EIDER DECOMMISSIONING

Eider Upper Jacket
Decommissioning Environmental Appraisal

77IFS-156680-H99-0003-000

TAQA INTERNAL REVISION SUMMARY			
Document Owner:	TAQA Bratani Limited		
Revision No:	06	**Revision Date:**	22-02-2023
Revision Summary:	Issued for Submission		
Authorisation:	**Prepared by**	**Verified by**	**Approved by**
	Xodus	Duncan Talbert	Louisa Dunn

OPRED REVISION SUMMARY			
Revision No.	Reference	Changes/Comments	Issue Date

DISTRIBUTION LIST		
Company	Name	No. Copies
TAQA Bratani Limited		1
OPRED		1

CONTENTS

ABBREVIATIONS

Abbreviation	Meaning
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AWMP	Active Waste Management Plan
BEIS	Business, Energy and Industrial Strategy
CA	Comparative Assessment
COP	Cessation of Production
CPR	Continuous Plankton Reader
DECC	Department for Energy and Climate Change
DP	Decommissioning Programme
DR MPA	Demonstration and Research Marine Protected Areas
EA	Environmental Appraisal
EEMS	The Environmental and Emissions Monitoring System
EMS	Environmental Management System
ES	Environmental Statement
EU	European Union
EUNIS	European Nature Information System
EWC	European Waste Catalogue Codes
HES	Historic Environment Scotland
HSSE	Health, Safety, Security and Environment
ICES	International Council for the Exploration of the Sea
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
MCZ	Marine Conservation Zone
MSF	Modular Support Frame
NC MPA	Nature Conservation Marine Protected Area
NMPI	National Marine Plan Interactive
NNS	Northern North Sea
NSTA	North Sea Transition Authority

OESEA	Offshore Energy Strategic Environmental Assessment
OGA	Oil and Gas Authority
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	The Oslo Paris Convention
P&A	Plug and Abandonment
PETS	Portal Environmental Tracking System
PEXA	Practice and Exercise Areas
PMF	Priority Marine Feature
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SMRU	Sea Mammal Research Unit
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
THC	Total Hydrocarbon Content

Tables

Figures

EXECUTIVE SUMMARY

Introduction and Background

This non-technical summary provides an outline of the findings of the Environmental Appraisal (EA) conducted by TAQA Bratani Limited (TAQA) for the proposed decommissioning of the Eider Platform Upper Jacket which consists of the structure from the topsides cut height to approximately EL -127 m, or approximately 30 m above the seabed. This structure is referred to as the “Upper Jacket” throughout this document. The Upper Jacket estimated gross weight (inclusive of marine growth), is ≈14,000 Te. The purpose of the EA is to understand and communicate the potential significant environmental impacts associated with the proposed Upper Jacket decommissioning activities.

The Eider platform is located in block 211/16a of the northern North Sea (NNS), approximately 120 km northeast of Shetland and 32 km west of the UK/Norway median line (Figure 1). The platform, comprising a modular topsides and an 8 legged K-braced steel sub-structure, was installed and started producing in 1988, with oil and gas being exported to North Cormorant through a 12-inch subsea pipeline and then via the Brent Oil Pipeline System to Sullom Voe in the Shetland Islands.

Over the lifetime of the Eider platform, drill cuttings have been discharged to sea resulting in a drill cuttings pile with an approximate volume of 11,267 m3. The majority of these cuttings are located directly beneath the Eider platform with a maximum height of 3.5 m (Fugro, 2018). The cuttings will not be affected by the Upper Jacket decommissioning operations and are outside the scope of this environmental appraisal.

Separate Decommissioning Programmes (DPs) & supporting EAs covering the Eider Footings and associated drill cuttings pile, pipelines, power cables and umbilicals adjacent to the platform will be submitted at a later stage, in line with TAQA’s wider northern North Sea Field plans.

Regulatory Context

The decommissioning of offshore oil and gas infrastructure in the UKCS is principally governed by the Petroleum Act 1998, as amended by the Energy Act 2008, which sets out the requirements for a formal DP and the approval process. Under the Department for Business, Energy and Industrial Strategy (BEIS), Guidance Notes on Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1988 (BEIS, 2018), the DP must be supported by an EA.

As part of the planning for decommissioning and to obtain regulatory approval for the activities, four DPs are in preparation, each supported by an EA:

- Topsides DP, covered by a previous EA. (Approved by OPRED May 2020);
- Upper Jacket DP, covered by this EA; and
- Footings DP, incorporating remaining structure left after Upper Jacket removal, and covered by a separate EA.
- Otter subsea tie-back to Eider will be covered in a separate DP and EA.

Due to the complexities of the Footings decommissioning, all current, proven technologies indicate the requirement to remove and transport the Upper Jacket as a separate entity from the Footings. Removal of the Upper Jacket will be carried out such that it does not preclude the possible future full removal of the Footings. Therefore separate DPs and EAs will be submitted for each. As TAQA intend to fully remove the Eider Upper Jacket, it has been agreed with OPRED that no CA submission is required in support of the Eider Upper Jacket DP. A Steel Piled Jackets Technical Assessment (TAQA, 2022) that demonstrates removal of the Upper Jacket does not preclude subsequent removal of the Footings will be provided to OPRED in support of the submission.

The Eider Footings are in close proximity to the cuttings pile. Leg B1 is located adjacent to the northerly section of the pile. In line with OSPAR Recommendation 2006/5, which governs the management of offshore cuttings piles, TAQA commissioned a screening survey to analyse the cuttings pile contents (Fugro, 2018). This study determined that the Eider drill cuttings pile is well below the OSPAR thresholds for both “total rate of oil release into the water column” and “persistence over the area of seabed contaminated”. OSPAR Recommendation 2006/5 indicates that natural degradation in situ is considered to be the best environmental strategy (OSPAR, 2019). Further information and details on the decommissioning of Eider cuttings pile and the pile itself can be found within the Footings DP and EA.

Proposed Schedule

This schedule may change to maximise economic recovery, or to exploit other opportunities to minimise greenhouse gas (GHG) emissions or other decommissioning impacts by combining activities into campaigns, or by combining Eider decommissioning operations with third-party decommissioning. The Eider Upper Jacket decommissioning schedule is shown below in Figure 1.

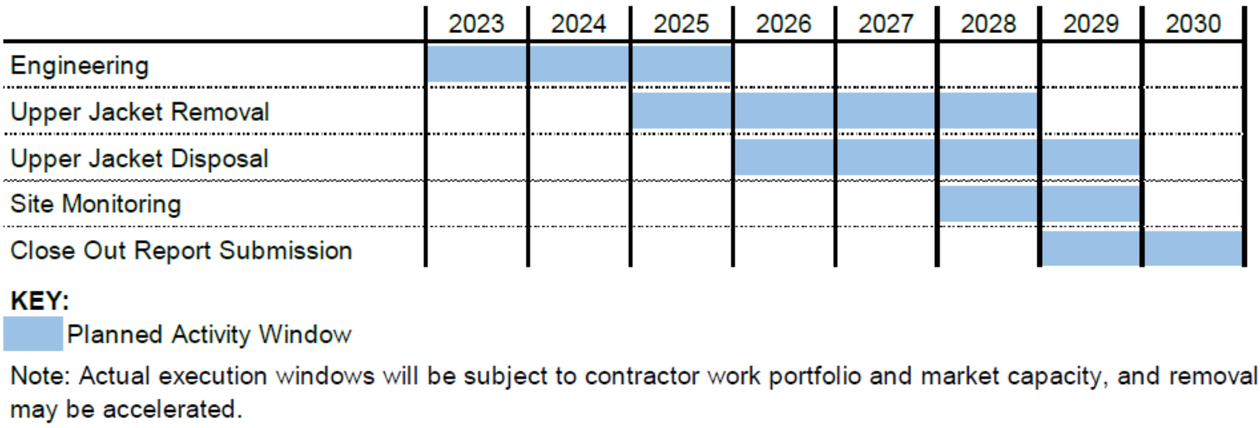

Figure 1 Eider decommissioning schedule

Options for Decommissioning

A study conducted to assess options for reuse of the Eider installation concluded that there are no credible reuse options principally due to the limited remaining life of the sub-structure due to fatigue issues (TAQA, 2018b).

Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in the Eider area have been summarised in Table 1.

Table 1 Key environmental and social sensitivities for the Eider area

Sediment type and seabed features
The Eider platform is located at a water depth of 157.5 m. The annual mean wave height within the Eider Field ranges from 2.11 m - 2.40 m, and current speeds are low. The combined energy at the seabed from wave and tide action is also low. Survey work shows that the seabed sediments present are muddy sand. This is consistent with mapped information which classifies this region of the North Sea as the European Nature Information System (EUNIS) broadscale habitat A5.27 deep circalittoral sand. Seabed surveys indicated that sediments in the wider Eider area comprise muddy sand or slightly gravelly muddy sand. The stations located close to the platform were classified predominantly as medium or coarse silt with high percentage of gravels in the top sections of the cores taken from the drill cuttings pile.

Sediment chemical composition
Hydrocarbon concentrations within the wider area are generally within expected background levels for the northern North Sea. Hydrocarbon levels within 250 m of the Eider platform are elevated above background concentrations but still in line with levels recorded during cuttings pile surveys carried out at platforms across the North Sea. Metal concentrations within 500 m of the platform and within the drill cuttings pile generally exceeded the OSPAR Effect Range Low levels.
Seabed habitats and species
Invertebrate communities living within the sediments are dominated by polychaete and mollusc species characteristic of background conditions in this part of the NNS, and evident in the earliest baseline surveys. Although, species richness appears to be unaffected by the influence of drilling related activity with stations close to the platform displaying levels similar to that sampled northwest, the organically enriched sediment close to the platform showed a reduced species diversity.
Fish and shellfish
The Eider platform lies within known spawning grounds for haddock, saithe, Norway pout and cod. Cod is recorded as using the Eider area as high intensity spawning ground. Blue whiting is the only species with a high intensity nursery ground around the Eider platform. The area is also a potential low intensity nursery ground for mackerel, haddock, Norway pout, spurdog, herring, hake and ling. However, published sensitivity maps indicate that the probability of aggregations of juvenile anglerfish, haddock, horse mackerel, mackerel, plaice, sprat, whiting, Norway pout, blue whiting and hake occurring in the offshore decommissioning project area is low.
Seabirds
Offshore in the NNS, the most numerous species present are likely to be northern fulmar, black-legged kittiwake and common guillemot. The Eider platform is located close to hotspots for northern fulmar, northern gannet and Atlantic puffin during their breeding season, when adults of these species can be seen foraging far from their coastal breeding colonies. In addition, after the breeding season ends in June, large numbers of moulting auks (common guillemot, razorbill *Alca torda* and Atlantic puffin *Fratercula arctica*) disperse from their coastal colonies and into the offshore waters from July onwards. At this time these high numbers of birds are particularly vulnerable to oil pollution. Seabird sensitivity to oil pollution in the region of the Eider platform is considered low from February to September, and medium between November and January. There is no data available for May and October.
Marine mammals
Harbour porpoise, white-beaked dolphin, minke whale and white-sided dolphin are the most abundant species recorded in the survey block covering the Eider platform. The harbour porpoise is the most frequently recorded cetacean in the vicinity of Eider, which is reflective of these being the most abundant and widely distributed cetaceans in the North Sea. Both grey and harbour seal densities are known to be low 120 km offshore, and around the Eider platform, densities are predicted to be between 0 and 1 seals per 25 km^2 for both species, which is considered low.
Conservation
There are no Nature Conservation Marine Protected Areas, Special Protection Areas, Special Areas of Conservation or Demonstration and Research Marine Protected Areas within 40 km of the Eider platform. The closest designated sites are the North-east Faroe-Shetland Channel NC MPA, located approximately 94 km to the north west, and the Pobie Bank Reef, located approximately 87 km to the south west.

Five individual ocean quahog (aggregations of which are listed by OSPAR and as a Priority Marine Feature in Scottish waters) were identified in a closer proximity to the Eider platform in a 2018 survey. No ocean quahog aggregations were noted during surveys. Sea-pens and other burrowing megafauna have been recorded in this region The OSPAR habitat and Priority Marine Feature *'seapens and burrowing megafauna communities*' are typically found in plain or fine muds, which is a finer sediment type than the sediments identified close to the Eider platform, classified as muddy sand. Therefore, this habitat is unlikely to occur here.
Fisheries and shipping
The Eider platform is located in International Council for the Exploration of the Sea (ICES) Rectangle 51F1. This region is primarily targeted for demersal species. Annual fishery landings by live weight and value are considered low to moderate for demersal and pelagic fisheries in comparison to other areas of the North Sea. Fishing effort has remained low within this region for the last five fishing years and is dominated by bottom-towed demersal fishing gears. Fishing effort generally peaks in the summer months within ICES Rectangle 51F1. Shipping density in the NNS in the vicinity of the proposed decommissioning activities is very low. Between 100 - 200 vessels transit through Block 211/16 annually.
Other sea users
The proposed decommissioning operations are located in a well-developed area for oil and gas extraction. However, there is little activity from other sea users recorded in the area. Apart from pipelines and cables associated with the Eider platform, there are no other cables or pipelines in the vicinity, no designated military practice and exercise areas, no offshore renewable or wind farm activity and no designated or protected wrecks nearby.

Impact Assessment Process

This EA Report has been prepared in line with the BEIS Decommissioning Guidelines and with Decom North Sea's EA Guidelines for Offshore Oil and Gas Decommissioning. The BEIS Decommissioning Guidelines state 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 (EIA) within this EA has been informed by several different processes, including identification of potential environmental issues through project engineer and marine environmental specialist review during a desktop screening exercise, and consultation with key stakeholders (Marine Scotland, JNCC and SFF).

The impact assessment exercise addressed the proposed decommissioning activities and any potential impacts these may pose. This discussion identified thirteen potential impact areas based on the proposed removal methods. Of the thirteen potential impacts, all were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. The thirteen potential impacts are tabulated in Table 2, together with justification statements for the screening decisions.

Table 2 Environmental impact screening summary for Eider Upper Jacket decommissioning

Impact	Further assessment	Rationale
Emissions to air	No	• Majority of emissions relate to vessel time, or the recycling of material returned to shore which will be limited in duration. • The estimated CO_2 emissions to be generated by the decommissioning activities is 22,305 te. This equates to less than 0.13% of the total oil and gas UKCS emissions in 2020.

Impact	Further assessment	Rationale
		Considering the above, atmospheric emissions do not warrant further assessment.
Disturbance to the seabed	No	• Planned use of dynamically positioned vessels therefore no direct seabed interaction associated with the decommissioning. • The decommissioning activities associated with the cutting of the Eider Upper Jacket are not expected to impact the seabed and, where relevant, Marine Licences will be requested. On this basis, no further assessment need be undertaken.
Physical presence of vessels in relation to other sea users	No	• Limited in duration • Similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities • Vessel activity focussed within the existing 500 m safety zone and will not occupy 'new' areas • Other sea users will be notified in advance of and subsequent to operations • The decommissioning of the Eider Upper Jacket is estimated to require up to four vessels, however these would not all be on location at the same time (max of three at any one time) Considering the above, temporary presence of vessels does not need further assessment.
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	No	• The decommissioning of the Upper Jacket will not result in infrastructure decommissioned *in-situ* considered within this scope. On this basis, no further assessment need be undertaken.
Physical presence of Footings following removal of the 500 m safety zone but prior to the Footings DP approval in relation to other sea users	No	• The risk posed by the Footings following removal of the Upper Jacket will be reduced to a tolerable level by marking the Footings on Admiralty charts and including them in the Fish Safe system. On this basis, no further assessment need be undertaken.
Discharges to sea	No	• Discharges from vessels are typically well-controlled activities • Regulated through vessel and machinery design, management and operation procedures. • The storage tanks for diesel and base oil located on the legs will be cut through during removal activities, however there is expected to be negligible discharge from these tanks which will have been flushed and purged as part of preparation activities, which will be fully assessed in the relevant environmental permit applications. • Any marine growth present on the Upper Jacket will be removed prior to cutting but will be limited to the cut location and lift points. This will be fully assessed in the relevant environmental permit applications. Marine growth remaining on the Upper Jacket will be removed onshore.

Impact	Further assessment	Rationale
		Considering the above, discharges to sea resulting from any vessel and Upper Jacket removal activity should not be assessed further.
Underwater noise emissions	No	• Aside from vessel noise and Upper Jacket cutting activities, there will be no other noise generating activities. • Vessel presence and cutting activities will be limited in duration. • The project is not located within an area protected for marine mammals. • With industry-standard mitigation measures and JNCC guidance, EAs for offshore oil and gas decommissioning projects typically show no injury, or significant disturbance associated with these projects. On this basis, underwater noise assessment does not need assessed further.
Resource use	No	• Limited raw materials required (largely restricted to fuel use). • The estimated total energy usage for the decommissioning activities is 268,244 GJ. • Material will be returned to shore as a result of project activities, expectation is to reuse or recycle c.95% of this returned material. There may be instances where infrastructure returned to shore is contaminated and cannot be recycled, but the weight/volume of such material is not expected to result in substantial landfill use. Considering the above, resource use does not warrant further assessment.
Onshore impacts	No	• The BEIS Guidance states that onshore activities are not in scope of Decommissioning EAs, and this topic does not require further assessment.
Waste	No	• The waste to be brought to shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy and the Waste Hierarchy, as part of the project Active Waste Management Plan (AWMP), using approved waste contractors and in liaison with the relevant Regulators. On this basis, no further assessment of waste is necessary.
Employment	No	• TAQA will communicate regularly with all crew members throughout. Following the above measures and continued communications further environmental assessment is not warranted for this aspect.
Unplanned events	No	• The current OPEP for the Eider platform considers a diesel release of approx. 450 m^3. This quantity of diesel will be more than the quantity expected to be contained within the largest tank of the HLV. • The results of the spill modelling indicate a very low probability of landfall (less than 3%, after 20 days) and any beached volume would be extremely small (circa. 0.01 m^3; TAQA, 2018f). • Vessel fuel inventories are split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory. • Shipboard Oil Pollution Emergency Plans in place • Dropped object procedures industry-standard

Impact	Further assessment	Rationale
		• Any dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the Upper Jacket decommissioning activities. Considering the above, the potential impacts from accidental chemical/hydrocarbon releases or dropped objects during decommissioning activities do not warrant further assessment.
Disturbance or destruction of seabird nests	No	All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to: • take, damage or destroy the nest of any wild bird while that nest is in use or being built, or • take or destroy an egg of any wild bird. TAQA have in place a proactive Seabird Management Strategy, which is managed continuously. This includes a suite of remedial strategies that can be used, if required, to prevent birds from nesting. TAQA will engage with OPRED to agree any further licensing obligations should it be necessary. This would be dealt with in a consequent licence application in the future and as such is not assessed any further here

Environmental Management

The project has limited activity associated with it beyond the main period of preparation for decommissioning and removal of the Eider Upper Jacket. 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 TAQA's accredited Environmental Management System (EMS) and Health, Safety, Security and Environment (HSSE) 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.

TAQA also operates a Waste Management Strategy and will develop an AWMP for the project to identify and describe the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the DP for the Eider Upper Jacket. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during the decommissioning.

TAQA has developed a draft Emissions Reduction Strategy which supports their commitment to Net Zero and the NSTA Stewardship Expectation 11. This strategy defines TAQA's asset portfolio including future decommissioning activities and is intended to drive increased energy efficiencies and reduced emissions. TAQA plans several improvements under the Emissions Reduction Strategy including working with the supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

In terms of activities in the northern North Sea, the National Marine Plan (NMP) has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been developed in line with UK, European Union (EU) and OSPAR legislation, directives and guidance. With regards to decommissioning, the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as

Carbon Capture and Storage (CCS), decommissioning must take place in line with standard practice, and as allowed by international obligations. As part of the conclusions to this assessment (Section 6.0), TAQA has given due consideration to the Scottish NMP during project decision making and the interactions between the project and NMP.

Conclusions

The Eider Upper Jacket is located well offshore in the northern North Sea remote from coastal sensitivities and from any designated sites. Therefore, no significant impact to any protected sites is expected. The marine environment where the Eider Upper Jacket is located is typical of the NNS. Whilst recognising there are certain times of the year when populations of seabirds, fish spawning and commercial fisheries are vulnerable to oil pollution, the area is not considered particularly sensitive to the proposed decommissioning activities.

Following detailed review of the project activities, the environmental sensitivities of the project area and industry experience with decommissioning activities, it was determined that there are no potential risks which are required to be considered further. Removal of the Upper Jacket will be carried out such that it does not preclude the possible future full removal of the Footings.

This EA has considered the Scottish National Marine Plan, adopted by the Scottish Government to help ensure sustainable development of the marine area. TAQA 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 TAQA's HSSE Policy and EMS, it is considered that the proposed Eider Upper Jacket decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the United Kingdom Continental Shelf (UKCS).

1.0 INTRODUCTION

In accordance with the Petroleum Act 1998, TAQA Bratani Limited (TAQA), 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 the Eider Upper Jacket. The platform is currently in a non-producing state after reaching Cessation of Production (CoP) in early 2018. The Eider Field is 100% owned and operated by TAQA.

This Environmental Appraisal (EA) has been conducted to assess the potential environmental impacts that may result from undertaking the Upper Jacket decommissioning activities as part of a staged decommissioning of the Eider field facilities. This EA supports the Eider Upper Jacket Decommissioning Programme (DP) submitted to OPRED, the offshore decommissioning regulator under the Department for Business, Energy and Industrial Strategy (BEIS). It covers the decommissioning of the Eider Upper Jacket from the topside cut height to approximately EL -127 m, or approximately 30 m above the seabed. This structure is referred to as the Upper Jacket throughout this document (TAQA, 2018a). The decommissioning of the Eider Topsides was addressed in a separate DP, approved by OPRED in May 2020. The decommissioning of the Footings will be covered under a separate DP and supporting CA and EA which will be submitted to OPRED for approval. A further DP and supporting EA covering the decommissioning of the remainder of the Eider and Otter Field subsea facilities, including the Eider subsea structures, associated pipelines, power cables and umbilicals, will be provided at a date yet to be determined.

OSPAR Decision 98/3 recognises that there may be difficulty in removing large steel substructures weighing more than 10,000 tonnes (te) that were installed before 1999. As a result, there is a provision for derogation from the presumption of total removal for such substructures. The Eider sub-structure, i.e. the Upper Jacket and Footings combined, has a maximum gross weight of 26,981 te and was installed in 1988 and is therefore a potential derogation candidate.

1.1 Project Overview

The Eider platform was a drilling/production unit located in block 211/16a of the northern North Sea (NNS), approximately 120 km northeast of Shetland and 32 km west of the UK/Norway median line (Figure 1-1). The platform stands in 157.5 m of water relative to lowest astronomical tide (LAT) and is orientated at 45 degrees west of true North.

The Eider platform was installed in 1988 with a modular topsides and steel sub-structure. Production started in 1988, with oil and gas being exported to North Cormorant through a 12-inch subsea pipeline, and then via the Brent Oil Pipeline System to Sullom Voe in the Shetland Islands. Injection water was imported via a 16-inch subsea pipeline from the Tern platform.

The Otter Field, 21 km to the north, was developed as a subsea tieback to Eider and commenced production in 2002. Subsea modifications in 2017 allowed Otter production to flow directly to North Cormorant, and water injection at Otter to be provided directly from Tern Alpha. Eider now functions as a Utility Platform, providing power, chemical injection, control fluids and control to Otter, and back-up power for North Cormorant via a two-way 33 kV subsea electrical power link. A schematic Figure illustrating Eider in the context of other installations in the vicinity, together with connecting infrastructure including pipelines, umbilicals and power cables, is shown in Figure 1-2.

A CoP application for the Eider facilities was submitted in 2016 and accepted by the North Sea Transition Authority (NSTA), formerly the Oil and Gas Authority (OGA) in 2017. CoP was reached in early 2018.

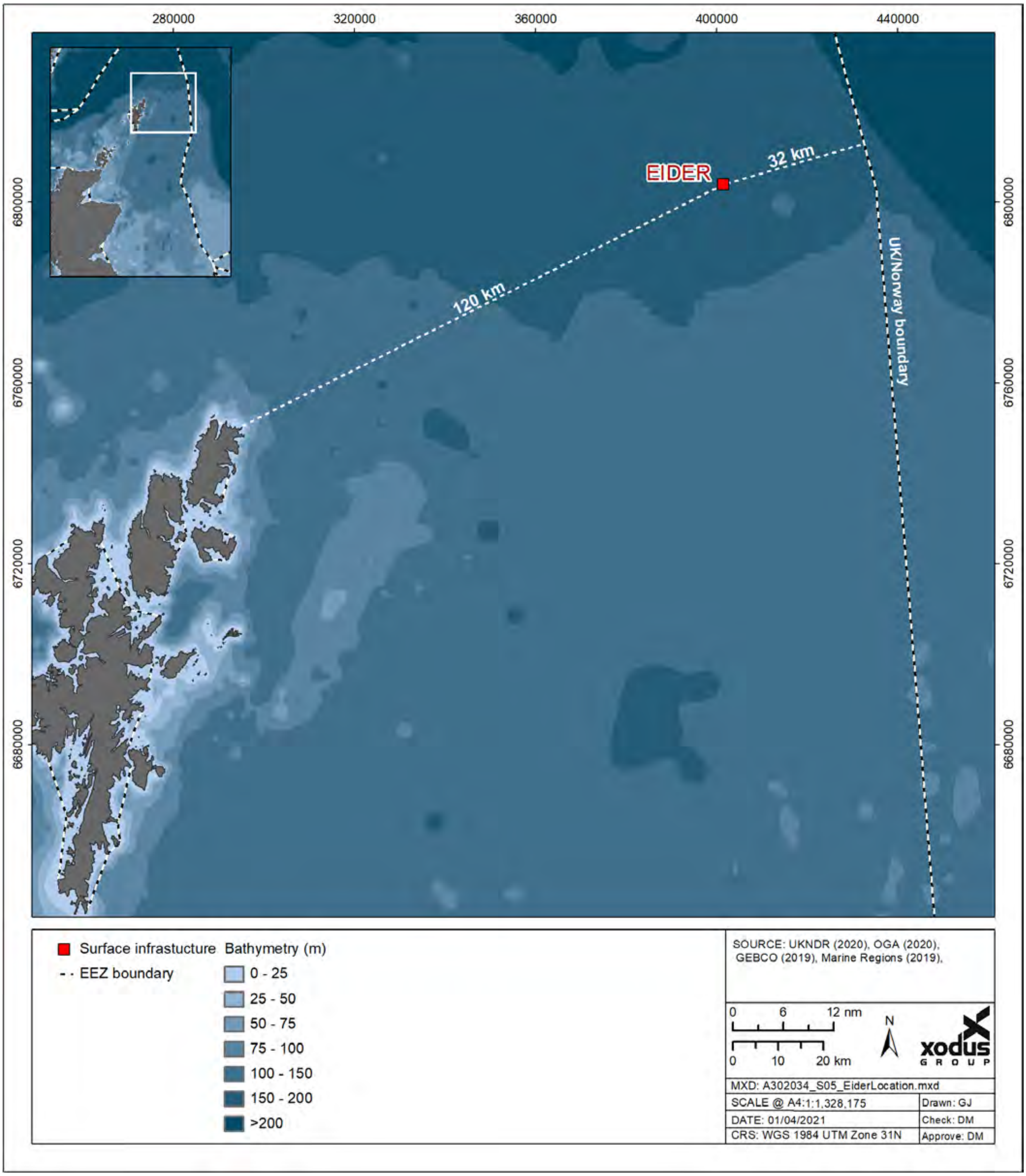

Figure 1-1 Location of the Eider platform Upper Jacket

1.2 Purpose of the Environmental Appraisal

This EA assesses the potential environmental impacts associated with the proposed Eider Upper Jacket decommissioning activities. The impact identification and assessment process accounts for 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

1.3.1 The Decommissioning Programme

The decommissioning of offshore oil and gas installations and pipelines on the UKCS is controlled through the Petroleum Act 1998 (as amended). Decommissioning is also regulated under the Marine and Coastal Act 2009 and Marine (Scotland) Act 2010. The UK's international obligations on decommissioning are primarily governed by the 1992 Convention for the Protection of the Marine Environment of the Northeast Atlantic (the Oslo Paris (OSPAR) Convention). The responsibility for ensuring compliance with the Petroleum Act 1998 rests with OPRED.

In terms of activities in the NNS, the Scottish National Marine Plan has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been developed in line with UK, European Union (EU) and OSPAR legislation, directives and guidance. With regards to decommissioning the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets will be fully supported where practicable and adhering to relevant regulatory process. As part of the conclusions to this assessment (Section 6.0), TAQA has given due consideration to the National Marine Plan during Project decision making and the interactions between the Project and Plan.

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 the Eider Upper Jacket 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 TAQA has arrived at the selected decommissioning strategy (Section 2.0);
- A description of the proposed decommissioning activities (Section 2.0);
- A summary of the baseline sensitivities and receptors relevant to the assessment area that support this EA (Section 3.0);
- A review of the potential impacts from the proposed decommissioning activities and justification for the assessments that support this EA (Section 5.0);
- Assessment of key issues (Section 5.1); and
- Conclusions (Section 6.0).

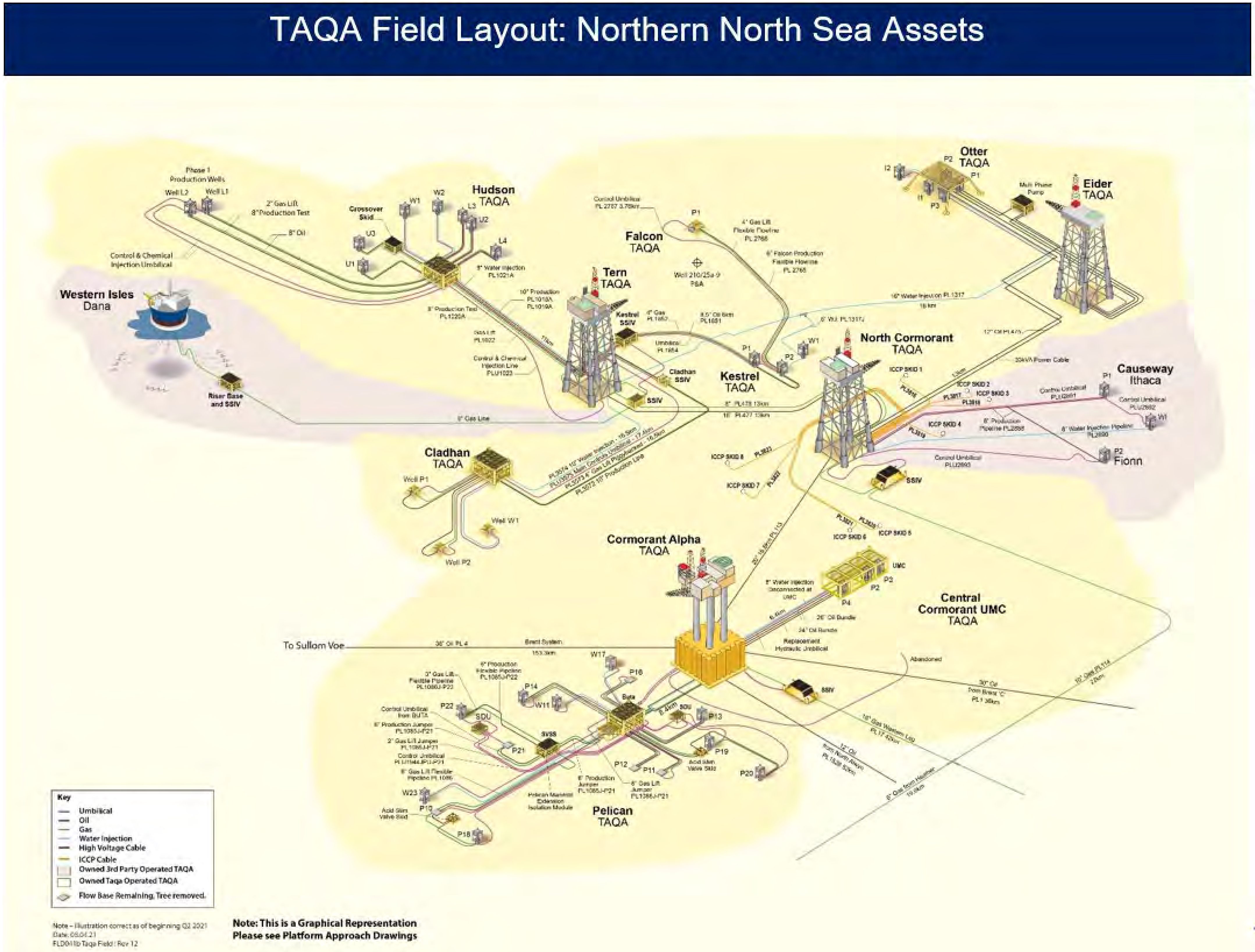

Figure 1-2 Location of the Eider platform in relation to other installations

Intentionally blank page

2.0 PROJECT SCOPE

2.1 Description of the Infrastructure being Decommissioned

The Eider sub-structure consists of an eight leg, steel 'K' braced frame secured to the seabed by 24 piles, six at each corner leg. Above 107 m, Legs B2 and B3 form storage tanks for diesel and base oil. Conductors for the installation wells ran down from the superstructure on the north side. The conductors were maintained in their positions by frames and guides located at 10 m, -13 m, -43 m, -78 m, and -116 m LAT (TAQA, 2018a; Figure 2-1). The Eider Upper Jacket will be removed down to approximately EL -127 m LAT or approximately 30 m above the seabed. The exact cut height will be determined following detailed engineering.

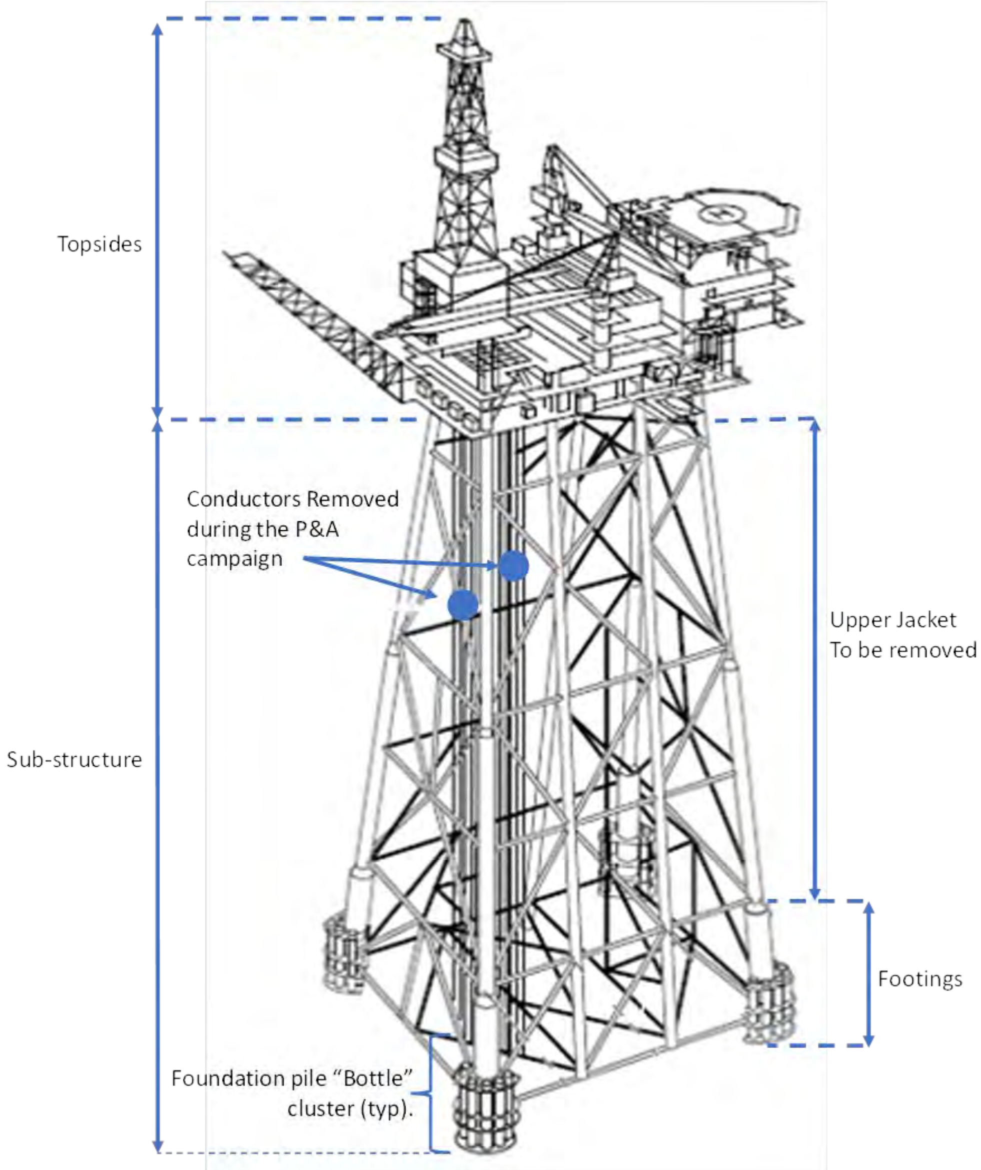

Figure 2-1 Eider platform

The sub-structure was fabricated onshore at Nigg and loaded horizontally on to a barge for 450 km transit to the Field location. Once on location the sub-structure was launched from the barge, rotated into the vertical position and sunk to the seabed. The sub-structure was then secured to the seabed by 24 piles driven into the seabed. The piles form 4 clusters comprising 6 piles around the foot of each corner leg.

2.2 Description of Proposed Decommissioning Activities

Upon completion of topside decommissioning activities, the sub-structure will remain in place for a period prior to its removal. During this period, a temporary ‘Aid to Navigation’ unit will be installed to ensure that the installation meets all operational and regulatory requirements. It is envisaged that the system will be developed in consultation with the Northern Lighthouse Board (NLB). The existing 500 m safety zone will remain in operation until the Upper Jacket is removed and the installation no longer projects above the sea surface.

TAQA will continue to maintain an Oil Pollution Emergency Plan (OPEP) for the installation and a Dismantling Safety Case will be in place to cover all activities required to complete the Upper Jacket removal operations. It is assumed that prior to Upper Jacket decommissioning:

- Conductors have been removed and were cut at a depth of ≈143 m below LAT with the exception of EA10 which was cut at 141.8 m below LAT;
- Caissons will either be removed or pinned to the Upper Jacket prior to decommissioning activities; and
- The MSF will be fully removed, access platforms will be installed to support Upper Jacket removals post-topsides removal.

Due to the complexities associated with the Footings decommissioning, all current, proven technologies indicate the requirement to remove and transport the Upper Jacket as a separate entity from the Footings. The decommissioning solution for the Eider Upper Jacket is removal. The Upper Jacket will be cut and recovered to shore for dismantling. The final cut locations will be confirmed following detailed engineering studies and analysis. Removal of the Upper Jacket will be carried out such that it does not preclude the possible future removal of the Footings.

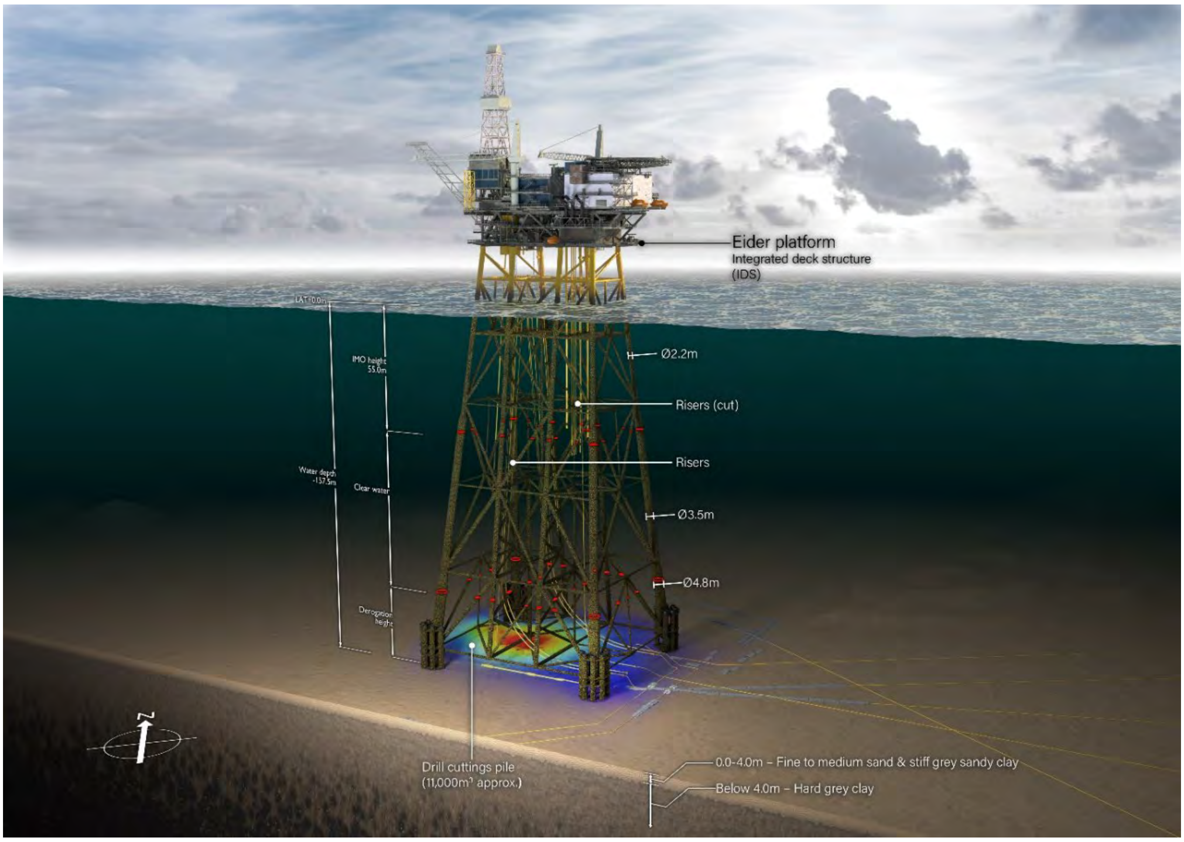

Figure 2-2 Eider decommissioning schematic

2.3 Proposed Schedule

This schedule may change to maximise economic recovery, or to exploit opportunities to minimise greenhouse gas (GHG) emissions or other decommissioning impacts by combining activities into campaigns, or by combining Eider decommissioning operations with third-party decommissioning. The Eider Upper Jacket decommissioning schedule is shown below in Figure 2-3.

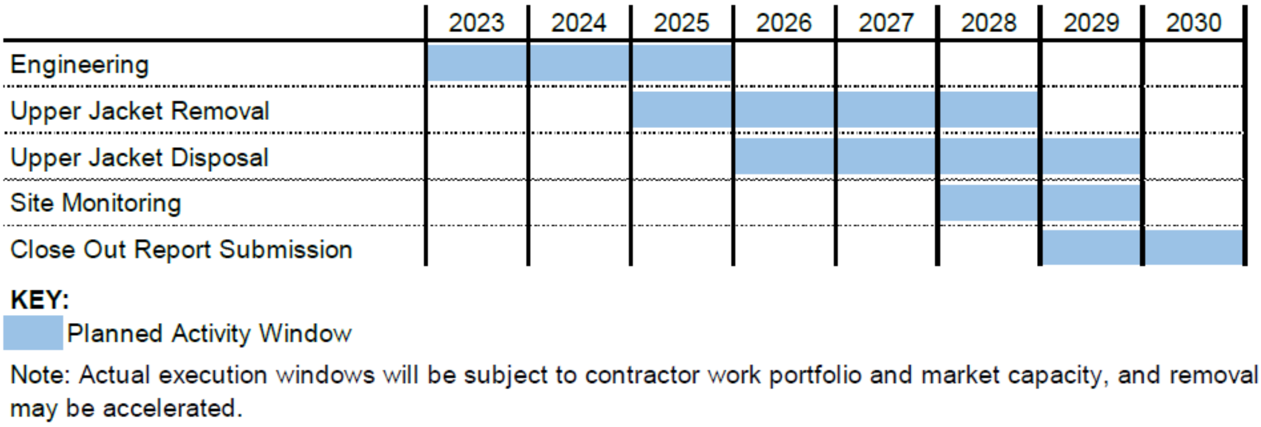

Figure 2-3 Eider decommissioning schedule

2.4 Summary of Materials Inventory

The Eider Upper Jacket comprises a predominantly steel structure between the Topsides cut height and approximately EL - 127 m LAT. The Upper Jacket estimated gross weight is ≈14,000 Te. Table 2-1 and Figure 2-4 provide a summary of the quantities of materials that would be recovered to shore following removal of the Upper Jacket. Table 2-1 also indicates the proposed fate of these materials.

Table 2-1 Summary of proposed fate of the materials from the Eider Upper Jacket

Material	Estimated weight to be recovered to shore (te)	Proposed fate			Total weight (te)
		Reuse (te)	Recycling (te)	Disposal (te)	
Ferrous Metal	10,594		10,594		10,594
Hazardous Material / NORM	15			15	15.0
Other Non-Hazardous Material (Including Marine Growth)	2,100		1,398	702	2,100
Concrete	1,295		1,295		1,295
Total	**≈14,000**		**13,287**	**717**	**≈14,000**

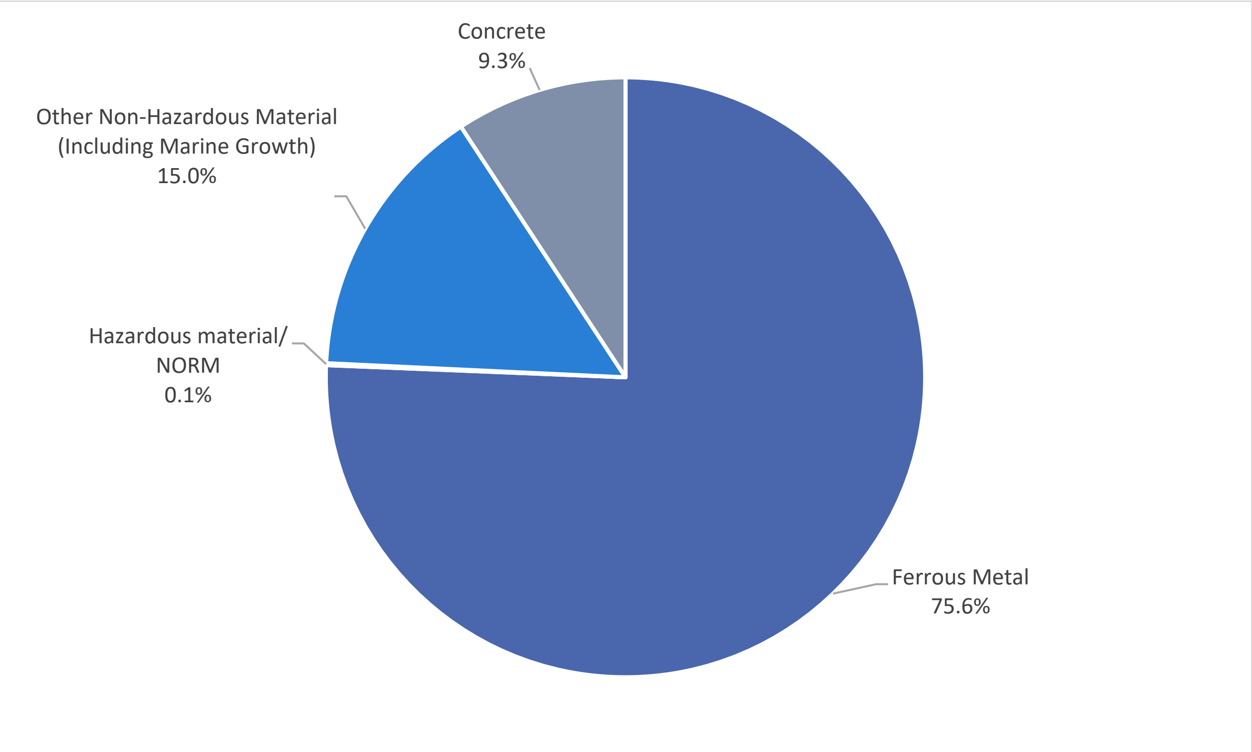

Figure 2-4 Bulk materials from the Eider Upper Jacket

2.5 Waste Management

TAQA will comply with the Duty of Care requirements under the UK Waste Regulations and The Environmental Protection (Duty of Care) (Scotland) Regulations 2014. The hierarchy of waste management will also be followed at all stages of disposal (see Figure 2-5) and industry best practice will be applied (Decom North Sea, 2018 Managing Offshore Decommissioning Waste, November 2018). Driving waste management up the waste hierarchy is central to the development of sustainable waste management and the ambition of a zero-waste society in Scotland.

All waste will be managed in compliance with relevant waste legislation by a licenced and/or permitted waste management contractor. The selected contractor will be assessed for competence through due diligence and duty of care audits.

Most of the material recovered during the Eider Upper Jacket decommissioning activities will be non-hazardous, including steel, non-ferrous metals and concrete as outlined in Section 2.4.

Preventing waste is ultimately the best option, achieved through reducing consumption and using resources more efficiently. However, this is followed by re-use and recycling of goods (Figure 2-5). If all re-use opportunities have been taken by TAQA, the next preferable option is for recycling of materials and specifically, closed loop recycling of materials. Evidence shows that there are greater environmental benefits to closed loop recycling, where a product is used, discarded, captured, and then the component materials recycled into a new product of similar functionality. Which can then again travel through this cycle, continuously moving the material through the supply chain.

Figure 2-5 Waste hierarchy model

The Material Inventory has also classified each material according to the European Waste Catalogue Codes (EWC) as required for disposal of wastes within the EU and a further categorisation of hazardous/special or non-hazardous/non-special wastes. The EWC is a standardised way of describing waste and was established by the European Commission. The use of EWC codes to describe waste is a legal requirement of the Duty of Care for waste which requires the holder of waste to take all reasonable steps to ensure that waste is described in a way that permits its safe handling and management.

Until a waste management contractor has been selected and disposal routes identified, the final disposal options for waste materials are unknown. The project aspiration is that all ferrous and non-ferrous metals and concrete will be recycled. Approximately 95% of material will be reused or recycled, and the remaining material will be sent for disposal. There may be instances where infrastructure returned to shore is contaminated (marine growth, hydrocarbons, paints etc) and cannot be recycled, but the weight/volume of such material is not expected to result in substantial landfill use.

As part of TAQA's standard processes, all sites and waste carriers will have appropriate environmental and operating licences and/or permits to carry out this work and will be closely managed within TAQA's contractor assurance processes.

Should NORM be encountered, TAQA will ensure the disposal site is suitably licenced to accept the waste arising from the decommissioning of the Upper Jacket.

An Active Waste Management Plan (AWMP) including an inventory of hazardous waste will be compiled to aid the segregation and recycling of waste.

TAQA's Emissions Reduction Strategy supports our commitment to Net Zero and the NSTA Stewardship Expectation 11 and defines our asset portfolio including future decommissioning activities. This Strategy is also intended to drive increased energy efficiencies and reduced emissions within our supply chain.

2.6 Environmental Management Strategy

TAQA Bratani has an established and independently verified Environmental Management System (EMS) which operates in accordance with the requirements of ISO14001:2015. The scope of the TAQA EMS is defined to include all activities, onshore and offshore, in relation to the exploration for and production of hydrocarbons in defined license areas of the UK sector of the North Sea. This scope encompasses the Eider platform plus associated infrastructure, all under the control of the TAQA Aberdeen headquarters. The EMS meets the requirements of OSPAR Recommendation 2003/5 which promotes the use and implementation of the EMS by the offshore industry.

Relevant to the EA, and to all of TAQA's activities, is the company's commitment to managing all environmental impacts associated with its activities. Continuous improvement in environmental performance is sought through effective project planning and implementation, emissions reduction, waste minimisation and waste management; this mindset has fed into the development of the mitigation measures developed for the Project; these include both industry-standard and project-specific measures. A signed copy of TAQA's Health, Safety, Security and Environment Policy is presented in Appendix A.

The project has limited activity associated with it beyond the main period of preparation for decommissioning and removal of the Eider Upper Jacket. 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 TAQA's accredited Environmental Management System (EMS) and Health, Safety, Security and Environment (HSSE) 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.

TAQA also operates a Waste Management Strategy and will develop an AWMP for the project to identify and describe the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the Decommissioning Programme for the Eider Upper Jacket. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during the decommissioning.

TAQA has developed a draft Emissions Reduction Strategy which supports their commitment to Net Zero and the NSTA Stewardship Expectation 11. This strategy defines TAQA's asset portfolio including future decommissioning activities and is intended to drive increased energy efficiencies and reduced emissions. TAQA plans several improvements under the Emissions Reduction Strategy including working with the supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

In terms of activities in the NNS, the National Marine Plan (NMP) has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been developed in line with UK, EU and OSPAR legislation, directives and guidance. With regards to decommissioning, the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as Carbon Capture and Storage (CCS), decommissioning must take place in line with standard practice, and as allowed by international obligations. As part of the conclusions to this assessment (Section 6.0), TAQA has given due consideration to the Scottish NMP during project decision making and the interactions between the project and NMP.

3.0 ENVIRONMENTAL AND SOCIETAL BASELINE

The Eider platform is located in UKCS Block 211/16, in the NNS, approximately 120 km northeast of the Shetland coastline and 32 km from the UK/Norway median line (see Figure 1-1). The water depth at the installation is 157.5 m LAT.

As part of the EA process, it is important that the main physical, biological and societal sensitivities of the receiving environment are well understood. This environmental baseline describes the main characteristics of the offshore environment in and around the Eider platform and highlights the key sensitivities. This section draws on several information sources including published papers, relevant Strategic Environmental Assessments (SEAs) and site-specific investigations.

3.1 Physical Environment

3.1.1 Bathymetry

The Eider platform is located at a water depth of 157.5 m LAT and is not located on any large-scale features of functional significance such as shelf deeps, shelf banks and mounds, seamounts, or continental slopes (NMPI, 2020).

3.1.2 Currents, waves and tides

The annual mean wave height in the NNS region follows a gradient increasing from the southern point in the Fladen/Witch Ground to the northern area of the East Shetland Basin. In the south, the mean wave height ranges from 2.11 - 2.40 m whilst in the north it ranges from 2.41 - 3.00 m (NMPI, 2020). McBreen *et al*. (2011) shows wave energy at the seabed is 'low' (less than 0.21 N/m^2) within the Eider Field. The annual mean wave height within the Eider Field ranges from 2.11 m - 2.40 m and the annual mean wave power is 41.31 kW/m (NMPI, 2020).

The anti-clockwise movement of water through the North Sea and around the NNS region originate from the influx of Atlantic water, via the Fair Isle Channel and around the north of Shetland and the main outflow northwards along the Norwegian coast (DECC, 2016). Against this background of tidal flow, the direction of residual water movement in the NNS is generally to the south or east (DTI, 2001; DECC, 2016). The peak flow for mean spring tide ranges between low velocities of 0.1 m/s in open (DECC, 2016). The mean residual current through the Eider Field is approximately 0.05 to 0.1 m/s (Wolf *et al*., 2016).

The NNS is seasonally stratified, and the strength of the thermocline is determined by solar energy, tidal and wave forces (DECC, 2016). Distinct density stratification occurs in the NNS region in summer at around 50 m depth and the thermocline becomes increasingly distinct towards deeper water in the north of the region (DECC, 2016). This stratification breaks down in September as the frequency and severity of storms increases causing mixing in the water column (DECC, 2009).

3.1.3 Meteorology

The prevailing winds in the NNS are from the southwest and north northeast. Wind strengths in winter are typically in the range of Beaufort scale force 4-6 (6-11 m/s) with higher winds of force 8-12 (17-32 m/s) being much less frequent. Winds of force 5 (8 m/s) and greater are recorded 60-65% of the time in winter and 22-27% of the time during the summer months.

3.1.4 Seabed environment

3.1.4.1 Northern North Sea

In the NNS, and indeed across the North Sea, seabed sediments generally comprise a veneer of unconsolidated terrigenous and biogenic deposits, generally much less than 1 m thick, although areas of outcropping rock occur in coastal waters around and between Shetland, Orkney and the Scottish mainland. Sediments in the area are predominantly sand and muddy sand, although the deeper areas within the Fladen Ground consist of mud or sandy mud off the edge of the continental shelf to the north of the region, the slope is characterised by areas of mixed and coarse sediments, while the floor of the Faroe-Shetland Channel is classified as mud (JNCC, 2017; DECC, 2016).

A survey gap analysis study commissioned by TAQA, has assessed all available survey reports covering TAQA assets across the wider NNS area including Eider (Xodus, 2018). The full coverage of this study, including sampling station locations and listings of the survey reports consulted, are shown in Figure 3-1. These surveys have all indicated similar species and sediment compositions which provide evidence of a relatively uniform nature of the seabed habitats and communities within the vicinity and the wider region.

Under the European Nature Information System (EUNIS) habitat classification, the predicted broad-scale seabed type at the Eider platform is '5.27 deep circalittoral sand', as shown in Figure 3-2 (JNCC, 2017). The Eider platform is also located approximately 8 km southeast of an area of 'deep circalittoral mud' (EUNIS habitat code A5.37). The seabed in Block 211/16 is within a wider area of 'subtidal sand and gravels', a seabed type designated as a priority marine feature (PMF) in Scottish waters (Tyler-Walters, 2016) (NMPI, 2020).

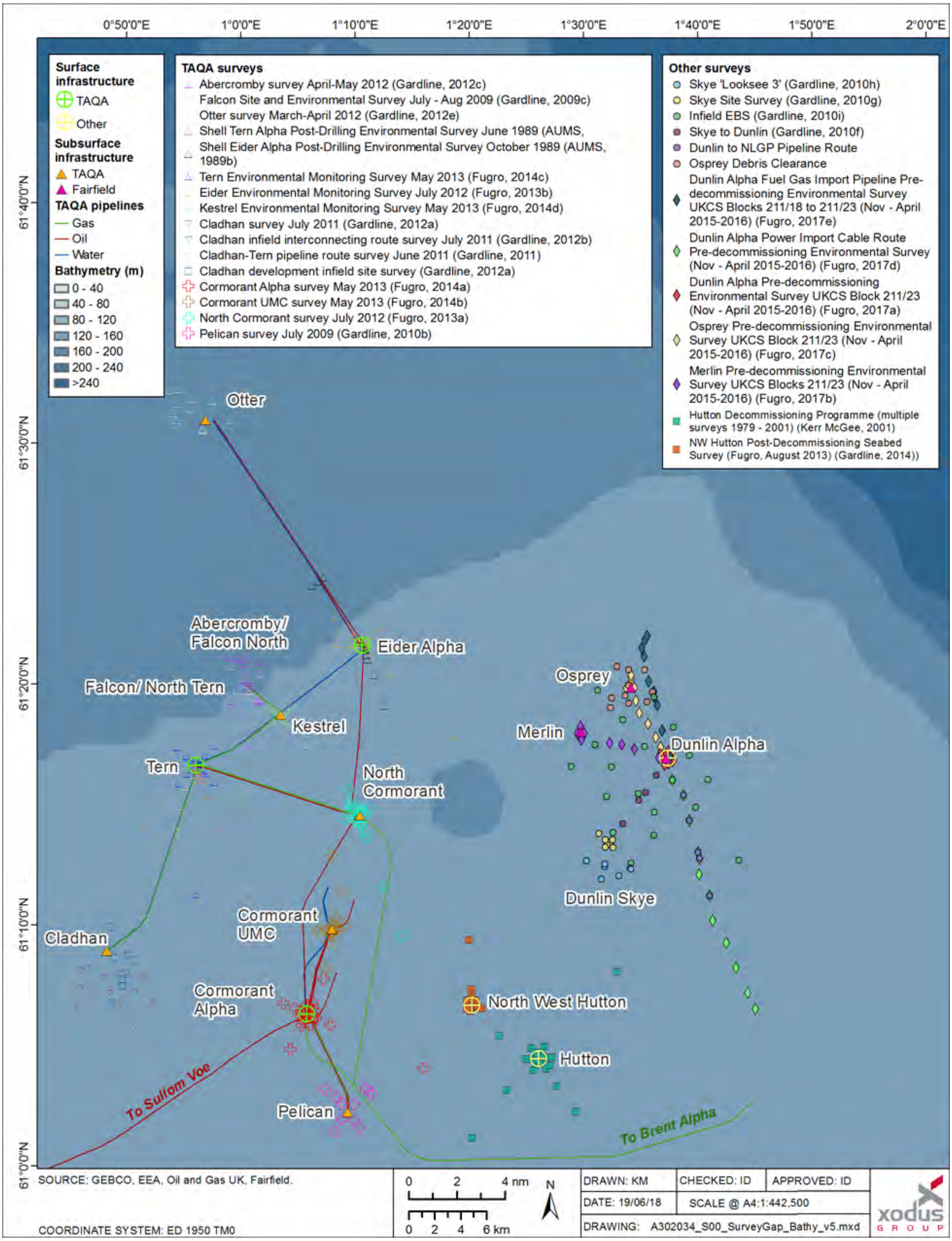

Figure 3-1 Location of additional surveys around the TAQA NNS infrastructure

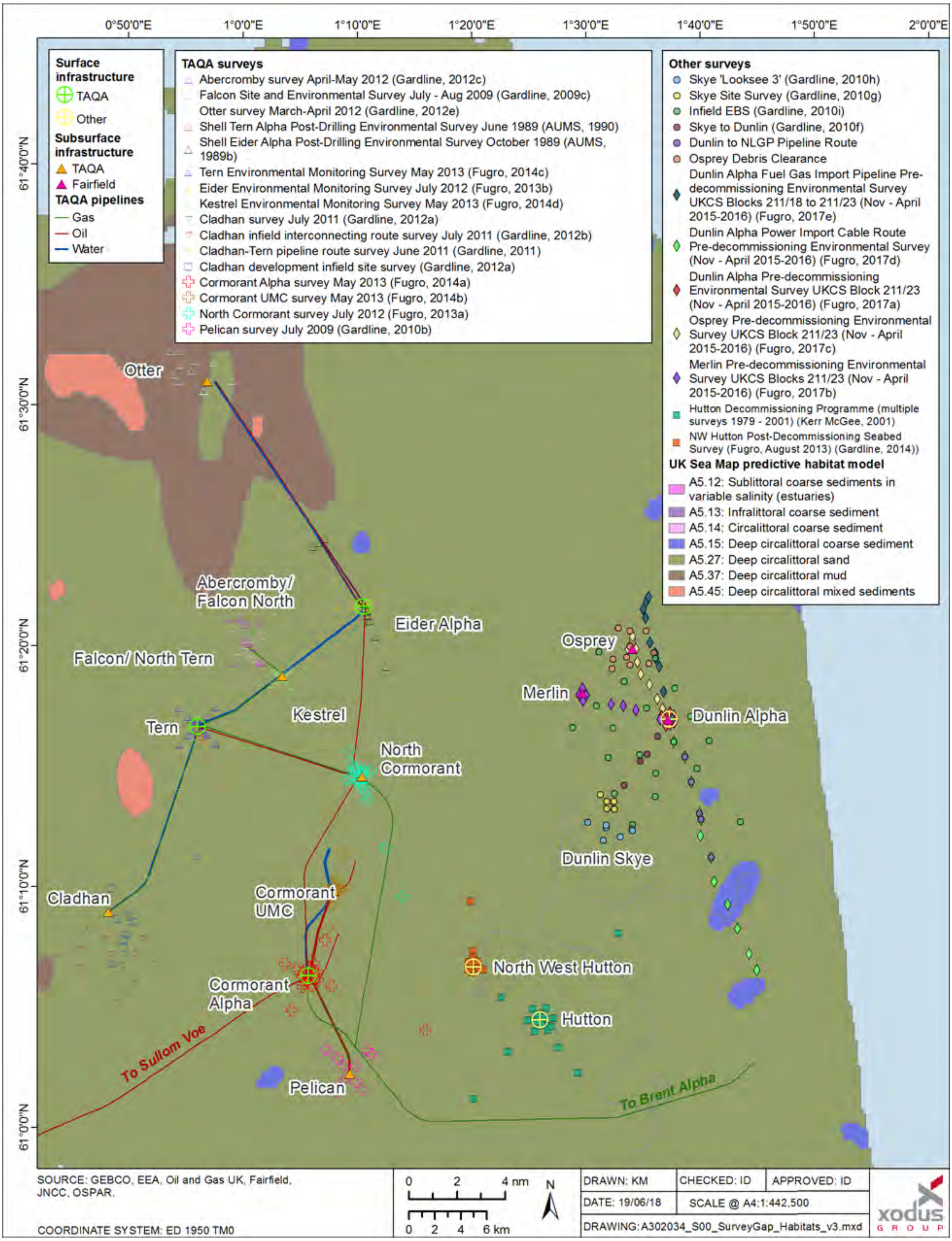

Figure 3-2 Broad-scale predicted habitat around the Eider platform (JNCC, 2017)

3.1.4.2 Around the Eider Platform

The Benthic Solutions (2019) Environmental Baseline and Habitat Assessment Survey Report included samples collected at 10 stations, as presented in Figure 3-3.The survey ran from the 17th of November 2018–27th of November 2018. Seabed ground-truthing took place at these 10 stations, all located between 50 and 500 m from the Eider platform, along with the acoustic survey data and environmental sampling. This survey was designed specifically to support the EA and incorporates seabed photography and sediment sampling. A selection of images taken during the survey are visible in Figure 3-4. Details of sample station values are referred to in the text and are presented in tables which can be referred to in Appendix B.

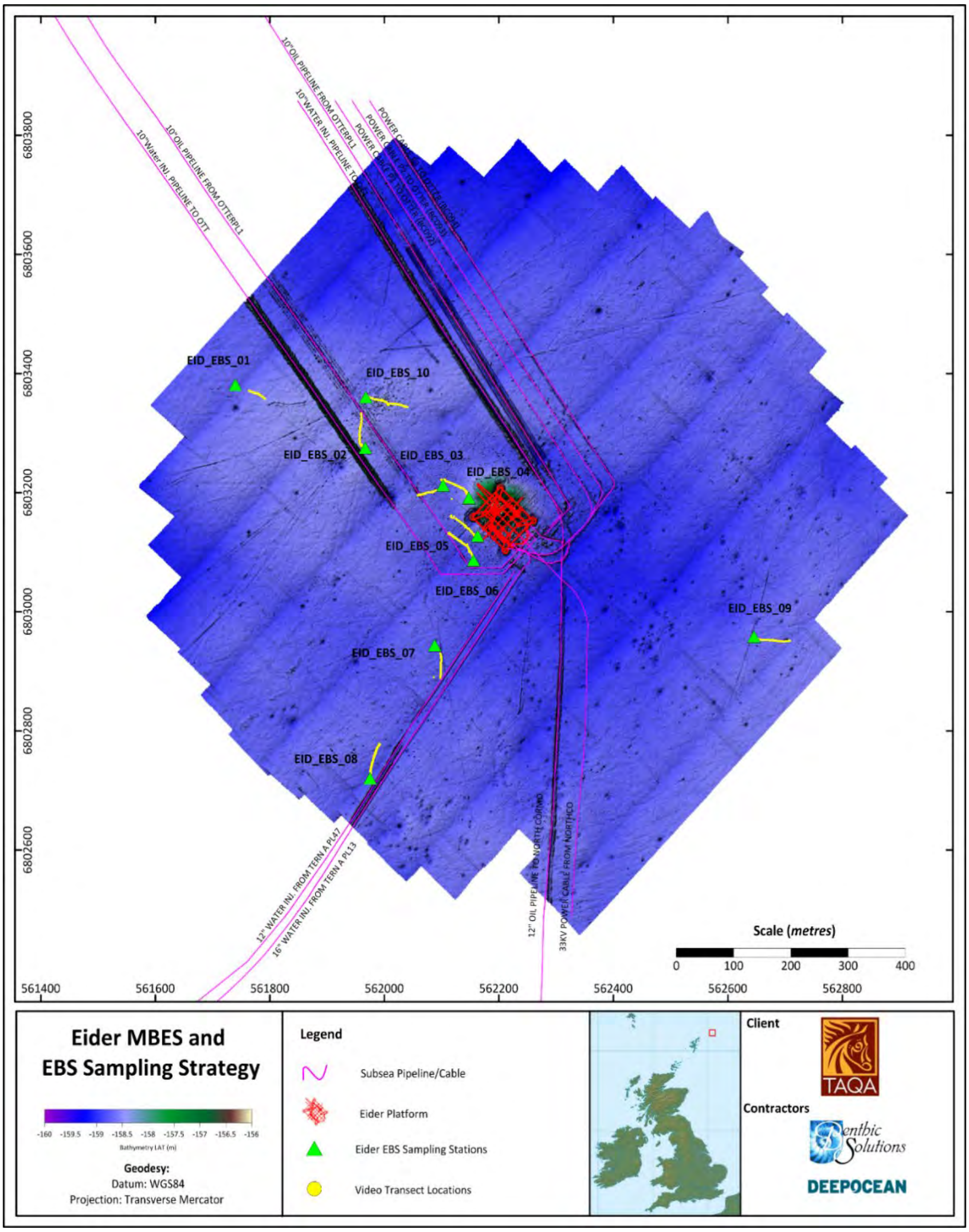

Figure 3-3 **Sample stations and bathymetry from the Benthic Solutions (2019) survey**

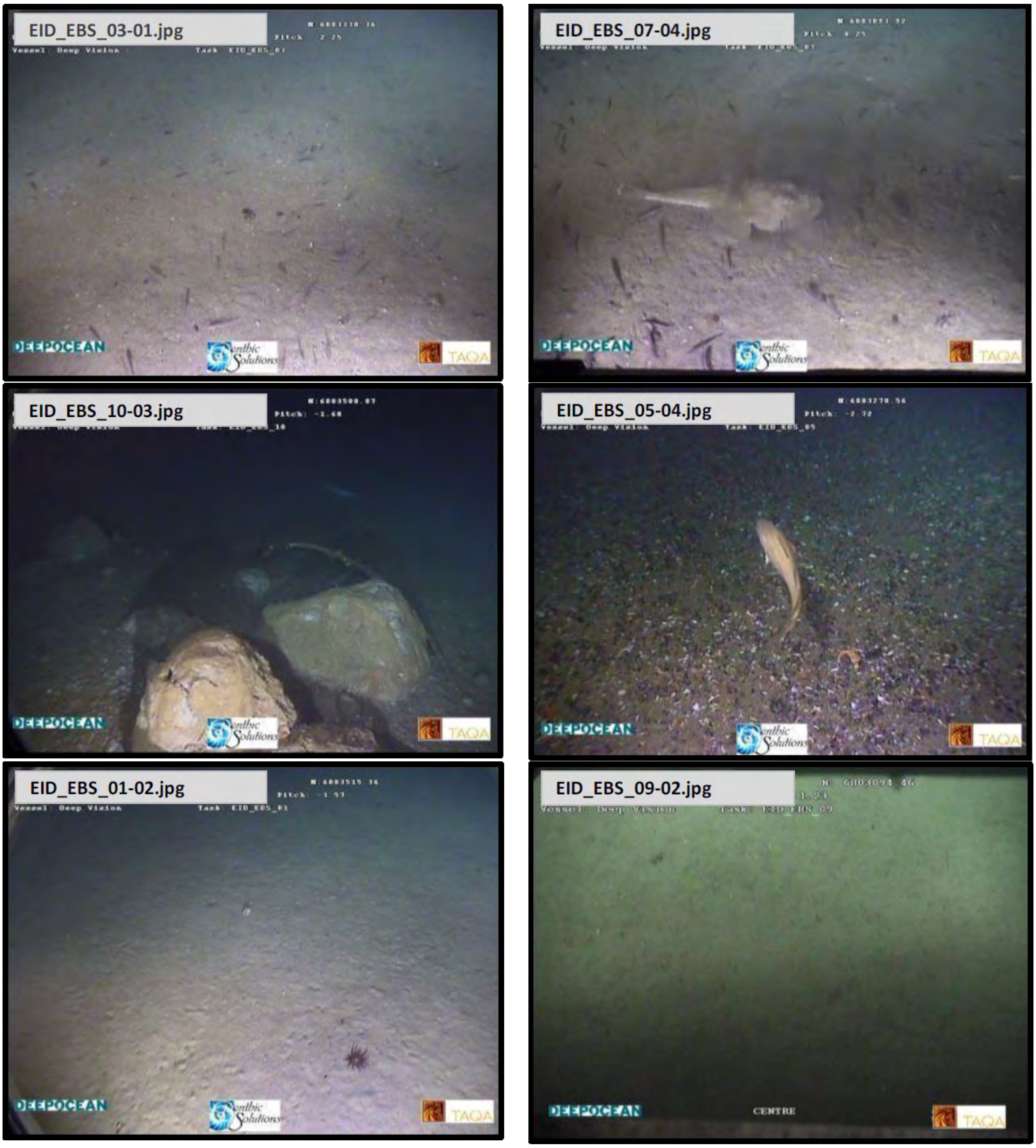

Figure 3-4 Seabed imagery taken around the Eider platform. Benthic Solutions (2019) survey

Physical Characteristics

Sediment within the survey area was generally dominated by sands (Appendix B; Table B-1) with most stations conforming to the Folk classifications of muddy sand or slightly gravelly muddy sand. Peaks in the proportion of sedimentary fines were observed at the seabed surrounding the platform and visually showed conformity to drilling muds. Similarly, higher proportions of gravels (>4%) were found exclusively within 100 m west of the Eider platform relating to the presence of drill cuttings (Benthic Solutions, 2019).

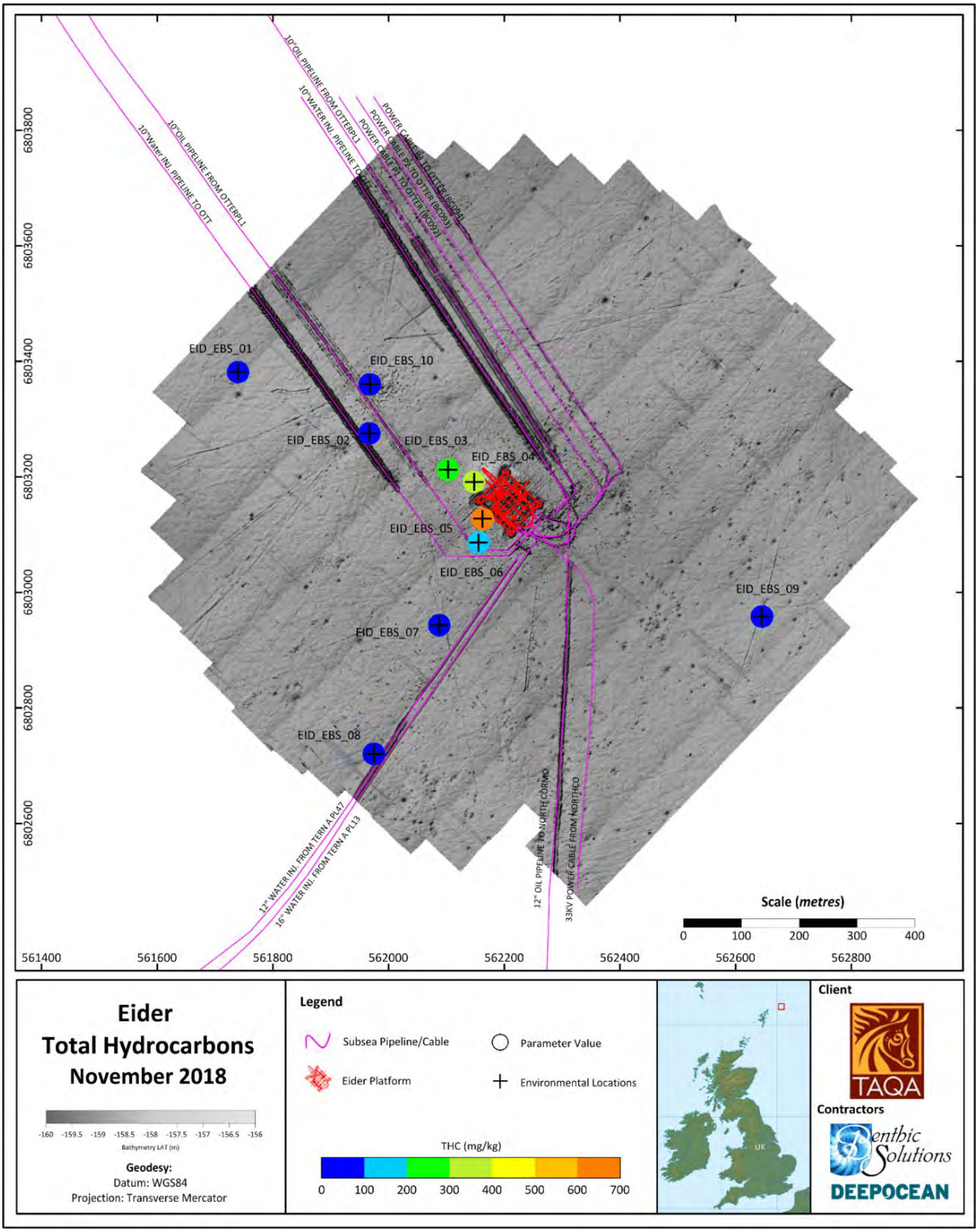

Figure 3-5 Total Hydrocarbon content (THC) around the Eider platform. Benthic Solutions (2019) survey

Chemical Characteristics

Total hydrocarbon content (THC) measured in the surface sediments around the Eider platform. THC was noted between the stations located at >250 m distance as would be expected for natural sediment sampled away from the influence of the Eider platform. However, two stations within 50 m of the platform had considerably higher concentrations, with EID_EBS_05 recording a THC (693 $mg.kg^{-1}$), which is 30 times greater than the UKOOA 95^{th} percentile for the NNS (20.32 $mg.kg^{-1}$) and indicates a significant hydrocarbon enrichment had occurred close to the Eider platform. Anaerobic sediment noted in deck log observations suggests anoxic conditions has slowed the organic degradation at this station.

Stations sampled between 100 m-500 m distance of the platform displayed TOC concentrations representative of an organically deprived environment, but this is considered typical of the northern North Sea region dominated by a sand component. In contrast, the two stations located within 50 m of the Eider platform (EID_EBS_04 and EID_EBS_05) presented peak TOC concentrations, in line with the higher fines content recorded, indicating organic enrichment by drilling muds and drilling-related material (Appendix B, Table B-2).

Significantly higher levels of barium (Appendix B, Table B-3) were recorded at the two previously mentioned stations sampled 50 m from the Eider platform during the Benthic Solutions (2019) survey, also reflecting the strong influence of drilling muds on the seabed. It is worth noting that the concentration at station EID_EBS_04 (46,200 $\mu g/g^{-1}$) exceeded the level described by Cefas (2001) for stations located within 500 m of active UK platforms (33,562.12 $\mu g/g^{-1}$; Cefas, 2001). Elevated levels for all 14 metals analysed were identified at the two stations in proximity to the Eider platform: EID_EBS_04 and EID_EBS_05. This appeared to be a result of the drilling mud rich in barium (Ba), present at these two stations (Benthic Solutions, 2019).

Overall, cadmium levels at all stations sampled between 100 m – 500 m distance from the platform fell well below the UKOOA 95^{th} percentile (0.81 $\mu g/g^{-1}$). Peak levels were found in close proximity to the platform where concentrations exceeded the UKOOA 95^{th} percentile (Appendix B, Table B-3). Some papers describe cadmium as “very toxic” (Muniz et al., 2004), whilst others consider this metal to have no negative effects (McLeese et al., 1987). Other attempts to quantify the critical level of cadmium toxification were carried out by Buchman (1999) and suggested ‘probable effect level’ of around 4.2 $\mu g/g^{-1}$ of which all stations surveyed fell below (Benthic Solutions, 2019).

Notably, concentrations of copper and lead at EID_EBS_04 (Cu: 55.4 $\mu g/g^{-1}$; Pb: 163 $\mu g/g^{-1}$, Appendix B, Table B-3) and EID_EBS_05 (Cu: 43.9 $\mu g/g^{-1}$; Pb: 250 $\mu g/g^{-1}$) exceeded the mean levels expected at stations within 500 m of active UK platforms (Cu, 17.45 $\mu g/g^{-1}$; Pb, 57.52 $\mu g/g^{-1}$, Cefas, 2001; Benthic Solutions, 2019).

High zinc concentrations were also found across the entire survey area with 90% of stations recording levels exceeding the UKOOA 95^{th} percentile for zinc levels in the northern North Sea (17.1 $\mu g/g^{-1}$; Appendix B, Table B-3). Once again, two stations within 50 m distance of the platform had zinc levels at considerably high levels with concentrations also exceeding the mean levels expected at stations within 500 m of active UK platforms (129.74 $\mu g/g^{-1}$; Cefas, 2001; Benthic Solutions, 2019).

Vanadium is often associated with the oil and gas industry as it is present in relatively high concentrations in most crude oils (Khalaf *et al*., 1982). Vanadium was present at moderate levels ranging from 7.6 $\mu g/g^{-1}$ at EID_EBS_01 to 40.1 $\mu g/g^{-1}$ at EID_EBS_04 (mean 16.2 $\mu g/g^{-1}$; Appendix B, Table B-3), with the majority of stations showing levels below the 95^{th} percentile for background levels in the region (19.66 $\mu g/g^{-1}$; UKOOA, 2001; Benthic Solutions, 2019).

Aluminium ranged from 2,130 $\mu g/g^{-1}$ at EID_EBS_02 to 15,000 $\mu g/g^{-1}$ at EID_EBS_04 (mean 5,007 $\mu g/g^{-1}$). Higher aluminium levels tend to occur naturally in sediment with high silicate content, which is typical for the North Sea, thus explaining the moderate concentrations recorded throughout the survey area. Elevated levels were once again noted at the two stations at 50 m west of the platform which likely relates to the influence of the drilling mud expelled onto the seabed surface (Benthic Solutions, 2019; Appendix B, Table B-3).

Mercury concentrations were present throughout the Eider survey area and with the exception of three stations (EID_EBS_04, EID_EBS_05, and EID_EBS_06), all fell well below the UKOOA 95th percentile for the northern North Sea (0.1 µg/g^{-1}; Appendix B, Table B-3; Benthic Solutions, 2019).

Peak arsenic concentrations were observed at EID_EBS_04 and EID_EBS_05 which also recorded peak hydrocarbon and barium concentration, indicative of drilling related contamination (Appendix B, Table B-3; Benthic Solutions, 2019).

3.2 Biological Environment

3.2.1 Plankton

Planktonic assemblages exist in large water bodies and are transported simultaneously with tides and currents as they flow around the North Sea. Plankton forms the basis of marine ecosystem food webs and therefore directly influences the movement and distribution of other marine species. There is a water column of approximately 157.5 m at the Eider platform (Fugro, 2013b).

In both the northern and central areas of the North Sea, the phytoplankton community is dominated by dinoflagellates of the genus *Ceratium* and diatoms such as *Thalassiosira spp*. and *Chaetoceros spp*. In recent years the dinoflagellate *Alexandrium tamarense* and the diatom *Pseudo-nitzschia* (known to cause amnesic shellfish poisoning) has been observed in the area (DECC, 2016). Densities of phytoplankton fluctuate during the year, with sunlight intensity and nutrient availability driving its abundance and productivity together with water column stratification (Johns & Reid, 2001; DECC, 2016). In the 10-year period between 1997 and 2007, two main blooms are seen to occur in the NNS: one in May, and a second in August before levels decrease through the winter months when light and temperature are less abundant (SAHFOS, 2015).

Zooplankton species richness is greater in the northern and central areas of the North Sea, than in the south and displays greater seasonality. Zooplankton in this area is dominated by calanoid copepods, in particular *Calanus* and *Acartia spp*. and *Euphausiids* and decapod larvae are also important to the zooplankton community in this region (DECC, 2016).

Calanus finmarchicus has historically dominated the zooplankton of the North Sea and is used as an indicator of zooplankton abundance. Analysis of data provided by the Continuous Plankton Reader (CPR) surveys in the 10-year period between 1997 and 2007 shows a sharper spring increase in *C. finmarchicus* biomass in May in the NNS compared to more southerly areas. This peak in numbers is 70% greater than seen in the central North Sea and 88% greater than the southern North Sea over the same period (SAHFOS, 2015). The increase is likely a reflection of the increased availability of nutrients and food (including phytoplankton) in spring. Overall abundance of *C. finmarchicus* has declined dramatically over the last 60 years, which has been attributed to changes in seawater temperature and salinity (Beare *et al*., 2002; FRS, 2004). *C. finmarchicus* has largely been replaced by boreal and temperate Atlantic and neritic (coastal water) species in particular, and a relative increase in the populations of *C. helgolandicus* has occurred (DECC, 2009; Edwards *et al*., 2010; Baxter *et al*., 2011).

3.2.2 Benthos

3.2.2.1 Wider area benthos (Benthic Solutions, 2019)

The biota living near, on or in the seabed is collectively termed benthos. The diversity and biomass of the benthos is dependent on several factors including substrata (e.g. sediment, rock), water depth, salinity, the local hydrodynamics and degree of organic enrichment (DECC, 2016). The species composition and diversity of the benthos or macrofauna found within sediments is commonly used as a biological indicator of sediment disturbance or contamination.

During the environmental survey around the Eider platform, conducted by Benthic Solutions (2019), the macrobenthos was analysed from 20 grab samples at ten stations. A total of 10,784 individuals and 363 taxa were recorded. Four of the taxa were solitary epifauna, including three Cnidaria (Edwardsiidae, *Actiniaria*, *Cerianthus lloydii*) and one Porifera, *Sycon ciliatum*. Coarse material in the form of drill cuttings and relic *Mytilus edulis* shells was a common component of the sediments at stations within 100 m of the Eider platform, providing a hard substrate for colonisation by sessile epifaunal species. A further 345 taxa were infaunal, consisting of 159 annelid species (accounting for 45.8% of the total individuals). The arthropods were represented by 85 species (5.6%), the molluscs by 65 species (8.7%) and the echinoderms by only 18 species (4%) (Benthic Solutions, 2019). Figure 3-6 shows the epifaunal and infaunal species abundance and richness at the Eider survey stations. The relatively high abundance at some of the stations (EID_EBS_04, EID_EBS_05, and EID_EBS_06) relates to the organic enrichment of sediment close to the platform (Benthic Solutions, 2019).

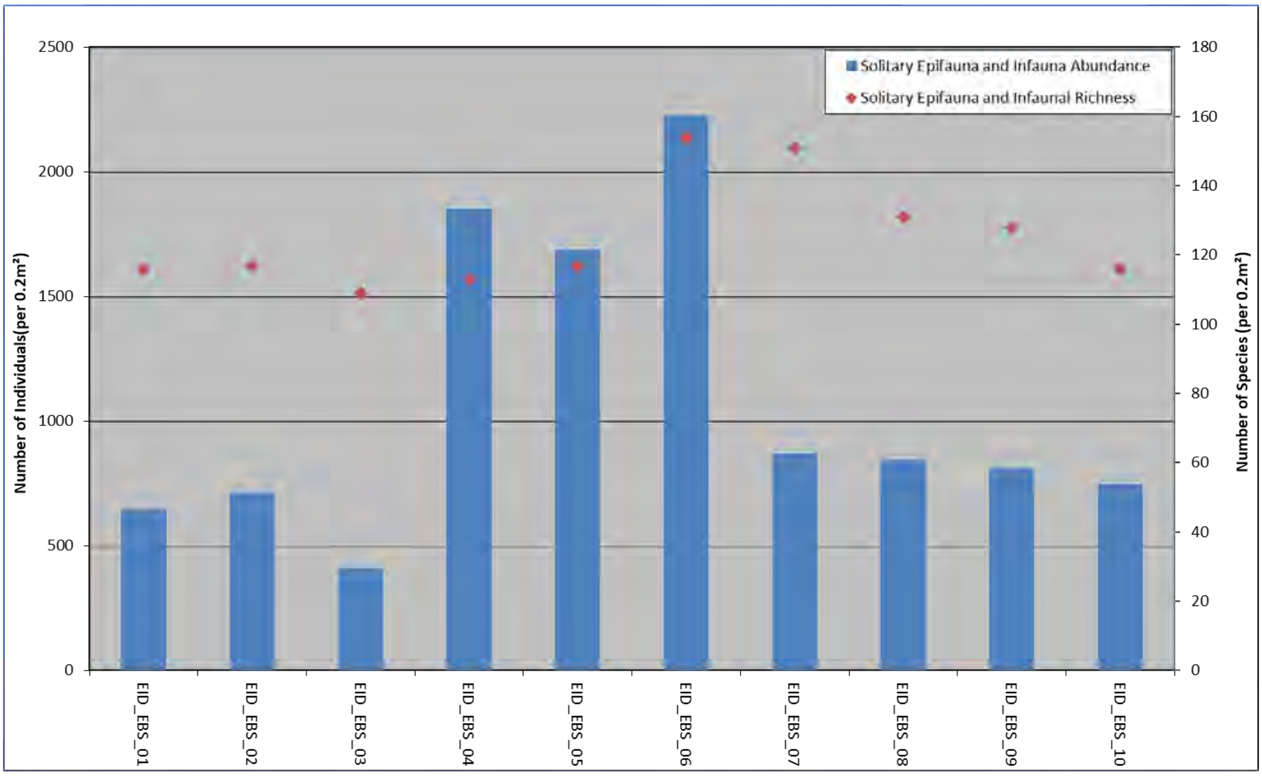

Figure 3-6 Species richness and abundance at the Eider survey stations. Source: Benthic Solutions (2019)

Although, species richness appears to be unaffected by the influence of drilling related activity with stations close to the platform displaying levels similar to that sampled northwest, the organically enriched sediment close to the platform showed a reduced species diversity. The increased abundance of opportunistic deposit feeders found at the seabed surface surrounding the Eider platform lowered the overall diversity when compared to stations further away from the platform (Benthic Solutions, 2019).

The macrofauna within the Eider platform survey area was variable with different species dominating at the sediment close to the platform compared to the sediment sampled further afield. Macrofaunal composition at inner stations (up to 100 m from the platform) was modified in comparison to background stations, which can be attributed to physical smothering and organic enrichment of seabed sediments by drill cuttings contaminated with hydrocarbons. For example, the annelid species, *Glycera lapidum, Prionospio cirrifera, and Spiophanes kroyeri* (polychaete worms) were found uniformly distributed throughout the survey area corresponding to the generally muddy sand/ slightly gravelly muddy sand habitat. Polychaetes have frequently been found to account for ca. 50% of the species encountered in offshore sediments in the North Sea and the taxa identified across the Eider survey area are broadly similar to those encountered previously in the NNS (Eleftheriou and Basford, 1989; Kunitzer *et al.*, 1992).

In contrast, a high abundance of the taxa Nematoda, *Capitella*, *Mytilus edulis*, and *Ophiocten affinis* were exclusively found at the three stations close to the Eider platform: EID_EBS_04, EID_EBS_05 and EID_EBS_06, where barium-rich drill cuttings have had an influence. *Mytilus edulis* is likely to have initially colonised the platform and associated infrastructure before being dislodged to the seabed. Similarly, anemones colonise hard substrata, including live shells and shell debris. Both species richness and abundance were affected by the influence of drilling related activity with stations close to the platform showing a reduced species diversity and increase in the abundance of opportunistic species (Benthic Solutions, 2019).

A measure of the overall dominance pattern in the sampling area was achieved by ranking the top 15 species per sample replicate according to abundance, giving a rank score of 10 to the most abundant species, decreasing to one for the tenth most abundant species, and summing these scores for all 20 samples to provide an overall dominance score (Eleftheriou and Basford, 1989) for each species. The top 15 species are given in Table 3-1. In overall rank order, the polychaete *Prionospio cirrifera* was top with a total abundance of 621 individuals and being recorded in all 20 replicates. This was followed by the highly abundant group Nematoda (3,510 individuals in the 20 replicates), the polychaetes *Euchone incolor*, *Galathowenia oculata*, *Eclysippe vanelli* and *Spiophanes kroyeri*. The next rank was occupied by the mollusc *Axinulus croulinensis*. The remaining three ranks were dominated by polychaetes, illustrating the dominance of the phylum on the infaunal community (Table 3-1).

Table 3-1 Overall species ranking (Top 15 Species)

Overall Top 15 Rank	Species/Taxon	Total rank score (out of 200)	Phylum	Numerical Abundance (20 replicates)	Numerical Top 15 rank
1	*Prionospio cirrifera*	148	Annelida	621	2
2	Nematoda	145	Nematoda	3510	1
3	*Euchone incolor*	107	Annelida	426	3
4	*Galathowenia oculata*	87	Annelida	264	6
5	*Eclysippe vanelli*	82	Annelida	310	4
6	*Spiophanes kroyeri*	61	Annelida	295	5
7	*Axinulus croulinensis*	46	Mollusca	161	10
8	*Spiophanes bombyx*	39	Annelida	169	9
9	*Spiophanes wigleyi*	38	Annelida	186	8
10	*Glycera lapidum*	32	Annelida	193	7
11	*Pseudopolydora*	24	Annelida	135	12
12	*Abra nitida*	22	Mollusca	98	19
13	*Ophiocten affinis*	22	Echinodermata	140	11
14	*Amphipholis squamata*	20	Echinodermata	114	15
15	*Prionospio*	19	Annelida	106	18

3.2.3 Potential sensitive habitats and species

A review of the ground-truthing data from the survey area surrounding the Eider platform indicated the presence of several potentially sensitive habitats and species, including:

- ‘Submarine structures made by leaking gases’ - Annex I Habitat

- Ocean quahog *Arctica islandica* - OSPAR list of threatened and/or declining species and habitats (Region II - Greater North Sea)

These habitats are listed by one or more International Conventions, European Directives or UK Legislation (including devolved UK administrations).

'Submarine structures made by leaking gases' encompass hard substrates which support a unique community of organisms that are able to survive on the methane and hydrogen sulphide gasses associated with these ecosystems. They are defined as Annex I habitats, which are protected within Special Areas of Conservation (SACs) under the EU Habitats Directive. There are two main types of submarine structures known to occur in the UK: bubbling reefs and submarine structures associated with pockmarks. Pockmarks are generally connected to the release of methane, which reacts with the surrounding seawater forming carbonate blocks. Depressions resembling unit pockmarks were recorded throughout the survey area on side scan sonar and bathymetry data (Benthic Solutions, 2019). The observed depressions were confirmed by visual survey, revealing depressions filled with gravel and cobbles. Methane-derived authigenic carbonates (MDAC), often formed within larger pockmarks, which can form bubbling reefs and the Annex I habitat "Submarine structures made by leaking gases" were not identified in the depressions (Benthic Solutions, 2019).

The Benthic Solutions (2019) survey recorded five examples of the ocean quahog *Arctica islandica* (a type of clam). Four were found at stations to the north west of the platform (EID_EBS_01 and EID_EBS_10; two at each) and a further individual was found 250 m to the south east at station EID_EBS_09 (Benthic Solutions, 2019). This species is listed as a PMF in Scottish waters (Tyler-Walters, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). However, there was no evidence of distinct *A. islandica* siphons at the seabed on any of the video footage or still photographs. The Eider platform is located on the edge of a number of UKCS Blocks where this species has been recorded (Figure 3-7). The distribution of *A. islandica* is relatively wide in the North Sea (OSPAR, 2009).

Another feature of conservation concern potentially present in the area is the OSPAR (2008) listed habitat 'seapens and burrowing megafauna communities'. This habitat has been recorded at a few locations well to the east of the Eider Field (Figure 3-7) and is one of the constituent habitats of the PMF 'burrowed mud', which does not cover the Eider area (Tyler-Walters, 2016; NMPI, 2020). Seapen species such as *Virgularia mirabilis* were noted in the sieved grab samples although no evidence of bioturbation and burrowing megafauna communities were apparent in the photographic data.

No other benthic habitat or species features of conservation interest have been noted in the vicinity of Eider including those listed on the Annex I of the EU Habitats Directive, the International Union for Conservation of Nature (IUCN) Red List of Threatened Species, the OSPAR list of threatened and/or declining species, or the Scottish PMF list (NMPI, 2020).

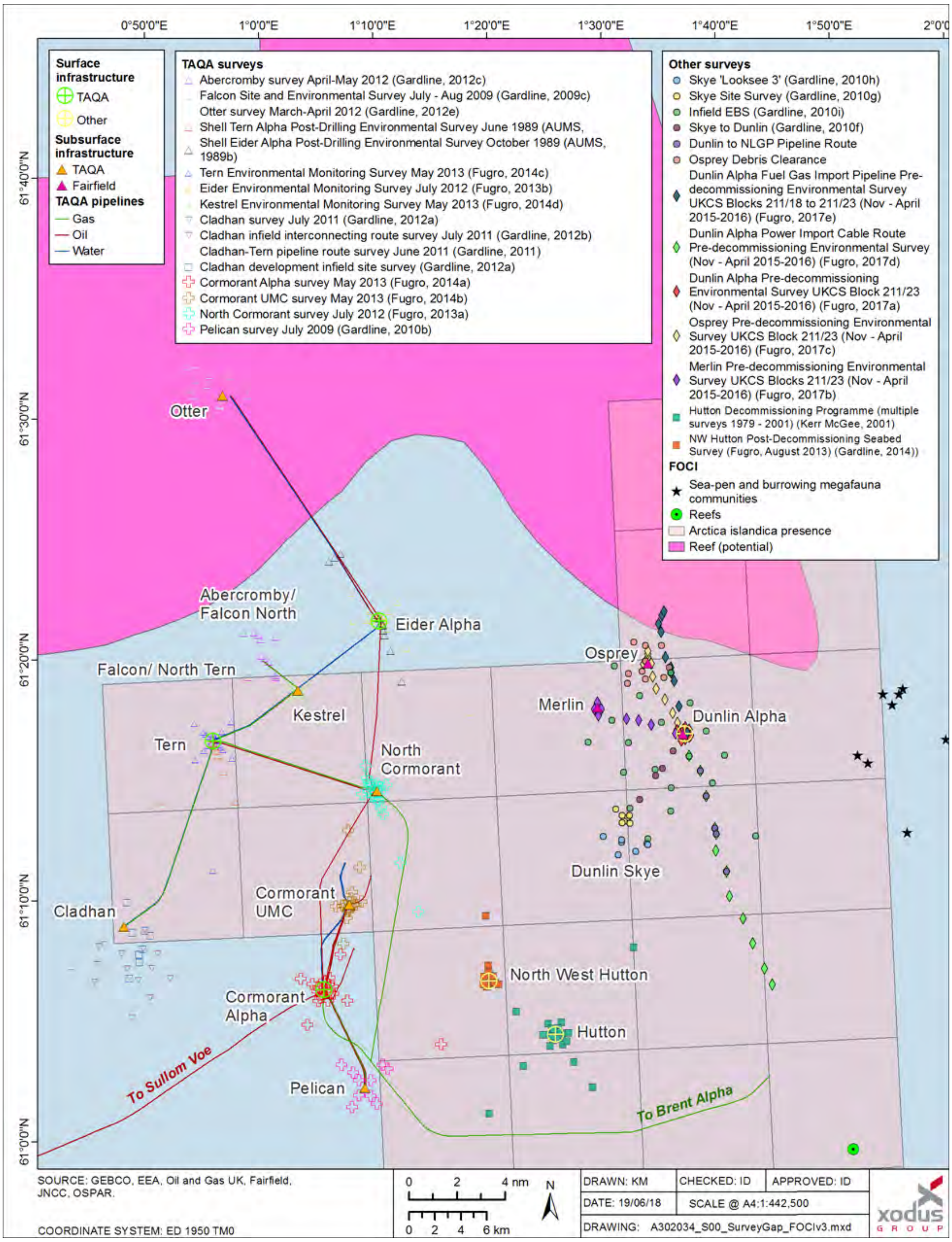

Figure 3-7 Features of conservation importance in the vicinity of the Eider platform

3.2.4 Fish and Shellfish

A number of commercially important fish and shellfish species occur in the vicinity of the proposed decommissioning operations. Fish and shellfish populations may be vulnerable to impacts from offshore installations such as hydrocarbon pollution and exposure to aqueous effluents, especially during the egg and juvenile stages of their lifecycles (Bakke *et al*., 2013).

The Eider platform is located in International Council for the Exploration of the Sea (ICES) rectangle 51F1, in an area of spawning and nursery grounds for several commercially important species.

Information on spawning and nursery periods for these different species, including peak spawning times are detailed in Table 3-2.

Table 3-2 Fisheries sensitivities within the 51F1 ICES rectangle (Coull *et al.*, 1998 and Ellis *et al.*, 2012)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Haddock	N	S*N	S*N	S*N	SN	N	N	N	N	N	N	N
Saithe	S*	S*	S	S								
Norway Pout	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Blue Whiting	N	N	N	N	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Herring	N	N	N	N	N	N	N	N	N	N	N	N
Cod	S	S*	S*	S								
Hake	N	N	N	N	N	N	N	N	N	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
S = Spawning, N = Nursery, SN = Spawning and Nursery; * = peak spawning; Species = High nursery intensity as per Ellis *et al*, 2012; Species = High intensity spawning as per Ellis *et al* (2012); Species = High concentration spawning as per Coull *et al.*, 1998;												

Spawning areas for most species are not rigidly fixed and fish may spawn either earlier or later from year to year. In addition, the mapped spawning areas represent the widest known distribution given current knowledge and should not be seen as rigid unchanging descriptions of presence or absence (Coull *et al*, 1998). Whilst most species spawn into the water column of moving water masses over extensive areas, benthic spawners (e.g. sandeel) have very specific habitat requirements, and therefore their spawning grounds are relatively limited and potentially vulnerable to seabed disturbance and change.

The Eider platform is within an area of spawning ground for haddock (*Melanogrammus aeglefinus*), saithe (*Pollachius virens*), Norway pout (*Trisopterus esmarkii*) and cod (*Gadus morhua*). Cod is the only species reported by Ellis *et a*l. (2012) as using the Eider area as high intensity spawning ground. High concentration spawning grounds for haddock, saithe and Norway pout were previously reported in the vicinity by Coull *et al*. (1998) (Figure 3-8).

The Eider platform is also within a potential nursery ground for mackerel (*Scomber scombrus*), haddock, Norway pout, blue whiting (*Micromesistius poutassou*), spurdog (*Squalus acanthias*), herring (*Clupea harengus*), hake (*Merluccius merluccius*) and ling (*Molva molva*). Blue whiting is the only species with a high nursery intensity ground in the Eider area while other species have a lower nursery intensity (Ellis *et al*., 2012).

Haddock, saithe and cod are known to produce pelagic eggs. Herring and sandeels are both benthic spawners but none of these are reported to spawn within Block 211/16 where the Eider platform is located (Coull *et al*, 1998; Ellis *et al*., 2012).

Fisheries sensitivity maps produced by Aires *et al*., (2014) for Marine Scotland Science detail the likelihood of aggregations of fish species in the first year of their life (i.e. group 0 or juvenile fish) occurring around the UKCS, as shown on Figure 3-9 and Figure 3-10. The probability of 0 group fish aggregations to occur in the vicinity to the Eider platform and in the 211/16 UKCS block is zero for cod, herring, and sole, and very low for anglerfish, haddock, horse mackerel, mackerel, plaice, sprat, and whiting. The probability is low for Norway pout (0.08) and slightly higher for blue whiting (0.26), and hake (0.27) although still low in comparison to other North Sea areas (Coull *et al*., 1998).

The following species listed above are also listed as Scottish PMF and are considered as of natural heritage importance: mackerel, Norway pout, spurdog, herring, and cod (SNH, 2014).

Herring, mackerel, Norway pout and spurdog are also on the IUCN Red List (although listed as species of 'least concern') (IUCN, 2018), and on the Scottish Biodiversity List which identifies species of most importance for biodiversity conservation in Scotland (SNH, 2013a). Cod is reported as 'vulnerable' on the IUCN Red List and is also listed on the Scottish Biodiversity List (IUCN, 2018; SNH, 2013a).

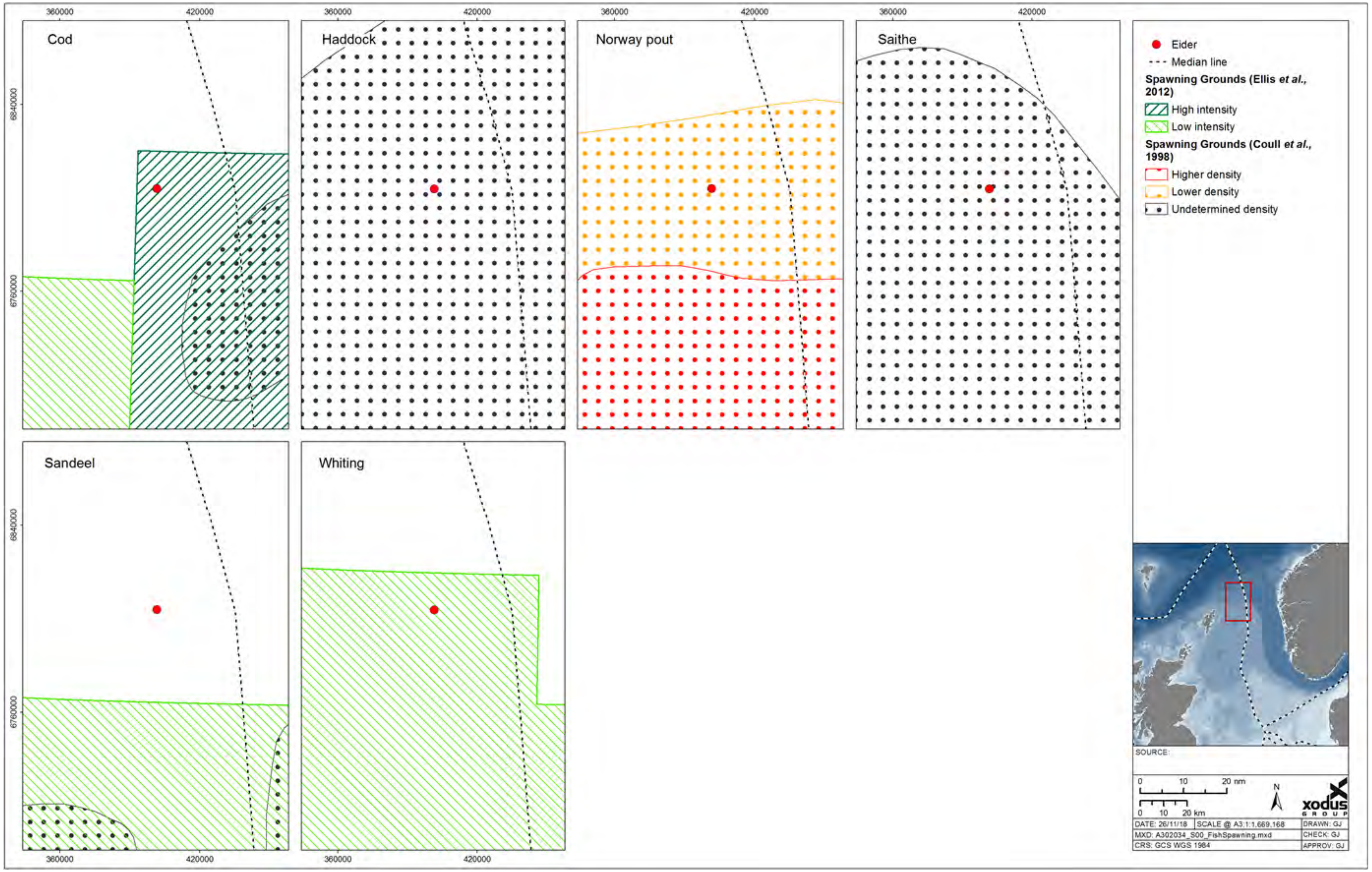

Figure 3-8 **Potential fish spawning grounds**

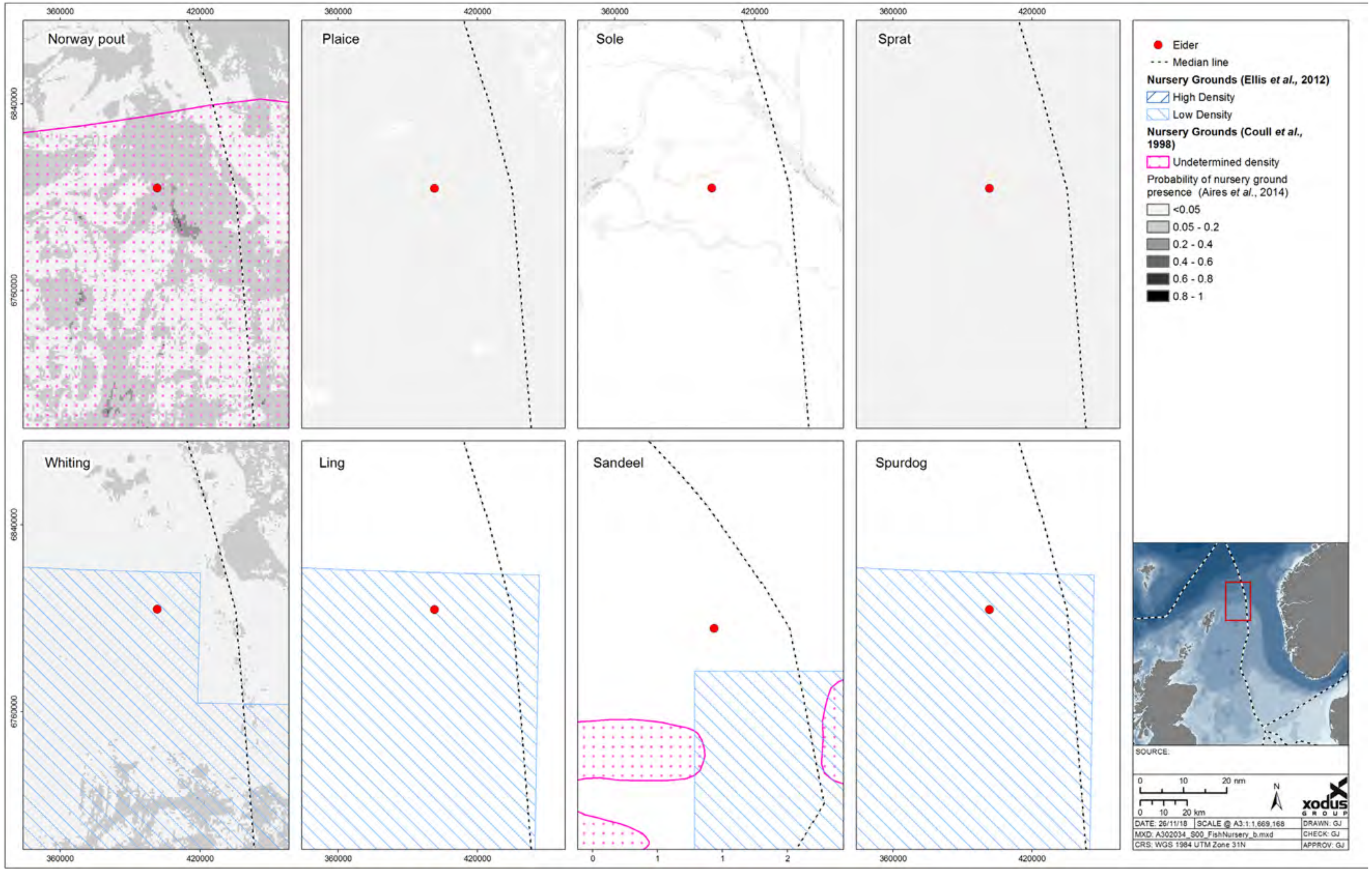

Figure 3-9 **Potential fish nursery habitats adapted from Aires *et al.* (2014) (1 of 2)**

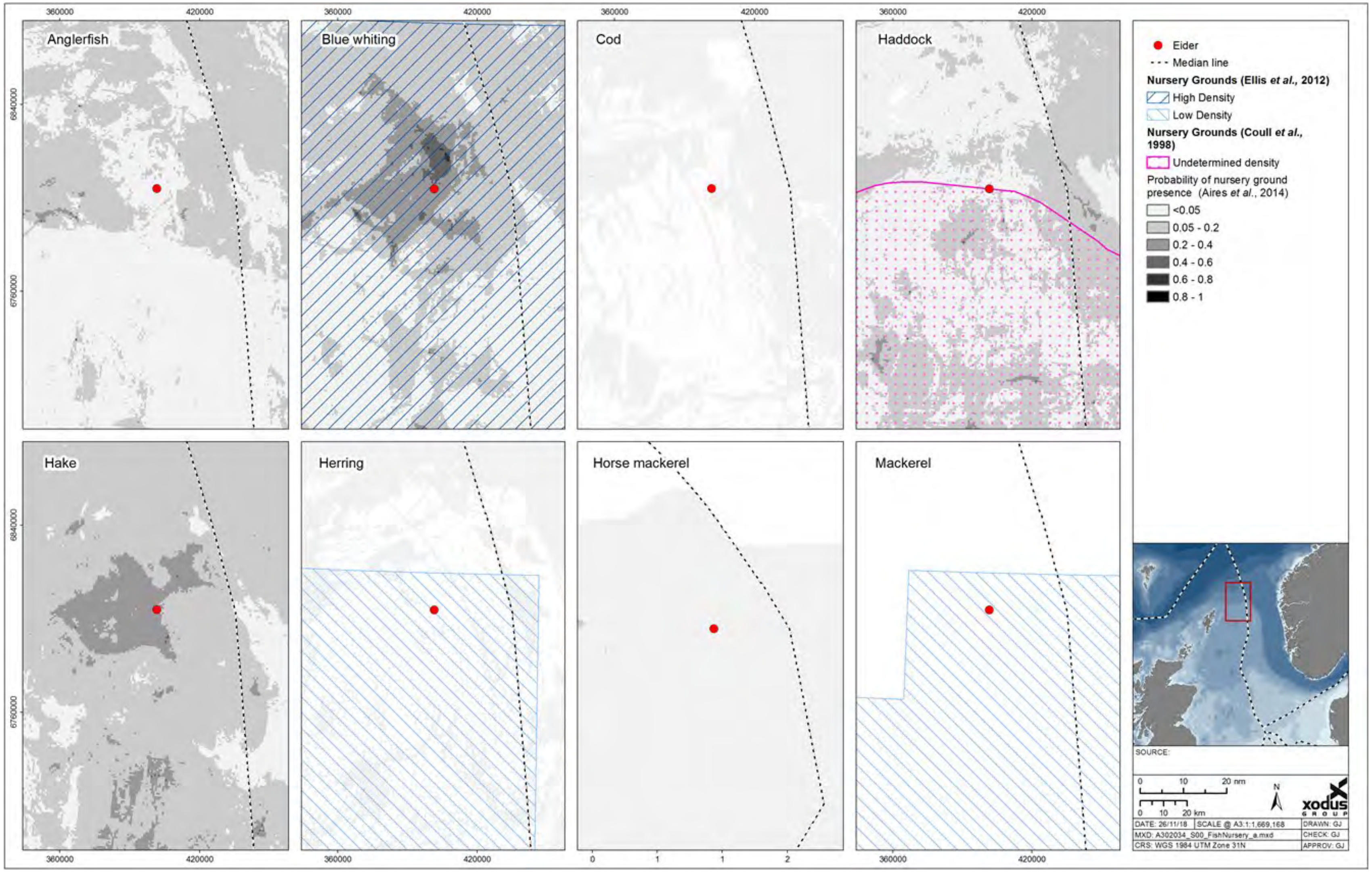

Figure 3-10 Potential fish nursery habitats adapted from Aires *et al.* (2014) (2 of 2)

Intentionally Blank Page

3.2.5 Seabirds

Much of the North Sea and its surrounding coastline is an internationally important breeding and feeding habitat for seabirds. In the NNS, the most numerous species present are likely to be northern fulmar *Fulmarus glacialis*, black-legged kittiwake *Rissa tridactyla* and common guillemot *Uria aalge* (DECC, 2009; 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 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, razorbill *Alca torda* and Atlantic puffin *Fratercula arctica*) disperse from their coastal colonies and into the offshore waters from July onwards. At this time these high numbers of birds are particularly vulnerable to oil pollution. In addition to auks, black-legged kittiwake, northern gannet *Morus bassanus*, and northern fulmar, are present in sizable numbers during the post breeding season.

Kober *et al*. (2010) have identified hotspots for a number of breeding seabirds in UK waters. The Eider decommissioning area is located within or in the vicinity of a wider area of aggregation (or hotspots) for northern fulmar, northern gannet and Atlantic puffin during their breeding season. The offshore presence of these species during the breeding season is confirmed by the maximum foraging distances from colonies reported by Thaxter *et al*. (2012). The northern fulmar has been recorded up to 580 km from colonies, the northern gannet up to 590 km, and the Atlantic puffin up to 200 km (Thaxter *et al*., 2012).

The Seabird Oil Sensitivity Index (SOSI) (Webb *et al*., 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution.

Overall, seabird sensitivity to oil pollution in the region of the Eider platform is considered low (score of 5) from February to September. No data was available for the months of May and October. Seabird sensitivity is considered medium (score of 4) between November and January (Table 3-3).

Table 3-3 Seabird oil sensitivity in Block 211/16 and surrounding blocks (Webb *et al*., 2016)

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
210/15	4*	4	5	5*	N	5*	5	5	5*	N	4*	4
210/20	3	5	5	5*	N	5*	5	5	5	5*	4*	4
210/25	5	5	5	5*	N	5*	5	5	5	5*	5*	5
211/11	3*	5	5	5*	N	5*	5	5	5*	N	3*	3
211/16	**4***	**5**	**5**	**5***	**N**	**5***	**5**	**5**	**5***	**N**	**4***	**4**
211/12	3*	5	4	5	5*	5*	5	5	5*	N	3*	3
211/17	3*	5	5	5*	N	5*	5	5	5*	N	3*	3
211/21	5	5	5	5*	N	5*	5	5	5	5*	5*	5
211/22	5	5	5	5*	N	5*	5	5	4	4*	4*	4
Key	Extremely high		Very high		High		Medium		Low		No data	
* In light of coverage gaps, an indirect assessment of SOSI has been made												

3.2.6 Marine mammals

3.2.6.1 Cetaceans

The central and NNS has a moderate to high diversity and density of cetaceans, with a general trend of increasing diversity and abundance with increasing latitude. Harbour porpoise *Phocoena*

phocoena and white-beaked dolphin *Lagenorhynchus albirostris* are the most widespread and frequently encountered species, occurring regularly throughout most of the year. Minke whales *Balaenoptera acutorostrata* are regularly recorded as frequent seasonal visitors. Coastal waters of the Moray Firth and east coast of Scotland support an important population of bottlenose dolphins *Tursiops truncatus*, while killer whales *Orcinus orca* are sighted with increasing frequency towards the north of the area. Atlantic white-sided dolphin *Lagenorhynchus acutus*, Risso's dolphin *Grampus griseus* and long-finned pilot whale *Globicephala melas* can be considered occasional visitors, particularly in the north of the area (DECC, 2016).

Harbour porpoise and minke whale have been recorded in the vicinity of the Eider Field (Reid *et. al*, 2003). Harbour porpoise has been recorded at medium densities (approximately 1 – 10 individuals cited per hour in the months May and July. Minke whale was also recorded at medium densities in May (Reid *et al*., 2003).

In 2016, the third series of Small Cetaceans in European Atlantic waters and the North Sea (SCANS-III) was conducted in European Atlantic waters. This involved a large-scale ship and aerial survey to study the distribution and abundance of cetaceans. Harbour porpoise, white-beaked dolphin, minke whale and white-sided dolphin were the most abundant species recorded in the survey block covering the Eider Decommissioning area, with specific densities listed in Table 3-4 (Hammond *et al*., 2017). Other species recorded within this survey block were Risso's dolphin, fin whale and Gervais beaked whale however there was not sufficient data for these species to provide abundance estimates (Hammond *et al*., 2017).

Table 3-4 Densities of cetaceans in the Eider decommissioning area (Hammond *et al*., 2017)

Species	Density of cetaceans in the survey block T (animals per km^2)
Harbour porpoise	0.402
White-beaked dolphin	0.037
Minke whale	0.032
White-sided dolphin	0.021

3.2.6.2 **Seals**

Two species of seal live and breed in the UK, namely the grey and harbour seal, both of which are protected under Annex II of the EU Habitats Directive and are listed as Scottish PMFs (SNH, 2016; Jones *et al*., 2015; DECC, 2016).

Approximately 38% of the world's grey seals breed in the UK with 88% of these breeding at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. Birth rates have grown since the 1960s, although according to data from the Special Committee on Seals (SCOS) population growth is levelling off (SCOS, 2014). In the case of harbour seals, approximately 30% of the world's population are found in the UK. Following significant population declines due to disease in 1988 and 2002, harbour seal numbers on the English east coast have been rising since 2009 (SCOS, 2014). Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles (SCOS, 2017).

Grey and harbour seals will feed both in inshore and offshore waters depending on the distribution of their prey, which changes both seasonally and yearly. Both species tend to be concentrated close to shore, particularly during the pupping and moulting season. Seal tracking studies from the Moray Firth have indicated that the foraging movements of harbour seals are generally restricted to a 40–50 km range of their haul-out sites (Special Committee on Seals, 2017). The movements of grey seals can involve larger distances than those of the harbour seal, and trips of several hundred kilometres from one haul-out to another have been recorded (SMRU, 2011).

As the Eider platform is located approximately 120 km offshore, grey and harbour seals may be encountered from time to time, but it is not likely that they use the area with any regularity or in great numbers. This is confirmed by the grey and harbour seal density maps published by the Sea Mammal Research Unit (SMRU), which are provided in the National Marine Plan Interactive (NMPI) (2020). These report the presence of grey and harbour seals in the Eider 211/16 Field as between 0 - 1 per 25 km^2.

3.3 Conservation

3.3.1 Offshore conservation

There are no Nature Conservation Marine Protected areas (NC MPAs), Special Protection areas (SPAs) Special Areas of Conservation (SAC), or Demonstration and Research Marine Protected Areas (DR MPA) within 40 km of the Eider platform (NMPI, 2019). The closest designated site is the North-east Faroe-Shetland Channel NC MPA, located approximately 94 km to the north west of the Eider platform (Figure 3-11). The closest SAC is the Pobie Bank Reef, located approximately 87 km south west of the Eider field. The closest SPA is the Hermaness, Saxa Vord and Valla Field, located in Unst, Shetland approximately 120 km to the south west (NMPI, 2019).

The seabed in Block 211/16 block is within a wider area of 'subtidal sand and gravels' (NMPI, 2019), a seabed type designated as PMF in Scottish waters (Tyler-Walters, 2016). 'Subtidal sands and gravels' also support internationally important commercial fisheries e.g. scallops, flatfish, sandeels, and are important nursery grounds for juvenile commercial fish species such as sandeels, flatfish, bass, skates, rays and sharks (SNH, 2016). However, the distribution of this feature is relatively wide in the North Sea (NMPI, 2019).

Block 211/16 is also located approximately 10 km south from an area identified as potential Annex I reef by the British Geological Survey due to the possible presence of rock, boulders and cobbles (BGS, 2011). However, this area is not mapped as potential reef in the more recent Joint Nature Conservation Committee (JNCC) map of distribution of potential Annex I reef in UK waters (JNCC, 2016).

Apart from the recorded presence of ocean quahogs in survey sediment samples, and the potential presence of sea pen communities in the area, there are no records of seabed features of conservation interest in the vicinity of Eider including those listed on the Annex I of the EC Habitats Directive, or any other Scottish PMF (NMPI, 2019). The Eider platform is not located on any large-scale features of functional significance such as shelf deeps, shelf banks and mounds, seamounts, or continental slopes (NMPI, 2019). In addition, the 2018 survey (Benthic Solutions, 2019) found the presence of ocean quahog in closer proximity to the platform. Two ocean quahog individuals were identified during the taxonomic analysis at stations EID_EBS_01 (500 m northwest of the Eider platform) and EID_EBS_10 (295m northwest), with a further single specimen found at EID_EBS_09 (500 m southeast). A total of 5 individuals were identified over the survey area, however no distinct *A. islandica* siphons were seen on the underwater footage (Benthic Solutions, 2019).

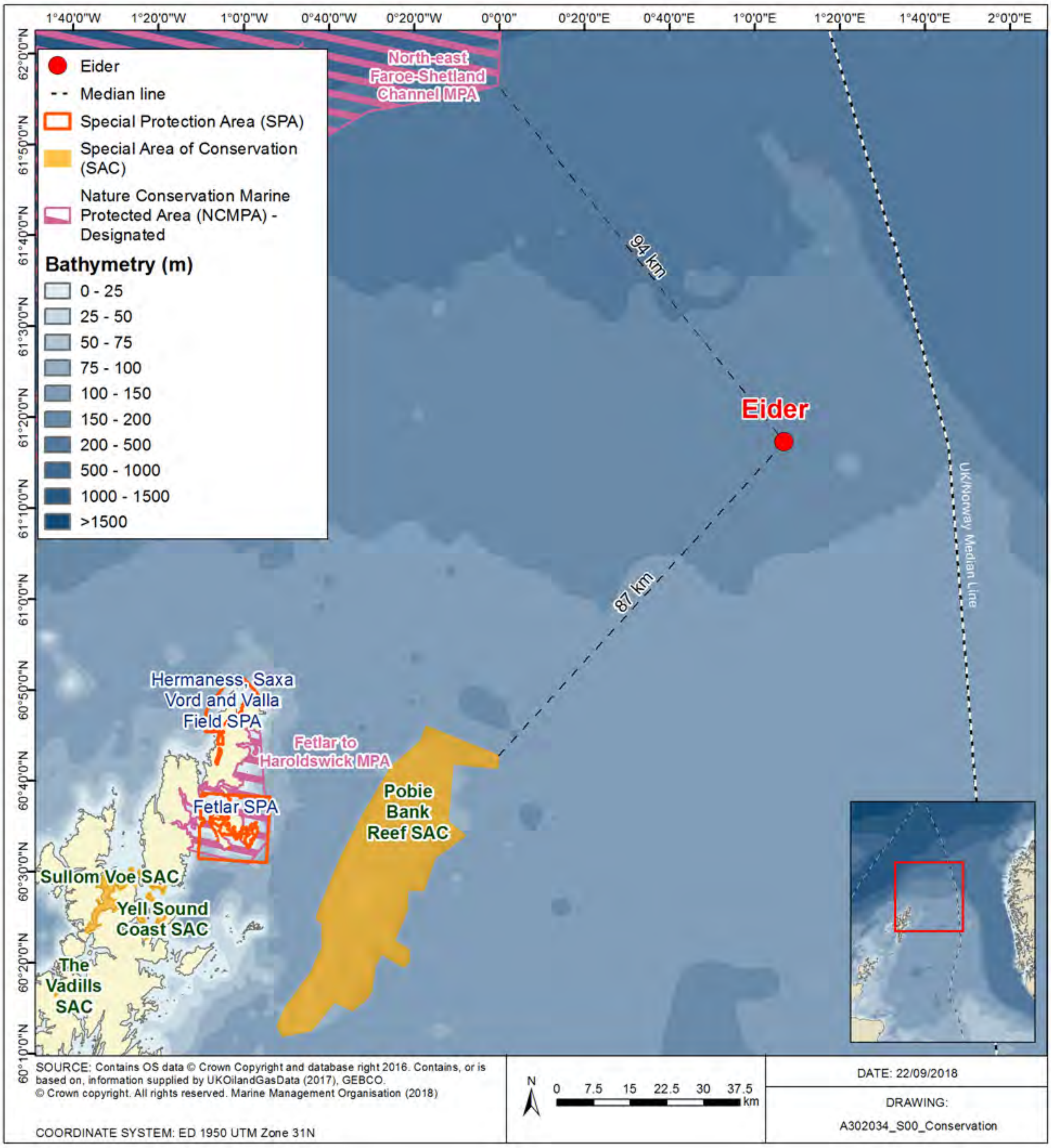

Figure 3-11 Location of the Eider platform in relation to protected areas Protected Species

Four species listed under Annex II of the EU Habitats Directive are found in UK waters; harbour porpoise, minke whale, grey seal and harbour seal. Grey and harbour seals are unlikely to be observed near the Eider project with any regularity as both species have very low densities as was previously described. The harbour porpoise and minke whale are the two Annex II species which could be present near the Eider decommissioning project; The species are however likely, due to their mobile nature, to move away and not be adversely affected by the proposed decommissioning activities.

All species of cetacean recorded within the proposed operations area are listed as EPSs. Other marine species listed as EPSs include turtles and sturgeon (*Acipenser sturio*), which are not likely to be present within this area of the North Sea.

In a 2013 survey a single ocean quahog was observed (Fugro, 2013b). More recently five individuals were identified during taxonomic analysis of samples in the Eider area most of which were located at sample stations furthest from the Eider platform in line with tidal direction. There was no further photographic or video evidence to indicate siphons (Benthic Solutions, 2019). The habitat within the Eider field is also reported as a suitable habitat for this species, which is commonly found in sandy or muddy sediments as identified in the Eider field (see Section 4.1.4). *A. islandica* is therefore likely to occur in the vicinity of the Eider platform, although Eider is located outside the area of distribution of ocean quahog defined by Defra (2010) as shown in Figure 3-7. This species is listed as PMF in Scottish waters (Tyler-Walters, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). However, the distribution of *A. islandica* is relatively widespread in the North Sea (OSPAR, 2009).

The OSPAR (2008) listed habitat 'seapens and burrowing megafauna communities' has been recorded to the east of the Eider platform along the border and within Norwegian waters. This habitat is listed under the PMF 'burrowed mud', which does not cover the Eider area (Tyler-Walters, 2016) (NMPI, 2019). No seapens were recorded in the Eider area during a 2013 survey (Fugro, 2013b) however, a 2019 survey identified seapens (namely *Virgularia mirabilis*) in sieved grab samples. Evidence of animal tracks were also observed in the sediment though these were not indicative of the burrowing megafauna communities (Benthic Solutions, 2019). Seapens and burrowing megafauna are typically found in plain or fine muds, which is a finer sediment type that the sediments identified in the Eider field, classified as muddy sand. Therefore, the habitat 'seapens and burrowing megafauna communities' as listed by OSPAR (2008) and as PMF in Scottish waters (Tyler-Walters, 2016) is unlikely to occur in the Eider field.

Lophelia pertusa (or *Desmophyllum pertusum*, WoRMS, 2022), is known to be present on some of the Eider Upper Jacket (Benthic Solutions, 2020). *Lophelia pertusa* is a reef-building cold water coral that provides habitats for other epifaunal and fish species, and is a UK habitat of principal importance and a Scottish Priority Marine Feature; it is also highlighted in Annex I of the European Habitats Directive, and is on the OSPAR List of Threatened and/or Declining Species and Habitats. This species is normally restricted to water in depths of between 200 and 2,000 m on the continental slope and the extent of Lophelia pertusa reefs is undergoing an overall decline due to mechanical damage by demersal fishing gear in all OSPAR areas (OSPAR, 2009b). However, the species has also been recognised in the scientific literature as one which grows opportunistically on oil and gas subsea infrastructure (e.g. Gass & Roberts, 2006) and which has been recorded from many offshore installations in the northern North Sea at depths between 59 m and 132 m.

3.3.2 Onshore Conservation

The Eider Field is located approximately 120 km from the northeast coast of Scotland. Due to this distance, no impacts to onshore conservation sites are expected from routine operations at the Eider decommissioning project in the UKCS block 211/16.

3.3.3 National Marine Plan

The NMP covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The aim of the NMP is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the NMP areas. The proposed operations as described in this permit have been assessed against the Marine Plan Objectives and policies, specifically GEN 1, 4, 5, 9, 12, 14 and 21 (Section 3.3.4.1 to Section 3.3.4.7) and OIL AND GAS 2, 3 and 6 (Section 3.3.4.8 to Section 3.3.4.10).

Assessment of compliance against relevant policies has already been achieved through the impact assessment in Section 5.0, in support of this EA Justification. The proposed operations do not contradict any of the marine plan objectives and policies. TAQA will ensure they comply with all the new policies that have been introduced; with particular attention being made to the following policies:

3.3.3.1 GEN 1 – General planning and principle

Development and use of the marine area should be consistent with the Marine Plan, ensuring activities are undertaken in a sustainable manner that protects and enhances Scotland's natural and historic marine environment. TAQA will ensure that any potential impacts associated with the Eider decommissioning operations will be kept to a minimum as discussed in Section 5.0.

3.3.3.2 GEN 4 – Co-existence

Where conflict over space or resource exists or arises, marine planning should encourage initiatives between sectors to resolve conflict and take account of agreements where this is applicable. TAQA will ensure that any potential impacts on other sea users associated with the proposed Eider Upper Jacket decommissioning operations will be kept to a minimum.

3.3.3.3 GEN 5 - Climate change

Marine planners and decision makers should seek to facilitate a transition to a low carbon economy. They should consider ways to reduce emissions of carbon and other greenhouse gasses. TAQA will ensure that any potential impacts associated with Eider Upper Jacket decommissioning operations will be kept to a minimum as discussed in Section 5.0.

3.3.3.4 GEN 9 - Natural heritage

Development and use of the marine environment must:

- Comply with legal requirements for protected areas and protected species.
- Not result in significant impact on the national status of PMF.
- Protect and, where appropriate, enhance the health of the marine area.

TAQA will ensure that any potential impacts to protected species and sites associated with Eider Upper Jacket decommissioning operations will be kept to a minimum, as discussed in Section 5.0

3.3.3.5 GEN 12 – Water quality and resource

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 that apply. TAQA will ensure that any potential impacts to water quality associated with Eider Upper Jacket decommissioning operations will be kept to a minimum, as discussed in Section 5.0

3.3.3.6 GEN 14 – 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 development and use 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. TAQA will ensure that any potential impacts to air quality with Eider Upper Jacket decommissioning operations will be kept to a minimum, as discussed in Section 5.0

3.3.3.7 GEN 21 – Cumulative impacts

Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation. TAQA will ensure that any potential impacts to air and water quality and biological communities with Eider Upper Jacket decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

3.3.3.8 OIL AND GAS 2 – Decommissioning end-points

Where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets from the seabed will be fully supported where practicable and adhering to relevant regulatory process. TAQA will ensure that any material returned to shore as a result of the Eider Upper Jacket decommissioning activities adheres to the waste hierarchy (Figure 2-5) as discussed in Section 2.5.

3.3.3.9 OIL AND GAS 3 - Minimising environmental and socio-economic impacts

Supporting marine and coastal infrastructure for oil and gas developments, including for storage, should utilise the minimum space needed for activity and should consider environmental and socio-economic constraints. TAQA will ensure that the onshore resources required for Eider Upper Jacket deconstruction activities will be minimised, as discussed in Section 5.0.

3.3.3.10 OIL AND GAS 6 – Risk reduction

Consenting and licensing authorities should be satisfied that adequate risk reduction measures are in place, and that operators should have sufficient emergency response and contingency strategies in place that are compatible with the National Contingency Plan and the Offshore Safety Directive. TAQA have the relevant risk reduction measures in place for the deconstruction of the Eider Upper Jacket, as discussed in Section 5.0.

3.4 Socio-Economic Environment

3.4.1 Commercial Fisheries

To provide the fullest picture of fisheries within the area, and the associated landings and effort trends, data from 2016 to 2020 are considered (see Table 3-5 and Table 3-6). The Eider Field is located in ICES rectangle 51F1, which in general is targeted primarily for demersal species in terms of both landed weights and value (Figure 3-12).

From 2016 until 2020, demersal fish accounted for between 87% and 100% of the total landed weight and >99% of the total value each time (see Table 3-5). In 2019 the incidence of pelagic catch was the largest recorded over the past 5 years, contributing 13% of the catch by weight (though only 3% of the value; Scottish Government, 2020).

In 2020, the three most valuable species were saithe, cod and whiting. Saithe and whiting also had the largest contribution to the live weight landed in 2020 (Scottish Government, 2020). Between 2016 and 2020, the average live weight of demersal fish in ICES 51F1 was lower than surrounding ICES rectangles, such as 51F0 and 50F1, where yearly demersal live weight regularly exceeded 1,000 te in (Figure 3-12).

In 2020 demersal fishing closer to Shetland was considerably higher; in rectangle 50F1, immediately southwest of 50F0, demersal catch was 2,304 te (NMPI, 2020).

To put the landings of 2020 into context, catches amounting to 416,758 te with a value of £655,897,389 were landed across the UK in 2020. Therefore, ICES rectangle 51F1 presents a relatively low contribution to the UK total, comprising 0.21% of tonnes landed and providing a 0.20% contribution to the total value of the UK commercial fisheries in 2020 (Scottish Government, 2020).

Table 3-6 presents the fishing effort in ICES rectangle 51F1 between 2016-2020. Fishing intensity is considered low to moderate for both demersal and pelagic fisheries in comparison with other areas of the North Sea (Kafas *et al*., 2012). Fishing effort amounted to 114 days in ICES rectangle 51F1 in 2020 representing a substantial decrease in effort compared to 2019. Fishing effort was highest in the summer months of June, July and August, and similar to 2019, fishing continued late into the year (November). This is in contrast to past years in which fishing effort was almost exclusive to the month of April, June and July (Scottish Government, 2020).

Trawls were the only gear type used in the ICES rectangle 51F1 over all the years, making up 100% of the effort in each consecutive year, until both 2019 and 2020; where there was some disclosive effort associated with the use of seine gears (Scottish Government, 2020). Figure 3-14 shows fishing intensity in the NNS according to gear type (Marine Scotland, 2020). Although this dataset differs in certain respects from that issued by the Scottish Government (2018), it broadly corroborates the overall picture that the fishing effort in UKCS Block 216/11 and in the surrounding blocks is low compared to other area of the North Sea.

Table 3-5 Live weight and value of fish and shellfish from ICES rectangle 51F1 from 2015-2019 (Scottish Government, 2020)

Species type	2020		2019		2018		2017		2016	
	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)
Demersal	877	1,301,666	1,205	2,136,673	846	1,381,095	545	824,054	482	709,207
Pelagic	<1	199	175	59,457	1	637	-	-	<1	12
Shellfish	2	5,734	3	12,507	1	3,272	<1	1,711	<1	765
Total	**879**	**1,307,599**	**1,383**	**2,208,637**	**848**	**1,349,529**	**545**	**825,765**	**482**	**709,983**

Table 3-6 Number of fishing days per month (all gear) in ICES rectangle 51F1 from 2015-2019 (Scottish Government, 2020)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016	D	D	D	D	14	D	20	D	D	D	D	D	62
2017	-	D	D	13	D	9	D	D	D	D	D	D	75
2018	D	10	D	27	14	D	7	17	19	19	D	-	131
2019	11	18	14	32	9	D	D	18	38	21	6	D	191
2020	D	9	11	16	D	11	24	14	7	12	10	D	114

Note: Monthly fishing effort by UK vessels landing into Scotland: Blank = no data, D = Disclosive data (indicating very low effort) [1], green = 0 – 100 days fished, yellow = 101 – 200, orange =201-300, red = ≥301

[1] The term ‘disclosive’ is used when fewer than five vessels have been recorded fishing in an area, meaning that detailed data cannot be shown in order to preserve data privacy. It therefore indicates very low levels of effort within the area.

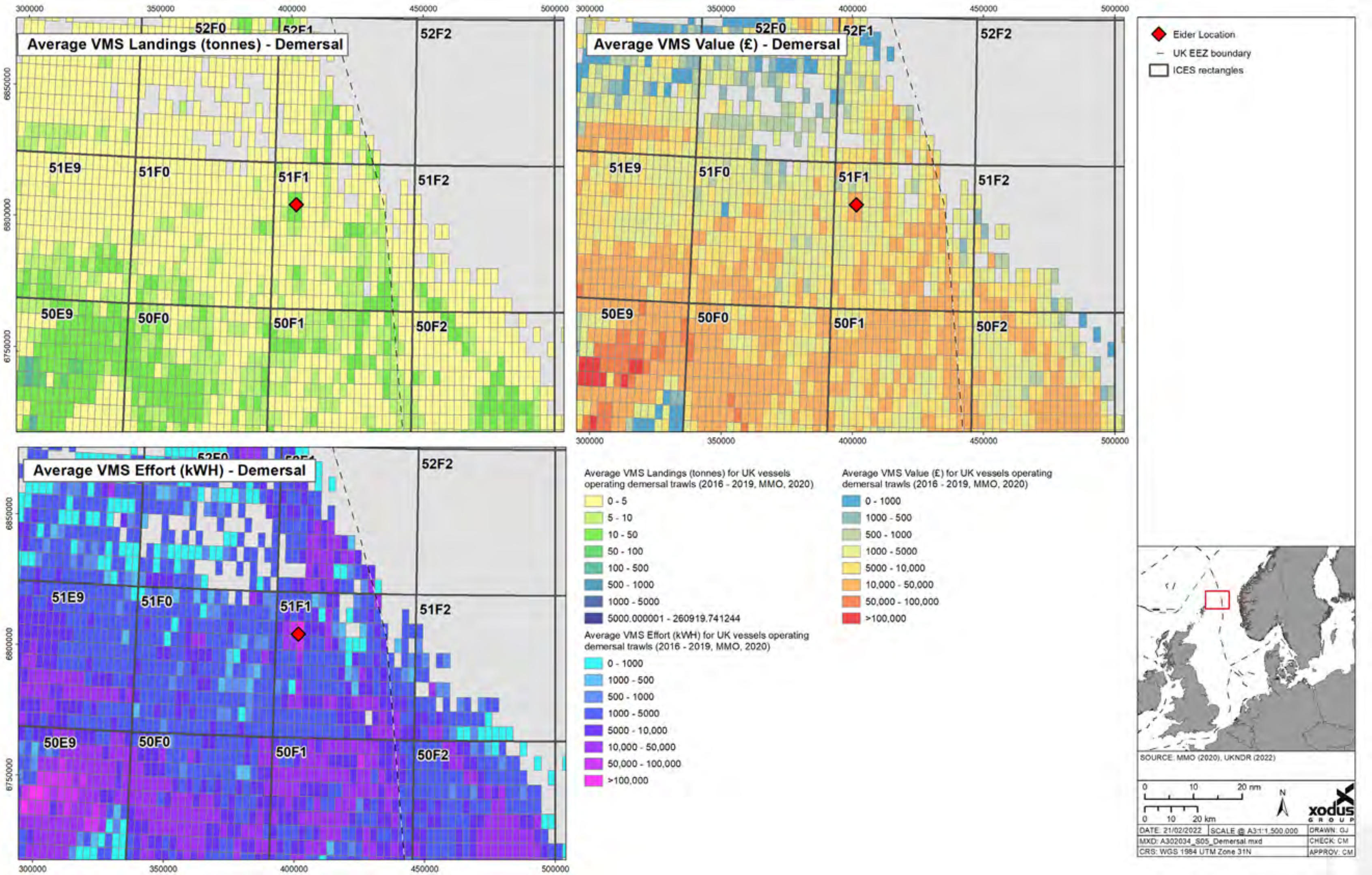

Figure 3-12 **Average landings (tonnes), value (£) and effort (kWh) of demersal fisheries by ICES rectangle (2016-2020)**

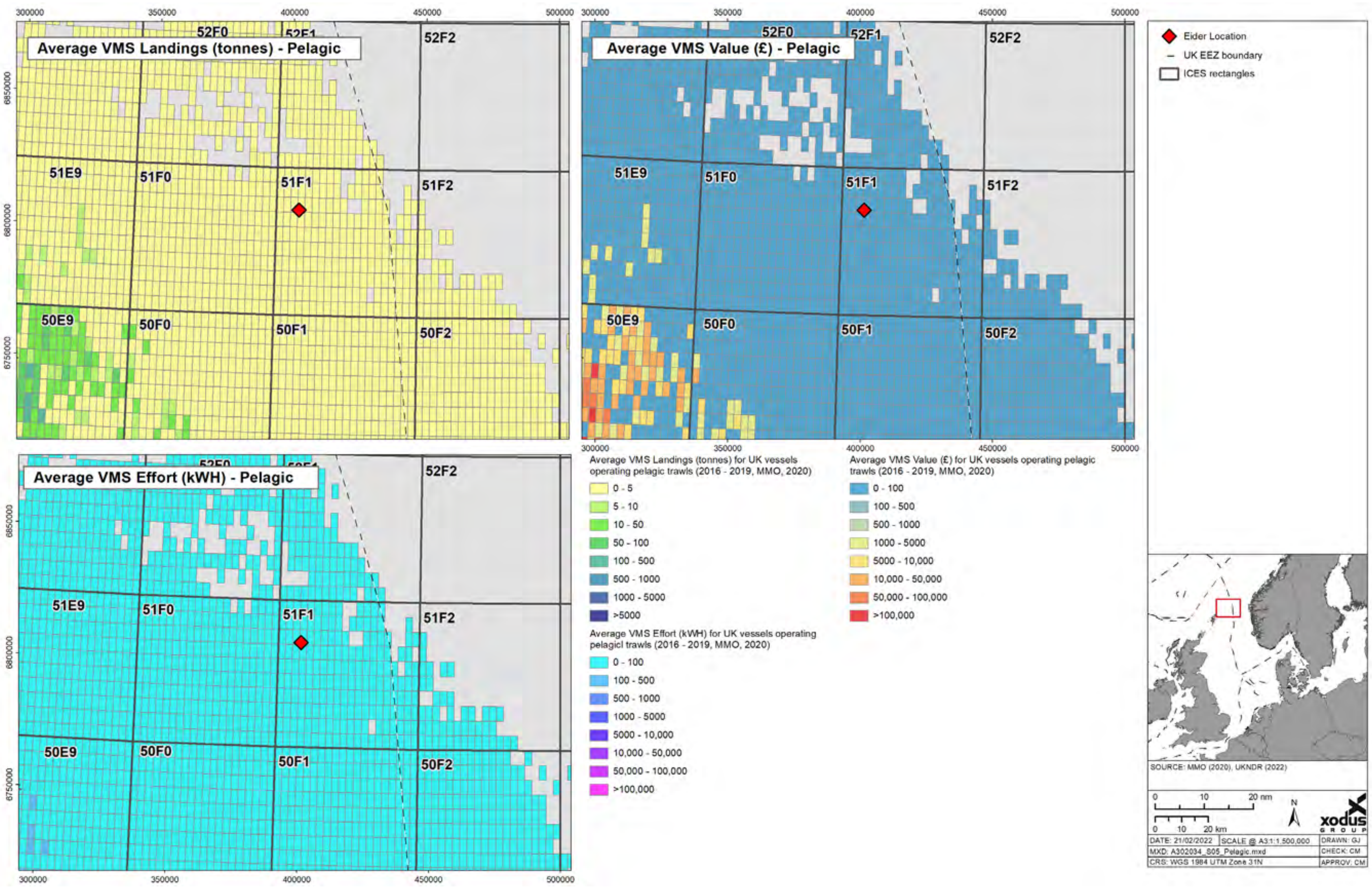

Figure 3-13 **Average landings (tonnes), value (£) and effort (kWh) of pelagic fisheries by ICES rectangle (2016-2020)**

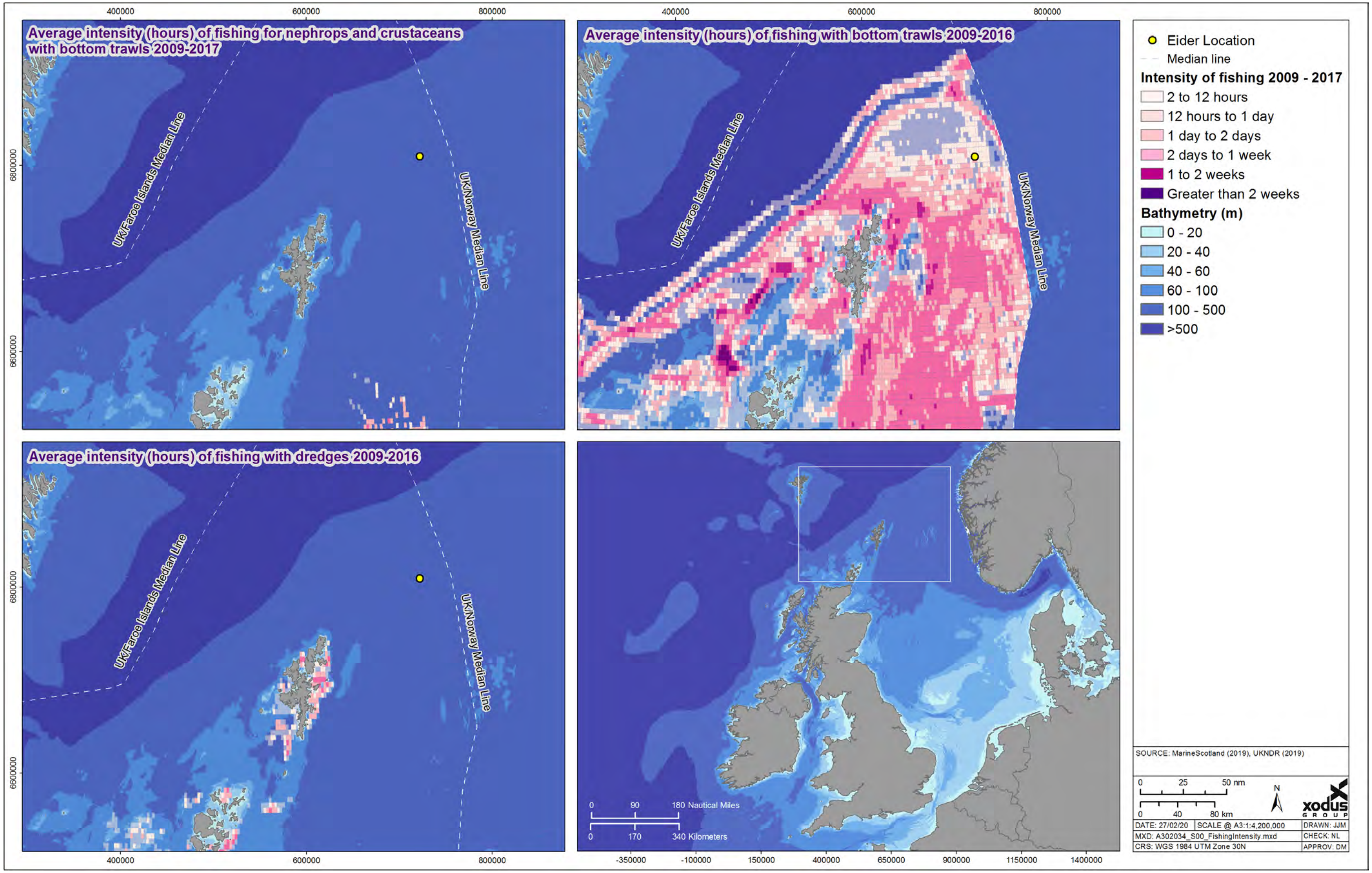

Figure 3-14 Average landings (tonnes) and values (£) of demersal, pelagic and shellfish fisheries by ICES rectangle (2009-2016)

3.4.2 Shipping

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 generate moderate vessel traffic in the form of support vessels, principally operating from Peterhead, Aberdeen, Montrose and Dundee in the north and Great Yarmouth and Lowestoft in the south (DECC, 2016).

The level of shipping activity is considered very low in Block 211/16 (OGA, 2016).

The average weekly density of vessels (all combined) using automatic identification systems (AIS) data between 2012 and 2015 is less than five transits in the UKCS block 211/16, which is very low compared to other areas in the North Sea (NMPI, 2020). Satellite data based on the Automatic Identification System dataset from 2015, plotted in Figure 3-15 show that between 100 – 200 vessels transit through Block 211/16 annually (MMO, 2017) and are most likely related to ongoing platform activity.

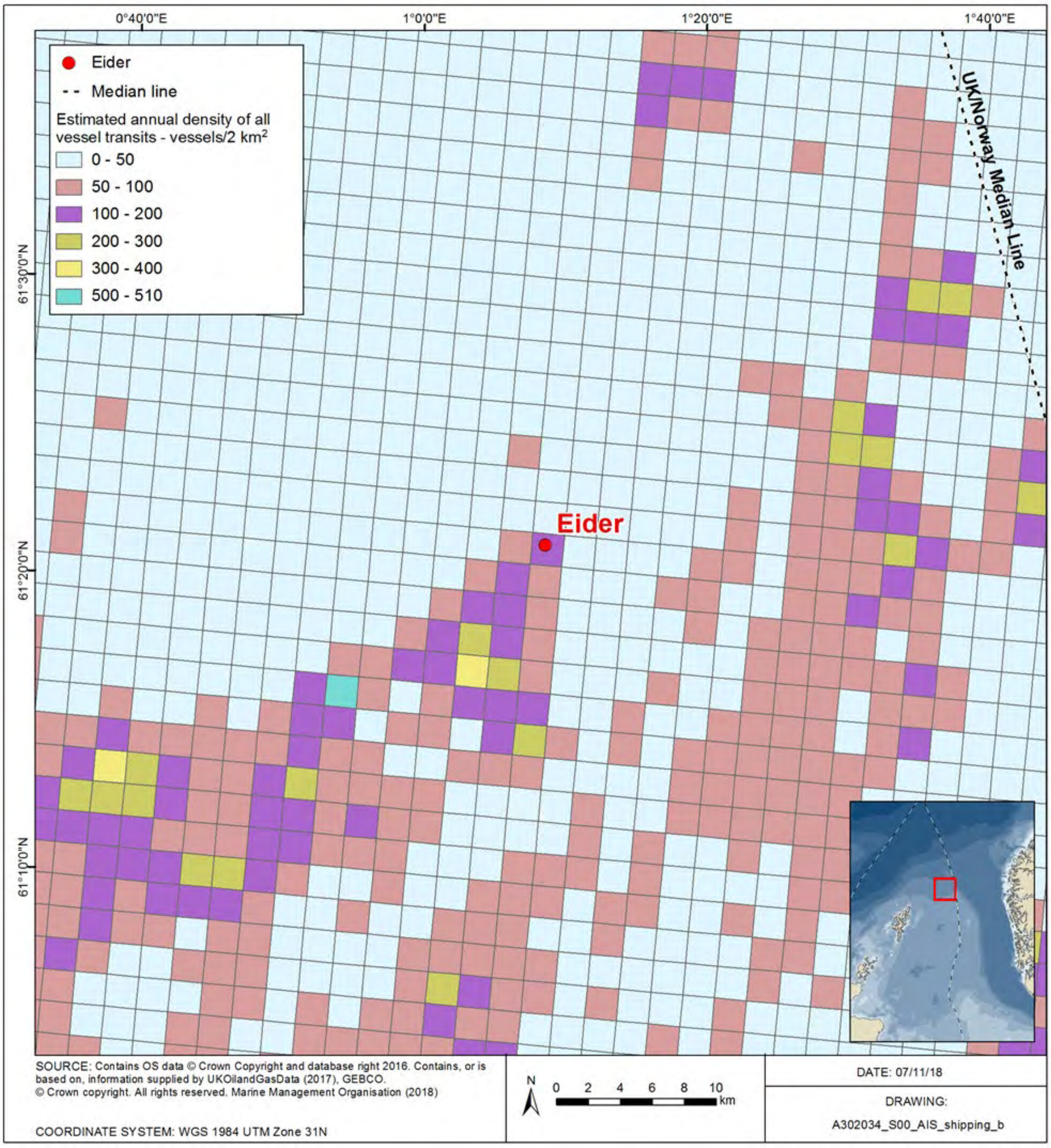

Figure 3-15 **Annual density of vessel transits (number of transits per 2 km^2) around Eider platform in 2015 (MMO, 2017)**

3.4.3 Oil and Gas Activity

There are several installations located within the vicinity of the Eider decommissioning project, as outlined in Figure 3-16. Table 3-7 provides the distances in the vicinity (<40 km) of the Eider platform.

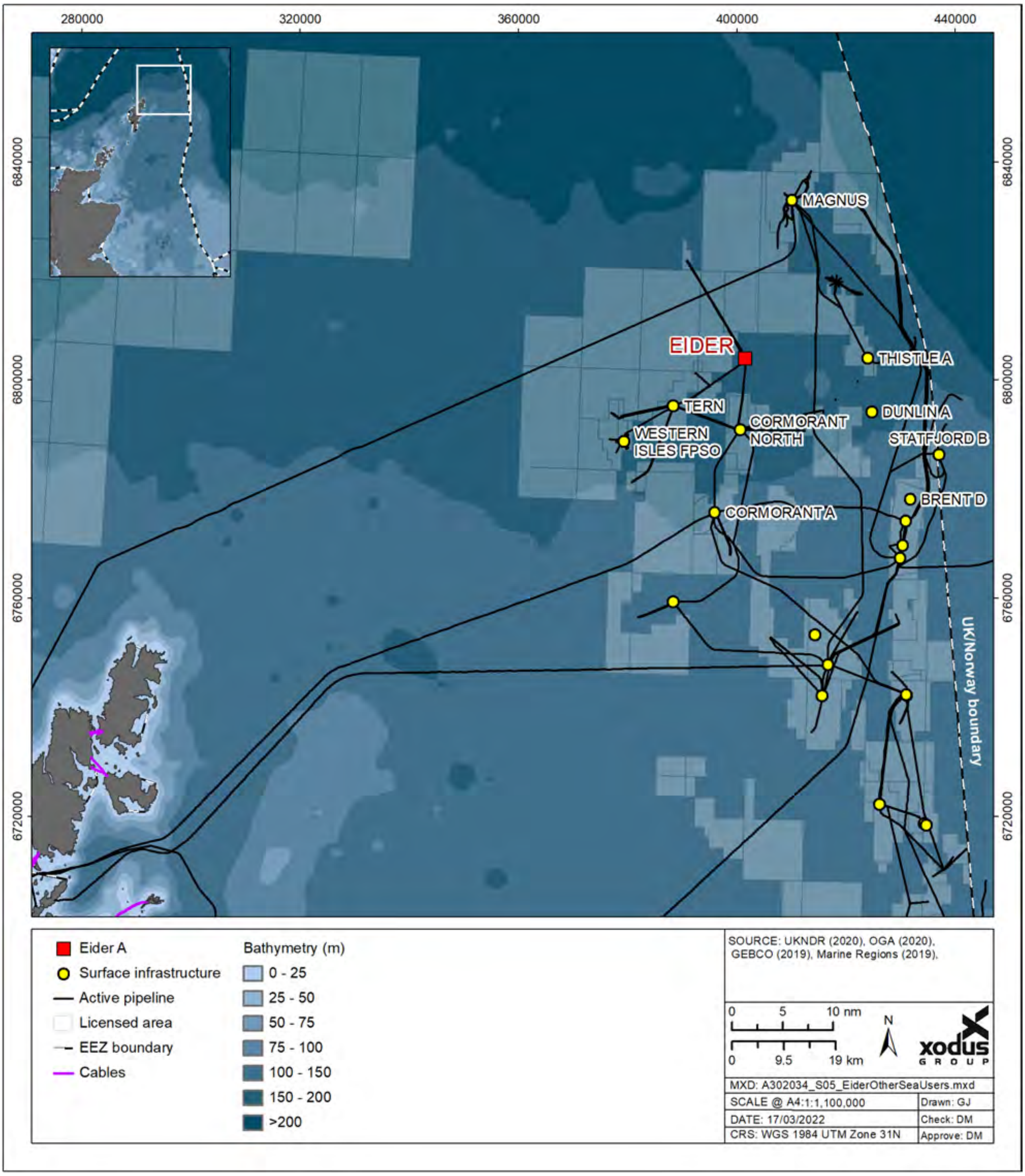

Figure 3-16 **Installations in the vicinity of the Eider platform**

Table 3-7 Installations located within 40 km of the Eider platform

Installation	Distance from Eider (km)	Direction from Eider	Status
Brent D	39.7	South east	Topsides removed
North Cormorant	13.0	South	Active
Cormorant A	28.8	South	Active
Dunlin A	25.1	South east	Topsides removed
Magnus	30.3	North	Active
Statfjord B	39.6	South east	Active
Tern	15.8	South west	Active
Thistle A	22.4	East	Under preparation for decommissioning
Western Isles FPSO	26.9	South west	Active

3.4.4 Military Activities

There are no charted Military Practice and Exercise Areas (PEXAs) the vicinity of the Project area (DECC, 2016).

3.4.5 Renewable Energy

There are no planned or operating renewable energy sites in close vicinity (<40 km) to the Eider platform.

3.4.6 Telecommunication Cables

There are no telecommunication cables within or in the vicinity of Block 211/16 (NMPI, 2020).

3.4.7 Wrecks

There are no known wrecks, as identified by the Historic Environment Scotland (HES) in November 2015, within Block 211/16 (NMPI, 2020).

4.0 EA METHODOLOGY

The Impact assessment is designed to:

- Identify potential impacts to environmental and societal receptors from the proposed decommissioning activities;
- Evaluate the potential significance of any identified impacts in terms of the threat that they pose to these receptors; and
- 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:

- The potential environmental issues arising from Upper Jacket 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:
    - Emissions to air;
    - Disturbance to the seabed;
    - Physical presence of vessels in relation to other sea users;
    - Physical presence of infrastructure decommissioned in situ in relation to other sea users;
    - Physical presence of Footings following removal of the 500 m safety zone but prior to the Footings DP approval in relation to other sea users;
    - Discharges to sea;
    - Underwater noise emissions;
    - Resource use;
    - Onshore activities;
    - Waste;
    - Employment;
    - Unplanned events; and
    - Disturbance or destruction of seabird nests.
- 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 (Sections 4.2.3 to 4.2.5); and
- For any potentially significant impact capture 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 Eider Upper Jacket decommissioning has been largely based on sharing project expectations, approach and specific considerations with key stakeholders including Health and Safety Executive (HSE) Marine Scotland, JNCC and SFF. Any specific stakeholder consultation and comments will be provided in this section following public consultation.

4.2 EA Methodology

4.2.1 Overview

The Eider Upper Jacket EA methodology was developed by reference to the Institute of Ecology and Environmental Management (IEEM) guidelines for marine impact assessment (IEEM, 2010), the Marine Life Information Network (MarLIN) species and ecosystem sensitivities guidelines (Tyler-Walters *et al*., 2004) and guidance provided by Scottish National Heritage (SNH) in their handbook on environmental impact assessment (SNH, 2018) and by 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:

- Identification of receptor and impact (including duration, timing and nature of impact);
- Definition of sensitivity, vulnerability and value of receptor;
- Definition of magnitude and likelihood of impact; and
- Assessment of consequence of the impact on the receptor, considering the probability that it will occur, the spatial and temporal extent and the importance of the impact. If the assessment of consequence of impact is determined as moderate or major, it is considered a significant impact.

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 and receptor

In order to assess 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 3.0 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 the potential receptors that could be affected by the Eider Upper Jacket Decommissioning Project (e.g. other users of the sea, water quality). High level receptors are identified within the impact assessments (Section 5.1).

4.2.3 Impact definition

4.2.3.1 Impact magnitude

Determination of impact magnitude requires consideration of a range of key impact criteria including:

- Nature of impact, whether it be beneficial or adverse;
- Type of impact, be it direct or indirect;
- Size and scale of impact, i.e. the geographical area;
- Duration over which the impact is likely to occur e.g. days, weeks;
- Seasonality of impact, i.e. expected to occur all year or at specific times; and
- Frequency of impact, i.e. how often the impact is expected to occur.

Each of these variables are expanded upon in Table 4-1 to Table 4-6 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. With respect to the nature of the impact (Table 4-1), it should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

Table 4-1 Nature of impact

Nature of impact	Definition
Beneficial	Advantageous or positive effect to a receptor (i.e. an improvement).
Adverse	Detrimental or negative effect to a receptor.

Table 4-2 Type of impact

Type of impact	Definition

Direct	Impacts that result from a direct interaction between the Eider Upper Jacket decommissioning activities and the receptor. Impacts that are actually caused by the activities.
Indirect	Reasonably foreseeable impacts that are caused by the interactions with the Eider Upper Jacket decommissioning activities, but which occur later in time than the original, or at a further distance. Indirect impacts include impacts that may be referred to as 'secondary', 'related' or 'induced'.
Cumulative	Impacts that act together with other impacts (including those from any concurrent or planned future third-party activities) to affect the same receptors as the Eider Upper Jacket decommissioning activities. Definition encompasses "in-combination" impacts.

Table 4-3 Duration of impact

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 Geographical extent of impact

Geographical extent	Description
Local	Impacts that are limited to the area surrounding Eider Upper Jacket decommissioning activities footprint and associated working areas. Alternatively, where appropriate, impacts that are restricted to a single habitat or biotope or community.
Regional	Impacts that are experienced beyond the local area to the wider region, as determined by habitat/ecosystem extent.
National	Impacts that affect nationally important receptors or protected areas, or which have consequences at a national level. This extent may refer to either Scotland or the UK depending on the context.
Transboundary	Impacts that could be experienced by neighbouring national administrative areas.
International	Impacts that affect areas protected by international conventions, European and internationally designated areas or internationally important populations of key receptors (e.g. birds, marine mammals).

Table 4-5 Frequency of impact

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 Eider Upper Jacket

	decommissioning activities This definition also covers such impacts that occur on a planned or unplanned basis and those that may be described as 'periodic' impacts.

4.2.3.2 Impact magnitude criteria

Overall impact magnitude requires consideration of all impact parameters described above. Based on these parameters, magnitude can be assigned following the criteria outlined in Table 4-6. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement.

Table 4-6 Impact magnitude criteria

Magnitude	Criteria
Major	Extent of change: Impact occurs over a large scale or spatial geographical extent and/or is long term or permanent in nature. Frequency/intensity of impact: high frequency (occurring repeatedly or continuously for a long period of time) and/or at high intensity.
Moderate	Extent of change: Impact occurs over a local to medium scale/spatial extent and/or has a prolonged duration. 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.
Minor	Extent of change: Impact occurs on-site or is localised in scale/spatial extent and is of a temporary or short-term duration. Frequency/intensity of impact: low frequency (occurring occasionally/intermittently for short periods of time) and/or at low intensity.
Negligible	Extent of change: Impact is highly localised and very short term in nature (e.g. days/few weeks only).
Positive	An enhancement of some ecosystem or population parameter.
Notes: Magnitude of an impact is based on a variety of parameters. Definitions provided above are for guidance only and may not be appropriate for all impacts. For example, an impact may occur in a very localised area (minor to moderate) but at very high frequency/intensity for a long period of time (major). In such cases informed judgement is used to determine the most appropriate magnitude ranking and this is explained through the narrative of the assessment.	

4.2.3.3 Impact likelihood for unplanned and accidental events

The likelihood of an impact occurring for unplanned/accidental events 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. Consideration of likelihood is described in the impact characterisation text and used to provide context to the specific impact being assessed in topic specific chapters as required.

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

These range from negligible to very high and definitions for assessing the sensitivity of a receptor are provided in Table 4-7.

Table 4-7 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 receptor sensitivity and impact magnitude is required to be able to determine receptor vulnerability. These criteria, described in Table 4-6 and Table 4-7 are used to define receptor vulnerability as per Table 4-8.

Table 4-8 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, 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 in determining sensitivity. In some instances, it has also been necessary to take a precautionary approach where stakeholder concern exists with regard to a particular receptor. Where this is the case, this is detailed in the relevant impact assessment in Section 5.0.

4.2.4.3 Receptor value

The value or importance of a receptor is based on a pre-defined judgement based on 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 4-9.

Table 4-9 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. EU Habitats Directive) or those that are internationally recognised as globally threatened (e.g. 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 Eider platform 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 Eider platform 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 Eider platform 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.
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 Eider platform area. Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach.

4.2.5 Consequence and significance of potential impact

Having determined impact magnitude and the sensitivity, vulnerability and value of the receptor, it is then necessary to evaluate impact significance. This involves:

- Determination of impact consequence based on a consideration of sensitivity, vulnerability and value of the receptor and impact magnitude;
- Assessment of impact significance based on assessment consequence;
- Mitigation; and
- Residual impacts.

4.2.5.1 Assessment of consequences and impact significance

The sensitivity, vulnerability and value of receptor are combined with magnitude (and likelihood, where appropriate) of impact using informed judgement to arrive at a consequence for each impact, as shown in Table 4-10. The significance of impact is derived directly from the assigned consequence ranking. The assessment of consequence considers mitigation measures that are embedded within the proposed activities.

Table 4-10 Assessment of consequence

Assessment consequence	Description (consideration of receptor sensitivity and value and impact magnitude)	Impact significance
Major consequence	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 or industry). These impacts are a priority for mitigation in order to avoid or reduce the anticipated effects of the impact.	Significant
Moderate consequence	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.	Significant
Low consequence	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.	Not significant
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.	Not significant
Positive	Impacts are expected to have a positive benefit or enhancement. 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.	Not significant

4.2.6 Cumulative Impact Assessment

While the scope of this impact assessment is restricted to the decommissioning of the Eider Upper Jacket as outlined in Section 2.0, 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 being of moderate impact level or higher in Table 4-10) are identified, mitigation measures must be considered. The intention is that such measures should remove, reduce or manage the impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation is also proposed in some instances to ensure impacts that are predicted to be not significant remain so.

5.0 IMPACT ASSESSMENT 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 thirteen potential impact areas based on the proposed removal methods. Of the thirteen potential impacts, all were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. The potential impacts are tabulated in Section 5.1, together with justification statements for the screening decisions and proposed mitigation.

5.1 Assessment of potential impacts

Impact	Further Assessment	Rationale	Proposed Mitigation
Emissions to air	No	Reviewing historical EU Emissions Trading Scheme (EUETS) data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be small relative to those during production. Most emissions for the Eider Upper Jacket decommissioning relate to the vessel time or are associated with the recycling of material returned to shore. As the decommissioning activities proposed are of such short duration this aspect is not anticipated to result in significant impact. The estimated CO2 emissions to be generated by the recommended decommissioning options is 22,305 te (Appendix C), this equates to less than 0.13% of the total UKCS oil and gas emissions in 2020 (17,060,000 te; OEUK, 2021). Considering the above, atmospheric emissions do not warrant further assessment.	• Vessel management in accordance with TAQA's marine procedures • Minimal vessel use/movement • Vessel sharing where possible • Engine maintenance

Disturbance to the seabed	No	Currently it is envisaged that all vessels undertaking the decommissioning and removal works would be dynamically positioned vessels. As a result, there will be no direct seabed interaction associated with the decommissioning of the Upper Jacket. Should this change following the commercial tendering process and an anchor vessel be required, any potential impact would be assessed and captured in the Consent to Locate application and its supporting EIA justification within the Portal Environmental Tracking System (PETS). The decommissioning activities associated with the cutting of the Eider Upper Jacket are not expected to impact the seabed in any way. On this basis, no further assessment need be undertaken.	• Dropped objects procedure will be followed according to industry standard • A post-decommissioning seabed verification will be conducted using non-intrusive methods
Physical presence of vessels in relation to other sea users	No	The presence of a small number of vessels for Upper Jacket decommissioning activities will be relatively short-term in the context of the life of the Eider platform. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. The small number of vessels required will also generally be in use within the existing 500 m safety zone and will not occupy ‘new’ areas. Other sea users will be notified in advance of activities occurring meaning those stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations. The decommissioning of the Eider Upper Jacket is estimated to require up to four vessels, however these would not all be on location at the same time (max of three at any one time). A review of previously submitted decommissioning EAs show that some projects indicate a greater potential issue with	• Minimal vessel use/movement • Notification to Mariners • Opening up of 500 m safety exclusion zones following close-out.

		short-term vessel presence, but those largely relate to project-specific sensitive locations, which is not the case for this decommissioning project. Considering the above, temporary presence of vessels does not need further assessment.	
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	No	As previously detailed, this documents scope is focused on the Eider Upper Jacket. As such, the activities associated with the decommissioning of the Upper Jacket will not result in infrastructure decommissioned in-situ considered within this scope. Considering the above, the physical presence of infrastructure decommissioned *in situ* in relation to other sea users (namely commercial fisheries), does not need further assessment.	• A post-decommissioning seabed verification will be conducted using non-intrusive methods.
Physical presence of Footings following removal of the 500 m safety zone but prior to the Footings DP approval in relation to other sea users	No	The risk posed by the Footings following removal of the Upper Jacket will be reduced to a tolerable level by marking the Footings on Admiralty charts and including them in the Fish Safe system.	• A monitoring schedule for the Footings will be agreed with OPRED.
Discharges to sea	No	Discharges from vessels are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. During cutting activities, the storage tanks for diesel and base oil will also be cut through, however there is expected to be negligible discharge from these tanks which will have been flushed and purged as part of preparation activities which will	• MARPOL compliance. • Bilge management procedures. • Vessel audit procedures. • Contractor management procedures.

		be fully assessed in the relevant environmental permit applications. Considering the above, discharges to sea resulting from any vessel and Upper Jacket removal activity should not be assessed further in this EA.	
Underwater noise emissions	No	Aside from vessel noise and Upper Jacket cutting activities, there will be no other noise generating activities. Vessel presence will be limited in duration. Thus, vessel presence during the cutting process will mask the cutting noise generated (Pangerc et al., 2016). As a result, noise generated during the decommissioning activities will be largely undetectable. Furthermore, the project is not located within an area protected for marine mammals. With industry-standard mitigation measures and JNCC guidance, EAs for offshore oil and gas decommissioning projects typically show no injury, or significant disturbance associated with these projects (Shell, 2017; CNRI, 2013; CNRI, 2017; and Marathon, 2017). On this basis, underwater noise assessment does not warrant further assessment.	• Vessel management. • Minimal vessel/use movement. • Vessel sharing where possible. • Cutting activities will be minimised and carried out in isolation where possible.
Resource use	No	Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Such use of resources is not typically an issue of concern in offshore oil and gas. The estimated total energy usage for the decommissioning activities is 268,244 GJ.	• Adherence to the Waste Hierarchy. • Vessel Management. • Minimal vessel use/movement. • Vessel sharing where possible.

			• Engine maintenance.
Onshore impacts	No	The BEIS 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, through TAQA's Waste Management Strategy, only licenced contractors will be considered who can demonstrate they are capable of handling and processing the material to be brought ashore. This will form part of the commercial tendering process.	• Overall 'Duty of Care' • Selection of suitably licenced site (if applicable) • Communication with relevant Regulator(s) e.g. SEPA established • Contractor management
Waste	No	It is waste management, not generation, that is the issue across DPs, often cited as a stakeholder concern. The waste to be brought to shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy and the Waste Hierarchy, as part of the project AWMP, using approved waste contractors and in liaison with the relevant Regulators (Section 2.5). On this basis, no further assessment of waste is necessary.	• Waste Hierarchy • Waste Management Strategy and Active waste tracking • EEMS tracking and close-out reporting
Employment	No	TAQA will communicate regularly with all crew members throughout. Following the above measures and continued communications further environmental assessment is not warranted for this aspect.	• Regular communication • Contractor Management
Unplanned events	No	The current OPEP for the Eider platform considers a diesel release of approx. 450 m3. This quantity of diesel will be more than the quantity expected to be contained within the largest tank of the HLV. The results of the spill modelling indicate a very low probability of landfall (less than 3%, after 20 days) and any beached volume would be extremely small (circa. 0.01 m3; TAQA, 2018f).	• OPEP in place for operations • SOPEP on all vessels • Navigational warnings in place • 500 m zones operational until seabed clearance certified

		Although the risk of oil spill is remote, an OPEP is in place for the Eider Decommissioning activities. Any spills from vessels in transit and outside the 500 m zone is covered by a separate Shipboard Oil Pollution Emergency Plan (SOPEP). Up to four vessels will be deployed during decommissioning activities at any one time, including an HLV, Construction Support Vessel (CSV), a support vessel and a survey vessel. Dropped object procedures are industry-standard and there is only a very remote probability of any interaction with any live infrastructure. Any dropped objects of significant size will be removed. Any dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the Upper Jacket decommissioning activities. Considering the above, the potential impacts from accidental chemical/hydrocarbon releases or dropped objects during decommissioning activities do not warrant further assessment in this EA.	• Spill response procedures • Contractor management and communication • Lifting operations management of risk • Dropped object recovery and debris clearance surveys • PON2 submission • Careful planning, selection of equipment, subsequent management and implementation of activities
Disturbance or destruction of seabird nests	No	In recent years, there has been an increase in the number of seabirds utilising offshore installations for nesting. Opportunistic species such as kittiwake and herring gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Although for most offshore platforms, the number of breeding birds remains very low. All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to: • take, damage or destroy the nest of any wild bird while that nest is in use or being built, or • take or destroy an egg of any wild bird.	• TAQA Seabird Management Strategy • Non-lethal deterrent methods • Ornithologist support if required • Disturbance licence in discussion with OPRED if required

		This legislation is relevant to installations more than 12 nautical miles from the coast, applies to all species of bird and applies irrespective of the number of nests found. i.e. there is no de-minimus. TAQA have in place a proactive Seabird Management Strategy, which is managed continuously. This includes a suite of remedial strategies that can be used, if required, to prevent birds from nesting. TAQA will engage with OPRED to agree any further licensing obligations should it be necessary. This would be dealt with in a consequent licence application in the future and as such is not assessed any further here.	

6.0 CONCLUSIONS

The Eider Upper Jacket is located 120 km offshore Shetland in the northern North Sea, remote from coastal sensitivities and from any designated sites. Therefore, no impact to any protected or sensitive habitats or species is expected. The marine environment where the Eider Upper Jacket is located is typical of the northern North Sea. Whilst recognising there are certain times of the year when populations of seabirds, fish spawning and commercial fisheries are vulnerable to oil pollution, the area is not considered particularly sensitive to the proposed decommissioning activities.

This EA presents a detailed review of the project activities, the environmental sensitivities of the project area and stakeholder concerns, informed by industry experience of decommissioning activities and their interaction with various aspects of the environment. It has also considered the objectives and marine planning policies of the National Marine Plan across the range of policy topics including biodiversity, natural heritage, cumulative impacts and the oil and gas sector. TAQA considers that the proposed decommissioning activities are in alignment with such objectives and policies.

Based on the findings of this EA, the identification and subsequent application of appropriate mitigation measures, and project management according to TAQA’s Health, Safety, Security and Environment Policy and EMS, it is considered that the proposed Eider Upper Jacket decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the UKCS.

7.0 REFERENCES

Aires, C., Gonzlez-Irusta, J. M. & Watret, R., 2014. Scottish Marine and Freshwater Science Report, Vol 5 No 10, Updating Fisheries Sensitivity Maps in British Waters.

Bakke, T., Klungsøyr, J. & Sanni, S., 2013. Environmental impacts of produced water and drilling waste discharges from the Norwegian offshore petroleum industry, Marine Environmental Research 92 (2013) 154-169.

Baxter, J.M., Boyd, I.L., Cox, M., Donald, A.E., Malcolm, S.J., Miles, H., Miller, B., & Moffat, C.F. (Editors), 2011. Scotland's Marine Atlas: Information for the national marine plan. Marine Scotland, Edinburgh. pp. 191.

Beare, D., Batten, S., Edwards, M. & Reid, D., 2002. Prevalence of boreal Atlantic, temperate Atlantic and neritic zooplankton in the North Sea between 1958 and 1998 in relation to temperature, salinity, stratification intensity and Atlantic inflow. Journal of Sea Research, 48, p 29 – 49.

Benthic Solutions (2019). EIDER – Combined Environmental Baseline and Habitat Assessment Survey Report.

Benthic Solutions (2020), Eider to North Cormorant: Pre-decommissioning and Environmental Baseline Survey [1932_E-NC_EBS-HAS_02], ROV footage captured 4th to 22nd November 2019

BGS, 2011. Cooper R, Green S, Long D. 2011a. User Guide for the British Geological Survey DiGHardSubstrate250k Dataset. British Geological Survey Open Report, IR/11/027. 14pp

Buchman, M. F., 1999. NOAA screening Quick Reference Tables. NOAA HAZMAT Report 99-1. Seattle, WA. Coastal Protection and Restoration Division. National Oceanic and Atmospheric Administration, 12pp.

CEFAS, 2001. Contaminant Status of the North Sea. Technical report TR_004 produced for Strategic Environmental Assessment – SEA 2. Available online at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197330/TR_SEA2_Contamination.pdf [Accessed on 01/09/2022]

CNRI, 2013. Environmental Statement of the Murchison Facilities. MURDECOM-BMT-EN-REP-00198. May 2013.

CNRI, 2017. Ninian Northern Platform Decommissioning Programme. P0005-CNR-PM-REP-00004. February 2017.

Coull, K., Johnstone, R. & Rogers, S., 1998. Fisheries Sensitivity Maps in British Waters, Published and distributed by UKOOA Ltd.

Decom North Sea, 2017. Environmental Appraisal Guidelines. Online at http://decomnorthsea.com/about-dns/projects-update/environmental-appraisal-guidelines [Accessed 19/02/2021].

Decom North Sea, 2018. Managing Offshore Decommissioning Waste. First Edition, November 2018.

DECC (Department of Energy Climate Change), 2016. UK Offshore Energy Strategic Environmental Assessment 3 (OESEA3). Available at:

https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-3-oesea3 [Accessed 19/02/2021].

DECC, 2009. UK Offshore Energy Strategic Environmental Assessment. OESEA supporting documents. Available at: https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-oesea-supporting-documents [Accessed 19/02/2021].

Defra, 2010. MB0102 2B Distribution of *Arctica islandica* in the United Kingdom and Isle of Man. Published by Marine Environmental Data & Information Network

DTI, 2001. Report to the Department of Trade and Industry. Strategic Environmental Assessment of the mature areas of the offshore North Sea 2. Consultation document, September 2001. Available online at http://www.offshore-sea.org.uk/consultations/SEA_2/index.php [Accessed 19/02/2021].

Edwards, M., Beaugrand, G., Halaouet, P., Licandro, P., McQuatters-Gollop, A. & Wootton, M., 2010. Ecological Status Report (2010): results from the CPR survey 2009/2010. SAHFOS Technical Report 8 1-8, Plymouth UK.

Eleftheriou, A. and Basford, D.J., 1989. The macrobenthic infauna of the offshore Northern North Sea

Ellis, J. R., Milligan, S. P., Readdy, L., Taylor, N., & Brown, M. J., 2012. Spawning and nursery grounds of selected fish species in UK waters. Sci. Ser. Tech. Rep., Cefas Lowestoft, 147, 56.

FRS (Fisheries Research Services), 2004. Zooplankton and climate change – the Calanus story. Available online at http://www.vliz.be/docs/Zeecijfers/zooplankton_and_climate_change.pdf [Accessed 19/02/2021].

Fugro, 2018. Eider Cuttings Pile, UKCS Block 211/16. Fugro Document No: 172361-R-002(03)

Gass, S. and Roberts, J.M. (2006). The occurrence of the cold-water coral *Lophelia pertusa* (Scleractinia) on oil and gas platforms in the North Sea: Colony growth, recruitment and environmental controls on distribution. *Marine Pollution Bulletin* 52 (5) 549-559.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Börjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M., Scheidat, M. and Teilmann, J., 2017. Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Wageningen Marine Research.

Henry, LA., Fox, A., Roberts, M., Polton, J., Adame, CM., Corne, D., Ferris, J., McLellan, F., McCabe, C (2017). ANChor Summary Report. Appraisal of Network Connectivity between North Sea oil and gas platforms. Available online at: https://s3-eu-west-1.amazonaws.com/static.insitenorthsea.org/files/INSITE-ANChor-Summary-Report-v1.0.pdf.

IEEM, 2010. Guidelines for Ecological Impact Assessment in Britain and Ireland, marine and Coastal. August 2010. Final Version 5.

IEMA, 2015. Environmental impact assessment Guide to Shaping Quality Development.

IEMA, 2016. Environmental impact assessment Guide to Delivering Quality Development.

IUCN (International Union for Conservation of Nature), 2022. IUCN Red List of Threatened Species. Available at: https://www.iucnredlist.org/ [Accessed 30/08/2022].

JNCC (Joint Nature Conservation Committee), 1999. Seabird vulnerability data in UK waters, block specific vulnerability. Joint Nature Conservancy Committee.

JNCC, 2016. Potential Annex I reefs in UK waters. Available online at http://jncc.defra.gov.uk/page-3054 [Accessed 19/02/2021].

JNCC, 2017. UKSeaMap 2016. A broad-scale seabed habitat map for the UK. Available at: http://jncc.defra.gov.uk/ukseamap [Accessed 19/02/2021].

Johns, D.G. and Reid, P.C., 2001. An Overview of Plankton Ecology In The North Sea. Technical report produced for Strategic Environmental Assessment – SEA2. Produced by SAHFOS, August 2001. Technical Report TR_005.

Jones, E. L., McConnell, B. J., Smout, S. C., Hammond, P. S., Duck, C. D., Morris, C., Thompson, D., Russell, D.J.F., Vincent, C., Cronin, M., Sharples, R. J. & Matthiopoulos, J., 2015. Patterns of space use in sympatric marine colonial predators reveals scales of spatial partitioning. Marine Ecology Progress Series, vol 534, pp. 235-249. DOI: 10.3354/meps11370. Available online at https://research-repository.st-andrews.ac.uk/bitstream/handle/10023/9386/Jones_2015_MEPS_Patterns_AM.pdf?sequence=1&isAllowed=y [Accessed 19/02/2021].

Kafas, A., Jones, G., Watret, R., Davies, I. and Scott, B., 2012. Representation of the use of marine space by commercial fisheries in marine spatial planning. ICES CM I: 23.KIS-ORCA (2016). Submarine cable routes of the Southern North Sea. Kingfisher Information Service - Cable Awareness. Available online at https://www.seafish.org/safety-and-training/kingfisher-information-services/ [Accessed 19/02/2021].

Khalaf, K., Literarthy, P. and Anderlini, V., 1982. Vanadium as a tracer of oil pollution in the sediments of Kuwait. Sediment/ Freshwater Interaction pp 147-154

Kober, K., Webb, A., Win, I., Lewis, M., O'Brien, S., Wilson, L. J., & Reid, J. B., 2010. An analysis of the numbers and distribution of seabirds within the British Fishery Limit aimed at identifying areas that qualify as possible marine SPAs. JNCC report, 431.

Künitzer, A., Basford, D., Craeymeersch, J.A., Dewarumez, J.M., Dörjes, J., Duineveld, C.A., Elftheriou, A., Heip, C., Herman, P., Kingston, P., Niermann, U., Rachor, E., Rumohr, H. and de Wilde, P.A.J., 1992. The Benthic Infauna of the North Sea: Species Distribution and Assemblages. ICES Journal of Marine Science, 49, 127 – 143.

MAIB, 2020. Marine Accident Investigation Branch (MAIB). Available online at: https://www.gov.uk/government/organisations/marine-accident-investigation-branch [19/02/2021

Marathon Oil U.K. LLC, 2017. Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick – Combined Decommissioning Programmes. Document reference number: 9000-MIP-99-PM-RP-00003-000,102. June 2017.

McBreen, F., Askew, N., Cameron, A., Connor, D., Ellwood, H. & Carter, A., 2011. UK SeaMap 2010. Predictive mapping of seabed habitats in UK waters. JNCC Report No. 446. Available online at http://jncc.defra.gov.uk/PDF/jncc446_web.pdf [Accessed 19/02/2021].

McLeese, D. W., Sprague, J. B., and Ray, S., 1987. Effects of cadmium on marine biota. p. 171-198. In: Nriagu, J.O. and J.B. Sprague (eds.). Cadmium in the Aquatic Environment. Advances in Environmental Science and Technology, Volume 19. John Wiley & Sons, New York. 272 pp.

MMO, 2017. Vessel Density Grid 2015. Available at: https://data.gov.uk/dataset/b7ae1346-7885-4e2d-aedf-c08a37d829ee/vessel-density-grid-2015 [Accessed 19/02/2021].

MMO, 2018. Fishing Activity for UK Vessels 15m and over 2016. Dataset available at https://data.gov.uk/dataset/4bd80f1a-4ead-44c5-b3fa-975da1cb4d7d/fishing-activity-for-uk-vessels-15m-and-over-2016 [Accessed 19/02/2021].

Muniz, P., Danulat, E., Yannicelli, B., Garcia-Alonso, J., and Bicego, M. C., 2004. Assessment of contamination by heavy metals and petroleum hydrocarbons in sediments of Montevideo harbour (Uruguay). Environmental International. 29: 1019-1028

NMPI, 2020. National Marine Plan Interactive. Available at: https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed 19/02/2021].

BEIS, 2018. Guidance Notes - Decommissioning of Offshore Oil and Gas Installations and Pipelines.

Oil and Gas UK, 2021. Energy Transition Outlook 2021. Available online at: https://oeuk.org.uk/wp-content/uploads/2021/10/Energy-Transition-Outlook-2021.pdf [Accessed 01/09/2022].

OSPAR, 1998. Ministerial Meeting of the OSPAR Commission Sintra, 22-23 July 1998 Programmes and Measures. p 15-23

OSPAR, 2008. Case Reports for the OSPAR List of threatened and/or declining species and habitats. OSPAR Commission. Available online at http://qsr2010.ospar.org/media/assessments/p00358_case_reports_species_and_habitats_2008.pdf [Accessed 19/02/2021].

OSPAR, 2009a. Background for ocean quahog *Arctica islandica*. OSPAR Publication No. 407/2009.

OSPAR 2009b. Background Document for Lophelia pertusa reefs. Biodiversity Series. ISBN 978-1-906840- 63-1, Publication Number: 423/2009.

Pangerc, T., Robinson, S., Theobald, P. and Galley, L., (2016). Underwater sound measurement data during diamond wire cutting: First description of radiated noise.

Reid, J., Evans, P. & Northridge, S., 2003. An atlas of cetacean distribution on the northwest European Continental Shelf, Joint Nature Conservation Committee: Peterborough.

Rouse, S., Hayes, P. and Wilding, T. (2018). Commercial fisheries losses arising from interactions with offshore pipelines and other oil and gas infrastructure and activities. ICES Journal of Marine Science, 77(3), pp.1148-1156.

SAHFOS, 2015. Sir Alister Hardy Foundation for Ocean Science. CPR Data: Standard Areas. Available at: https://www.cprsurvey.org/1409 [Accessed 19/02/2021].

SCOS, 2017. Scientific advice on matters related to the management of seal populations: 2017. Available at: http://www.smru.st-andrews.ac.uk/files/2018/01/SCOS-2017.pdf [Accessed 19/02/2021].

SCOS, 2014. Scientific advice on matters related to the management of seal populations 2013. Available online at http://www.smru.st-and.ac.uk/documents/1803.pdf [Accessed 19/02/2021].

Scottish Government, 2020. Scottish Sea Fisheries Statistics, 2017. Scottish Government. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/RectangleData [Accessed 19/02/2021].

Shell U.K. Limited, 2017. Brent Topsides Decommissioning Technical Document. Document Reference: BDE-F-TOP-HE-0709-00001. February 2017.

SINTEF Fisheries and Aquaculture, 2001. UKOOA Phase II- Task 3. Large scale erosion studies.

SMRU, 2011. Utilisation of space by grey and harbour seals in the Pentland Firth and Orkney waters, Scottish Natural Heritage Commissioned Report No. 441.

SNH, 2013a. Scottish Biodiversity List. Scottish Natural Heritage. Available at: https://www2.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL [Accessed 19/02/2021].

SNH, 2018. Environmental Impact Assessment Handbook. Guidance for competent authorities, consultation bodies and others involved in the Environmental Impact Assessment process in Scotland. Online at https://www.nature.scot/sites/default/files/2018-05/Publication%202018%20-%20Environmental%20Impact%20Assessment%20Handbook%20V5.pdf [Accessed 30/08/2022].

SNH, 2014. Priority Marine Features in Scotland's seas, available online at http://www.snh.gov.uk/docs/A1327320.pdf [Accessed 19/02/2021]

TAQA, 2018a. EIA, NC & TA Sub-Structures. Substructure Potential Deferral Assessment. Document Reference: 77-AEIA0288-S-RE-0003-000

TAQA, 2018b. Eider Asset Reuse Study. Document Reference: 77-AEIA0288-X-SU-0001-000.

TAQA, 2018c. Eider Sub-structure Removal Options Structural Assessment. Document Reference: 77 -AEIA0288-S-RE-0001-000

TAQA, 2018d. Eider Materials Inventory Approach Paper. Document Reference: 77-AEIA0288-X-RE-0002-000. 14 November 2018.

TAQA, 2018f. Oil Pollution Emergency Plan (OPEP) Eider Field System (including the Eider Field). TAQA Document Reference TUK-14-C-006. May 2018.

TAQA, 2022. Steel Pile Jackets – Technical Assessment Document. Document Reference: 77-153436-H99-0007-000.

Thaxter, C.B., Lascelles, B., Sugar, K., Cook, A.S., Roos, S., Bolton, M., Langston, R.H. and Burton, N.H., 2012. Seabird foraging ranges as a preliminary tool for identifying candidate Marine Protected Areas. Biological Conservation, 156, pp.53-61.

Tyler-Walters, H., James, B., Carruthers, M. (eds.), Wilding, C., Durkin, O., Lacey, C., Philpott, E., Adams, L., Chaniotis, P.D., Wilkes, P.T.V., Seeley, R., Neilly, M., Dargie, J. & Crawford-Avis, O.T., 2016. Descriptions of Scottish Priority Marine Features (PMFs). Scottish Natural Heritage Commissioned Report No. 406. Available online at http://www.snh.org.uk/pdfs/publications/commissioned_reports/406.pdf [Accessed 19/02/2021].

Tyler-Walters, H., Lear, D. and Allen J.H. (2004). Identifying offshore biotope complexes and their sensitivities. Report to Centre for Environmental, Fisheries, and Aquaculture Sciences from the Marine Life Information Network (MarLIN). Plymouth: Marine Biological Association of the UK. [Sub contract reference A1148]. Online at https://1library.net/document/zpv7mooz-identifying-offshore-biotope-complexes-and-their-sensitivities.html [Accessed 19/02/2021].

Webb, A., Elgie, M., Irwin, C., Pollock, C. & Barton, C., 2016. Sensitivity of offshore seabird concentrations to oil pollution around the United Kingdom: Report to Oil & Gas UK. Document No HP00061701. Available online at http://jncc.defra.gov.uk/page-7373 [Accessed 19/02/2021].

Wentworth, C. K. (1922). A scale of grade and class terms for clastic sediments. The journal of geology, *30*(5), 377-392.

Wolf, J. Yates, N., Brereton, A., Buckland, H., De Dominicis, M., Gallego, A. & O'Hara Murray, R., 2016. The Scottish Shelf Model. Part 1: Shelf-Wide Domain. Scottish Marine and Freshwater Science Vol 7 No 3, 151pp. Available online at http://data.marine.gov.scot/sites/default/files//SMFS%20Vol%207%20No%203.pdf. [Accessed 19/02/2021]

WoRMS, 2022. World Register of Marine Species – *Lophelia pertusa* page. Available online at https://marinespecies.org/aphia.php?p=taxdetails&id=135161 [Accessed 22/03/2022]

Xodus, 2018. Survey Gap Analysis for TAQA Northern North Sea Assets. Document number A-302034-S00-TECH-001.

APPENDIX A - TAQA HSSE POLICY

TAQA Europe Health, Safety, Security and Environment Policy

The health, safety and security of our employees, contractors and the public is our highest priority; it is more important than any operational priority.

We must also:

- Ensure that our assets are operated safely
- Assure the integrity of our assets
- Respect, protect and understand the natural environment

HSSE = Health, Personal Safety, Major Accident Prevention, Security and Environment

We strongly believe that excellent business performance requires excellent HSSE performance – we recognise this as a core value.

Employees and contractors are required to focus on the four areas below:

Leadership

- Everyone within TAQA understands their accountabilities for the management of HSSE
- The structure and resources necessary to achieve and measure HSSE accountabilities are provided
- Requirements of applicable legislation and standards are identified, understood and complied with
- Personnel have the required competencies and are fit for work
- Our workforce is aligned, involved and empowered in the identification and management of HSSE hazards and the achievement of our HSSE goals
- Key stakeholder groups are identified and a good working relationship is maintained with them (understanding and addressing their issues and concerns)
- Everyone within TAQA demonstrates commitment and accountability to implement this policy and to work in accordance with the TAQA Management System Elements and Expectations

Operational Risk Identification and Assessment

- Risks are identified, assessed and appropriately managed
- Information required to support safe operation is identified, accurate, available and up to date

Operational Risk Management

- The standards, procedures and operating manuals required to support project, maintenance and operational activities are identified, developed, understood and consistently applied
- Process and operational status monitoring and handover requirements are defined, understood and carried out
- Operational interfaces with third parties are identified, assessed and appropriately managed

Document No: TUK-01-A-001 Issue Date: September 2022

TAQA Europe Health, Safety, Security and Environment Policy

- Risks arising from any form of change are systematically identified, assessed and managed
- A systematic process is in place to verify the safe condition of plant and equipment and to ensure that personnel are appropriately prepared (before start-up or return to normal operations)
- We are appropriately prepared for all necessary actions which may be required for the protection of the public, personnel (including contractors), the environment, plant equipment and reputation in the event of an incident
- We aim to prevent pollution and protect the environment from the impact of our operations

Review and Improvement

- We routinely monitor our activities through internal/external audits and produce key performance indicators – we review these indicators and intervene as necessary
- Compliance with our expectations is routinely reviewed and audited to determine whether this policy remains appropriate and is being implemented effectively
- The management system is routinely reviewed for continual improvement and to enhance HSSE performance
- All incidents, near misses and opportunities for improvement are consistently reported and investigated, and that identified actions and learnings are implemented on a timely basis

We all have a personal responsibility to work safely and protect the environment. We are all safety leaders, irrespective of our role or location. Everyone is empowered to challenge and stop work if they are in any doubt regarding a job they are involved in or observing.

Donald Taylor, Managing Director

John Mulvany, Interim HSSEQ Director

René Zwanepol, NL Country Manager

Sandy Hutchison, Legal, Commercial and Business Services Director

Calum Riddell, Operations Director

Jeremy Kibble, Interim Finance Director

Corrine Kelt, Human Resources Director

Gary Tootill, Technical Director

David Wilson, Decommissioning Director

Document No: TUK-01-A-001 Issue Date: September 2022

APPENDIX B - SEABED PHYSICAL AND CHEMICAL COMPOSITION

Table B-1 Summary of surface particle characteristics from the wider area (Benthic Solutions, 2019)

Station	Direction from platform	Depth (m)	Distance from Platform (m)	Mean Sediment Size (mm)	Fines (%)	Sands (%)	Gravel (%)
EID_EBS_01	NW	167	500	0.19	15.2	84.4	0.4
EID_EBS_02	NW	173	250	0.24	9.2	88.6	2.2
EID_EBS_03	NW	159	100	0.21	12.2	85.4	2.4
EID_EBS_04	NW	159	50	0.06	44.3	51.4	4.3
EID_EBS_05	SW	159	50	0.23	22.8	61.2	16.0
EID_EBS_06	SW	158	100	0.16	20.7	72.9	6.4
EID_EBS_07	SW	162	250	0.21	12.2	85.6	2.3
EID_EBS_08	SW	161	500	0.17	16.7	81.7	1.6
EID_EBS_09	SE	156	500	0.20	12.1	87.4	0.5
EID_EBS_10	NW	169	295	0.30	8.9	87.5	3.6
Mean				**0.20**	**17.4**	**78.6**	**4.0**
Standard Deviation				**0.06**	**10.5**	**12.8**	**4.6**

Table B-3 Summary of Total Hydrocarbons Content (THC), Total Organic Carbon (TOC) and Total Organic Matter (TOM) from the wider area (Benthic Solutions, 2019)

Station	Direction from platform	Depth (m)	Distance from Platform (m)	THC (mg.kg^{-1})	TOC (%M/M)	TOM (%)
EID_EBS_01	NW	167	500	13.4	0.38	1.8
EID_EBS_02	NW	173	250	9.79	0.35	1.9
EID_EBS_03	NW	159	100	242	0.35	2.4
EID_EBS_04	NW	159	50	356	1.11	5.7
EID_EBS_05	SW	159	50	693	0.80	5.0
EID_EBS_06	SW	158	100	126	0.42	2.7
EID_EBS_07	SW	162	250	45.4	0.39	1.9
EID_EBS_08	SW	161	500	27.1	0.42	2.0
EID_EBS_09	SE	156	500	24.5	0.36	1.8
EID_EBS_10	NW	169	295	17.1	0.25	1.5
Mean				**115.4**	**0.48**	**2.7**
Standard Deviation				**221.1**	**0.26**	**1.5**
Reference value:						
UKOOA 95th Percentile (UKOOA, 2001)				**20.32**		**2.04**

Table B-3 Total heavy and trace metal concentrations (µg/g^{-1} or ppm) from the wider area (Benthic Solutions, 2019)

Station	Depth (m)	Distance from Platform (m)	Arsenic (HF-MS)	Cadmium (HF-MS)	Chromium (HF-MS)	Copper (HF-MS)	Lead (HF-MS)	Mercury (Tot.MS)	Nickel (HF-MS)	Vanadium (HF-MS)	Zinc (HF-MS)	Aluminium (Sediments HF-OES)	Iron (HF-OES)	Barium (Sediments HF-OES)	Barium (By Fusion)	Strontium (Sediments	Lithium (HF-OES)
EID_EBS_01	167	500	1.3	0.06	7.1	7.5	6.3	0.02	5.1	7.6	14.9	2,370	4,340	987	848	545	6.3
EID_EBS_02	173	250	1.8	0.08	6.6	8.8	12.2	0.02	4.5	7.7	30.7	2,130	4,590	2,250	4,470	644	6.0
EID_EBS_03	159	100	4.7	0.51	10.9	23.9	46.2	0.07	7.0	15.5	111.	3,870	10,000	1,320	15,700	640	9.1
EID_EBS_04	159	50	9.6	0.96	33.0	55.4	163	0.89	25.6	40.1	1,161	15,000	25,900	153	46,200	354	44.5
EID_EBS_05	159	50	18.1	1.71	23.4	43.9	250	0.45	18.2	35.9	723	12,700	24,700	156	32,700	470	30.4
EID_EBS_06	158	100	7.4	0.43	19.0	22.2	75.0	0.16	11.1	19.2	265	4,510	14,000	960	24,500	556	10.7
EID_EBS_07	162	250	2.7	0.17	8.0	6.2	20.2	0.05	5.4	9.0	48.1	2,150	4,730	2,460	5,710	659	5.9
EID_EBS_08	161	500	1.4	0.09	8.2	4.8	7.50	0.06	5.6	8.5	20.1	2,460	4,470	816	1,130	651	6.4
EID_EBS_09	156	500	1.7	0.08	9.7	5.8	12.5	0.04	6.2	9.9	27.3	2,810	5,600	2,430	3,090	508	6.9
EID_EBS_10	169	295	2.1	0.10	7.9	10.7	11.3	0.02	4.2	8.5	29.4	2,070	5,140	440	721	667	5.6
Mean			**5.1**	**0.42**	**13.4**	**18.9**	**60.4**	**0.18**	**9.3**	**16.2**	**243.1**	**5,007**	**10,347**	**1,197**	**13,507**	**569.**	**13.2**
Standard Deviation			**5.4**	**0.54**	**8.9**	**17.71**	**82.5**	**0.28**	**7.1**	**12.1**	**389.9**	**4,760**	**8,474**	**896**	**15,954**	**103**	**13.3**
Reference Values																	
UKOAA 95th Percentile (UKOOA, 2001; µg/g^{-1})			**-**	**0.81**	**11.48**	**4**	**11.03**	**0.10**	**7**	**19.66**	**17.10**	**-**	**8039.80**	**577.25**	**-**	**-**	
Cefas (2001) mean levels of metals within 500 m of North Sea oil and gas platforms (µg/g^{-1})			**-**	**0.85**	**34.68**	**17.45**	**57.52**	**0.36**	**17.79**	**32.61**	**129.74**	**-**	**14,096.14**	**-**	**33,562.12**	**-**	**-**

Source: Benthic Solutions (2019). Light orange cell = above ERL/TEL or TRV (whichever is lowest). Dark orange cell = above ERM/PEL (whichever is lowest

Intentionally Blank Page

APPENDIX C - ENERGY USE AND ATMOSPHERIC EMISSIONS

Energy use and atmospheric emissions by project activity for decommissioning of Upper Jacket

Planned activity	Operations energy (GJ)	Operations CO_2 (Te)
Onshore transportation of materials	14	1
Onshore deconstruction	16,105	N/A
Onshore recycling of materials	110,565	11,794
Offshore transport	141,560	10,510
Total	**268,244**	**22,305**

Offshore transport energy use and atmospheric emissions for decommissioning of Upper Jacket

Vessel type	Total Duration (days)				Operations energy (GJ)	Operations CO_2 (Te)
	Mob/ Demob	Transit	Working	Wait on Weather		
HLV	1.5	7.33	14.8	0	141,560	10,510
CSV	2.0	2.0	18.9	0		
Supply vessel	4.0	7.0	14.7	0		
Survey vessel	6.0	6.0	1.5	2.025		