 2004).

Macrofauna were more varied across the nearby Babbage survey area. At the Babbage 'A' site and on the first part of the pipeline route polychaetes were the most abundant group, with *M. mirabilis* and *Chaetozone gibber* being the most abundant species. Between approximately KP3.5 and KP15.5, crustaceans were most abundant, largely due to increased numbers of amphipods (*Bathyporeia spp.),* although in terms of number of taxa present, polychaetes remained dominant. Throughout these two communities, diversity was high. Polychaetes were again most abundant between approximately KP15.5 and the end of the route but here the bristleworms (*O. borealis* and *S. armiger*) were the most abundant species, and species diversity was somewhat lower. The change in dominance was correlated to changes in sediment type. There were many species represented by a single individual, or found at a single station, indicating the area is not subject to stress from pollution, which would be expected to eliminate many of these rarer species (Gardline, 2008a; 2008b; 2008c). This is also consistent with the benthic assemblages present at the Ravenspurn North Development, located 9.6 km to the west in Block 43/26 (Oil and Gas UK, 2019; Perenco, 2019).

Surveys in the Ravenspurn Field (Oil & Gas UK, 2019) included grab sampling from the seabed (~7 km from Johnston). The dominant macrofaunal taxonomic groups found were echinoderms, annelids, arthropods and phoronids. Echinoderms comprised three of the ten most abundant species including (in descending order of abundance) the following species: *Amphiura chiajei*, *Amphiura filiformis* and *Echinocardium cordatum*. The remaining seven species included *Saccammina sphaerica*, *Pontophilus bispinosus*, *Mysella bidentate*, *Edwardsia* spp., *Chaetozone setosa*, *Tubulanus* spp. and *Nematoda* spp (Oil and Gas UK, 2019).

THC within the Johnston Field was generally in line with the background concentration for the SNS. THC levels were between 90 ng g^{-1} and 154 ng g^{-1} (Gardline, 2004). A survey of the Babbage area identified TOM content between 0.5% and 0.8%. TOC ranged from 0.2% to 0.4%. These levels were consistent

with past surveys conducted within Block 43/27, within which Johnston is located (Gardline, 2008a). The TOM range is also considered to be within background levels for sediment within 5 km of an installation in the SNS. Additionally, the results of the survey at Babbage indicate that the sediments are nutrient poor and therefore unlikely to have been exposed to significant anthropogenic nutrient enrichment (Gardline, 2008a).

Heavy metals were at background concentrations at most stations. Arsenic was slightly elevated at two pipeline route stations within the scope of the Babbage survey, above the OSPAR (2005) Background Assessment Criteria (BAC) of 25 $\mu g\ g^{-1}$, but in line with concentrations previously recorded in the area and therefore not unusual (Gardline, 2008a).

Cuttings piles, which are often the most obvious and long-term source of pollution from historic activity, are generally smaller in the SNS than other areas of the North Sea, since the shallow water and resulting stronger seabed currents tend to disperse discharged material more widely, and re-suspend and disperse any material that does form a coherent accumulation. Sidescan sonar picked up some localised reflective areas within the Johnston Field which indicated the presence of dispersed drilling mud/cuttings (Gardline, 2004).

Metals which are most characteristic of sediments contaminated with drilling mud or cuttings are barium, chromium, lead and zinc. Barium was low at all Babbage stations (between 140 $\mu g\ g^{-1}$ and 260 $\mu g\ g^{-1}$), which were comparable to past surveys of Block 43/27 (Gardline, 2008a). Within the Johnston Field barium concentrations were mostly <400 $\mu g\ g^{-1}$, except at one station which had a higher concentration of 580 $\mu g\ g^{-1}$ (Gardline, 2004).

The Babbage EBS report (Gardline, 2008a) compared the levels of a number of metals in the Babbage samples against levels reported in Block 43/27. Chromium, lead and zinc levels in Block 43/27 were 12 $\mu g\ g^{-1}$, 10.3 $\mu g\ g^{-1}$, and 11 $\mu g\ g^{-1}$ respectively, (as reported for the Johnston Field in Gardline, 2004) and all well below their respective OSPAR (2005) BAC levels and Background Concentrations (BCs). When compared to UKOOA (2001) mean background concentrations for the SNS, the three metals also fell within the expected levels (Gardline, 2008a). This suggests there is limited contamination due to cuttings in the Johnston Field.

Potential for herring spawning is considered very low along the majority of the route and low towards the West Sole end of the route. There was no evidence of species or habitats of conservation concern at either the Babbage drilling site or along the pipeline. *S. spinulosa* was noted to be absent (Gardline, 2008a; 2008b; 2008c).

3.5 Other Sea Users

3.5.1 Maritime Activities

The North Sea contains some of the world's busiest shipping routes, with significant traffic generated by vessels trading between ports at either side of the North Sea and the Baltic. North Sea oil and gas fields also generate moderate vessel traffic in the form of support vessels (DECC, 2016).

Regionally, the SNS contains numerous international ports and the area sees a moderate number of oil tankers, cargo vessels and ferries passing through (DTI, 2001). Shipping activity is assessed to be high in Block 43/27 (DECC, 2016; OGA, 2016). Figure 3-3 below illustrates the relative vessel activity surrounding Johnston.

An average of 9 or less vessel transits per week pass within the project area with the majority of traffic consisting of small to medium sized tankers ships (MMO, 2018). Other vessels that pass within the vicinity of the project area include passenger vessels, cargo vessels, dredging or underwater operation vessels, recreational vessels, unknown vessels, non-port service crafts, port service crafts and fishing

vessels. A composite from Automatic Identification System (AIS) tracks of vessels using the project area in 2015 is presented in Figure 3-4.

There are three renewable energy development sites within 40 km of Johnston. The Hornsea Project 4 Lease Area is located within the Project Area.

There is no military activity or military restrictions on Block 43/27 (OGA, 2018).

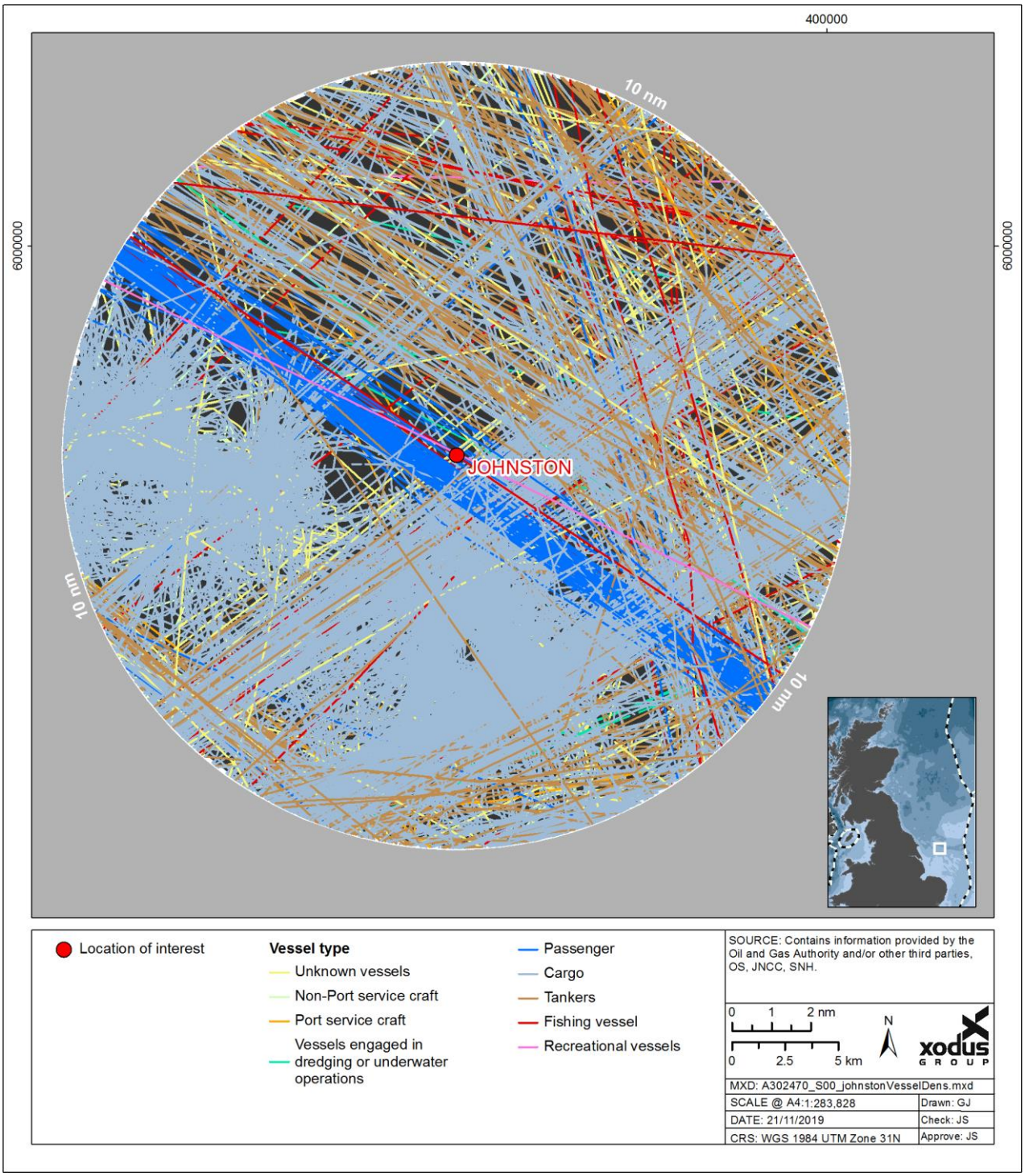

Figure 3-3 Vessel activity around Johnston over period July 2016 - June 2017 (MMO, 2017)

3.5.2 Commercial Fisheries

This Section describes the type of fishing vessels occurring in the area, the weight and value of fish landed in the UK and the fishing effort. The study area considered to be relevant for the decommissioning activities is shown in relation to ICES Rectangle 37F1. To provide the fullest picture of fisheries within the area, the associated landings and effort trends for ICES Rectangle 37F1 have been provided for the five most recent fishing years (2015-2019 inclusive; Table 3-2 and Table 3-3).

According to fishing data from the Scottish Government (2020), the waters comprising Johnston are fished for a variety of species by both UK and foreign vessels. Over the years ICES Rectangle 37F1 has been predominantly targeted for shellfish and demersal species (Table 3-2). For the last five fishing years, the total landings value in ICES Rectangle 37F1 was £4.2M, and the live weight was 2,505 Te (Table 3-2). Shellfish species had the highest live weight landing for the past four years and contributed the most to the overall landings weight total for the last five years. Pelagic catch has had a very low contribution to the species landings (Table 3-2). Shellfish contributed the greatest total and greatest average monetary value between 2015 and 2019 across Johnston. The total annual landings for Johnston (as defined by ICES Rectangle 37F1) were <0.12% of the total landings within the UKCS for each of the five most recent fishing years.

Average annual fishing effort, as a measure of total fishing days per annum, in ICES Rectangle 37F1 has been consistently low (<200 days), with the exception of 2016 in which 227 fishing days were recorded (Table 3-3). This corresponds to the peak in landings value and live weight tonnage in 2016. UK average effort, landings and live weight are consistently markedly higher than the equivalent findings within ICES Rectangle 37F1, although most recent years have seen a decreasing trend in effort, landings weight and value at both a UK level and within ICES Rectangle 37F1 (Table 3-3). When comparing between data sets, it is worthwhile considering the catch per unit effort (CPUE), a measure of the weight of catches versus per number of effort days (an indirect measure of fish availability). The average CPUE for ICES Rectangle 37F1 was 2.95 Te/day, which is slightly less than three quarters of the average for the UKCS across the same period (4.34 Te/day; Scottish Government, 2020).

Total fishing effort amounted to 145 effort days in ICES Rectangle 37F1 in 2019, and 135 days in 2018 as shown in Table 3-4. This represents a slight increase in effort compared to the preceding year, although is still lower than effort levels from 2017 and before. Effort within ICES Rectangle 37F1 has been recorded as disclosive or no data for several months (predominantly January, February, March, April, October, November and December) each year between 2015 and 2019, indicating low levels of fishing activity during those times. Fishing effort is generally highest between June and September. Trawls were most utilised gear type used in the ICES Rectangle 37F1 over all the years, other gear types used include traps and seine nets (Scottish Government, 2020). In 2019, trawls contributed 65.6% of total fishing effort in the ICES rectangle 37F1 with the remainder made up by traps (Scottish Government, 2020).

Table 3-2 Live Weight and Value of Fish and Shellfish from ICES Rectangle 37F1 Between 2015-2019 (Scottish Government, 2020)[1]

Species type	2019		2018		2017		2016		2015	
	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)
Demersal	283	129,649	135	276,773	227	339,689	186	258,955	224	276,919
Pelagic	1	1,619	0	78	0	37	0	236	0	20
Shellfish	289	605,009	256	630,487	254	534,461	468	849,831	181	371,540
Total	**573**	**736,277**	**391**	**907,338**	**481**	**874,188**	**655**	**1,109,022**	**405**	**648,479**
UK Landings Total	**493,075**	**767,721,934**	**555,570**	**764,993,803**	**565,635**	**725,854,084**	**564,680**	**729,378,317**	**547,426**	**574,430,213**

[1] All values are rounded to the nearest whole number. For purposes of identifying totals within the UK, disclosive data has not been included to limit the effects of zero-inflation on the results.

Table 3-3 Summary Statistic of Annual Fishing Effort by UK Vessels and Landings by UK and Non-UK Vessels Landing in UK within Johnston and Across the Wider UK[2] (Scottish Government, 2020)

Year	Within ICES Rectangle 37F1			Average Across the UK		
	Fishing effort (days)	Landings Value (£)	Live weight (Te)	Fishing effort (days)	Landings Value (£)	Live weight (Te)
2015	180	648,479	450	641	2,976,322	2,836
2016	227	1,109,022	655	618	3,610,784	2,795
2017	189	874,188	481	635	3,624,270	2,828
2018	135	907,338	391	618	3,805,939	2,764
2019	145	736,277	573	641	3,800,604	2,441
Annual average	**175**	**855,061**	**510**	**631**	**3,563,584**	**2,733**

Table 3-4 Number of Fishing Days per Month (all gear) for vessels landing into Scotland in ICES Rectangle 37F1 between 2015-2019 (Scottish Government, 2020)[3]

ICES Rectangle	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total[4]
37F1	2015	-	-	D	D	D	42	36	51	15	D	D	D	180
	2016	-	D	D	D	16	30	58	33	32	33	D	D	227
	2017	D	D	7	D	10	56	41	36	17	D	D	D	189
	2018	D	D	D	D	D	14	16	39	20	14	D	D	135
	2019	-	D	D	D	25	D	17	18	18	D	D	D	145

Note: Monthly fishing effort by UK vessels landing into UK: green = 0 – 100 days fished, yellow = 101 –200, orange = 201-300, red = ≥301, D = Disclosive data (indicating very low effort, specifically less than 5 over-10 m vessels undertook fishing activity in that month), - = no data

AIS recordings of fishing vessel movements from 2015 indicate vessel use is dominated by transiting vessels and trawling activity, based on the long 'legs' of vessel movement (Figure 3-4). Fishing vessel activity was generally low within Johnston compared to the surrounding waters and mostly comprised of transiting fishing vessels (Figure 3-4). There is increased fishing vessel movement to the north west of the Johnston Field which appears to be associated with demersal trawl fishing activity, such as *Nephrops* trawling activity based on the sweeping movement patterns (Figure 3-4). Additionally, fishing vessel movements to the south east of the Johnston Field likely constitutes creel fishing, based on the ladder movement patterns (Figure 3-4).

[2] All values are rounded to the nearest whole number. For purposes of identifying averages across the UK, disclosive data has not been included to limit the effects of zero-inflation on the results.

[3] Note: Monthly fishing effort by UK vessels landing into Scotland: "-" = no data, D = Disclosive data (indicating very low effort) [3], green = 0 – 100 days fished, yellow = 101 – 200, orange =201-300, red = ≥301.

[4] Disclosive data has not been considered in the totals.

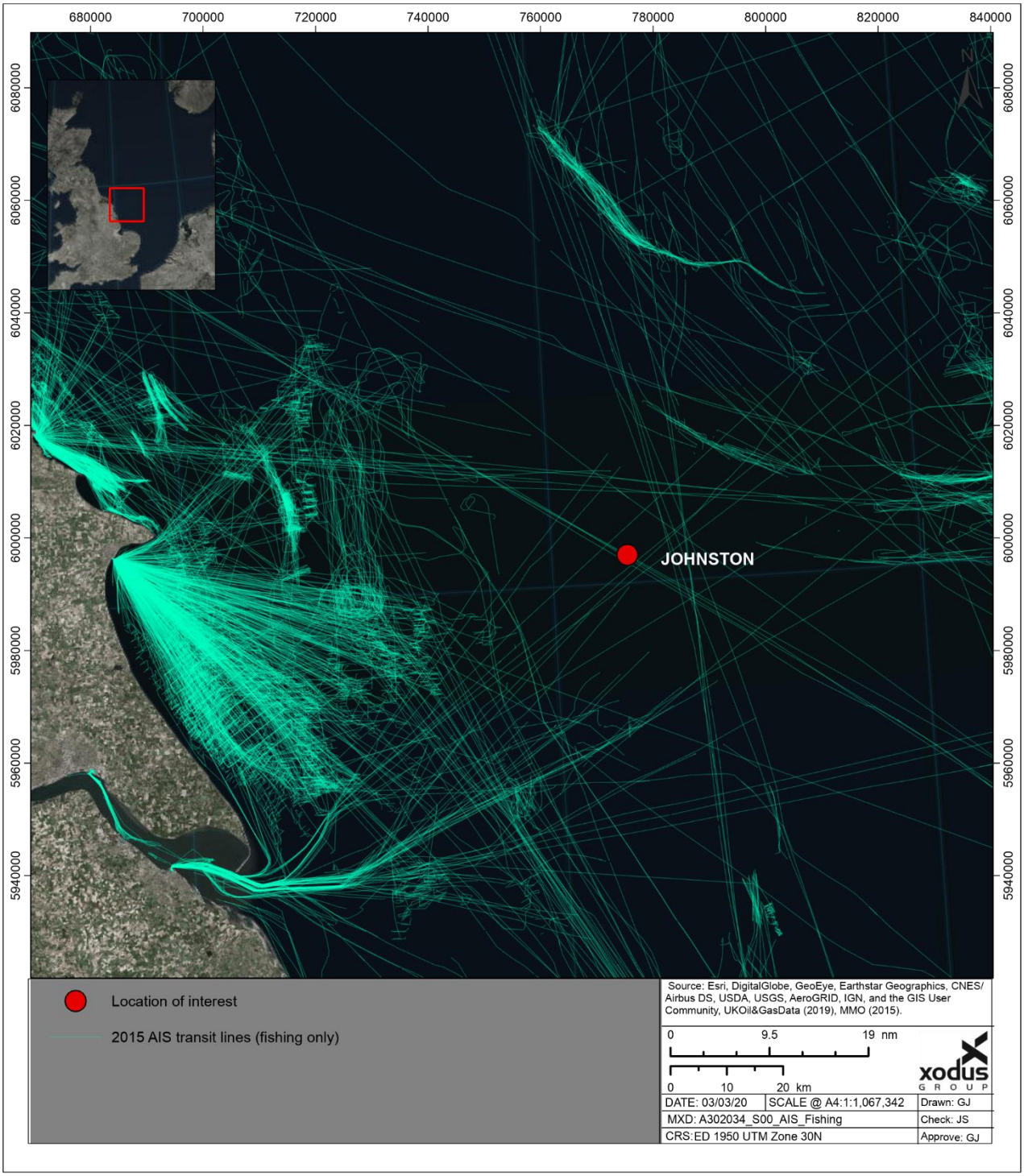

Figure 3-4 Automatic Identification System (AIS) Data for Commercial Fishing Vessels During the Year 2015 (MMO, 2017)

Amalgamated Vessel Monitoring System (VMS) data from 2007 – 2015 shows demersal trawling activity associated with oil and gas pipelines in this region (Figure 3-5). The fishing intensity is very low and increases slightly in the vicinity of the Johnston Field. ICES Rectangle 37F1 experiences low levels of trawling (i.e. between 5 – 20 tracks) on the majority of its pipelines, when compared to the rest of the UKCS (Rouse *et al.*, 2018; Figure 3-5). Furthermore, amalgamated VMS data from 2009-2013 which has been analysed to generate 'hotpots' of fishing density (i.e. through kernel density estimates) shows low levels of fishing by registered UK vessels (> 15 m) using *Nephrops* mobile gears and pelagic gear for

herring (Figure 3-6). Levels of fishing intensity for *Nephrops* mobile gears and pelagic fishing was low in the project area between 2009-2013 in comparison to other areas in the North Sea (Figure 3-6).

Nephrops along with crabs and plaice are the key commercial species landed from ICES Rectangle 37F1 for both value and weight for the five most recent fishing years. Figure 3-5 shows the relative trawling activity associated with pipelines within Johnston for both demersal and *Nephrops* fisheries between 2007-2015. *Nephrops* trawling activity was similar to total demersal trawls, however, higher levels of fishing activity occurred to the south west of the ICES Rectangle (Rouse *et al.*, 2018; Figure 3-5).

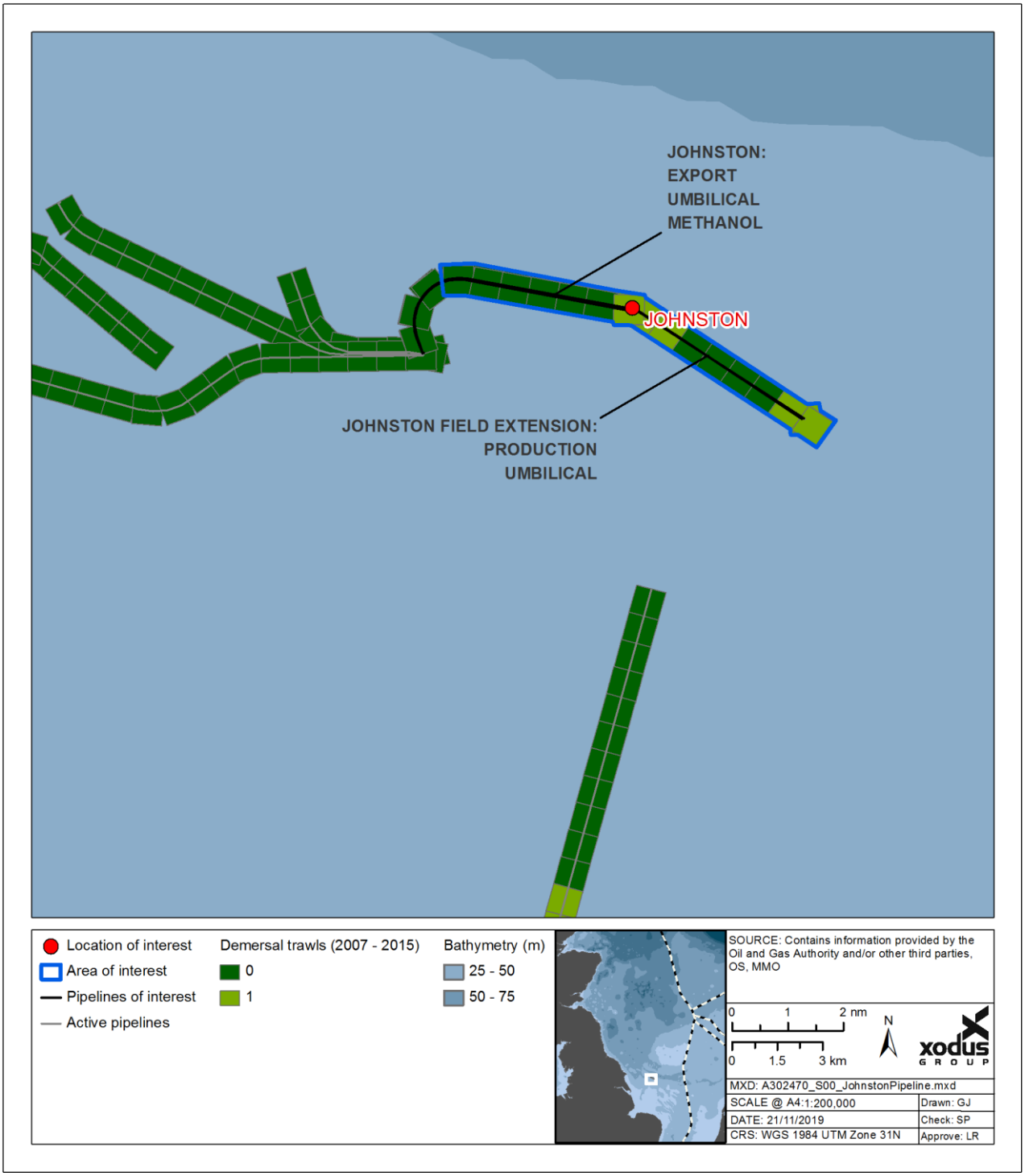

Figure 3-5 Relative Trawling Activity Associated with the Pipelines within Johnston (Rouse *et al.*, 2018)

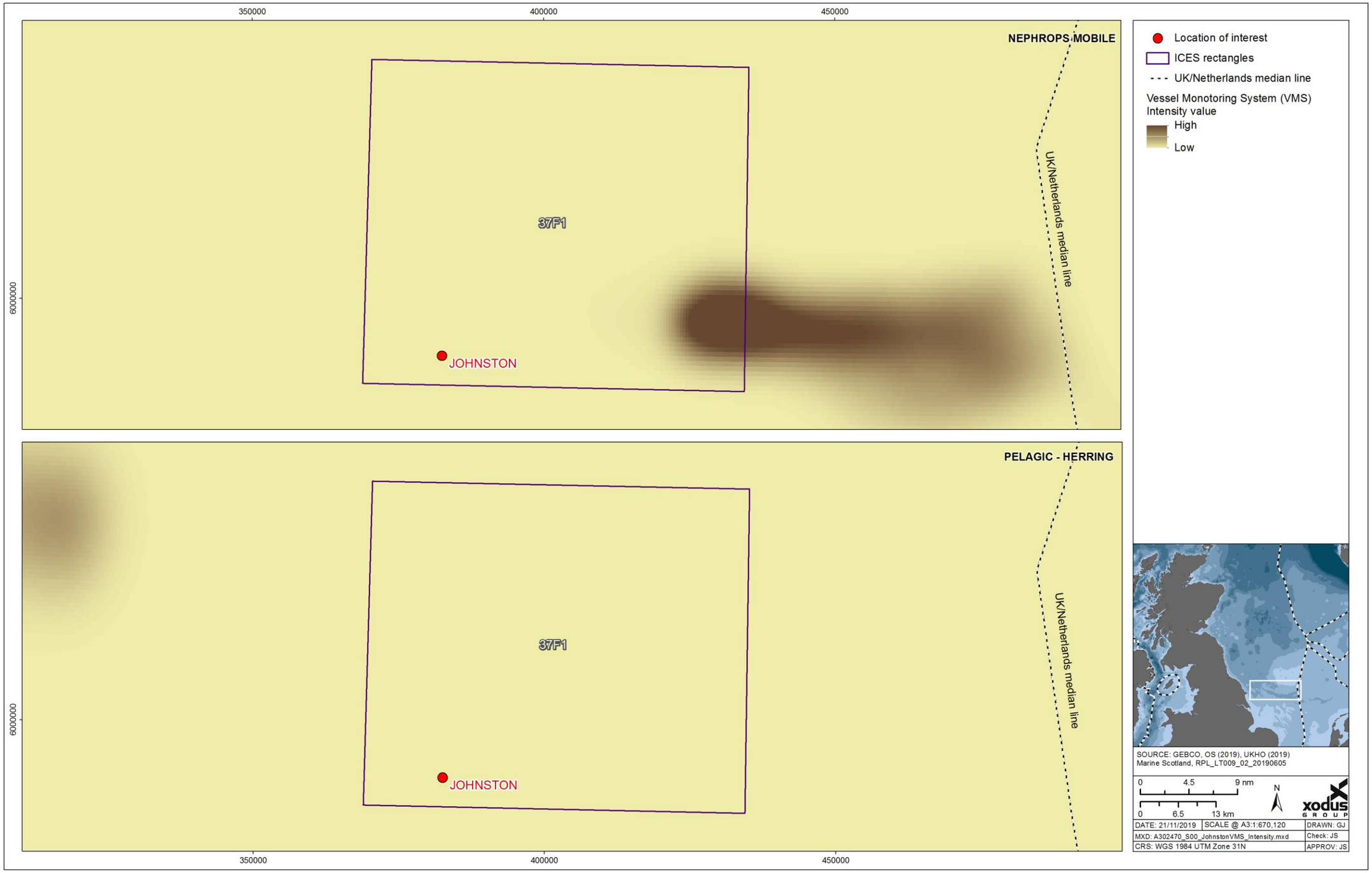

Figure 3-6 Vessel Monitoring Intensity for *Nephrops* (Mobile Gear) and Pelagic (Herring) Fisheries in ICES Rectangle 37F1 (2009 - 2013) (Marine Scotland, 2015)

3.6 Conservation Sites and Species

3.6.1 Offshore Conservation

There is one protected Marine Conservation Zone (MCZ) within 40 km of Johnston; the Holderness Offshore MCZ. The site is designated for a number of protected features including: North Sea glacial tunnel valleys, ocean quahog, subtidal coarse sediments, subtidal mixed sediments and subtidal sand (DEFRA, 2019). There was no evidence of ocean quahog siphons observed in any survey sampling (Gardline, 2008c). Although this does not definitively rule out the presence of this species either on the investigated transects or at the Johnston Field.

Johnston lies within the Southern North Sea SAC. This site is addressed in the following section.

3.6.1.1 Southern North Sea SAC

The Southern North Sea SAC has been identified as an area of importance for Annex II species harbour porpoise (*Phocoena phocoena*) and includes key winter and summer habitat for this species. Indeed, the SAC is considered to be "one of the best areas in the United Kingdom" for harbour porpoise. The habitat within the SAC is also highly suitable for the key prey species of harbour porpoise (JNCC, 2019c). The SAC covers a total area of 3,695,054 ha, making it the largest SAC in European waters (JNCC, 2019a). It is thought to support a population of between 11,864 and 28,889 individuals (JNCC, 2019d). Harbour porpoise are the most abundant cetacean species in UK waters, including the Johnston Field Area (Reid *et al.*, 2003; Hammond *et al.*, 2017). Further detail on the presence of protected species in the region is provided in Section 3.6.3.

The Conservation Objectives of the Southern North Sea SAC are as follows:

"To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters.

In the context of natural change, this will be achieved by ensuring that:

1. *Harbour porpoise is a viable component of the site;*
2. *There is no significant disturbance of the species; and*
3. *The condition of supporting habitats and processes, and the availability of prey is maintained."* (JNCC, 2019b).

The intention of the objectives is to minimise the risk of injury and fatality to harbour porpoise and also maintain the site for its use as habitat by the species. Disturbance of the species is considered significant if it leads to the exclusion of the species from a significant portion of the site. Noise disturbance *"within an SAC from a plan/project individually or in combination is significant if it excludes harbour porpoises from more than:*

1. *20% of the relevant area of the site in any given day, and*
2. *an average of 10% of the relevant area of the site over a season."* (JNCC, 2019b).

Pressures or threats to the conservation features of the Southern North Sea SAC which are considered high include: fishing and harvesting aquatic resources; exploration and extraction of oil or gas; and renewable abiotic energy use; whilst marine water pollution forms a moderate potential pressure. The following activities are thus considered to be of low threat to the integrity of the site: shipping lanes, ports, marine constructions; military use and civil unrest; and other ecosystem modifications (JNCC, 2019c).

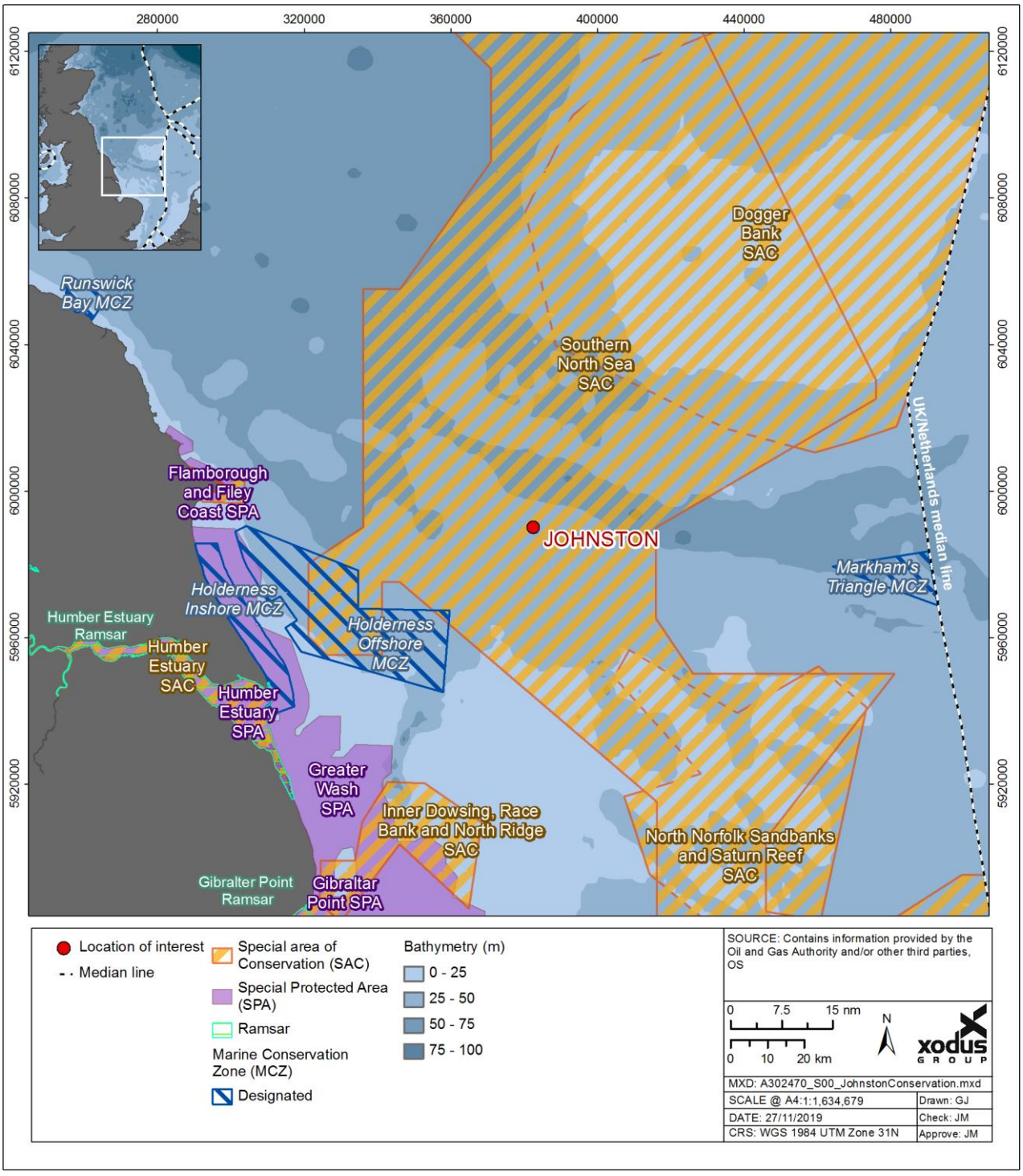

Figure 3-7 Protected Sites Proximal to Johnston

3.6.2 Onshore Conservation

Johnston is located approximately 84 km from the east coast of England. The closest onshore conservation site is the Greater Wash SPA the located approximately 71 km to the south west (Figure 3-7). The site is classified for the protection of red-throated diver (*G. stellata*), common scoter (*M. nigra*), and little gull (*H. minutus*) during non-breeding season, and for breeding sandwich tern (*S. sandvicensis*), common tern (*S. hirundo*) and little tern (*S. albifrons*). The risk of an oil spill from the

proposed operations at Johnston is considered to be high risk as the project area is close to shore and a potentially increase in seabird activity due to the Project Areas proximity to the Greater Wash SPA.

3.6.2.1 Seabirds

Much of the North Sea and its surrounding coastline is an internationally important breeding and feeding habitat for seabirds. The western flank of the Dogger Bank supports high densities of seabirds, with notable colonies on the east coast located at Flamborough Head and Bempton Cliffs, including black-legged kittiwake (*R. tridactyla)*, gannet (*Morus bassanus)*, guillemot (*U. aalge)*, razorbill (*A. torda)* and northern fulmar (*F. glacialis*) (DECC, 2016). Seabirds are not normally affected by routine offshore oil and gas operations. In the unlikely event of an oil release, however, birds are vulnerable to oiling from surface pollution, which could cause direct toxicity through ingestion, and hypothermia as a result of the birds' inability to waterproof their feathers. Birds are most vulnerable in the moulting season when they become flightless and spend a large amount of time on the water surface.

After the breeding season ends in June, large numbers of moulting auks (common guillemot and razorbill) disperse from their coastal colonies and into the offshore waters. At this time these high numbers of birds are particularly vulnerable to oil pollution. In addition to little auks, great black-backed gull and northern fulmar are present in sizable numbers during the post breeding season (DECC, 2016).

The Joint Nature Conservation Committee (JNCC) prepares the latest analysed trends in abundance, productivity, demographic parameters and diet of breeding seabirds, from the Seabird Monitoring Programme (JNCC, 2016). This data provides at-a-glance UK population trends as a percentage of change in breeding numbers from complete censuses. From the years 1998-2015, the following population trends for species known to use the field area have been recorded: northern fulmar (-31%), black legged kittiwake (-44%), and common guillemot (+5%). Breeding seabird numbers of some species have shown a long-term decline, most probably as a result of a shortage of key prey species such as sandeels associated with changes in oceanographic conditions (Baxter *et al.*, 2011: DECC, 2016).

According to the density maps provided in Kober *et al.* (2010), the following species have been recorded within the Johnston Field Area in low densities are: sooty shearwater (*Ardenna grisea*), manx shearwater (*Puffinus puffinus*), northern gannet (*M. bassanus*), great skua (*Stercorarius skua*), black-headed gull (*Chroicocephalus ridibundus*), little gull (*H. minutus*), common gull (*Larus canus*), lesser black-backed gull (*Larus fuscus*), sandwich tern (*Thalasseus sandvicensis*), common tern (*S. hirundo*), Arctic tern (*Sterna paradisaea*) and little auk (*Alle alle*). The following species are predicted to be in the Project Area in medium densities are: northern fulmar, pomarine skua (*Stercorarius pomarinus*), Arctic skua (*S. parasiticus*)(expected to be higher densities between September and November), black-legged kittiwake (*R. tridactyla*), great black-backed gull (*Larus marinus*) (medium to high in winter), herring gull (*L. argentatus*), common guillemot (*Uria aalge*), razorbill and Atlantic puffin (*F. arctica)* (Kober *et al.,* 2010).

The Seabird Oil Sensitivity Index (SOSI) (Webb *et al.*, 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution. It uses survey data collected between 1995 and 2015 and includes an improved method to calculate a single measure of seabird sensitivity to oil pollution. The survey area covers the UKCS and beyond. Seabird data was collected using boat-based, visual aerial, and digital video aerial survey techniques. This data was combined with individual species sensitivity index values and summed at each location to create a single measure of seabird sensitivity to oil pollution (Webb *et al.*, 2016). Block/month combinations that were not provided with data have been populated using the indirect assessment method provided by Webb *et al.* (2016).

Seabird oil sensitivity in the region of the Johnston Field ranges between low and extremely high throughout the year, with September to January, April, May and July being considered extremely high. There was no data for February in Block 43/21 in the vicinity (See Table 3-5).

Table 3-5 Seabird oil sensitivity in the Johnston Field and surrounding vicinity (Webb *et al.*, 2016)

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
43/21	1*	N	5*	5*	5	1	2	4	1	1*	1*	1
43/22	1*	5*	5	5*	2*	2	2	4	2	2*	1*	1
43/23	1*	5*	5	5*	2*	2	2	3	2	2*	1*	1
43/26	1*	2	1	1*	5	1	2	3	1	1*	1*	1
43/27	1*	3	5	1*	1	2	1	3	1	1*	1*	1
43/28	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1
48/1	1*	2	2	2*	5	1	3	2	1	1*	1*	1
48/2	1*	2	1	1*	2	2	2	3	1	1*	1*	1
48/3	1*	5*	5	5*	3*	3	1	4	1	1*	1*	1
Key	Extremely high		Very high		High		Medium		Low		No data	
* in light of coverage gaps, an indirect assessment of SOSI has been made												

Seabird distribution for kittiwake, guillemot, shag (*Phalacrocorax aristotelis*) and razorbill have been detailed in Figure 3-8. Kittiwake is the only species expected in low to medium distribution across the Johnston Field. Areas of high utilisation distribution are located to the east and the west of the Project Area. Guillemot, razorbill and shag utilisation distributions are focused closer to shore (Figure 3-8).

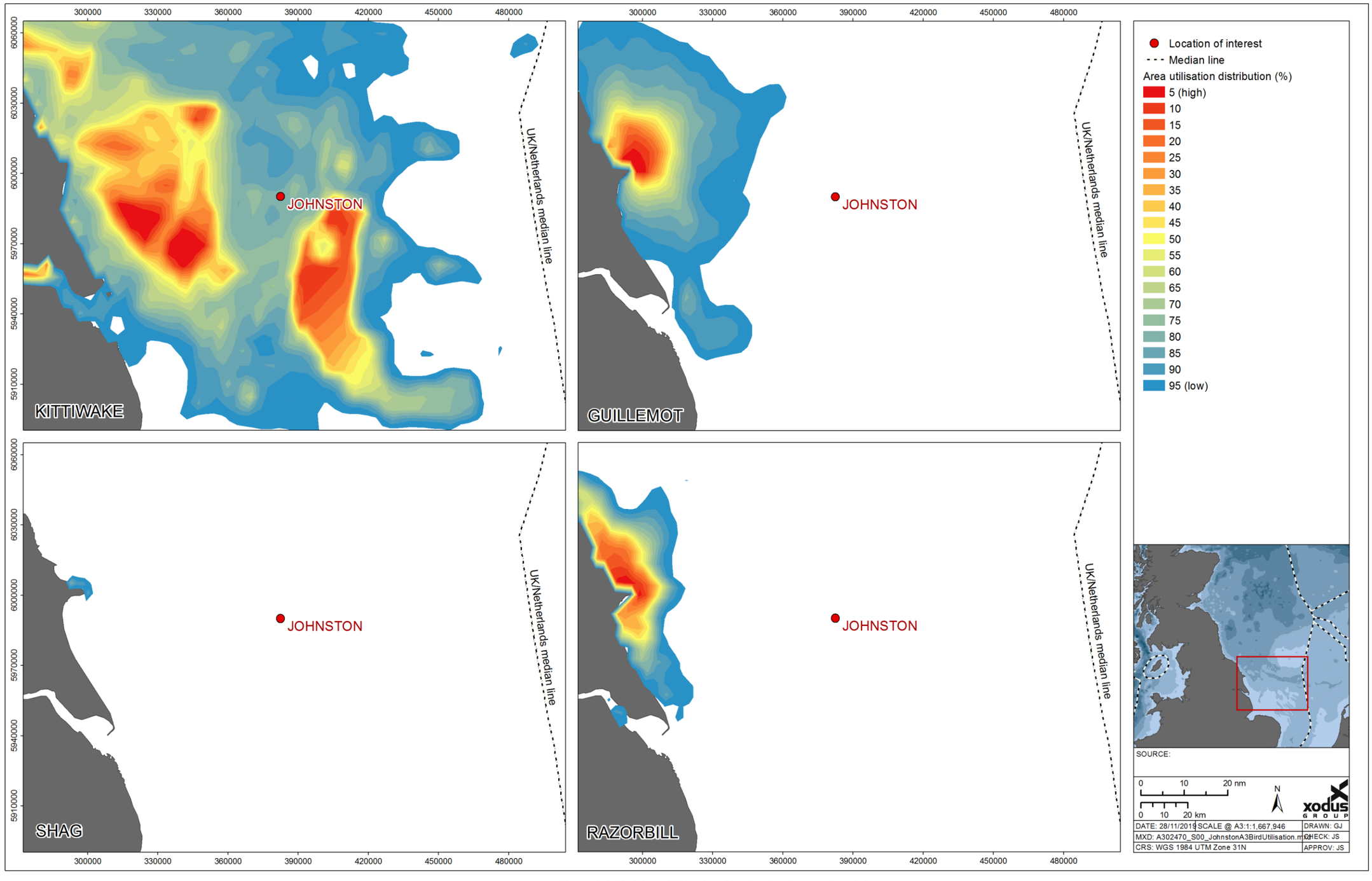

Figure 3-8 Bird Area Utilisation Distribution Proximal to Johnston

3.6.3 Protected Species

Marine mammals are afforded varying levels of protection under different international and national legislation depending upon their genus. Within English waters, all species of cetaceans (whales, dolphins and porpoises) are protected under Annex IV of the Habitats Directive and are considered European Protected Species (EPS). Other marine species listed as EPS under Annex IV include sea turtles and sturgeon (*Acipenser sturio*), which are very unlikely to be present within this region of the North Sea.

Bottlenose dolphin, harbour porpoise, grey and harbour seals gain additional protections in UK waters through Annex II of the Habitats Directive, which requires their consideration in the designation of Special Areas of Conservation (SACs). Pinnipeds (seals) are also protected through provisions set out in Annex V of the Habitats Directive, which defines them as species of community interest, in addition to their required consideration for the designation of SACs as defined in Annex II.

Harbour seals are unlikely to be observed near Johnston with any regularity, as both species have very low densities (see Section 3.2), and bottlenose dolphins do not regularly occur in this region of the Southern North Sea. Therefore, harbour porpoise and grey seals are the main Annex II species with potential to be present near Johnston during decommissioning activities.

3.6.3.1 Cetaceans

Compared to the central and northern North Sea, the SNS generally has a relatively low density of marine mammals, with the likely exception of harbour porpoise (*Phocoena phocoena*). While over ten species of cetacean have been recorded in the SNS, only harbour porpoise and white-beaked dolphin (*Lagenorhynchus albirostris)* can be considered as regularly occurring throughout most of the year, and minke whale (*Balaenoptera acutorostrata)* can be considered a frequent seasonal visitor. Bottlenose dolphin (*Tursiops truncatus)* and Atlantic white-sided dolphin (*Lagenorhynchus acutus)* can be considered uncommon visitors (DECC, 2016).

The following cetacean species are known to be sighted frequently or seasonally in the vicinity of the Johnston Field Area: harbour porpoise; minke whale*;* bottlenose dolphin*;* Atlantic white-sided dolphin and white-beaked dolphin (Reid *et al.*, 2003). Of these, harbour porpoise, white-beaked dolphin and minke whale regularly occur within the vicinity of the Johnston Field (Hammond *et al.,* 2017).

The following summarises those species regularly sighted within the Project Area:

- **Harbour porpoise** are the most abundant cetacean species in UK waters, including the region where the Johnston Field is located (Reid *et al.,* 2003; Hammond *et al.,* 2017). These small cetaceans are likely to be present across the Project Area throughout the year, with sightings peaking in the summer months and into September (Reid *et al.*, 2003). The European population of harbour porpoise is listed in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species as 'Least Concern' (IUCN, 2020), and have a Favourable Conservation Status (FCS) in UK waters (Hammond *et al.*, 2002).
- **Minke whale** are the smallest, most prevalent baleen whale to be sighted in UK waters (HWDT, 2018). Generally seen further offshore (i.e. around 200 m depths), individuals can be seen throughout, although sightings tend to peak between July and September (Reid *et al.,* 2003). Minke whales have a conservation listing of '*Near threatened*', meaning they are near qualifying for being listed as '*Vulnerable*' on the IUCN Red List of Threatened Species (IUCN, 2020), and have a FCS in UK waters (Hammond *et al.*, 2002).
- **White-beaked dolphin** are usual found in small groups number less than ten individuals. However, in the North Sea they can be found in aggregation between 100-500 individuals (Reid *et al.,* 2003). These small cetaceans are more likely to be present in the Project Area between June and October. White-beaked dolphins have a conservation status of 'Least

Concern' in the IUCN Red List of Threatened Species (IUCN, 2020), and have a FCS in UK waters (Hammond *et al.*, 2002).

The distribution, density, and abundance of the most commonly occurring cetacean species around the Project area are described in Table 3-6.

Table 3-6 Population parameters of cetacean species potentially present within the vicinity of the Johnston Field (density and abundance estimates taken from SCANS III Survey Block O; Hammond *et al.,* 2017)

Species name	Estimated density (individuals/km^2)	Eastimated total regional abundance (No. of individuals)	Management Unit (MU)/ biogeographical population estimate (IAMMWG, 2015)
Harbour porpoise	0.888	53,485	227,298
Minke whale	0.010	603	23,528
White-beaked dolphins	0.002	143	15,895

Density estimates from the most recent Small Cetaceans in the European Atlantic and North Sea (SCANS-III) illustrate that all species for which there is population data across the Project Area, have low population densities and abundances with the exception of harbour porpoise (Hammond *et al.*, 2017; Table 3-6).

The surveys show harbour porpoise to be the most abundant species in the vicinity of the Johnston Field. The estimated density is considered to be high compared to the other regions of the North Sea (Hammond *et al.,* 2017). Minke whales and white-beaked dolphins estimated densities are considered to be low in comparison. Whilst some individuals or groups may be sighted in the vicinity of the Johnston Field, these would be decidedly rare and are not expected to be encountered during Project activities. Based on available sightings data, it is unlikely that minke whales or white-beaked dolphins would occur in such high densities in the vicinity of the Johnston Field (Evans *et al.,* 2011; Reid *et al.*, 2003; Weir *et al.*, 2001).

3.6.3.2 Pinnipeds

Two species of pinniped regularly occur in the North Sea: grey seals (*Halichoerus grypus)* and harbour seals (*Phoca vitulina)*.

Grey and harbour seals forage in coastal and offshore waters, depending on the seasonal distribution of their prey. However, both species tend to be concentrated close to shore, particularly during the pupping seasons which occur from May to July for harbour seals and September to December for grey seals (Marine Scotland, 2014a). Grey seals have larger foraging ranges than harbour seals, often travelling hundreds of kilometres, whereas harbour seals will generally forage within 50 km of their selected haul out sites (SCOS, 2018; Thompson *et al.*, 1996). There are two SACs designated for the protection of seal located to the east England, this includes the Humber Estuary SAC located 84.7 km to the south west and the Wash and North Norfolk Coast located 111.5 km to the south east of the Project Area. These are considered outwith the range for potential impacts.

Harbour and grey seal distributions are considered to be low in the vicinity of the Johnson Field. Harbour seals densities range between 0-1 number/ 25 km^2 and grey seal between 1.1-5 number/ 25 km^2 (SMRU and Marine Scotland, 2017). While it is unlikely harbour seal will be sited due to the distance of the Project Area from shore, it is possible that grey seals will be sited in the vicinity of the Johnston Field in low densities.

3.6.4 Marine Plan Areas

Marine Plans (MPs) cover the management of both English inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The aim of the MPs is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the Marine Plan Areas. The proposed operations as described in this permit have been assessed against the Marine Plan Objectives and policies.

The UK is divided into marine planning regions with an associated plan authority who prepares a MP for each area, in England, the MMO is the planning authority. There are eleven MP areas in English waters, the Johnston Field is located within the East Offshore MP area. The East Offshore MP area encompasses the marine environment from 12 nautical miles out to the Exclusive Economic Zone (the maritime borders with the Netherlands, Belgium and France), covering a total of approximately 49,000 km^2. The proposed operations do not contradict any of the marine plan objectives and policies. Premier will ensure they comply with all new policies and objectives that have been introduced, with particular attention being made to the following objectives: 1, 5, 6, 7, 8, 9, and 10, and the following policies which underpin them: OG1, SOC2, SOC3, ECO1, BIO1, MPA1, CC1, CC2, and GOV2. The following Sections describe the aims of each policy and how Premier's commitments will ensure that the MP objectives will not be contravened.

3.6.4.1 Objective 1: Economic Productivity

Development and use of the marine area should be consistent with the MP, ensuring activities are undertaken in a sustainable manner taking account of spatial requirements of other activities of importance to the East MP areas. There are no policies that directly link to this project under Objective 1. However, Premier will ensure that any potential impacts associated with the Johnston decommissioning operations will be kept to a minimum.

3.6.4.2 Objective 5: Heritage Assets

The objective aims to conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area. The following policies (SOC2 and SOC3) are of particular relevance. Premier will ensure that any potential impacts to protected species and sites associated with Johnston decommissioning operations will be kept to a minimum.

Policy SOC2

Developments that may affect heritage assets should demonstrate, in order of preference:

- that they will not compromise or harm elements which contribute to the significance of the heritage asset;
- how, if there is compromise or harm to a heritage asset, this will be minimised;
- how, where compromise or harm to a heritage asset cannot be minimised it will be mitigated against; or,
- the public benefits for proceeding with the proposal if it is not possible to minimise or mitigate compromise or harm to the heritage asset.

Mitigation measures will be in place to minimise the potential impacts to conservation sites within the vicinity of Johnston.

Policy SOC3

Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference:

- that they will not adversely impact the terrestrial and marine character of an area;
- how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them;

- how, where these adverse impacts on the terrestrial and marine character of an area cannot be minimised they will be mitigated against;
- the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts.

Measures will be in place to minimise the potential impacts to the marine character within the vicinity of Johnston.

3.6.4.3 Objective 6: Healthy Ecosystems

This objective aims to ensure a healthy, resilient and adaptable marine ecosystem in the East marine plan areas. Within this objective, ecological and chemical water quality, air quality, and noise are most pertinent to the Johnston decommissioning. Discussion surrounding these topics is provided within the Marine Plan and is described below. Within Objective 6, Policy ECO1 is relevant to the project.

Ecological and chemical water quality – general

Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply. Premier will ensure that any potential impacts to water quality associated with Johnston decommissioning operations will be kept to a minimum.

Air quality

Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits. Some developments may result in increased emissions to air, including particulate matter and gasses. Impacts on relevant statutory air quality limits must be taken into account and mitigation measures adopted, if necessary, to allow an activity to proceed within these limits. The Sustainability Appraisal does not indicate the need for any specific East Inshore MP policies on air quality. Premier will ensure that any potential impacts to air quality with Johnston decommissioning operations will be kept to a minimum.

Noise

The Marine Policy Statement outlines issues to consider in relation to noise, including the potential for adverse effects on wildlife and on people, and existing legislation and requirements. In addition, reference should be made to targets and indicators to address Marine Strategy Framework Directive Descriptor 11 'Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment'. More research and evidence is required to understand the effects of noise and determine if and what further measures are required.

Premier will ensure that noise generated by the project will be kept to minimal levels to align with the MP objectives and policy.

Policy ECO1

Cumulative impacts affecting the ecosystem of the MP area should be addressed in decision making and plan implementation. Premier will ensure that any potential impacts to air and water quality and biological communities with Johnston decommissioning operations will be kept to a minimum.

3.6.4.4 Objective 7: Biodiversity

Objective 7 aims to protect, conserve and, where appropriate, recover biodiversity that is in or dependent upon the East MP areas. Potential impacts to biodiversity as a result of the decommissioning activities have been addressed throughout Section 3 of the EA.

Policy BIO1

Appropriate weight should be attached to biodiversity, reflecting the need to protect biodiversity as a whole, taking account of the best available evidence including on habitats and species that are protected

or of conservation concern in the East MPs and adjacent areas (marine, terrestrial). Premier will ensure that potential impacts are reduced as far as practicable to minimise the potential impact of the decommissioning on local biodiversity.

3.6.4.5 Objective 8: Designated conservation sites

This objective aims intends support the objectives of MPAs (and other designated sites around the coast that overlap, or are adjacent to the East MP areas), individually and as part of an ecologically coherent network. Conservation sites proximal to the Johnston Field are detailed in Section 3.6, as are the conservation objectives in relation to the proposed decommissioning activities. Premier will ensure that impacts associated with the decommissioning will be minimised as far as possible thereby reducing the potential impact on conservation areas, in line with the following policy.

Policy MPA1

Any impacts on the overall MPA network must be taken account of in strategic level measures and assessments, with due regard given to any current agreed advice on an ecologically coherent network.

3.6.4.6 Objective 9: Climate Change

This objective aims to facilitate action on climate change adaptation and mitigation in the East MP areas. Premier will minimise atmospheric emissions production and resource use associated with the decommissioning as far as practicable to align with the following MP policies.

Policy CC1

Marine planners and decision makers should take into account:

- how they may be impacted upon by, and respond to, climate change over their lifetime; and,
- how they may impact upon any climate change adaptation measures elsewhere during their lifetime.

Where detrimental impacts on climate change adaptation measures are identified, evidence should be provided as to how the proposal will reduce such impacts. Premier will ensure that any potential impacts associated with Johnston decommissioning operations will be kept to a minimum.

Policy CC2

Proposals for development should minimise emissions of greenhouse gases as far as is appropriate. Mitigation measures will also be encouraged where emissions remain following minimising steps. Consideration should also be given to emissions from other activities or users affected by the proposal. Where possible, measures will be undertaken by Premier to reduce emissions associated with the project.

3.6.4.7 Objective 10: Governance

This MP objective is to ensure its integration with other plans, and in the regulation and management of key activities and issues, in the East MPs, and adjacent areas. The GOV2 policy regarding co-existence is of relevance to the Johnston decommissioning project, and is detailed below.

Policy GOV2

Opportunities for co-existence should be maximised wherever possible. Premier will ensure that any potential impacts on other sea users associated with the proposed Johnston decommissioning operations will be kept to a minimum.

4 EA METHODOLOGY

The Impact assessment is designed to: (1) identify potential impacts to environmental and societal receptors from the proposed decommissioning activities; (2) evaluate the potential significance of any identified impacts in terms of the threat that they pose to these receptors; and (3) assign measures to manage the risks in line with industry best practice; and address concerns or issues raised by stakeholders through consolation.

The impact assessment was undertaken using the following approach:

1 The potential environmental issues arising from decommissioning activities were identified through a combination of the expert judgement of project engineers and marine environmental specialists in a screening workshop, and consultation with key stakeholders (Section 4.1). The potential environmental issues were grouped under the following key receptor risk groups:
   - Atmospheric emissions;
   - Disturbance to the seabed;
   - Physical presence;
   - Discharges to sea;
   - Underwater noise;
   - Resource use;
   - Onshore activities;
   - Waste; and
   - Unplanned events.

2 Undertake initial screening based on a high-level consideration of these aspects against the evaluation criteria. Screening aspects in or out of further detailed assessment. Justification statements will be compiled detailing the rationale for screening out any aspects from further assessment (Section 5.1).
   - For aspects which are considered potentially significant, evaluate significance of potential impacts against impact criteria definitions (Section 4); and
   - For any potentially significant impact, capture any potential mitigation and/or control measures to be used to further reduce any impact to ‘as low as reasonably practicable’ (ALARP).

4.1 Stakeholder Engagement

The consultation for the Johnston Field decommissioning has been largely based on sharing project expectations, approach and specific considerations with key stakeholders including:

- National Federation of Fisherman’s Organisations (NFFO);
- Joint Nature Conservation Committee (JNCC);
- Marine Management Organisation (MMO);
- Oil & Gas UK (OGUK);
- OPRED Environmental Management Team (EMT);
- OPRED Offshore Decommissioning Unit (ODU) (observers); and
- Environment Agency.

This is summarised in Table 4-1 and full details of the consultation to date are provided in Section 5 of the DP (Premier, 2019).

Table 4-1 Stakeholder Issues and Concerns Raised Through Consultation

Relevant Party	Comments/Concerns Raised	Response & EA Section where addressed
Informal Consultations		
NFFO, JNCC, MMO, OGUK, OPRED EMT, OPRED ODU (observers), Neptune E&P UKCS Limited.	Premier has engaged with interested parties and stakeholders who participated in CA workshops. No objections have been raised to date.	N/A
Statutory Consultations		
NFFO	No objections have been raised to date.	N/A
Environment Agency	No objections have been raised to date.	N/A
OPRED EMT and ODU / BEIS	A Scoping Letter has been issued and initial engagement has been undertaken for future survey planning. The following important response has been considered throughout the report: It is noted that a potentially significant area of impact has been identified from overtrawling. Over-trawl verification surveys should normally only be required and undertaken if the area has not been open to fishing during the operational phase, and there is evidence that infrastructure, debris or any other obstructions could remain on the seabed and interfere with future fishing operations. Over-trawl verification surveys should be avoided in areas where there are sensitive seabed features or organisms that could be adversely impacted. Where geophysical surveys and ROV recovery operations have been undertaken and there is no evidence that infrastructure, debris or any other obstructions remain on the seabed, the report of the recovery operations should be accepted as equally valid verification that there is unlikely to be interference with future fishing operations. On that basis we request that the area of impact from overtrawl is reviewed and refined to focus on those areas where overtrawl will realistically be required.	Section 2.4.7 – Clear Seabed Verification; Section 6.1 - Seabed Impacts; and Section 6.2 – Commercial Fisheries
JNCC	A Scoping Letter has been issued and comments received. In addition to minor	

Relevant Party	Comments/Concerns Raised	Response & EA Section where addressed
	comments, the following important comments have been considered:	
	Survey data should at least include the area of proposed operations, unless justification is provided as to why wider area surveys are sufficiently representative of conditions at the site of proposed operations.	Section 3.2 – Summary of Environmental Surveys
	Survey data should provide adequate evidence that habitats and species of nature conservation concern (including Annex I habitats) are or are not present.	
	It is good practice to include a diagram indicating the surveyed area in the context of the proposed activity and to identify any sample points or the location of photographic evidence. Data provided should also include high resolution acoustic data, video and / or still images.	
	As per BEIS 2018, the environmental description should focus on that of the actual area to be developed/decommissioned and not just provide a generic description of the local environment. Evidence should be presented within the application confirming that the data are still relevant.	
	Any gaps or limitations in environmental information should be acknowledged with, where appropriate, strategies to address these gaps or limitations.	
	We would highlight that when using the SOSI for assessment that blocks surrounding the operations should also be reviewed and not just the "central" block.	Section 3.3– Summary of Receptors
	With regards to the location of the Johnston Field being in the Southern North Sea SAC, the following comment has been considered within the EA: Applicants are required to provide regulators with sufficient information to enable them to undertake a Habitats Regulations Appraisal.	Section 3.6 - Conservation Sites and Species and Section 6.1 - Seabed Impacts
	Preference will be given to an approach not impacting on the seabed for example using side scan sonar data to show a clear seabed, although we note the assessment	Section 2.4.7 – Clear Seabed Verification;

Relevant Party	Comments/Concerns Raised	Response & EA Section where addressed
	demonstrates the worst case impacts from overtrawl survey, suggest include option to utilise methods which minimise seabed impacts where possible as this seems to be an area of increasing concern from JNCC.	Section 6.1 - Seabed Impacts; and Section 6.2 – Commercial Fisheries

4.2 EA Process

4.2.1 Overview

Whether a project is likely to significantly impact on the environment is the core principle of the environmental impact assessment process. The methods used for identifying and assessing potential impacts should be transparent and verifiable.

The method presented here has been developed using the following sources:

- The Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for marine impact assessment (CIEEM, 2018);
- The Marine Life Information Network (MarLIN) species and ecosystem sensitivities guidelines;
- The Institute of Environmental Management and Assessment (IEMA) in their guidelines for environmental impact assessment (IEMA, 2015; 2016).

Environmental impact assessment provides an assessment of the environmental and societal effects that may result from a project's impact on the receiving environment. The terms impact and effect have different definitions in environmental impact assessment, and one drives the other. Impacts are defined as the changes resulting from an action, and effects are defined as the consequences of those impacts.

In general, impacts are specific, measurable changes in the receiving environment (volume, time and/or area); for example, were a number of marine mammals to be disturbed following exposure to vessel noise emissions. Effects (the consequences of those impacts) consider the response of a receptor to an impact; for example, the effect of the marine mammal/noise impact example given above might be exclusion from an area caused by disturbance, leading to a population decline. The relationship between impacts and effects is not always so straightforward; for example, a secondary effect may result in both a direct and indirect impact on a single receptor. There may also be circumstances where a receptor is not sensitive to a particular impact and thus there will be no significant effects/consequences.

For each impact, the assessment identifies a receptor's sensitivity and vulnerability to that effect and implements a systematic approach to understand the level of impact. The process considers the following:

- Assessment of the consequence/extent of the impact, defined by the nature and type of impact, and the spatial extent of the impact on the receptor;
- Identification of the duration and frequency of the effect of the receptor;
- Definition of magnitude of impact, based on the magnitude of the shift from the environmental baseline conditions;
- Definition of the probability of impacts; and
- Ranking of impact significance, considering the probability that it will occur, the spatial and temporal extent and the magnitude of the impact and any residual effects after mitigations are applied.

Each of these variables are expanded upon in the following Sections to provide consistent definitions across all EA topics. In each impact assessment, these terms are used in the assessment summary table to summarise the impact and are enlarged upon as necessary in any supporting text. It should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

Once the consequence of a potential impact has been assessed it is possible to identify measures that can be taken to mitigate impacts through engineering decisions or execution of the project. This process also identifies aspects of the project that may require monitoring, such as a post-decommissioning survey at the completion of the works to inform inspection reports.

For some impacts significance criteria are standard or numerically based. For others, for which no applicable limits, standards or guideline values exist, a more qualitative approach is required. This involves assessing significance using professional judgement.

Despite the assessment of impact significance being a subjective process, a defined methodology has been used to make the assessment as objective as possible and consistent across different topics. The assessment process is summarised below. The terms and criteria associated with the impact assessment process are described and defined; details on how these are combined to assess consequence and impact significance are then provided.

4.2.2 Baseline Characterisation

In order to make an assessment of potential impacts on the environment it was necessary to firstly characterise the different aspects of the environment that could potentially be affected (the baseline environment). The baseline environment has been described in Section 3 and is based on desk studies combined with additional site-specific studies such as surveys and modelling where required. Information obtained through consultation with key stakeholders was also used to help characterise specific aspects of the environment in more detail.

The EA process requires identification of potential receptors which could be affected by the Johnston Decommissioning Project (e.g. commercial fisheries, seabed impacts, etc.). High level receptors are identified within the impact assessments (Section 4).

4.2.3 Impact Definition

4.2.3.1 Impact Consequence/Extent

The impact consequence is based on the geographical extent, as described in Table 4-2.

Table 4-2 Impact Consequence Criteria

Ranking	Consequence	Criteria
High	**Major**	Extent of change: Impact occurs over a large scale or spatial geographical extent.
Medium	**Moderate**	Extent of change: Impact occurs over a local to medium scale/spatial extent and/or has a prolonged duration.
Medium	**Minor**	Extent of change: Impact occurs on-site or is localised in scale/spatial extent.
Low	**Negligible**	Extent of change: Impact is highly localised.

4.2.3.2 Duration/Frequency of Effect

The duration of effect is key to determining the final ranking of impact significance. This criteria takes account of:

- Duration over which the impact is likely to occur e.g. days, weeks; and

- Frequency and/or intensity of impact, i.e. how often the impact is expected to occur.

These variables are defined in Table 4-3 and Table 4-4, and the overall ranking methodology of duration of effects is provided in Table 4-5.

Table 4-3 Definition of Duration Criteria

Duration	Definition
Short-term	Impacts that are predicted to last for a short duration (e.g. less than one year).
Temporary	Impacts that are predicted to last a limited period (e.g. a few years). For example, impacts that occur during the decommissioning activities and which do not extend beyond the main activity period for the works or which, due to the timescale for mitigation, reinstatement or natural recovery, continue for only a limited time beyond completion of the anticipated activity.
Prolonged	Impacts that may, although not necessarily, commence during the main phase of the decommissioning activity and which continue through the monitoring and maintenance, but which will eventually cease.
Permanent	Impacts that are predicted to cause a permanent, irreversible change.

Table 4-4 Definition of Frequency Criteria

Frequency	Description
Continuous	Impacts that occur continuously or frequently.
Intermittent	Impacts that are occasional or occur only under a specific set of circumstances that occurs several times during the course of the Johnston Decommissioning Project. This definition also covers such impacts that occur on a planned or unplanned basis and those that may be described as 'periodic' impacts.

Table 4-5 Overall Duration/Frequency Ranking Criteria

Ranking	Duration	Criteria
High	**Major**	Frequency/intensity of impact: high frequency (occurring repeatedly or continuously for a long period of time) and/or at high intensity.
Medium	**Moderate**	Frequency/intensity of impact: medium to high frequency (occurring repeatedly or continuously for a moderate length of time) and/or at moderate intensity or occurring occasionally/intermittently for short periods of time but at a moderate to high intensity.
Medium	**Minor**	Frequency/intensity of impact: low frequency (occurring occasionally/intermittently for short periods of time) and/or at low intensity.
Low	**Negligible**	Impact is very short term in nature (e.g. days/few weeks).

4.2.3.3 Impact Magnitude

The impact magnitude requires an understanding of how far the receptor will deviate from its baseline condition as a result of the impact. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement. Table 4-6 defines the criteria for impact magnitude.

Table 4-6 Impact Magnitude Criteria

Ranking	Magnitude	Criteria
High	**Major**	Total loss or major alteration to key elements/features of the baseline conditions.
Medium	**Moderate**	Partial loss or alteration to one or more key elements/features of the baseline conditions.
Medium	**Minor**	Minor shift from the baseline conditions. Impact is localised and temporary/short term with minor detectable change to site characteristics or a minor change to a small proportion of the receptor population. Low frequency impact occurring occasionally or intermittently.
Low	**Negligible**	Very slight change from baseline conditions. Impact is highly localised and short term resulting in very slight or imperceptible changes to site characteristics.

4.2.3.4 Impact Probability

The probability of an impact is another factor that is considered in this impact assessment. This captures the probability that the impact will occur and also the probability that the receptor will be present and is based on knowledge of the receptor and experienced professional judgement. Table 4-7 provides definitions of the different levels of probability of impact that are used in the Johnston Decommissioning Project impact assessment.

Table 4-7 Impact Probability Criteria

Ranking	Probability	Criteria
High	**Major**	The impact is likely to occur.
Medium	**Moderate**	The impact is moderately likely to occur.
Medium	**Minor**	The impact is possible.
Low	**Negligible**	The impact is unlikely to highly unlikely.

4.2.4 Receptor Definition

As part of the assessment of impact significance it is necessary to differentiate between receptor sensitivity, vulnerability and value. The sensitivity of a receptor is defined as 'the degree to which a receptor is affected by an impact' and is a generic assessment based on factual information whereas an assessment of vulnerability, which is defined as 'the degree to which a receptor can or cannot cope with an adverse impact' is based on professional judgement taking into account an number of factors, including the previously assigned receptor sensitivity and impact magnitude, as well as other factors such as known population status or condition, distribution and abundance.

4.2.4.1 Receptor Sensitivity

Receptor sensitivity to potential impact activities ranges from negligible to very high. Definitions for assessing the sensitivity of a receptor are provided in Table 4-8.

Table 4-8 Criteria for Assessment of Sensitivity of Receptor

Receptor Sensitivity	Definition
Very high	Receptor with no capacity to accommodate a particular effect and no ability to recover or adapt.
High	Receptor with very low capacity to accommodate a particular effect with low ability to recover or adapt.
Medium	Receptor with low capacity to accommodate a particular effect with low ability to recover or adapt.
Low	Receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt.
Negligible	Receptor is generally tolerant and can accommodate a particular effect without the need to recover or adapt.

4.2.4.2 Receptor Vulnerability

Information on both impact magnitude and receptor sensitivity is required to determine receptor vulnerability. These criteria, described in Table 4-9 and Table 4-10 are used to define receptor vulnerability as per Table 4-11.

Table 4-9 Criteria for Assessment of Vulnerability of Receptor

Receptor Vulnerability	Definition
Very high	The impact will have a permanent effect on the behaviour or condition on a receptor such that the character, composition or attributes of the baseline, receptor population or functioning of a system will be permanently changed.
High	The impact will have a prolonged or extensive temporary effect on the behaviour or condition on a receptor resulting in long term or prolonged alteration in the character, composition or attributes of the baseline, receptor population or functioning of a system.
Medium	The impact will have a short-term effect on the behaviour or condition on a receptor such that the character, composition, or attributes of the baseline, receptor population or functioning of a system will either be partially changed post development or experience extensive temporary change.
Low	Impact is not likely to affect long term function of system or status of population. There will be no noticeable long-term effects above the level of natural variation experience in the area.
Negligible	Changes to baseline conditions or receptor population of functioning of a system will be imperceptible.

It is important to note that the above approach to assessing sensitivity/vulnerability is not appropriate in all circumstances and in some instances professional judgement has been used to determine receptor sensitivity. In some instances, it has also been necessary to take a precautionary approach where stakeholder concern exists regarding a particular receptor. Where this is the case, this is detailed in the relevant impact assessment in Section 4.

4.2.4.3 Receptor Value

The value, or importance, of a receptor is based on a pre-defined judgement established in legislative requirements, guidance or policy. Where these may be absent, it is necessary to make an informed

judgement on receptor value based on perceived views of key stakeholders and specialists. Examples of receptor value definitions are provided in Table 4-10.

Table 4-10 Criteria for Assessment of Value of Receptor

Receptor Value	Definition
Very high	Receptor of international importance (e.g. United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site). Receptor of very high importance or rarity, such as those designated under international legislation (e.g. European Union (EU) Habitats Directive) or those that are internationally recognised as globally threatened (e.g. International Union for Conservation of Nature (IUCN) red list). Receptor has little flexibility or capability to utilise alternative area. Best known or only example and/or significant potential to contribute to knowledge and understanding and/or outreach.
High	Receptor of national importance (e.g. Nature Conservation Marine Protected Area (NCMPA), Marine Conservation Zone (MCZ)). Receptor of high importance or rarity, such as those which are designated under national legislation, and/or ecological receptors such as United Kingdom Biodiversity Action Plan (UKBAP) priority species with nationally important populations in the study area, and species that are near-threatened or vulnerable on the IUCN red list. Receptor provides the majority of income from the Johnston Area. Above average example and/or high potential to contribute to knowledge and understanding and/or outreach.
Medium	Receptor of regional importance. Receptor of moderate value or regional importance, and/or ecological receptors listed as of least concern on the IUCN red list but which form qualifying interests on internationally designated sites, or which are present in internationally important numbers. Any receptor which is active in the Johnston Area and utilises it for up to half of its annual income/activities. Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.
Low	Receptor of local importance. Receptor of low local importance and/or ecological receptors such as species which contribute to a national site, are present in regionally. Any receptor which is active in the Johnston Area and reliant upon it for some income/activities. Below average example and/or low potential to contribute to knowledge and understanding and/or outreach.

Receptor Value	Definition
Negligible	Receptor of very low importance, no specific value or concern. Receptor of very low importance, such as those which are generally abundant around the UK with no specific value or conservation concern. Receptor of very low importance and activity generally abundant in other areas/ not typically present in the Johnston installation area. Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach.

4.2.5 Impact Significance Ranking

The initial ranking of impact significance is based on the criteria described in Sections 4.2.3 and 4.2.5. It involves:

- Determination of the extent of impact, the duration/frequency, the impact magnitude and its probability;
- Consideration of sensitivity, vulnerability and value of the receptor; and
- Existing controls which can be industry standards, legislation requirements or prescriptive.

The sensitivity, vulnerability and value of receptor are combined with the impact magnitude (and probability, where appropriate) using informed judgement to arrive at a significance assessment for each impact, as described in Table 4-11. The assessment of significance considers mitigation measures that are embedded within the proposed activities.

Table 4-11 Criteria for Assessment of Significance

Ranking	Significance	Criteria
High	**Major**	Impacts are likely to be highly noticeable and have long term effects, or permanently alter the character of the baseline, and are likely to disrupt the function and status/value of the receptor population. They may have broader systemic consequences (e.g. to the wider ecosystem/industry). These impacts are a mitigation priority to avoid or reduce the anticipated effects of the impact.
Medium	**Moderate**	Impacts are likely to be noticeable and result in prolonged changes to the character of the baseline and may cause hardship to, or degradation of, the receptor population, although the overall function and value of the baseline/ receptor population is not disrupted. Such impacts are a priority for mitigation in order to avoid or reduce the anticipated effects of the impact.
Medium	**Minor**	Impacts are expected to comprise noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause long term degradation, hardship, or impair the function and value of the receptor. However, such impacts may be of interest to stakeholders and/or represent a contentious issue during the decision-making process, and should therefore be avoided or mitigated as far as reasonably practicable.
Low	**Negligible**	Impacts are expected to be either indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not anticipated to be a stakeholder concern and/or a potentially contentious issue in the decision-making process.

4.2.6 Cumulative Impact Assessment

While the scope of this impact assessment is restricted to the decommissioning of the Johnston Field, there will be other marine activities which have the potential to interact with the activities completed under the decommissioning work scope. The impact assessments presented in the following Sections consider the potential for significant cumulative impacts to occur as a result of overlapping activities.

4.2.7 Transboundary Impact Assessment

For most potential impacts from decommissioning, the likelihood of transboundary impact is low. However, where impacts on mobile receptors are of concern, the likelihood of a transboundary impact is higher. The impact assessments presented in the following Sections have identified the potential for transboundary impacts and the potential for transboundary impact is considered within the definition of significance.

4.2.8 Mitigation

Where potentially significant impacts (i.e. those ranked as ‘moderate’ or ‘major’ in Table 4-11) are identified, mitigation measures must be considered. The intention is that mitigations should remove, reduce or manage potential impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation is also proposed in some instances to maintain the

significance levels of impacts defined as ‘not significant’. The impact assessment conclusions define the residual impact significance after mitigations are applied.

5 INITIAL ASSESSMENT SCREENING AND JUSTIFICATION

An impact assessment screening workshop was undertaken to discuss the proposed decommissioning activities and any potential impacts these may pose. This discussion identified ten potential impacts based on the proposed removal methods identified in Section 2. Two of these potential impacts could not be screened out of further assessment based on the significance or likelihood of the impact occurring. The ten potential impacts and their screening rationales are detailed in Section 5.1, and those impacts carried forward for further assessment are defined in Section 5.2.

5.1 Assessment of Potential Impacts

The screening of potential environmental impacts from the decommissioning of Johnston for further assessment is provided in Table 5-1, including summarised rationales for the screening outcomes.

Table 5-1 Environmental Impact Screening Summary for Johnston Decommissioning

Potential impact	Further assessment?	Rationale
Emissions to air	No	Emissions during decommissioning activities (largely comprising fuel combustion gases) will occur in the context of the CoP. As such, emissions generated by infrastructure, equipment and vessels associated with the maintenance of the Johnston subsea assets will be replaced by those from vessels and equipment required for decommissioning activities, as well as the recycling of decommissioned materials. Reviewing historical EU Emissions Trading Scheme data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be minor relative to those generated during production. The majority of atmospheric emissions for the Johnston decommissioning relate to vessel time or are associated with the recycling of material returned to shore. As the decommissioning activities proposed are of short duration, this aspect is not anticipated to result in significant impacts. The estimated CO_2 emissions to be generated by the vessel operations associated with the selected decommissioning options are 7,648 Te, this equates to 0.1% of the total UKCS vessel emissions (excluding fishing vessels) in 2017 (7,800,000 Te; BEIS, 2019). A further 2,277 Te CO_2 will be generated through the recovery of the project materials. This equates to a total CO_2 production of 9,926 Te associated with the proposed decommissioning activities. The operations CO_2 emissions total has been calculated assuming an anticipated 48 days of operational vessel activity for the duration of the project. This is split across three vessel types (possibly including, but not limited to, a DSV/CSV, trawler and survey vessel). Atmospheric emissions in highly dispersive offshore environments do not present significant impacts and are extremely small in the context of UKCS and global emissions. Furthermore, emissions from short-term decommissioning activities are small compared to those previously arising from the asset over its operational life.

Potential impact	Further assessment?	Rationale
		Considering the above, atmospheric emissions do not warrant further assessment.
Seabed disturbance	Yes	There is potential for decommissioning activities to generate disturbance to the seabed, including activities associated with the removal of the Johnston pipelines and umbilicals, and any remediation required post-decommissioning. Seabed impacts may range in duration from short-term impacts, such as temporary sediment suspension or smothering, to permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire. Additionally, seabed disturbance from the removal of infrastructure has the potential to modify the habitat in a way which might impact upon other sea users which utilise the seabed. Post-decommissioning, the clear seabed will be validated by an independent verification survey over the installation sites and pipeline corridors. The methods used will be discussed and finalised with OPRED. Non-intrusive verification techniques will be considered in the first instance, but where these are deemed inconclusive by the NFFO, seabed clearance is likely to require conventional overtrawl survey methods. Field debris items are anticipated to be located on the surface of the seafloor, or partially buried by surface sediments, and will be recovered with minimal intervention (e.g. using an ROV). The area of potential impact will be superficial, temporary, and largely limited to the dimensions of the debris item being retrieved, which will be determined during the Seabed Clearance Verification survey. As such, seabed disturbance associated with field debris items is considered negligible and has thus been screened out of further assessment. The project area falls within the Southern North Sea SAC, which forms part of the Summer area utilised by the harbour porpoise this site protects. One of the conservation objectives of this Natura site is to ensure '*the condition of supporting habitats and processes, and the availability of prey is maintained*' (JNCC, 2019b). For this reason, it is considered that potential impacts to the benthic environment as a component of the conservation objectives of this site require further assessment. Project-related impacts to seabed habitats and species, and sites designated for their protection, have been addressed in detail in Section 6.1. Impacts to commercial fisheries which may be generated by seabed disturbance are addressed in Section 6.2.
Physical presence of vessels in	No	The presence of a small number of vessels for decommissioning activities will be short-term in the context of the life of the Johntston

Potential impact	Further assessment?	Rationale
relation to other sea users		Area. A collective 48 days of total vessel time is anticipated for the project area, split across three vessel types (possibly including, but not limited to, a DSV/CSV, trawler and survey vessel). Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. Other sea users will be notified in advance of planned activities through the appropriate mechanisms, meaning those stakeholders will have time to make any necessary alternative arrangements during the finite period of operations. Although the Johnston decommissioning project is estimated to require various vessels depending on the selected method of removal, these would not all be on location at the same time. A review of previously submitted decommissioning EAs show that some projects indicate a greater potential issue with short-term vessel presence, but those largely relate to project-specific sensitive locations, which is not the case for this decommissioning project. In consideration of the duration and location of vessel presence in conjunction with employment of standard practices, temporary presence of vessels does not require further assessment.
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	Yes	Trenched and/or buried flexible flowlines will be reverse-reeled for removal and the seabed will be subsequently remediated. All jumpers and spool pieces will be fully removed, as well as the drilling template and protection and stabilisation materials. The only infrastructure to be decommissioned *in situ* are the trenched and buried rigid flowlines. They will have the ends cut and lifted, with remediation. Depth of Burial (DoB) surveys have confirmed the integrity of these flowlines and they are not expected to pose any risk of interaction with other sea users (see Appendix C). However, long-term degradation may compromise the integrity of the buried flowlines and introduce free spans which pose a potential snagging hazard to commercial fisheries which utilise the seabed. Future monitoring work will ensure the integrity of the DoB of these flowlines, but further consideration of the proposed activities are necessary. Further assessment related to potential snagging risks associated with the decommissioning of infrastructure *in situ* is provided in Section 6.2.
Water quality	No	The Johnston substructures will be Drained, Flushed, Purged and Vented (DFPV) using Premier's DFPV management strategies prior to the commencement of any decommissioning activities. Vessel discharges are managed through existing, International Convention for the Prevention of Pollution from Ships (MARPOL) compliant controls, including bilge management procedures and

Potential impact	Further assessment?	Rationale
		good operating practices. Post-flushing and/or water jetting, residual liquids present during the decommissioning of pipelines and substructures will be treated before being discharged to sea, such that the discharge will comprise treated water. Any residual remaining material will be in trace levels/volumes following the DFPV regime and will not pose any significant risk to water quality. All residual solids will be shipped to shore for disposal.
Underwater noise emissions	No	Vessel presence will be limited in scale (i.e. the size and number of vessels) and duration and, therefore, does not constitute a significant or prolonged increase in noise emissions across the project area. The cutting of flowlines will likely be done with shears, thereby minimising produced underwater noise during this activity. All other noise generating activities associated with the decommissioning of the Johnston Field are considered negligible in the context of ambient noise levels and are likely to be masked by project-related vessel activities. The Johnston Field is located in areas of high shipping activity, therefore the contribution of the decommissioning activities to the overall noise produced by vessels in the area, will be minor. Geophysical surveys may be undertaken to assess post-decommissioned infrastructure decommissioned *in situ*. The need for such surveys will be assessed in future through the process of permit application. Multibeam echosounder survey equipment is likely to be used for imaging and identification of pipeline exposures. The Southern North Sea SAC encompassing the Johnston Field has been designated for the protection of harbour porpoise and this region is characterised as “one of the best areas in the United Kingdom” for habitat quality and importance to this species. None of the proposed project activities include those which have been identified as potential threats to harbour porpoise (including oil and gas extraction or exploration, abiotic marine renewable energy, fishing, marine construction, and water pollution (JNCC, 2019b)). Although decommissioning is considered reverse installation of oil and gas infrastructure (a form of ‘marine construction’), it is the seismic surveys associated with the development of oil and gas infrastructure which may have detrimental impacts on hearing sensitive marine species, such as harbour porpoise. Such surveys are not required as part of the Johnston Field decommissioning. There are not anticipated to be significant levels of noise generated by any of the decommissioning activities which may have such an impact. For these reasons, the proposed decommissioning activities do not contravene the conservation objectives set out by the JNCC for the site. These objectives and further discussion on marine mammals in

Potential impact	Further assessment?	Rationale
		the vicinity of the project can be found in Sections 3.6.1 and 3.6.3, respectively. Therefore, based on the above, impacts from underwater noise associated with the decommissioning of the Johnston Field have been screened out from further assessment.
Resource use	No	Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Any opportunities for increasing fuel efficiency and reducing use of resources will be implemented by Premier during the decommissioning programme. The estimated total energy usage for the project is 284,094 GJ. This number accounts for all operations, material recycling, and the loss associated with decommissioning items *in situ*. This is considered very low compared to the resources generated during the production phase of the project. Considering the above, resource use does not warrant further assessment.
Onshore activities	No	The OPRED Guidance states that onshore activities are not in scope of Decommissioning EAs, and this topic does not require further assessment. It should be noted that only licenced contractors which can demonstrate they are capable of handling and processing the material to be brought ashore will be considered for onshore activities. This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact. Premier understands that dismantling sites will also require consents and approvals from onshore regulators such as the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work.
Waste	No	The recycling and disposal of wastes are covered by Premier's Waste Management Strategy, which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous and special waste, and TFSW. The Waste Management Strategy is guided by Premier's HSES Policy and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for each phase of the Johnston Field's end of life in individual Active Waste Management Plans (AWMPs), and ongoing

Potential impact	Further assessment?	Rationale
		monitoring of waste procedures and performance review against target Key Performance Indicators (KPIs). Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned material. There may be instances where infrastructure returned to shore is contaminated (e.g. by Naturally Occurring Radioactive Material (NORM), hazardous, and/or special wastes) and cannot be recycled. In these instances, the materials will require disposal. However, the weight and/or volume of such material is not expected to result in substantial landfill use. On this basis, no further assessment of waste is necessary.
Unplanned events	No	There will be a variety of vessel types and sizes on-site during the decommissioning process. However, a loss of the volume of vessel diesel inventory would be less than the worst-case gas release from loss of well containment. The decommissioning activities detailed in this EA will occur after well P&A, therefore the fuel inventory of a vessel likely to be present during decommissioning has been used as a worst-case unplanned event scenario. A vessel's fuel inventory is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of the full inventory. Any spills from vessels in transit and outside the 500 m safety zone are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Premier will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP. Consequently, any impact from vessel-based fuel inventory release will be less than that already assessed and mitigated against within the OPEP for the operational phase of the Johnston. The worst-case unplanned event during decommissioning activities would be the release of fuel inventory from the largest vessel on site. This is thought to be a CSV or DSV type vessel. The Seven Falcon, a vessel which is comparable to one which may be used during decommissioning has a fuel capacity of 1,335 m^3. As stated previously, the nature of the fuel tank layout is such that this is unlikely to be released all at once. In addition to the mitigation measures outlined in the individual vessel SOPEPs, Premier maintains manned bridges, navigational aids and monitoring of safety zones. Considering the above, the potential impacts from accidental chemical/hydrocarbon releases during decommissioning activities do not warrant further assessment. As previously mentioned, the Johnston Field sit within the Southern North Sea SAC, which has 'marine water pollution' identified as a potential threat to the integrity and/or qualifying features of those sites. However, for the reasons supplied above regarding the

Potential impact	Further assessment?	Rationale
		management measures and standards currently in place, the potential for marine pollution impacts resulting from accidental events are considered negligible. As such, potential impacts on the conservation objectives of the Southern North Sea SAC through the generation of marine pollution are considered negligible and do not warrant further assessment under this impact pathway. As the methodology for the post-removal flowline return to shore has not been defined in detail, there exists the remote possibility that during transport of those materials, elements may dislodge and drop from the transport vessel. Premier will cut and lift the short section of exposed pipeline at the ends; however, these sections are short and will be relatively easy to manoeuvre. Therefore, the likelihood of accidental loss of pipeline materials to the seabed during lift operations is low. Moreover, all subsea installations are considered sound and no issues regarding their integrity have been identified, therefore methods of removal are not anticipated to generate issues which result in material losses to sea. Dropped object procedures are industry-standard. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. Any dropped objects will be reported to OPRED via PON2 notifications and addressed during the debris clearance survey. These will be removed or remediated in agreement with OPRED. In line with the mitigation measures in place, unplanned loss of materials to the sea do not require further assessment.

5.2 Aspects taken Forward for Further Assessment

Based on the initial screening provided in Section 5.1, the following potential environmental and societal impacts have been identified as requiring further assessment within the EA:

- Unplanned Events;
- Seabed impacts; and
- Commercial fisheries.

These potential impacts are addressed in detail within Section 4.

5.3 Proposed Mitigations and Existing Controls

To ensure that impacts remain as described above, Premier will follow routine environmental management activities, for example appropriate project planning, contractor management, vessel audits, activity permitting and legal requirements to report discharges and emissions, such that the environmental and societal impact of the decommissioning activities will be minimised. The activities associated with decommissioning the Johnston assets are not likely to result in significant impacts to the environment or other sea users, including fishing or seabed communities, if appropriate mitigation and control measures are effectively applied. A summary of the proposed control and mitigation measures is shown in Table 5-2.

Table 5-2 Proposed Mitigation and Control Measures

General and Existing

• Lessons learnt from previous decommissioning scopes will be reviewed and implemented as appropriate;
• Vessels will be managed in accordance with Premier's existing marine procedures, including:
  ○ The vessels' work programme will be optimised to minimise vessel use where possible;
  ○ The 500 m safety exclusion zone will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where decommissioning activities are taking place;
  ○ All infrastructure will be subject to a drain, flush, purge and vent philosophy that will be assessed and permitted under existing operational permits prior to decommissioning, to ensure minimal residual contaminants are present in the infrastructure before removal operations commence;
  ○ The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of large hydrocarbon releases and to mitigate their impacts should they occur;
  ○ All vessels undertaking decommissioning activities will have a MARPOL-approved SOPEP;
  ○ Existing processes will be used for contractor management to assure and manage environmental and social impacts and risks;
  ○ Premier's management of change process will be followed should changes of scope be required;
  ○ Careful planning, selection of equipment, subsequent management and implementation of activities; and
  ○ Impacts resulting from the disturbance of the drill cuttings deposits are expected to be minimal given their rapid resettlement and the fact that drill cuttings deposits will be directed to the immediate vicinity of the template, minimising the extent of any seabed impacts or reduction in water quality. Remediation of any potential impacts on seabed communities will be undertaken, where required.
• A post-decommissioning environmental seabed survey, centred around the well locations, will be carried out. The survey will focus on chemical, physical and biological changes, disturbances and will be compared with the pre- decommissioning survey. Results of this survey will be available once the work is complete, with a copy forwarded to OPRED.
• All pipeline routes and installation sites will be the subject of oilfield debris clearance and as-left verification surveys when decommissioning activity has concluded.
• The main risk from infrastructure remaining *in situ* is the potential for interaction with other users of the sea, specifically from fishing related activities. Where the infrastructure is trenched below seabed level or trenched & buried below, the effect of interaction with other users of the sea is considered to be negligible.
• The infrastructure is currently shown on Admiralty Charts and the FishSafe system. When decommissioning activity has been competed, updated information will be made available to update Admiralty Charts and FishSafe system.
• When decommissioning activities have been completed, and where applicable, the safety zones around offshore infrastructure will be removed.
• The licence holders recognise their commitment to undertake post-decommissioning monitoring of infrastructure left *in situ*. After the post-decommissioning survey reports have been submitted to OPRED and reviewed, a post-decommissioning monitoring survey regime, scope and frequency, will be agreed with OPRED.

• Any snagging risk to other sea users will be minimised by continual monitoring of degrading structures or free spans.
Large-scale Releases to Sea
• Post-flushing water will be cleaned before it is discharged to sea, and will be in accordance with Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 controls, including MARPOL-compliant bilge management procedures and good operating practices. • All solid waste will be skipped and shipped to shore for disposal, rather than being discharged at sea. • Risk of full inventory loss from a vessel is very low given that the majority of vessels have multiple, separated fuel tanks, making full contaminant loss highly unlikely and the distance from shore would prevent any significant volume of diesel reaching any shoreline. Any potential diesel fuel spillages resulting from unplanned collisions will be minimised by approved OPEP/SOPEP, in which risks associated with the decommissioning activities have been appropriately assessed and planned for.
Waste Management
• All waste will be managed in accordance with the Waste Management Plan, including any marine growth waste, or NORM identified during flushing and cleaning of substructures. • The Waste Management Plan will involve the use of a waste inventory, and all residual wastes being shipped to shore for processing.

6 IMPACT ASSESSMENT

The following receptors have been identified as requiring further assessment against potential impacts from the proposed decommissioning activities:

- Seabed impacts; and
- Commercial fisheries.

Sources and environmental response to potential impacts to these receptors are detailed in the Sections below.

6.1 Seabed Impacts

The impact of Johnston decommissioning activities on seabed receptors is discussed in this Section, along with measures proposed to minimise the scale and duration of any potential impacts.

6.1.1 Approach

There are two seabed impact pathways associated with the decommissioning operations: direct and indirect disturbance.

Direct disturbance is considered the physical disturbance of seabed sediments and habitats. Direct disturbance has the potential to cause either temporary or permanent changes to the marine environment, depending upon the nature of the associated activity. Activities which contribute to the direct disturbance impact pathway include the lifting and removal of infrastructure and remediation of snagging hazards via placement of material (rock armour) on the seabed. The total area of seabed expected to be impacted by direct physical disturbance has been calculated by adding together the individual areas of physical disturbance estimated for each activity and the expected duration of the direct disturbance has been provided. All dimensions used in calculating the disturbance area of each decommissioning activity are available in Appendix A.

The second impact mechanism, indirect disturbance, is that which occurs outside of the direct disturbance footprint. It may be caused by the suspension and re-settlement of natural seabed sediments and cuttings pile materials disturbed during activities. This secondary impact pathway is considered temporary in all instances, based on the definitions provided in Section 4. The scale of indirect disturbance due to re-suspension and re-settlement of natural sediment has been estimated based on the expected area of direct disturbance from any activity. The estimated indirect disturbance area is assumed to be double the direct disturbance area for all installations and activities taking place.

These impact mechanisms have been assessed in detail in the sections below. This includes an assessment against the conservation objectives of relevant protected sites (as detailed Section 3.6.1) in Section 6.1.4 below.

Seabed disturbance may be classified in the following sections as short-term, temporary or permanent, as defined in Table 4-3.

6.1.2 Sources of Potential Impact

6.1.2.1 Overview

The following activities have been identified as sources of potential seabed disturbance:

- Pipeline, flowline and umbilical decommissioning:
  - Cutting and removal of the ends of buried rigid flowlines;
  - Full removal of trenched and buried flexible flowlines and umbilicals via reverse reel; and
  - Spool and jumper full removal and recovery.

- Additional subsea infrastructure decommissioning:
  - Full removal of the Johnston Subsea Template.
- Stabilisation materials:
  - Removal of the non-biodegradable grout bags and concrete mattresses; and
  - Deposition of new rock or gravel armour to protect ends and cut exposures of flowlines decommissioned *in situ*.

As detailed in Section 2.4.7, a seabed clearance verification survey is required following all decommissioning projects to ensure the seabed is left in a safe condition for future fishing effort, in line with the current Decommissioning Guidance (BEIS, 2018). Seabed clearance verification includes a non-intrusive survey of the decommissioned area (e.g. using ROV, side scan sonar (SSS), etc.) and third-party review by the National Federation of Fishermen's Organisations (NFFO) to achieve certification.

Due to the moderate mobility of the surface sediments characterising the project area, the removal of buried rigid flowlines, buried flexible flowlines/umbilicals, spools and jumpers, subsea infrastructure and protection materials are not anticipated to generate any snagging hazards to commercial fisheries. Any potential field debris identified are expected to be small and found on the seabed surface or partially buried, precluding the requirement of intrusive methods of remediation. Rather, the decommissioning footprint will likely experience varying degrees of self-remediation through backfill of the coarse sediments exposed to hydrographic movement in the shallow waters of the Johnston Field.

For these reasons, seabed impacts associated with the potential post-decommissioning remediation of the project area are not anticipated for the Johnston Field and have thus not been assessed further. Should the clear seabed verification survey determine that direct intervention is required, such remediation is expected to be minor in nature and will be agreed upon with OPRED prior to works commencing.

6.1.2.2 Pipelines, Flowlines and Umbilicals Decommissioning

As described in Section 2.4.1, the two rigid pipelines that are trenched and buried will have their unburied ends cut and removed. The cut ends within the base of the trench shall be remediated with local rock or gravel placement and the profile flushed with the surrounding seabed. Approximately 250 m will be cut and removed from the PL989 and PL990 at the Ravenspurn North platform end. A further 125 m will be removed from the template end. In total, 375 m of ach pipeline will be cut and removed.

The trenched and buried flexible flowline and the two umbilicals in the Johnston Field will be fully removed by reverse reeling (see Section 2.4.2). This method has the potential to generate berms, particularly in areas where clay outcrops occur as this type of seabed environment is relatively stable and berms are likely to persist in the long term.

All jumpers and spools, as described in Section 2.4.3 will be cut into sections and fully removed.

The area of seabed disturbed by recovery of each individual line to the surface has been estimated by multiplying the length of each individual line section which will be removed, by the outer diameter. The areas disturbed by recovery of each individual line have then been summed to give an overall area of disturbance affected. As the flexible flowlines will be removed by reverse reeling, this is expected to have an impact beyond the area of the flowline alone. The direct disturbance area therefore has a 10 m buffer added (5 m either side of the lines). This buffer allows for instances in which reverse reeling may not occur in a straight line.

The direct and indirect disturbance areas associated with these proposed operations are summarised in Table 6-1. A full inventory of infrastructure dimensions is available in Appendix A. Both of these disturbance levels are temporary and will only last as long as activities are occurring. Disturbance due

to placement of rock armour to protect exposed ends of flowlines decommissioned *in situ* has been assessed separately in Section 6.1.2.4.

Table 6-1 Seabed Disturbance Associated with Pipeline, Flowline and Umbilical Decommissioning

Activity	Quantity and dimensions	Expected duration of disturbance	Direct disturbance area (km^2)	Indirect disturbance area (km^2)
Cutting and removal of the ends of buried rigid flowlines	• A total of 375 m to be removed from the ends of both pipelines.	Temporary	0.000144	0.000288
Full removal of trenched and buried flexible flowlines via reverse reel	• 3 flexible flowlines of differing dimensions and lengths; • 10 m wide corridor of impact to account for reverse reeling.	Temporary	0.236	0.473
Spools and jumper full removal and recovery	• 5 spools of varying dimensions • 12 jumpers of varying dimensions	Temporary	0.0000157	0.000103
		Total	**0.237**	**0.473**

6.1.2.3 Additional Subsea Infrastructure Decommissioning

As described in Section 2.4.4, the Johnston Subsea Template will be recovered to the surface.

The area of seabed disturbed by recovery of the Template has been estimated by multiplying the item length by the width. As described in Section 2.4.4, some of the seabed installations are gravity based. In a worst-case scenario, should extraction from the seabed prove difficult, liquification of the seabed around the installation may be required. This has been accounted for when calculating the area of disturbance by adding a 1 m buffer around the installation. The direct and indirect disturbance areas associated with the removal of the Johnston Subsea Template are summarised in Table 6-2.

Table 6-2 Seabed Disturbance Associated with Decommissioning of Other Seabed Infrastructure

Activity	Quantity and dimensions	Expected duration of disturbance	Direct disturbance area (km^2)	Indirect disturbance area (km^2)
Full removal of the Johnston Subsea Template	25 m length x 13 m width	Temporary	0.000325	0.000065
		Total	0.000325	0.000065

6.1.2.4 Stabilisation Materials

Concrete mattresses and non-biodegradable grout bags have previously been deployed across the Johnston Field to stabilise and protect seabed infrastructure.

As noted in Section 2.4.5, the intention is that all concrete mattresses and grout bags will be recovered, this will cause a temporary disturbance. New deposits of rock armour will also be required in order to

protect the newly cut ends of trenched and buried rigid pipelines due to be decommissioned *in situ.* An estimated 30 m^2 of rock will be deposited per cut end (6 m width by 5 m length along the pipeline). This is based on the assumption that "a 36-inch pipeline would need to covered by 0.5 metres of rock, which would require a pile 3 metres either side" (AURIS Environmental, 1995; as referenced in in Etkins, Vanner and Firebrace, 2006). This is considered a source of permanent disturbance.

In the case of stabilisation materials, there are an estimated 280 grout bags in the Johnston Field and an estimated 155 across a variety of sizes. Grout bags and mattresses are used in conjunction with different subsurface installations to provide protection or stability. As such, they are usually stacked or piled on top of one another or on top of other installations/stabilisation materials. The exact location and layout of the grout bags is unknown. Although highly unlikely, the worst-case scenario has been defined as all grout bags and mattresses spread in a single layer on the seabed. A standard grout bag size has been used to estimate the area cover by grout bags in the Johnston Field. The dimensions of the mattress types is available in Appendix A. The seabed disturbance associated with the stabilisation materials is summarised in Table 6-3.

Table 6-3 Seabed Disturbance Associated with Stabilisation Materials (Including Existing Materials Decommissioned *in situ* and New Materials Deposited to Protect Pipeline Ends)

Activity	Quantity and dimensions	Expected duration of disturbance	Temporary direct disturbance area (km^2)	Temporary indirect disturbance area (km^2)	Permanent disturbance area (km^2)
Remediation of cut ends via rock placement	• 4 cut ends • 30 m^2 footprint per cut end	Permanent	-	0.00024	0.00012
Removal of grout bags	• 280 grout bags; • Bag dimensions: 0.6 m x 0.3 m	Temporary	0.0000504	0.0001	-
Removal of concrete mattresses	• 155 mattresses; • 5 different sizes	Temporary	0.00265	0.00529	-
		Total	**0.00270**	**0.00563**	**0.00012**

6.1.2.5 Summary of Seabed Impacts

Potential seabed impacts from project activities are summarised in Table 6-4. Temporary indirect disturbance associated with the removal of pipelines, flowlines, umbilicals, spools and jumpers forms the greatest contributor to the total seabed impact area. An area of approximately 0.24 km^2 will be affected by direct disturbance. This area is located within the 0.48 km^2 indirect disturbance area.

Table 6-4 Total Potential Seabed Disturbance from Johnston Decommissioning Activities

Activity	Temporary direct disturbance (km^2)	Temporary indirect disturbance (km^2)	Permanent disturbance (km^2)
Pipelines, Flowlines, Umbilicals, Spools and Jumpers Decommissioning	0.237	0.473	N/A
Subsea Infrastructure Decommissioning	0.000325	0.00065	N/A
Stabilisation Materials	0.00270	0.00563	0.00012
Total	**0.240**	**0.480**	**0.00012**

6.1.3 Effects on Sensitive Receptors

6.1.3.1 Direct Disturbance

Decommissioning activities are expected to lead to two types of direct physical disturbance. The first is temporary disturbance, which will result from the removal of infrastructure from the seabed, and from overtrawling. The sediment will be disturbed by the action of retrieving equipment from the seabed and by the trawl running over the seabed, but once decommissioning is complete, the affected areas will be free of anthropogenic material. This should allow recovery in line with natural processes such as sediment re-suspension and deposition, movement of animals into the disturbed area from the surrounding habitat, and recruitment of new individuals from the plankton.

The second type of direct disturbance will be permanent disturbance caused by the deposition of additional rock armour on the seabed to protect infrastructure decommissioned *in situ*. This type of disturbance will effectively change the seabed type in the affected areas from the naturally occurring soft clay sediment (as described in Section 3.3) to a hard substrate. The seabed surface impact duration of this disturbance will last until the rock placement materials are fully buried by the deposition of new natural sediment, whilst the overall duration of the disturbance will last until the rocks are eroded to coarse sediments through hydrographic processes. Consequently, this disturbance has been characterised as 'permanent'.

The effects expected to be associated with each type of direct disturbance are discussed in the subsections below. The areas of anticipated direct and indirect disturbance are captured in the figure below (Figure 6-1) in relation to existing environmental survey effort (detailed in Section 3.2). Areas of temporary direct disturbance are light grey, and permanent disturbance (comprising rock placement) is shown in dark grey. Supporting survey images on the following figure were taken during the 2004 Johnston Geophysical Survey (Gardline, 2004), and the Babbage Environmental Baseline Surveys (Gardline, 2008a, 2008b, 2008c); they are colour coded by survey according to the legend. The images show a consistent sandy seabed throughout the wider Johnston area.

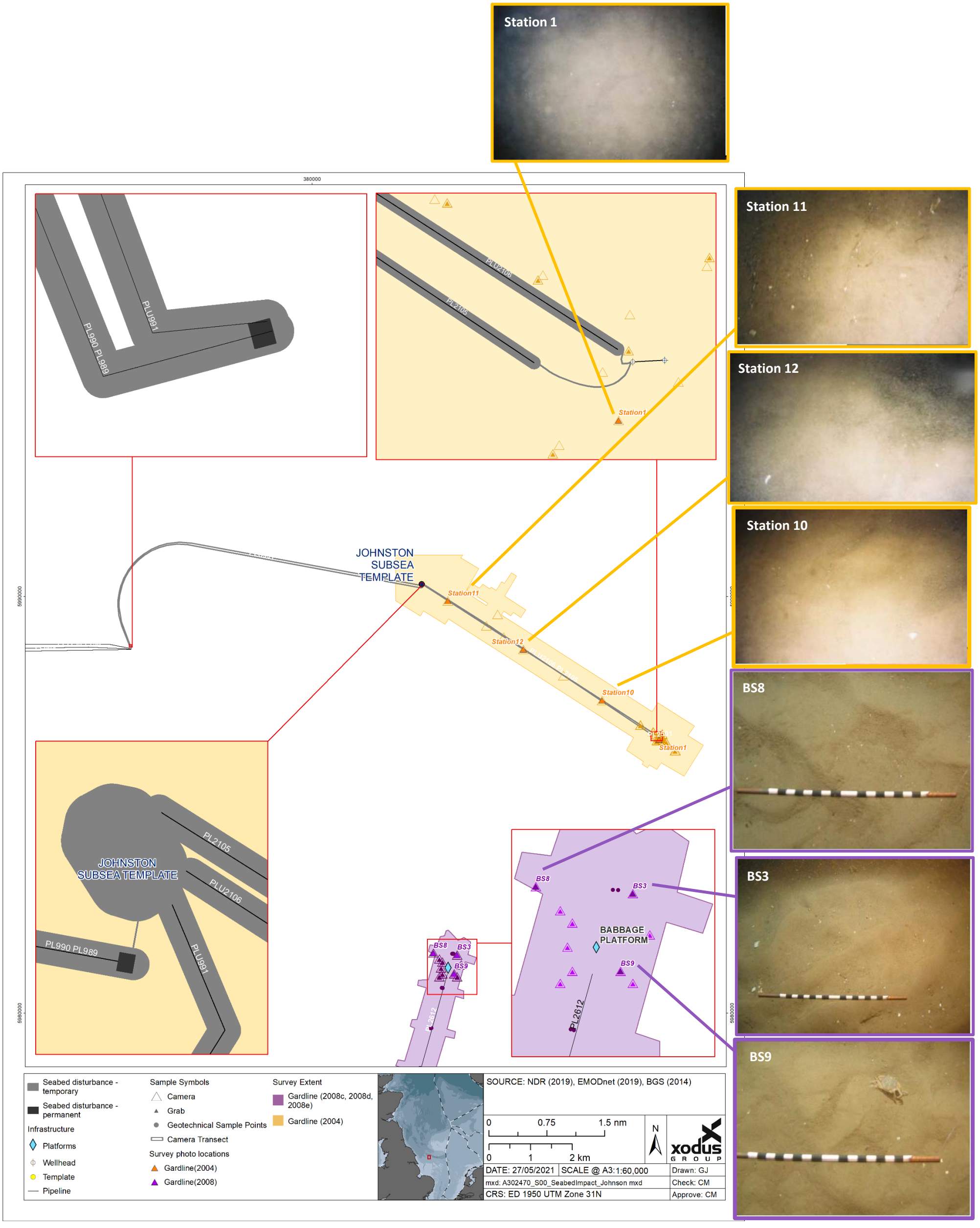

Figure 6-1 Extents of Potential Seabed Impacts against Existing Environmental Data

6.1.3.1.1 Temporary Direct Disturbance

Temporary direct disturbance has the potential to cause mortality to benthic and epibenthic fauna, due to injuries arising from the crushing of species which are sedentary or unable to move quickly. The sediment structure, including the burrows of any animals present, may also be affected. Mobile fauna will likely also be disturbed.

The marine environment in the SNS is dynamic in nature, with wave energy at the seabed between 0.21 – 1.2 N/m^2, increasing towards the shore (McBreen *et al.*, 2011). Flow rates of approximately 1.0 m/s have been recorded in the nearshore region of the SNS, close to Johnston (DECC, 2016). The dynamic environment will result in suspended sediment, in particular any fines, being transported away from the source of the disturbance. The natural settling of the suspended sediments is such that the coarser material (sands) will quickly fall out of suspension with the finer material being the last to settle. This natural process will ensure that all the suspended sediment is not deposited in one location. Therefore, not only is anticipated disturbance highly localised but the sediment disturbed as a result of the decommissioning activities will likely be comparable to the background sediment redistribution process.

As noted in Table 6-4, approximately 0.24 km^2 of seabed is expected to be affected by temporary direct disturbance. The scale of the disturbance is small when compared to other forms of disturbance that already occur in the area, such as commercial fisheries. In 2019, trawls contributed to 65.6% of fishing effort in the Johnston area. A commercial trawler with a 12 m wide beam trawl trawling at its slowest rate of approximately 4.7 km/h would cover an area of roughly 0.06 km^2 per hour and would therefore take approximately 4 hours to cover the anticipated direct disturbance area (FAO, 2019). In this context, the potential temporary direct disturbance associated with the possible full remediation of the relevant infrastructure will be a very small fraction of the disturbance already taking place by commercial fisheries trawling activities.

Past surveys of benthic fauna at the nearby Ravenspurn North field identified communities comprising echinoderms, annelids, arthropods and phoronids (as described in Section 3.4, Oil & Gas UK, 2019). Species in the Johnston Field were recognised as being mainly psammophilous (sand-loving). The species which were identified during the survey were all typical of clean sandy SNS substrates (Gardline, 2004). Therefore, given the dynamic nature of the SNS, species which are typical of the area are likely to be accustomed to certain levels of seabed disturbance. No sensitive benthic species of conservation importance (*A. islandica* and *S. spinulosa*) have been identified in the Johnston area.

The Johnston Field is not located near any areas protected for seabed habitat or benthic features. However, the field lies in the centre of the Southern North Sea SAC which is protected as a key area for harbour porpoise. Potential impacts to the Southern North Sea SAC are fully explored in Section 6.1.5. The nearest designated site protected for benthic features is the Holderness Offshore MCZ (32 km south west). It is designated for the composition of local sediments, glacial features and the presence of *A. islandica*, as described in further detail in Section 3.6. Due to the localised scale of decommissioning activities and the distance from the field to the MCZ, no impact is expected to affect the protected area.

6.1.3.1.2 Permanent Direct Disturbance

Permanent direct disturbance will occur due to leaving hard substrate on the seabed in perpetuity. This encompasses both the leaving *in situ* of existing material that has previously been introduced, and the introduction of new rock armour to protect trenched and buried rigid flowlines that will be decommissioned *in situ*. Approximately 0.00012 km^2 of seabed will be subject to permanent direct disturbance due to the introduction of hard substrate.

The immediate effect of the introduction of new hard substrate will be mortality and injury of benthic and epibenthic fauna that cannot move away from the activities, as well as disturbance of motile fauna. Following the introduction of the material, the ongoing effect will be the change of an area of softer

habitat to a hard substrate, and a related change in the types of organisms that can use the habitat. Organisms such as sea pens and burrowing bivalves, anemones and crustaceans will no longer be able to use the area affected, while new habitat will be created for other groups such as encrusting sponges and other species of anemone. Given the substrate at the Johnston Field is classified as deep circalittoral sand, under the European Nature Information System (EUNIS) code A5.27 (JNCC, 2019), placement of hard substrate will inevitably cause a change in benthic community structure.

While the introduction of hard substrate clearly results in a change in the habitat type and associated fauna present, the scale of the impact is negligible considering the very large extent of sandy seabed available in the SNS. Recovery of the affected areas is expected to take many years but will eventually occur as the deposited rock material is gradually buried by natural sediment deposition. Therefore, the community is expected to recover and revert to pre-disturbance composition with time. However, due to the time scale across which this will occur, this disturbance has been deemed permanent. Efforts to minimise the area of impact from stabilisation materials will include re-positioning of rock stabilisation features within the existing field layout and minimising the amount of rock required through the use of highly localised placement via rock bags.

6.1.3.2 Indirect Disturbance

Direct disturbance of the seabed during decommissioning operations (Section 6.1.3.1) will cause sediment re-suspension. Most suspended sediment is expected to settle within the direct disturbance area, but some may settle in adjacent areas not directly affected by decommissioning operations. To account for this indirect area of disturbance, a doubling of the direct disturbance area has been used. The potential area of direct seabed disturbance from all operations is 0.24 km^2. The area of indirect impact from sediment resettlement is thus expected to be approximately 0.48 km^2, with the direct impact area nested within it (Table 6-4).

Defra's (2010) report, *Charting Progress for UK Seas*, considers impacts arising from sediment re-suspension to be short-term (usually over a period of a few days to a few weeks). Increased sediment load within the water column and its subsequent resettlement can interference with feeding in some species due to individuals' inability to keep their feeding apparatus clear of sediment or the burial of individuals which are unable to recover to the surface through the newly deposited sediment (Gubbay, 2003; Rogers, 1990). Generally, infaunal communities are naturally habituated to sediment transport processes and are therefore less susceptible to the direct impact of temporarily increased sedimentation rates. For this reason, the species present in the vicinity of the Johnston Field are likely to be adapted to living in an area with high levels of sediment suspension and deposition and any impacts will be limited in both spatial and temporal extent.

6.1.4 Cumulative and Transboundary Impacts

The closest installations are the Ravenspurn North platform, operated by Perenco, and Babbage platform, operated by Spirit Energy, which are located 7 km and 9 km from the Johnston Field, respectively. It is not expected that impacts from the Johnston decommissioning activities will interact with impacts from operations at these structures. The Johnston Field is also located 106 km west-south-west of the UK/Netherlands median line and therefore no transboundary impacts are expected.

The decommissioning activities outlined within this EA are likely to extend over a period of several years (see full schedule in Section 2.8). Given this duration, it is possible that the activities will coincide with other activities proximal to the decommissioning area. However, the rigid pipeline infrastructure within the Johnston Field is stably buried to below the minimum depth of burial, with no areas of spans, exposures or shallow burial, therefore only the ends of the lines will be cut and removed (Appendix C), thereby minimising the total area of impact to approximately 0.24 km^2.

This area of impact is small compared to the area of the SNS which has been and continues to be developed for offshore oil and gas and renewable energy projects. For example, the offshore windfarms, Hornsea 1 and 2, comprise a total area of 870 km^2 (MMO, 2020), in which seabed impacts could occur from foundation installation, interarray and export cable lay and maintenance, vessel anchorages, and other activities. The temporary seabed impacts associated with the proposed decommissioning footprint across the Johnston Field will constitute, in relative terms, such a small area in the context of the potential area to be impacted by those large-scale developments, which are common throughout the SNS. The wind farm that is planned to be developed in the Hornsea Project 4 Lease Area, which overlaps with the decommissioning project area, is likely to result in a similar area of impact than Hornsea 1 and 2 combined, located 15 km and 33 km south east. The Hornsea Project 4 is in the pre-application phase at the time of writing.

The decommissioning of offshore oil and gas infrastructure is legally bound by the Petroleum Act 1998 in UK waters and is an essential part of the life cycle of offshore oil and gas development. Potential seabed impacts associated with the decommissioning of the Johnston Field have been minimised where possible through the reuse of materials and exercising caution with the use of planned interventions. The highly localised and temporary nature of the residual seabed impacts are insignificant when put in the context of offshore activities taking place across the wider region. Finally, due to the absence of seabed species or habitats of conservation importance within the decommissioning area (see Section 3.6) and the extent of similar seabed habitat in its surrounds, no important impacts to seabed features or fauna are predicted from the proposed activities in tandem with any other activities occurring within the immediate vicinity or across the wider region. For these reasons, cumulative impacts to seabed habitats and species are considered negligible.

Cumulative impacts to protected sites have been addressed in Section 6.1.5.

The Johnston Field is located 106 km west-south-west of the UK/Netherlands median line, which is outwith the potential area for transboundary impacts. Therefore, no transboundary impacts are expected to result from the proposed activities.

6.1.5 Potential Impacts to Protected Sites

6.1.5.1 Southern North Sea SAC

The Southern North Sea SAC is a single feature site which has been designated for the protection of the EPS, harbour porpoise (Sections 3.6.1 and 3.6.3), based upon their population density (i.e. top 10% persistent high density in the UK) and continued or regular presence within this region (JNCC, 2017b). As Europe's largest offshore MPA, the site covers an area of 36,951 km^2 and overlaps several other Natura Sites, including: the Dogger Bank; North Norfolk Sandbanks and Saturn Reef; Haisborough, Hammond and Winterton; and Margate and Long Sands SACs.

In addition to protecting harbour porpoise from direct or indirect injury, mortality and disturbance, the Southern North Sea SAC's conservation objectives also aim to limit damage to the habitats which support harbour porpoise prey (JNCC, 2019b) – namely sandeels and whiting, which are abundant demersal fish species in the SNS (JNCC, 2017b; Ransijn *et al.*, 2019). Both of these fish species are considered Species of Principal Importance in English waters (MarLIN, 2020).

As evidenced in Section 5.1, no impacts to harbour porpoise, either directly or indirectly, are anticipated from any of the proposed activities. However, there is potential that seabed impacts generated during the decommissioning of the Johnston Field infrastructure may damage relevant habitats which support their prey species. Harbour porpoise habitat use and distribution are highly dependent upon prey distributions, so significant impacts to their 'relevant habitats' would mean impacts to the habitats of their prey species (JNCC, 2019b; Ransijn *et al.*, 2019). To interpret the significance of the proposed

project activities on the integrity of the habitats supporting the qualifying feature of this site, it is therefore important to characterise the relative habitat use of the prey species in question.

In the absence of high resolution regional data on fish distributions, inferences on prey availability can be made through interpolative density models (Ransijn *et al.*, 2019). Research was undertaken by Ransijn *et al.* (2019) on behalf of the JNCC which aimed to develop such a model to identify the distribution of harbour porpoise prey (and their calorific energy content) seasonally across the greater North Sea. The findings of this study indicated that the area encompassing the Johnston Field supports moderate whiting densities in both the summer and winter months (Ransijn *et al.*, 2019). Additionally, the decommissioning area does not appear to support sandeels (Ransijn *et al.*, 2019). The project area overlaps with an area considered as main nursery ground for whiting, and with a likely spawning ground for this species (Coull *et al.*, 1998; Ellis *et al.*, 2012). However, the probability of 0-group (i.e. juvenile) whiting aggregations in the project area is low (Aires *et al.*, 2014). It should be noted that nursery areas described by Coull *et al.* (1998) and Ellis *et al.* (2012) are highly indicative based on extrinsic environmental factors, such as temperature, salinity and sediment character. These vast swathes of seabed are considered appropriate and likely for use as a nursery by the species in question, but they do not assure use by that species (Coull *et al.*, 1998).

Commercial fisheries landings data can supplement information on habitat use by fish species which have limited confidence. Published data from the five most recent (2015-2019 inclusive) reveals that ICES Rectangle 37F1, within which the Johnston Field is located, actually has low annual whiting catches (mean value = £994; mean tonnage (liveweight) = 2) compared to the averages across the greater UKCS (mean value = £69,814; mean tonnage (liveweight) = 59) (Scottish Government, 2020). These landings data suggest that there is low commercial fishing pressure acting on this particular prey species and also that this species may be occurring in lower densities than indicative modelling data suggests (Ransijn *et al.*, 2019).

As a mobile demersal fish, whiting are well adapted to varying levels of sediment suspension within the water column, as well as localised seabed disturbance. Moreover, because they spawn pelagically, there is limited potential for seabed disturbance to adversely impact recruitment within whiting populations due to the destruction of spawning habitat (Loots *et al.*, 2010). Similarly, it appears that due to age-sex class niche partitioning, juvenile habitat use is highly variable, which localised pockets of 0-group occupancy scattered across the wider whiting habitat (Loots *et al.*, 2010). For these reasons, it is considered that the limited addition of stabilisation materials during decommissioning of the Johnston Field Area will not adversely impact the habitat use, and therefore availability, of important harbour porpoise prey species known to utilise the project area, or the wider region covered by the Southern North Sea SAC.

In consideration of the above findings, none of the project activities will impact the integrity of the Southern North Sea SAC by generating LSEs on the conservation objectives of the site. Explicitly, project activities are not considered to add pressure, either alone or in combination with other projects, on the qualifying feature of the site, its habitat use, or the habitat use and availability of its prey. In this way, the Johnston Field decommissioning project will not adversely impact the ability of the Southern North Sea SAC to achieve Favourable Conservation Status (FCS) as a Natura site.

6.1.6 Mitigation Measures

Both temporary and permanent seabed disturbance generated by the decommissioning activities will be minimised as far as practicable. No sediment will be removed from the seabed as a result of the proposed activities. As well, rock dumping will be carefully managed (e.g. through use of an ROV or a fall pipe equipped with an underwater camera) thereby reducing unnecessary spreading and ensuring accurate placement of the rock armour, a minimised footprint, and that the minimum safe quantity of rock is used. Where possible, rock bags will be reused as stabilisation materials during the

decommissioning of the Johnston Field. Finally, non-invasive survey methods which are agreed with OPRED will be implemented for clear seabed verification.

6.1.7 Conclusion

Receptor	Impact Magnitude	Receptor Sensitivity	Receptor Vulnerability	Receptor Value
Benthic Environment	**Low**	**Low**	**Low**	**Low**
Protected Sites	**Low**	**Low**	**Low**	**Very High**
Justification				
Decommissioning activities in the Johnston Field will result in temporary direct disturbance to the seabed amounting to 0.24 km^2. When accounting for temporary indirect disturbance, the total area impacted increases further to 0.48 km^2. Permanent disturbance caused by long term rock armour placement will affect 0.00012 km^2. Temporary direct seabed disturbance may cause injury and mortality to the benthos within the disturbance footprint, whilst indirect temporary disturbance may interfere with feeding, and smother individuals that are unable to burrow back to the surface through settled sediment. Permanent direct disturbance will result in the loss of a small area of soft-sediment habitat, which will be replaced with an equivalent area of hard substrate. The EUNIS habitat type that categorises much of the Johnston Field is A5.37 'Deep circalittoral sand' (JNCC, 2019). This habitat is very widely distributed across the SNS. Thus vulnerability and value are classed as **low** for the general benthic environment. The scale of direct and indirect disturbance associated with the decommissioning activities is small relative to the area of similar habitat available and so impact magnitude is also considered **low**. Furthermore, no habitats or species of conservation concern were identified within the decommissioning footprint or its immediate vicinity. As such, sensitivity was deemed **low**. Overall, the spatially and temporally limited extent of the impacts associated with the Johnston decommissioning are considered to be **negligible** with respect to the benthic environment. The Johnston Field is located within the Southern North Sea SAC. As this site is of European importance and contribute to an international network of protected sites, the receptor value is considered **very high** for protected sites. The proposed decommissioning activities will affect an estimate 0.00065% of the SAC, which covers an area of 36,951 km^2. Given the limited potential for cumulative impacts to the qualifying habitat or supporting processes of the Southern North Sea SAC and the fact that project activities are not considered to add pressure, either alone or in combination with other projects, on harbour porpoise as a qualifying feature of the Southern North Sea SAC, or the habitat use and availability of its prey, the impact magnitude and receptor sensitivity are considered **low**. Impacts are not likely to affect long term function of system or status of the population of harbour porpoises therefore the vulnerability of this receptor is considered **low**. The proposed activities will not have any LSEs on the integrity or conservation objectives of either SAC and therefore the significance of potential impacts to the SAC are considered **negligible**.				
Residual Impact Significance	**Negligible**			

6.2 Commercial Fisheries

The impact of Johnston decommissioning activities on commercial fisheries is discussed in this Section, along with measures proposed to minimise the scale and duration of potential impacts.

6.2.1 Approach

Potential impacts to commercial fisheries from decommissioning of infrastructure is limited to:

- The introduction of possible snagging risks to commercial trawl fisheries and other fisheries which utilise the seabed; and
- The presence of decommissioning vessels temporarily modifying the area of available fishing grounds.

6.2.2 Sources of Potential Impacts

Free-spans associated with infrastructure decommissioned *in situ* during their initial decommissioning and long-term degradation have the potential to snag demersal fishing gears, which may lead to the losses of catches or commercial fishing gears and may even result in vessel capsize in extreme circumstances.

The greatest identified risk to commercial fisheries is the potential snagging of fishing gears on exposed infrastructure (e.g. de-buried infrastructure or spans along rigid pipelines) or seabed modified by removal of infrastructure (e.g. clay berms generated by the removal of flexible umbilicals). For commercial fisheries, snagging can mean the loss of gear and catches or, in the worst-case scenario, the possible loss of life if a vessel is capsized (MAIB, 1998). Data from the Marine Accident Investigation Branch (MAIB) (www.gov.uk/maib) shows that 15 vessels have been sunk by snagged fishing gear between 1989 and 2014, resulting in 26 fatalities. According to the 2018 fisheries statistics, demersal mobile gear used in this block includes trawls, demersal seine nets and dredging which may be impacted by snagging (Scottish Government, 2019).

The trenched and buried flexible flowlines and umbilicals, as well as the drilling templates and wellheads will be fully removed. Trenched and/or buried flexible flowlines will be reverse-reeled without prior de-burial for removal and the seabed will be subsequently remediated. All jumpers, spool pieces and risers will be fully removed.

The only infrastructure to be decommissioned *in situ* are the trenched and buried rigid flowlines. The buried flexible flowlines to be removed may share the trench with a buried rigid flowline, which may complicate the removals process. In such instances, reverse reeling will only take place where safe and technically practicable to do so. Both decommissioning options have the potential to introduce snagging hazards, should the buried rigid flowlines develop exposures or spans over time or if the reverse reeling of the flexible flowlines generates clay berms in the sediment encasing the infrastructure. As discussed in Section 3.4, a seabed survey of the nearby Ravenspurn Field described the seabed as being 0.24% – 26.48% fines (silt and clay) (Oil & Gas UK, 2019). Reverse reeling of flexible pipelines through fine muds and clays could potentially result in the formation of clay berms, which are a snagging hazard for fishing vessels.

The majority of pipelines are known to be stable and have remained buried throughout the lifetime of Johnston. Information on the DoB of the existing pipeline infrastructure indicates all of the pipelines are suitably buried along their lengths, with few potential areas where exposures may develop along the pipelines (Appendix C).

Future monitoring work will ensure the integrity of the DoB of these flowlines, but further consideration of the proposed activities is necessary. All identified exposures are to be removed and remediated, per the selected CA decommissioning option. However, the potential for legacy impacts to commercial

fisheries due to the degradation of infrastructure which is decommissioned *in situ* remains, which therefore warrants further assessment.

6.2.3 Effects on Sensitive Receptors

As discussed in Section 6.2.2, the potential impacts to commercial fisheries from decommissioning activities are most severe for demersal mobile fisheries, which utilise gears which are dragged along the seabed (e.g. bottom trawlers, dredgers, etc.). Various data sources indicate that the area is predominantly targeted for shellfish species, which had the highest live weight landing for the past three years and monetary value for the past five years. The data described above and in Section 3.5.2 suggests that fishing vessel activity was generally low within Johnston compared to the surrounding waters and annual fishing effort has gradually decreased between 2016 and 2018.

Amalgamated VMS data suggests that ICES Rectangle 37F1 experiences low fishing intensity over the oil and gas pipelines, with low levels of trawling on the majority of its pipelines when compared to the rest of the UKCS. The trawling activity associated with pipelines within Johnston is higher for *Nephrops* fisheries (Section 3.5.2) (Rouse *et al.*, 2017), which is the key commercial species landed from ICES Rectangle 37F1 for both value and weight.

Due to the relatively low demersal fishing activity in the Johnston Field, the decommissioning operations are not likely to have significant impacts on economic value of demersal fisheries operating within this region.

6.2.4 Cumulative and Transboundary Impacts

Johnston is located 106 km west of the UK/ Netherlands median line. This region is therefore not likely to experience above average levels of fishing by foreign vessels compared to other regions of the UKCS (Scottish Government, 2018; Marine Scotland, 2012). However, fishing fleets of several other nationalities may still be found throughout the waters surrounding Johnston (Marine Scotland, 2012).

Nevertheless, as all infrastructure will either be removed or decommissioned *in situ* to an overtrawlable condition, no cumulative impacts to any foreign fishing fleets, demersal or otherwise, are expected to result from the Johnston decommissioning project. Moreover, a positive outcome of the decommissioning of Johnston will be the removal of the fishing exclusion zone surrounding the template, once it is removed. This will increase the available fishing grounds for commercial fishing fleets of all nationalities which have been granted access to fishing in the UKCS.

6.2.5 Mitigation Measures

The existing controls of seabed clearance verification with independent review by the NFFO, continued monitoring for an agreed period, remediation where required, and accurate mapping of the locations and state of infrastructure which has been decommissioned *in situ* reduces the probability of important impacts to commercial fisheries through snagging risk.

The physical presence of vessels during decommissioning operations can cause disturbance to commercial fishing vessels. There are a number of existing controls which Premier is utilising for the impact of vessel presence on commercial fisheries. Stakeholder engagement will be continued prior to commencement of operations, including the promulgation of NtMs detailing any decommissioning activities. Appropriate navigation aids will be used in accordance with the Consent to Locate conditions to ensure that sea users are made aware of the presence of vessels undergoing decommissioning activities. In addition, there will be continual use of Automatic Identification System satellite vessel tracking and all decommissioning vessel activities will be in accordance with national and international regulations.

In addition, Premier keeps manned bridges to ensure that other sea users adhere to any safety zones which are in place, including temporary safety zones around decommissioning vessels.

Pipelines will be remediated should any pre-decommissioning or DoB/monitoring surveys indicate the integrity of the pipelines or DoB has been compromised or a free span has emerged. Given the stability of buried rigid pipelines (see Appendix C), no such remediation is expected. However, should such an instance arise in future, other sea users would be notified via the appropriate communications channels (as described in Section 5).

The decommissioning operations will be designed and executed to minimise the area of seabed that is disturbed, therefore reducing the potential for these operations to generate clay berms in the process of reverse reeling (which will only take place where safe and technically practicable to do so). Furthermore, a seabed survey following completion of decommissioning will be carried out and on review of the results of this survey, an overtrawl survey will be considered.

In spite of the above, Premier has a responsibility to ensure all potential residual impacts to fisheries from snagging risk are minimised, given the magnitude of this impact factor. A post-decommissioning survey using geophysical survey methods to provide a collective profile of the buried flowline/seabed interface to identify potential free spans, as well as identify any remaining field debris will be carried out. Where necessary, overtrawl surveys will be undertaken to further verify that reverse reeling did not generate clay berms (in clay outcrop areas) or other snagging risks. Any identified snagging hazards will be remediated with rock placement or other stabilisation materials, as required and agreed upon with the regulator. Following this, continued monitoring and remediation will take place to ensure that all buried infrastructure remains stable and without exposures.

All vessel activities will be in accordance with national and international regulations. Fishing activities have the potential to increase in the area once the 500 m safety zones surrounding the existing field infrastructure are re-assessed.

6.2.6 Conclusion

Receptor	Impact Magnitude	Receptor Sensitivity	Receptor Vulnerability	Receptor Value
Commercial Fisheries	**Low**	**Low**	**Negligible**	**Low**
Justification				
Residual impacts from the degradation of pipelines which are decommissioned *in situ* will be managed through continued monitoring and communications with other sea users. Considering the negligible likelihood of potential snagging risks predicted from the proposed decommissioning activities alongside the management and control measures that are in place to ensure no such risks arise, residual impacts associated with snagging of commercial fisheries are considered **negligible**. There will not be any long-term impacts associated with the proposed decommissioning activities. During decommissioning, impacts to fisheries will only result in a very limited and short-term loss of a small relative area of unexceptional fishing grounds. Therefore, impact magnitude is deemed **low**. Due to the very limited reduction in catches which may arise from the temporary loss of access to fishing grounds during decommissioning, and the capacity for the industry to accommodate this, receptor sensitivity is considered **low**. Furthermore, the impacts to fisheries associated with the decommissioning will be imperceptible and will not have lasting effects therefore vulnerability is **negligible**. The value of the receptor has been deemed **low** as the area in which Johnston is located and where the decommissioning activities will take place is not considered of particular commercial importance when compared to the surrounding regions of the North Sea.				

For these reasons, the overall residual impact significance of the proposed decommissioning activities on commercial fisheries is considered **negligible**.	
Residual Impact Significance	**Negligible**

7 CONCLUSIONS

Following detailed review of the proposed decommissioning activities, the environmental sensitivities characteristic of the Johnston Field, industry experience with decommissioning activities, and consideration of stakeholder concerns, it was determined that potential impacts to the seabed, and commercial fisheries required further consideration. As the Johnston Field is located within the Southern North Sea SACs, consideration of potential impacts to conservation features of the sites were required. Where relevant, impacts of the decommissioning activities in relation to this SAC were considered. As the approach for the decommissioning of the Johnston varies with the type of infrastructure, the worst-case aspects from each method were considered and assessed in line with a tried and tested EA Methodology described in Section 4. The results of the impact assessment are detailed in Section 6.

The activities associated with the decommissioning of the Johnston Fields will have an impact, both directly and indirectly on the seabed. These impacts are full addressed in Section 6.1. The proposed decommissioning activities are short-term and highly localised. The overall area of direct impact to the seabed will be 0.24 km^2. A seabed clearance verification survey is required following all decommissioning projects to ensure the seabed is left in a safe condition for future fishing effort. This includes a non-intrusive survey of the decommissioned area in the first instance. Should the clear seabed verification survey determine that direct intervention is required, such remediation is expected to be minor in nature and will be agreed upon with OPRED prior to works commencing. However, all the infrastructure being decommissioned *in situ* is considered stably buried and should not require further intervention. Given the nature of the activities, their short and mostly temporary duration, and the adaptability of the habitat, impacts to the seabed as a result of the Johnston decommissioning are expected to be **negligible**.

The Johnston Field is located within the Southern North Sea SAC. The Southern North Sea SAC is protected for harbour porpoise, and its conservation objectives also aim to limit damage to the habitats which support harbour porpoise prey, namely sandeels and whiting. As decommissioning constitutes a form of 'marine construction', the implications of the proposed activities were assessed against the Conservation Objectives of the site, which includes limiting damage to the habitats which support harbour porpoise prey, including sandeels and whiting. The potential to impact upon the integrity of this site was reviewed in the assessment of seabed impacts (Section 6.1.5). The spatial extent of disturbance caused by the decommissioning activities is limited and short-term, and the total area of impact will only affect 0.00065% of the SAC. The Southern North Sea SAC habitat is naturally mobile therefore increased sedimentation attributed to the decommissioning would not be significantly above natural levels. The impacts were not found to contravene the site's Conservation Objectives therefore, the impact of the decommissioning on the SAC is deemed **negligible**.

Impacts are also associated with the physical presence of vessels during decommissioning activities. This will result in a temporary loss of fishing grounds. Risk may also arise from snagging hazards created due to the decommissioning activities. Both of these impact pathways are discussed in Section 6.2, though snagging risk was determined to be minimal early on.

Residual impacts from the removal and degradation of pipelines which are decommissioned *in situ* will be managed through mitigation measures outlined in Section 6.2.5. There are no exposures of pipeline or area of shallow burial along the buried rigid pipelines to be decommissioned *in situ*, and the ends will be cut and removed, with remediation of cut ends with spot rock or gravel cover. The risk to fisheries will thus be reduced. All the remaining subsea infrastructure will be removed, including trenched and buried flexible flowlines and umbilicals, spools and jumpers, drilling template and protection/stabilisation materials. Any clay berms that may be formed during reverse reeling for the

removal of the flexible flowlines will be detected during clear seabed verification survey The mitigation measures, in combination with the minimal likelihood of potential snagging risks arising from the decommissioning activities, will ensure that impacts to commercial fisheries from snagging risk are **negligible**. Therefore, the primary impact to other sea users in the vicinity is the temporary loss in fishing grounds during decommissioning.

The physical presence of vessels in association with the decommissioning activities will result in a temporary loss of fishing area; the impact associated with this is discussed fully in Section 6.2. The area in which the Johnston Field is located is not of significant commercial importance to the fishing industry; it is predominantly targeted for shellfish species (see Section 3.5.2). Due to its mobile nature, the commercial fishing industry is able to adapt to short term exclusion. Overall, the residual impact significance of the decommissioning activities to commercial fisheries is **negligible**.

Finally, this EA has considered the objectives and marine planning policies of the East Offshore Marine Plan across the range of policy topics including biodiversity, natural heritage, cumulative impacts and the oil and gas sector. Premier considers that the proposed decommissioning activities are in alignment with such objectives and policies.

Based on the findings of this EA, including the identification and subsequent application of appropriate mitigation measures and Project management according to Premier's HSES Policy and EMS, it is considered that the proposed Johnston decommissioning activities do not pose any threat of significant impact to environmental or societal receptors within the UKCS or internationally.

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APPENDIX A: JOHNSTON – INFRASTRUCTURE DETAILS

Table A-1 Johnston Infrastructure - Pipelines, Flowlines, Spool, Jumpers, Umbilicals & Risers

Group Title	Asset	From	To	Description
Rigid Pipelines	PL989	Template Tie-In Spool	Ravenspurn North Riser Tie-In Spool	9.28 km long 12" production pipeline, trenched and buried
	PL990	Ravenspurn North Riser Tie-In Spool	Template Tie-In Spool	9.28 km 2" methanol pipeline, piggy-backed on pl989. trenched and buried
Rigid Spools	PL989 Spools	Template Header Tie-In Flange	Pipeline Tie-In Flange	1 off 12" production spools, 35.4 m long.
		Pipeline Tie-In Flange	Riser Tie-In Flange	1 off 12" production spools, 61.2 m long.
	PL990 Spools	Riser Tie-In Flange	Pipeline Tie-In Flange	1 off 2" methanol spools, 76.8 m long.
		Pipeline Tie-In Flange	Template Header Tie-In Flange	1 off 2" methanol spools, 25 m long.
	PL2501 Tie-in Spool	J5 Well Tie-In Flange	J4 Well Tie-In Flange	1 off production spool, 25 m long
Flexible Flowlines	PL2105	J4 Well Tie-In Flange	Template Tie-In Flange	6.89 km long 8" production flowline, trenched and buried.
Jumpers	PLU2502	J4 Well	J5 Well	2" J5 Methanol Jumper, 35 m long
	PL3679	Johnston Template	Johnston Template Umbilical Termination Assembly	0.65" J4 Power Jumper, 24 m long
	PL3680	Johnston Template	Johnston Template Umbilical Termination Assembly	0.65" J4 Signal Jumper, 24 m long
	PL3681	Johnston Template	Johnston Template Umbilical Termination Assembly	1.15" J4 HP Hydraulic Jumper, 24 m long

Group Title	Asset	From	To	Description
	PL3682	Johnston Template	Johnston Template Umbilical Termination Assembly	1.15” LP Hydraulic Jumper, 24 m long
	PL3687	J4 Tree Umbilical Termination Assembly	J4 Subsea Control Module	0.65” J4 Power Jumper, 10 m long
	PL3688	J4 Tree Umbilical Termination Assembly	J4 Subsea Control Module	0.65” J4 Signal Jumper, 10 m long
	PL3689	J4 Tree Umbilical Termination Assembly	J4 Subsea Control Module	1.15” J4 HP Hydraulic Jumper, 10 m long
	PL3690	Johnston Wellhead facility	Johnston Umbilical Termination Assembly	1.15” LP Hydraulic Jumper, 24 m long
	PL3697	J4 Subsea Control Module	J5 Tree	2.95” J5 Signal Jumper, 50 m long
	PLU3698	J4 Subsea control module	J5 Tree	1.15” Hydraulic Jumper, 50 m long
	PL3710	J4 Subsea control module	J5 Tree	1.15” J5 CIV Hydraulic Jumper, 50 m long
Umbilicals	PL991	Ravenspurn North J-Tube Hang Off	Template	9.52 km long static umbilical, trenched and buried.
	PLU2106	Template	J4 Well	6.88 km long static umbilical, trenched and buried.
Risers [Note 1]	PL989	Pipeline Tie-In Spool Flange	Ravenspurn North Topsides Pipework	87.1 m long 12” production riser
	PL990	Ravenspurn North Topsides Pipework	Pipeline Tie-In Spool Flange	107.2 m long 2” methanol riser

Table A-2 Johnston Infrastructure - Installations and Stabilisation

Group Title	Asset	Description
Protection / Stabilisation	Concrete Mattress	Dimensions: 5 m x 3 m x 0.3 m, total weight: 979te (approx.), estimated 68 off Dimensions: 6 m x 3 m x 0.15 m, total weight: 63te (approx.), estimated 63 off Dimensions: 6 m x 5 m x 0.3 m, total weight: 58te (approx.), estimated 2 off Dimensions: 6 m x 3 m x 0.3 m, total weight: 4te (approx.), estimated 4 off Dimensions: 5 m x 4 m x 0.3 m, total weight: 346te (approx.), estimated 18 off
	Grout Bags (non-biodegradable)	Weight: 25 kg, estimated 280 off
Installations [Note 2]	Johnston Subsea Template	Dimensions: 25 m x 13 m x 6.5 m, weight: 221te
	J4 WHPS	Dimensions: 7.6 m x 7.6 m x 5.6 m, weight: 36te
	J5 WHPS	Dimensions: 7.6 m x 7.6 m x 5.6 m, weight: 36.7te

Notes:

1. The risers are attached to the Ravenspurn North platform and are therefore discounted from this decommissioning programme and EA and will remain *in situ* until the platform decommissioning.
2. The WHPS are out of scope of the EA and will be covered by the appropriate permits as part of well decommissioning.

APPENDIX B: ENVID SUMMARY

The ENVID workshop was held to review environmental sensitivities and potential impact pathways for all of Premier's assets which are under consideration for decommissioning (i.e. Greater Balmoral Area (includes Balmoral, Glamis, Nicol, Brenda and Stirling), Caledonia, Huntington, Hunter & Rita, and Johnston Fields). As such, infrastructure and sensitivities associated with all of these assets are included in the ENVID Summary Table below.

Premier Oil UK Ltd. Decommissioning Project: Environmental Management Worksheet **06/08/2019**

Environmental Impact Review					Controls, Mitigations, Review and Ranking												Identified Actions		
						Initial Ranking						Residual Ranking							
Operational Phase	Project Element	Operation / Aspect	Activity	Summary of Environmental Impact	Existing Controls (Standards, Legislative, or Prescriptive)	Consequence/Extent	Duration of Effect	Impact	Probability	Rank	Premier Specific / Best Practice Standards	Consequence/Extent	Duration of Effect	Impact	Probability	Rank	Description	Comment	Status
General	Vessels	Physical presence	Vessels	Disturbance to vessel operations offshore (e.g. fisheries and other maritime users); disturbance to marine species	Stakeholder engagement. Existing controls through DP Vessels and the usual notifications (key stakeholders).	L	M	L	M	M	In addition to existing controls, Premier keeps manned bridges.	L	M	L	M	M		Screened out	
			Discharges	Vessel discharge of grey water, bilge water, etc.	MARPOL compliant, bilge management procedures, good operating practices.	L	L	L	H	L		L	L	L	H	L		Screened out	
			Vessel engine noise	Underwater noise - behavioural modifications to marine mammals, turtles and potentially fish.	Vessel noise will not have significant sound levels - unlikely to be far above ambient noise levels.	L	M	L	M	L		L	M	L	M	L		Screened out	
		Power generation	Emissions	Gaseous emissions to atmosphere cause increased degradation of local/regional air quality (NOx and particulates). Transboundary air pollution. Contributing to global warming (CO2).	Lift vessel likely to dominate gaseous emissions.												Not assessed at this stage due to global scale. This would be a very small amount of CO2 emissions.	Screened out	
			Energy Use	Impact on climate change and reduction of resources of hydrocarbons. Products used for recycling.	Lift vessel and onshore smelting processes will dominate energy usage.												Not assessed at this stage due to global scale. This would be a very small amount of fuel usage.	Screened out	
	Waste	Waste management	Onshore	Use of landfill and landfill resource take (non-hazardous); special disposal (hazardous)	All waste will be handled and disposed of in line with regulations as detailed in the Waste Management Plan. Inventory of waste - tracking materials to final place. There are potential positive impacts from recycling of steel.	L					All wastes, including normal, hazardous and special wastes, will be shipped to shore for processing. Any transfrontier shipments of waste, including those for landfill, will be non-hazardous and will be managed under the Waste Management Plan and will comply with relevant legislation.	L						Screened out under Waste Management Strategies	
Preparation	Substructures	Template, wellheads, etc.	Flushing and cleaning	Liquid discharge to sea - Water quality in immediate vicinity of discharge will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts from sediment.	Treated water discharged to sea after cleaning.	L	L	L	M	L	Any NORM identified during flushing and cleaning of substructures are covered under the appropriate Waste Management Plan. This includes NORM from all subsea and topsides sources and from Non-Destructive Testing (NDT).	L	L	L	L	L	There is a higher risk of NORM at Balmoral and around the Voyageur FPSO. It is not significant at the moment, but likely to get worse. Brenda will undergo NDT, but this is covered by the handling of radioactive waste outlined in the Waste Management Strategy for Balmoral.	Screened out under Waste Management Strategies	
			Marine growth removal	Disposal to landfill. As a worst case assume landfill, but look for alternative route.	Waste management strategy.	L	H	L	H	M	All wastes, including special wastes, such as marine growth, will be shipped to shore for processing. Any transfrontier shipments of waste, including those for landfill, will be non-hazardous and will be managed under the Waste Management Plan and will comply with relevant legislation.	L	H	L	H	M	Soft growth will be jetted off the deck, *Lophelia* or other hard substrates/species would not be jetted off (it's a hard coral), may remain stuck on the structure when it's shipped to shore, but can't go to normal landfill because it's classed as biological waste.	Screened out under Waste Management Strategies	
	Pipelines & Umbilicals	Pipelines	Disconnect ends	Liquid / solid discharge to sea - Water quality in immediate vicinity of discharge will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts? Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Treated water discharged to sea after cleaning. Solids will be shipped to shore for disposal.	L	L	L	M	L		L	L	L	L	L	Residuals at cut ends released into the marine environment (post-flushing - should be low). Flooding into the pipeline only up to a certain level (pressure dependent), so displacement is not complete pipeline.	Screened out	
				Liquid /solid discharge to sea - Water quality in immediate vicinity of discharge will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Agate discharge as solid . Potential NORM impacts? Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Treated water discharged to sea after cleaning. Solids will be shipped to shore for disposal.	L	L	L	M	L		L	L	L	L	L	Low risk of substructures emitting fluids/solids - everything cut post-flushing. Residuals released in minute amounts.	Screened out	

		Template, wellheads, etc.	Internal cutting (water jetting)	Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	M	L	L	M	L		M	L	L	M	L	Impacts include localised deposition and localised smothering, leading to localised seabed disturbance.	Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	M	L	L	M	L		M	L	L	M	L	Impacts include localised deposition and localised smothering., leading to localised seabed disturbance. Wellheads around Brenda includes clean cuttings deposits (not classed as piles under OSPAR assessments). Assumes some level of residuals present in deposits, but all below OSPAR thresholds, given they're not classed as piles.	Screened in	
			External cutting with diamond wire (as fallback option)	Underwater noise - behavioural modifications to marine mammals, turtles and potentially fish. Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	Diamond wire cutting noise will not have significant sound levels.	L	L	L	L	L		L	L	L	L	L	Ambient noise levels in the SNS are already very high due to vessel traffic, and any noise impacts from cutting will be negligible and limited in duration.	Screened out	
				Liquid / solid discharge to sea - Water quality in immediate vicinity of discharge will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts? Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Treated water discharged to sea after cleaning. Solids will be shipped to shore for disposal.	L	L	L	L	L	Transfer of controlled, hazardous and special wastes to UK ports for disposal will be governed by waste management plans.	L	L	L	L	L		Screened out under Waste Management Strategies	
				Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	M	L	L	M	L		M	L	L	M	L	Perhaps there are old piles at Johnston (old), but cuttings will have dissipated in the currents of the SNS which run closer to the coastline.	Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	M	L	L	M	L		M	L	L	M	L		Screened in	
	Substructure			Water quality in immediate vicinity of the jetted cuttings will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts?	Approximately 2 Te of cuttings jetted to surrounding environment - dynamic environment means dispersal and resettlement anticipated to be rapid.	H	M	H	M	H	MFE will direct the majority of the cuttings pile to the seabed immediate to the template (i.e. within hundreds of metres).	M	M	L	L	M	The MFE plume will only carry approximately 0.001 ppm of particulates from the cuttings pile within the water column. Whilst the plume will travel quite far in the water currents, this level of contamination is highly diluted and anticipated to have negligible impacts on marine species within the water column.	Screened in	
				Underwater noise - behavioural modifications to marine mammals, turtles and potentially fish. Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	MFE will not generate sound levels which will generate injury or significant disturbance to any marine species.	L	M	M	L	L	Premier will undertake MFE outwith periods of concern for drilling activities, as this activity is considered greater than a worst-case analogue for underwater noise generated by MFE.	L	L	L	L	L	Noise emissions from MFE are likely to be lower than drilling sounds and will be masked to a certain degree by the excavation vessel. MFE will be limited in duration and unlikely to exceed emissions for any of the operational equipment assessed for noise impacts. It is noted that the JNCC's period of concern for drilling activities, which are anticipated to generate noise levels slightly above those produced during MFE, is October to December.	Screened out	

Decommissioning		Template (and potentially old wellheads)	MFE of cuttings	Seabed disturbance - Template is 9 km outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles. Cuttings deposits - in and around template, jetting deposit (2K tonnes) into water column - modelling report	Volume of sediment/ cutting mobilised - Large quantities of material excavated and introduced into a dynamic environment - region of impact will be large, but dispersal and resettlement anticipated to be rapid.	H	M	H	H	H	MFE will direct the majority of the cuttings pile to the seabed immediate to the template (i.e. within hundreds of metres).	M	M	M	M	M	The area is characterised by benthic fauna which includes species sensitive to smothering, particularly seapens. Seabed impacts will be most marked within several hundred metres of the Balmoral template, though beyond this the template cuttings deposition rates fall below 1 mm . There will be some movement of cuttings material towards the Scannar Pockmarks SAC, located approx. 9 km NW of the template. However, the majority of sediment deposition will occur to the south and southeast of the template. Any sediment deposition which reaches the SAC is likely to fall below 0.01 mm, based on available modelling, which is indiscernible against background sedimentation levels. Moreover, the template structure needs to be removed to be legally compliant. For these reasons no significant impacts to the SAC anticipated.	Screened in	
			Lifting and removal	Underwater noise - behavioural modifications to marine mammals, turtles and potentially fish. Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	Lifting and removal will not generate significant sound levels.	L	L	L	L	L		L	L	L	L	L		Screened out	
				Seabed disturbance - Template is 9 km outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles. Cuttings deposits - in and around template, jetting deposit (2K tonnes) into water column - modelling report	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation.	M	M	M	M	M		M	M	M	M	M		Screened in	
		Decommissioned *in situ*	Residuals	Liquid / solid discharge to sea - Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Treated water discharged to sea after cleaning. Solids will be shipped to shore for disposal.	L	L	L	L	L		L	L	L	L	L	There may be some residuals from when cuts take place, but small volumes to shoot out at end, but these will be permitted with flushing of pipelines.	Screened out	
			Free spans	Snagging risk to trawl and other demersal fisheries	Continued monitoring for an agreed period and remediation if required, accurate mapping of decommissioned in situ location and state	H	M	H	M	H	Almost all pipelines are stable and have remained buried. However, pipelines will be remediated regardless.	H	M	H	L	M	Majority of pipelines don't have free spans - except potentially around 'dog kennels' which protect locations where umbilicals have popped out. These protections cover the free spans, and would only expose free spans if they are removed.	Screened in	
			Rock dump	Introduction of new substrate which may alter habitat architecture, influencing water movement, sediment accumulation and light conditions.	Minimise introduction of material where possible	L	H	L	L	L		L	H	L	L	L		Screened in	
				Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	L	H	L	L	L		L	H	L	L	L	Relatively small footprint compared to volume of fishing taking place in surrounding edges.	Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	L	H	L	L	L		L	H	L	L	L		Screened in	

	Pipelines & Umbilicals	Full removal	Reverse reeling and cut & lift	Liquid / solid discharge to sea - Water quality in immediate vicinity of discharge will be reduced, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts. Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Treated water discharged to sea after cleaning. Solids will be shipped to shore for disposal.	L	L	L	L	L	Transfer of controlled, hazardous and special wastes to UK ports for disposal will be governed by waste management plans.	L	L	L	L	L		Screened out under Waste Management Strategies	
				Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	H	M	M	H	H	Remediation will be undertaken where required.	H	L	M	H	M	Clay berms may require remediation (overtrawl) so that lumps of clay exposed during reverse reeling do not pose a snagging risk.	Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	H	M	M	H	H	Remediation will be undertaken where required.	H	L	M	H	M	Clay berms may require remediation (overtrawl) so that lumps of clay exposed during reverse reeling do not pose a snagging risk.	Screened in	
			Rock dump	Introduction of new substrate which may alter habitat architecture, influencing water movement, sediment accumulation and light conditions.	Minimise introduction of new material where possible	L	H	L	L	L		L	H	L	L	L		Screened in	
				Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	L	H	L	L	L		L	H	L	L	L		Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	L	H	L	L	L		L	H	L	L	L		Screened in	
	Surveys	Surveys for post-decommissioned infrastructure left in-situ	Geotechnical survey activities - may include grab sampling	Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	L	L	L	L	L		L	L	L	L	L	Seabed disturbance from benthic surveys will be minute and limited to the immediate vicinity of the installations, with the odd grab sample along the pipelines, though this is unlikely. Only relevant to Rita/Hunter installations.	Screened out as no significant impacts identified	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	L	L	L	L	L		L	L	L	L	L	Seabed disturbance from benthic surveys will be minute and limited to the immediate vicinity of the installations, with the odd grab sample along the pipelines, though this is unlikely.	Screened out as no significant impacts identified	

Legacy			Geophysical survey activities	Underwater noise - Physiological harm, behavioural modifications to marine mammals, turtles and potentially fish. Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	Noise impacts to marine species from use of seismic, sub-bottom profiler, and other survey equipment. JNCC (2017) Guidelines will be employed for mitigation of noise impacts to marine mammals for future survey work involving seismic survey equipment.	H	L	H	M	H	Future permitting will cover post-decommissioning geophysical surveys. Multibeam will likely be used for imaging and identification of any exposures.	H	L	H	M	H		Screened out as covered by future permitting	
	Remediation	Remediation of spans	Rock dump/ reburial	Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	L	H	L	L	L	Exposures remediated primarily with rockdump rather than reburial, but with additional discussion inside SAC. However, the use of rockdump will be minimised where possible.	L	H	L	L	L		Screened in	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	L	H	L	L	L	Exposures remediated primarily with rockdump, rather than reburial. However, the use of rockdump will be minimised where possible.	L	H	L	L	L		Screened in	
	Degradation	Degradation of substructure	Free spans	Snagging risk to trawl and other demersal fisheries	Continued monitoring for an agreed period and remediation if required, accurate mapping of decommissioned in situ location and state.	H	L	H	L	M	Eventual corrosion and collapse of structures pose a potential snagging risk. Continued monitoring and remediation will be undertaken where required. This includes deployment of a PowerBuoy at Balmoral.	H	L	H	L	M	This is primarily an issue at Balmoral, where additional monitoring will take place via a PowerBuoy.	Screened in	
Unplanned events	Vessels	Significant Hydrocarbon release	Unplanned collision	Catastrophic loss of containment Pollution of the marine ecosystem. Organic enrichment and chemical contaminant effects in water column and seabed sediments.	Unplanned - Project will introduce new diesel inventory to the site with additional inherent spill / pollution risk e.g. from heavy lift vessel. OPEP MAS Navaids SOPEP	H	M	H	L	H	This will be covered in future Navigational Risk Assessment work.	H	M	H	L	M	SNS higher risk of collision, but manned wheelhouses, notifications, AIS, etc. No modelling required.	Screened Out; *Johnston may need assessment b/c seabirds, seals, etc.*	
		Dropped Objects	Unplanned loss of material to sea	Seabed disturbance - **inside Dogger Bank SAC** - edges mostly clay/not replaceable (CMS assets). Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - Dogger Bank is an extensive sublittoral sandbank which is characterised by moderately mobile, clean sediments. Impacts to fauna will be minor, due to community-level change from bottom-trawling. Impacts to the gross physical nature of the site are not expected.	L	H	L	L	L	Everything will be endeavoured to be retrieved. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. Debris clearance surveys will aid in the identification of any dropped objects.	L	M	L	L	L	Not undertaking any cutting or lifting of pipelines, just reverse reel, and the integrity of all subsea structures is considered sound. No issues have been identified.	Screened out as no significant impacts identified	
				Seabed disturbance - outside SAC Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	Volume of sediment mobilised proportional to area of sediment disturbed - expected to be minor and in dynamic environment with frequent natural sediment mobilisation	L	H	L	L	L	Everything will be endeavoured to be retrieved. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. Debris clearance surveys will aid in the identification of any dropped objects.	L	M	L	L	L	Not undertaking any cutting or lifting of pipelines, just reverse reel, and the integrity of all subsea structures is considered sound. No issues have been identified.	Screened out as no significant impacts identified	

APPENDIX C: DEPTH OF BURIAL PROFILE