CORMORANT ALPHA DECOMMISSIONING

Cormorant Alpha Topsides Decommissioning Environmental Appraisal

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ABBREVIATIONS

Abbreviation	Meaning
AIS	Automatic Identification System
ALARP	As low as reasonably practicable
AtoN	Aid to Navigation
AWMP	Active Waste Management Plan
BAC	Background Assessment Concentration
BAP	Biodiversity Action Plan
BEIS	Department for Business, Energy and Industrial Strategy
CGBS	Concrete Gravity Base Structure
CNS	Central North Sea
CO_2	Carbon Dioxide
CoP	Cessation of Production
DECC	Department for Energy and Climate Change
DP	Decommissioning Programme
DR MPA	Demonstration and Research Marine Protected Areas
EA	Environmental Appraisal
EIA	Environmental Impact Assessment
EC	European Commission
EMS	Environmental Management System
EPS	European Protected Species
ES	Environmental Statement
EU	European Union
EUNIS	European Nature Information System
EWC	European Waste Catalogue Codes
g	grams
GJ	Gigajoules
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security and Environment
ICES	International Council for the Exploration of the Sea
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment

ITOPF	International Tanker Owner's Pollution Federation
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
kg	kilogram
km	kilometres
km^3	Cubic kilometres
l	litre
LAT	Lowest Astronomical Tide
LQ	Living Quarters
m	metre
m^2	Squared metres
MAH	Major Accident Hazard
MarLin	Marine Life Information Network
MCZ	Marine Conservation Zone
MEI	Major Environmental Incident
MEWM	Marine Environmental Modelling Workbench
mg	milligrams
MMO	Marine Management Organisation
MSFD	Marine Strategy Framework Directive
NC MPA	Nature Conservation Marine Protected Area
NMPI	National Marine Plan Interactive
NNS	Northern North Sea
NORM	Naturally Occurring Radioactive Material
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSCAR	Oil Spill Contingency and Response
OSPAR	The Oslo Paris Convention
P&A	Plug and abandonment
PAH	Polycyclic Aromatic Hydrocarbons
PETS	Portal Environmental Tracking System
PLEM	Pipeline End Manifold
PMF	Priority Marine Feature

ppb	Parts per billion
PSV	Platform Supply Vessel
SAC	Special Area of Conservation
SCOS	Special Committee on Seals
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
SVT	Sullom Voe Terminal
TAQA	TAQA Bratani Limited
te	Tonne
THC	Total Hydrocarbon
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UKOOA	United Kingdom Offshore Operators
UMC	Underwater Manifold Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VMS	Vessel Monitoring System
WFD	Water Framework Directive

Tables

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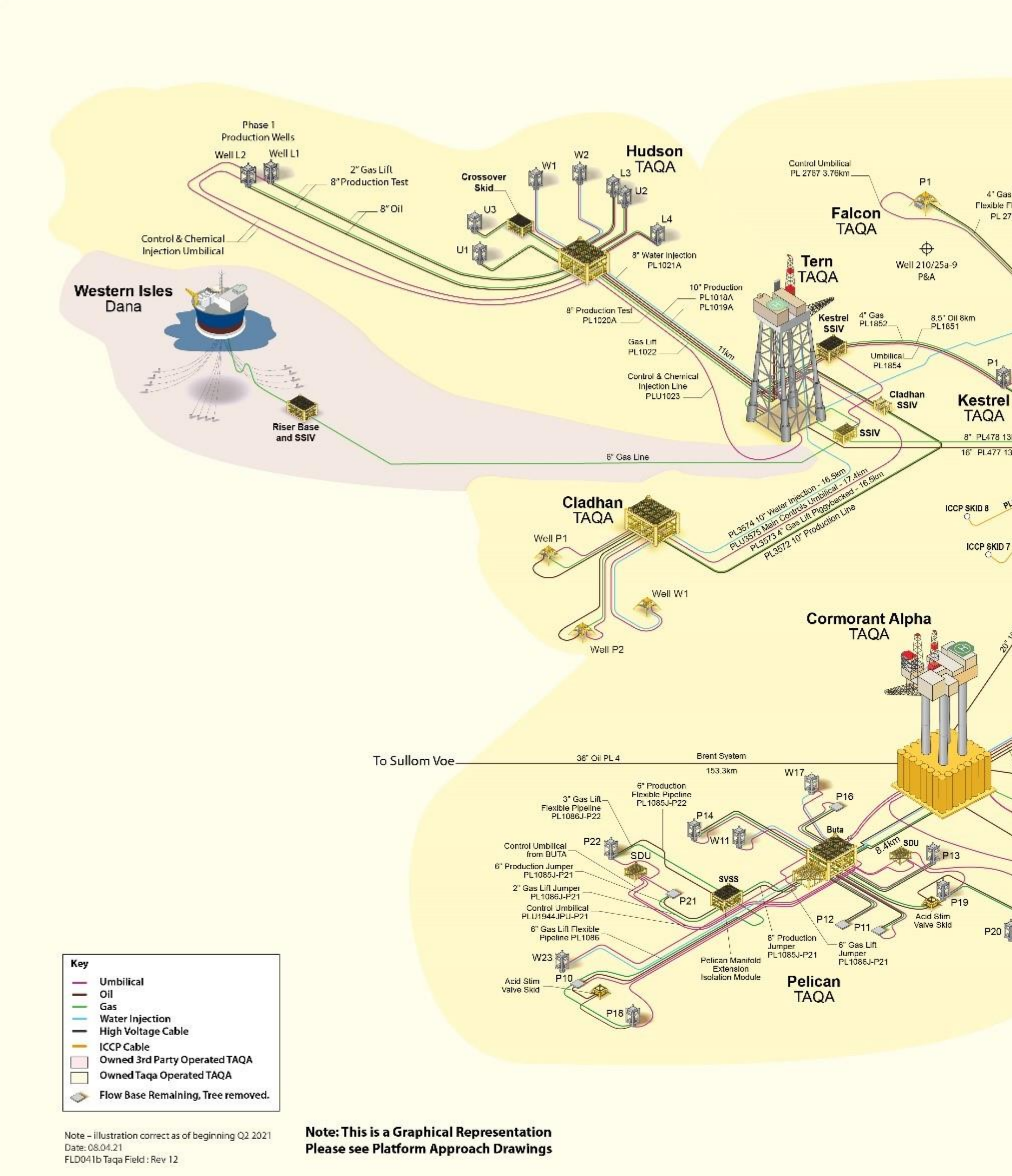
Phase 1
Production Wells
Well L2
Well L1
2" Gas Lift
8" Production Test
8" Oil
Control & Chemical
Injection Umbilical
Crossover
Skid
W1
W2
Hudson
TAQA
L3
U2
U3
L4
U1
8" Water Injection
PL1021A
10" Production
PL1018A
PL1019A
8" Production Test
PL1020A
Gas Lift
PL1022
11km
Control & Chemical
Injection Line
PLU1023
Western Isles
Dana
Riser Base
and SSIV
6" Gas Line
Control Umbilical
PL 2757 3.76km
P1
Falcon
TAQA
Well 210/25a-9
P&A
Tern
TAQA
Kestrel
SSIV
4" Gas
PL1852
8.5" Oil 8km
PL1851
Umbilical
PL1854
P1
Cladhan
SSIV
Kestrel
TAQA
SSIV
Cladhan
TAQA
Well P1
PL3574 10" Water Injection - 16.5km
PLU3575 Main Controls Umbilical - 17.4km
PL3573 4" Gas Lift Piggybacked - 16.5km
PL3572 10" Production Line
ICCP SKID 8
ICCP SKID 7
Well W1
Well P2
Cormorant Alpha
TAQA
To Sullom Voe
36" Oil PL 4
Brent System
153.3km
W17
6" Production
Flexible Pipeline
PL1085J-P22
3" Gas Lift
Flexible Pipeline
PL1086J-P22
P16
P14
W11
Buta
8.4km
SDU
P13
P22
Control Umbilical
from BUTA
SDU
6" Production Jumper
PL1085J-P21
2" Gas Lift Jumper
PL1086J-P21
SVSS
P21
Control Umbilical
PLU1944JPU-P21
6" Gas Lift Flexible
Pipeline PL1086
P12
P11
P19
Acid Stim
Valve Skid
P20
W23
P10
8" Production
Jumper
PL1085J-P21
6" Gas Lift
Jumper
PL1086J-P21
Pelican Manifold
Extension
Isolation Module
Acid Stim
Valve Skid
Pelican
TAQA
P18
Key
Umbilical
Oil
Gas
Water Injection
High Voltage Cable
ICCP Cable
Owned 3rd Party Operated TAQA
Owned Taqa Operated TAQA
Flow Base Remaining, Tree removed.
Note – illustration correct as of beginning Q2 2021
Date: 08.04.21
FLD041b Taqa Field : Rev 12
Note: This is a Graphical Representation
Please see Platform Approach Drawings

Figure 1-2

Figure 2-1

Figure 2-2

Figure 2-3

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Figure 2-8

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APPENDICES

EXECUTIVE SUMMARY

Introduction and Background

This section provides a non-technical summary of findings from the Environmental Appraisal (EA) conducted by TAQA Bratani Limited (TAQA), for the proposed decommissioning of the Cormorant Alpha platform topsides. This EA also covers the decommissioning of product separation facilities that are part of the Cormorant Alpha concrete gravity base structure (CGBS). The Cormorant Alpha platform is located in Block 211/26 of the Northern North Sea (NNS), approximately 103 km north east of Shetland and 41 km west of the UK/Norway median line (Figure 1).

The Cormorant Alpha platform consists of a four leg CGBS with a steel box girder structure supporting two levels of modules on the topsides and sits in a water depth of approximately 150 m. The Living Quarters (LQ) can accommodate 175 persons. The installed total weight of topsides is currently estimated to be approximately 25,546 te.

The platform was installed in May 1978 and began production in December 1979. TAQA acquired the asset from Shell in 2008. Current production from the Cormorant Alpha field is from 24 platform wells and five water injection wells. It was designed to fulfil four functions; a production facility, drilling facility, an oil pumping station for the Brent Pipeline System and a centre for telecommunications in the area. The CGBS includes four groups of storage cells and pipework of a rundown line system in one of the four legs, which connect the storage cell groups with the production and export facilities on the topsides.

Live crude is imported from the North Cormorant, Brent Charlie, and North Alwyn platforms. Crude entering the platform normally flows across the platform and is exported directly to the Sullom Voe terminal together with the Cormorant Alpha production.

A schematic figure illustrating Cormorant Alpha in the context of other installations in the vicinity, together with connecting infrastructure including pipelines, umbilicals and power cables, is shown in Figure 2.

Decommissioning Overview

As part of the planning for decommissioning and to obtain regulatory approval for the activities, three Decommissioning Programmes (DPs) will be prepared, each supported by an EA:

1. Topsides decommissioning covered by this EA; and
2. Substructure decommissioning, including the Cormorant Alpha CGBS, associated pipelines, power cables and umbilicals and cell top recovery of residual attic oil, to be prepared at a time yet to be confirmed and to be covered by a separate DP and supporting EA.
3. Subsea decommissioning, including pipelines, power cables and umbilicals. The associated Pelican and Central Cormorant Underwater Manifold Centre (UMC) and PL4 Brent System PL subsea developments (Figure 2) will both be subject to their own separate DP(s) and supporting EA(s).

Well P&A activities and flushing and cleaning operations that will be undertaken on the topsides will be carried out as part of the preparatory work preceding decommissioning, under platform and field operational permits.

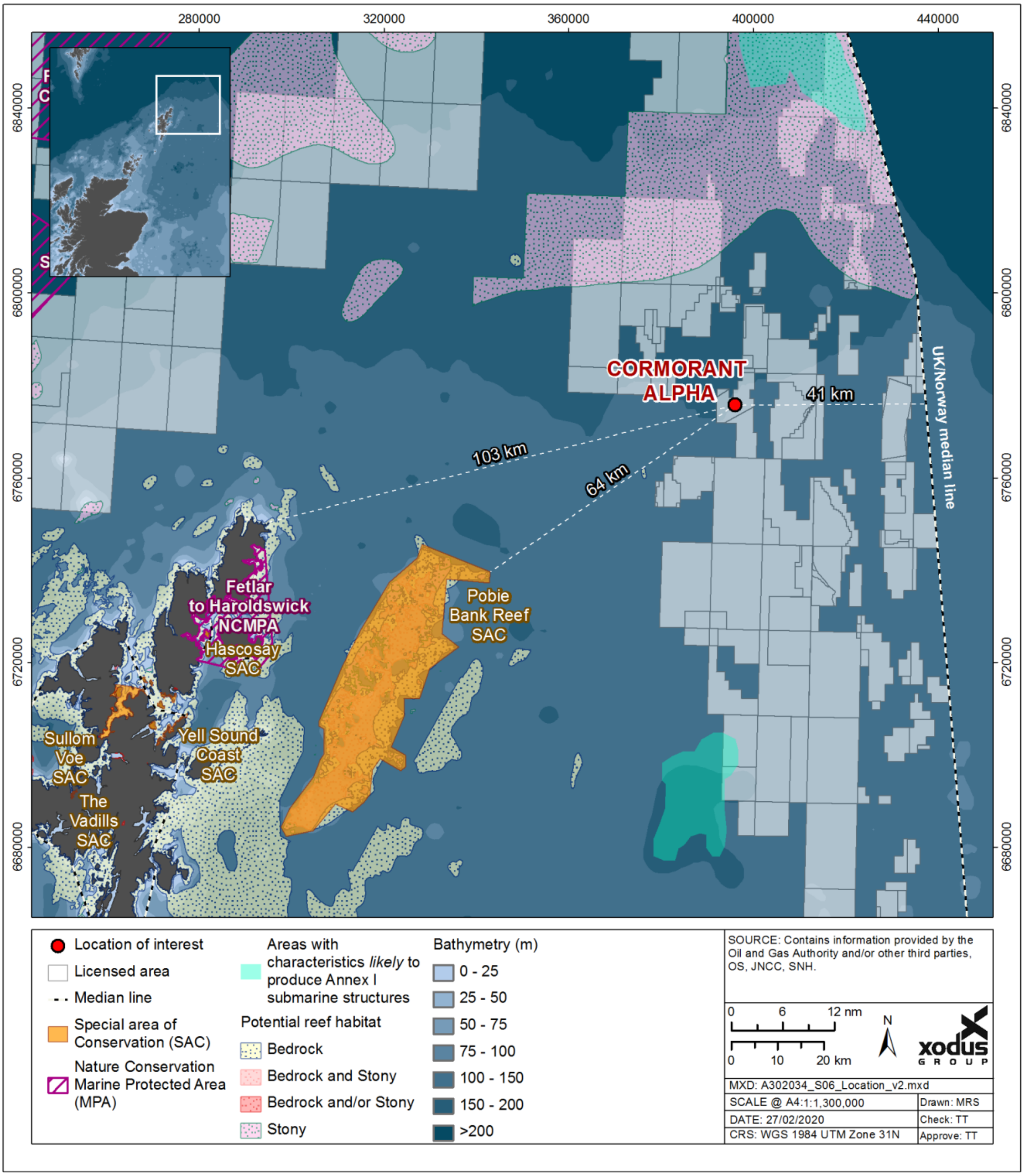

Figure 1 Location of the Cormorant Alpha Platform

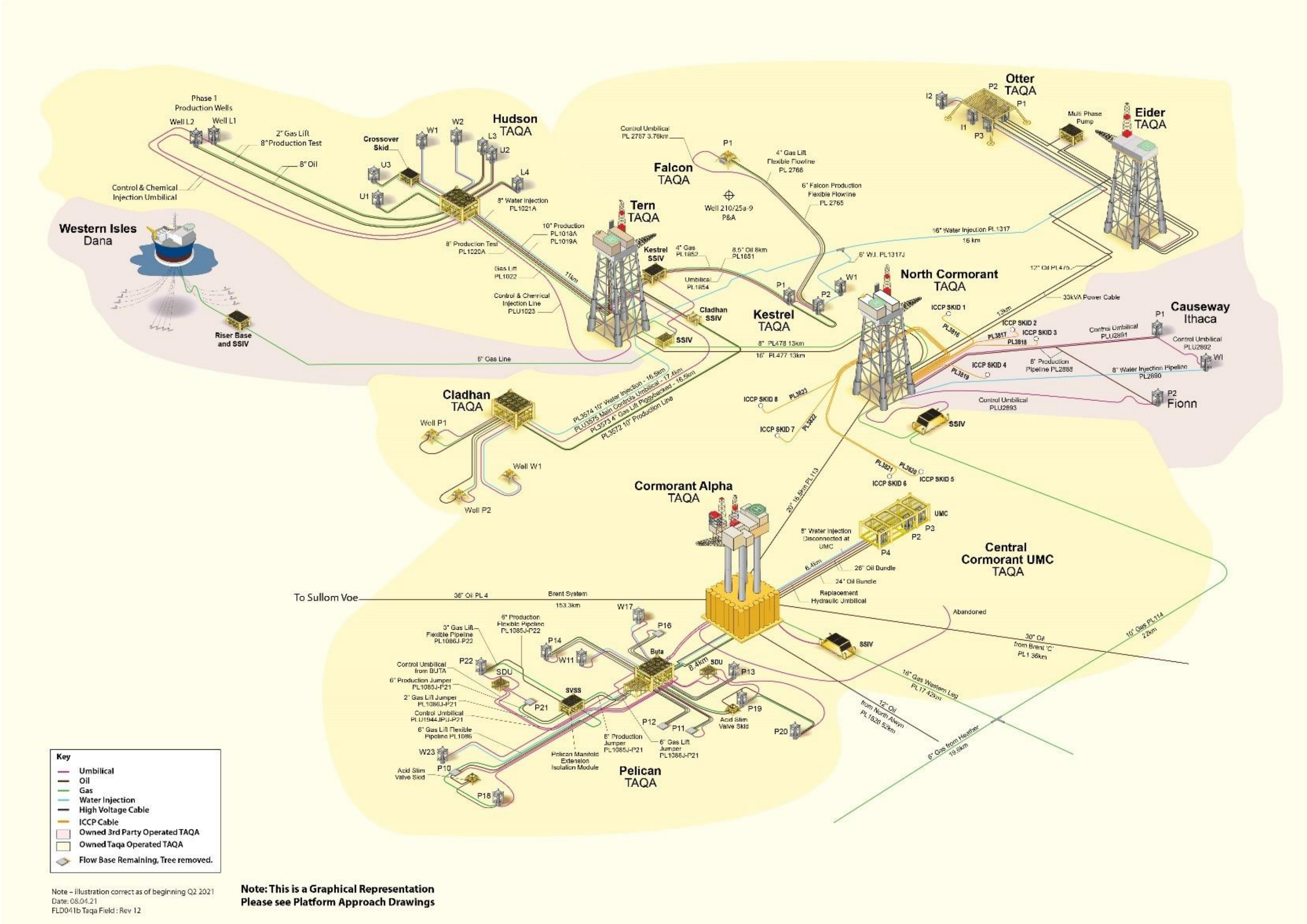

Figure 2 Location of the Cormorant Alpha Platform in Relation to Other Installations

Options for Decommissioning

Topsides

A study conducted to assess options for reuse of the Cormorant Alpha platform (TAQA, 2020b) concluded that there are no credible reuse options for the topsides. This is principally due to the limited remaining life of the topsides structure due to fatigue and obsolescence issues and economic factors associated with converting the installation for any intended reuse purpose. Components from the topsides may be re-used if a suitable use can be found.

In line with the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) guidelines on decommissioning, it is therefore proposed to fully remove the Cormorant Alpha topsides and transport it to a suitable onshore yard facility for dismantling and recycling.

Two possible methods of topsides removal are under consideration; single lift and modular removal. At this stage, the specific method by which the removal activity will take place has not been determined. Both are potentially suitable. These decisions will depend to some degree on the proposals made by the eventual contractor. The approaches are summarised in Table 1, and all will involve the following steps for the preparation for removal:

- Removal of under deck objects and cutting of risers, J-tubes and caissons;
- Cutting for topsides separation using diamond wire cutting tools;
- Cellar deck strengthening;
- Equipment and loose items sea fastening/removal;
- Installation of clamps and/or beams to provide lifting points; and
- Installation of an above-water guiding system mounted on the CGBS.

Table 1 Decommissioning Activities for Cormorant Alpha Topsides Removal

Item	Method
1	**Single Lift Method:** Lift and removal to shore as a single unit, using a Single Lift Vessel (SLV).
2	**Modular Removal Method:** Removal of the topsides in modular sections, using a Heavy Lift Vessel (HLV).

CGBS internal structure

Active use of the CGBS cells ceased in 2017. Due to the large capacity of the export pumps it was not feasible to export all remaining hydrocarbons from the storage cells as once the majority of oil had been exported the pumps would “cone” water up through the remaining thin layer of hydrocarbons. These hydrocarbons are known as “hydrodynamically trapped oil”. A subsequent project was tasked to undertake a trial to remove this hydrodynamically trapped oil from three of the four cells groups. This second project concluded in April 2020 having exported over 4,000 barrels (approximately 655 m^3) of oil. It is estimated that a maximum of 10,856 m^3 of oil remains in the cells following this most recent recovery. This figure estimates the remaining export quality crude and does not include any emulsions.

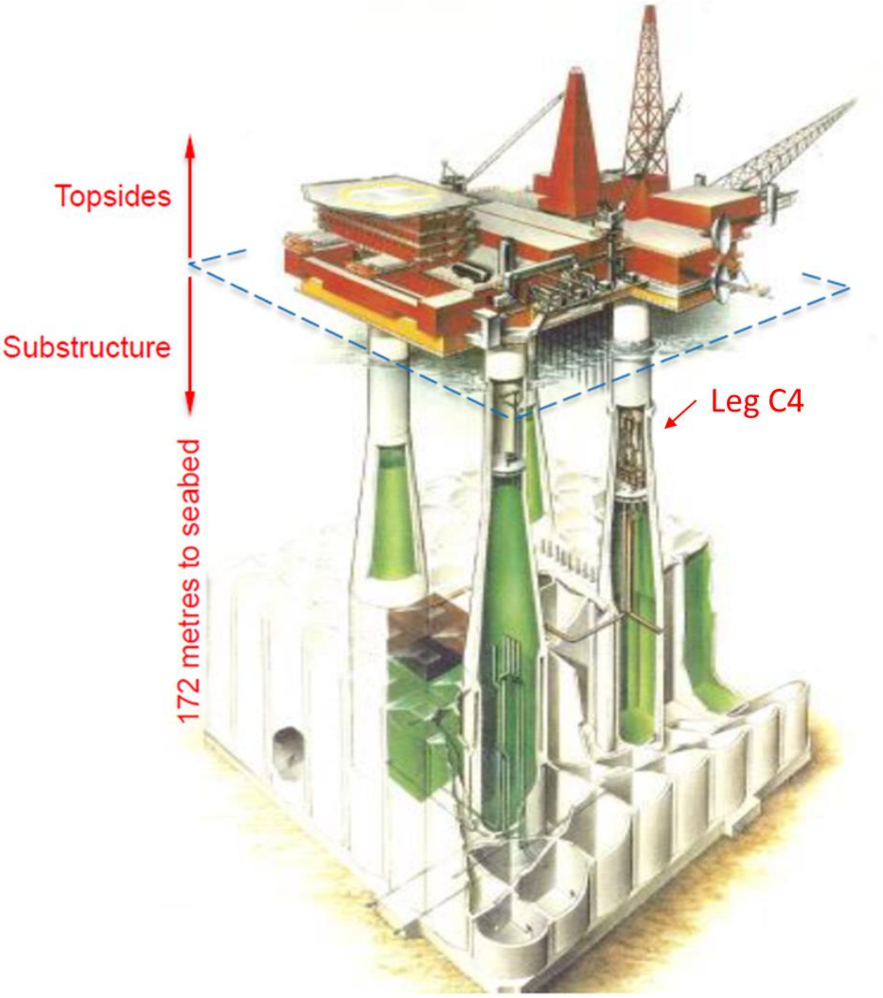

Figure 3 Cormorant Alpha Platform showing Topsides and CGBS

The rundown line and vent line pipework within Leg C4 (Figure 3) connects the topsides facilities to the (disused) storage cells. These lines will be isolated within the platform substructure to facilitate safe execution of topside removal and are therefore also within the scope of this EA.

It is planned to remove the residual hydrocarbon inventory after topside removal. This scope will be executed utilising cell top drilling, similar to the technology deployed within the Brent Field. A feasibility study into utilising this technology was completed in late 2020. This study concluded that, subject to some modifications to existing tooling, it would be feasible to deploy the technology at Cormorant Alpha to access the cells. Management of residual hydrocarbons within the storage cells will be covered under the Cormorant Alpha Substructure DP.

Navigational Aids

During removal operations, navigational aid requirements will be fulfilled by the decommissioning contractor. TAQA proposes to pre-install a supporting cap at the top of one of the concrete legs to support an Aid to Navigation (AtoN) unit. Once removal of the topside has been completed, the HLV will install the AtoN on top of the supporting platform using the vessel crane. TAQA proposes to undertake monitoring and maintenance of the AtoN through a service contract with a specialist contractor, including real time status and analysis.

Proposed Schedule

The date of the isolation of the lines remains to be confirmed but the vent lines isolation is also most likely to occur in 2021 and rundown line isolation in 2022. Topsides preparation work will be undertaken between 2023 and 2026 and topsides removal between 2026 and 2028.

Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in the area are summarised in Table 2.

Table 2 Key Environmental and Social Sensitivities around the Cormorant Alpha Platform

Sediment type and seabed features
The Cormorant Alpha platform is located at a water depth of 150 m. The annual mean wave height within the field ranges from 2.71 m – 3.00 m and the annual mean wave power is 39.35 kW/m (NMPI, 2019). Sediments in the area show little variation and were dominated by sands. A small cuttings pile was detected around the south-east CGBS which had a high proportion of sedimentary fines with some evidence of coarser sediments related to the presence of relic *Mytilus edulis* shells (Benthic Solutions Ltd, 2019). Four sediment types were detected within the survey area. The Cormorant Alpha Platform was classified as 'Circalittoral Muddy Sand' (A5.26). The small cuttings pile was classified as 'Organically Enriched Gravelly mud' (Benthic Solutions Ltd, 2019). The total hydrocarbon content (THC) close to the Cormorant Alpha platform, and within the 500 m safety zones, exceeded the background concentrations for the NNS and this was attributed to long-term historical input from oil exploration rather than a defined duration event. This is consistent with the high Total Organic Matter (TOM) observed within the cuttings pile and the high concentrations of barium (Ba) close to the Cormorant Alpha Platform (Furgro, 2014; Benthic Solutions Ltd, 2019).
Seabed habitats and species
The macrofauna varied considerably between the sediments sampled close to the platform and the sediments sampled further afield. There were several taxa associated with post-drilling contaminants and/ or organic enrichment gradients present including *Nematoda*, *Capitella*, *Nereimyra punctata*, *Cirratulus cirratus*, *Ophryotrocha*, *Nereis zonata* and *Thyasira sarsii*. The presence of these pollution-tolerant species was highest close to the Cormorant Alpha Platform (Benthic Solutions Ltd, 2019). There was also a high abundance of Mytilus edulis shells at some sampling stations, providing a hard substrate for colonisation by sessile epifaunal species (Benthic Solutions Ltd, 2019). Only two ocean quahog (bivalve) (one adult and one juvenile) were observed in a recent survey. Although sea-pen species were observed, their presence was not considered to represent the habitat 'Seapen and burrowing megafauna communities'. No other species/habitat of conservation concern were found to be present in the offshore decommissioning Project area.
Fish and shellfish
The Cormorant Alpha platform sits within known spawning grounds for cod, haddock, Norway pout, saithe and whiting. Norway pout have high concentration spawning grounds in the vicinity of the Cormorant Alpha platform. The area is also a potential nursery ground for haddock, Norway pout, whiting, blue whiting, hake, herring, ling, mackerel and spurdog. The area is known to be a high intensity nursery ground for blue whiting. Published sensitivity maps indicate that the probability of aggregations of juvenile blue whiting and hake are medium. All other species are low.
Seabirds
Offshore in the NNS, the most numerous species present are likely to be northern fulmar, black-legged kittiwake and common guillemot. The Cormorant Alpha decommissioning area is located within or close to hotspots for northern fulmar, European storm-petrel, northern gannet, Arctic skua, long-tailed skua, great

skua, black-legged kittiwake, great black-backed gull, common guillemot, and Atlantic puffin during their breeding season. 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 and Atlantic puffin) 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 Cormorant Alpha platform is considered low from January to August and medium from September to December.
Marine mammals
Harbour porpoise, white-beaked dolphin, white-sided dolphin and minke whale have been recorded in the vicinity of the Cormorant Alpha platform. Harbour porpoise are the most abundant and frequently recorded species recorded in the survey block covering the Cormorant Alpha platform, which is reflective of these being the most abundant and widely distributed cetaceans in the North Sea. Around the Cormorant Alpha platform, both grey and harbour seal densities are predicted to be between 0 and 1 seals per 25 km^2, which is considered to be low.
Conservation
There are no Nature Conservation Marine Protected Areas (NCMPAs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Demonstration and Research Marine Protected Areas (MPAs) within 40 km of the Cormorant Alpha platform. The closest designated site is the Pobie Bank Reef SAC (64 km), located to the south west of the Cormorant Alpha platform.
Fisheries and shipping
The Cormorant Alpha platform is located in International Council for the Exploration of the Sea (ICES) Rectangle 51F1. This region is primarily targeted for demersal species, with some minor shellfish and pelagic fishing occurring therein. Annual fishery landings by live weight and value in 2018 are considered low for shellfish and pelagic fisheries and moderate for demersal fisheries in comparison to other areas of the North Sea. According to the Scottish Government (2019) fisheries statistics, fishing effort has remained low within this region for the last five fishing years and is dominated by demersal trawl fishing gears. Fishing effort generally peaks in the spring/summer months within ICES Rectangle 51F1. Shipping density in the NNS in the vicinity of the proposed decommissioning activities is moderate. Between 100 - 300 vessels transit through Block 211/21 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. There are no other cables or pipelines in the vicinity, no designated military practice and exercise areas, no offshore renewable or wind farm activity.

Impact Assessment Process

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

An impact assessment screening workshop discussed the proposed decommissioning activities and any potential impacts these may pose. This discussion identified twelve potential impact areas based on the two proposed removal methods (i.e. single lift or modular removal). The twelve potential impacts are tabulated in Table 3, together with justification statements for the screening decisions.

Table 3 Environmental Impact Screening Summary for Cormorant Alpha Topsides Decommissioning

Impact	Further Assessment	Management
Emissions to Air	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of the cessation of production (CoP). As such, emissions from operations and vessels associated with operation of the Cormorant Alpha topsides will cease. Reviewing historical European Union (EU) Emissions Trading Scheme data and comparison with the likely emissions from the proposed operations suggests that emissions relating to decommissioning will be small relative to those during production. The majority of emissions for the Cormorant Alpha topsides decommissioning can be attributed to 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 latest available total annual CO_2 emissions estimate from oil and gas exploration and production is 13,200,000 tonnes (for 2018, Oil and Gas UK, 2019) and the latest (confirmed) total annual CO_2 emissions estimate for UK shipping is approximately 7,800,000 tonnes (for 2017, BEIS, 2019), giving a total of 21,000,000 tonnes of CO_2. The annual CO_2 emissions from the worst-case decommissioning option (Single Lift) is estimated to be 25,179 te (Appendix A), which will contribute less than 0.12% of the atmospheric emissions associated with UK offshore shipping and oil and gas activities. In comparison with CO_2 emissions associated with annual production operations at Cormorant Alpha, this figure amounts to approximately 18.80% in 2020 (133,897 te), 17.89% in 2019 (140,765 te) and 15.80% in 2018 (159,344 te). Considering the above, atmospheric emissions do not warrant further assessment.
Disturbance to 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 anchoring associated with the decommissioning of the topsides. Should this change following the commercial tendering process and an anchor vessel is required, any potential seabed impact would be assessed and captured in the Consent to Locate application, Marine Licence application and supporting Environmental Impact Assessment (EIA) justification within the Portal Environmental Tracking System (PETS). On this basis, no further assessment needs to be undertaken.

Physical Presence of Vessels in Relation to Other Users of the Sea	No	The presence of a small number of vessels for topsides decommissioning activities will be short-term in the context of the life of the Cormorant Alpha installation. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. The decommissioning of the Cormorant Alpha topsides is estimated to require up to six vessels, with a maximum of four on site at the platform location at any one time, depending on the selected method of removal. If applicable, Notices to Mariners will be made in advance of activities occurring. This may not be a requirement as decommissioning activities will only take place within the existing 500m safety exclusion zone. Stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations. Considering the above, temporary presence of vessels does not need further assessment.
Physical Presence of Infrastructure Decommissioned in situ in relation to Others Sea Users	No	As topsides will be fully removed and a temporary navigational aid will be installed on the substructure up until its subsequent removal, there will be no mechanism for associated long-term impact through physical presence. Upon completion of the removal of topsides the statutory safety exclusion zone will automatically be revoked. TAQA will engage with the relevant navigational authorities at the appropriate times in order to determine the necessary actions to minimise navigational risk. Considering the above, no further assessment related to long term presence of infrastructure is justified.
Discharges to Sea (Short-term and Long-term)	No	Discharges from vessels associated with the decommissioning work are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. In addition, the topsides will be Drained, Flushed, Purged and Vented (DFPV) using the TAQA DFPV philosophy prior to any decommissioning activities commencing. There would be no planned discharges from the topsides. Any residual remaining material will be in trace levels/volumes following the DFPV regime and therefore would not pose any significant risk. The rundown lines connect the topsides facilities with the (disused) storage cells. Planned hydrocarbon/ chemical discharges during the isolation of the rundown and vent line pipework within Leg C4 (Figure 2-1) will be covered by oil discharge permits and chemical permits under the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 and the Offshore Chemicals Regulations 2002 (as amended), respectively. The process to break containment of the rundown lines will be internal to the legs. A small amount of metal waste (<100 kg) may be produced during the breaking of containment. This will be collected and returned to shore along with the topsides waste inventory. Breaking of containment will enable the installation of launcher cans and the environmental isolation of the rundown lines.

		As the topsides will be fully removed and the rundown lines will be isolated, there will be no potential for any discharges in the longer term from the facilities. The potential for any accidental release is assessed in the 'Accidental Events' section of this Table. Considering the above, discharges to sea from the topsides will not be assessed further.
Underwater Noise Emissions	No	Cutting required to remove the topsides will take place above the waterline, and there will be no other noise-generating activities. Vessel presence 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	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 worst-case (Single Lift option) total energy usage for the project is 284,310 GJ (Appendix A). Material will be returned to shore as a result of project activities, and expectation is to recycle at least 97% 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 Activities	No	The onshore waste management process is likely to have negligible consequences for the human population in terms of an increase in dust, noise, odour and reduced aesthetics. 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 (e.g. permitted capacity to accept the relevant waste streams). This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact. TAQA understands that dismantling sites will also require consents and approvals from onshore regulators such as the Scottish Environment Protection Agency (SEPA) or the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work.
Waste	No	It is waste management, not generation, that is the issue across DPs, with capacity to handle waste within the UK often cited as a stakeholder concern. The limited waste to be brought to

		shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy as part of the project Active Waste Management Plan, which will be developed in collaboration with SEPA and other regulatory bodies, using approved waste contractors. 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 assessment is not warranted for this aspect.
Unplanned Events	Yes (dropped objects only)	Prior to topside preparation and removal, the topsides system will have been through the DFPV process, the rundown and vent lines which connect the topsides to the storage cells will have been isolated. Release of a live hydrocarbon and chemical inventory is therefore not a relevant impact mechanism. Any discharges to sea associated with rundown and vent line isolation activities will also be covered by oil discharge permits and chemical permits under the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 and the Offshore Chemicals Regulations 2002 (as amended). The lift vessel to be used for removing the topsides is likely to have the largest fuel inventory of the few vessels involved in the decommissioning activities. However, the inventory of an HLV tank is likely to be less than the worst-case loss of inventory (10,856 m^3) of crude from the CGBS cells during decommissioning activities. In addition, the vessel's fuel inventory is likely to be split between several fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory (the largest tank holds 720 m^3). The potential impact from fuel inventory release would be significantly less than that modelled for the loss of inventory scenario (Section 5.2), and vessel-related spills can be scoped out of further analysis. Any dropped objects of significant size will be removed (i.e. those reported to OPRED via PON2 notifications). Any small non-significant objects will be marked and will be within the safety zone of the substructure. These dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the substructure decommissioning activities. Although unlikely, the dropping of a large object during decommissioning activities (i.e. during heavy lifts) onto the CGBS storage cells could lead to a release of the cell contents (hydrocarbons, water, scale, sediments) to sea. Considering this, the impacts of dropped objects colliding with the CGBS and the consequent potential for release of the cell contents during decommissioning activities will be assessed in Section 5.2. Based on the results of a recent study (Intertek, 2018), the impact of a dropped object on the existing cuttings pile is not anticipated to have an impact beyond its existing footprint, on and around the CGBS. Any impacts relating to long-term

		structural stability and potential collapse will be assessed as part of the Cormorant Alpha substructure EA. Further assessment is therefore not warranted for cuttings pile aspects.
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 not identified any nesting birds or nests on the Cormorant A installation to date and are aware that this may change as operations wind-down. TAQA will undertake surveys to determine the presence of birds nesting on their platforms closer to the point of disembarkation and regularly thereafter until final removal. TAQA may employ a range of non-lethal deterrents to prevent birds nesting if required. These methods will continue throughout the duration of decommissioning operations and will be outlined within a TAQA bird management strategy document which will be in line with current legislation and guidance. TAQA will engage with OPRED to agree any further licensing requirements, as appropriate. This process will form part of future licensing applications for subsequent offshore applications and as such is not assessed here further.

Based on this initial screening, only one warranted further assessment within the EA, namely the potential for a dropped object on the CGBS and the potential impact of a release to sea on any environmental receptors. The remaining aspects were scoped out of assessment as they were deemed to pose no significant risk to environmental or societal receptors.

Environmental Management

The project has limited activity associated with it beyond a period of preparation and removal of the Cormorant Alpha topsides and the removal of the product separation facilities that are part of the Cormorant Alpha CGBS. 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 and Health, Safety, Security and Environment 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 to an All Asset Waste Management procedure and asset specific Garbage Management Plan. An Active Waste Management Plan (AWMP), which will be developed in collaboration with SEPA and other regulatory bodies, will refer to the current disposal processes and identify the materials to be managed to support the DP for the Cormorant Alpha topsides. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during decommissioning.

TAQA has developed a draft Emissions Reduction Strategy which supports our commitment to Net Zero and the OGA Stewardship Expectation 11. This strategy defines our 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 our 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 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, 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 National Marine Plan during Project decision making and the interactions between the Project and Plan.

Conclusions

Following detailed review of the decommissioning activities, the environmental sensitivities in the area of the Cormorant Alpha platform and industry experience with decommissioning activities, it was determined that eleven of the issues commonly associated with offshore oil and gas activities could be scoped out of detailed assessment.

The potential for a dropped object on the CGBS cells was assessed further in terms of the impacts from a release to sea of residual cell contents (including hydrocarbons and other residual contaminants) on any environmental receptors. With numerous control measures in place, the negligible level of impact as assessed by Xodus (2017) and Intertek (2018) and the overall design of the CGBS, is unlikely to lead to a complete loss of inventory, therefore the risk is deemed to be low overall.

Given the remote offshore location of the Cormorant Alpha platform, there is no potential for the Cormorant Alpha topsides decommissioning to impact any European or nationally designated protected sites.

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 Health, Safety, Security and Environment Policy and Environmental Management System (EMS), it is considered that the proposed Cormorant Alpha decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the 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 Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for decommissioning the Cormorant Alpha topsides.

The Cormorant Alpha platform is jointly owned by TAQA and the Brent System Owners (as listed in Table 1.2 in the Decommissioning Programme), as Cormorant Alpha forms part of the Brent System Infrastructure.

This EA supports the Decommissioning Programme (DP) being submitted to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), the offshore decommissioning regulator under the Department for Business, Energy and Industrial Strategy (BEIS) , which covers decommissioning the topsides of the Cormorant Alpha platform (TAQA, 2020a). This EA also covers the isolation of the rundown line and vent line pipework, which connects the topsides facilities with the (disused) storage cells.

Active use of the CGBS cells ceased in 2017. Due to the large capacity of the export pumps and storage cells/ run-down line geometries, it was not feasible to export all remaining hydrocarbons from the storage cells as once the majority of oil had been exported the pumps would “cone” water up through the remaining thin layer of hydrocarbons. These hydrocarbons are known as “hydrodynamically trapped oil”. A subsequent project was tasked with undertaking a trial to remove this hydrodynamically trapped oil from three of the four cells group. This second project concluded in April 2020 having exported over 4,000 barrels (approximately 655 m^3) of oil. It is estimated that a maximum of approximately 10,856 m^3 of oil remains in the cells following this most recent recovery.

It is planned to remove the residual hydrocarbon inventory after topside removal. This scope will be executed utilising cell top drilling, similar to the technology deployed within the Brent Field. A feasibility study into utilising this technology was completed in late 2020. This study concluded that, subject to some modifications to existing tooling, it would be feasible to deploy the technology at Cormorant Alpha to access the cells. Management of residual hydrocarbons within the storage cells will be covered under the Cormorant Alpha Substructure DP.

Further DPs and supporting EAs covering the decommissioning of the remainder of the Cormorant Alpha development, including the associated pipelines, power cables and umbilicals, will be also be provided at a later date yet to be determined.

1.1 Project Overview

The Cormorant Alpha platform is a drilling/production unit located in Block 211/26 of the Northern North Sea (NNS), approximately 103 km north east of Shetland and 41 km west of the UK/Norway median line (Figure 1-1). Cormorant Alpha is a fixed installation located in the South Cormorant field in the East Shetland basin of the Northern North Sea, in 150 m of water at Lowest Astronomical Tide (LAT).

The Cormorant Alpha platform consists of a four-leg Concrete Gravity Base Structure (CGBS) with a steel box girder structure supporting two levels of modules on the topsides. The Living Quarters (LQ) can accommodate 175 persons. The installed total weight of the topsides is currently estimated to be approximately 25,546 te. The platform was installed in May 1978 and began production in December 1979. It was designed to fulfil four functions; a production facility, drilling facility, an oil pumping station for the Brent Pipeline System and a centre for telecommunications in the area. The Cormorant Alpha platform facilitates production from the North Cormorant, Brent Charlie and Alwyn North Fields. TAQA acquired the asset from Shell in 2008.

Current production from the Cormorant Alpha field is from 11 platform wells and five water injection wells. An Underwater Manifold Centre (UMC; Figure 1-2) was installed to act as a template structure for nine wells and pipelines linked back to Cormorant Alpha. The platform is connected to other field installations by five interfield pipelines, six infield pipelines serve the Central Cormorant Underwater Manifold Centre (UMC) and Pelican, one oil export line to Sullom Voe Terminal (SVT) and a gas pipeline to the Western Leg of the FLAGS Pipeline End Manifold (PLEM) (Figure 1-2)

The installation was originally designed to utilise its large CGBS with storage cells capable of holding 1 MMbbls of oil, although that functionality has been disused since 2017. The new export configuration allows native field and Brent Pipeline System Partner's production to tie into a new collection manifold prior to flowing to SVT.

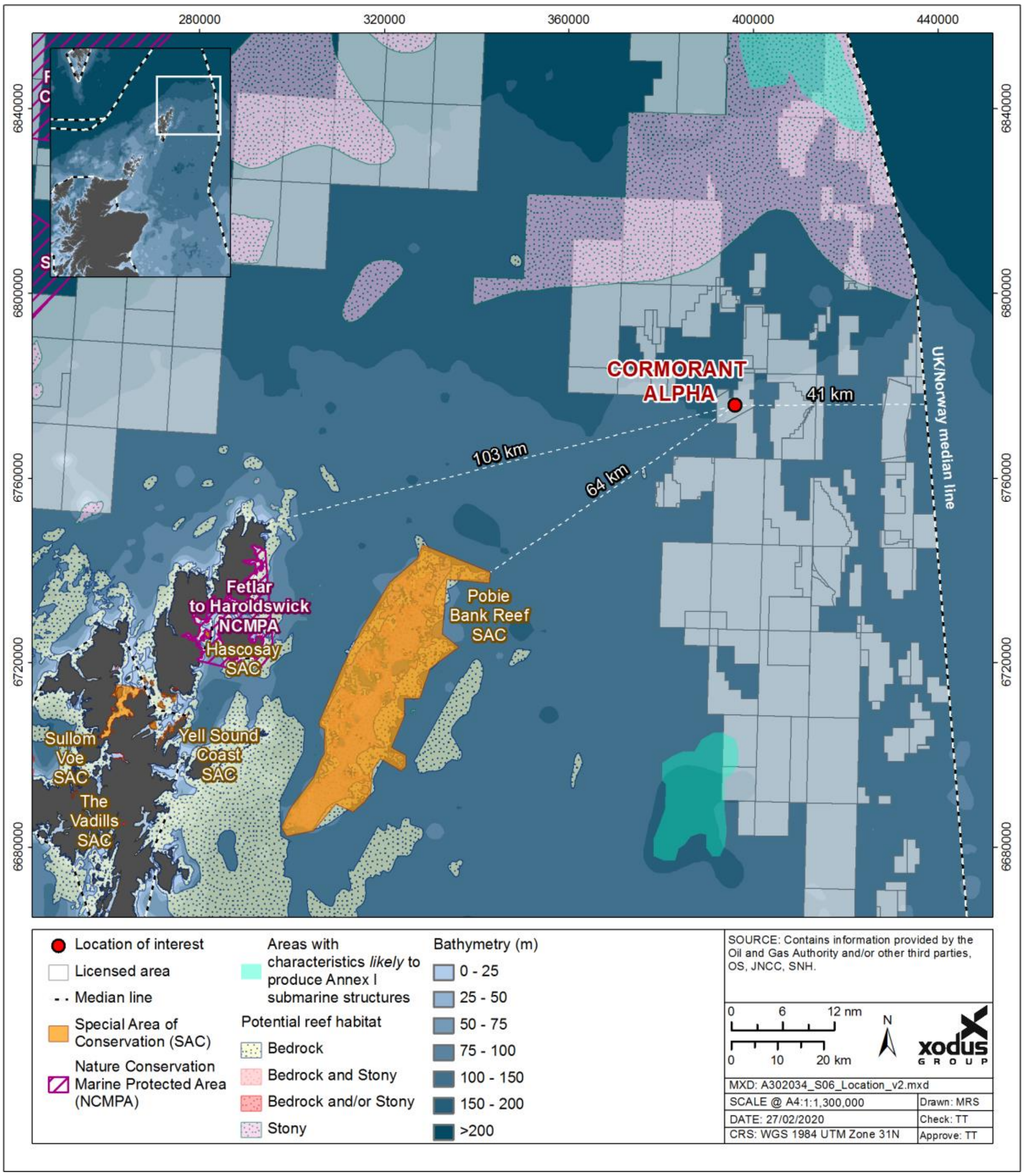

Figure 1-1 **Location of the Cormorant Alpha Installation in Relation to Protected Areas**

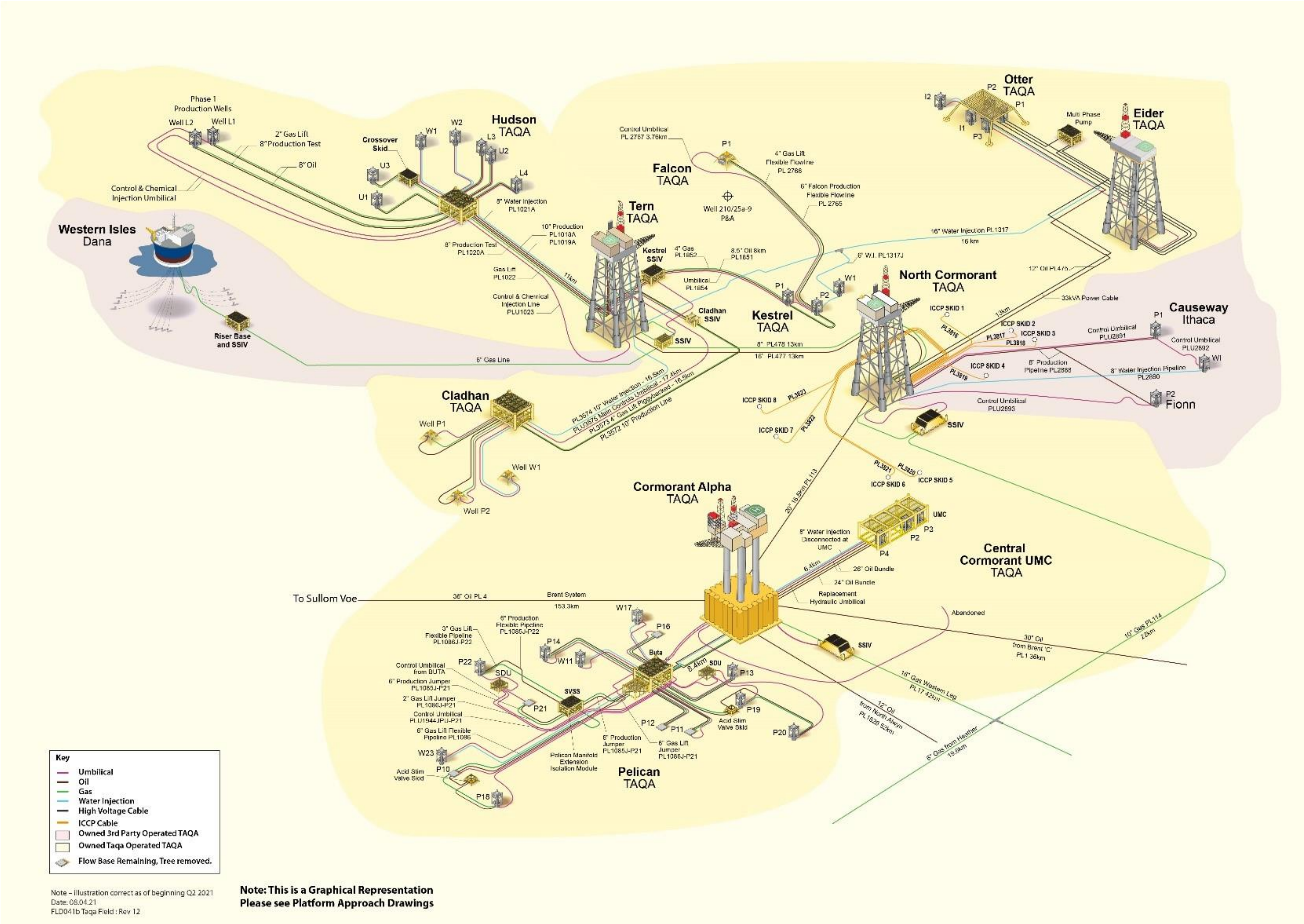

Figure 1-2 Location of the Cormorant Alpha Installation in Relation to Other Installations

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Decommissioning at the Cormorant Alpha platform will be split into three distinctive DPs, each supported by an EA:

1.0 Topsides decommissioning covered by this EA; and

2.0 Substructure decommissioning, including the Cormorant Alpha CGBS, associated pipelines, power cables and umbilicals and cell top recovery of residual attic oil, to be prepared at a time yet to be confirmed and to be covered by a separate DP and supporting EA.

3.0 Subsea decommissioning, including pipelines, power cables and umbilicals. The associated Pelican and Central Cormorant Underwater Manifold Centre (UMC) subsea developments will both be subject to their own separate DP(s) and a supporting EA(s).

With uncertainties in the timing of Cormorant Alpha decommissioning in relation to other TAQA decommissioning scopes, splitting the DPs provides TAQA with greater flexibility as to the timing of specific decommissioning activities. Allowing topsides decommissioning in the short term could also potentially result in cost savings, since the requirement for a long period of topsides maintenance can be avoided in the eventuality that full facilities decommissioning is significantly delayed. The removal of the Cormorant Alpha topside will not prejudice any decommissioning options for the remaining substructure.

The presentation of separate DPs will minimise the period between CoP and the removal of the topsides. This also has safety and environmental benefits, as it reduces the length of time that people and equipment are mobilised to the platform to perform maintenance of the topsides to ensure they are in a safe condition for dismantling.

Well plug and abandonment (P&A) will have been assessed, permitted and completed prior to any of the platform and subsea decommissioning activities progressing. This means that each well will be systematically and permanently closed in accordance with well abandonment best practice. Similarly, flushing and cleaning operations for pipeline systems subsea and on the Cormorant Alpha topsides will also have been completed and the rundown and vent lines in the CGBS will have been isolated under existing operational permits prior to commencement of removal activities.

1.2 Purpose of the Environmental Appraisal

This EA assesses the potential environmental impacts associated with the proposed Cormorant Alpha topsides decommissioning activities.

The impact identification and assessment process also 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

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 North East Atlantic (the Oslo Paris (OSPAR) Convention). The responsibility for ensuring compliance with the Petroleum Act 1998 rests with OPRED.

The Petroleum Act 1998 (as amended) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the UKCS. The Act requires the operator of an offshore installation or pipeline to submit a draft DP for statutory and public consultation, and to obtain approval of the DP from OPRED, part of BEIS, before initiating decommissioning work. The DP must outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place.

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

In terms of activities in the 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 from the seabed 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 Cormorant Alpha topsides 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 4.0);
- Assessment of key issues (Section 5.0); and
- Conclusions (Section 6.0).

This EA report has been prepared in line with TAQA's environmental assessment requirements and has given due consideration to the regulatory guidelines (OPRED, 2018) and to Decom North Sea's Environmental Appraisal Guidelines for Offshore Oil and Gas Decommissioning (Decom North Sea, 2017).

2.0 PROJECT SCOPE

2.1 Description of the Infrastructure being Decommissioned

The Cormorant Alpha platform consists of a four-leg CGBS with two levels of modules on the topsides. Figure 2-1 provides an overview of the platform. The topsides (Figure 2-2) are the main focus of this EA. The cellar deck comprises a compartmentalised box girder assembly connecting all of the CGBS legs. The conductor slots are located in the box-girder assembly between the legs. The module deck is supported from the superstructure roof. The drilling deck comprises drilling package modules supported from the roofs of the modules below. The drilling derrick structure has already been covered by a separate approved decommissioning programme. This was due to the need to have a serviceable rig with which to execute platform well P&A and the uneconomic proposition of returning the original facilities to service. The modular drill rig which will be used for the P&A campaign will be removed prior to topside removal.

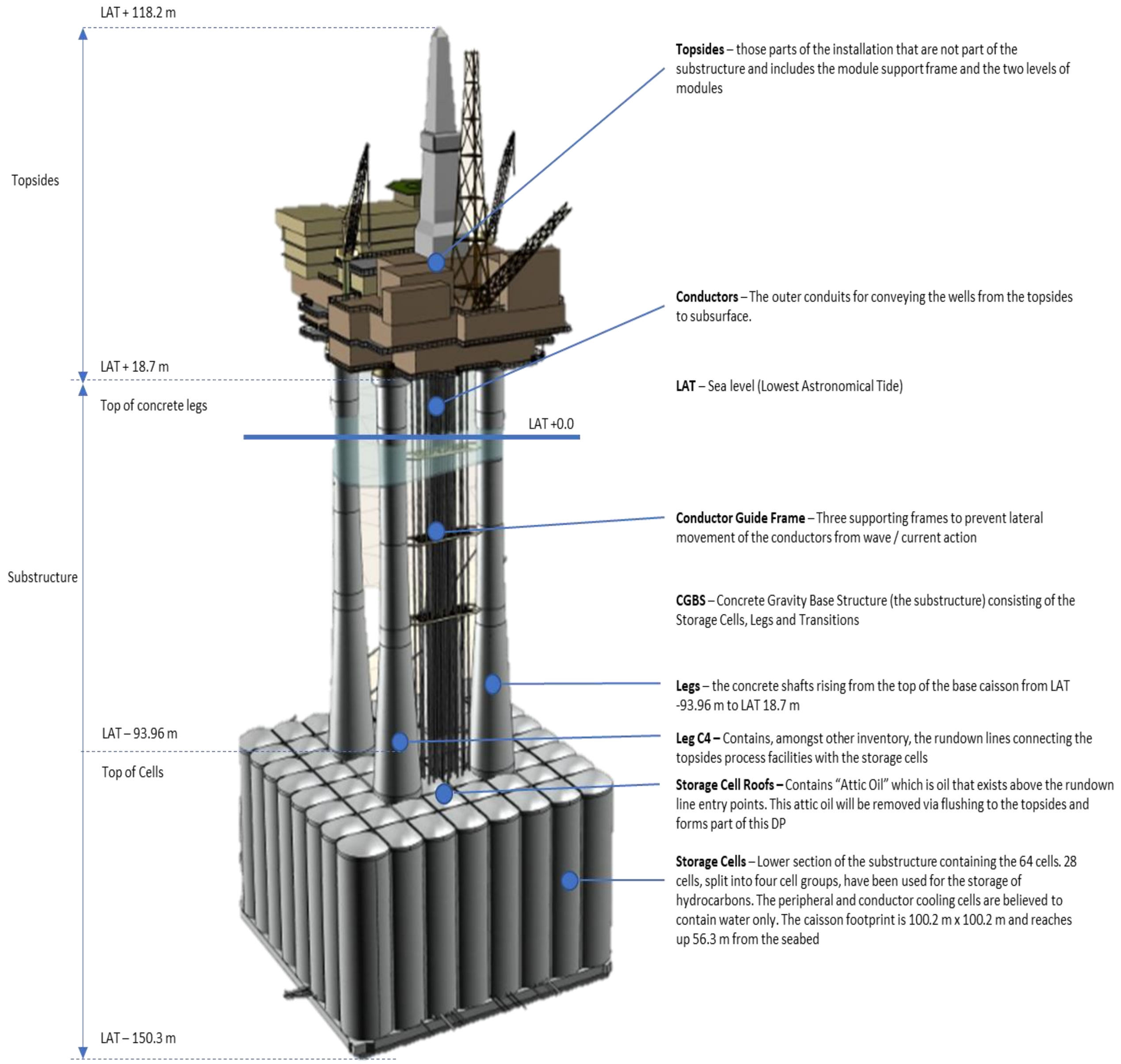

Figure 2-1 Cormorant Alpha Platform including CGBS

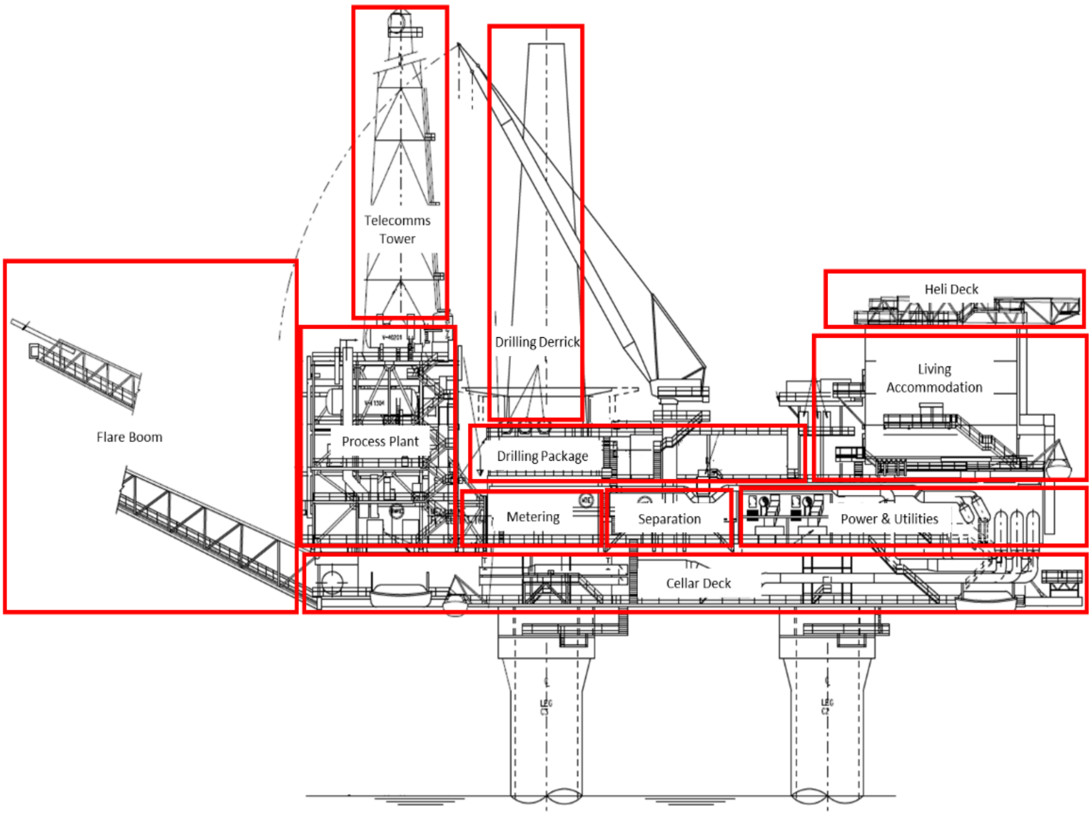

Figure 2-2 Cormorant Alpha East Elevation showing the various Modules (highlighted)

The CGBS is 100.2 m^2 by 56.4 m high. It contains 64 individual cells arranged in an eight by eight matrix. The 28 peripheral cells contain seawater and provide cooling for the inner matrix of storage cells. Each inner cell is approximately 11.1 m x 11.1 m x 56.4 m. The storage cells are split into four cell groups (CGs); two of eight cells and two of six cells. Each storage cell group surrounds a platform leg base, which is not used for oil storage. The storage cell groups are divided between the processing and storage of Cormorant oils (two cell groups) storage of Partner oil (two further cells groups), if this could not be directly exported (Figure 2-3). Pressure throughout the CGBS is regulated through a tank water ballast system. Pressure within the oil storage cells and the cooling cells is maintained through separate connections, ensuring that oil could not enter the cooling cells.

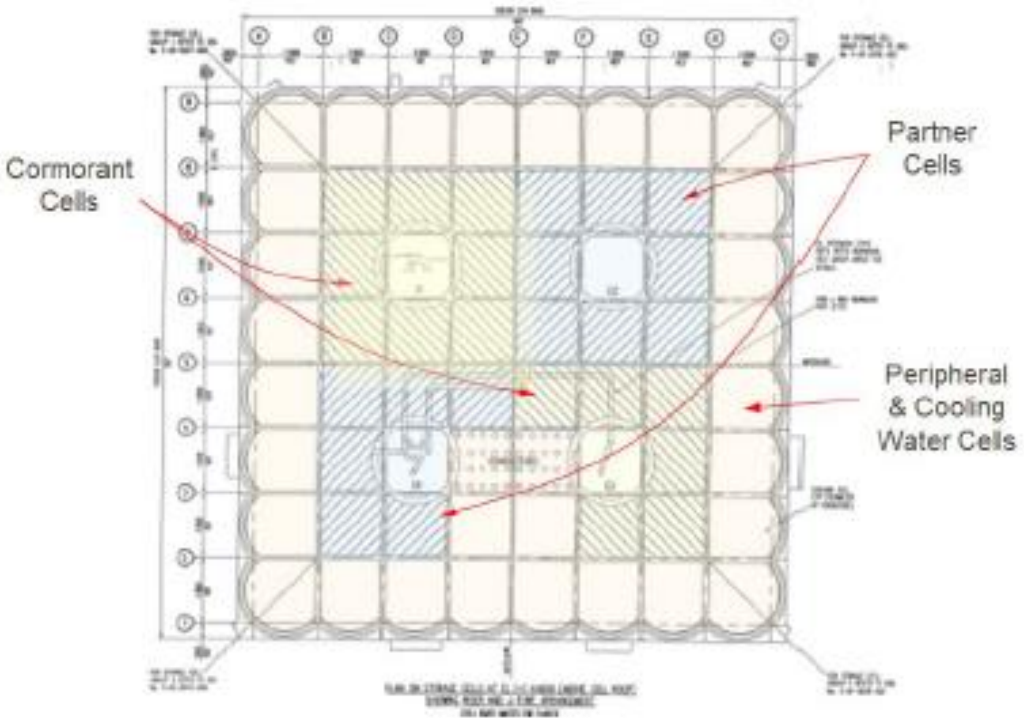

Figure 2-3 Cormorant Alpha CGBS Cell Layout

Options for the reuse of the Cormorant Alpha platform (TAQA, 2020b) included the following potential options for reuse: offshore renewable energy generation (wind), and offshore sub-station/ hub, a marine research station, a training centre and reuse of the facilities at an alternative location. It was concluded that there are no credible reuse options for the topsides principally due to obsolescence issues associated with the installed topsides/equipment, and economic factors associated with converting the installations for any intended reuse purpose. Components from the topsides maybe reused if a suitable use can be found.

Cormorant Alpha is of a similar design, vintage and in a similar location and water depth to other CGBS assets within the NNS which are in various stages of the decommissioning process, including Brent Delta and Brent Bravo (Shell). None of these assets was identified for reuse.

2.2 Description of Proposed Decommissioning Activities

2.2.1 Rundown and vent line isolation

The rundown and vent line pipework within Leg C4 (Figure 2-1) connects the topsides facilities with the (disused) storage cells. To ensure safety of those onboard through until disembarkation, and to facilitate the safe leg separation and finally topside removal, it is planned to isolate the rundown lines and vent lines within the platform substructure.

The final isolation solution is still to be confirmed, but it is anticipated that this will be implemented by injection of isolation material into the rundown line and vent line pipework using a pressure containing clamp arrangement. These scopes will be internal to the legs. A small amount of metal waste (<100kg) may be produced during the execution of these scopes.

2.2.2 Topsides removal

The topsides removal methodology detail has not been finalised yet, as this will be subject to a commercial tendering process. TAQA has conducted several topsides removal studies (TAQA, 2019a, 2019b), which reviewed the technically feasible options and provide detailed method statements for each approach. As outlined in Section 1.1, all engineering down and cleaning (EDC) associated with the topsides will be managed through permit applications prior to commencement of topsides removal activities.

The methods for removal of the topsides have been reviewed by TAQA and the resulting feasible options were single lift and modular removal. Details of these are summarised in Section 2.4.

Upon completion of topside decommissioning activities, the substructure will have a temporary 'Aid to Navigation' (AtoN) unit installed ensuring 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) and monitoring and maintenance of the system will be via a service contract with a specialist contractor.

In addition to the maintenance of navigational aids, 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 substructure decommissioning operations.

2.3 General Assumptions

A number of assumptions have been made in the preparation of method statements for each of the topsides removal options considered:

- Cormorant Alpha platform is hydrocarbon free (flushed/cleaned, target oil in water cleanliness levels subject to permit);
- Run down and vent line isolation processes as described in Section 2.2.1 will have been undertaken prior to the removal of the topsides.
- Attic oil removal is outside the scope of this EA and will be considered as part of the Cormorant Alpha Substructure Decommissioning Programme;
- Substructure (CGBS) decommissioning is out of the scope of these method statements;
- The Drill package will not be present and is outside of the topside scope;
- All essential systems (lighting, power), navigation aids (as required by the Consent to Locate permit) and escape/egress facilities (escape routes, lifeboats etc.) will be in place for all removal methodologies;
- Additional essential services (lighting, power) and escape/egress facilities (escape routes, lifeboats etc.) are required to be in place for Single Lift methodology and appropriately managed in conjunction with full personnel on board (POB);
- Suitable cranage will be available on the platform/ vessels as required;
- Installation of required temporary services (e.g. welding, burning, compressed air, water, power generation etc.);
- The estimated durations do not take account of weather delays;
- Assumes 14 days on, 21 days off rota pattern for all personnel on the platform and 28 days on, 28 days off for any HLV;

- All helicopter flights have a maximum capacity for 19 people, but only 14 seats assigned to scheduled flights to accommodate ad-hoc requirements and visitors.
- Assume 1 platform supply vessel (PSV) visit per week for food, diesel, water whilst platform supports existing accommodation;
- Minor lifts - assume 10 tonne lifts (skips) offshore, 2 tonne lifts (components) onshore and offshore and normal food/material transfers from PSV;
- Heavy Lift Vessel POB 320;
- Single Lift Vessel POB 200;
- Tug POB assumed to be 12;
- Barge POB assumed to be 20; and
- Onshore demolition estimate is based on industry feedback, including information from the Murchison and Brent Delta decommissioning projects.

During topside decommissioning activities, the existing 500 m safety exclusion zone will be maintained and will remain in operation. Vessels other than standby and supply boats will be required to remain outside of this exclusion zone. Upon completion of the removal of topsides the statutory safety exclusion zone will automatically be revoked. TAQA will engage with the relevant navigational authorities at the appropriate times in order to determine the necessary actions to minimise navigational risk.

2.4 Method Statements

The methods reviewed by TAQA are single lift and modular removal. The processes involved in each case are detailed in the following sections. These options are considered potentially suitable and as such any decision on the selection will be open to the contractor in the commercial tendering process.

This EA considers two options (Single Lift and Modular Removal), and selects the worst-case impact posed for each aspect or receptor rather than assessing both options simultaneously against each aspect or receptor.

2.4.1 Single Lift method statement

This method would entail the removal of the topsides infrastructure in one piece via a single lift vessel (SLV) or for transport to shore for size reduction, reuse, recycling or disposal. A maximum of six vessels will be used during decommissioning operations, but not all concurrently (SLV, guard/support vessel, cargo barge and tugs x3).

2.4.1.1 Preparation

The required preparation works, to avoid clashes between the topsides and the topsides lift system equipment and to ensure structural integrity and stability of the topsides structures during the lift and transport operations, consist of:

1. Under deck and Integrated Deck Structure (IDS) preparations:
    - Removal of under deck objects;
    - Topsides cutting – substructure separation (diamond wire); and
    - Cellar deck strengthening.
2. Lift point preparations (installation of support points):

- Access for under deck preparations.

3. Module deck preparations:
   - Equipment and loose items sea fastening/removal.
4. Transfer of personnel between the SLV (when in field) and platform would be likely to be by basket transfer or walk to work via bridge link. Otherwise helicopter to platform would be used;
5. Installation of an above-water guiding system mounted on the CGBS due to clearance requirements between the vessel hull and substructure; and
6. Flare boom removal.

2.4.1.2 **Removal**

The topsides would be raised and then lifted using hydraulic clamps mounted to horizontal lifting beams on the SLV. This would be subject to stringent sea state limits (although a motion compensation system will be used).

2.4.1.3 **Transport to shore**

1. Topsides would be secured to the SLV for transport;
2. Topsides transferred to a cargo barge; and
3. Final loading on to the quayside.

2.4.1.4 **Onshore handling**

1. Rigging installation;
2. Size reduction of entire topsides including module separation, module internals and the external structure of each module. This would involve significant cutting and grinding etc;
3. Lifting (small and large lifts would be required, this would be dependent on how the topsides are dismantled);
4. Waste segregation; and
5. Re-use, recycle or disposal.

2.4.2 Modular Removal method statement

The topsides would be removed in modular sections, in a manner similar to their original installation by using a HLV. The modules would then be transported to shore for re-use, recycling or disposal. A total of four vessels would be on site at any one time (HLV, tug, PSV and guard/support vessel).

2.4.2.1 **Preparation**

1. Installation of between 1% and 5% of the topsides weight in steel reinforcements/bracings. These would be installed prior to the arrival of the HLV.
2. Transfer of personnel between the HLV (when in field) and platform would be likely to be by basket transfer. Otherwise helicopter to platform will be used whilst the helideck is in place;
3. Installation of required temporary services (e.g. welding, compressed air, water, power generation etc.) would be supplied via HLV (when in field);
4. Installation of module lift off bumpers and guides (requires welding and non-destructive examination activities);

5. Removal and recovery of any temporary securing;
6. Installation of access/rigging laydown platforms (these will require modifications as the modules are removed);
7. Diamond wire cutting between modules to ensure adequate clearance between modules. This would typically require two cuts and removal of material between the modules; and
8. Installation of rigging on modules, infills and laydown/access areas.

2.4.2.2 Removal

Modules would be lifted clear of the platform using HLV crane(s) and placed on the HLV deck.

2.4.2.3 Transport to shore

1. Each module would be adequately sea-fastened to the HLV deck for transport to shore; and
2. Each module would be lifted to quayside using HLV crane.

2.4.2.4 Onshore handling

1. Rigging installation;
2. Size reduction of entire topsides including module separation, module internals and the external structure of each module. This will involve significant cutting and grinding etc.;
3. Lifting (small and large lifts will be required, this being dependent on how the topsides are dismantled);
4. Waste segregation; and
5. Re-use recycle or disposal.

2.5 Navigational aids

During removal operations, navigational aid requirements will be fulfilled by the decommissioning contractor. TAQA proposes to pre-install a supporting cap at the top of a concrete leg to support an AtoN unit. Once removal of the topside has been completed, the HLV will install the AtoN on top of the supporting platform using the vessel crane. Replacement of the module following any failure will be undertaken via helicopter deployment (Figure 2-4).

TAQA will consult with the Northern Lighthouse Board (NLB) to ensure that the design of the AtoN unit meets all regulatory requirements. It is anticipated that the unit will be of a self-contained offshore lighthouse (SCOL) design and will be helicopter portable to facilitate maintenance and replacement as required. TAQA proposes to undertake monitoring and maintenance of the AtoN through a service contract with a specialist contractor, including real time status and analysis. Further information on the long-term monitoring and management of AtoN requirements will be provided within the Cormorant Alpha Topsides Decommissioning Programme.

Figure 2-4 AtoN Deployment via Helicopter

2.6 Proposed Schedule

The date of the isolation of the lines remains to be confirmed but the vent lines isolation is also most likely to occur in 2021 and rundown line isolation in 2022. Topsides preparation work will be undertaken between 2023 and 2026 and topsides removal between 2026 and 2028 (Figure 2-5).

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Well Plug & Abandonment											
Topsides & Pipelines Clean & Make Safe											
Removal Strategy Contract Tender & Award											
Topsides Removal											
Close Out Report Submission											

KEY:
Potential Activity Window

Figure 2-5 Project Schedule

2.7 Summary of materials inventory

During the decommissioning of the Cormorant Alpha topsides, there will be a wide range of materials that will need to be processed and, where possible either reused or recycled. Table 2-1 and Table 2-2 presents the estimated total tonnage of infrastructure to be decommissioned and recovered to shore for processing and its high-level constituent material. The total amount of hazardous and non-hazardous waste is 25,546.45 te (Table 2-2). Figure 2-6 and Figure 2-7 present the bulk and hazardous waste material breakdowns, respectively, for the Cormorant Alpha topsides infrastructure (D3, 2020).

Table 2-1 Summary of Proposed Fate of Non-Hazardous Materials from the Cormorant Alpha Topsides

Material	Estimated total weight to be recovered to shore (te)	Proposed fate %		
		Reuse/	Recycling	Disposal
Iron and Steel	21,535.71	0	100	0
Copper, bronze, brass	19.46	0	100	0
Aluminium	10.55	0	100	0
Other	3,141.09	<10	90-97	<3
Total	**24,706.81**			

Table 2-2 Summary of Hazardous Materials and NORM from the Cormorant Alpha Topsides

Material	Estimated total weight to be recovered to shore (te)
Miscellaneous equipment	456.84
Waste paint and varnish	57.69
Hydrofluorocarbons (HFCs)	0.02
End-of-life vehicles	67.52
Batteries (Pb)	31.02
Batteries (NiCd)	15.8
Asbestos	49.25
Fluorescent lighting	6.78
Total Hazardous	**684.92**
Naturally occurring radioactive material (NORM)	154.72
Total Hazardous (including NORM)	**839.64**
Total Topsides Inventory (Table 2-1 and Table 2-2)*	**25,546.45**

* A small amount of metal waste (<0.1 te) may be produced during the breaking of containment of the rundown lines in leg C4. This has not been accounted for here, but will be collected and returned to shore along with the topsides waste inventory.

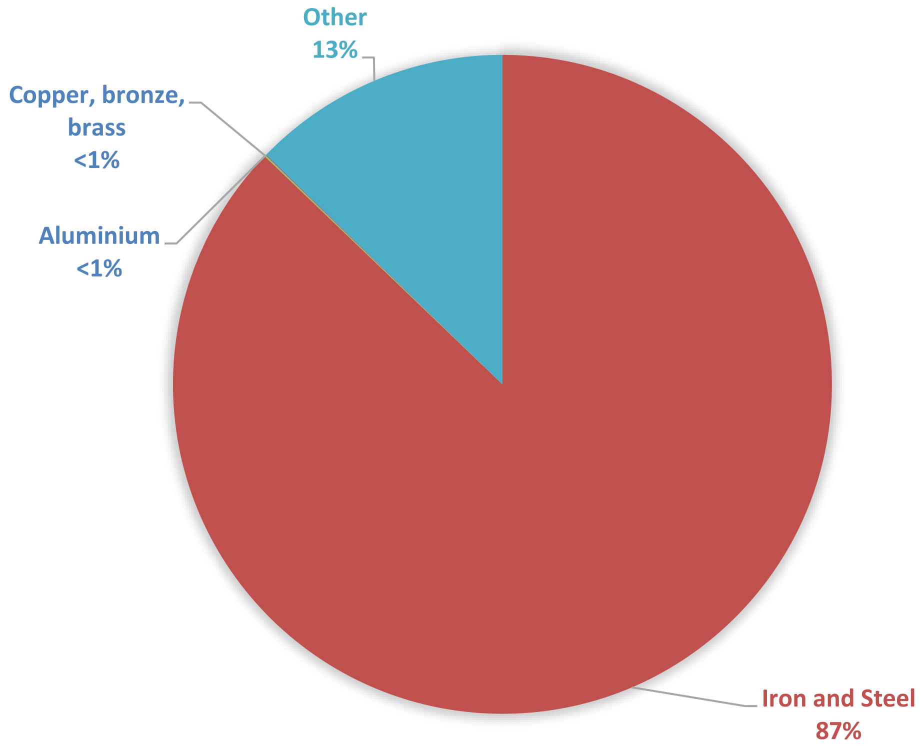

Figure 2-6 Bulk Materials from the Cormorant Alpha Topsides Infrastructure (Source: D3, 2020)

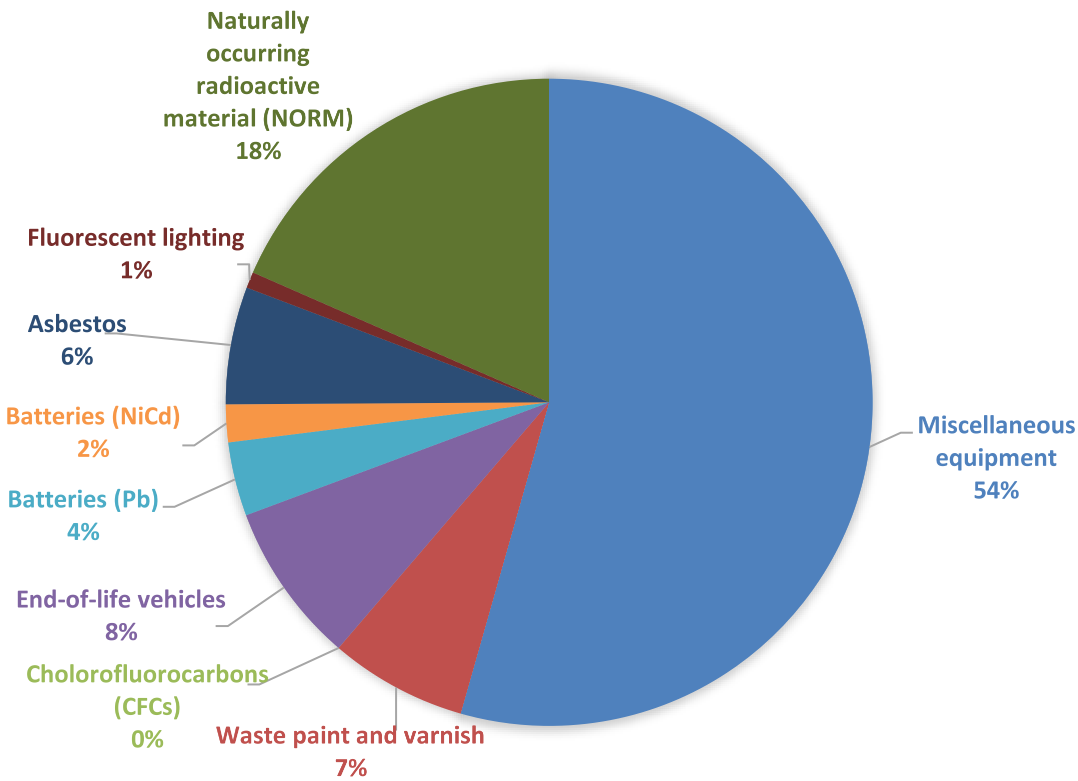

Figure 2-7 Hazardous Material from the Cormorant Alpha Topsides Infrastructure (Source: D3, 2020)

2.8 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 2-8) 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 Cormorant Alpha topsides decommissioning activities will be non-hazardous and mostly consists of iron and steel (Table 2-1).

Preventing waste is ultimately the best option, achieved through reducing consumption and using resources more efficiently. However, this is followed by re-use of goods. TAQA intends to review Cormorant Alpha's critical equipment and stores with the objective of identifying the re-use opportunities that potentially exist and ensuring application of the principles of the circular economy. By re-using items, it may be possible to address prospective equipment obsolescence issues or as a way to fulfil the first principal of the waste hierarchy (Figure 2-8): reducing consumption of resources. If all re-use opportunities have been taken by TAQA we will look to canvass other Operators for their interest in items. An auditable trail of items removed for re-use will be available via asset register updates, manifests/consignment notes and Maximo records. These materials are not defined as waste as they are to be used for the same purpose.

Figure 2-8 Waste Hierarchy Model

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.

The Material Inventory has also classified each material according to the European Waste Catalogue (EWC) codes 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 (EC). 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 not yet known. The project aspiration is that all ferrous and non-ferrous metals and concrete will be recycled. Approximately 97% of material recovered is anticipated to be recycled, with a target of less than 3% to go to landfill.

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 naturally occurring radioactive material (NORM) be encountered TAQA will hold a permit for the onshore disposal of radioactive waste arising from the decommissioning of the topsides infrastructure under the Environmental Authorisations (Scotland) Regulations 2018.

An AWMP including an inventory of hazardous waste will be compiled to aid the segregation and recycling of waste.

2.9 Environmental Management Strategy

TAQA have an established and independently verified 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 Cormorant Alpha 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 this 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.

TAQA has also developed a draft Emissions Reduction Strategy which supports our commitment to Net Zero and the OGA Stewardship Expectation 11. This strategy defines our 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 our supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

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3.0 ENVIRONMENTAL AND SOCIETAL BASELINE

The Cormorant Alpha platform is located in UK Continental Shelf (UKCS) Block 211/26a, in the NNS. The platform is located approximately 103 km north east of the Shetland coastline and 41 km from the UK/ Norway median line (see Figure 1-1). The water depth at the installation is 150 m lowest astronomical tide (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 Cormorant Alpha 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.

A survey gap analysis study commissioned by TAQA, mapped and assessed all available survey reports covering TAQA assets across the wider NNS area including Cormorant Alpha (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 the relatively uniform nature of the seabed habitats and communities across the wider region.

The following environmental survey reports have also been used to inform the seabed and benthos sections of this environmental description of the area immediately adjacent to the Cormorant Alpha platform:

- *Cormorant Alpha Environmental Monitoring Survey UKCS Block 211/26A (Fugro, 2014)*

  This environmental monitoring survey was carried out in May 2013 around the Cormorant Alpha platform. The main objective of the survey was to determine the current seabed status to provide robust baseline conditions for future environmental monitoring sites. Samples for quantitative macrofaunal, chemical and physical analysis were retrieved using a dual van Veen grab designed to sample 2 x 0.1 m^2 of seabed. A total of 21 stations were sampled around the Cormorant Alpha platform during the survey (Figure 3-1).

- *Cormorant Alpha Environmental Baseline, Habitat Assessment and Cuttings Pile Assessment Survey (Benthic Solutions Ltd, 2019)*

  A pre-decommissioning environmental baseline, habitat assessment and cuttings pile assessment survey was conducted around the Cormorant Alpha platform and along the PL113 pipeline route in November 2018. Environmental baseline sampling and ground truthing was carried out at 10 stations within the 500 m safety zone around the platform, and at seven stations along the PL113 pipeline route connecting the Cormorant Alpha and North Cormorant platforms. In addition, 23 remotely-operated vehicle (ROV) push core samples and one vibrocore sample was obtained in order to establish the physical extent and chemical footprint of the Cormorant Alpha cuttings pile. The cuttings pile assessment comprised sidescan sonar and multibeam echosounder surveys. The location of sampling stations and the extent of the acoustic surveys are shown in Figure 3-2.

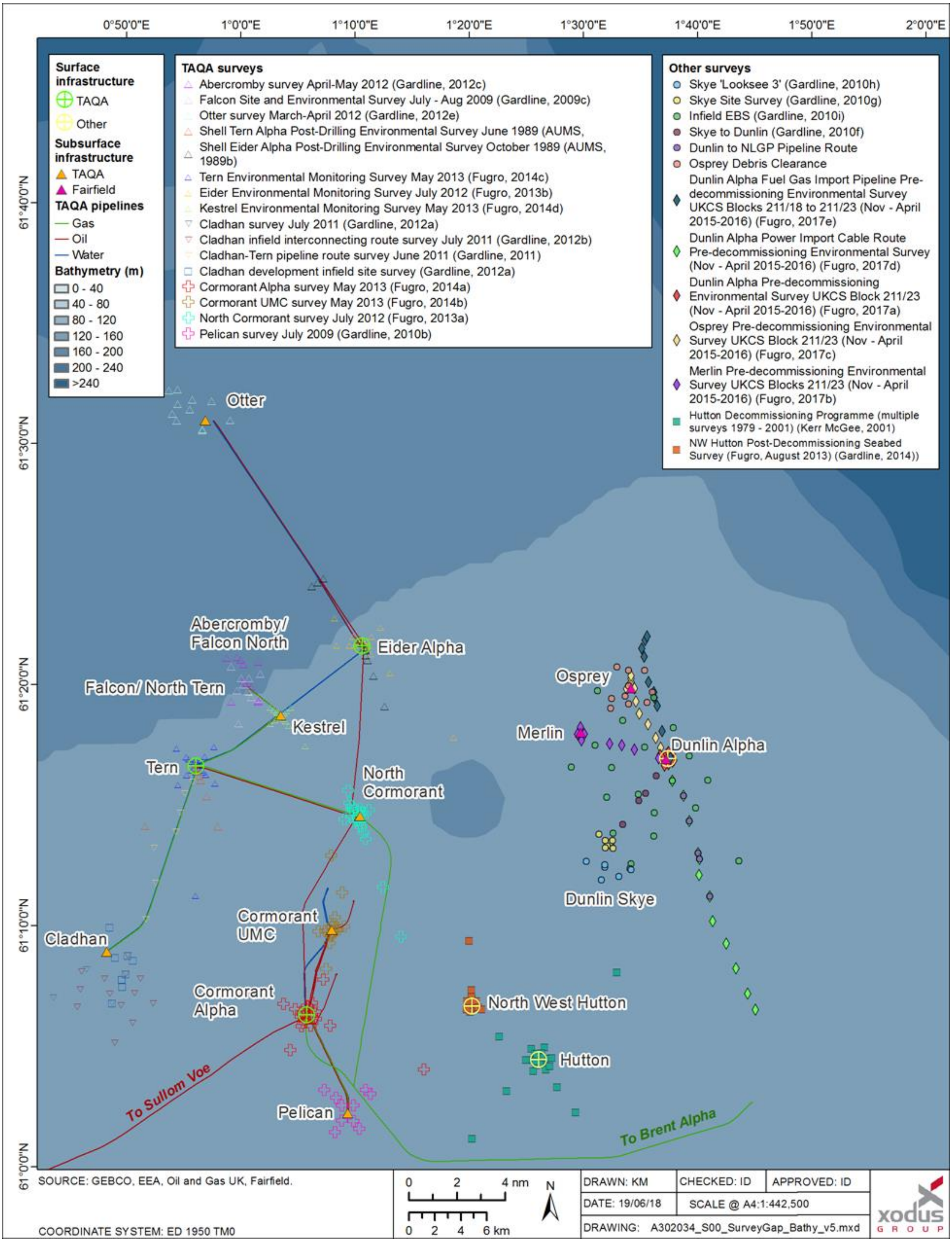

Figure 3-1 **Location of Surveys around the TAQA Infrastructure**

3.1 Physical Environment

3.1.1 Bathymetry

The geophysical data collected during the Benthic Solutions (2019) survey showed little variation in water depth across the Cormorant Alpha survey area, ranging from 149 m to 153 m. Small seabed depressions were detected at transects EBS_01, EBS_02, EBS_04, EBS_10, and THC_10, up to approximately 30 cm deep and 1 m wide (Figure 3-2). These small depressions could be associated with possible minor gas release. 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 however not identified in the depressions ground-truthed (Benthic Solutions Ltd, 2019).

The Cormorant Alpha 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).

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 2.71 - 3.0 m whilst in the north it ranges from 2.41 - 3.00 m (NMPI, 2019). McBreen *et al.* (2011) shows wave energy at the seabed is ‘moderate’ (0.21 - 1.2 N/m^2) within UKCS Block 211/26. The annual mean wave height within UKCS Block 211/26 ranges from 2.71 m – 3.00 m and the annual mean wave power is 39.35 kW/m (NMPI, 2019).

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 0.11 to 0.25 m/s (DECC, 2016).

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

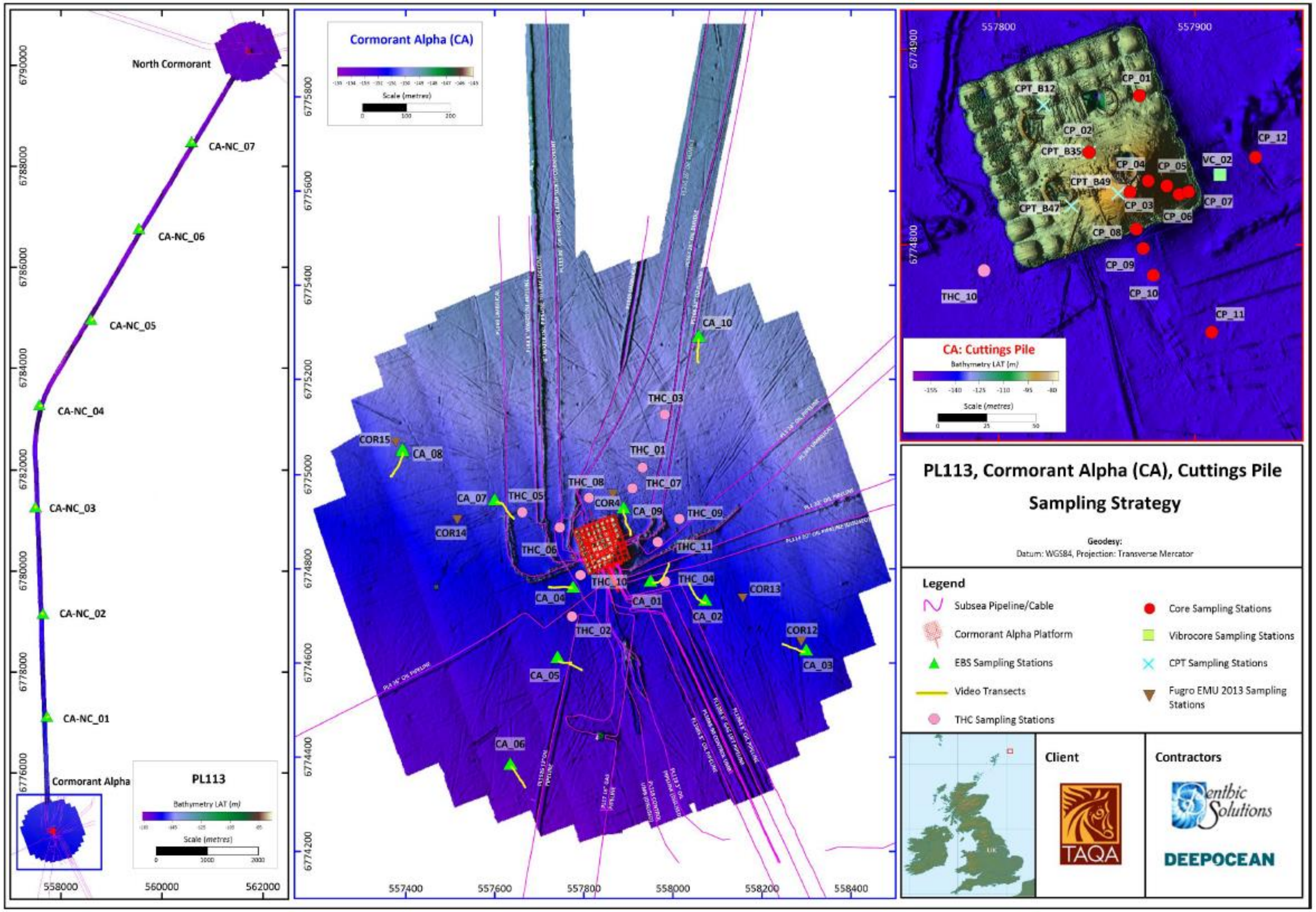

Figure 3-2 **Cormorant Alpha, North Cormorant to Cormorant Alpha Oil Export Line and Cuttings Pile Environmental Baseline Sampling Strategy (Benthic Solutions Ltd, 2019)**

3.1.3 Meteorology

The prevailing winds in the NNS are from the south west and north north-east. 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. In April and July, winds in the open, central to NNS, are highly variable and there is a greater incidence of north westerly winds (DECC, 2016).

3.1.4 Seabed sediments

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.

The sediments identified at the 17 stations sampled across the Cormorant Alpha area and PL113 (North Cormorant to Cormorant Alpha oil export) pipeline route were dominated by sands that ranged from 74.7% at CA _04 to 89.9% at CA_02 (Figure 3-2). The homogeneous distribution of sandy sediment at these two survey areas is reflected by a low overall coefficient of variation (5.3% and 4.1% respectively) in line with the results from the wider study (Xodus, 2018). After review of the acoustic data, the multibeam echosounder recorded a significant cuttings pile around the south-east of the substructure, which extended as overspill onto the seabed (Benthic Solutions Ltd, 2019). The physical volume of the pile was estimated at 1,596 m^3, covering an area of 17,080 m^2. However, this volume may be slightly overestimated due to the difficulty of accurately quantifying and accounting for the volume of subsea infrastructure, including the gravity base and debris within the pile area. This would be categorised as a “small cuttings pile” according to the OLF/NOREG (2016) guidelines (<5,000 m^3).

The proportion of sedimentary fines was high at the majority of stations sampled within the cuttings pile (mean 72.4%±16.2SD) which upon review of ROV video footage, core logs and sample photographs (Figure 3-4) were clearly influenced by drilling muds. Coarser sediment in the form of relic *Mytilus edulis* shells was observed within the samples obtained in the cuttings pile (particularly at CP_08 and CP_05 (Benthic Solutions Ltd, 2019).

The Benthic Solutions (2019) survey classified seabed habitat at seven stations around the Cormorant Alpha Platform as ‘Circalittoral Muddy Sand’ (A5.26), including stations CA_03, CA_04, CA_ 05, CA_ 06, CA_ 07, CA_ 08, and CA_ 10, which is consistent with the broad-scale predicted seabed habitat in the wider region (Figure 3-4). Three stations within the Cormorant Alpha survey area (CA_01, CA_02 and CA_09) were assigned to the European Nature Information System (EUNIS) classification of ‘Deep Circalittoral Coarse Sediment’ (A5.15). The biotope “Organically Enriched Gravelly Mud” was assigned to the sediment analysed as part of the cuttings pile assessment positioned on top of the gravity base.

Sediments were analysed for total hydrocarbon content (THC). The THC recorded at the 10 stations within the 500 m safety zones ranged between 25 – 418 μgg^{-1}, with a median of 31.5 μgg^{-1}. These all exceed the United Kingdom Offshore Operators (UKOOA) 95th percentile for the NNS of 20.32 μgg^{-1}, which is considered background concentration for the NNS. The THC at the stations closer to the platform, including CA_01 (125 m from the platform), CA_04 (100 m from the platform) and CA_09 (100 m from the platform) were particularly high, with values ≥309 μgg^{-1}. The widespread footprint of hydrocarbon contamination within the CA survey area indicates the enrichment derives from a long-term, historical input from oil exploration at the site rather than a defined duration event (Benthic Solutions Ltd, 2019).

Significant organic enrichment was evident within the cuttings pile, with Total Organic Matter (TOM) concentrations at all stations exceeding the UKOOA 95th percentile for the NNS (2.4%, UKOOA, 2001). This is indicative of the sediment being organically enriched by drilling related material.

As would be expected, the peak metal concentrations across the two surveys (Benthic Solutions, 2019; Fugro, 2014) were found closest to the CA platform which significantly decreased at stations sampled at >250m. Concentrations of Barium (Ba) were elevated at the stations sampled 100 m from the CA platform in both survey campaigns and considerably declined at the stations sampled between 250 m-500 m.

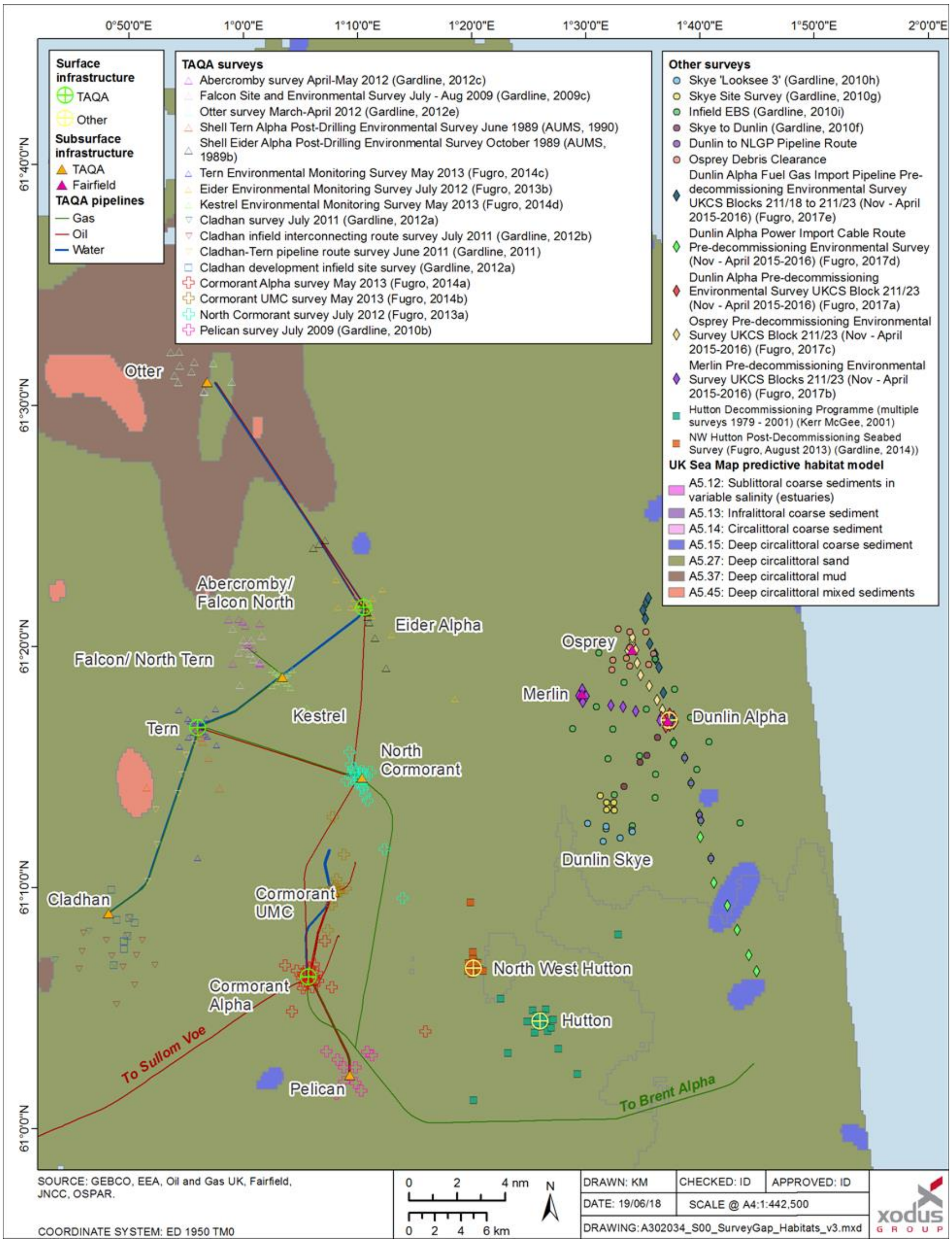

Figure 3-3 **Broad-Scale Predicted Habitat around the Cormorant Alpha Platform (Xodus, 2018; JNCC, 2017)**

Sediment Description
Coarse shelly sand

Conspicuous Fauna
Cnidaria: *Metridium senile* (Plumose Anemone), *Virgularia mirabilis* (Slender sea pen). **Mollusca:** *Mytilus edulis* (Blue Mussel), *Buccinum sp.* . **Echinodermata:** *Asterias rubens* (Common starfish), *Hippasteria phrygiana* (Cusion star). **Chordata:** *Molva molva* (Ling), *Sebastes* sp (Red fish, rock fish), *Helicolenus dactylopterus* (Rosefish), Gadiformes sp. **Bryozoa:** *sp* sp.

Sediment Description
Gravelly muddy sand with varying densities of shell fragments

Conspicuous Fauna
Cnidaria: *Pennatula phosphorea* (Phosphorescent sea pen), *Virgularia mirabilis* (Slender sea pen), *Urticina felina* . **Arthropoda:** *Paguridae sp.* . **Echinodermata:** *Asterias rubens* (Common starfish), *Astropecten irregularis* (Sand star), *Gracilechinus acutus* , *Echinocardium cordatum* (Heart Urchin or Sea potatoe). **Chordata:** *Molva molva* (Ling).

Sediment Description
Gravelly muddy sand and deposits of *Mytilus edulis*.

Conspicuous Fauna
Porifera: *Axinella sp.* . **Cnidaria:** *Metridium senile* (Plumose Anemone), Actiniaria sp, Hydrozoa sp. **Echinodermata:** *Hippasteria phrygiana* (Cusion star). **Chordata:** *Molva molva* (Ling), Actinopterygii sp, *Helicolenus dactylopterus* (Rosefish).

Sediment Description
Gravelly sand with varying densities of shell fragments

Conspicuous Fauna
Annelida: *Polychaeta sp.* . **Arthropoda:** *Paguridae sp.* . **Mollusca:** *Mytilus edulis* (Blue Mussel), *Buccinum sp.* . **Echinodermata:** *Astropecten irregularis* (Sand star), *Hippasteria phrygiana* (Cusion star), *Luidia ciliaris* (seven armed starfish), *Gracilechinus acutus* . **Chordata:** *Helicolenus dactylopterus* (Rosefish).

Sediment Description
Slightly grvaelly muddy sand

Conspicuous Fauna
Cnidaria: Actiniaria sp, *Pennatula phosphorea* (Phosphorescent sea pen), *Virgularia mirabilis* (Slender sea pen), *Urticina felina* . **Annelida:** *Polychaeta sp.* . **Echinodermata:** *Gracilechinus acutus* , Ophiurida sp. **Chordata:** *Helicolenus dactylopterus* (Rosefish).

Sediment Description
Gravelly muddy sand with rare shell fragments

Conspicuous Fauna
Cnidaria: *Pennatula phosphorea* (Phosphorescent sea pen), *Virgularia mirabilis* (Slender sea pen), *Urticina felina* . **Annelida:** *Polychaeta sp.* . **Echinodermata:** *Asterias rubens* (Common starfish), *Gracilechinus acutus* . **Chordata:** *Helicolenus dactylopterus* (Rosefish).

Figure 3-4 **Seabed Photography from the Cormorant Alpha Environmental Baseline Survey Area (Benthic Solutions Ltd, 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 150 m at the Cormorant Alpha platform. 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*. 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

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).

3.2.2 Benthos

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 (i.e. sediment or 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 most recent environmental baseline survey at Cormorant Alpha (Benthic Solutions, 2019)., macrofaunal analysis at a station level found that the number of species was highly variable across the survey area with lower species richness found closer to the Cormorant Alpha platform. This spatial pattern in diversity is considered a classic response to point-source organic pollution, with a peak of opportunistic species occurring close to the platform, followed by a rapid increase in diversity at distances >200m from the point source (Davies *et al*., 1984). A series of negative correlations were noted between species richness and a suite of heavy metals (As, Ba, Cd, Cr, Cu, Pb, Hg, Ni, Z), which again relates to the heavy metal contamination close to the platform. The high levels of metals such as As and Cd within the cuttings pile and close to the platform resulted in a reduction in the number of species (Benthic Solutions, 2019).

The macrofauna within the Cormorant Alpha survey area was variable with different species dominating at the sediment close to the platform compared to the sediment sampled further afield. An abundance of the taxa *Nematoda*, *Capitella*, *Nereimyra punctata*, *Cirratulus cirratus*, *Ophryotrocha*, *Nereis zonata* and *Thyasira sarsii* were found at stations within the cuttings pile, and to a lesser extent at the three stations between 100 m - 125 m east (CA_ 09), southeast (CA_ 01), and west (CA_ 04) of the Platform. Such taxa are most frequently associated with post-drilling contaminants and/or organic enrichment gradients as evidenced in the survey area with the highest abundance of the pollution-tolerant taxa found close to the platform (Benthic Solutions Ltd, 2019).

As previously discussed in Section 3.2, coarse material in the form of drill cuttings and relic *Mytilus edulis* shells was a common component of the sediments at stations within 125m of the CA platform, providing a hard substrate for colonisation by sessile epifaunal species (Benthic Solutions Ltd, 2019).

Free-swimming megafauna was limited to only a few species, being mainly dominated by members of the order Gadiformes but did include the presence of monkfish (*Lophius piscatorius*; Benthic Solutions Ltd, 2019.

3.2.3 Potential sensitive habitats and species

The closest protected area is the Pobie Bank Reef SAC, located approximately 64 km to the south-west of the Cormorant Alpha platform (Figure 1-1). The Pobie Bank Reef SAC has been designated due to a combination of stony and bedrock reef, with very large, rugged bedrock outcrops present in the central section of the reef. The reef provides a habitat for encrusting coralline algae, cup sponges, and bryozoans in the shallower areas; and small erect sponges, cup corals and brittlestars (*Ophiuroidea)* in the deeper areas. Harbour porpoise (*Phocoena phocoena*), grey (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) are also known to be present at the Pobie Bank Reef SAC.

Studies have shown that the deep-water coral *Desmophyllum pertusum* (formerly, *Lophelia pertusa*) is widely distributed and occurs on all the offshore banks of the north-east Atlantic, although it is comparatively rare on the upper continental slope and shelf edge to the west and north of Scotland (Wilson, 1979). Although *D. pertusum* may be present in the Cormorant Alpha platform area, the majority of *D. pertusum* communities are located in water depths below 200 metres and as such it unlikely to be present in significant numbers.

Scottish Natural Heritage (SNH) and the JNCC have been working together to develop a prioritised list of marine habitats and species in Scotland's seas, known as Priority Marine Features (PMFs). The draft list of PMFs contains 80 habitats and species which are considered to be of particular importance in Scotland's seas (JNCC, 2013).

During the most recent environmental baseline surveys (Benthic Solutions Ltd, 2019), a review of the ground-truthing data from area surrounding the Cormorant Alpha Platform indicated the presence of several potentially sensitive habitats and species, including:

- Submarine structures made by leaking gases, such as methane-derived authigenic carbonates (MDAC), an Annex I Habitat;
- Burrowing megafauna communities, listed under the UK Biodiversity Action Plan (BAP) and the OSPAR list of threatened and/or declining species and habitats);
- Ocean quahog *Arctica islandica*, in the OSPAR list of threatened and/or declining species and habitats.

Occasional depressions resembling unit pockmarks have been recorded throughout the survey area. The SSS and bathymetry data also revealed numerous small depressions approximately 20 cm - 30cm in depth and up to 1 m across surrounding the Cormorant Alpha platform. Review of the sidescan sonar and multibeam echosounder data illustrated the majority of seabed depressions were located within 250 m and in the north-east to south-east region of the Platform. However, no Annex I habitat such as MDAC was noted in the underwater footage acquired within the Cormorant Alpha survey area (Benthic Solutions Ltd, 2019).

Evidence of bioturbation and burrowing megafauna communities were present in the photographic data at two stations sampled between 250 m - 500 m northeast and northwest of the Cormorant Alpha Platform. Sea-pen species such as *Virgularia mirabilis* were noted in the sieved grab samples at some stations. In order for the habitat to be classified as 'Seapen and burrowing megafauna communities' the presence of burrowing macrofauna is an essential element, while seapens (e.g. *V. mirabilis*, *P. phosphorea* and *Funiculina quadrangularis*) may, and by extension may not, be present. According to JNCC (2020) guidance, the key determinant for classification of 'Sea-pen and burrowing megafauna communities' is the presence of burrowing species or burrows at a SACFOR density of at least 'frequent'. The density of small burrows was recorded as 'occasional' on the SACFOR scale across the two transects sampled around the CA platform, but no large burrows were observed. The habitat did not meet all criteria to be classified under the OSPAR and UK BAP-listed burrowing megafauna communities.

A single ocean quahog was identified during the taxonomic analysis at station CA_EBS_02 (200 m southeast of the Cormorant Alpha Platform) with a further juvenile specimen found at station CA_EBS_05 (200 m south-west). There was no evidence of distinct *A. islandica* siphons at the seabed on any of the video footage or still photographs and no individuals were noted on the PL113 pipeline route (Benthic Solutions Ltd, 2019). Only one individual was recorded at Cormorant Alpha during the 2013 survey (Fugro, 2014), providing further evidence that the species is not expected to occur in the Cormorant Alpha Decommissioning area in significant numbers.

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 proposed decommissioning project for the Cormorant Alpha 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 3-1.

Table 3-1 Fisheries Sensitivities within ICES Rectangle 51F1 (Coull *et al.*, 1998 and Ellis *et al.*, 2012)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Blue whiting	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
Haddock	N	S*N	S*N	S*N	SN	N	N	N	N	N	N	N
Herring	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
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Norway pout	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Saithe	S*	S*	S	S								
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	SN	SN	SN	SN	SN	N	N	N	N	N	N

S = Spawning, N = Nursery, J = Juveniles, Blank = No data, Species = High nursery intensity as per Ellis *et al*., 2012, Species = High intensity spawning as per Ellis *et al*., 2012.

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; *Ammodytidae sp*) have very specific habitat requirements, and therefore their spawning grounds are relatively limited and potentially vulnerable to seabed disturbance and change.

The Cormorant Alpha platform (in the context of ICES Rectangle 51F1) is within an area of spawning ground for cod (*Gadus morhua*); January – April [peak spawning February – March], haddock (*Melanogrammus aeglefinus*; February to May [peak spawning February – April]), Norway pout (*Trisopterus esmarkii;* January to April [peak spawning February – March]), saithe (*Pollachius virens;* January to April [peak spawning January – February]) and whiting (*Merlangius merlangus*;

February to June) (Coull *et al.*, 1998; Ellis *et al.*, 2012). Norway Pout exhibit high concentration spawning grounds in the vicinity of the Cormorant Alpha platform, as reported by Ellis *et al.* (2012) (Table 3-1; Figure 3-5).

The Cormorant Alpha platform is also a potential nursery ground for haddock, Norway pout, whiting, blue whiting (*Micromesistius poutassou)*, European hake (*Merluccius merluccius)*, herring (*Clupea harengus)*, ling (*Molva molva*), mackerel (*Scomber scombrus)* and spurdog (*Squalus acanthias)*. Blue whiting is the only species with a high nursery intensity ground in the Cormorant Alpha platform area while other species have a lower or undetermined nursery intensity (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 3-6 and Figure 3-7.

Aires *et al.,* (2014) provided modelled spatial representations of the predicted distribution of 0 age group fish (fish in the first year of their life) aggregations. These do not represent 'nursery grounds' as described in Coull *et al.*, (1998) and Ellis *et al.*, (2012), as nursery grounds can comprise a larger spread of ages and sizes. With this caveat in mind, the modelling indicates the presence, in medium densities, of juvenile fish (less than one years old) for two species within Block 211/26. This includes blue whiting and European Hake. All other species were low.

Most fish are known to produce pelagic eggs with the exception of herring and sandeels, which are both benthic spawners. Neither species is reported to spawn within Block 211/26 or ICES rectangle 51F1, where the Cormorant Alpha platform is located, although sandeel spawning grounds can be found approximately 10 km to the south of the Cormorant Alpha platform (Figure 3-5; Coull *et al*, 1998; Ellis *et al.*, 2012).

The following species listed above are also listed as Scottish PMF and are considered as of natural heritage importance: blue whiting, ling, mackerel, Norway pout, spurdog, herring, saithe, whiting and cod (SNH, 2016). Norway pout, saithe, whiting, blue whiting, hake, herring and mackerel are also on the International Union for Conservation of Nature (IUCN) Red List (although listed as species of 'least concern') (IUCN, 2018), and all, except for saithe, on the Scottish Biodiversity List, which identifies species of most importance for biodiversity conservation in Scotland (SNH, 2013a). Cod, spurdog and haddock are reported as 'vulnerable' on the IUCN Red List and are also listed on the Scottish Biodiversity List (IUCN, 2018; SNH, 2013a). Ling is also on the Scottish Biodiversity list (SNH, 2013a).

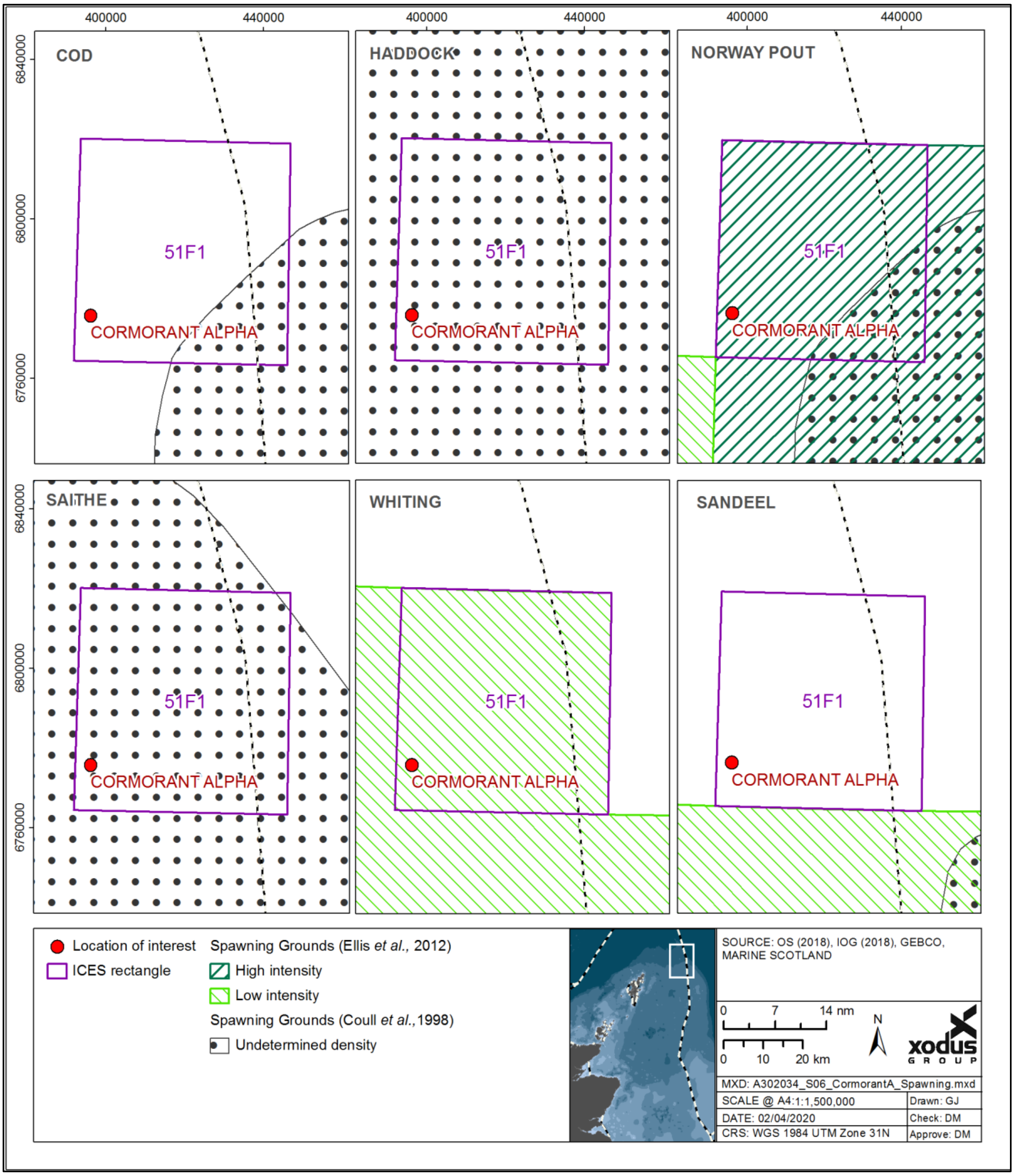

Figure 3-5 **Potential Fish Spawning Grounds**

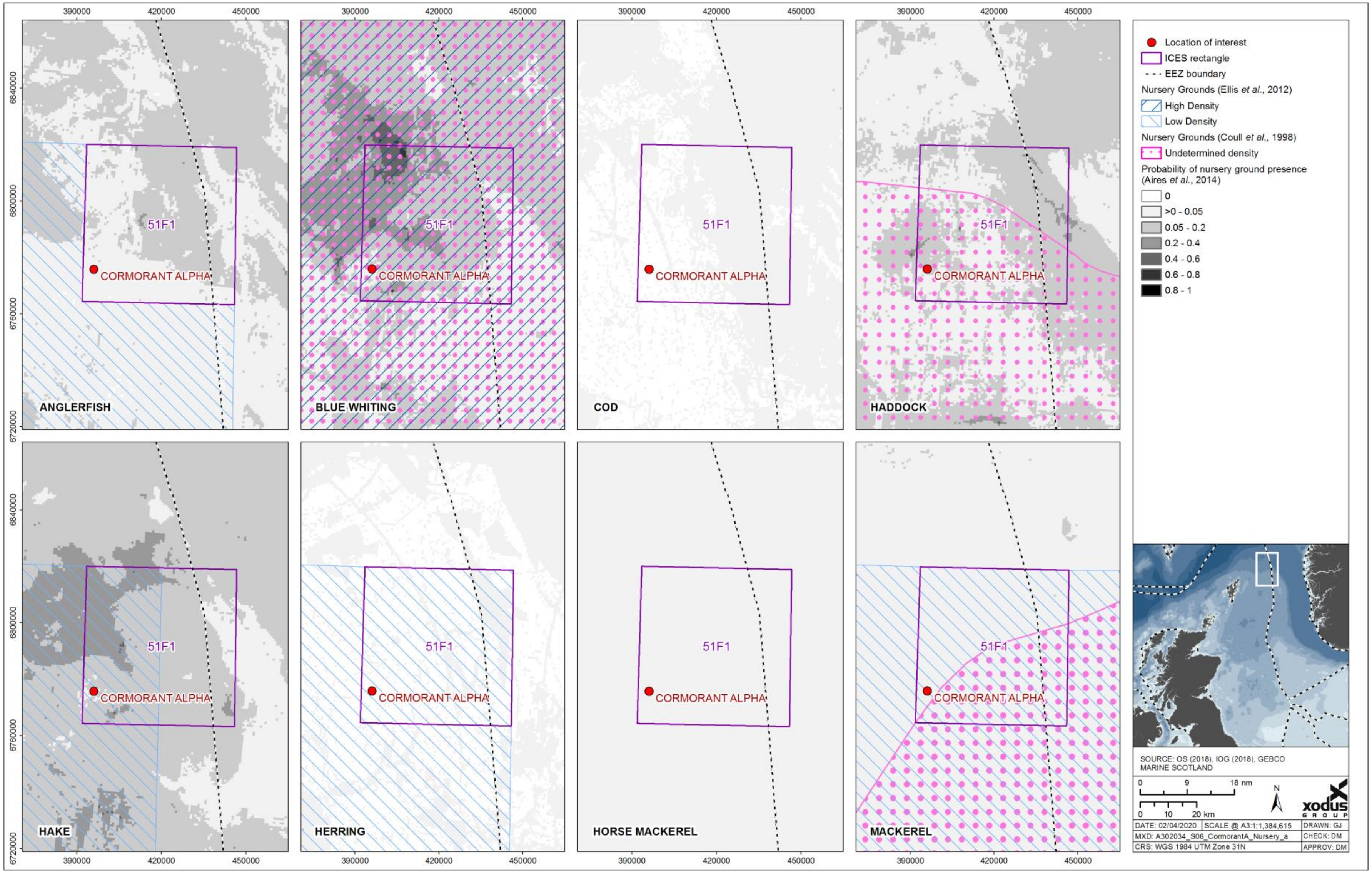

Figure 3-6 Potential Fish Nursery Habitats adapted from Aires *et al.* (2014) (1 of 2)

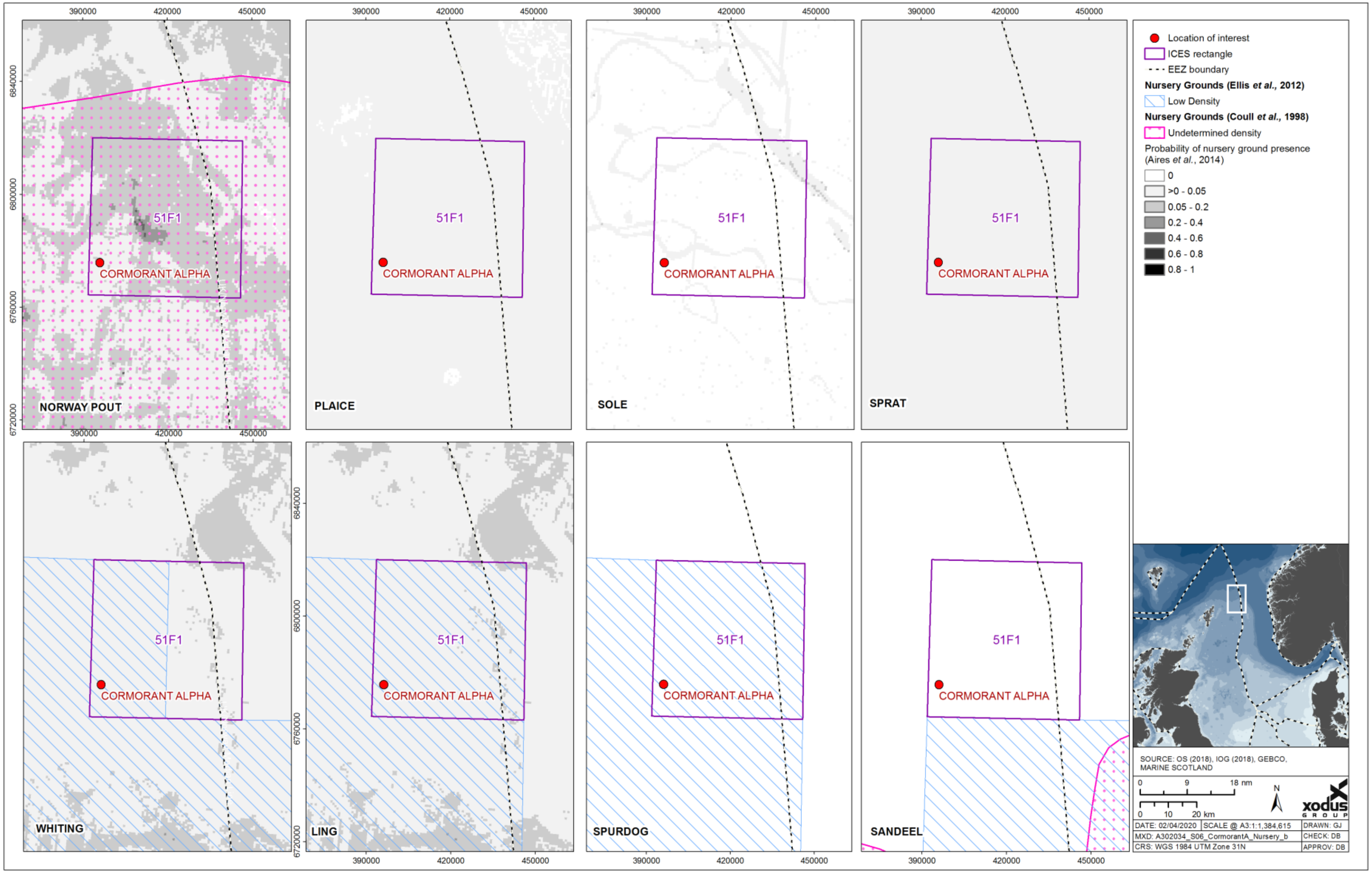

Figure 3-7 **Potential Fish Nursery Habitats adapted from Aires *et al.* (2014) (2 of 2)**

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 Central North Sea (CNS) and 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 Cormorant Alpha platform is located within or in the vicinity of a wider area of aggregation (or hotspots) for northern fulmar, European storm-*petrel Hydrobates pelagicus*, northern gannet, Arctic skua *parasitic jaeger*, long-tailed skua *Stercorarius longicaudus*, great skua *Stercorarius skua*, black-legged kittiwake, great black-backed gull *Larus marinus*, common guillemot, 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).

Breeding birds have been known to build nests on platforms (topsides and jackets). All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats) 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's approach to bird management is covered in Table 5-1.

Table 3-2 Seabird Oil Sensitivity in Block 211/26 and Surrounding Vicinity (Webb *et al.*, 2016)

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
210/25	5	5	5	5*	N	5*	5	5	5	5*	5*	5
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
210/30	5	5	5	5*	5*	5	5	5	5	5*	5*	5
211/26	**5**	**5**	**5***	**5***	**5**	**5**	**5**	**5**	**5**	**5***	**5***	**5**
211/27	5	5	5*	5*	5	5	5	5	4	4*	5*	5
002/5	5	5	5	5*	5*	5	5	5	5	5*	5*	5
003/1	5	5	5	5*	5*	5	5	5	5	5*	5*	5
003/2	5	5	5	5*	5*	5	5	5	4	4*	5*	5
Key	Extremely High		Very High		High		Medium		Low		No Data	
* in light of coverage gaps, an indirect assessment of SOSI has been made												

The Seabird Oil Sensitivity Index (SOSI) (Webb *et al.*, 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution. It is an updated version of the Oil Vulnerability Index (JNCC, 1999) as it uses survey data collected between 1995 and 2015 and includes an improved method to calculate a single measure of seabird sensitivity to oil pollution. Overall, seabird sensitivity to oil pollution in the region of the Cormorant Alpha platform is considered low (score of 5) from January to August and medium from September to December (Table 3-2).

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, white-beaked dolphin, white-sided dolphin and minke whale have been recorded in the vicinity of the Cormorant Alpha platform (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, minke whale and white-sided dolphin were the most abundant species recorded in the survey block covering the Cormorant Alpha platform area, with specific densities listed in Table 3-3 (Hammond *et al.*, 2017). This does not discount other species from occurring within the area, however, there is insufficient data for these species to provide abundance estimates (Hammond et al., 2017). Gervais beaked whale has also been recorded within the survey block, however, there was not sufficient data for this species to provide abundance estimates (Hammond *et al.*, 2017).

Table 3-3 Densities of Cetaceans in the Cormorant Alpha Platform Area (Hammond *et al.*, 2017)

Species	Density of cetaceans in the survey Block U (animals per km^2)
Harbour porpoise	0.321
Minke whale	0.015
White-sided dolphin	0.003

3.2.6.2 Seals

Two species of seal live and breed in the UK, namely the grey seals *Halichoerus grypus* and harbour seal *Phoca vitulina*, both of which are protected under Annex II of the EC 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 within a 40–50 km range of their haul-out sites (SCOS, 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 Cormorant Alpha platform is located approximately 103 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 data published by the Sea Mammal Research Unit (SMRU), which are provided in the NMPI (2019). The data reports the presence of grey and harbour seals in UKCS Block 211/26 as between 0 - 1 per 25 km^2 (Figure 3-8).

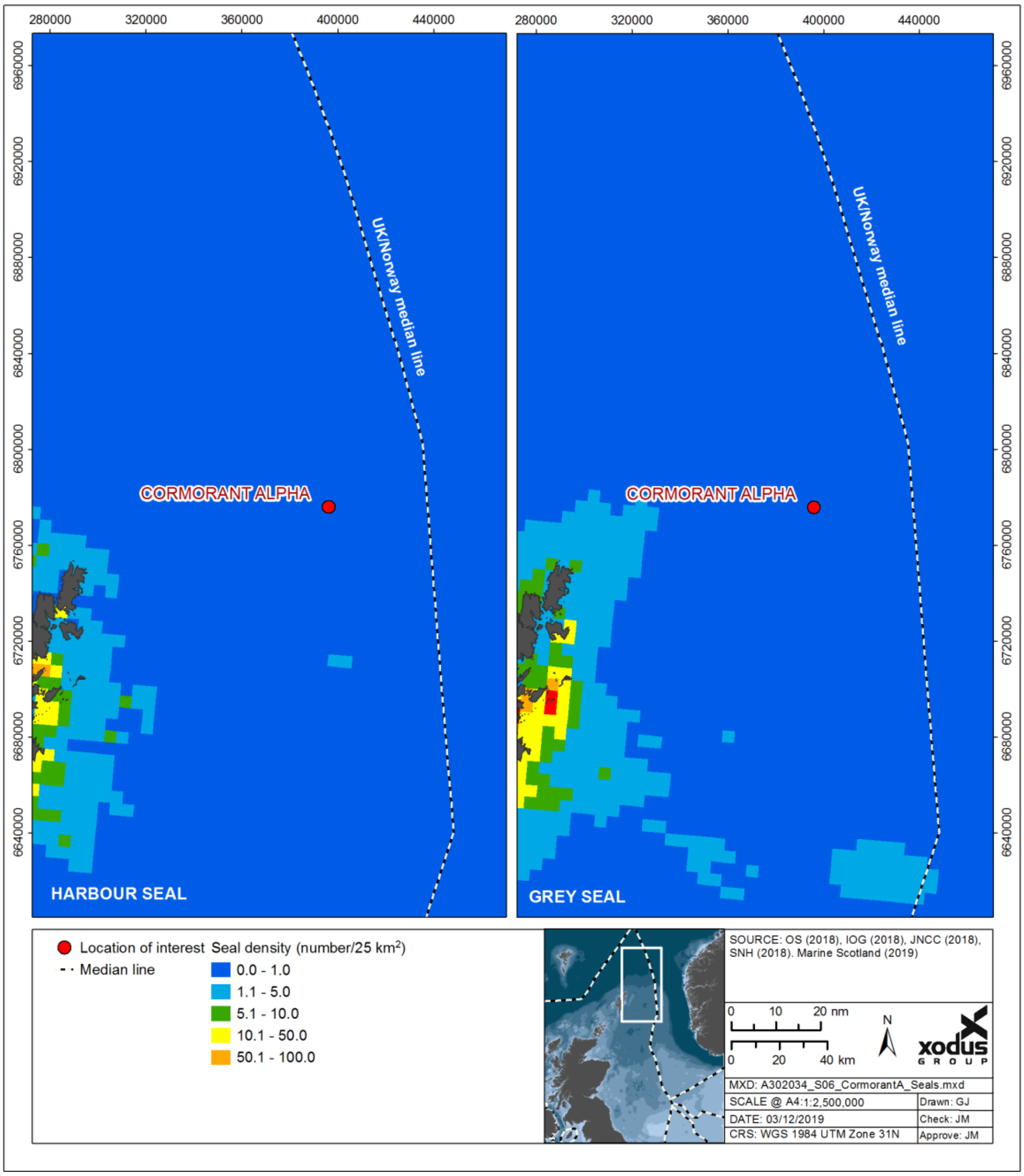

Figure 3-8 Seal Densities around the Cormorant Alpha Platform (per 25 km^2)

3.3 Conservation

3.3.1 Offshore conservation

There are no Nature Conservation Marine Protected areas (NC MPAs), Special Protection areas (SPAs), SAC, or Demonstration and Research Marine Protected Areas (DR MPA) within 40 km of the Cormorant Alpha platform (NMPI, 2019; Figure 1-1).

The closest SAC is the Pobie Bank Reef, located approximately 64 km south west of the Cormorant Alpha platform area (Figure 1-1). The closest NC MPA to the Cormorant Alpha platform is Fetlar to Haroldswick, which lies approximately 104 km to the south-west

The seabed in UKCS Block 211/26 is within a wider area of 'subtidal sand and gravels' (NMPI, 2019), a seabed type designated as a 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).

3.3.2 Protected species

Four species listed under Annex II of the EC 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 Cormorant Alpha platform 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 Cormorant Alpha platform; the species are however likely, due to their mobile nature, to move away and not be adversely affected by the proposed Cormorant Alpha topsides decommissioning activities.

All species of cetacean recorded within the proposed operations area are listed as European Protected Species (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.

A. islandica is listed as PMF in Scottish waters (Tyler-Walters, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). The presence of the individuals in close proximity to the Cormorant Alpha platform is discussed in Section 3.2.3.

3.3.3 Onshore conservation

The Cormorant Alpha platform is located approximately 103 km from the northeast coast of Scotland. Due to this distance, no impacts to onshore conservation sites are expected from decommissioning activities in UKCS Block 211/26.

3.3.4 National Marine Plan

The Scottish National Marine Plan (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 Marine Plan areas. The proposed operations as described in this EA 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. 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 paid to the following policies:

3.3.4.1 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 Cormorant Alpha topsides decommissioning operations will be kept to a minimum as discussed in Section 5.0.

3.3.4.2 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 decommissioning operations will be kept to a minimum.

3.3.4.3 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 decommissioning operations will be kept to a minimum as discussed in Section 5.0.

3.3.4.4 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 Cormorant Alpha topsides decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

3.3.4.5 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 decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

3.3.4.6 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 decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

3.3.4.7 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 decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

3.3.4.8 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 topsides decommissioning activities adheres to the waste hierarchy (Figure 2-8) as discussed in Section 5.0.

3.3.4.9 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 take into account environmental and socio-economic constraints. TAQA will ensure that the onshore resources required for topsides deconstruction activities will be minimised, as discussed in Section 5.0.

3.3.4.10 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 topsides, 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 2015 to 2019 are considered here. The Cormorant Alpha platform is located in ICES rectangle 51F1, which in recent years has been targeted primarily for demersal species in terms of both landed weights and value.

Since 2016, landings of demersal fish have accounted for more than 96% of the total value. Landings of demersal fish accounted for more than 99% of the total landed weight in 2018, 2017 and 2016; in 2019 the proportion of pelagic catch increased slightly such that the demersal catch contributed 87% of the total. From 2016 to 2018, shellfish and pelagic species accounted for less than 1% of the value and the landed weight. By contrast, in 2015 there were significant pelagic species landings accounting for 73% of the live weight and 53% of the value. In 2019, the three most valuable species were saithe, cod, haddock and whiting. These species also had the largest contribution to the live weight landed that same year (Table 3-4).

In 2019, the live weight of demersal fish in ICES 51F1 (1,383 te) was moderate compared to surrounding ICES blocks such as rectangle 50F0, where demersal live weight reached 3,085 te (Scottish Government, 2020). To put the landings of 2019 into context, catches amounting to 493,075 te with a value of £767,721,934 were landed across the UK in 2019. Therefore, ICES rectangle 51F1 presents a relatively low contribution to the UK total, comprising 0.28% of the total tonnage landed and providing a 0.29% contribution to the total value of the UK commercial fisheries in 2019 (Table 3-4).

Figure 3-10 shows fishing intensity (hours) in the NNS around Cormorant Alpha based on vessel monitoring system (VMS) data (NMPi, 2021). Table 3-5 presents the fishing effort in ICES rectangle 51F1 between 2015-2019 and Figure 3-11 presents fishing effort (days) (by UK vessels >10m length) (NMPi, 2021). Fishing effort in ICES Rectangle 51F1 is dominated by demersal (trawl) activities and is relatively low in comparison to areas to the south and east. Fishing effort amounted to 191 days in ICES rectangle 51F1 in 2019, as detailed in Table 3-5. This represents a substantial increase in effort compared to the four preceding years, particularly compared to the 62 days spent fishing in 2016. Prior to 2019, effort for the 51F1 rectangle has been recorded as disclosive for all except the spring/summer months each year, indicating very low levels of fishing effort. In 2019, this trend became reversed with fishing effort apparent almost all year round, with the exception of June and July. In 2019 effort was highest in April and early-mid autumn. Trawls were the predominant gear type used in the ICES rectangle 51F1 over all the years, though in 2019 seine trawls were recorded albeit at a disclosive level (Scottish Government, 2020).

Table 3-4 Live Weight and Value of Fish and Shellfish from ICES Rectangle 51F1 from 2015-2019 (Scottish Government, 2020)

Species type	2019		2018		2017		2016		2015	
	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)	Live weight (te)	Value (£)
Demersal	1,205	2,136,673	846	1,381,095	545	824,054	482	709,207	525	724,269
Pelagic	175	59,457	1	637	ND	ND	<1	12	1,404	830,843
Shellfish	3	12,507	1	3,272	<1	1,711	<1	765	3	7,819
Total	**1,383**	**2,208,637**	**848**	**1,385,005**	**545**	**825,765**	**482**	**709,983**	**1,933**	**1,562,931**

Note: Annual weight and value of Fish and Shellfish in Scotland: “ND” = no data

Table 3-5 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
2015	D	D	D	5	13	47	D	D	D	D	-	D	102
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	18	19	D	-	131
2019	11	18	14	32	9	D	D	18	38	21	6	D	191

Note: Monthly fishing effort by UK vessels landing into Scotland: “-“ = 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 3-9 Average Landings (tonnes) and Values (£) of Demersal, Pelagic and Shellfish Fisheries by ICES Rectangle (2015-2019)

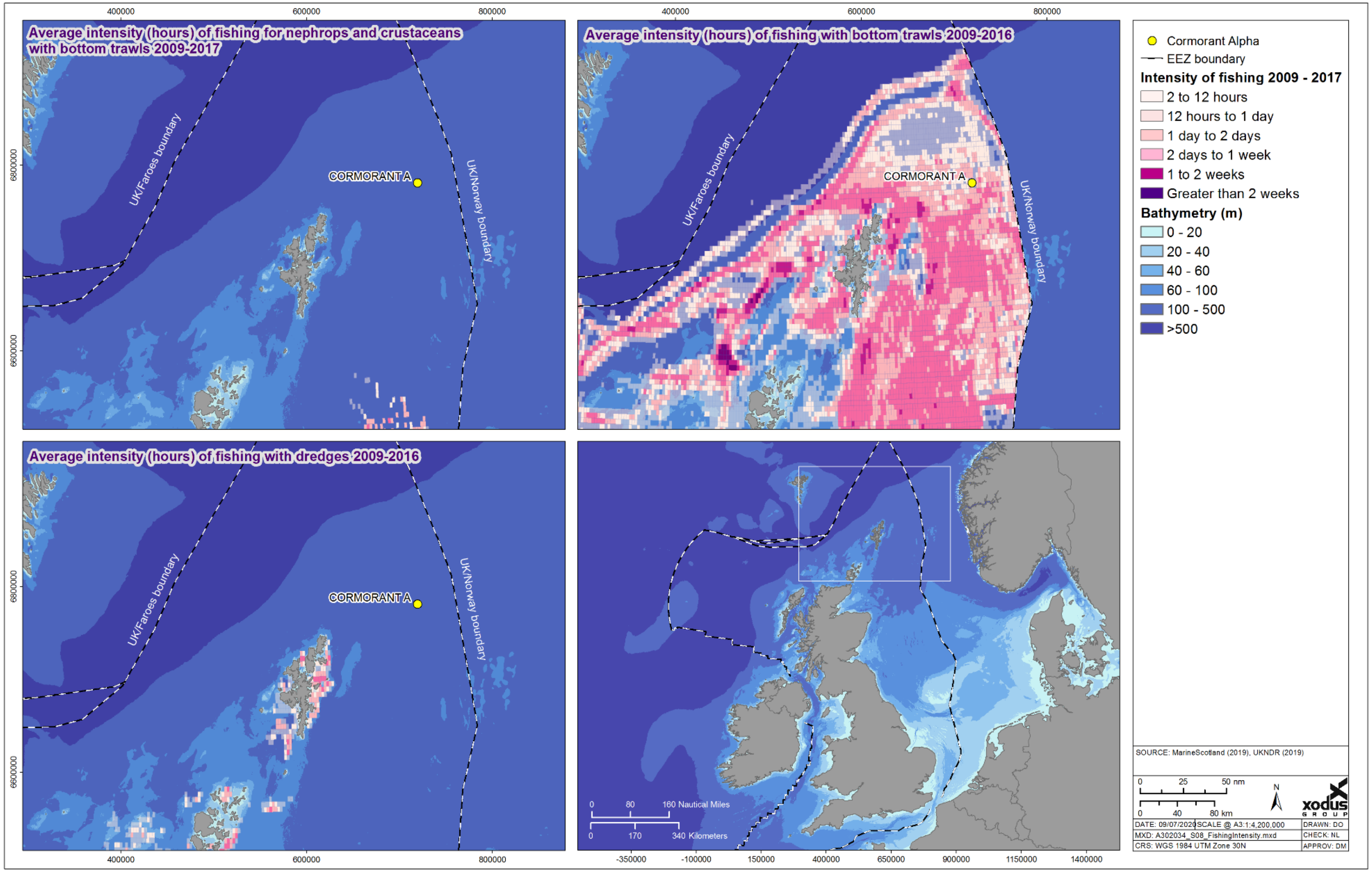

Figure 3-10 Fishing Intensity (hours) in the Region of the Cormorant Alpha Development Between 2009 – 2017 Grouped by Fishing Method

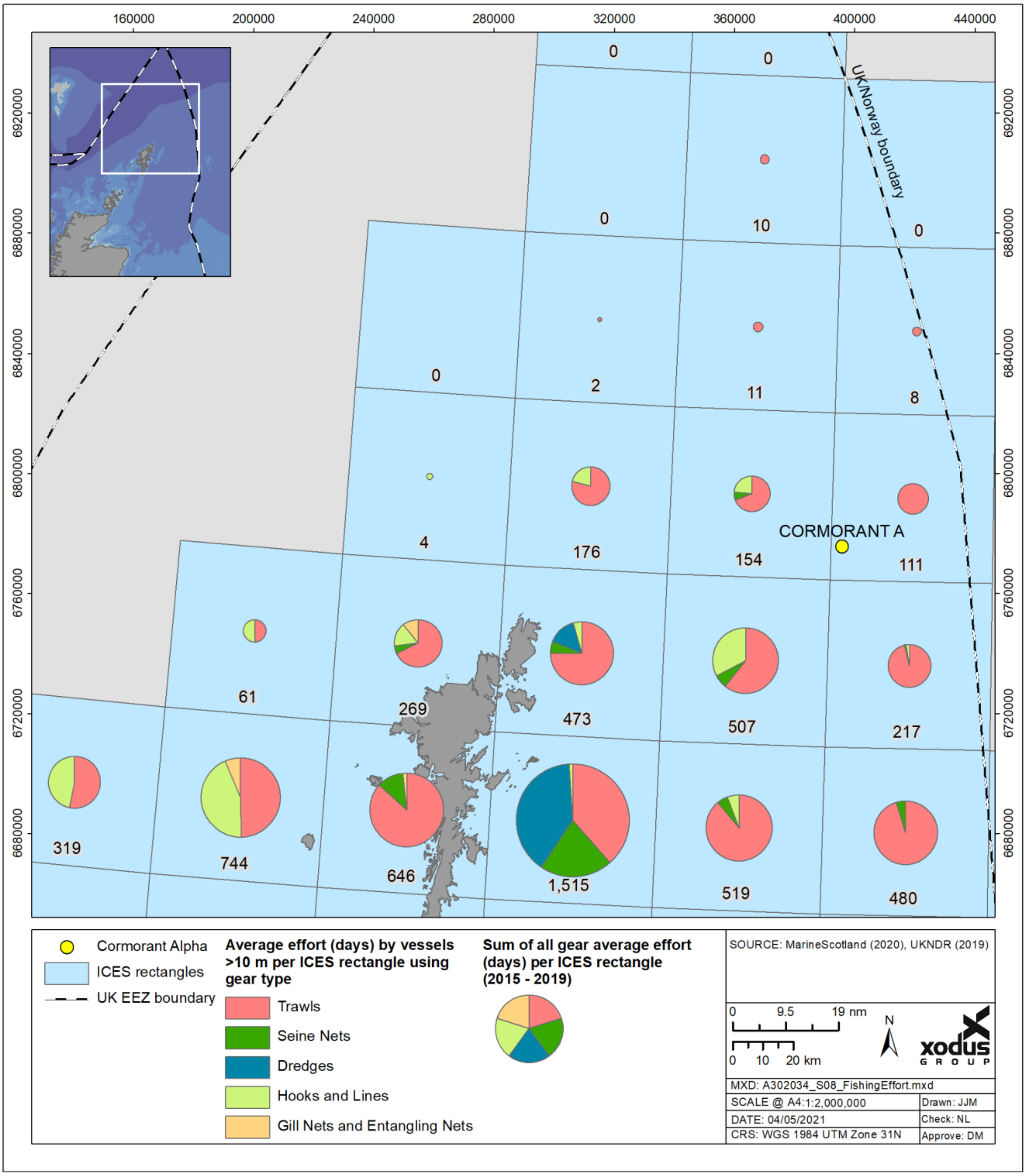

Figure 3-11 Fishing Effort (days) (by UK vessels >10m length) per ICES Rectangle for Demersal, Passive and Pelagic Gears (2015 – 2019)

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). Shipping activity is considered moderate in Block 211/26

(Oil and Gas Authority, 2016). The average weekly density of vessels (all combined) using automatic identification systems (AIS) data between 2012 and 2015 is 5-20 transits in the UKCS block 211/26, which is low compared to other areas in the North Sea (NMPI, 2019). Satellite data based on the AIS dataset from 2015, plotted in Figure 3-12, show 100 – 300 vessels transit through the area adjacent to the Cormorant Alpha platform annually (MMO, 2017). This can be attributed to platform-vessel support. The background vessel activity in this area generally ranges from 0 to 100 vessels annually.

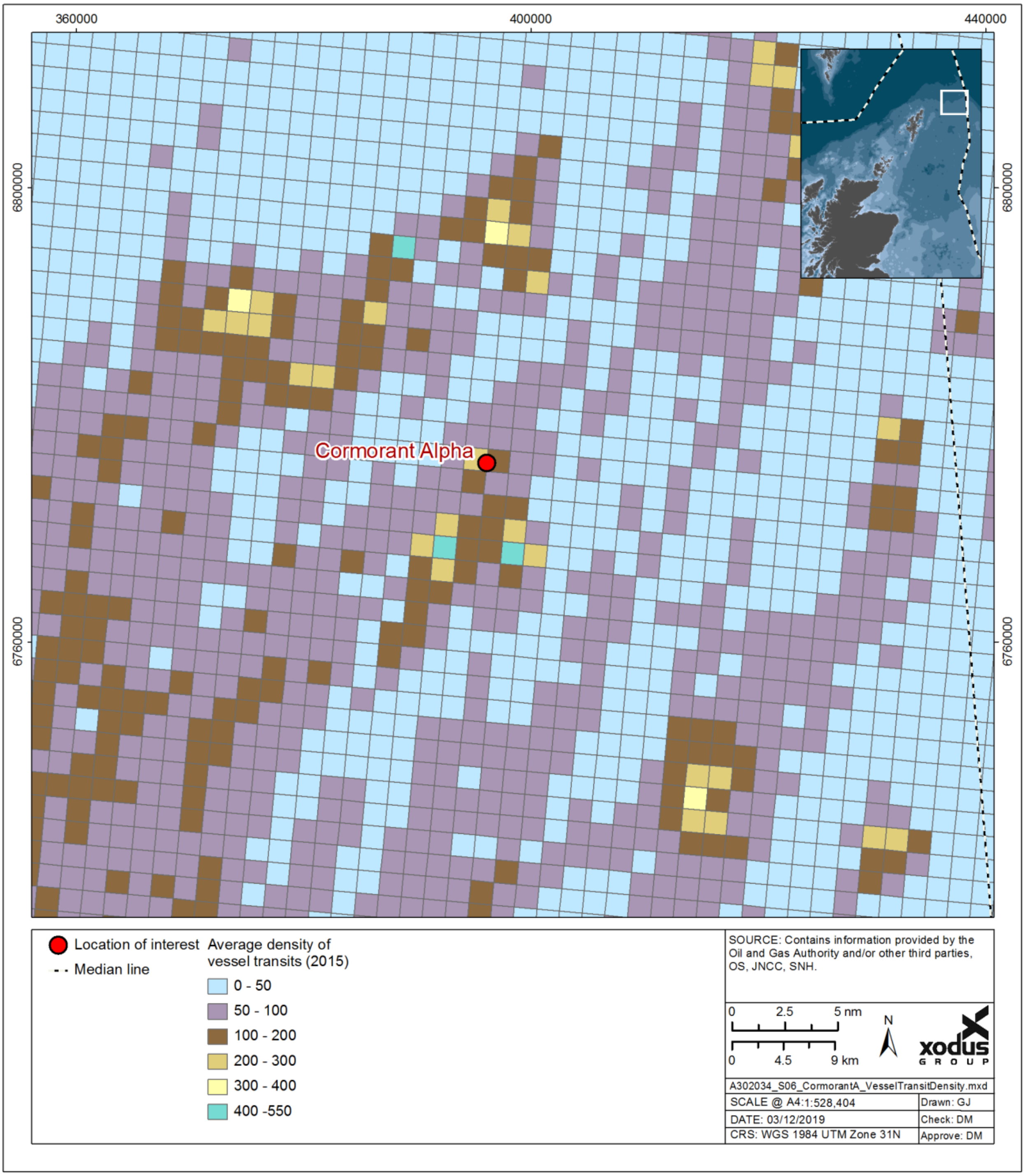

Figure 3-12 Annual Density of Vessel Transits (number of transits per 2 km^2) around Cormorant Alpha Platform in 2015 (MMO, 2017)

3.4.3 Oil and gas activity

There are a number of installations located within the vicinity of the Cormorant Alpha platform, as shown in Figure 3-13. Table 3-6 provides the distances in the vicinity (<40 km) of the Cormorant Alpha platform.

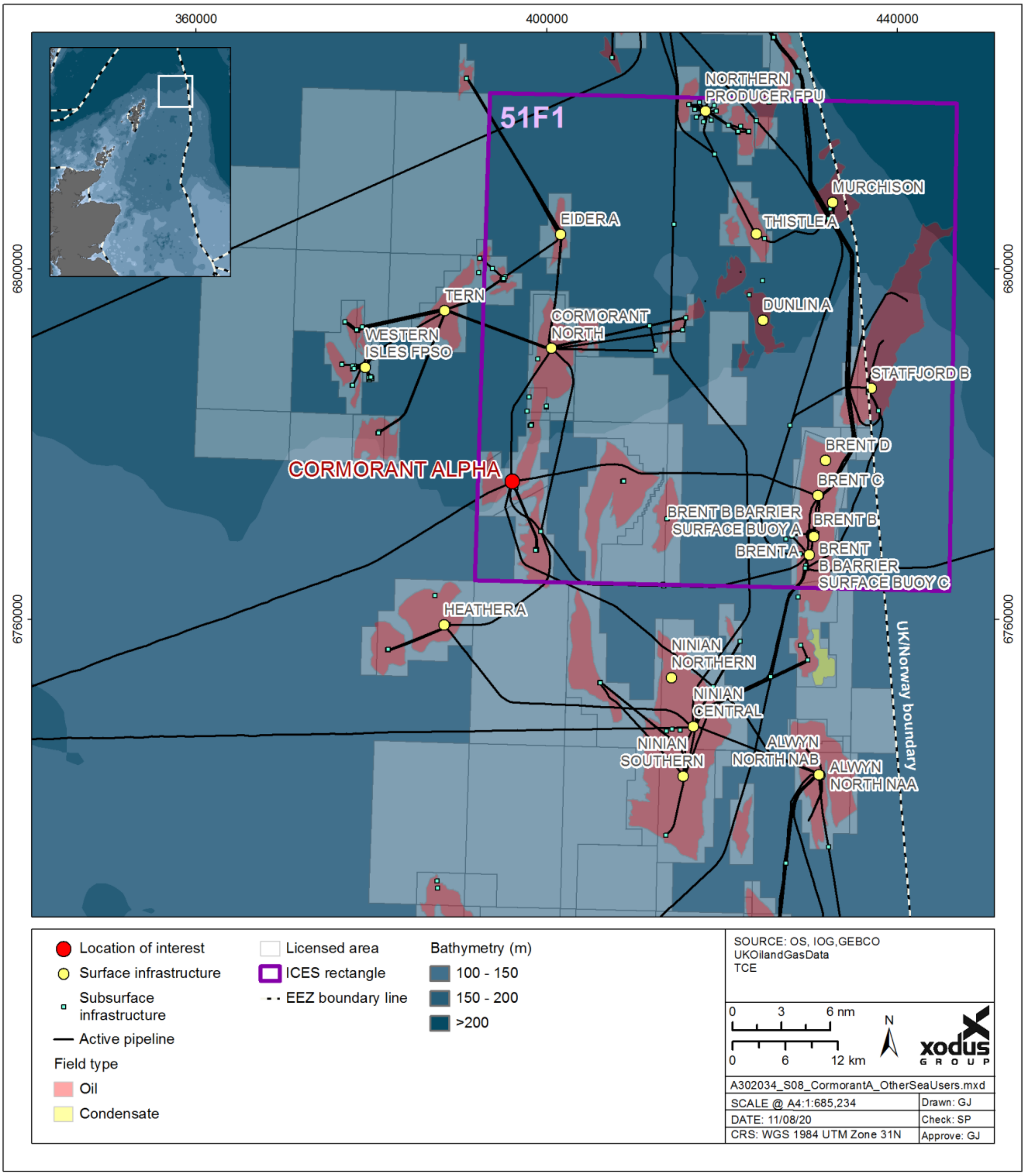

Figure 3-13 Other Users in the Vicinity of the Cormorant Alpha Platform

Table 3-6 Installations Located within 40 km of the Cormorant Alpha Platform

Installation	Distance from Cormorant Alpha (km)	Direction from Cormorant Alpha	Status
North West Hutton	13.0	northeast	Removed
North Cormorant	15.0	northeast	Active
Heather Alpha	18.0	southwest	Active
Tern	21.0	northwest	Active
Western Isles FPSO	21.0	northwest	Active
Eider Alpha	29.0	northeast	Active
Ninian Northern	29.0	southeast	Inactive
Dunlin Alpha	34.0	northeast	Inactive
Brent B Barrier Surface Buoy A	35.0	southeast	Active
Brent B Barrier Surface Buoy B	35.0	southeast	Active
Brent B Barrier Surface Buoy C	35.0	southeast	Active
Ninian Central	35.0	southeast	Active
Brent B Barrier Surface Buoy D	35.0	southeast	Active
Brent B	35.0	southeast	Topsides Removed
Brent B Barrier Surface Buoy E	35.0	southeast	Active
Brent A	35.0	southeast	Topsides Removed
Brent C	35.0	northeast	Active
Brent B Barrier Surface Buoy F	35.0	southeast	Active
Brent D	36.0	northeast	Topsides Removed
Brent Flare	37.0	southeast	Removed
Ninian Southern	39.0	southeast	Active
Thistle Alpha	40.0	northeast	Inactive

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 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;
    - Discharges to sea;
    - Underwater noise;
    - Resource use;
    - Onshore activities;
    - Waste;
    - Employment; and
    - Unplanned events.
- 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 5.0).
- For aspects which are considered potentially significant, evaluate significance of potential impacts against impact criteria definitions (Section 4.2.3 to section 4.2.5)
- For any potentially significant impact capture any potential mitigation and/or control measures to be used to further reduce any impact to 'as low as reasonably practicable' (ALARP).

4.1 Stakeholder Engagement

The initial consultation for the Cormorant Alpha topsides decommissioning has been largely based on sharing project expectations, approach and specific considerations with key stakeholders. This is summarised in Table 4-1.

Table 4-1 Stakeholder Consultation and Comments

Engagement	Outline response
National Federation of Fishermen's Organisations (NFFO)	
23rd April email to provide a high-level summary of the project scope and intent with an invitation for further engagement	No comment received
Scottish Fisherman's Federation (SFF)	
23rd April email to provide a high-level summary of the project scope and intent with an invitation for further engagement	SFF thanked TAQA for their early engagement and confirmed any further comments would be through the statutory consultation
Northern Irish Fish Producers Organisation	
23rd April email to provide a high-level summary of the project scope and intent with an invitation for further engagement	No comment received
Global Marine Systems Limited	
15th June email to provide a high-level summary of the project scope and intent with an invitation for further engagement	No comment received

4.2 EA Methodology

4.2.1 Overview

The decision process related to defining whether or not a project is likely to have a significant impact on the environment is the core principle of the environmental impact assessment process; the methods used for identifying and assessing potential impacts should be transparent and verifiable.

The method presented here has been developed 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 SNH in their handbook on environmental impact assessment (SNH, 2013b) 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 receptors

In order to make an assessment of potential impacts on the environment it was necessary to firstly characterise the different aspects of the environment that could potentially be affected (the baseline environment). The baseline environment has been described in Section 1.0 and is based on desk studies combined with additional site-specific studies such as surveys and modelling where required.

The EA process requires identification of the potential receptors that could be affected by the Cormorant Alpha topsides decommissioning (e.g. other users of the sea, water quality). High level receptors, where present, 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. is the impact expected to occur all year or during 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 4-2 - 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 4-2), it should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

Table 4-2 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 4-3 Type of Impact

Type of impact	Definition
Direct	Impacts that result from a direct interaction between the Cormorant Alpha topsides decommissioning project and the receptor. Impacts that are actually caused by the activities.
Indirect	Reasonably foreseeable impacts that are caused by the interactions of the Cormorant Alpha topsides decommissioning project 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 Cormorant Alpha topsides decommissioning project. Definition encompasses “in-combination” impacts.

Table 4-4 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 4-5 Geographical Extent of Impact

Geographical extent	Description
Local	Impacts that are limited to the area surrounding the Cormorant Alpha topsides decommissioning project 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 4-6 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 course of the Cormorant Alpha topsides decommissioning project. This definition also covers such impacts that occur on a planned or unplanned basis and those that may be described as 'periodic' impacts.

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 4-7. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement.

Table 4-7 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 4-8.

Table 4-8 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 4-7and Table 4-8 are used to define receptor vulnerability as per Table 4-9.

Table 4-9 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/ or specialists. Examples of receptor value definitions are provided in Table 4-10.

Table 4-10 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. 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 UK BAP 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 Cormorant Alpha 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 Cormorant Alpha 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 Cormorant Alpha 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 Cormorant Alpha 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 4-11. 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 4-11 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 Cormorant Alpha topsides decommissioning 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 5-1) 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 twelve potential impact areas. Eleven potential impacts were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. One impact (Accidental Events) was identified as needing further analysis. The potential impacts are tabulated in Section 5.1, together with justification statements for the screening decisions. TAQA's understanding of and approach to potential accidental events is outlined in Section 5.2.

5.1 Assessment of Potential Impacts

Table 5-1 Potential Impacts Considered for Assessment

Impact	Further Assessment	Management
Emissions to Air	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of the cessation of production. As such, emissions from operations and vessels associated with operation of the Cormorant Alpha topsides will cease. Reviewing historical European Union (EU) Emissions Trading Scheme data and comparison with the likely emissions from the proposed operations suggests that emissions relating to decommissioning will be small relative to those during production. The majority of emissions for the Cormorant Alpha topsides decommissioning can be attributed to 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.

Impact	Further Assessment	Management
		The latest available total annual CO_2 emissions estimate from oil and gas exploration and production is 13,200,000 tonnes (for 2018, Oil and Gas UK, 2019) and the latest (confirmed) total annual CO_2 emissions estimate for UK shipping is approximately 7,800,000 tonnes (for 2017, BEIS, 2019), giving a total of 21,000,000 tonnes of CO_2. The annual CO_2 emissions from the worst-case decommissioning option (Single Lift) is estimated to be 25,179 te (Appendix A), which will contribute less than 0.12% of the atmospheric emissions associated with UK offshore shipping and oil and gas activities. In comparison with CO_2 emissions associated with annual production operations at Cormorant Alpha, this figure amounts to approximately 18.80% in 2020 (133,897 te), 17.89% in 2019 (140,765 te) and 15.80% in 2018 (159,344 te). Considering the above, atmospheric emissions do not warrant further assessment.
Disturbance to 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 anchoring associated with the decommissioning of the topsides. Should this change following the commercial tendering process and an anchor vessel is required, any potential seabed impact would be assessed and captured in the Consent to Locate application, Marine Licence application and supporting Environmental Impact Assessment (EIA) justification within the Portal Environmental Tracking System (PETS). On this basis, no further assessment needs to be undertaken.
Physical Presence of Vessels in Relation to Other Users of the Sea	No	The presence of a small number of vessels for topsides decommissioning activities will be short-term in the context of the life of the Cormorant Alpha installation. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. The decommissioning of the Cormorant Alpha topsides is estimated to require up to six vessels, with a maximum of four on site at the platform location at any one time, depending on the selected method of removal. If applicable, Notices to Mariners will be made in advance of activities occurring. This may not be a requirement as decommissioning activities will only take place within the existing 500m safety exclusion zone. Stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations. Considering the above, temporary presence of vessels does not need further assessment.
Physical Presence of Infrastructure Decommissioned in situ in relation to Others Sea Users	No	As topsides will be fully removed and a temporary navigational aid will be installed on the substructure up until its subsequent removal, there will be no mechanism for associated long-term impact through physical presence. Upon completion of the removal of topsides the statutory safety exclusion zone will automatically be revoked. TAQA will engage with the relevant navigational authorities at the appropriate times in order to determine the necessary actions to minimise navigational risk

Impact	Further Assessment	Management
		Considering the above, no further assessment related to long term presence of infrastructure is justified.
Discharges to Sea (Short-term and Long-term)	No	Discharges from vessels associated with the decommissioning work are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. In addition, the topsides will be Drained, Flushed, Purged and Vented (DFPV) using the TAQA DFPV philosophy prior to any decommissioning activities commencing. There would be no planned discharges from the topsides. Any residual remaining material will be in trace levels/volumes following the DFPV regime and therefore would not pose any significant risk. The rundown lines connect the topsides facilities with the (disused) storage cells. Planned hydrocarbon/ chemical discharges during the isolation of the rundown and vent line pipework within Leg C4 (Figure 2-1) will be covered by oil discharge permits and chemical permits under the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 and the Offshore Chemicals Regulations 2002 (as amended), respectively. The process to break containment of the rundown lines will be internal to the legs. A small amount of metal waste (<100 kg) may be produced during the breaking of containment. This will be collected and returned to shore along with the topsides waste inventory. Breaking of containment will enable the installation of launcher cans and the environmental isolation of the rundown lines. As the topsides will be fully removed and the rundown lines will be isolated, there will be no potential for any discharges in the longer term from the facilities. The potential for any accidental release is assessed in the 'Accidental Events' section of this Table. Considering the above, discharges to sea from the topsides will not be assessed further.
Underwater Noise Emissions	No	Cutting required to remove the topsides will take place above the waterline, and there will be no other noise-generating activities. Vessel presence 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	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 worst-case (Single Lift option) total energy usage for the project is 284,310 GJ (Appendix A). Material will be returned to shore as a result of project activities, and expectation is to recycle at least 97% 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.

Impact	Further Assessment	Management
		Considering the above, resource use does not warrant further assessment.
Onshore Activities	No	The onshore waste management process is likely to have negligible consequences for the human population in terms of an increase in dust, noise, odour and reduced aesthetics. 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 (e.g. permitted capacity to accept the relevant waste streams). This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact. TAQA understands that dismantling sites will also require consents and approvals from onshore regulators such as the Scottish Environment Protection Agency (SEPA) or the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work.
Waste	No	It is waste management, not generation, that is the issue across DPs, with capacity to handle waste within the UK often cited as a stakeholder concern. The limited waste to be brought to shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy as part of the project Active Waste Management Plan, which will be developed in collaboration with SEPA and other regulatory bodies, using approved waste contractors. 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 assessment is not warranted for this aspect.

Impact	Further Assessment	Management
Unplanned Events	Yes – See Section 5.2 for more details	Prior to topside preparation and removal, the topsides system will have been through the DFPV process, the rundown lines which connect the topsides to the storage cells will have been isolated. Release of a live hydrocarbon and chemical inventory is therefore not a relevant impact mechanism. Any discharges to sea associated with rundown line isolation activities will also be covered by oil discharge permits and chemical permits under the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005 and the Offshore Chemicals Regulations 2002 (as amended). The lift vessel to be used for removing the topsides is likely to have the largest fuel inventory of the few vessels involved in the decommissioning activities. However, the inventory of an HLV tank is likely to be less than the worst-case loss of inventory (10,856 m^3) of crude from the CGBS cells during decommissioning activities. In addition, the vessel's fuel inventory is likely to be split between several fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory (the largest tank holds 720 m^3). The potential impact from fuel inventory release would be significantly less than that modelled for the loss of inventory scenario (Section 5.2), and vessel-related spills can be scoped out of further analysis. Any dropped objects of significant size will be removed (i.e. those reported to OPRED via PON2 notifications). Any small non-significant objects will be marked and will be within the safety zone of the substructure. These dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the substructure decommissioning activities. Although unlikely, the dropping of a large object during decommissioning activities (i.e. during heavy lifts) onto the CGBS storage cells could lead to a release of the cell contents (hydrocarbons, water, scale, sediments) to sea. Considering this, the impacts of dropped objects colliding with the CGBS and the consequent potential for release of the cell contents during decommissioning activities will be assessed in Section 5.2. Based on the results of a recent study (Intertek, 2018), the impact of a dropped object on the existing cuttings pile is not anticipated to have an impact beyond its existing footprint, on and around the CGBS. Any impacts relating to long-term structural stability and potential collapse will be assessed as part of the Cormorant Alpha substructure EA. Further assessment is therefore no warranted for dropped objects and cuttings pile aspects.
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 not identified any nesting birds or nests on the Cormorant A installation to date and are aware that this may change as operations wind-down. TAQA will undertake surveys to determine the presence

Impact	Further Assessment	Management
		of birds nesting on their platforms closer to the point of disembarkation and regularly thereafter until final removal. TAQA may employ a range of non-lethal deterrents to prevent birds nesting if required. These methods will continue throughout the duration of decommissioning operations and will be outlined within a TAQA bird management strategy document which will be in line with current legislation and guidance. TAQA will engage with OPRED to agree any further licensing requirements, as appropriate. This process will form part of future licensing applications for subsequent offshore applications and as such is not assessed here further.

Based on the initial screening (Section 5.0), eleven of the potential impacts do not require further assessment as any potential impact will be short in duration and of low impact severity, therefore pose no significant risk to the environmental or societal receptors assessed. Given the potential for cell contents release associated with dropped objects on the CGBS (identified under 'Accidental Events) this has been assessed further in Section 5.2.

To ensure that non-significant impacts remain as described above, TAQA will follow routine environmental management activities, for example appropriate project planning, contractor management, vessel audits, activity permitting and legal requirements to report discharges and emissions, such that the environmental and societal impact of the decommissioning activities will be minimised. The activities scoped out of further assessment in Table 5-1 are not likely to result in significant impacts to the environment or other sea users either offshore or onshore, for example shipping traffic, fishing or seabed communities, if appropriate mitigation and control measures are effectively applied. A summary of the proposed control and mitigation measures is shown in Table 5-2. Separate mitigation measures for the Accidental Events are provided in Section 5.2.6

Table 5-2 Proposed Mitigation and Control Measures

General and Existing
• Lessons learnt from previous decommissioning scopes will be reviewed and implemented as appropriate; • Vessels will be managed in accordance with TAQA's existing marine procedures; • The vessels' work programme will be optimised to minimise vessel use; • The 500 m safety exclusion zone will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where decommissioning activities are taking place; • All topsides facilities will be subject to a drain, flush, purge and vent philosophy that will be assessed and applied for via PETS prior to decommissioning, to ensure minimal residual contaminants are present in the infrastructure before removal operations commence; • The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of large hydrocarbon releases and to mitigate their impacts should they occur; • All vessels undertaking decommissioning activities will have an approved Shipboard Oil Pollution Emergency Plan (SOPEP); • Existing processes will be used for contractor management to assure and manage environmental and social impacts and risks; • TAQA's management of change process will be followed should changes of scope be required; • Careful planning, selection of equipment, management and implementation of activities;

• A debris survey will be undertaken once decommissioning activities for the field as a whole are fully completed. Any debris identified as resulting from oil and gas activities will be recovered from the seabed where possible; and • Similarly, overtrawl assessments conducted as assurance of a safe seabed for other sea users will be undertaken (in discussion with OPRED) once decommissioning activities for the Cormorant Alpha area as a whole have been completed.
Waste Management
• All contractors will be audited as part of a stringent commercial tendering process to ensure they can demonstrate that they are capable of handling the materials expected to be present in the Cormorant Alpha topsides; • TAQA is targeting at least 97% of the material brought back onshore will be recycled and will actively engage with the supply chain and other operators/ industries to explore opportunities to maximise this recovery of the other 3%; • All waste will be managed in compliance with relevant waste legislation by a licenced waste management contractor; and • TAQA will develop and maintain an AWMP to help identify and track all wastes generated.

5.2 Accidental Events

There is the possibility that residual hydrocarbons, chemicals, sands and clays, scale, trace metals, NORM and drainage fluid contained within the cells could be released over a short period of time in the event of the dropping of a significantly-sized object during topsides removal. The impacts relating to the potential release of hydrocarbons have been assessed in this section based on TAQA's latest (worst-case) estimation of the cell attic oil content and against the potential for the release of these hydrocarbons to represent a Major Environmental Incident (MEI; Xodus, 2017). The remaining cell contents have been estimated and assessed using a cell contents desktop modelling study carried out by Intertek (2018).

5.2.1 Accidental release scenario

All marine activities carry with them some risk of accidents. Accidents caused by human error, equipment failure or by extreme natural conditions may result in environmental impacts. The risk of accidental hydrocarbon or chemical release is inherent in all offshore oil and gas activities, and an area of public concern that may have potentially significant impacts on water quality, flora, fauna and other users of the sea.

It is possible to postulate failure scenarios which involve breaching many of the cells and during which sufficient energy may be imparted to the cells contents to mobilise the contents into the surrounding environment. The scenario considered here is a dropped object onto the CGBS during topsides removal activities, resulting in rapid (hours) loss of liquids, with the solid residues remaining in situ and exposed to the wider environment.

The potential impact of any release will be determined by the chemical characteristics of the release (including weathering potential), the circumstances of the release, the environmental conditions at the time, the direction of travel of the release and the presence of environmental sensitivities in the path of the release. These environmental sensitivities will have spatial and temporal variations. Therefore, the likelihood of any accidental release having a potential impact on the environment must take into account the likelihood of the release occurring against the probability of that hydrocarbon or chemical reaching a sensitive area and the environmental sensitivities present in that area at the time.

5.2.2 Description of expected residual cell contents

Evaluation of the Cormorant Alpha CGBS cell inventory has been informed by TAQA's most recent estimate of the remaining hydrocarbon contents of the CGBS and also by Intertek (2018), who estimated and assessed the residual cell contents by undertaking a mass balance exercise based on an understanding of the physical and chemical processes which have led to the deposition of these materials. It should be noted that the Intertek (2018) study carries a degree of uncertainty and is based on iterative desktop modelling and assumptions based on similar CGBS structures and their contents and is presented here as a guideline. TAQA plans to survey and sample the cell contents which will provide improved understanding of the potential residual contaminants. Quantities quoted in this assessment therefore present an indicative worst-case scenario. Refined modelling of the contents and their potential interaction with the environment will be assessed in the Cormorant Alpha Substructure EA.

An assessment of the remaining CGBS cell contents (Intertek, 2018) has assumed that residual materials will be present as either:

- Dissolved solids in the water which takes up the majority of the cell volume;
- A layer adhering to the storage cell walls and roofs (scale);
- Bottom residues above the inert ballast in the floor of the storage cells (sands and clays); and
- Hydrocarbons in the attic spaces, in the form of waxes and oils deposited within the scale and incorporated within the sands and clays.

Table 5-3 summarises the estimated inventory of major components of the cell contents. Table 5-4 summarises any other less prolific, but potentially toxic contents (e.g. heavy metals and NORM). Both tables have been used to inform the environmental impact assessment using the upper bound estimates for cell contents, i.e. the contents of all cells. In reality, only a few cells would be impacted by a dropped object.

Table 5-3 Cell Contents - Major Components

Cell Contents	Best Estimate (Te)	Upper Bound (Te)
Sea Water	45,261	45,261
Scale	4.5	68.5
Sand/clays	328	833
Free Hydrocarbons*	9,227.6**	

* The quantity of hydrocarbons bound to settled particles is currently unknown.

**To be recovered from cell attics post topside lift. Converted from 10,856 m^3 using a crude oil (Pelican crude) density of 0.85.

Table 5-4 Cell Contents – Other (potentially toxic) Components

Cell Contents	Best Estimate (Te)	Upper Bound (Te)
Metals	0.08	0.98
NORM	5.4	37.4
PAH	0.95	3.7

Assessment of the potential release of the hydrocarbon inventory is assessed in Section 5.2.3 and is based on a Major Environmental Incident (MEI) assessment undertaken by Xodus, on behalf of TAQA (Xodus, 2017). Intertek (2018) undertook an assessment of the other potential contaminants within the CGBS cells, the assessment of which is summarised in Section 5.2.4.

5.2.3 Hydrocarbon release

An instantaneous hydrocarbon release into the water column of 10,856 m^3 of crude oil has been assessed here in conjunction with the OPEP modelling and MEI assessment undertaken by Xodus, on behalf of TAQA (Xodus, 2017). The study considers the potential for a series of Major Accident Hazards (MAH) and their potential to constitute a MEI with significant adverse effects on the environment, as defined by the Safety Case Regulations (2015) in accordance with Environmental Liability Directive 2004/35/EC of the European Parliament and of the Council on environmental liability with regard to the prevention and remedying of environmental damage. The Environmental Liability Directive 2004/35/EC defines environmental damage against three criteria:

1. protected habitats or species which has significant adverse effects on them reaching or maintaining favourable conservation status (i.e. designated sites under habitats and birds' directives);
2. significant adverse effects on the ecological potential of water bodies under Water Framework Directive (i.e. non-designated Water Framework Directive (WFD) waterbodies or length of coastline); and, or
3. significant adverse effects on environmental status of marine waters under Marine Strategy Framework Directive (i.e. non-designated MSFD regional seas).

5.2.3.1 Approach

MEI assessment

The maximum expected quantity of crude oil contained in the CGBS cells has been assessed here against the results of the Xodus (2017) assessment, to determine the potential for a MEI in the instance of an instantaneous total loss of containment of a maximum inventory of 10,856 m^3 due to a dropped object. It should be considered that a total loss of containment is highly unlikely, given the cell layout of the CGBS (Figure 2-3).

On review of the MEI assessment, the MAH-33 scenario was highlighted as most closely representing this situation of loss of containment of crude oil. This scenario is outlined in

Table 5-5. Under this scenario, the quantity of hydrocarbons (34,846 m^3) far exceeds the quantity currently stored in the Cormorant Alpha CGBS (10,856 m^3). The main reason for this comparison is to assess the potential for a MEI against an existing modelled scenario.

Table 5-5 Comparable MAH (Xodus, 2017)

Cormorant Alpha MAH Title	Cause and Consequence of MAH	Screening description
MAH-33 Crane Failure/ Dropped Objects	Impact or clash / Dropped object / Human error / Loss of communication / Equipment failure could lead to: • Personnel injuries / fatalities • Damage to process equipment • Damage to pipelines (only if object is dropped overboard onto seabed) • Damage to storage cells	There is the potential for crane failure / dropped objects to result in a hydrocarbon release to sea. MAH-33 could lead to the loss of 34,846 m^3 (approximately 29,169 tonnes) of residual oil. The consequence of this MAH was determined to assess the potential to result in a MEI using deterministic modelling to assess the impact to environmentally sensitive receptors. Key receptors potentially impacted would be habitats and species occurring within the water column, on the sediment, on the shoreline in the eventuality of an oil beaching and animals coming into contact with surface oiling.

Environmental vulnerability to oil spills is both a function of the magnitude of impact and the sensitivity of environmental receptors to such events. There is no standard and widely recognised method of determining the environmental impact associated with crude oil spills, therefore the approach undertaken was based on the “Impact Scales and Gradation of Oil Spill Ecological Hazards and Consequences in the Marine Environments” classification guide described by Patin (2004), which is in line with Directive 2013/30/EU [Article 2(37)], as detailed in Table 5-6 to Table 5-9[2]. Due to the resolution of the model grid the and the extreme nature of the releases being assessed the spatial scale will always be confined or larger. The assessment approach adopted is therefore qualitative, depending on the presence and abundance of receptors in areas predicted to be contaminated. The assessment considers the impact on sediments, the water column, the water surface and the coastline. For the oil releases assessed here, it is assumed that there is potential for an MEI if the general assessment (Table 5-9) is assessed as ‘moderate’ or above whilst no MEI is predicted if the outcome of the general assessment is insignificant or slight.

Table 5-6 Consequence Assessment – Spatial Scale (Area)

Spatial scale	Area under impact
Point	Less than 100 m^2
Local	Range from 100 m^2 to 1 km^2
Confined	Range from 1 km^2 to 100 km^2
Sub-regional	More than 100 km^2
Regional	Spread over shelf area

Table 5-7 Consequence Assessment – Temporal Scale

[2] Adapted from Patin (2004).

Temporal scale	Longevity
Short term	Several minutes to several days
Temporary	Several days to one season
Long-term	One season to one year
Chronic	More than one year

Table 5-8 Consequence Assessment – Reversibility of Changes

Reversibility of changes	Longevity of disturbance
Reversible (acute stress)	Acute disturbances in the state of environment and stresses in biota that can be eliminated either naturally or artificially within a short time span (several days to one season)
Slightly reversible	Disturbances in the state of environment and stresses in biota that can be eliminated either naturally or artificially within a relatively short time span (one season to three years)
Irreversible (chronic stress)	Prolonged disturbances in the state of environment and stresses in biota that exist longer than three years

Table 5-9 Consequence Assessment – General Assessment

General assessment	Disruption
Insignificant	Minimal changes that are either absent or not discernible.
Slight	Slight disturbances to the environment and short-term stresses in biota are discernible (below minimum reaction threshold 0.1% of natural population reaction).
Moderate	Moderate disturbances to the environment and stresses in biota are observed (changes up to 1% of natural population reaction are feasible).
Severe	Severe disturbances to the environment and stresses in biota are observed (up to 10% of natural population).
Catastrophic	Catastrophic disturbances to the environment and stresses in biota are observed (up to 50% of natural population). Changes are irreversible and stable structural and functional degradation of a system is evident.

Oil spill modelling

OPEP modelling outputs were reviewed during the Xodus (2017) study, to determine the fate and effects of any credible oil release scenarios. This was undertaken using SINTEF Marine Environmental Modelling Workbench (MEMW) Version 7.01 to assess the potential for an MAH to lead to a MEI via a deterministic run. The SINTEF MEMW is a graphical user interface that incorporates OSCAR which is a numerical model developed by SINTEF to model the fate of spilled oil at sea. It has a built-in oil database, containing over 110 oils. OSCAR is a 3D model, designed to predict the fate of oil particles at the surface, sub-surface and once dissolved. OSCAR calculates and records the distribution in three physical dimensions, plus time, of a contaminant on the water surface, along shorelines, in the water column and in the sediments.

The potential environmental impact of a hydrocarbon release depends on a wide variety of factors, which in the offshore environment include:

- the release volume;
- the type of hydrocarbon released;
- the slick trajectory;
- the weathering properties of the hydrocarbon; and
- any environmental sensitivities present in the path of the slick (these may change with time) including potential beaching locations.

The model was run as a stand-alone deterministic model (using the same start date, time and random seed) of the crane failure / dropped objects scenario (MAH-33). A worst case (largest) release volume of 34,846 m^3 (approximately 29,619 tonnes) was used. In doing this it was possible to understand the fate of the oil released during this scenario and to fully evaluate impacts on shoreline, sediment, water column and the sea surface over the duration of the release. The fate of the released hydrocarbons over time are presented in Figure 5-1. Beaching of the oil first occurs on Day 4 with the amount onshore reaching a maximum of 1,664 tonnes (5.6%) after 12 days, before decreasing to 1,008 tonnes (3.4% of the total release amount) by Day 30. Evaporation and dispersion in the water column were the most significant removal pathway for the oil accounting for 53.5% (15,980 tonnes) and 34.7% (10,360 tonnes) by Day 30. By Day 30 7.3% (2,176 tonnes) had biodegraded, 0.6% (188 tonnes) had entered the sediment, 0.5% (140 tonnes) remained on the surface and none had left the model domain.

It should be reiterated here, that under the current scenario (10,856 m^3 of attic oil), represents less than a third of the amount modelled under scenario MAH-33, implying that the maximum percentage beached would be much less, evaporation and dispersion would occur much more rapidly and environmental residuals by Day 30 would be negligible.

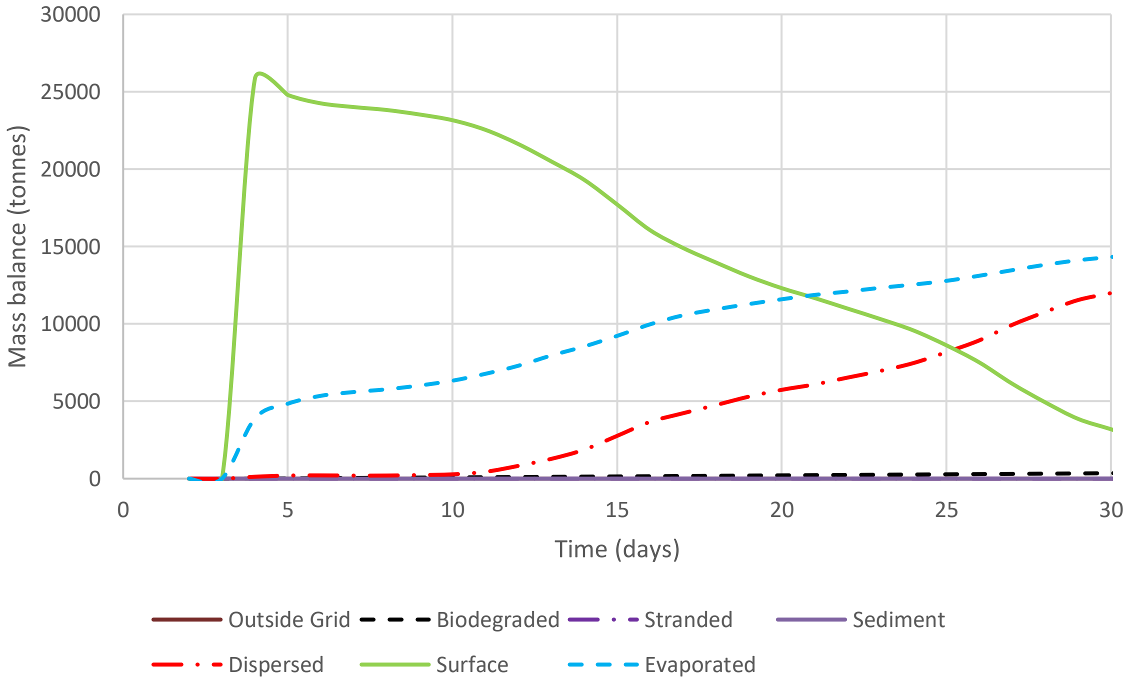

Figure 5-1 Mass Balance of Oil Released due to MAH-33 at Cormorant Alpha

5.2.3.2 Potential environmental impact

Environmental vulnerability to oil release events is both a function of the likelihood of an impact and the sensitivity of the environmental receptors to such events. An assessment was undertaken based on the MAH-33 scenario and was based on the environmental sensitivities relevant to Cormorant Alpha decommissioning activities, presented in Section 3.0. The potential impacts on the environmental aspects sensitive to hydrocarbon contamination and their assessment in the context of a MEI are outlined below.

Sediment

Currently, no published UK thresholds for oil in sediment exist; however, the Fisheries Research Services have carried out temporal studies into the levels of hydrocarbons in the sediments from the East Shetland Basin and the Fladden grounds. Both areas are potentially sinks for contaminants such as hydrocarbons (accumulating areas) and important fishing grounds (Marine Scotland, 2008). The results of these surveys showed that the sediment concentrations had decreased over time since the areas were first surveyed in the 1980s and that surveys carried out in 2001 and 2002 (Fladden and East Shetland Basin respectively) showed that the sediments were below the background of 50 µg/g dry weight, irrespective of sampling station proximity to oil and gas well sites and infrastructure. Therefore, determining that hydrocarbon sediment concentration of 50 µg/g are common in North Sea sediments and levels higher than this appear to return to background levels over time. In terms of mass 50 µg/g equates to 6.875 g/m^2 (assuming a sediment bulk density of 2.75 kg/m^2).

Sediment hydrocarbon concentrations are predicted by deterministic modelling. Sediment contamination as a result of MAH-33 is predicted around the Shetland coast. Hydrocarbon concentration in the sediment resulting from MAH-33 is less than 1 g/m^2 across much of the contaminated area. Concentrations resulting from MAH-33 are not predicted to exceed background levels (Figure 5-2). The general assessment of the potential to release crude oil in a sufficient volume to cause significant adverse change to sediment is deemed to be *insignificant* and the rationale behind this is provided in Table 5-11.

Water Column

Fish juveniles and eggs are particularly sensitive life-stages with respect to oil in the water column, with dispersed oil concentrations as low as 1 mg/l having negative effects (Broderson *et al*. 1977). Therefore, a threshold of 1 ppb dispersed oil is considered protective of the water column.

The volume of water predicted to experience greater than 1ppb concentrations as a result of the MAH-33 scenario was 2,070 km^3. Although an impact on protected fish species may be expected if a large release coincides with spawning or nursery activity, none of the fish species likely to be present in the area are listed as protected species. However, any migrating protected species passing through the impact area could potentially be impacted, although any impact is not expected to adversely impact these species, attributed to the mobility of migrating fish species coming into contact with the contaminated areas. The general assessment of the potential to release crude oil in a sufficient volume to cause significant adverse change to the water column is deemed to be *insignificant* and the rationale behind this is provided in Table 5-11.

Sediment Oiling Concentration (MAH-33)

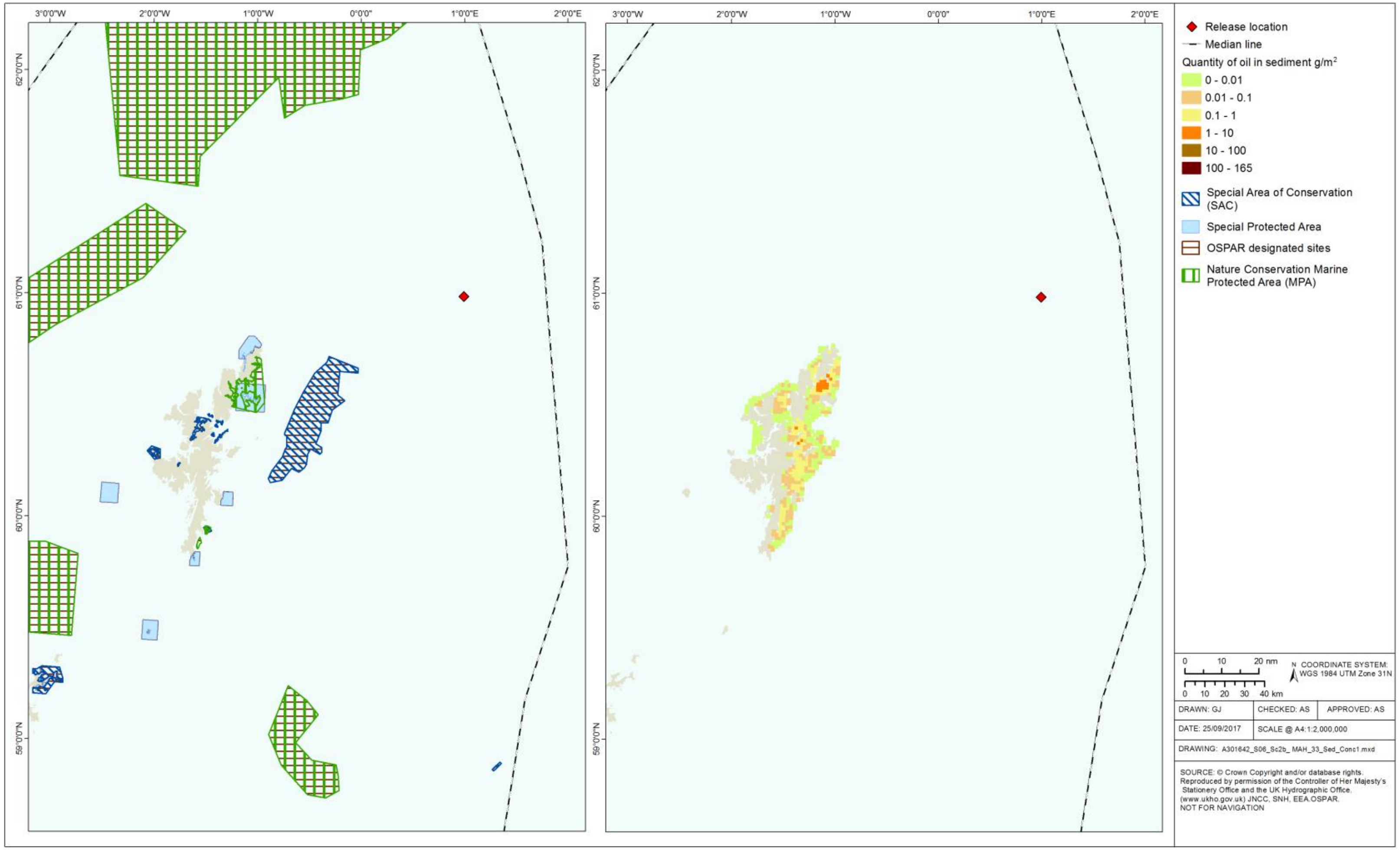

Figure 5-2 Sediment Oiling Concentration (MAH-33)

Surface Oiling

Birds on the sea surface are sensitive to oiling which damages their feathers and thus causes death via waterlogging and hypo/hyperthermia. Canadian research (O'Hara and Morandin, 2010) has identified that sheens as thin as 0.1 µm can have a negative impact on feather structure. At certain times of the year there is potential for high densities of birds to be on the sea surface in the vicinity of the projected oil sheen and to encounter the resulting surface slick. The SOSI (Webb *et al.*, 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution. Seabird vulnerability in Block 211/26 where Cormorant Alpha is located is classed as low through the year. Marine Mammals also have potential to encounter the surface slick, although no specific threshold for impact has been determined.

As a result of the loss of inventory scenarios surface oiling above 0.1 µm was predicted to affect an area of 25,600 km^2. The release trajectory extends 100 km to the north of the release location and 300 km to the south. The thickest areas of hydrocarbon follow a south westerly trajectory from the release location before reaching Shetland coast moving down the east coast as shown in Figure 5-3.

The predicted surface thickness resulting from the MAH-33 scenario reach a maximum of 72 µm in the Hermaness, Saxa Vord and Valla Field SPA and 161 µm in the Fetlar SPA. The maximum predicted in Hermaness, Saxa Vord and Valla Field SPA is localised with low or no contamination predicted across much of the site. This extent of surface thickness is anticipated to be short term due to the high energy environment at the coastal cliffs. The maximum surface thickness predicted in the Fetlar SPA is restricted to the north coast of the island. Of the species protected by Fetlar SPA red-necked phalarope may be considered the most sensitive due to the proportion of the British population present during the breeding season (75%) (JNCC, 2005). In Shetland, this species typically remains in moorland pools and mires and is unlikely to be present in the sea during the breeding season (Ellis, 2004). This coastline is primarily rocky shore, an unlikely habitat for the remaining protected species: dunlin and whimbrel breed in moorland and upland habitats, potentially utilising sandy and muddy shores for feeding and the arctic tern which typically nest on shingle and sandy beaches and remain close whilst feeding (JNCC, 2021). The great skua is the most likely species to occupy this area of coast, however as a species which primarily hunts seabirds when nesting in small colonies, it is unlikely that large numbers of greats skuas will be present in the seas on the north coast of Fetlar at any one time (JNCC, 2016).

The general assessment of the potential to release crude oil in a sufficient volume to cause significant adverse change to the water surface is deemed to be *slight* and the rationale behind this is provided in Table 5-11.

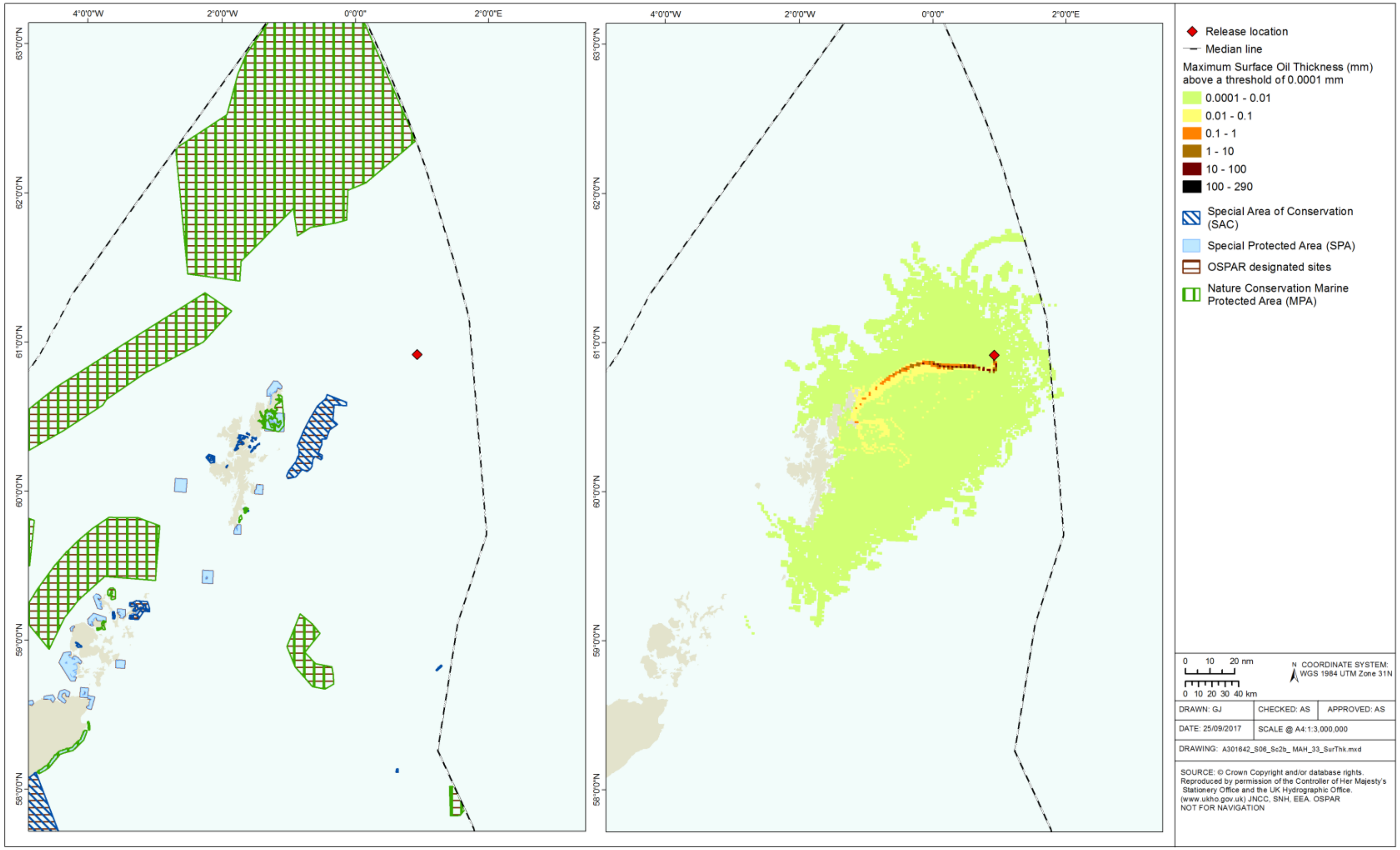

Figure 5-3 Surface Oiling Concentration (MAH-33)

Coastline

The International Tankers Owners Pollution Federation (ITOPF) have produced a Technical Information Paper offering some guidance on how to estimate the stranded oil volume from a resultant oil release event (ITOPF, 2011). Using the examples provided in the paper, the values for light, moderate and heavy oiling were estimated for each of the hydrocarbons used in the deterministic modelling[3]. The ranges are detailed in Table 5-10.

Table 5-10 Stranded oil categories for Cormorant Alpha

Hydrocarbon	Density of analogue	Light Oiling Equivalent to 0.1 – 1 l/m^2 (kg/m^2)	Moderate Oiling Equivalent to 1 – 10 l/m^2 (kg/m^2)	Heavy Oiling Equivalent to > 10 l/m^2 (kg/m^2)
Pelican Crude	0.85	0.085 to 0.85 kg/m^2	0.85 to 8.5 kg/m^2	>8.5 kg/m^2

Figure 5-4 indicates that no sites are predicted to be contaminated with high concentrations of oiling as a result of MAH-33, however seven of the nine contaminated sites identified are affected by moderate levels of shoreline oiling, including those in the north of Shetland (Fetlar SPA, Noss SPA, Yell Sound Coast SAC and Fetlar to Haroldswick MPA). This extent of surface thickness is anticipated to be short term due to the high energy environment at the coastal cliffs. The general assessment of the potential to release crude oil in a sufficient volume to cause significant adverse change to the coastline is deemed to be *slight* and the rationale behind this is provided in Table 5-11.

[3] The analogue oil has been used for this analysis to be consistent with the modelling output

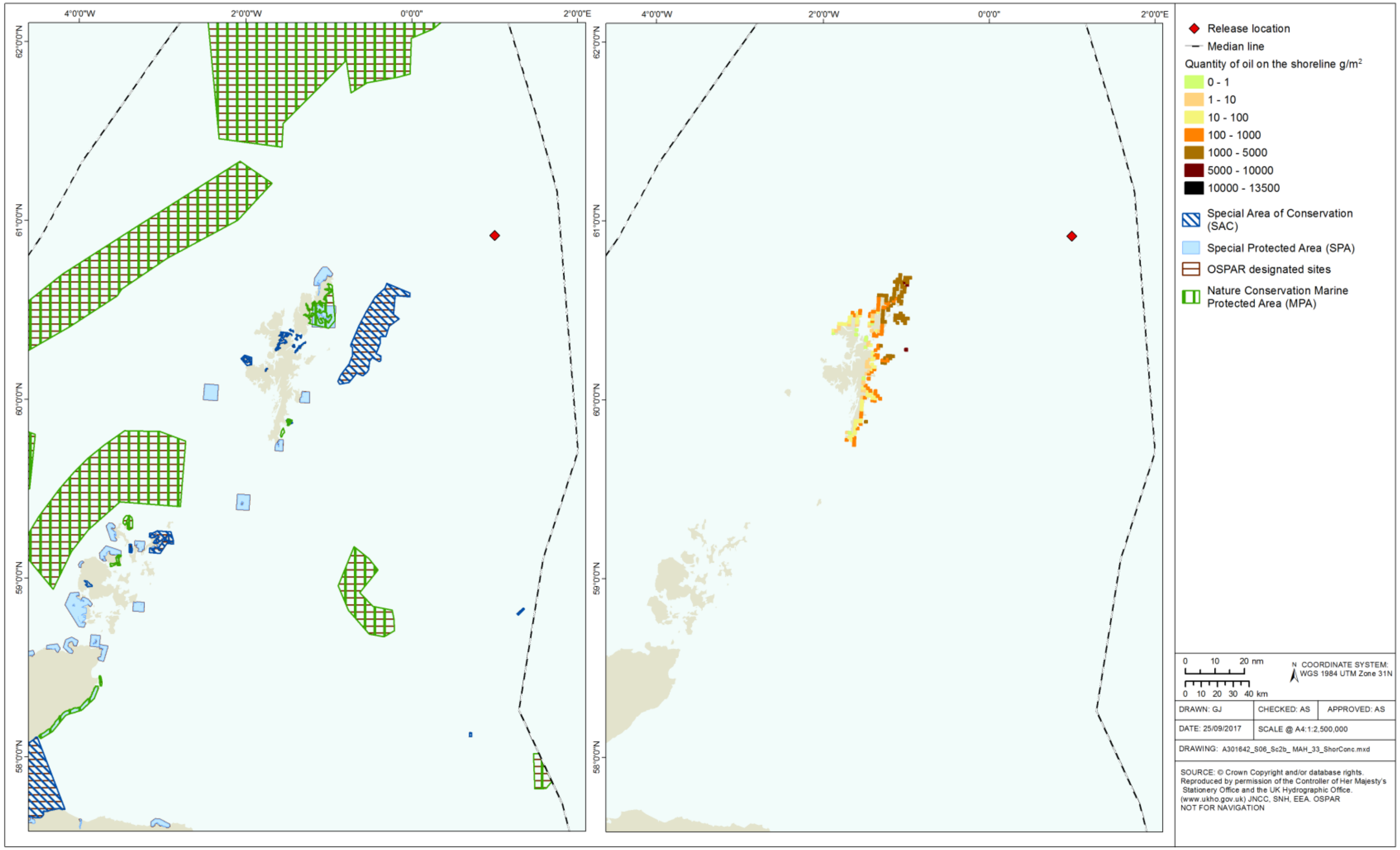

Figure 5-4 **Coastal Protection Sites and Areas of Oil Beaching (MAH-33)**

5.2.3.3 Summary

Although all releases of hydrocarbons to the marine environment have the potential to cause some environmental impact, the general assessment of MAH-33 (Table 5-11) determined that this scenario did not have the potential to release crude oil in a sufficient volume to cause significant adverse change to any protected species or habitat. Under the current scenario (10,856 m^3 of attic oil), represents less than a third of the amount modelled under scenario MAH-33, implying that the maximum percentage beached would be much less, evaporation and dispersion would occur much more rapidly and environmental residuals by Day 30 would be negligible.

Table 5-11 Overall MEI Assessment of the Environmental Aspects of MAH-33 (Xodus, 2017)

Aspect	Spatial scale	Temporal scale	Reversibility of changes	General assessment	Constitutes an MEI
Sediment	Confined	Temporary	Reversible (acute stress)	Insignificant	No
Water column	Sub-regional	Temporary	Reversible (acute stress)	Insignificant	No
Surface oiling	Sub-regional	Temporary	Reversible (acute stress)	Slight	No
Coastline	Confined	Temporary	Reversible (acute stress)	Slight	No

This amount of sediment, water column, surface and coastal contamination is unlikely to cause a measurable significant adverse change to a protected species or habitat as defined by Annex I of the Directive 2009/147/EC (European Commission, 2009), formerly Directive 79/409/EEC, or Annex II and IV of the Directive 92/43/EEC (European Commission, 1992) in accordance with Directive 2013/30/EU [Article 2(37)] and therefore does not have the potential to constitute an MEI. It is therefore expected that (given that this scenario considers a worst-case scenario with a volume of hydrocarbons approximately three times that of the residual CGBS hydrocarbon content) the current hydrocarbon contents of the Cormorant Alpha CGBS would also not constitute a MEI under the same circumstances.

5.2.4 Residual contaminants release

Besides hydrocarbons, the other main components in the CGBS are mostly found in a solid state, bound to the inner walls of the cells and include:

- Sand and clays
- Wax and oil
- Precipitates (Scale)
- Trace metals and NORM
- Other (e.g. Production chemicals and effluent from drains)

The trace metals, NORM and production chemicals within the cells will be distributed among the three solid phase carriers: hydrocarbons (oil or wax), inert solids (sands and clays) or scale.

5.2.4.1 Approach

To assess whether a chemical discharge represents a potential risk, the maximum potential concentration has been compared with a concentration below which any risk is deemed acceptable (Intertek, 2018). The standard model for carrying out this comparison, for seabed discharges on the UKCS, is the Osborne Adams model (Osborne and Adams 2005). In this assessment the expected concentrations were assessed against:

- Background Assessment Concentrations (BAC), as defined by OPSAR (2005a). This approach can only be applied to naturally occurring substances (e.g. trace metals). BACs are environment-specific, as naturally occurring concentrations vary between upper oceanic waters, deep oceanic waters, continental shelf waters and estuaries. In environments such as the North Sea, which has been subject to long term industrial inputs, BAC evaluation depends on defining a pristine environment, i.e. one which has not been significantly affected by chemical inputs.
- Limiting concentrations for substances which are potentially toxic in the marine environment. These are based on laboratory estimates of the toxicity of assessed compounds to representative species of marine algae, planktonic crustaceans and fish larvae, and incorporate a safety factor, designed to reduce the values to levels where any effects on sensitive species are expected to be negligible. Depending on the source these are available as:
    - Ecotoxicological or Environmental Assessment Criteria (EAC, OSPAR 2005b)
    - Environmental Quality Standards (EQS, UKMSAC 2001, UKTAG 2008)
    - Predicted no effect concentrations (PNEC, OGP 2002).

Given that the concentration of any component will reduce with distance from the source, the calculations included consideration of a zone of influence. Intertek (2018) adopted a 500 m radius from the Cormorant Alpha platform as a threshold beyond which contamination levels greater than the assessment criteria would require further investigation. This is also the distance used to assess regulated discharges of offshore chemicals and it thereby provides the most direct benchmark from which acceptability can be inferred.

5.2.4.2 Potential environmental impact

Seabed sediment and water column contamination was also assessed in more detail by Intertek (2018) if the concentration of a contaminant in the residue within the cells was anticipated to be more than EAC (OSPAR 2005). The method for assessment was through determining the ecotoxicological harm to biota feeding on solid residues from the cell contents and assessing the potential for bioaccumulation as the contaminant moves up through the food chain.

Sediment

The main mechanism for potential contaminants to enter the food chain will be by sediment ‘reworkers’ ingesting contaminated sediments. It is likely that the contaminants will be ‘recycled’ through many organisms and physical states before becoming available for consumption by apex predators. Should a dropped object breach the base caisson, there is the potential for a proportion of the residual cell contents to be ingested by bottom-feeding biota and thereby enter the water column and the food chain.

In terms of sedimentary impacts, none of the components of the solid contents assessed could be delivered at sufficient rate, or for long enough duration, to lead to a significant (more than 1%) proportion of the chronic dose in humans:

- None of the components within the cells is capable of concentrating into the food chain in sufficient quantity to deliver an acute dose to humans.
- Only sessile, non-resistant species living on the outer boundary of the contaminated zone will be able to accumulate toxic levels of contaminants. These represent a very small portion of the regional population

A radiological impact assessment was also undertaken by an independent specialist to consider the potential impacts resulting from a release of NORM contaminated sediment from the CGBS. The assessment considered a worst-case release scenario resulting in the greatest potential mass of NORM contaminated sediments being dispersed throughout an area capable of sustaining a small fishing trawler. The exposure of fishermen to the potential NORM release was considered to be acceptable, as it was concluded that no annual dose of any concern would arise as the result of even the worst-case release scenario (ARPS, 2018).

Water column

There may also be impacts on plankton in the water column in the immediate area of the release until the release disperses and dissolves (Brussaard *et al.*, 2016). Such effects will be greater during any periods of plankton blooms and during fish spawning. The contamination of marine prey, including plankton and small fish species, may lead to bioaccumulation. This could potentially have long-term chronic effects such as reduced fecundity and breeding failure on fish, bird and cetacean populations. However, the relatively small volume and localised nature of any release in comparison to the available habitat, the dispersion of any contaminant by prevailing currents and the widespread populations of bottom-feeding biota and plankton is expected to limit these impacts.

The Cormorant Alpha platform (in the context of ICES Rectangle 51F1) is within an area of spawning ground for five species and is also a potential nursery ground for nine species. Although an impact on protected fish species may be expected if a release coincides with spawning or nursery activity, none of the fish species likely to be present in the area are listed as protected species. A release of contaminants is not expected to affect fish spawning or recruitment success as the maximum release volume will be rapidly dispersed and the available spawning and nursery areas are very large. A number of commercially important fish and shellfish species occur in the vicinity of the proposed decommissioning operations (Section 3.2.4). Fish populations may be vulnerable to impacts from exposure to aqueous effluents, especially during the egg and juvenile stages of their lifecycles (Bakke *et al.*, 2013). A release may therefore have a localised effect on the fishing industry, however certain areas be temporarily closed to fishing if deemed necessary.

For water components, it was determined that sulphide, polycyclic aromatic hydrocarbon (PAH) compounds, copper (Cu) and mercury (Hg) could all exceed the assessment criteria following rapid release. This would give rise to locally detectable concentrations over a short period following a catastrophic failure of part of the CGBS. However, the overall impact on the environment is deemed to be low due to the following reasons;

- Sulphide oxidises rapidly to non-harmful sulphate on contact with seawater;
- Cu and Hg are rapidly diluted and detoxified on contact with seawater; and
- PAHs may exceed the assessment criteria on a short duration, however they will also be rapidly diluted and the toxicity criteria referred to in the Intertek (2018) study is four orders of magnitude greater than the assessment criteria, even with a rapid release due to a high energy event the full quantity of PAH would have to be released within minutes to cause any harm to the marine environment.

Bioaccumulation

The bioaccumulation of toxic pollutants in marine life is most likely in mammals that feed near the top of the food chain. The human population, together with cetaceans, are the apex predators in the marine environment. Minke whales have been recorded at medium densities in May and July and white-sided dolphins and white-beaked dolphins are both recorded at relatively medium densities in July (Table 3-3). In the event of a release of contaminants, the potential impact will depend on the species and their feeding habits; the overall health of individuals before exposure; and the characteristics of the contaminants. It is thought unlikely that a population of cetaceans in the open sea would be affected by a release in the long-term (Aubin, 1990). Cetaceans are pelagic (move freely in the oceans) and migrate. Their strong attraction to specific areas for breeding or feeding may override any tendency cetaceans have to avoid contaminated areas (Gubbay and Earll, 2000). However, given the low density of cetaceans in the vicinity of the Cormorant Alpha installation and the rapid dispersal of any contaminants released instantaneously, there is not likely to be any significant impact on individuals or populations.

While metals may bio-accumulate they do not, in general, bio-magnify (i.e. they are not likely to be more concentrated in a species of a higher trophic level than in the prey species). This means that the metals in the CGBS cells are likely to become a very small component of the ubiquitous background metal concentrations in the North Sea (Intertek, 2018).

5.2.4.3 Summary

It was concluded that only immobile (benthic), non-resistant species in the immediate vicinity would be susceptible to bioaccumulation and none of the contaminants are capable of concentrating in the food chain at sufficient quantities to have a toxic effect on the top end of the food chain.

Within the water column, certain contaminants (sulphide, PAH compounds, Cu and Hg) could potentially exceed assessment criteria in an instantaneous release event, however, the rapid dispersion, detoxification and/or dissolution of these components on release would limit any acute impacts.

Given the static nature of many of the residual contaminants within the CGBS (many of which are bound to sediments), the spread of these contaminants between individual cells and the highly unlikely scenario of a full inventory (

Table 5-3 and Table 5-4) release, it is improbable that these contaminants will be released instantaneously into the surrounding environment. The release of these contaminants would be expected at very low levels over time and any instantaneous release would be quickly dispersed.

Although all releases of contaminants to the marine environment have the potential to cause some environmental impact, the general assessment by Intertek (2018) determined that this scenario did not have the potential to release contaminants in sufficient volume to cause significant adverse change to any protected species or habitat.

5.2.5 Combination and transboundary impacts

It is important to consider the potential for impacts to arise from an instantaneous release of the cell contents in conjunction with similar releases from other installations in the wider area. In the North Sea, there are 12 CGBS facilities in the UK sector, 12 in the Norwegian sector, two in the Dutch sector and one in the Danish sector. The closet CGBS to Cormorant Alpha is Dunlin Alpha which is situated 34km southeast.

The failure mechanisms of other CGBS in the area are likely to be different, due to different construction of the substructures (i.e. transitions or different numbers of legs). Since any instantaneous hydrocarbon or chemical release from the cells at the Cormorant Alpha installation is expected to dissipate within days, it is considered very unlikely that additional similar releases from other CGBS facilities would occur in the same timeframe to produce a cumulative impact. Cumulative impacts are therefore considered unlikely due to the relatively short duration of the release in comparison to the relatively large distances between structures over an extended period. However, the contents of the cells may persist for hundreds of years therefore there is the potential for bioaccumulation within the food chain, the potential cumulative impact for this is low as there are only a small number of similar structures in the UK sector of the North Sea.

Existing hydrocarbon spill risks in the North Sea are associated primarily with oil and gas industry activities as well as other marine industries such as merchant shipping and fishing. The closest oil and gas developments to the Cormorant Alpha platform are the North Cormorant platform (15 km northeast), Heather Alpha platform (18 km southwest), the Tern platform (21 km northwest) and the Western Isles FPSO (21 km northwest; Section 3.4.3). The likelihood of a simultaneous accidental release from any of these structures occurring is extremely remote, limiting the cumulative impact from the Cormorant Alpha CGBS and other nearby installations. TAQA will have their OPEP in place, outlining the response measures to be implemented in the event of any accidental release.

There is the potential for released cell contents to cross into the Norwegian sector. The predicted spread of a release due to a comparable dropped object event (Figure 5-3) indicates a negligible impact in Norwegian waters, for a scenario that considers a worst-case scenario with a volume of hydrocarbons approximately three times that of the current CGBS hydrocarbon content . As such, there is not expected to be a significant transboundary impact associated with an instantaneous release from the cells.

5.2.6 Limiting Aspects and Mitigation measures

Several aspects have been identified as limiting the potential impact from instantaneous cell contents release. There are also several factors that will minimise the impacts of instantaneous releases from the cells:

- Under the current scenario (10,856 m^3 of attic oil), represents less than a third of the amount modelled under scenario MAH-33, implying that the maximum percentage beached would be much less, evaporation and dispersion would occur much more rapidly and environmental residuals by Day 30 would be negligible.
- The top of each leg will have an environmental seal to prevent the ingress of seawater,
- Waxy residues are strongly bonded to the walls so would not be released instantaneously (Intertek, 2018);
- Cell contents are compartmentalised, limiting the circulation of hydrocarbons or other contents that could be released from any single ingress to the structure (Intertek, 2018); and
- The geometry of the cells makes it difficult for falling debris to physically pierce the cells (Intertek, 2018).

Further to this, the following mitigation measures would be in place for dropped object prevention, navigational and spill-response concerns:

- TAQA will have a comprehensive topsides removal engineering plan in place for the chosen option, focussing on any integrity issues and ensuring that the prevention of dropped objects is paramount, both from a safety and environmental perspective.

- Existing processes will be used for contractor management and any personnel involved in operations will therefore undergo environmental awareness and emergency response training.
- The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of a releases and to mitigate their impacts should they occur;
- All vessels undertaking decommissioning activities will have an approved SOPEP;
- The substructure will have a temporary ‘Aid to Navigation’ (AtoN) unit installed ensuring 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) and monitoring and maintenance of the system will be via a service contract with a specialist contractor. The existing 500 m safety exclusion zone will remain in operation following removal of the topsides;
- Standard notifications and notice to mariners will detail the presence of the CGBS and associated 500 m safety zone; and
- Admiralty charts and the FishSafe system will be updated to show the location of the CGBS.

TAQA will have an approved OPEP in place for the proposed decommissioning activity, conforming to the Merchant Shipping (Oil Pollution, Preparedness, Response and Co-operation Convention) Regulations 1998, the Offshore Installations (Emergency Pollution Control) Regulations 2002 and TAQA’s HSSE Policy (Appendix A). The OPEP will fully consider the oil spill response requirements of the proposed operations, accounting for the location, the prevailing meteorological conditions and the environmental sensitivities of the area. It will be designed to assist the decision-making process if an incident was to occur, indicate what resources are required to combat the spill, minimise any further discharges, and mitigate its impacts. Small spills, which disperse quickly and pose little threat to environmental sensitivities, will generally be controlled by on-site resources. Larger spills, with the potential to impact the surrounding environment (particularly seabirds), may be managed onshore and could involve external expertise and equipment. All spills will be reported to the relevant authorities using an EPON1 and by telephone as appropriate.

TAQA has access to specialist oil spill response services provided by Oil Spill Response Limited (OSRL) including access to aerial surveillance, aerial dispersant spraying and clean-up equipment and specialist staff.

5.2.7 Residual impact: accidental release scenario

Receptor	Sensitivity	Vulnerability	Value	Magnitude
Sediment	Low	Low	Low	Minor
Water column	Low	Low	Low	Minor
Water surface	Medium	Low	Medium	Minor
Coastline	Medium	Low	Medium	Minor

Rationale

The information in the Environmental and Societal Baseline (Section 3.0) has been used to assign the overall sensitivity, vulnerability and value of the receptors, using the EA Methodology outlined in Section 4.0.

The sediments and water column adjacent to the Cormorant Alpha CGBS and any potential spill route, and their associated biological communities, would not exhibit concentrations of hydrocarbons or other contaminants above background levels in the event or a release. The impact on this around the Cormorant Alpha installation and along the potential route of mobile oil to shore will have some tolerance to accommodate the particular effects that could result from a release (as a result of the mobility of fish and marine mammal species and the extent of spawning and nursery grounds). As potential impacts are not likely to affect the long-term function of a system or a population, there will be no noticeable long-term effects above the level of natural variation experienced in the area and risk is therefore deemed to be low for all aspects.

The *sensitivity* and *value* of the water surface and coastal locations have been assessed as medium, due the potential for a hydrocarbon release to impact protected areas (SPAs and SACs) on the north Shetland coastline. This coastline is rocky and high energy, and it would be anticipated that any hydrocarbons would be quickly dispersed. Bearing in mind that the modelling undertaken as part of the MEI assessment (Xodus, 2017) represents a worst-case scenario that considers a volume of hydrocarbons approximately three times that of the current CGBS hydrocarbon content, it is very likely that this impact would have a lower level of significance than that presented here.

There is expected to be extremely limited potential for cumulative or transboundary impacts from such a release.

Overall, the impact consequence of a dropped object is considered to be *Low*. The likelihood of a release has also been limited and mitigated by TAQA who have numerous measures in place to prevent a dropped object and to minimise the impacts in the very unlikely event of an instantaneous releases from the cells.

Consequence	Impact significance
Low	Not significant

6.0 CONCLUSIONS

Following detailed review of the decommissioning activities, the environmental sensitivities in the area of the Cormorant Alpha platform and industry experience with decommissioning activities, it was determined that eleven of the issues commonly associated with offshore oil and gas activities could be scoped out of detailed assessment. Most of the proposed Cormorant Alpha topsides removal activities will involve surface activities only with a limited number of vessels mostly within the Cormorant Alpha 500 m safety zone. It will not involve any intentional interaction with the seabed, significant discharges to sea or underwater noise generation.

The potential for a dropped object on the CGBS cells was assessed further in terms of the impacts from a release to sea of residual cell contents (including hydrocarbons and other residual contaminants) on any environmental receptors. With numerous control measures in place, the negligible level of impact as assessed by Xodus (2017) and Intertek (2018), the overall design of the CGBS unlikely to lead to a complete loss of inventory, the risk is deemed to be low overall.

This EA has 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 including 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 Cormorant Alpha topsides removal activities do not pose any significant threat to environmental or societal receptors within the UKCS.

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APPENDIX A: ENERGY AND EMISSIONS

Table A-1 Energy and emissions by project activity for Single Lift removal of topsides

Planned activity	Operations energy (GJ)	Operations CO_2 (Te)
Onshore transportation of materials	26	2
Onshore deconstruction	29,378	ND
Onshore recycling of materials	194,466	20,692
Offshore transport (See table 8.2)	60,439	4,485
Total	**248,310**	**25,179**

Table A-2 Offshore transport energy and emissions for Single Lift removal of topsides

Vessel type	Total Duration (days)				Operations energy (GJ)	Operations CO_2 (Te)
	Mob/ Demob	Transit	Working	Wait on Weather		
Single Lift Vessel	2	4	4	2	60,008	4,455
Cargo Barge	2	8	20	6		
Standby vessel	2	8	40	5		
Tugs (4)	8	16	16	8		
Helicopters	<1				431	30
Total offshore transport					**60,439**	**4,485**

APPENDIX B - 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

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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 Hogg, HSSEQ Director

René Zwanepol, NL Country Manager

Sandy Hutchison, Legal, Commercial and Business Services Director

Calum Riddell, Operations Director

Iain Lewis, Europe CFO / Europe Decommissioning Director

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